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Natural Resources
GROUND WATER QUALITY

October 1, 2014

South Dakota Department of Environment and Natural Resources
Groundwater Quality Program
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3182
(605)773-6477

Attn: Mr. Brian Walsh

Dear Mr. Walsh:

At the request of TransCanada, we are providing you the accompanying copy of the Emergency Response Plan (ERP). Additionally, you will find one (1) CD containing Tactical Plans and one (1) CD containing the ESMs.

If you have any questions, please feel free to contact me at (314) 563-1068 or cking@wittobriens.com.

Thank you,

Caleb T. King
Sr. Compliance Consultant
Witt O'Brien's

EMERGENCY RESPONSE PLAN

Keystone Pipeline System

Prepared for:

TransCanada
450 - 1st Street
Calgary, Alberta T2P 5H1
(403) 920-2033

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Dept. of Environment &
Natural Resources
GROUND WATER QUALITY

Prepared by:

Witt O'Brien's
818 Town & Country Blvd., Suite 200
Houston, TX 77024-4564
Phone: (281) 320-9796 I Fax: (281) 320-9700
www.wittobriens.com

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Executive Summary

The Keystone Pipeline is a 2,637 miles (4,235 km) pipeline that transports crude oil from Hardisty, Alberta to markets in the American Midwest at Wood River and Patoka in Illinois, Cushing, Oklahoma, and at Nederland, Texas. The Canadian portion of the pipeline runs from Hardisty, Alberta east into Manitoba where it turns south and crosses the border into North Dakota. From North Dakota, the pipeline runs south through South Dakota and Nebraska. At Steele City, Nebraska, one arm of the pipeline runs east through Missouri for deliveries into Wood River and Patoka, Illinois; another arm runs south through Kansas and Oklahoma for deliveries into Cushing, Oklahoma. In 2013 the Gulf Coast Project was added which extended the pipeline from Cushing to Nederland Texas.

Deliveries to Wood River and Patoka began in the summer of 2010, deliveries to Cushing began in February of 2011. The pipeline system currently has the capacity to deliver up to 700,000 bpd of Canadian crude oil into these important North American refining markets.

A critical aspect of operating the Keystone Pipeline system is to have a comprehensive Emergency Management System. A key component of the system includes having an Emergency Response Plan. The Keystone Emergency Response Plan (ERP or Plan) was prepared to achieve a number of goals: ensure regulatory compliance, appropriate for all key stakeholders including field operations, include all emergencies and response measures, timely internal and external notification procedures, and training requirements. In addition, the plan contains information related to worst case discharge, company owned equipment, environmental sensitivities, contract resources, public officials, and tactical control plans.

The Plan is distributed to key internal and external stakeholders and delivered to TransCanada personnel through a secure internet portal hosted by one of TransCanada's emergency response providers and co-preparer of the plan. The plan has been submitted to the National Energy Board (NEB) in Canada and the United States Department of Transportation's;(DOT) Pipeline and Hazardous Material Safety Administration (PHMSA) office. The plan will be updated annually and when substantial changes are made or when deemed necessary by either of the agencies.

The Keystone ERP is combined with a rigorous training program; retention of and access to the industry's most known response experts; and a state of the art pipeline integrity and maintenance program making emergency response for the Keystone pipeline system a priority fully endorsed at all levels within TransCanada.

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ACKNOWLEDGMENT AND PLAN APPROVAL

The information and procedures in this Plan must be treated as guidelines only. The user should determine to what extent it is practical and advisable to follow them. This decision may involve considerations not discussed in this Plan.

The information and procedures contained herein are considered to be accurate as of this date and are consistent with the National Contingency Plan (NCP) and applicable Area Contingency Plans (ACP) as detailed in Section 1.5.

CERTIFICATION OF QUALIFIED INDIVIDUAL AND ALTERNATE QUALIFIED INDIVIDUAL

TransCanada hereby certifies that the individuals identified as Qualified Individual (QI) and Alternate Qualified Individual (AQI in this Plan have the full authority in accordance with the applicable United States Federal and State regulations and as detailed in this Plan to:

1. Activate and engage in contracting with oil spill removal organizations.

2. Act as a liaison with the pre-designated Federal On-Scene Coordinate (FOSC), and

3. Obligate funds required to carry out response activities.

Plan Approved:



Vice President - Pipeline Safety and Compliance

Signature	Title
Vern Meier	08/20/2013
Name (please type or print)	Date

NOTE: Witt O'Brien's, LLC provided consulting and plan development services in the preparation of this Plan utilizing data provided by the owner/operator. Witt O'Brien's assumes no liability for injury, loss, or damage of any kind resulting directly or indirectly from the use of the regulatory interpretation, response planning, or information contained in this Plan.

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OPERATOR'S STATEMENT - SIGNIFICANT AND SUBSTANTIAL HARM AND CERTIFICATION OF RESPONSE RESOURCES

FACILITY NAME: Keystone Pipeline System

CORPORATE ADDRESS: 450 - 1st Street
Calgary, Alberta T2P 5H1

1.	Is the pipeline greater than 6 and 5/8 inches (168 mm) in outside nominal diameter, greater than 10 miles (16.1 km) in length? and	Yes✓ No
2.	Has any line section experienced a release greater than 1,000 barrels (159 cubic meters) within the previous five years? or	Yes No✓
3.	Has any line section experienced two or more reportable releases, as defined in 49 CFR 195.50, within the previous five years? or	Yes✓ No
4.	Does any line section contain any electric resistance welded pipe, manufactured prior to 1970 and operates at a maximum operating pressure established under 49 CFR 195.406 that corresponds to a stress level greater than 50 percent of the specified minimum yield strength of the pipe? or	Yes No✓
5.	Is any line located within a 5-mile (8 km) radius of potentially affected public drinking water intakes and could reasonably be expected to reach public drinking water intakes? or	Yes✓ No
6.	Is any line located within a 1-mile (1.6 km) radius of potentially affected environmentally sensitive areas and could reasonably be expected to reach these areas?	Yes✓ No

Based on the U.S. DOT PHMSA criteria above, the Keystone Pipeline System is considered "Significant and Substantial Harm".

TransCanada hereby certifies to the Pipeline and Hazardous Materials Safety Administration of the U.S. Department of Transportation that we have identified and ensured, by contract or by other means, the availability of personnel and equipment to respond, to the maximum extent practicable, to a worst case discharge.



Vice President - Pipeline Safety and Compliance

Signature — Title

Vern Meier — 08/20/2013

Name (please type or print) — Date

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U.S. Department
Of Transportation

**Pipeline and
Hazardous Materials
Safety Administration**

1200 New Jersey Ave., S.E.
Washington, DC 20590-0001

May 15, 2009

Mr. Robert Jones
TransCanada Keystone LP/TC
Oil Pipeline Operations, Inc.
717 Texas Street
Houston, Texas 77002

Dear Mr. Jones:

I approved the Facility Response Plan for Sequence Number TC59, TransCanada Keystone LP/TC Oil Pipeline Operations, Inc., on November 5, 2008.

Sincerely,

Melanie M. C. Barber
Environmental Planning Officer
Office of Pipeline Safety
Room E22-210
Office: 202-366-4560

U.S. Department
of Transportation
**Pipeline and Hazardous
Materials Safety Administration**

1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

December 12, 2013

Niki Affleck
Senior Emergency Management Specialist
TransCanada
450 – 1st Street S.W.
Calgary, AB
Canada T2P 5H1

RE: LETTER OF APPROVAL: Keystone Pipeline System, Sequence Number: 2285 August 2013

Dear Ms. Affleck:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) has received and reviewed TransCanada's updated oil spill response plan for Keystone Pipeline System dated August 2013. We conclude that the Plan complies with PHMSA's regulations concerning onshore oil pipelines found at 49 Code of Federal Regulations (CFR) Part 194. Your Response Plan has been approved.

This approval is valid for five years from the date of this letter. You must revise and resubmit a Response Plan for approval by **December 12, 2018**. If discrepancies are found during PHMSA inspections, or if new or different operating conditions or information would substantially affect the implementation of this plan, you will be required to resubmit a revised plan. See 49 CFR § 194.121(b).

Should you have any questions or concerns, please contact me at (202) 366-4595 or by email at PHMSA.OPA90@dot.gov. Please include the sequence number and your PHMSA Operator Identification Number on any future correspondence.

Sincerely,

David K. Lehman

David K. Lehman, Acting Director
Emergency Support and Security Division
Office of Pipeline Safety

cc: PHMSA Central, Southwest and Western Regions
John McHugh, Vice President, Witt O'Brien's, 818 Town & Country Blvd., Suite 200
Houston, TX 77024- 4564

NOTE: It is the responsibility of the holder of this Plan to ensure that all changes and updates are made. The Plan Holder must:

- Remove and discard obsolete pages.
- Replace obsolete pages with the updated pages.

REVISION RECORD		
CHANGE DATE	AFFECTED PAGE NUMBER(S)	DESCRIPTION OF CHANGE(S)
December 2009	Appendix F	Updated Air Operations Checklist
March 2010	Appendix A	Added Location description to A.1
April 2010	FWD	Distribution List updated TSB contact
October 2011	Section 6	Added Drain Tile
December 2011	Entire Plan	Qualified Individual Updated, Drain Tile Information Added, Air Monitoring Guideleins Updated, OSRO Updated, Activation Flowchart Updated, Emergency Response Contractors Updated, MSDS Updated,Misc. Forms Updated
March 2012		Pipeline has been updated.
March 2012	Section 3	Added Range of Reported thicknesses table to Section 3
April 2012	Section 2, Glossary and Acronyms	Updated External Notifications and Glossary
December 2012	Foreword, Sections 1 - 4, Section 6, Apps. C & D, App. G, App. I, Glossary, and Response Zones	Updated Approver, QI(s), other contacts & Distrib. List, Revised Notification Procedures and Response Actions, Revised and added new MSDS, Updated Environmental/Socio Economic Sensitivities, Updated Media Information, Updated Glossary, Updated 24-Hour Emergency Contact Number in all Response Zones, minor typo changes, Uploaded Guidelines for Creating and Maintaining Privilege US and Canada documents and the Oil Properties Composition List into "Other Documents" section

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REVISION RECORD (Cont'd)		
CHANGE DATE	AFFECTED PAGE NUMBER(S)	DESCRIPTION OF CHANGE(S)
August 2013	Entire Plan	Updated Executive Summary, new signature page, change to external and internal contacts, addition of Tank Farm to Cushing Response Zone, change in Worst Case Discharge in all Response Zones, addition of NTSB recommendations, addition of Hurricane Plan, and Hurricane Checklist, addition of TGLO and SD DENR Cross References, addition of Figure 6.7, updated contracts with NRC and WCSS, addition of Environmental Sensitivity Maps and ACPs
August 2013		Added HSE Integrated to plan
August 2013		Added Role of Incident Commander to Patrick Kelly
August 2013		Added Role of Incident Commander to Stephen Bachorcik
August 2013	App A	Added Agreement letter for Quantum Murray LP
October 2013	FWD, Sec 2, Resp Zone Annexes	Change to Executive Summary; Changes to Titles
December 2013	Foreword, Section 1, Section 2, Appendix B	Response to PHMSA Letter of Correction: Added Cushing breakout tank to WCD amount, added bbls, removed column titled Planning Volume and changed PHMSA Sequence number in Figure 1.1; added list of QIs to Section 2; added more detail to WCD calculations for US Response Zones in Appendix B.
February 2014	FWD-8, 2-2	Updated National Response Corporation phone number

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DISTRIBUTION LIST	
COPY NUMBER	PLAN HOLDER[1]
1	Copy removed from circulation
2	TransCanada Senior Emergency Management Specialist 450-1st Street SW Calgary, Alberta T2P 5H1
3	TransCanada Corporate Emergency Operations Center 450-1st Street SW Calgary, Alberta T2P 5H1
4	TransCanada Alternate Corporate EOC 450-1st Street SW Calgary, Alberta T2P 5H1
5	TransCanada Emergency Response Analyst 450-1st Str. SW Calgary, T2P 5H1
6	TransCanada Emergency Preparedness Coordinator, CA 34 Terracon Place Winnipeg, Manitoba R2J 4G7
7	TransCanada Central Region Emergency Operations Center 34 Terracon Place Winnipeg, Manitoba R2J 4G7
8, 9, 10	National Energy Board Secretary 444 Seventh Avenue SW Calgary, Alberta T2P 0X8
11, 12 (electronic)	Office of Pipeline Safety - PHMSA John Hess U.S. Department of Transportation 1200 New Jersey Avenue, SE-E-22-311 Washington, District Of Columbia 20590
13	Witt O'Brien's ePlanPro Manager 818 Town & Country Blvd., Suite 200 Houston, Texas 77024

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DISTRIBUTION LIST (Cont'd)	
COPY NUMBER	PLAN HOLDER
14	TransCanada US Oil Pipeline Operations Emergency Operations Ce 13710 FNB Parkway; Suite 300 Omaha, Nebraska 68154
15	TransCanada Incident Response Specialist, US 13710 FNB Parkway; Suite 300 Omaha, Nebraska 68154
16	TransCanada Oil Control Center 450 1st Street SW Calgary, Alberta T2P 5H1
17	TransCanada Alternate Oil Control Center 450 - 1st Street SW Airdrie, Alberta T2P 5H1
18	Transportation Safety Board Transportation Safety Board of Canada Place du Cen 4th Floor - Suite 481 200 Promenade du Portag Gatineau (Hull), Quebec K1A 1K8
19	TransCanada Director of Canadian Oil Pipeline Operations 450 - 1st Street SW Calgary, Alberta T2P 5H1
20	TransCanada Director of Northern US Oil Pipeline Operations 13710 FNB Parkway; Suite 300 Omaha, Nebraska 68154
21	TransCanada Incident Management Specialist, CA 34 Terracon Place Winnipeg, Manitoba R2J 4G7
22	TransCanada Vice President of Pipeline Safety and Compliance 717 Texas Street Houston, Texas 77002-2761
23	TransCanada - Keystone Ken Jones 425 Diamond Avenue Spruce Grove, Alberta T7X 3B3

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DISTRIBUTION LIST (Cont'd)	
COPY NUMBER	PLAN HOLDER
24	TransCanada Director of Southern US Oil Pipeline Operations 2029 Capital Drive, Suite 100 Tyler, Texas 75703
25	TransCanada Vice President of Oil Operations 450-1st Street SW Calgary, Alberta T2P 5H1
NOTE[1]: The Distribution of this Plan is controlled by the Copy Number located on the front cover or Compact Disk (CD) label. The Plan Distribution Procedures provided in Section 1.3 and the Plan Review and Update Procedures provided in Section 1.4 should be followed when making any and all changes.	

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1.0 INTRODUCTION AND PLAN CONTENT

1.1 Plan Purpose/Objectives

1.2 Scope of Plan

1.3 Controlled Plan Distribution Procedures

1.4 Plan Review and Update Procedures

1.5 Regulatory Compliance

Figure 1.1 Facility Information

Figure 1.2 Piping System Overview

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1.1 PLAN PURPOSE/OBJECTIVES

The purpose of this Emergency Response Plan (ERP or Plan) is to assist TransCanada personnel in preparing for and responding quickly and safely to emergencies originating from the pipelines and associated facilities. The Plan provides techniques and guidelines for achieving an efficient, coordinated, and effective response to emergencies which may occur along the pipeline.

The specific objectives of the Plan are to:

- Establish Response Teams, assign individuals to fill the positions on the teams, and define the roles and responsibilities of team members.
- Define notification, activation, and mobilization procedures to be followed when a discharge occurs.
- Define organizational lines of responsibility to be adhered to during a response operation.
- Document equipment, manpower, and other resources available to assist with the response.
- Ensure compliance with Canadian Onshore Pipeline Regulations and the U.S. National Oil and Hazardous Substances Contingency Plan and associated Area Contingency Plan(s) for the area of operation.

1.2 SCOPE OF PLAN

This Plan has been developed in accordance with the regulation published in the Statutory Orders and Onshore Pipeline Regulations (OPR) (SOR)/99-294, S. 32-34 – Emergency Procedures Manual and Title 49 Code of Federal Regulations (CFR) Part 194 - Response Plans for Onshore Oil Pipelines.

This Plan is meant to comply with all applicable state regulations.

This Plan contains prioritized procedures for Company personnel to prevent and mitigate emergencies resulting from the operation of the pipeline. A description of the Pipeline's details is presented in Figure 1.1 with additional information provided in the sections, appendices and annexes.

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1.3 CONTROLLED PLAN DISTRIBUTION PROCEDURES

The Senior Emergency Response Specialist is responsible for maintenance and distribution of the Plan. Distribution will be handled in the following manner:

- Distribution of controlled Plans is determined by the copy number assigned to agency and designated corporate Plan Holders. A distribution list is included in the Foreword.
- Company personnel who may be called upon to provide assistance during discharge response activities will have access to a copy of the Plan for their use and training.
- Any person holding a controlled copy of the Plan shall ensure that the copy is transferred to their replacement in the event of reassignment or change in responsibility.
- Various regulatory agencies will also be distributed a controlled copy of the Plan. The list of agencies is detailed in the Distribution List located in the Foreword.

1.4 PLAN REVIEW AND UPDATE PROCEDURES

Review/Update

The Plan resides as a web-based document, which permits authorized Corporate and field staff access to make:

- Appropriate revisions as required by operational or organizational changes.
- Appropriate revisions as required by changes in the names and phone numbers detailed in Section 2.0.
- Appropriate revisions as required by improved procedures or deficiencies identified during response team tabletop exercises or actual emergency responses.

Incorporation of Plan Revisions

Email notification allows Authorized Plan Holders to update hard copy Plans as changes occur.

The Individual Plan Holder shall:

- Review and insert the revised pages into the Plan.
- Discard or archive the obsolete pages.

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Agency Revision Requirements

Company shall revise and resubmit changes to the Canadian National Energy Board (CA NEB) and the U.S. DOT/PHMSA Pipeline Response Plans Officer within 30 days of each change that would substantially affect the implementation of the Response Plan. Additionally, the South Dakota Department of Environment and Natural Resources shall be notified within 30 days of any change. Examples of changes in operating conditions that would cause a significant change to the Plan include:

Requiring Changes

- An extension of the existing pipeline or construction of a new pipeline in a response zone not covered by the previously approved Plan.
- Relocation or replacement of portions of the pipeline, which in any way substantially affect the information included in this Plan, such as a change in the Worst Case Discharge (WCD) volume.
- A change in the type of oil handled, stored, or transferred that materially alters the required response resources.
- A change in the name of the Oil Spill Removal Organization (OSRO).
- A material change in capabilities of the OSRO that provides equipment and personnel.
- A change in emergency response procedures.
- A change in the Qualified Individual (QI).
- A change in the NCP or an ACP that has significant impact on the equipment appropriate for response activities.
- Any other changes that materially affect the implementation of the Plan.
- As a result of post incident or drill evaluations.

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1.5 REGULATORY COMPLIANCE

CA NEB and U.S. DOT/PHMSA must be provided such revisions. The Company must submit the U.S. DOT/PHMSA issued Facility Control Number with the changes (the PHMSA Control Number is listed in Figure 1.1). In addition to periodic updates, when applicable, the Facility will resubmit the Emergency Response Plan to U.S. DOT/PHMSA every five years from the last approval date of the Plan.

Except as provided above, amendments to the following do not require approval by U.S. DOT/PHMSA:

- Personnel and telephone number lists included in the Plan.
- Oil Spill Removal Organization(s) (OSRO) change which does not result in a material change in support capabilities.

The development, maintenance, and use of this Plan implements Company policy and addresses the following regulatory requirements and guidelines:

The response zones have been reviewed for consistency with the following plans:

- Canada - NEB Onshore Pipeline Regulations SOR/94-294
- Canada - United States Joint Inland Pollution Contingency Plan - Annex II CANUSCENT
- CA Environment Canada National Environmental Emergencies Contingency Plan
- Greater St. Louis Sub-Area Plan
- U.S. Environmental Protection Agency (EPA) Region 5 Oil and Hazardous Substances Integrated Contingency Plan
- U.S. Environmental Protection Agency (EPA) Region 6, Regional Integrated Contingency Plan
- U.S. Environmental Protection Agency (EPA) Region 7 Regional Contingency Plan
- U.S. Environmental Protection Agency (EPA) Region 8 Regional Contingency Plan
- U.S. National Oil and Hazardous Substances Pollution Contingency Plan (NCP)

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FIGURE 1.1

FACILITY INFORMATION

GENERAL INFORMATION		
Facility Name:	Keystone Pipeline System	
U.S. DOT/PHMSA Control:	2285	
Owner's Name:	TransCanada	
Address:	***Physical Address*** 450 - 1st Street Calgary, Alberta T2P 5H1	***Operator's Address*** 450 - 1st Street S.W. Calgary, Alberta T2P 5H1
Mainline Number:	(800) 447-8066 (24 Hours)	
Contact Person:	Niki Affleck Senior Emergency Management Specialist	
Primary NAICS Code:	486910	
Determination of Significant and Substantial Harm (U.S. DOT PHMSA):	All Response Zones meet the criteria for "Significant and Substantial Harm."	
Operator Statement of (U.S.DOT PHMSA) "Significant and Substantial Harm":	It is the Company's goal to respond as quickly as possible to all uncontrolled releases of crude oil, regardless of the source point location along the system. Based upon this goal, and the overbreadth of the definitions provided in 49 CFR 194.103(c)(4) & (5), the Company is compelled to consider all the active line sections listed below in the Response Zone Annexes as capable of a release potentially causing "significant and substantial harm."	

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PIPELINE LOCATION	
Provinces/States/Counties:	The System covers 6 specific Response Zones covering 3 Provinces, 8 States and 81 Counties specifically detailed in this Figure 1.1.
Provinces Traversed:	Alberta, Saskatchewan, Manitoba
States Traversed:	North Dakota, South Dakota, Nebraska, Kansas, Missouri, Illinois, Oklahoma, Texas
Pipeline System Overview Diagram:	**See Figure 1.2**

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PHYSICAL DESCRIPTION - PIPELINE

Response Zone(s):

- The Keystone Pipeline transports crude oil from Hardisty, Alberta to U.S. Midwest markets at Wood River, Patoka, Illinois, Cushing, Oklahoma and Nederland, Texas. The total length of the Keystone Pipeline is 2,637 miles (4,235 km), which is divided into two sections. The Canadian portion includes 769 miles (1,237 km) of pipeline, pump stations and terminal facilities from Hardisty, Alberta to the Canadian (Manitoba)-U.S. Border (North Dakota). Additionally, there is also a Hardisty West Interconnect (HWI) that connects into the Hardisty Terminal. The U.S. portion includes approximately 1,867 miles (3,005 km) of pipeline, pump stations and terminal stations which extend from the Canadian (Manitoba)-U.S. Border (North Dakota), to Patoka, Illinois; Cushing, Oklahoma; and to Nederland Texas.
- The Keystone Pipeline System is divided into 6 specific Pipeline Response Zones. The Response Zones are as follows (Specific information to Response Zones are provided later in the Response Zone Appendices):

Country	Response Zones		Length (Miles)	Length (Km)
Canada	1	Hardisty Pump Station, Alberta/Regina Pump Station, Saskatchewan	417.67	672.03
	2	Regina Pump Station, Saskatchewan/Haskett Pump Station, Manitoba (extending to the Canada (Manitoba) - U.S. Border (North Dakota))	351.24	656.15
		Total	768.91	1237.18
United States	3	North Dakota, South Dakota, Steele City, Nebraska	640.77	1031
	4	Steele City, Nebraska/Kansas/Missouri/Patoka, Illinois	444.24	714.78
	5	*Cushing Extension* Steel City, Nebraska/Kansas/Cushing, Oklahoma	297.84	479.22
	6	*Gulf Coast* Cushing, Oklahoma/Nederland, Texas	484.57	779.67
	Total		1867.42	3004.67
	Total Length		2636.33	4235.13

General:

- This Plan is written in English and understood by personnel responsible for carrying out the Plan.
- The Keystone Pipeline System includes pipeline sections of 30, 34 or 36-inch diameter pipe, as well as pump stations and terminal facilities.

Pipeline Specifications:

- ***Products Type:***

  Crude Oil

- ***Pipe Detail:*** The pipeline system consists of several pipeline sections. The sections are indicated in Mile Post (MP) / Kilometer Post (KP).

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Pipe Diameter (inches)	Mile Post		Kilometer Post		Country	Location
	From	To	From	To		
30"	0	170.4	0	274.2	Canada	Alberta to Saskatchewan Border
34"	174.4	713.7	274.2	1148.3		Western Saskatchewan to Central Manitoba
30"	713.7	770.3	1148.3	1239.4		Central Manitoba to Canadian-U.S. Border
30"	770.3	1854.5	1239.4	2983.9	United States	Canadian-U.S. Border, through North Dakota, South Dakota, Nebraska, Kansas, Missouri, to Illinois
36"	0	298.0	0	479.5		*Cushing Extension* Nebraska, through Kansas, to Oklahoma
36"	0	484.6	0	779.7		*Gulf Coast* Oklahoma to Texas

** Hardisty West Interconnect (HWI) consists of 42" diameter piping, with a 16" recirculation line back to Gibson Tanks. The length of pipe from the HWI Facility to the Hardisty Terminal is approximately 0.78 miles (1.25 km) and is 36" in diameter.

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RESPONSE ZONE INFORMATION

Response Resources:

Facility spill mitigation procedures and response guidelines are provided in Section 3.0 for discharges that could result from any of the following scenarios:

- Pipeline rupture/leak
- Explosion and/or fire
- Failure of facility piping
- Equipment failure (e.g. pumping system failure, relief valve failure, etc.)

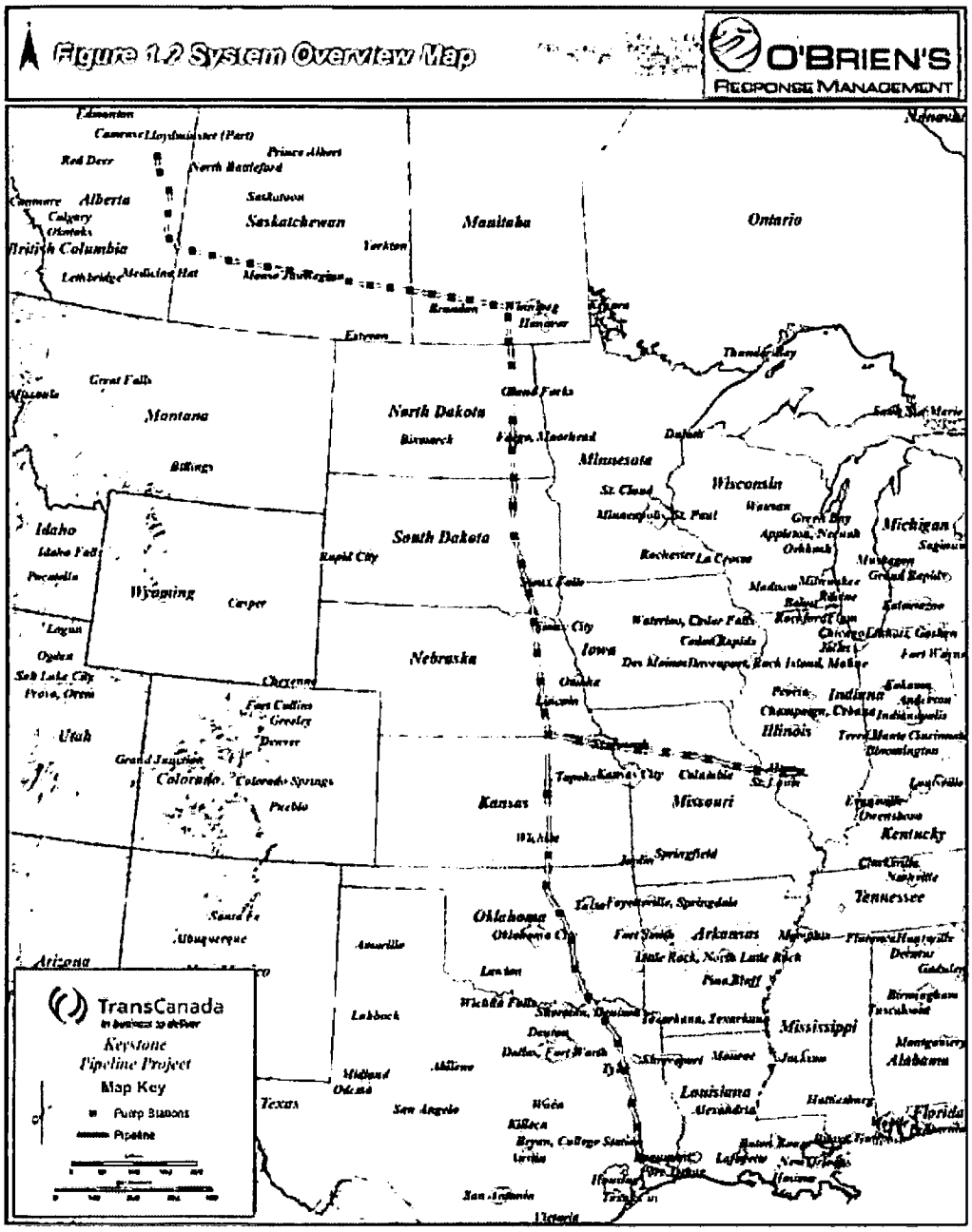
Response Zone	Discharge Scenario	Provinces / Counties Traversed
Hardisty Pump Station/ Regina Pump Station	39,723 Bbls	Alberta, Saskatchewan , Eastern Alberta, Western Saskatchewan, Eastern Saskatchewan
Regina Pump Station / Haskett Pump Station	47,782 Bbls	Saskatchewan, Manitoba , Eastern Saskatchewan, Southwestern Manitoba, Western Saskatchewan
North Dakota, South Dakota, Nebraska	33,058 Bbls	Barnes, Beadle, Butler, Cavalier, Cedar, Clark, Colfax, Day, Gage, Hanson, Hutchinson, Jefferson, Kingsbury, Marshall, McCook, Miner, Nelson, Pembina, Platte, Ransom, Saline, Sargent, Seward, Stanton, Steele, Walsh, Wayne, Yankton
Kansas, Missouri, Illinois	28,787 Bbls	Audrain, Bond, Brown, Buchanan, Butler, Caldwell, Carroll, Chariton, Clay, Clinton, Cowley, Dickinson, Doniphan, Fayette, Lincoln, Madison, Marion, Marshall, Montgomery, Nemaha, Randolph, St. Charles, Washington
Cushing Extension	105,000 Bbls	Atoka, Bryan, Butler, Clay, Coal, Cowley, Dickinson, Hughes, Jefferson, Kay, Lincoln, Marion, Noble, Okfuskee, Payne, Seminole, Washington, Marshall, Nemaha, Brown, Doniphan, Cedar, Wayne, Stanton, Platte, Colfax, Seward, Saline, Gage, Creek, Pontotoc, Johnston
Gulf Coast	34,539 Bbls	Angelina, Atoka, Bryan, Cherokee, Coal, Creek, Delta, Fannin, Franklin, Hardin, Hopkins, Hughes, Jefferson, Johnston, Lamar, Liberty, Lincoln, Nacogdoches, Okfuskee, Orange, Payne, Polk, Pontotoc, Rusk, Seminole, Smith, Upshur, Wood, Kay, Noble

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FIGURE 1.2

PIPING SYSTEM OVERVIEW

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Figure 1.2 System Overview Map

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
(281)320-9796

O'BRIEN'S RESPONSE MANAGEMENT



2.0 NOTIFICATION PROCEDURES

2.1 Internal Notifications

2.2 External Notifications

Figure 2.1 Emergency Activation Flowchart

Figure 2.2 Internal Notification References

Figure 2.3 Notification Data Sheet

Figure 2.4 External Notification Flowchart

Figure 2.5 External Notification References

Figure 2.6 Possible Command Post Locations

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This Section is a guide for notification procedures that should be implemented immediately after discovering a discharge incident and, if possible, securing the source. Internal and external notifications are described separately for clarification purposes only. All notifications are of extreme importance and must be completed in a timely manner.

2.1 INTERNAL NOTIFICATION

The following internal notifications should be made for each emergency incident to the extent that the incident demands (telephone reference is provided in Figure 2.2). In no event shall notification be delayed because the immediate supervisor is inaccessible. Authorization is given to bypass management levels if necessary to provide timely notification to appropriate management. The typical internal notification responsibilities for each person potentially involved in the initial response are as follows:

Employee Discovering Discharge

- Immediately notify the Keystone Oil Control Center (OCC) (403) 920-8080.
- Notify the local fire department, police department, and rescue, as needed.
- Notify the Spill Response Contractor, Quantum Murray at (877) 378-7745 (Canada only).
- Notify the Spill Response Contractor, National Response Corporation at (800) 899-4672 (US only).
- Notify the contracted Spill Management Team, the O'Brien's Group at (985) 781-0804 if required (Canada & US).
- Notify Area Manager or Regional On-Call Manager.

Keystone Oil Control Center (OCC)

- Verify emergency.
- Immediately notify the OCC and Regional On-Call Manager.
- Notify the emergency response contractor if the employee that discovered the discharge has not already made the notification.

Calgary Emergency Operations Center (EOC) Manager

- Once the emergency has been verified by the Oil Control Center (OCC), request contact information for Regional On Call Manager.
- Contact the Regional On Call Manager to confirm activation of Regional EOC and inform that activation of the Corporate EOC will be completed.
- Notify the Corporate Emergency Response Team (CERT) and activate the Corporate EOC.
- Dial into Regional EOC conference line to establish communications with Regional EOC and Incident Management Team on site.
- Once Corporate EOC is activated, determine with Corporate Security whether emergency seems to meet "crisis" criteria.
- If yes, ensure Corporate Security activates TransCanada's Crisis Management Team.
- Continue to provide support to both Regional EOC and Incident Management Team throughout the emergency response phase.

Corporate Security

- Engage in Corporate Emergency Operations Center (EOC)
- Confirm emergency meets "crisis" criteria.
- Notify the Executive VP of Operations and Engineering.

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Regional Emergency Operations Center

- Activate Regional Emergency Operations Center (EOC).
- Set up Regional conference line to establish communications with Incident Management Team and Corporate Emergency Operations Center (EOC).
- Immediately provide support to Incident Management Team.
- Complete all local notifications.
- Facilitate ongoing communication between Incident Management Team and the Corporate EOC.
- Transmit appropriated MSDS to Incident Commander, local officials, and State Environmental Agencies.

Corporate Emergency Response Team (CERT)

- Attend Corporate Emergency Operations Center (EOC).
- Immediately notify senior management to inform about the emergency event.
- Fulfill profile of service and functional plan as required based on the type of emergency event.
- Continue to provide support to Incident Management Team and Regional EOC.
- Notify: U.S. National Response Center, the CA Transportation Safety Board National Occurrence Hot Line, CA National Energy Board, appropriate Federal agencies, County Emergency Management, Province/State Environmental Agency, and the Utilities One-Call, as needed (notification requirements and contact information are listed in Figure 2.5).

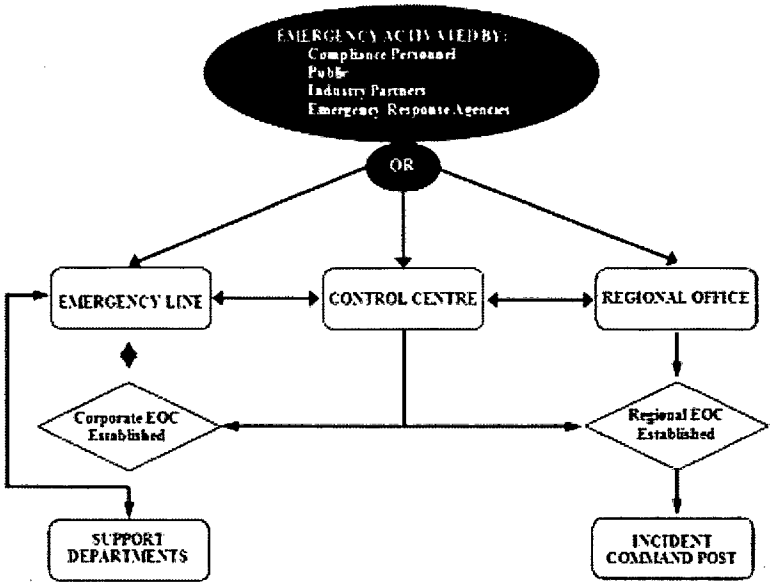
Witt O'Brien's Command Center

- Email is received at the Witt O'Brien's Command Center as well as by key Response Services personnel.
    - Primary - response@wittobriens.com
    - Secondary - ccenter@wittobriens.com

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FIGURE 2.1

EMERGENCY ACTIVATION FLOWCHART



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FIGURE 2.2

INTERNAL NOTIFICATION REFERENCES

CORPORATE RESPONSE PERSONNEL / OTHER COMPANY CONTACTS INTERNAL NOTIFICATIONS				
POSITION/TITLE	NAME	OFFICE	HOME	CELL
	Keystone Oil Control Center	(403) 920-8080		

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INTERNAL NOTIFICATIONS (Cont'd) Hardisty Pump Station/ Regina Pump Station			
TITLE	ICS ROLE	NAME	NUMBERS
Director		Michael Liao	(204) 957-6832 (Office) (204) 260-9364 (Cell)
Qu'Appelle Area Manager	Incident Commander	Deanna Doig	(306) 347-4307 (Office) (306) 781-2964 (Home) (306) 533-4852 (Cell)
Hardisty Area Manger	Incident Commander	Bryan Templeton	(780) 888-2668 (Office) (780) 842-4023 (Home) (403) 928-1852 (Cell)
Incident Response Specialist	Incident Commander, Operations Section Chief, Environmental Unit Leader	Gary Trask	(204) 957-6837 (Office) (204) 736-4730 (Home) (204) 619-2416 (Cell)
Palliser Area Manager	Incident Commander, Planning Section Chief	Rob Ferguson	(403) 529-4318 (Office) (403) 548-6077 (Home) (204) 233-7109 (Cell)
RAR Manager	Incident Commander	Patrick Kelly	(204) 957-6813 (Office) (204) 330-5139 (Home) (204) 918-2984 (Cell)
Incident Response Specialist	Incident Commander	Ken Jones	(780) 962-7331 (Office) (587) 337-8713 (Cell)
Heartland Area Manager	Incident Commander	Stephen Bachorcik	(306) 773-7501 (Office) (306) 750-2103 (Cell)

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INTERNAL NOTIFICATIONS (Cont'd) Regina Pump Station / Haskett Pump Station			
TITLE	ICS ROLE	NAME	NUMBERS
Director		Michael Liao	(204) 957-6832 (Office) (204) 260-9364 (Cell)
Agassiz Area Manger	Incident Commander, Operations Section Chief	Barry Adamson	(204) 957-6840 (Office) (204) 878-4473 (Home) (204) 471-7918 (Cell)
Qu'Appelle Area Manager	Incident Commander	Deanna Doig	(306) 347-4307 (Office) (306) 781-2964 (Home) (306) 533-4852 (Cell)
Incident Response Specialist	Incident Commander, Operations Section Chief, Environmental Unit Leader	Gary Trask	(204) 957-6837 (Office) (204) 736-4730 (Home) (204) 619-2416 (Cell)
RAR Manager	Incident Commander	Patrick Kelly	(204) 957-6813 (Office) (204) 330-5139 (Home) (204) 918-2984 (Cell)
Incident Response Specialist	Incident Commander	Ken Jones	(780) 962-7331 (Office) (587) 337-8713 (Cell)

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INTERNAL NOTIFICATIONS (Cont'd) North Dakota, South Dakota, Nebraska			
TITLE	ICS ROLE	NAME	NUMBERS
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
West River Area Manager	Incident Commander	Virgil Pfenning	(402) 492-7469 (Office) (402) 889-7383 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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INTERNAL NOTIFICATIONS (Cont'd) Kansas, Missouri, Illinois			
TITLE	CS ROLE	NAME	NUMBERS
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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INTERNAL NOTIFICATIONS (Cont'd) Cushing Extension			
TITLE	ICS ROLE	NAME	NUMBERS
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Red River Area Manager	Incident Commander, Operations Section Chief	Jeff Brown	(903) 939-0109 (Office) (254) 893-3082 (Home) (903) 714-5434 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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INTERNAL NOTIFICATIONS (Cont'd) Gulf Coast			
TITLE	ICS ROLE	NAME	NUMBERS
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Red River Area Manager	Incident Commander, Operations Section Chief	Jeff Brown	(903) 939-0109 (Office) (254) 893-3082 (Home) (903) 714-5434 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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QUALIFIED INDIVIDUALS Hardisty Pump Station/ Regina Pump Station			
NAME	OFFICE	HOME	CELL
Deanna Doig	(306) 347-4307	(306) 781-2964	(306) 533-4852
Bryan Templeton	(780) 888-2668	(780) 842-4023	(403) 928-1852
Gary Trask	(204) 957-6837	(204) 736-4730	(204) 619-2416
Rob Ferguson	(403) 529-4318	(403) 548-6077	(204) 233-7109

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QUALIFIED INDIVIDUALS Regina Pump Station / Haskett Pump Station			
NAME	OFFICE	HOME	CELL
Barry Adamson	(204) 957-6840	(204) 878-4473	(204) 471-7918
Deanna Doig	(306) 347-4307	(306) 781-2964	(306) 533-4852
Gary Trask	(204) 957-6837	(204) 736-4730	(204) 619-2416

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QUALIFIED INDIVIDUALS North Dakota, South Dakota, Nebraska			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Virgil Pfenning	(402) 492-7469		(402) 889-7383
Jon Wickersham	(402) 492-7406		(402) 672-6386

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QUALIFIED INDIVIDUALS Kansas, Missouri, Illinois			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Jon Wickersham	(402) 492-7406		(402) 672-6386

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QUALIFIED INDIVIDUALS Cushing Extension			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Jeff Brown	(903) 939-0109	(254) 893-3082	(903) 714-5434
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Jon Wickersham	(402) 492-7406		(402) 672-6386

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QUALIFIED INDIVIDUALS Gulf Coast			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Jeff Brown	(903) 939-0109	(254) 893-3082	(903) 714-5434
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Jon Wickersham	(402) 492-7406		(402) 672-6386

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2.2 EXTERNAL NOTIFICATIONS

External notifications are those made to entities outside of the Company including Federal, Province/State and local regulatory agencies, as well as railroad and utility companies. These notifications include both verbal and written requirements.

Verbal Notification Requirements

Immediate internal notification is to be made in accordance with the Internal Notification Procedures found in Section 2.1 when a system operational failure or other type of incident occurs. This will allow immediate evaluation and classification of incidents and prompt immediate telephonic notification as detailed in Figure 2.4 and 2.5 to the Transportation Safety Board, National Response Center (NRC), Province/State agencies, local agencies, and other Federal agencies as required. The information found on the Notification Data Sheet, Figure 2.3, should be used to disseminate incident information to the appropriate agencies.

For the purpose of this procedure, immediate reporting means reporting the instant a person has knowledge of an actual or suspected leak, uncontrolled release of product, any unplanned spill or other pipeline system failure. Information that causes any employee to reasonably suspect a leak or uncontrolled release of product must be immediately reported, even when the actual existence or location of a leak or release cannot yet be confirmed.

Written Notification Requirements

In the United States, a written report is to be filed as soon as practical, but not later than 30 days after discovery of the incident to the Information Resources Manager, Office of Pipeline Safety, Pipeline and Hazardous Materials Safety Administration, US Department of Transportation. Information concerning the event shall be reported on Pipeline and Hazardous Materials Safety Administration Form 7000-1 on-line on the Pipeline and Hazardous Materials Safety Administration website via log-in. Paper reports are not required. This report is to be filed for all incidents reported telephonically and other incidents required to be reported in accordance with the criteria listed below.

The information required for completing the 30-day written report will be furnished by the Area Offices to the Department of Transportation Regulatory Compliance Department for submission to the Department of Transportation. Any subsequent or additional information that was not reported on the initial written report must be reported to the Department of Transportation Regulatory Compliance Department by the Area Office. This information will be utilized in filing a supplemental written report to the Department of Transportation as soon as possible, but no later than 30 days after its discovery.

In Canada, a detailed written incident report is required as soon as practicable.

Transportation Safety Board (TSB)

The TSB's role is to advance transportation safety through the investigation of transportation occurrences in the marine, pipeline, rail and aviation modes.

TSB Classification System

The primary criterion for determining if an occurrence in any mode will be investigated is whether or not such analysis is likely to lead to a reduction of risk to persons, property, or the environment.

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Class 1 Occurrences (Public Inquiry)

- The potential for reducing the risk to persons, property, or the environment;
- Whether an inquiry would uncover facts that might not otherwise be made known;
- Whether an inquiry would result in quicker remedial action;
- The actual or potential extent of injuries and/or loss of life;
- The degree of public interest in and concern about public safety; or
- The possible involvement of an arm of government.

Class 2 Occurrence (Individual Occurrence Investigation)

- There is a high probability of advancing Canadian transportation safety in that there is significant potential for reducing the risk to persons, property, or the environment; or
- The Governor in Council so requests (pursuant to Section 14(1) of the CTAISB Act).

Class 3 Occurrences (Individual Occurrence Investigation)

- There is significant public expectation that the TSB should independently make findings as to cause(s) and contributing factors; or
- There is potential for better understanding the latent unsafe conditions contributing to a significant safety issue; or
- A government representative so requests (pursuant to Section 14(2) of the CTAISB Act); or
- The Board must do so to meet its obligations or commitments.

Class 4 Occurrences (Safety Issue Investigation)
Multiple occurrences, which the Board deems to be indicative of significant unsafe situations or conditions, will be subject to a safety issue investigation when:

- There is a high probability of advancing Canadian transportation safety by reducing the risk to persons, property, or the environment; or
- In the Board's opinion, there is widespread public expectation that the TSB should independently analyze a particular safety issue.

Class 5 Occurrences (Data Collection)

Data pertaining to occurrences that do not meet the criteria of classes 1 through 4 will be recorded in suitable scope and detail for possible safety analysis, statistical reporting, or archival purposes.

National Energy Board (NEB)

The NEB's role and responsibilities generally includes:

- The NEB's top priority in any emergency is to make sure that people are safe and secure, and that property and the environment are protected. Any time there is a serious incident, the NEB Inspectors may attend the site to oversee a company's immediate response. The NEB will require that all reasonable actions are taken to protect employees, the public and the environment. Further, the NEB will verify that the regulated company conducts adequate and appropriate clean-up and remediation of any environmental effects caused by the incident.

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And/or

As lead regulatory agency, the NEB:

- Monitors, observes and assesses the overall effectiveness of the company's emergency response in terms of:
  - Emergency Management;
  - Safety;
  - Security;
  - Environment;
  - Integrity of operations and facilities; and
  - Energy Supply.
- Investigates the event, either in cooperation with the Transportation Safety Board of Canada, under the Canada Labour Code, or as per the National Energy Board Act or Canada Oil & Gas Operations Act (whichever is applicable).
- Inspects the pipeline or facility.
- Examines the integrity of the pipeline or facility.
- Requires appropriate repair methods are being used.
- Requires appropriate environmental remediation of contaminated areas is conducted.
- Coordinates stakeholder and Aboriginal community feedback regarding environmental clean-up and remediation.
- Confirms that a company is following its Emergency Procedures Manual(s) commitments, plans, procedures, and NEB regulations and identifies non-compliances.
- Initiates enforcement actions as required.
- Approves the restart of the pipeline.

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Transportation Safety Board of Canada Pipeline Occurrence Reporting	
Citation	**Description**
Extracts from Transportation Safety Board Regulations Sections 5 (1) and 5 (5)	When a reportable pipeline accident or incident takes place, the operator and any employee of the operator having direct knowledge of the accident or incident shall report to the Board as soon as possible and by the quickest means available. Where any person mentioned above makes a report, no other person referred to is required to make such a report.
Transportation Safety Board Regulations Section 2 (1)	A "reportable pipeline accident" is an accident resulting directly from the operation of a pipeline, where (a) a person sustains a serious injury or is killed as a result of being exposed to i. a fire, ignition or explosion, or ii. a commonly released from the pipeline, or (b) the pipeline i. sustains damage affecting the safe operation of the pipeline as a result of being contacted by another object or as a result of a disturbance of its supporting environment, ii. causes or sustains an explosion, or a fire or ignition that is not associated with normal operating circumstances, or iii. sustains damage resulting in the release of any commodity.
Transportation Safety Board Regulations Section 2 (1)	A "reportable pipeline incident" means an incident resulting directly from the operation of a pipeline where (a) an uncontained and uncontrolled release of a commodity occurs, (b) the pipeline is operated beyond design limits, (c) the pipeline causes an obstruction to a ship or to a surface vehicle owing to a disturbance of its supporting environment, (d) any abnormality reduces the structural integrity of the pipeline below design limits, (e) any activity in the immediate vicinity of the pipeline poses a threat to the structural integrity of the pipeline, or (f) the pipeline, or a portion thereof, sustains a precautionary or emergency shut-down for reasons that relate to or create a hazard to the safe transportation of a commodity.

NOTE: Refer to Figure 2.5 for any additional Province/State written reporting requirements.

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FIGURE 2.3

NOTIFICATION DATA SHEET

Date: _____ *Time:* _____

INCIDENT DESCRIPTION

Reporter's Full Name: _____ *Position:* _____

Day Phone Number: _____ *Evening Phone Number:* _____

Company: TransCanada Keystone Limited Partnership / TC Oil Pipeline Operations, Inc. *Organization Type:* _____

Facility Address: 450 - 1st Street S.W. Calgary, Alberta *Owner's Address:* 450 - 1st Street Calgary, Alberta

Facility Latitude: _____ *Facility Longitude:* _____

Spill Location (if not at Facility): _____

Responsible Party's Name: _____ *Phone Number:* _____

Responsible Party's Address: _____

Source and/or cause of discharge: _____

Nearest City: _____

County: _____ *State:* Alberta *Zip Code:* T2P 5H1

Section: _____ *Township:* _____ *Range:* _____

Distance from City: _____ *Direction from City:* _____

Container Type: _____ *Container Storage Capacity:* _____

Facility Oil Storage Capacity: _____

Material: _____

Total Quantity Released	Water Impact (*YES or NO*)	Quantity into Water

RESPONSE ACTION(S)

Action(s) taken to Correct, Control, or Mitigate Incident:

Number of Injuries: _____ *Number of Deaths:* _____

Evacuation(s): _____ *Number Evacuated:* _____

Damage Estimate: _____

More information about impacted medium: _____

Possible hazards to human health or the environment outside of the Facility: _____

CALLER NOTIFICATIONS

National Response Center (NRC): 1-800-424-8802 *Transportation Safety Board:* 819-997-7887

Additional Notifications (Circle all applicable): *USCG* *NEP* *EPA* *Province* *State* *Other*____

NRC Incident Assigned No. _____

ADDITIONAL INFORMATION

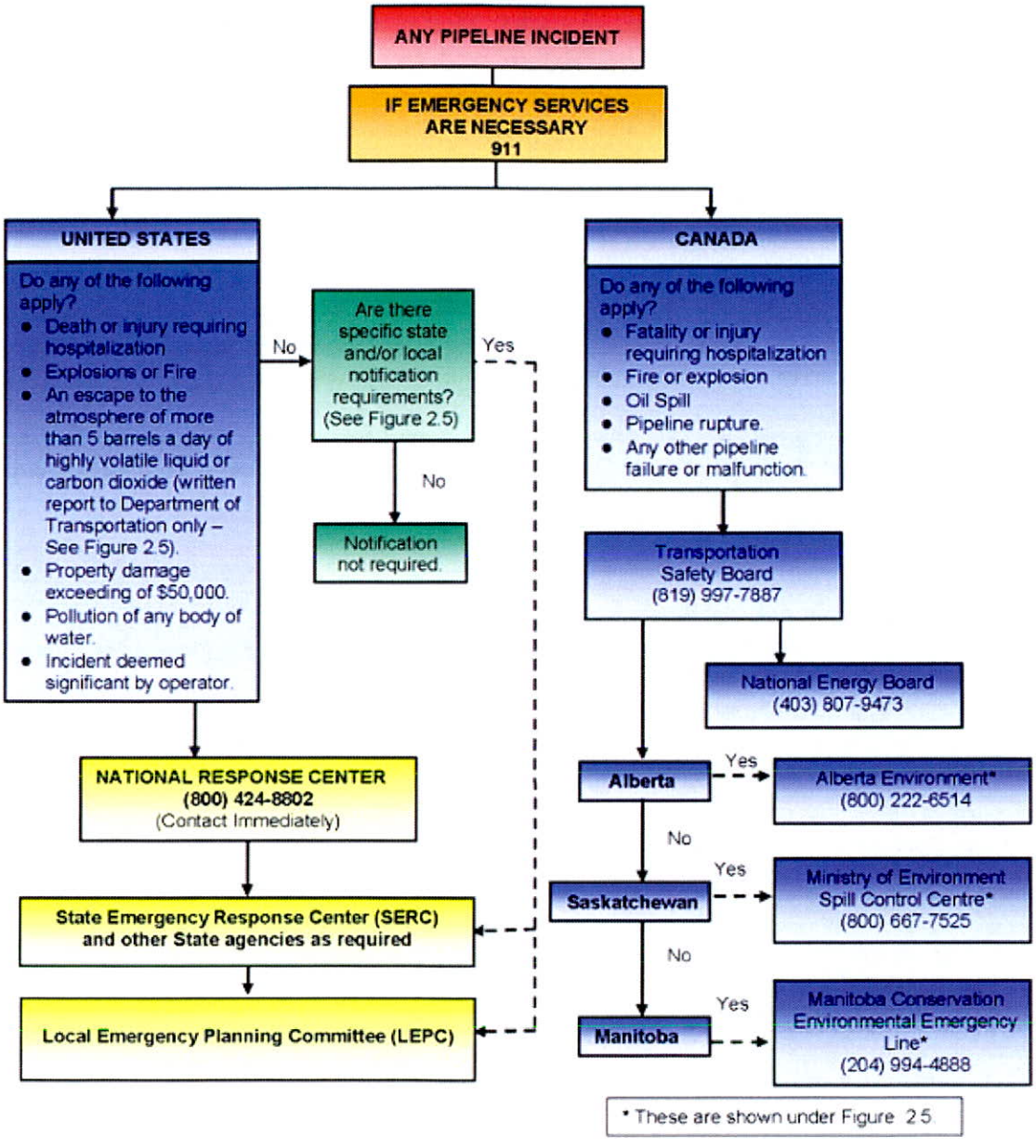
Any information about the incident not recorded elsewhere in this report including estimated quantity and disposition of recovered material:

NOTE: DO NOT DELAY NOTIFICATION PENDING COLLECTION OF ALL INFORMATION.

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FIGURE 2.4

EXTERNAL NOTIFICATION FLOWCHART



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FIGURE 2.5

EXTERNAL NOTIFICATION REFERENCES

REQUIRED FEDERAL NOTIFICATIONS	
National Response Center (NRC) c/o United States Coast Guard (CG-5335) - Stop 7581, 2100 2nd Street, SW Washington, District Of Columbia 20593-0001	(800) 424-8802 (202) 267-2675
REPORTING REQUIREMENTS TYPE: Any discharge or sighting of oil on navigable waters. VERBAL: Immediate notification required (within 2 hours). WRITTEN: If an RQ limit is reached, refer to state requirements for written report requirements. NOTE: A call to the NRC must also be made for spills or releases of hazardous substances that meet or exceed their Reportable Quantities.	

Office of Pipeline Safety and Hazardous Materials U.S. Department of Transportation 1200 New Jersey Avenue SE-E-22-311 Washington, District Of Columbia 20590	(202) 366-4000
REPORTING REQUIREMENTS TYPE: In addition to the reporting of accidents to the NRC as noted below, a written accident report PHMSA Form 7000-1. VERBAL: Call to the NRC meets the required verbal notification under DOT reporting requirement. WRITTEN: Reported on PHMSA Form 7000-1 no later than 30 days, submit a report resulting from explosion/ fire/ hospitalization, death, property damage greater than $50,000, or above reportable quantity. NOTE:	

PHMSA OPS Central Region Kansas City, Missouri	(816) 329-3800
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED FEDERAL NOTIFICATIONS (Cont'd)

PHMSA OPS Southwest Region Houston, Texas	(713) 272-2859

REPORTING REQUIREMENTS

TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

U.S. Environmental Protection Agency, Region 8 999 18th Street Suite 500 Denver, Colorado 80202-246	(303) 312-6312

REPORTING REQUIREMENTS

TYPE: Immediately for spills that impact or threaten navigable water or adjoining shoreline.
VERBAL: Notification to the EPA is typically accomplished by the call to the NRC.
WRITTEN: In accordance with the applicable SPCC regulations, within 60 days for a spill in excess of 1,000 gallons (24 Bbls) in a single event or two spill events within a twelve month period into or upon nav
NOTE: In accordance with the applicable SPCC regulations, within 60 days for a spill in excess of 1,000 gallons (24 Bbls) in a single event or two spill events within a twelve month period into or upon nav

U.S. Environmental Protection Agency, Region 5 77 W. Jackson Blvd., 5th Floor Chicago, Illinois 60604	(312) 353-2318 (312) 353-2000

REPORTING REQUIREMENTS

TYPE: Any oil discharge that has impacted or threatens to impact navigable waters or release of hazardous substances in an amount equal or greater than the reportable quantity.
VERBAL: Notification to the EPA is typically accomplished by the call to the NRC.
WRITTEN: For oil discharge within 60 days, in accordance with applicable SPCC RQ.
NOTE:

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REQUIRED FEDERAL NOTIFICATIONS (Cont'd)

U.S. Environmental Protection Agency, Region 6 1445 Ross Avenue, Suite 1200 Dallas, Texas 75202	(214) 665-6595 (866) 372-7745

REPORTING REQUIREMENTS
TYPE: Immediately for all spills that impact or threaten navigable water or adjoining shoreline.
VERBAL: Notification to the EPA is typically accomplished by the call to the NRC.
WRITTEN: As the agency may request depending on circumstances.
NOTE: N/A

U.S. Army Corps of Engineers, Missouri Office Missouri	(573) 634-5667

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Army Corps of Engineers - St. Louis District Illinois	(314) 331-8583

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED FEDERAL NOTIFICATIONS (Cont'd)

U.S. Corps of Engineers - Illinois Illinois	(309) 794-5351

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Transportation Safety Board (TSB) of Canada 200 Promenade du Portage, Place du Centre, 4th Floor Gatineau, Quebec 1K8	(819) 997-7887 (800) 387-3557

REPORTING REQUIREMENTS
TYPE: All pipeline accidents with fatality or serious injury, fire or explosion, oil spill, pipeline rupture or any other pipeline failure or malfunction.
VERBAL: Immediately.
WRITTEN: Within 30 days.
NOTE:

Canadian National Energy Board (CA NEB) 444 Seventh Avenue SW Calgary, Alberta T2P OX8	(403) 807-9473 (800) 899-1265

REPORTING REQUIREMENTS
TYPE: All pipeline incidents with fatality or serious injury, fire or explosion, oil spill or hydrocarbon release, or any operation beyond the design limits of the pipeline.
VERBAL: Immediately.
WRITTEN: As soon as practical.
NOTE: For further definition of Incident see Glossary.

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REQUIRED STATE/PROVINCE NOTIFICATIONS

Alberta Environment & Sustainable Resource Development 9915 -108 Street 10th Floor, Petroleum Plaza South Tower Edmonton, Alberta T5K 2G8	(800) 222-6514

REPORTING REQUIREMENTS
TYPE: All spills to water or exceeds a reportable quantity or emission level.
VERBAL: Immediately.
WRITTEN: Within 7 days.
NOTE:

Saskatchewan Environment and Resource Management Box 3003, 800 Central Avenue. Prince Albert, Saskatchewan S5V 6G1	(800) 667-7525

REPORTING REQUIREMENTS
TYPE: Any oil spill to water or oil spill greater than or equal to 50 L. to land.
VERBAL: Immediately
WRITTEN: Within 7 days.
NOTE:

Manitoba Conservation Environmental Emergency Line Winnipeg, Manitoba	(204) 994-4888

REPORTING REQUIREMENTS
TYPE: All spills or discharges.
VERBAL: Immediately.
WRITTEN: As requested by the Agency.
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

North Dakota Division of Emergency Management PO Box 5511 Bismarck, North Dakota 58506-5511	(701) 328-8100

REPORTING REQUIREMENTS
TYPE: Any spill or discharge above RQ.
VERBAL: Immediately.
WRITTEN: Within 30 days.
NOTE:

North Dakota Dept. of Health-Environmental Health 918 East Divide Avenue Bismarck, North Dakota 58501-1947	(701) 328-5150 (701) 328-5210

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

North Dakota Industrial Commission State Capitol, 14th Floor, 600 E. Boulevard Ave., Dept 405 Bismarck, North Dakota 58505-0840	(701) 328-8020

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Game & Fish, Conservation and Communication Div North Dakota	(701) 328-6612 (701) 328-6300

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Environmental Health Sect, Div. of Water Quality North Dakota	(701) 328-5210

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Public Service Commission, Public Utilities Divisi North Dakota	(701) 328-4077

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

South Dakota DENR, Div of Environmental Services 523 East Capitol Ave. Pierre, South Dakota 57501-3182	(605) 773-3296 (Day) (605) 773-3231 (Night)

REPORTING REQUIREMENTS

TYPE: Any Spill or discharge greater than reportable quantity.
VERBAL: Immediately.
WRITTEN: Within 30 days if, 1) Is of 5 gals. or more; or 2) Causes an explosion or fire; or 3) Causes the injury or death of any person.
NOTE:

Game, Fish and Parks South Dakota	(605) 223-7660

REPORTING REQUIREMENTS

TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

South Dakota Department of Transportation, ROW South Dakota	(605) 773-3710 (605) 773-4249

REPORTING REQUIREMENTS

TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

South Dakota Department of Transportation, RR	(605) 773-3046 (605) 773-3921

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

South Dakota Department of Transportation (SDDOT) 700 E. Broadway Ave. Pierre, South Dakota 57501	(605) 773-3265

REPORTING REQUIREMENTS
TYPE: All spills or discharges.
VERBAL: Immediately.
WRITTEN: As requested by the Agency.
NOTE: As requested by the Agency.

South Dakota Public Utilities Commission South Dakota	(605) 773-3201

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Department of Environmental Quality 1200 N Street Suite 400 / PO Box 98922 Lincoln, Nebraska 68509-8922	(402) 471-2186 (402) 471-4545

REPORTING REQUIREMENTS
TYPE: Any Discharge that leaves the Facility or threatens to impact navigable waters.
VERBAL: Immediately, but not longer than 30 minutes.
WRITTEN: As Requested by the Agency
NOTE:

Department of Natural Resources Nebraska	(308) 697-3730

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Nebraska Emergency Management Agency Lincoln, Nebraska	(402) 499-1219

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Nebraska Game & Parks Commission Lincoln, Nebraska	(402) 471-5423 (402) 471-0641 (402) 271-5440

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Kansas Department of Health & Environment Curtis State Office Building 1000 SW Jackson Topeka, Kansas 66612	(785) 296-1679

REPORTING REQUIREMENTS
TYPE: All Spills that impact soil, surface water or groundwater.
VERBAL: Immediately, within one hour.
WRITTEN:As requested by Agency.
NOTE:

Kansas Dept. of Transportation Dwight D. Eisenhower State Office Building, 700 S.W. Harrison Street Topeka, Kansas 66603-3754	(785) 296-3566

REPORTING REQUIREMENTS
TYPE: All spills or discharges.
VERBAL: Immediately.
WRITTEN:As requested by the Agency.
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Kansas Dept. of Wildlife and Parks Kansas	(620) 672-5911 (620) 672-0795

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Missouri DNR, Environmental Improvement and Energy PO Box 176 Jefferson City, Missouri 65102	(573) 751-4919

REPORTING REQUIREMENTS
TYPE: Any Spill or discharge that meets or exceeds the Federal reportable quantity.
VERBAL: Immediately, within 30 minutes
WRITTEN: As requested by Agency.
NOTE:

Missouri U.S. Fish and Wildlife Service Columbia, Missouri	(573) 234-2132

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Environmental Protection Agency - IL Office Illinois	(217) 524-3908 (217) 785-9250

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Illinois Department of Natural Resources (IDNR) 1 Natural Resources Way Springfield, Illinois 62702	(618) 462-1181 (Region 4) (217) 782-6302 (State of IL)

REPORTING REQUIREMENTS
TYPE: Wildlife Protection / Rehabilitation
VERBAL: Courtesy Reporting.
WRITTEN: As the agency may request depending on circumstances.
NOTE:

Illinois Department of Transportation (IDOT) 2300 S. Dirksen Parkway Springfield, Illinois 62764	(217) 782-7820 (217) 782-2937

REPORTING REQUIREMENTS
TYPE: All spills or discharges.
VERBAL: Immediately.
WRITTEN: As requested by the Agency.
NOTE: As requested by the Agency.

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Illinois Emergency Management Agency (SERC) 2200 South Dirksen Parkway Springfield, Illinois 62703	(800) 782-7860 (217) 782-7860

REPORTING REQUIREMENTS

TYPE: Any Discharge or sighting of oil, or hazardous substances exceeding a reportable quantity in Cook County, IL.
VERBAL: Immediately.
WRITTEN: As soon as practicable after the release.
NOTE:

Oklahoma Department of Environmental Quality 707 N Robinson Oklahoma City, Oklahoma 73102	(405) 702-1000

REPORTING REQUIREMENTS

TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Railroad Commission of Texas PO Box 12967 Austin, Texas 78711-2967	(512) 463-7288 (512) 463-6788

REPORTING REQUIREMENTS

TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

State of Texas Spill-Reporting Hotline Austin, Texas	(800) 832-8224
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

TCEQ - Area Director, Kelly Keel Austin, Texas	(512) 239-3607
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Texas Division of Emergency Management (TDEM) Austin, Texas	(512) 424-2208
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS

Manitoba Water Stewardship Manitoba Water Stewardship Box 11 200 Saulteaux Crescent Winnipeg, Manitoba R3J 3W3	1-866-626-4862 1-204-945-6398

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Cavalier County LEPC Langdon, North Dakota	(701) 256-3911

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

City of Fargo Fargo, North Dakota	(701) 241-1310

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Tri-County Water District North Dakota	(701) 345-8240

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Cedar County (LEPC) Hartington, Nebraska	(402) 254-7411

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

City of South Sioux Nebraska	(402) 494-7517 (402) 494-7500

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Brown County LEPC Hiawatha, Kansas	(785) 547-3415 (785) 547-3511

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity.
VERBAL: Immediately, but not longer than 30 minutes.
WRITTEN: As requested by the Agency.
NOTE: As requested by the Agency.

Butler County (LEPC) Augusta, Kansas	(316) 733-9796

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

City of Axtell Axtell, Kansas	(785) 736-2834 (785) 736-2381

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
City of Beattie Beattie, Kansas	(785) 353-2527
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

City of Fairview Fairview, Kansas	(785) 467-3521 (785) 467-5341
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

City of Hamlin Hamlin, Kansas	(785) 742-2995 (785) 459-2436
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

City of Hiawatha Hiawatha, Kansas	(785) 742-2967 (785) 742-7417

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

City of Robinson Robinson, Kansas	(785) 544-7766 (785) 544-6850

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

City of Summerfield Summerfield, Kansas	(785) 244-6531

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

City of Seneca Seneca, Kansas	(785) 336-2747

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Clay County LEPC Clay Center, Kansas	(785) 632-2166

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Cowley County (LEPC) Winfield, Kansas	(620) 441-4569 (620) 221-0470

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Dickinson County LEPC Abilene, Kansas	(785) 263-3120 (785) 263-1121
REPORTING REQUIREMENTS TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity VERBAL: Immediately, but not longer than 30 minutes WRITTEN: As requested by the Agency NOTE: As requested by the Agency	

Marion County LEPC Marion, Kansas	(620) 382-2144 (620) 382-3441
REPORTING REQUIREMENTS TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity VERBAL: Immediately, but not longer than 30 minutes WRITTEN: As requested by the Agency NOTE: As requested by the Agency	

Marshall County LEPC First Responder Marysville, Kansas	(785) 562-3141
REPORTING REQUIREMENTS TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity VERBAL: Immediately, but not longer than 30 minutes WRITTEN: As requested by the Agency NOTE: As requested by the Agency	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Nemaha Co. Emergency Management / First Responder Seneca, Kansas	(785) 336-2135 (785) 336-8010

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Washington County LEPC Washington, Kansas	(785) 325-2134 (785) 325-2924

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Audrain County, Missouri LEPC Mexico, Missouri	(660) 582-8183

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Buchanan County LEPC St. Joseph, Missouri	(816) 271-1574 (816) 901-1604

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Chariton County, Missouri LEPC/First Responder Keytesville, Missouri	(660) 288-3277

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

City of St Joseph LEPC St Joseph, Missouri	(816) 271-4603

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

City of Troy Troy, Missouri	(636) 528-4712 x.227 (636) 528-7562

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

DeKalb County PWSD No 1 Missouri	(816) 393-5311

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Douglas County Commission Missouri	(417) 683-4714

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Hickory County Commission Missouri	(417) 745-6450

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Lincoln County, Missouri LEPC Troy, Missouri	(636) 528-6182

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

McDonald County Commission Missouri	(417) 223-4717

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Montgomery County LEPC Montgomery City, Missouri	(573) 564-2283

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN:As requested by the Agency
NOTE:

New Madrid County Commission New Madrid, Missouri	(573) 748-2524

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Nodaway County Commission Maryville, Missouri	(660) 582-2251

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Pike County Commission Missouri	(573) 324-2412

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Polk County Commission Missouri	(417) 326-4031

REPORTING REQUIREMENTS
TYPE:
VERBAL: In cases of emergency requiring immediate maintenance or repair of any pipeline or utility, notice should be given to the County Commissioner as soon as possible.
WRITTEN:
NOTE:

Randolph County LEPC Huntsville, Missouri	(573) 564-2283

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

St. Charles County LEPC St. Charles, Missouri	(636) 949-3023

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the federal reportable quantity.
VERBAL: Immediately, but not longer than 30 minutes.
WRITTEN: As requested by the Agency.
NOTE:

Taney County Missouri	(417) 546-7200

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Vernon County Commission Missouri	(417) 448-2500

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Bond County (LEPC) Greenville, Illinois	(618) 644-1442

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

City of Edwardsville Edwardsville, Illinois	(618) 692-7520 (618) 692-7513

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

City of Greenville Greenville, Illinois	(618) 664-1644

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
City of Salem Marion County Salem, Illinois	(618) 548-2222 (618) 548-3400
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

City of Patoka Patoka, Illinois	(618) 432-5855
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

City of Vandalia, Illinois Vandalia, Illinois	(618) 283-1196
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Fayette County Vandalia, Illinois	(618) 283-5000 (618) 283-1198

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Fayette County (LEPC) Vandalia, Illinois	(618) 283-4292

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Madison Co. IL Emergency Svcs. and Disaster Agency Edwardsville, Illinois	(618) 692-0537

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Madison County (LEPC) Edwardsville, Illinois	(618) 296-4482 (618) 692-8903

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Marion County (LEPC) Salem, Illinois	(618) 548-2600

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Atoka County LEPC Atoka, Oklahoma	(580) 889-2221

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Bryan County LEPC Durant, Oklahoma	(580) 924-3737
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Coal County LEPC Coalgate, Oklahoma	(580) 927-0107
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Creek County LEPC Bristow, Oklahoma	(918) 367-2252
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Hughes County LEPC Holdenville, Oklahoma	911 / (405) 379-7740
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Johnston County LEPC Tishomingo, Oklahoma	911 / (580) 371-2691
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Kay County (LEPC) Ponca City, Oklahoma	(580) 362-2517
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Lincoln LEPC Chandler, Oklahoma	911

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Noble County (LEPC) Perry, Oklahoma	(580) 336-3517

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Okfuskee County LEPC Okemah, Oklahoma	(918) 623-1234 / (918) 623-1122

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Payne County LEPC Stillwater, Oklahoma	(405) 372-4522 (405) 533-6875

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Pontotoc County LEPC Ada, Oklahoma	911 (580) 436-8055

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Seminole County LEPC Wewoka, Oklahoma	911 / (405) 382-9342

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Angelina County LEPC Lufkin, Texas	(936) 634-5413
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Cherokee County LEPC Rusk, Texas	(903) 683-2324
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Delta County LEPC Linden, Texas	(903) 756-5181
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Fannin County LEPC Bonham, Texas	(903) 640-8484

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Fannin Emergency Management Fannin County, Texas	(706) 632-2011

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Franklin County LEPC Mt. Vernon, Texas	(903) 537-4539

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Hardin County LEPC Kountze, Texas	(409) 246-5119

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Hopkins County LEPC Sulphur Springs, Texas	(903) 439-6217 op. 1

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Jefferson County Engineer Beaumont, Texas	(409) 835-8584

REPORTING REQUIREMENTS
TYPE:
VERBAL: In any emergency, contact the County Engineer by phone and inform him of the proposed emergency repairs.
WRITTEN: As soon as practical, but no later than 48 hours after the start of emergency repairs, notify the County Engineer in writing of the emergency repairs effected, detailing the repairs and the reasons immediate action was required.
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Jefferson County LEPC Beaumont, Texas	(409) 835-8757

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Lamar County LEPC Paris, Texas	(903) 737-2400

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Liberty County LEPC Liberty, Texas	(936) 334-3129

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Nacogdoches County LEPC Nacogdoches, Texas	(936) 560-7755

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Orange County LEPC Orange, Texas	(409) 882-7895

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Polk County LEPC Livingston, Texas	(936) 327-6826

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Rusk County LEPC Henderson, Texas	(903) 657-0326
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Smith County LEPC Tyler, Texas	(903) 590-2653
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Upshur County LEPC Gilmer, Texas	(903) 843-4003
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Wood County LEPC Quitman, Texas	(903) 763-2356
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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ADDITIONAL RESPONSE RESOURCES		
Planning and Incident Support		
COMPANY	**LOCATION**	**TELEPHONE**
National Response Corporation	3500 Sunrise Hwy Ste. T103 Great River, New York 11739	(800) 899-4672
Witt O'Brien's	Slidell, Louisiana	(985) 781-0804
ENSR	Fort Collins, Colorado	(800) 722-2440
Western Canadian Spill Services	Calgary, Alberta	(866) 541-8888
Saskatchewan Co-op Area 1 Chairman	Saskatchewan	(780) 573-7350
Saskatchewan Co-op Area 1 Alt. Chairman	Saskatchewan	(306) 387-6449
Saskatchewan Co-op Area 2 Chairman	Box 1132 Kindersley, Saskatchewan S0L 1S0	(306) 968-2503
Saskatchewan Co-op Area 2 Co-Chairman	Box 5 Coleville, Saskatchewan S0L 0K0	(306) 965-2731
Saskatchewan Co-op Area 2 Custodian	Saskatchewan	(306) 834-7898
Saskatchewan Co-op Area 3 Chairperson	Saskatchewan	(306) 773-0234
Saskatchewan Co-op Area 3 Secretary	Saskatchewan	(306) 773-9381
Saskatchewan Co-op Area 3 Custodian	Saskatchewan	(306) 672-3723
Saskatchewan Co-op Area 4&5 Chair	Saskatchewan	(306) 842-1818
Saskatchewan Co-op Area 4&5 Vice-Chair	Saskatchewan	(306) 842-3088
Saskatchewan Co-op Area 6 Call-out	Saskatchewan	(306) 791-5058
Aberdeen Flying Service	Aberdeen, South Dakota	(605) 225-1384
Advantage Flight Solutions	Reno, Nevada	(775) 852-3512
Aero Air, LLC	Hillsboro, Oregon	(503) 640-3711
Air Services Inc	Traverse City, Michigan	(888) 922-0406
Airwest Helicopters,	Glendale, Arizona	(623) 516-2790
American Jet Charter	Oklahoma City, Oklahoma	(405) 495-5453
Aviation Charter Inc	Duluth, Michigan	(800) 486-5387
Bemidji Aviation	Bimidji, Minnesota	(218) 751-1880
Blatti Aviation, Elwood, IL	Elwood, Illinois	(815) 423-5659
Brainerd Helicopter Service	Brainard, Minnesota	(218) 829-5484
Charter First	Marshall, Minnesota	(866) 776-6261
Concrod Helicopter Charters	Concord, New Hampshire	(800) 615-1655
Crow Executive Air	Millbury, Ohio	(800) 972-2769
Custom Air Charter	Greenville, Mississippi	(662) 334-6444
Duncan Aviation	Lincoln, Nebraska	(402) 475-2611
Elliott Aviation - Des Moines	Des Moines, Iowa	(800) 447-6711
Elliott Aviation - Moline	Moline, Illinois	(800) 447-6711

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ADDITIONAL RESPONSE RESOURCES (Cont'd)		
Planning and Incident Support		
COMPANY	**LOCATION**	**TELEPHONE**
Encore FBO, Sioux Falls, SD	Sioux Falls, South Dakota	(800) 888-1646
Executive Air	Bismark, North Dakota	(701) 258-5024
Executive Aircraft Charter	Lafayette, Louisiana	(866) 343-9940
Fargo Jet Center	Fargo, North Dakota	(701) 235-3600
Felts Field Aviation	Spokane, Washington	(509) 535-9011
First Wing Executive Air	Indianapolis, Indiana	(317) 293-6935
Frontline Aviation	Green Bay, Wisconsin	(800) 379-3359
Helimotion, LLC	Joliet, Illinois	(815) 725-9300
Hillsboro Aviation	Hillsboro, Oregon	(503) 648-2831
HSE Integrated	Brooks, Alberta	(888) 346-8260
JBI Helicopter Service	Pembroke, New Hampshire	(603) 225-3134
Jet Linx	Omaha, Nebraska	(402) 422-0393
Leading Edge Aviation	Bend, Oregon	(541) 383-8825
MaxAir Inc	Appleton, Wisconsin	(800) 833-1544
Midwest Corporate Aviation	Wichita, Kansas	(316) 636-9738
North Country Aviation	Gaylord, Michigan	(800) 959-1829
North Country Heliflite	North Clarendon, Vermont	(518) 361-1380
PHI Helicopters	Lafayette, Louisiana	(337) 235-2452
Rhinelander Flying Service	Wausau, Wisconsin	(715) 365-3456
Sharkeys Helicopters	West Lebanon, New Hampshire	(603) 298-8728
Silver Hawk Aviation	Lincoln, Nebraska	(800) 479-5851
Tri State Aero	Evansville, Indiana	(800) 473-2904
Tulip City Air Service	Holland, Michigan	(800) 748-0515
Ultra Air, LLC	Omaha, Nebraska	(402) 345-7372
Vermont Helicopter Charters	Burlington, Vermont	(866) 224-8830
Worcester Helicopter Charters	Worcester, Massachusetts	(800) 226-1116
Quantum Murray	100-3600 Viking Way Richmond, B.C., V6V1N6	(877) 378-7745
Alberta Coop Area 2U Custodian	Hardisty, Alberta	(780) 888-3845
Albert Coop Area 1S Regional Custodian	Lethbridge, Alberta	(403) 329-0427
Alberta Coop Area 1S Equip. Custodian	Brooks, Alberta	(403) 362-6551
Euroway Industrial Svc Co. Ltd	Winnipeg, Manitoba	(204) 661-0500
Titus Regional Medical Center Ambulance Service	Titus County, Texas	(903) 577-6079

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FIGURE 2.6

POSSIBLE COMMAND POST LOCATIONS

TRANSCANADA COMMAND POSTS			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Hardisty PS/Lakesend PS	R&R Hotel 4744-49th Street Hardisty, Alberta Canada Box 251 Hardisty AB TOB 1VO	(780) 888-0004	Meeting Room accommodates 40 people
Lakesend PS/Monitor PS	La Biche Inn PO Box 321 Lac La Biche, AB T0A 2C0, Canada	(780) 623-4427	Meeting Room accommodates 30 people
Monitor PS/Oyen PS	Super 8 - Provost 3611 57th Avenue Provost, AB T0B 3S0, Canada	(780) 753-2255	Meeting Room accommodates 55 people
Monitor PS/Oyen PS	Lucky Lake Hotel Main St Lucky Lake, SK S0L 1Z0, Canada	(306) 858-2008	Meeting Room accommodates 40 people
Oyen PS/Bindloss PS	None Available		
Blindloss PS/Cabri PS	Super 8 Motel Junction of Hwy 9 & 41 Oyen, AB T0J 2J0, Canada	(403) 664-3010	Meeting Room accommodates 65 people
Blindloss PS/Cabri PS	Swift Current Travelodge 605 North Service Road, East Swift Current, SK S9H 3T8, Canada	(306) 773-3101	Meeting Room accommodates 20 people
Cabri PS/Herbert PS	Super 8 Motel 405n Service Rd E Swift Current, SK S9H 0A1, Canada	(306) 778-6088	Meeting Room accommodates 20 people
Cabri PS/Herbert PS	Best Western Inn 105 George St W Swift Current, SK S9H 0K4, Canada	(306) 773-4660	Meeting Room accommodates 35 people
Herbert PS/Caron PS	Howard Johnson Inn - Swift Current 1150 South Service Road East Swift Current, SK S9H 3X6, Canada	(306) 773-2033	Meeting Room accommodates 55 people
Herbert PS/Caron PS	Days Inn Hwy 1 E Swift Current, SK S9H 3X6, Canada	(306) 773-4643	Meeting Room accommodates 250 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Caron PS/Regina PS	Comfort Inn & Suites 155 Thatcher Drive W. Moose Jaw, SK S6J 1M1, Canada	(306) 692-2100	Meeting Room accommodates 40 people
Caron PS/Regina PS	Hotel Saskatchewan Radisson Plaza 2125 Victoria Avenue Regina, SK S4P 0S3, Canada	(306) 522-7691	Meeting Room accommodates 100-800 people
Regina PS/Kendal PS	Best Western 7 Oaks Inn 777 Albert St Regina, SK S4R 2P6, Canada"	(306) 757-0121	Meeting Room accommodates 150 people
Regina PS/Kendal PS	Holiday Inn Express Hotel & Suites Regina 1907 11th Avenue Regina, SK S4P 0J2, Canada"	(877) 863-4780	Meeting Room accommodates 50 people
Kendal PS/Grenfell PS	The Prince William Suites Hotel Box 1030 21 Mall Road, Melville, SK S0A 2P0, Canada	(306) 728-4546	Meeting Room accommodates 300 people
Kendal PS/Grenfell PS	Holiday Inn Hotel & Suites Regina 1800 Prince Of Wales Drive Regina, SK S4Z 1A4, Canada	(877) 863-4780	Meeting Room accommodates 80 people
Grenfell PS/Moosomin PS	Katepwa Beach Resort Hotel Lebret, SK S0G 2Y0 Canada	(306) 332-4696	Meeting Room accommodates 30 people
Grenfell PS/Moosomin PS	Whitewood Inn Hwy 1 & 9 Whitewood, SK S0G 5C0, Canada	(306) 735-2651	Meeting Room accommodates 250 people
Moosomin PS/Rapid City PS	The Russell Inn Hwy 16 & 83 MB R0J 1W0, Canada	(204) 773-2186	Meeting Room accommodates 150 people
Moosomin PS/Rapid City PS	Royal Oak Inn & Suites Brandon 3130 Victoria Avenue Brandon, MB R7B 0N2, Canada	(204) 728-5775	Meeting Room accommodates 50 people
Rapid PS/Portage La Prairie PS	Canadian Inn 150 5th Street Brandon, MB R7A 3K4, Canada	(204) 727-6404	Meeting Room accommodates 200 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Rapid PS/Portage La Prairie PS	Super 8 Portage La Prairie MB Saskatchewan Avenue West Portage la Prairie, MB R1N, Canada	(204) 857-8883	Meeting Room accommodates 20 people
Portage La Prairie PS/Carman PS	Days Inn Highway 1 Quill Trail Portage la Prairie, MB R1N 3C3, Canada	(204) 857-9791	Meeting Room accommodates 50 people
Portage La Prairie PS/Carman PS	Days Inn & Suites-Winkler 395 Boundary Trail Winkler, MB R6W 4B1, Canada	(204) 325-8888	Meeting Room accommodates 40 people
Carman PS/Haskett PS	Super 8 Motel 400 Main St S MB R0G 1K0, Canada	(204) 746-6879	Meeting Room accommodates 30 people
Carman PS/Haskett PS	Heartland Inn 851 Main St Winkler, MB R6W 2L8, Canada	(204) 325-4381	Meeting Room accommodates 300 people
Haskett PS/Edinburg PS	Holiday Mountain Ski Resort & Golf Course Holiday Mountain La Riviere, MB R0G 1A0, Canada	(204) 242-2172	Meeting Room accommodates 70 people
Haskett PS/Edinburg PS	Cedar Inn Steak House & Motel 502 Division Ave S Cavalier, ND 58220	(701) 265-8341	Meeting Room accommodates 50 people
Edinburg PS/Niagara PS	Forestwood Inn 504 Sunset Ave Walhalla, ND 58282	(701) 549-2651	Meeting Room accommodates 30 people
Niagara PS/Luverne PS	Holiday Inn Express Hotel & Suites Grand Forks 4051 32nd Ave South Grand Forks, ND 58201	(877) 863-4780/ (701) 772-7700	Meeting Room accommodates 30 people
Niagara PS/Luverne PS	Quality Inn & Suites 507 25th St. SW Jamestown, ND 58401	(701) 252-3611	Meeting Room accommodates 325 people
Luverne PS/Fort Ransom PS	Governors Inn & Conference Center 2050 Governors Dr Casselton, ND 58012	(701) 347-4524	Meeting Room accommodates 450 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Luverne PS/Fort Ransom PS	America Inn 280 Wintershow Rd SW Valley City, ND 58072	(701) 845-5551	Meeting Room accommodates 60 people
Fort Ransom PS/Ludden PS	Holiday Inn Express Jamestown 803 20th St. S.W. Jamestown, ND 58401	(701) 251-2131	Meeting Room accommodates 25 people
Fort Ransom PS/Ludden PS	Ramada Aberdeen 2727 6th Avenue SE Aberdeen, SD 57401	(605) 225-3600	Meeting Room accommodates 25 people
Ludden PS/Ferney PS	Best Western-Ramkota Hotel 1400 8th Ave NW Aberdeen, SD 57401-2602	(605) 229-4040	Meeting Room accommodates 150 people
Ludden PS/Ferney PS	Ramada 2727 6th Ave SE Aberdeen, SD 57401 US	(605) 225-3600	Meeting Room accommodates 400 people
Ferney PS/Carpenter PS	Holiday Inn Express Hotel & Suites Aberdeen 1330-1399 7th Ave SE Aberdeen, SD 57401	(877) 863-4780/ (605) 725-4000	Meeting Room accommodates 100 people
Ferney PS/Carpenter PS	Country Inn Suites Watertown Reviews 100 S Maple Watertown, SD 57201	(605) 886-8900	Meeting Room accommodates 70 people
Carpenter PS/Roswell PS	Best Western Of Huron 2000 Dakota Ave S Huron, SD 57350-4027	(605) 352-2000	Meeting Room accommodates 50 people
Carpenter PS/Roswell PS	Super Deluxe Inn & Suites 288 US Highway 14 W De Smet, SD 57231	(605) 854-9388	Meeting Room accommodates 100 people
Roswell PS/Freeman PS	Days Inn Mitchell 1506 South Burr St. Mitchell, SD 57301	(605) 996-6208	Meeting Room accommodates 50 people
Roswell PS/Freeman PS	Best Western Ramkota Hotel Sioux Falls 3200 West Maple Street Sioux Falls, SD 57107	(605) 336-0650	Meeting Room accommodates 700-1500 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Freeman PS/Hartington PS	Cameron Inn 131 E Main St Canistota, SD 57012	(605) 296-3555	Meeting Room accommodates 25 people
Freeman PS/Hartington PS	Best Western Kelly Inn 1607 East Highway 50 Route Yankton, SD 57078	(605) 665-2906	Meeting Room accommodates 125 people
Hartington PS/Stanton PS	Holiday Inn Express Hotel & Suites Vermillion 1200 N. Dakota St. Vermillion, SD 57069	(877) 863-4780/ (605) 624-7600	Meeting Room accommodates 100 people
Hartington PS/Stanton PS	Holiday Inn Express Hotel & Suites Norfolk 920 South 20th Street Norfolk, NE 68701	(877) 863-4780/ (402) 379-1524	Meeting Room accommodates 200 people
Stanton PS/David City PS	New World Inn & Conference Center 265 33rd Ave Columbus, NE 68601	(402) 564-1492	Meeting Room accommodates 1000 people
Stanton PS/David City PS	Holiday Inn Express Hotel & Suites Columbus 524 E 23rd St Columbus, NE 68601	(877) 863-4780/ (402) 564-2566	Meeting Room accommodates 200 people
David City PS/Wilber PS	Sleep Inn & Suites 303 23rd St Columbus, NE 68601	(402) 562-5200	Meeting Room accommodates 35 people
David City PS/Wilber PS	Holiday Inn Lincoln-Downtown 141 N. 9th St. Lincoln, NE 68508	(877) 863-4780/ (402) 475-4011	Meeting Room accommodates 500-1000 people
Wilbur PS/Steele City PS	Embassy Suites Hotel Lincoln 1040 P Street Lincoln, NE 68508	(402) 474-1111	Meeting Room accommodates 500-1000 people
Wilbur PS/Steele City PS	Hotel Wilber 203 S Wilson St Wilber, NE 68465	(402) 821-2020	Meeting Room accommodates 30 people
Steele City (to State Line)	Travelers Lodge 3500 North 6th Street Beatrice, NE 68310	(402) 223-4074	Meeting Room accommodates 30 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Steele City (to State Line)	Holiday Inn Express Hotel & Suites Beatrice 4005 N 6th Street Beatrice, NE 68310	(402) 228-7000	Meeting Room accommodates 350 people
State Line to Seneca	Hiawatha Lodge 101 Lodge Rd Hiawatha, KS 66434	(785) 742-7401	Meeting Room accommodates 50 people
State Line to Seneca	Oak Tree Inn 1127 Pony Express Hwy # A Marysville, KS 66508	(785) 562-1234	Meeting Room accommodates 40 people
Seneca PS/Severance PS	Marysville Surf Motel 2105 Center Street Marysville, KS 66508	(785) 562-2354	Meeting Room accommodates 30 people
Seneca PS/Severance PS	Big Lake Resort Big Lake State Park 200 Lake Shore Drive Big Lake, MO 64437-4477	(660) 442-5432	Meeting Room accommodates 35, can use dining hall which adds an additional 100 people
Severance PS/Turney PS	Days Inn - St. Joseph 4312 Frederick Ave. Saint Joseph, MO 64506	(816) 279-1671	Meeting Room accommodates 40 people
Severance PS/Turney PS	Crowne Plaza Hotel Kansas City Downtown 1301 Wyandotte St. Kansas City, MO 64105	(888) 444-0401/ (816) 474-6664	Meeting Room accommodates 200-250 people
Turney PS/Tina PS	Radisson Hotel Kansas City Airport 11828 NW Plaza Cir Kansas City, MO 64153	(816) 464-2423	Meeting Rooms accommodates 200 people
Turney PS/Tina PS	Comfort Inn 1803 Comfort Lane Cameron, MO 64429	(816) 632-5655	Meeting Room accommodates 30 people
Tina PS/Salisbury PS	Comfort Inn Marshall Station 1356 W. College Ave. Marshall, MO 65340	(660) 886-8080	Meeting Room accommodates 25 people
Tina PS/Salisbury PS	Holiday Inn Express Hotel & Suites 1801 West Outer Road Moberly, MO 65270	(877) 863-4780/ (660) 269-9700	Meeting Room accommodates 30 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Salisbury PS/Centralia PS	Country Inns & Suites 817 N Keene St Columbia, MO 65201	(573) 445-8585	Meeting Room accommodates 50 people
Centralia PS/Middletown PS	Holiday Inn - Wentzville 1175 Technology Drive O'Fallon, MO 63368	(636) 300-4844	5 Meeting Rooms accommodates 10-250 people
Centralia PS/Middletown PS	Days Inn Conference Center Columbia 1900 I-70 Drive SW Columbia, MO 65203	(573) 445-8511	Accommodates 400 people
Middletown PS/Saint Paul PS	Comfort Inn 425 E. Veterans Memorial Pkw Warrenton, MO 63383	(636) 456-6000	Meeting Room accommodates 25 people
Middletown PS/Saint Paul PS	Comfort Inn & Suites - O'Fallon/St Charles 100 Comfort Inn Court O'Fallon, MO 63366	(636) 696-8000	Meeting Room accommodates 35 people
Saint Paul PS/Hartford PS	Holiday Inn Express St. Louis Airport - Riverport 13735 Riverport Drive St. Louis, MO 63043	(314) 298 3400	Meeting 120 Classroom Style
Saint Paul PS/Hartford PS	Best Western Airport Plaza Inn & Conf. Center 4530 N. Lindbergh Blvd. Bridgeton, MO 63044	(314) 731-3800	Accommodates 300 people
Hartford PS/Pierron PS	Mariners Village Resort 1 Resort Dr Carlyle, IL 62231	(618) 594-7666	TBD
Hartford PS/Pierron PS	Holiday Inn Express Highland 20 Central Blvd. Highland, IL 62249	(877) 786-9480/ (618) 651-1100	TBD
Pierron PS/Patoka Terminal	Holiday Inn Express Hotel & Suites 21 Mattes Ave Vandalia, IL 62471	(618) 283-0010	Meeting Room
Pierron PS/Patoka Terminal	Ramada 2707 Veterans Ave. Vandalia, IL, 62471	(618) 283-1400	Meeting Room accommodates 30 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Steel City PS/ Hope PS	Herington Inn & Suites 565 Highway 77 Herington, KS 67449	(785) 258-3300	Meeting Room accommodates 20 people
Steel City PS/ Hope PS	Holiday Inn Express Hotel & Suites 110 E. Lafayette Abilene, KS 67410	(877) 863 4780/ (325) 675-9800	Meeting Room accommodates 20 people
Hope PS/ Rock PS	Hampton Inn Derby 1701 Cambridge Street Derby, KS 67037	(316) 425-7900	Meeting Room accommodates 30 people
Hope PS/ Rock PS	Holiday Inn Express Hotel & Suites Andover East 54 Wichita 600 S Allen St. Andover, KS 67002	(877) 863-4780/ (316) 733-8833	Meeting Room accommodates 40 people
Rock PS/ Ponca City PS	Comfort Inn & Suites 3101 N. 14th Street Ponca City, OK 74604	(580) 765-2322	Meeting Room accommodates 30 people
Rock PS/ Ponca City PS	Holiday Inn Express Hotel & Suites Ponca City 2809 North 14th St. Ponca City, OK 74601	(877) 863-4780/ (580) 762-3700	Meeting Room accommodates 100 people
Moosomin PS/Rapid City PS	Canalta Hotel 405 Mtn. Street Moosomin, SK Canada	(306) 435-3044	Meeting Room accommodates 40 ppl
Severence PS/Turney PS	Stoney Creek Inn 1201 North Woodbine Road St. Joseph, MO 64506	(816) 901-9600	TBD
Cushing South PS/Cromwell PS	Holiday Inn Express Hotel & Suites Okmulgee 2780 N Woods Dr, Okmulgee, OK 74447	(918) 756-0100	Meeting Room accommodates 30-40 people
Cromwell PS/Tupelo PS	Comfort Suites McAlester 650 S George Nigh Expy, Mcalester, OK 74501	(918) 302-0001	Meeting Room accommodates 150 people
Tupelo PS/Bryan PS	Hampton Inn and Suites 3199 Shamrock Lane Durant, OK 74701	(580) 924-0300	Meeting Room accommodates 25-35 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Bryan PS/Delta PS	Hampton Inn Paris 3563 NE Loop 286 Paris, Texas 75460	(903) 784-6536	Meeting Room accommodates 20 people
Delta PS/Winnsboro PS	Holiday Inn Express & Suites Sulphur 421 Industrial Dr E Sulphur Springs, TX 75482	(903) 885-6851	Meeting Room accommodates 75 people
Winnsboro PS/Lake Tayler PS	Hampton Inn Kilgore 3109 N Highway 259 N Kilgore, TX 75662	(903) 983-3300	Meeting Room accommodates 55 people
Lake Tayler PS/Lufkin PS	Quality Inn & Suites Nacogdoches 3400 South Street Nacogdoches, TX 75964	(936) 564-2800	Meeting Room accommodates 150 people
Lufkin PS/Corrigan PS	Courtyard Lufkin 2130 South 1st Street Lufkin, TX 75901	(936) 632-0777	Meeting Room accommodates 75 people
Corrigan PS/Liberty PS	Hampton Inn Livingston 1510 Us Highway 59 South Loop Livingston, TX 77351	(936) 327-2300	Meeting Room accommodates 10-12 people
Liberty PS/End of Pipeline	Holiday Inn Hotel & Suites Beaumont Plaza 3950 I-10 South & Walden Rd Beaumont, TX 77705	(409) 842-5995	Meeting Room accommodates 150 people

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3.0 RESPONSE ACTIONS

3.1 Initial Response Actions

- Initial Response
- Line Rupture Or Leak (Piping, Valve Or Manifold)
- Fire (Minor, Major, Explosion)
- Severe Thunderstorm (Flash Flood/Landslide)
- Tornado/Straight Line Winds
- Earthquake
- Severe Winter Storm
- Volcanic Eruptions
- Security Incidents
- Abnormal Pipeline Operations
- Entrained Oil In Soil
- Release To Groundwater
- Hurricane

3.2 Documentation of initial Response Actions

3.3 Oil Containment, Recovery and Disposal/Waste Management

3.4 Storage/Disposal

3.5 Sampling and Waste Analysis Procedures

3.6 Safety Awareness

3.7 Emergency Medical Treatment and First Aid

Figure 3.1 Spill Classification

Figure 3.2 Product Specific Response Considerations

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3.1 INITIAL RESPONSE ACTIONS

Initial response actions are those taken by local personnel immediately upon becoming aware of a discharge or emergency incident, before the Initial Response Team (described in Section 4.0) is formed and functioning. Timely implementation of these initial steps is of the utmost importance because they can greatly affect the overall response operation.

The pages that follow discuss initial response actions for a variety of emergencies that have the possibility of occurring. These emergencies are discussed in the order listed below:

- Initial Response
- Line Rupture Or Leak (Piping, Valve Or Manifold)
- Fire (Minor, Major, Explosion)
- Severe Thunderstorm (Flash Flood/Landslide)
- Tornado/Straight Line Winds
- Earthquake
- Severe Winter Storm
- Volcanic Eruptions
- Security Incidents
- Abnormal Pipeline Operations
- Entrained Oil In Soil
- Release To Groundwater
- Hurricane

It is important to note that **these actions are intended only as guidelines** . The appropriate response to a particular incident may vary depending on the nature and severity of the incident and on other factors that are not readily addressed. Note, that **without exception, employees and public safety is first priority.**

The first Company person on scene will function as the Incident Commander (IC) until relieved by an authorized supervisor who will assume the IC position. Transfer of command will take place as more senior management respond to the incident. The role of IC will typically be assumed and retained by area management.

The person functioning as **Incident Commander** during the initial response period **has the authority to take the steps necessary to control the situation and must not be constrained by these general guidelines.**

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INITIAL RESPONSE ACTIONS - SUMMARY PERSONNEL AND PUBLIC SAFETY IS FIRST PRIORITY			
RESPONSE TIMES*			
US DOT Tier	1	2	3
High Volume Area	6 HR	30 HR	54 HR
All Other Areas	12 HR	36 HR	60 HR

CONTROL

- Eliminate sources of ignition
- Isolate the source of the discharge, minimize further flow

NOTIFY

- Make internal and external notifications
- Activate local Company personnel as necessary
- Activate response contractors and other external resources as necessary

CONTAIN

- Begin spill mitigation and response activities
- Monitor and control the containment and clean-up effort
- Protect the public and environmental sensitive areas

* Response resources and personnel available to respond within time specified after discovery of a worst case discharge per US DOT 49 CFR Part 194.115

In addition to the potential emergency events outlined in this Section, the Company has identified several "abnormal operations" that could be expected in the pipeline facilities. The Company has defined the events and established procedures to identify, eliminate or mitigate the threat of a worst case discharge due to these events. In compliance with 49 CFR 195.402(d), these procedures are defined in the Company's Operations Manual.

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Company First Responder / On Scene

- Verify emergency exists.
- Follow the appropriate steps outlined in the "Specific Incident Response Checklist" (Figure 3.1) and the "Product Specific Response Considerations" (Figure 3.2).
- Notify the Keystone Oil Control Center of the incident.
- Contact / Utilize local emergency services, as necessary (police, fire, medical).
- Follow TransCanada's Working Alone Procedures (EDMS No. 003743627).

Regional Emergency Operation Center

- Ensure local emergency agencies have been contacted (police, fire, medical).
- Assign personnel immediately to the discharge site to assist with emergency response (QI) and spill containment.
- Activate additional company and response contractors to site as situation demands.
- Confirm safety aspects at site, including need for Personal Protective Equipment (PPE), removal of sources of ignition, and potential need for evacuation.
- Evaluate the severity, potential impact, safety concerns and response requirements based on the initial data provided by the First Person On-scene. Refer to the spill response evaluation flowchart in this section.
- Establish communications with the Corporate Emergency Operations Center.
- Perform notifications using Figure 2.1, as appropriate.

Area Management

- Proceed to spill site and coordinate response and clean-up operations.
- Assume the role of Incident Commander.
- Coordinate/perform activation of additional spill response contractors, as the situation demands (telephone reference is provided in Figure 2.5).
- Direct containment, dispersion, and/or clean-up operations in accordance with the "Product Specific Response Considerations" provided in Figure 3.2.
- Complete the "Product Release Report" provided in Appendix F.

Local Company Personnel

- Assigned personnel will immediately respond to a discharge from the Pipeline or Facility, as the situation demands.
- Assist as directed at the spill site.
- Assume Incident Management Team roles as deemed by Incident Commander

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Range of Reported Oil Thicknesses Tool

	Barely Discernible	Silvery Sheen	Rainbow Colors	Darkening Bands of Color	Dull Colors	Light Brown
Reported average threshold, Microns	0.09	0.1	0.6	0.9	2.7	8
Range, microns	0.04 - .016	0.05 - 0.18	0.1 - 1.0	0.1 - 2.5	1.0 - 5.5	2.0 - 15.0

Source ExxonMobil Research and Engineering Company, Oil Spill Response Field Manual. Revised 2008

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FIGURE 3.1

SPILL CLASSIFICATION

Spills/Releases to Environment:

Minor

- A spill/release, onsite, that poses no adverse affect to the environment nor impact neither to a water body nor to groundwater. The spill may or may not be reportable to a regulatory agency.

Serious

- A spill/release, onsite or off-site/off-right-of-way, that poses an adverse affect to the environment but no impact to a water body nor to groundwater.

Major

- A spill/release, onsite or off-site/off-right-of-way, that has the potential to pose an adverse affect to the environment including an impact to a water body (water sources or otherwise) or rual water groundwater system.

Critical

- Emergency response for containment or clean up is required. A spill/release, onsite or off-site/off-right-of-way, that poses an adverse affect to the environment including an impact to a water body (drinking water source or otherwise) or rural groundwater systems.

Complaints - Health & Safety:

Minor

- Unverified community complaint from a landowner, police, fire, municipality, or a ministry.
- Verified employee complaint where an investigation is required to obtain resolution.

Serious

- Verified community complaint likely to cause danger/risk to the public, employees or TransCanada facilities.

Major

- Employee work refusal based on belief of unhealthy or unsafe work conditions.

Critical

- Regulatory body notified of employee complaint (by employee) and investigates employee work refusal.

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SPECIFIC INCIDENT RESPONSE CHECKLIST

Remember, without exception, personnel safety is the first priority, excessive exposure to the vapor and liquid stages of the spilled product should be avoided.

The following figures describe initial response activity for specific types of incidents. They are intended as guidelines. Each individual responsible for a response action must evaluate each action to ensure Personal Safety prior to conducting that action.

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Initial Response

All Roles

- Take appropriate personal protective measures.
- Conduct vapour monitoring.
- Complete hazard assessment.
- Secure site.
- Call for medical assistance if an injury has occurred.
- Notify Keystone Oil Control Center and area management of the incident.
- Eliminate possible sources of ignition in the near vicinity of the spill.
- Advise personnel or public in the area of any potential threat and/or initiate evacuation procedures.
- Identify/isolate the source and minimize the loss of product.
- Restrict access to the spill site and adjacent area as the situation demands. Take additional steps necessary to minimize any threat to health and safety.
- Verify the type of product and quantity released. (Material Safety Data Sheet(s) are provided in Appendix G).

All personnel are reminded that outsiders other than emergency services will not be allowed in the area during the time of an emergency and that statements issued to the media or other interested parties should be given by designated Company Management. Be courteous with media representatives and direct them to the designated spokesperson.

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Line Rupture or Leak (Piping, Valve or Manifold)

Oil Control Center

- Shut down pipeline.
- Close upstream and downstream block valves.
- Notify On-call regional designate to attend site as a First Responder.
- Initiate Regional EOC Manager Notification once incident is confirmed by First Responder.
- Initiate Calgary EOC Manager Notification and pass on Regional EOC contact Information.
- Notify Oil Control Center On-call designate.
- Notify Oil Movements Scheduling.
    - During Business /After hours - Callout Database
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
    - (403) 920-7859
    - (800) 608-7859

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Fire (Minor, Major, Explosion)

Oil Control Procedures

Be aware of Fire Weather conditions.

- Watch - Critical fire weather conditions are forecast to occur.
- Red Flag Warning - Critical Fire weather conditions are either occurring or will shortly.

Individual Discovering the Fire (All Employees)

- Call the Local Emergency Response Agency (911).
- Notify Oil Control Center (this should be the 1st notification completed in the event that it is a remote location with no immediate impacts to life safety).
- Notify Area Management.
- Complete all First Responder responsibilities and initially assume the role of TransCanada's Incident Commander.
- Ensure ongoing communications with Keystone Oil Control Center.
- Follow the instructions outlined in section 3.1 Initial Response and the Responsibilities outlined in TransCanada's First Responder checklist.

Note: Pipeline right-of-way are used by Firefighters as a fire break (barrier) to isolate fires and prevent them from growing in size. Right-of-ways are commonly used to access to fire areas. Many times Firefighters will need to increase the size of the cleared space over the Pipeline right-of-way to prevent the fire from leaping from tree top to tree top. To do this, heavy equipment may be used to quickly increase the amount of cleared space between the fire area and unignited forest. The following are steps to consider when working with the local authority on creating these fire breaks.

- Use your best judgment to ensure the safety of staff, fire ground workers and the public when determining if this activity is safe to perform;
- Call and confirm with Asset Reliability if this activity is safe and implement any instructions provided by Asset Reliability. Asset Reliability's role is to provide directions to protect the health and safety of those involved as well as pipeline integrity;
- Be physically on site to coordinate the activities related to any pipeline crossings;
- Stake the pipeline to identify the location of the pipe(s) in the right-of-way.
- First preference is to use already existing pipeline crossing areas;
- Gather the appropriate information to complete a formal pipeline crossing agreement. In Canada, send required information to the Land Department in Calgary.
- Notify the Oil Central Center and area management.
- Shut off pumps.
- Coordinate with the Keystone Oil Control Center to close appropriate valves to isolate in the vicinity of the fire, if necessary.
- Isolate Pump Station from Mainline.
- Evacuate site as safety considerations dictates.
- Notify the Oil Central Center of evacuation route and final destination.
- Notify the Oil Central Center of safe arrival.
- Inspect pump station, equipment and controls after the fire is extinguished and safe to return.
- Evaluate pipeline, monitoring or control systems for evidence of heat damage.
- Notify engineering to conduct further investigation if damage is found.
- Make appropriate repairs and return Pipeline to service.

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Third Party Call In Confirmation of Fire

This procedure applies to a pipeline facility integrity threat identified received via third party thru TransCanada Emergency Line (PDL 800-447-8066) or direct call to Keystone Oil Control Center reporting a fire at or adjacent to Keystone Pipeline Facilities or ROW.

If the third party indicates a pipeline facility (Pump Station/QMU Building/ESB Building etc.) is on fire or in jeopardy of catching fire the controller will do the following:

- Should the call come from PDL, confirm receipt of third party call-in contact information. If third party call-in comes direct to Oil Control Center please fill out third party call-in form Third Party Template.
- Once confirming all information with the caller and it is clear that the pipeline facilities are at risk, implement the following steps:
  - Shutdown and Isolate the affected pump station OR
  - Confirm, checking with leak triggers and discussion with third party, that the fire is not due to a pipeline failure.
- Once confirmed that the source is not us, keep the pipeline running.
- Notify On-call regional designate to investigate as a First Responder and provide further guidance.
- Initiate Regional EOC Manager Notification once incident is confirmed by First Responder.
- Initiate Calgary EOC Manager Notification and pass on Regional EOC contact Information.
- Notify Oil Control Center On-call designate.
- Notify Oil Movements Scheduling.
  - During Business /After hours - Callout Database
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
  - (403) 920-7859
  - (800) 608-7859

Aerial Pipeline Patrol Confirmation of Fire

If the Oil Control Center receives a call from the Aerial Pipeline Patrol indicating a fire on or adjacent to Keystone Pipeline ROW/Facilities, the controller's response will be as follows:

If the pilot/observer indicates a pipeline facility (Pump Station/QMU Building/ESB Building etc.) is on fire or in jeopardy of catching fire the controller will do the following:

- Once confirming all information from the pilot/observer is clear that the pipeline facilities are at risk.
- Shutdown and Isolate the affected pump station.
- Notify On-call regional designate to investigate as a First Responder and provide further guidance.
- Initiate Regional EOC Manager Notification once incident is confirmed by First Responder.
- Initiate Calgary EOC Manager Notification and pass on Regional EOC contact Information.
- Notify Oil Control Center On-call designate.
- Notify Oil Movements Scheduling.
  - During Business /After hours - Callout Database

If the pilot/observer indicates a fire on or adjacent to our Pipeline ROW, the controller will do the following:

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- Confirm, checking with leak triggers and discussion with third party, that the fire is not due to a pipeline failure.
- Once confirmed that the source is not us keep the pipeline running.
- Notify On-call regional designate to investigate as a First Responder and provide further guidance.
- Initiate Regional EOC Manager Notification once incident is confirmed by First Responder.
- Initiate Calgary EOC Manager Notification and pass on Regional EOC contact Information.
- Notify Oil Control Center On-call designate.

Company Employee Confirmation of Fire

If the integrity threat is confirmed by a TransCanada Employee that has been dispatched as a First Responder to a third party call-in of a fire, at or adjacent to Keystone Pipeline Facilities or ROW, the controller's response will be as follows:

- Confirm isolation of affected area, including valve positions with Regional personnel and commence further isolation or pipeline shutdown strategy with Regional personnel as required.
- Should the recommendation from the field be to shutdown the pipeline, the controller is to do a controlled shutdown and isolate as per Pipeline Isolation and Segmentation Standards
- Confirm EMS has been initiated and Calgary EOC is active. Continue Monitoring pressure profiles using Supervisory Control and Data Acquisition (SCADA) / Leak Detection System (LDS).
- Ensure all receipt and delivery interconnects are notified and updated as required.
- Notify Oil Control Center On-call designate.
- Notify Oil Movements Scheduling.
  - During Business /After hours - Callout Database
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
  - (403) 920-7859
  - (800) 608-7859

TransCanada Gas Conversion Pipe ROW Rupture/Fire

This procedure applies to a Keystone Pipeline integrity threat from an adjacent TransCanada Gas Pipeline rupture/fire in the conversion Pipeline ROW. The Conversion Pipeline ROW extends from Burstall Pigging Station to Elm Creek Pigging Station.

In the Event that the controller receives a suspected or a confirmed notification of a TransCanada Gas Pipeline rupture/fire adjacent to Keystone Oil Pipeline, the controller is to do the following:

- Confirm thru SCADA/LDS that pressures and flow rates are steady and that no other leak triggers are present.
- If no other leak triggers are present, the controller is to drive Keystone Pipeline to safe discharge limits and continue running.
- Notify On-call designate/first responder that the Keystone Pipeline is still running and we will await their direction once they arrive on scene.
- First responder will instruct the controller to shutdown or continue running once on scene and the integrity of Keystone Pipeline has been assessed.
- Notify Oil Control Center On-call designate.
- Confirm EMS has been initiated and Regional/Calgary EOC is active. Continue monitoring pressure profiles using SCADA/LDS.

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- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
  - (403) 920-7859
  - (800) 608-7859

If one or more leak triggers exist, the controller is to initiate an Emergency Pipeline Shutdown and isolate as per Pipeline Isolation and Segmentation Standards

- Notify On-call designate/first responder that the Keystone Pipeline has been shutdown and we will await their direction once they arrive on scene.
- Notify Oil Control Center On-call designate.
- Confirm EMS has been initiated and Regional/Calgary EOC is active. Continue monitoring pressure profiles using SCADA/LDS.
- Notify Oil Movements Scheduling.
  - During Business /After hours - Callout Database
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
  - (403) 920-7859
  - (800) 608-7859

TransCanada Gas Conversion Pipe Shared Pump Stat

This procedure applies to a Keystone Pipeline integrity threat from an adjacent TransCanada Gas Pipeline rupture/fire at a shared pump station . The Shared Pump Stations include Cabri, Herbert, Caron, Regina, Kendall, Grenfell, Moosomin, Rapid City and Portage La Prairie.

In the event that the suspected or confirmed TransCanada Gas Pipeline rupture/fire occurs at a shared pump station facility, the controller is to do the following:

- Confirm thru SCADA/LDS that pressures and flow rates are steady and that no other leak triggers are present.
- If no other leak triggers are present, the controller is to isolate the pump station from the mainline and drive Keystone Pipeline to safe discharge limits and continue running.
- Notify On-call designate/first responder that the Keystone Pipeline is still running and we will await their direction once they arrive on scene.
- First responder will instruct Keystone Pipeline Operator to shutdown or continue running once on scene and the integrity of Keystone Pipeline has been assessed.
- Notify Oil Control Center On-call designate.
- Confirm EMS has been initiated and Regional/Calgary EOC is active. Continue monitoring pressure profiles using SCADA/LDS.
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
  - (403) 920-7859
  - (800) 608-7859

If one or more leak triggers exist, the controller is to initiate an Emergency Pipeline Shutdown and isolate as per Pipeline Isolation and Segmentation Standards

- Notify On-call designate/first responder that the Keystone Pipeline has been shutdown and the pump station has been isolated and we will await their direction once they arrive on scene.

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- Notify Oil Control Center On-call designate.
- Confirm EMS has been initiated and Regional/Calgary EOC is active. Continue monitoring pressure profiles using SCADA/LDS.
- Notify Oil Movements Scheduling.
    - During Business /After hours - Callout Database
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
    - (403) 920-7859
    - (800) 608-7859

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Severe Thunderstorm (Flash Flood/Landslide)

Severe Thunderstorm (Flash Flood/Landslide)

Thunderstorms are a year round occurrence with lightning a major threat. The potential of flash flooding is also possible when one area is affected for an extended period.

- Be aware of changing weather conditions.
  - Severe Thunderstorm Watch - Conditions are favorable to the development of thunderstorms.
  - Severe Thunderstorm Warning - A severe thunderstorm has been observed or is imminent.
  - Flash Flood Watch- Flash flooding is possible within 6 hours after heavy rains have ended.
  - Flash Flood Warning - Flash flooding is occurring or imminent.
- Terminate outdoor work when lightning is occurring and move to shelter.
- Avoid areas subject to sudden flooding until the thunderstorm passes.
- Evaluate the situation after weather event.
  - Does standing water prevent visual inspection?
  - Have flood waters damaged the Pipeline?
  - Have flood waters exposed buried piping?
  - Has soil shifted that could lead to a landslide?
- Evaluate the accessibility of pipeline facilities that may be in jeopardy, such as valve settings, which are needed to isolate water crossings or other sections of a pipeline.
- Extend regulator vents and relief stacks above the level of anticipated flooding, as appropriate.
- Coordinate with emergency and spill responders on pipeline location and condition. Provide maps and other relevant information to such responders.
- Coordinate with other pipeline operators in the flood area and establish emergency response centers to act as a liaison for pipeline problems and solutions.
- Deploy personnel so that they will be in position to take emergency actions, such as shut down, isolation, or containment.
- Determine if facilities that are normally above ground (e.g., valves, regulators, relief sets, etc.) have become submerged and are in danger of being struck by debris.
- Perform frequent patrols, including appropriate overflights, to evaluate right-of-way conditions at water crossings during flooding and after waters subside. Determine if flooding has exposed or undermined pipelines as a result of new river channels cut by the flooding or by erosion or scouring.
- Perform surveys to determine the depth of cover over pipelines and the condition of any exposed pipelines, such as those crossing scour holes. Where appropriate, surveys of underwater pipe should include the use of visual inspection by divers or instrumented detection. Information gathered by these surveys should be shared with affected landowners. Agricultural agencies may help to inform farmers of the potential hazard from reduced cover over pipelines.
- Ensure that line markers are still in place or replaced in a timely manner. Notify contractors, highway departments, and others involved in post-flood restoration activities of the presence of pipelines and the risks posed by reduced cover. If a pipeline has suffered damage, is shut-in, or is being operated at a reduced pressure as a precautionary measure as a result of flooding.

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- Advise the appropriate PHMSA Regional Office or State pipeline safety authority before returning the line to service, increasing its operating pressure, or otherwise changing its operating status. PHMSA or the State will review all available information and advise the operator, on a case-by-case basis, whether and to what extent a line can safely be returned to full service.
- Make all necessary repairs.

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Tornado/Straight Line Winds

Tornado/Straight Line Winds

Although many disasters cannot be prevented or predicted, preparation can significantly reduce losses. In the event of a severe weather condition or a natural disaster, the Area Manager or assigned designee will be the Emergency Coordinator.

- **Be Aware of Changing Weather Conditions**
  - Tornado watch - Conditions are right for the formation of a tornado.
  - Tornado warning - A tornado has been sighted but is not in the area at this time.
  - Tornado alert - A tornado has been sighted in the immediate area, take cover immediately.

- **If Severe Weather Conditions Threaten**
  - Carry a battery operated portable radio and monitor conditions.
  - If a tornado is observed and time permits, evacuate the area.
  - If the tornado is approaching a pump station, notify the Oil Central Center to remotely isolate the station.
  - In vehicle, drive away from tornado at right angle. Get out of car and seek shelter if tornado cannot be avoided.
  - If outdoors, shelter in ditch, excavation or other low spot and lie flat, face down.
  - Make certain that all personnel are aware of the condition.
  - Stay in shelter until conditions are safe.

- **Immediately After the Storm**
  - Account for all personnel.
  - Survey for damages.
  - Initiate team for any repairs.
  - Refer to this Plan for additional response guidance regarding fires, spills, etc., as needed.

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Earthquake

Earthquake

The actual movement of the ground in an earthquake is rarely the direct cause of death or injury. Most casualties result from falling objects and debris because the shocks can shake, damage or demolish buildings and other structures.

- **Stay calm. Don't panic.**
- If you are indoors, stay there. Do not run outside.
- If you are in a building, take cover under a heavy furniture or stand in an inside doorway away from windows. (A door frame or the inner core of a building is its strongest point and least likely to collapse.)
- Exit building as situation determines.
- If you are outside, stay there. Move away from buildings to avoid falling debris. Avoid damaged utility lines.
- If you are driving, stop quickly and stay in your car. If possible, do not stop on a bridge, overpass or where buildings can fall on you. Your car can provide protection from falling debris.
- Do not reenter damaged buildings. Walls may collapse after the original shaking has ceased.
- Evaluate the situation and initiate appropriate pipeline patrol by the most expedient means possible to determine extent of damage.
- Make all necessary repairs as resources and conditions allow.

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Severe Winter Storm

Winter Storm

- Be aware of Changing Weather Conditions
  - Winter Storm Watch - Conditions are expected but not imminent.
  - Winter Storm Warning - A significant winter storm is occurring, imminent, or likely.
  - Blizzard Warning - Winds at least 35 mph (56.3km), blowing snow frequently reducing visibility to 0.25 miles or less, and dangerous wind chills are expected.
- Listen to local radio stations for weather advisory and road condition reports, carry a survival kit, and start the trip with a full tank of gasoline.
- Inspect pump station, equipment, and controls after storm for damage.
- Make any repairs as necessary.

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Volcanic Eruptions

Volcanic Eruptions

If a volcanic eruption ejects a large ash plume and the wind carries the ash to the pipeline facilities, this may cause a disruption of operations by making travel difficult or impossible due to reduced visibility.

- Begin gathering information from news media, field personnel, etc. to assess any ash cloud size, location, heading and speed as soon as news of an eruption breaks.
- Consider recalling crews prior to the expected arrival of the ash cloud while it is still clear to travel. If a crew is at a station when an ash fall begins, they should probably stay there for the duration and not travel until it is determined to be safe after the event.
- Advise contract aerial patrol service of the situation if contacted for the beginning of a pipeline patrol or if an aerial patrol is in progress.
- Inspect pump station, equipment and controls after eruption for damage.
- Make any repairs as necessary.

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Security Incidents

Bomb Threat

The following pages provide guidelines for actions to be taken in the event a bomb threat is received. A bomb threat to the pipeline system or personnel may present itself in any of several ways:

- Phone
- E-mail
- Fax
- Radio
- Mail
- Word-of-mouth
- Increase in the Homeland Defense Status

Other threats to pipeline system or personnel are often treated in the same manner as bomb threats. These may include:

- Terrorist threats
- Workplace violence threats
- General threat to an industry
- Civil disturbances

The following steps should be used as guidance when responding to the above situations. Actions during a real event will vary based on differences in circumstances, response activities, good judgment, etc.

Phone / Written (Fax, Letter, Telegram) Threats

Person Receiving the Call

- Immediately open the Bomb Threat form, (this should be kept next to the phone), so you can use it during the conversation with the individual making the bomb threat call. If possible, complete the form during the call.
- Remain calm and be engaging when talking to the caller.
- Keep the caller on the line as long as possible in order to obtain as much information as possible. Ask him/her to repeat the message. Try to write down every word spoken by the person. If you have a small hand-held tape recorder available, try to tape the conversation.
- If the caller does not indicate the location of the bomb or the time of detonation/attack, ask for this information.
- Inform the caller that the incident could result in death or serious injury to innocent people.
- Pay particular attention to background noises, such as motors, music, and any other noise that may give a clue as to the location of the caller.
- Listen closely to the voice (male, female), voice quality (calm, excited), accents, and speech impediments.

After the Caller Hangs Up and Written Threats

- Immediately report the threat call to the Oil Central Center or the Company person designated by management to receive such information.

Pipelines and Pump Stations - Additional Guidance

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- If the caller does not indicate the location of the bomb / substance or the time of possible detonation/attack, ask him / her for this information. Try to determine the Province / State, pipeline system, and specific location involved if possible.
- For offices and control center, inform the caller that the building/facility is occupied and the incident could result in death or serious injury to innocent people.
- For pipeline and pump stations, inform the caller that an incident could result in death of the innocent general public or significant environmental impact.

Area Manager/Designee

- Based upon discussion with Corporate Security, determine if the threat is credible. Then decide what actions to take, which can include:
  - Do Nothing
  - Attempt to determine which facility(s) are at risk
  - Stay and Search
  - Partial Evacuation or Internal Evacuation (offices or control center)
  - External Evacuation to an offsite Command Post (offices or control center)
- If a full or partial facility evacuation is necessary, activate Building Evacuation Plan immediately. When in doubt, evacuate. Encourage personnel to be vigilant for suspicious or out-of-place objects as they evacuate and leave their workstations.
- Initiate operations "shut down" procedures, as necessary.
- Secure the location and limit access to essential personnel only.
- Call the appropriate local and/or government agencies (fire, police, etc.) listed in Figure 2.5 and inform them of the threat and your Command Post location.
- Set up a Command Post at a pre-determined offsite location. Ensure you have:
  - Emergency Response Plan
  - Facility maps
  - Access keys
  - Cell Phones, Pagers & Radios
- Direct all members of the press to the designated spokesperson.

Pipeline Incidents

- Additional actions to consider taking upon credible threats against pipelines and pump stations:
  - Which if any system(s) should be shutdown
  - When any system(s) should be shutdown
- Survey from a distance with the aid of binoculars:
  - valves
  - station piping
- Due to the expanse of Pipeline facilities, aircraft should be considered to aid in the surveying pipeline ROW.
- Notify the appropriate local and/or government agencies listed in Figure 2.5 upon discovery of suspicious or out-of-place object(s).

Suspicious Mail / Delivered Package

- Frequently seen explosive devices have been incorporated, hidden, or camouflaged in letters, soft cover pocketbooks, hard cover books, manila envelopes, and cardboard boxes. While many are delivered by Canadian or U.S. mail, they may arrive by private courier or express service. Be alert to recognize suspicious-looking or unexpected items especially those that have:
  - Special handling marks (special delivery, air mail, registered, certified)

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- Restrictive markings (personal, confidential, addressee only)
- Excessive postage
- Handwritten or poorly typed address
- Incorrect title, or title but no names
- Misspelling of common words
- Oily stains, discolorations, or odor
- No return address
- Excessive weight
- Lopsided, uneven, or ridged envelope
- Protruding wires or tin foil
- Excessive securing material (tape, string, etc.)
- Any evidence that the envelope has been opened and re-glued
- Mail item from a new or strange source

- If you receive or find a suspicious-looking letter or package:
  - DO NOT TRY TO OPEN IT.
  - Isolate the area around the letter or package to the degree possible, and make emergency notifications as previously outlined, and evacuate personnel to a safe distance, as directed.
  - DO NOT MOVE NOR HANDLE unless absolutely necessary.
  - If opened, preserve, BUT DO NOT TOUCH FURTHER all original envelopes, twine, shipping documents, or packaging materials for evidence and release to the police as requested.
  - Report the call to the Regional Manager or their designee.

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Abnormal Pipeline Operations

Abnormal Pipeline Operations

- If operating design limits have been exceeded (increase or decrease pressure or flow) and no emergency condition exists, document the incident in IIT, immediately investigate the pipeline, and run the event to resolution.
- Verify whether a true safety problem, equipment malfunction, or operator error is present. Note: In all cases, safety to operations, the general public, and property will govern actions taken.
- Make appropriate repairs before continuing operations. Note: Corrective action will only be done by qualified personnel to perform the type of work involved.
- Monitor affected systems until normal operations are resumed.
- Complete follow-up and written reporting, as the situation demands.

Note: It is the responsibility of the pipeline operator to carry out the response procedures for abnormal pipeline operations as outlined in their respective O&M Manual (EDMS ID: 005713585). If Abnormal Operations occur in the US, refer to O&M manual, procedure 195.402d.

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Entrained Oil in Soil

All Roles

Response Operations area:

1. Bioremediation is not a first response option but can be effective when indigenous microbial populations, present in the substrate, are high enough to degrade the contaminants when the oil is entrained in the soil. For more details, see "*Annex IX - Guidance for Using Bioremediation in Response to Oil Spills in Region 8*" located in Appendix F, Miscellaneous Forms.
    - A number of microorganisms can utilize oil as a source of food. In some cases, natural populations adapt to the contaminant conditions and are able to convert the contaminants to non-hazardous end products rapidly enough to prevent impact downstream.
    - Biostimulation - Where natural populations can be stimulated to degrade contaminants by adding nutrients to the soil. Anaerobic respiration is a process by which organisms degrade containments, and the amendments are often the electron donors or electron acceptors needed by the organism to complete the decontaminating reaction.
    - Bioaugmentation - Adding microbial organisms that are capable of degrading the contaminant.
2. Encapsulation - Containment of soil on site with a properly designed barrier.
3. Disposal of affected soil to an approved landfill.

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Release to Groundwater

All Roles

The following procedure has been prepared in the event of a release of crude oil from the pipeline into a hydraulically sensitive groundwater resource area, but may not be currently identified as a high consequence area by PHMSA. Specific areas of concern have been evaluated for their sensitivity and plans to effect cleanup have been discussed. These specific areas include:

- The Winkler Aquifer
- The Wellhead Protection Areas near Seward, NE
- The Middle James Aquifer in Marshall County, SD

RESPONSE PROCEDURE

- Evaluate the topography and evidence of surface contamination.
- Establish containment, accounting for public safety, spill volume, terrain, and presence of surface water.
- Notify landowner and appropriate public agencies of potential groundwater contamination.
- Immediately retain an independent consultant with expertise in this area to evaluate impacts and remediation options.
- Consult with appropriate agencies regarding remediation, including water and soil cleanup levels, and need for groundwater monitoring.
- Notify and procure additional response equipment and personnel as necessary to address site-specific conditions.
- Dig intercept trench downgradient of release point.
- Line trench and stage vacuum truck to remove contaminated oil/water mixture.
- Excavate surface catchment upgradient of the intercept trench and near leading edge of visible contamination.
- Excavate until contaminated soil is completely removed and clean soil is encountered or conditions prohibit continued digging.
- Line the catchment to limit or prohibit further groundwater contamination.
- Move vacuum truck from intercept trench to catchment to recover oil and/or oily water.
- Line drop down area to stage contaminated soil as excavated.
- Segregate waste streams to minimize later disposal.
- Based on anticipated release, stage temporary storage and additional vacuum trucks to ensure recovery efforts continue without interruption.

  Options for Long term Remediation:

  - Air sparging
  - Vacuum extraction
  - Conventional pump and treat
  - Bioslurping
  - Excavation
  - Enhanced biodegradation/bioremediation
  - Chemical addition/oxidation
  - Natural Attenuation
- Enlist additional experts, as appropriate, for continuing remediation and coordination with appropriate agencies.

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Hurricane

Action Plan

The hurricane action plan is based on the following main points:

1. The Pipeline will be shut down if hurricane conditions are forecast (predicted winds in excess of 74 mph (119.1km).
2. Every attempt will be made to accomplish shutdowns in time for personnel to return home and evacuate safely. The phase criteria and timelines are different for Category 1, 2 and Category 3, 4, 5 storms.
3. They provide a proper sequence and timing for hurricane preparation, a four phase planning approach has been developed. The phase criteria and timeline follow.

Employee Action Plan

Employees should take the following actions when given instructions to evacuate:

1. Obtain directs for how to get information when the Pipeline will restart and for special instructions.
2. Contact your immediate supervisor for further instructions after departing site and hurricane conditions have passed.
3. Perform the following actions before leaving a closure location:
    - Remove any loose papers from the top of your desks.
    - Relocate or protect critical records to avoid damage.
    - Back-up and secure computer data files, shut down personal computers.
    - Close exterior doors prior to leaving Office.

NOTE: "For damage to pipeline facilities caused by hurricane and not otherwise required to report, report to John Hess, Director for Emergency Support and Security, 202-366-4595 or by email at PHMSA.OPA90@dot.gov."

Phased Criteria and Timeline

Phase 1 - Initiated when a storm presents a credible threat to the facility. The storm may or may not be in the gulf of Mexico, the key towards initiation, is the threat that it is likely to pose on the Pipeline. Phase 1 consists primarily of preparatory measures. The decision to implement Phase 1 rests with Corporate.

Topics of discussions should include:

- Notifications - Internal / External
- Current status and forecast of storm track and intensity.
- Selection and notification of volunteers for the hurricane crew members.
- Area industry preparation.
- Management updates to personnel on status of hurricane preparedness.
- Course of actions for the Pipeline.
- Timing and frequency of subsequent updates.

Phase 2 - Initiated 58 hours prior to 74 mph (119.1km) winds for Category 1, 2 storms, 84 hours prior to 74 mph (119.1km) winds Category 3, 4, or 5 storms.

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Upon entering Phase 2, the Pipeline is positioned for several response options:

- Continue to operate when best available information predicts a storm with winds less than 74 mph (119.1km).
- Begin taking steps to be positioned to move quickly to Phase 3.
- Move directly to Phase 3.

Phase 3 - Initiated 40 hour prior to 74 mph (119.1km) winds for Category 1, or 2 storms and 72 hours prior to 74 mph (119.1km) winds for Category 3, 4, or 5 storms. It calls for orderly shutdown. Shutdown procedures should establish a prompt safe off process conditions that will secure and protect equipment from damage.

The decision to implement Phase 3 rests with Corporate Management when the storm ETL is 40/72 hours. The timing of the decision will vary from storm to storm, based on the most accurate available information for forecast strength and path.

Phase 4 - After the storm passes, Management will determine when it is safe to do the initial hazard/damage assessment of the pipeline system following the storm.

Qualified Individual (QI)

Qualified Individual:

- Fulfills normal responsibilities and duties per normal operations.
- Keeps the Corporate informed of operating activities.
- Develops the list of shutdown crew members.
- Coordinates shutdown and securing of all assets.
- Responsible for accountability for all shutdown crew members.
- Maintains contact with the Corporate to inform them of issues and status of the shutdown crew and receive updates on response plans going forward.
- Conducts information meetings with the shutdown crew twice per day for updates on the storm and the response plans going forward.

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3.2 DOCUMENTATION OF INITIAL RESPONSE ACTIONS

It is difficult, particularly during the first few minutes of an initial response operation, to think about the importance of documentation. A log should be maintained which documents the history of the events and communications that occur during the response. When recording this information, it is important to remember that the log may become instrumental in legal proceedings, therefore:

- Record only facts, do not speculate.
- Do not criticize the efforts and/or methods of other people/operations.
- Do not speculate on the cause of the spill.
- Do not skip lines between entries or make erasures. If an error is made, draw a line through it, add the correct entry above or below it, and initial the change.
- Record the recommendations, instructions, and actions taken by government/regulatory officials.
- Document conversations (telephone or in person) with government/regulatory officials.
- **Request that government/regulatory officials document and sign their recommendations or orders (especially if company personnel do not agree with the suggestions, instructions, or actions).**

3.3 OIL CONTAINMENT, RECOVERY AND DISPOSAL/WASTE MANAGEMENT

After initial response has been taken to stop further spillage and notifications made to the required agencies, the Company will begin spill containment, recovery, and disposal operations.

The Incident Commander will assess the size and hazards of the spill (see Figure 3.2). The type of product, the location of the spill, and the predicted movement of the spill will be considered.

See Appendix H, Basics of Oil Spill Response, for additional information on oil containment removal.

Based on this assessment, additional clean-up personnel and equipment will be dispatched to the site and deployed to control and contain the spill. Boom may be deployed in waterways to contain the spill and to protect socio-economic and environmentally sensitive areas. Booms may also be used in waterways to deflect or guide the spill to locations where it can more effectively be cleaned up using skimmers, vacuum trucks, or sorbent material. Clean-up equipment and material will be used in the manner most effective for rapid and complete clean-up of all spilled product.

Response and clean-up will continue until all recoverable product is removed, the environment is returned to its pre-spill state, and the Unified Command of the Company Incident Commander and the Federal and/or State On-Scene Coordinators determine that further response and cleanup is no longer necessary.

See Appendix H, Basics of Oil Spill Response, for additional information on oil containment recovery.

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FIGURE 3.2

FLAMMABLE LIQUIDS (Non-Polar/Water-Immiscible)	
The following information provides the initial responder(s) with data that may be useful in making quick decisions and executing prompt response actions. The information is intended for guideline purposes only.	
HEALTH	
GUIDE NO. 128	• Inhalation or contact with material may irritate or burn skin and eyes. • Fire may produce irritating, corrosive and/or toxic gases. • Vapors may cause dizziness or suffocation. • Runoff from fire control or dilution water may cause pollution.
FIRST AID	
• Move victim to fresh air. • Call 911 or emergency medical service. • Give artificial respiration if victim is not breathing. • Administer oxygen if breathing is difficult. • Remove and isolate contaminated clothing and shoes. • In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. • Wash skin with soap and water. • In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin. • Keep victim warm and quiet. • Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. • Ensure medical personnel are aware of materials involved and take precautions to protect themselves.	
PUBLIC SAFETY	
• **CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.** • Isolate spill or leak area immediately for at least 50 meters (150 feet) in all directions. • Keep unauthorized personnel away. • Stay upwind. • Keep out of low areas. • Ventilate closed spaces before entering.	
EVACUATION	**Large Spill** • Consider initial downwind evacuation for at least 300 meters (1,000 feet). **Fire** • If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.
Information provided by the Emergency Response Guidebook 2012.	

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3.4 STORAGE/DISPOSAL

Strict rules designed to ensure safe and secure handling of waste materials govern the Company waste disposal activities. To ensure proper disposal of recovered oil and associated debris, the following guidelines should be considered:

- In the event of a product spill, Facilities have limited capacity to store recovered product and water. Separated product is pumped to frac tanks or to trucks to be carried to the Facility for processing.
- Oily debris will be segregated on site and containerized for temporary storage prior to disposal in accordance with hazardous waste regulations.
- Transportation of waste material will be performed in accordance with all applicable Federal and State Regulations.
- Waste associated with the spill will be disposed at sites that have the necessary permits to accept the type of waste to be discharged.

The Company's Community, Safety and Health Administration Dept. will coordinate activities and secure the permits to ensure proper disposal or recycling of recovered product and debris.

3.5 SAMPLING AND WASTE ANALYSIS PROCEDURE

The Company's sampling and waste analysis practices are governed by the regulations for the applicable Province/State and Federal agency. These regulations outline methods and procedures for determining the chemical and physical characteristics of wastes generated by the Facility, including waste associated with spills, so that they may be properly stored, treated, or disposed.

3.6 SAFETY AWARENESS

It is the corporate policy of the Company to provide a safe workplace for all workers. All employees and contractors are responsible for maintaining the safety and health of all workers on the pipeline and the response operations.

Prior to engaging in any spill response activity:

- All employees/contractors must have received orientation from the Company Safety Plan.
- All U.S. contractor response personnel must be in compliance with Occupational Safety and Health Administration training requirements.
- All other personnel will have completed appropriate training for their position as outlined in Section 4.0.
- No employee/contractor shall engage in activities without the appropriate protective equipment and training.

Response Safety

All Company and contractor personnel are expected to comply with the Site Safety Plan for each spill incident.

- Any concern regarding health or safety issues should be immediately addressed.
- The First Responder must consider the spill site as dangerous and the local atmosphere explosive until air monitoring procedures prove that the area is safe.

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- The First Responder must exit the area against or across the wind, if possible, and must also evacuate others who are working in the area.
- All injuries, no matter how minor, must be reported to the Incident Commander in a timely manner.
- Prior to entering a spill area, a qualified person must perform an initial safety and health evaluation of the site.

Air Monitoring

A Safety Monitor shall be designated who is trained in the operation of air monitoring equipment. The Incident Commander must ensure that Safety Monitors are trained and that their equipment is maintained and ready for use.

- The air monitoring equipment shall be activated and checked at the location in which it is stored.
- Calibration of instruments should be performed before use.
- Air monitoring measurements which are to be made prior to entry into the spill area include:
    - Oxygen content
    - Lower Explosive Limit (LEL) with a pentane calibrated instrument
    - Benzene level

H2S

- Lower Explosive Limit readings above 10% require immediate evacuation of the area and elimination of ignition sources.
- Oxygen readings below 19.5% require the use of air supplied respiratory protection.
- After assuring that there are no hazards relating to explosion or oxygen depletion, sampling for benzene or total petroleum hydrocarbons shall dictate the appropriate respiratory devices to be used by persons entering the area.
- Benzene levels must be below 0.5 ppm to work without respiratory protection. At a level of greater the 0.5 but less than 5 ppm a half face respirator may be used. When the level is between 5.0 and 25 ppm a full face respirator must be used. Anything readings higher than 25 ppm, a supplied air or Self Contained Breathing Apparatus must be used.

If H2S is present in low concentrations respiratory protective equipment may be used following the following criteria based on approved protection factors. Using the approved protection factors of 10 for ½ face respirators and 50 for full face and the most stringent OEL which is 1 ppm (Canadian Federal COHSR) the corresponding maximum use concentrations would be 10 ppm for ½ face and 50 ppm for full face. The use of respirators however should be limited to areas with concentrations less than 10 ppm. If concentrations are higher workers should immediately leave the area.

- Hydrogen Sulfide is an extremely hazardous toxic compound that is present in most crude oils that are transported through the pipeline.
- Air monitoring for Hydrogen Sulfide will be done by all personnel working on or near the pipeline and during any cleanup operation.

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- Hydrogen Sulfide is characterized by a rotten egg smell at low level concentrations.
- The gas causes rapid temporary paralysis of the olfactory system leading to the loss of the sense of smell.
- Permissible exposure limits in many countries is 10 ppm. In Canada the occupational exposure level is 1 ppm.

Symptoms of exposure to Hydrogen Sulfide are:

- 0-10 ppm no known health effects for most people
- 10-100 ppm can cause headache, dizziness, nausea (100 ppm is the immediately dangerous to life and health level)
- 100-500 ppm above mentioned effects within a short time and more severe. Loss of breathing and death is possible within minutes.
- 500-700 ppm affects the central nervous system. Symptoms could include a loss of balance and a loss of reasoning. You could become unconscious and stop breathing within seconds
- 700 and greater would result in immediate loss of consciousness and permanent brain damage due to hypoxia or death if not rescued immediately
- The Incident Commander is responsible for arranging industrial hygiene monitoring in the post discovery period.

Decontamination

Through training programs, response personnel know and understand the importance of the removal of hazardous substances from their person if they are contaminated. Eyewash stations and safety showers provide a means to quickly remove gross contamination of harmful agents, including gasoline. Personnel must immediately shower and remove any clothing which is wet or otherwise contaminated. Showers in the change room are to be used for thorough cleansing. Persons should inspect themselves thoroughly before donning a fresh change of clothing.

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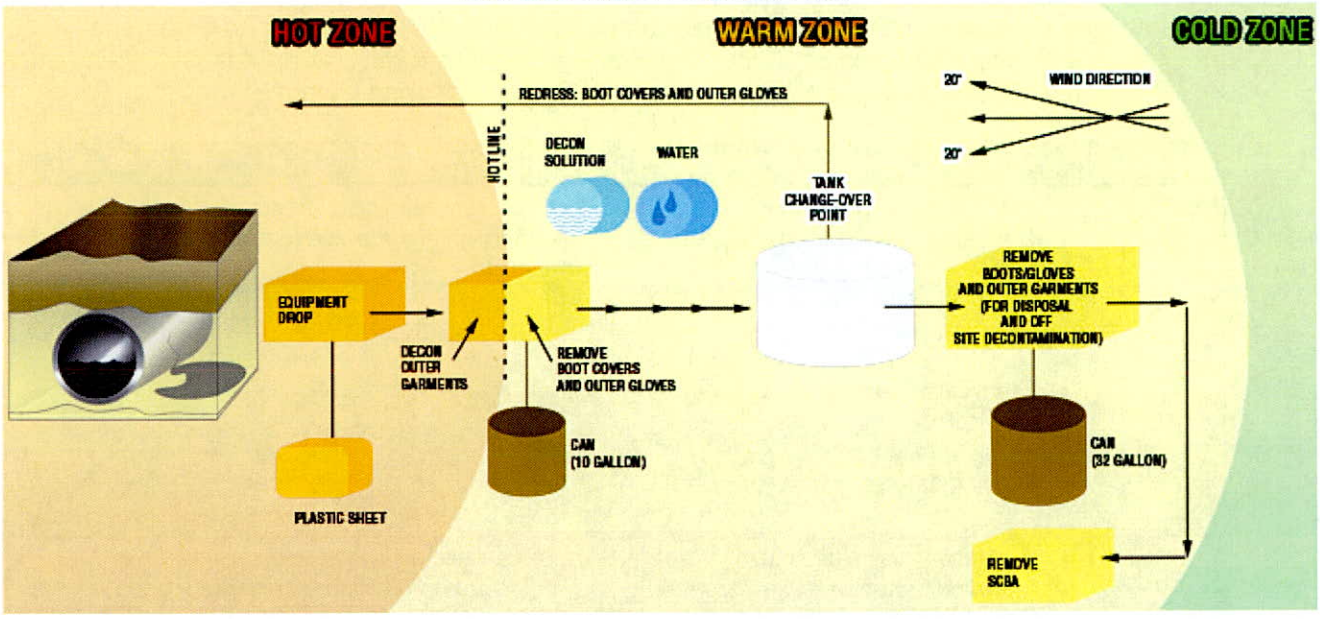
Contaminated clothing should be properly disposed. Contaminated personal protective equipment must be washed and sanitized before re-using. The washing of contaminated equipment is performed in a "contained area" to assure that the disposal of the wash water can be handled properly.

Establishing "Exclusion - Hot", "Decontamination - Decon", (warm) and "Support - Safe" (cold) Zones are required to prevent the removal of contaminants from the contaminated area as well as unauthorized entry into contaminated areas.

- Regardless of the decontamination facilities available, all efforts to minimize personnel exposure should be taken.
- Decontamination facilities should be positioned prior to employee/ contractor entrance to areas where the potential for exposure to contamination exists. The appropriate Material Safety Data Sheets (MSDS) are available to aid health professionals treating the injured parties. Material Safety Data Sheets are located in Appendix G.
- Decontamination facilities should be designed to prevent further contamination of the environment and should have a temporary storage area for items that will be reused in the contaminated area.
- Particular attention should be paid to personal hygiene prior to eating, drinking, or smoking.

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MINIMUM DECONTAMINATION LAYOUT
LEVELS A & B PROTECTION



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Personal Protective Equipment (PPE)

The following represents OSHA/USEPA designated PPE levels for responding to emergencies, post emergency cleanup sites, and/or Temporary Storage and Disposal (TSD) sites. The responder's PPE should be chosen based on his/her level of training and assigned job duties.

Personal Protective Equipment (PPE)		
LEVEL A	• Self Contained Breathing Apparatus (SCBA) (worn inside suit) • Encapsulated chemical protective suit • Chemical protective gloves • Chemical protective boots • Hard hat • Safety toe footwear • Safety glasses	To be selected when the greatest level of skin, respiratory, and eye protection is required.
LEVEL B	• SCBA (worn outside suit) • Chemical protective suit w/hood • Chemical protective boots • Chemical protective gloves • Hard hat • Safety toe footwear • Safety glasses	To be selected when the highest level of respiratory protection is necessary but a lesser level of skin protection is needed.
LEVEL C	• Air Purifying Respirator (APR) • APR ½ Face or Full Face • Hard hat • Glasses (worn with ½ face APR) • Chemical protective boots • Chemical protective gloves • Chemical protective suit/Tyvek • Safety toe footwear • Safety glasses	To be selected when the concentration and type of airborne substances is known and the criteria for using air purifying respirators are met.
MODIFIED LEVEL C Same as level C except no APR requirements.		To be selected when the concentration and type of airborne substances is known and the criteria for using air purifying respirators are not met.
LEVEL D	• Hard hat • Safety glasses • Work uniform / clothes • Leather gloves • Safety boots • Nomex (if required by the Company)	The atmosphere contains no known hazard and work functions preclude the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

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3.7 EMERGENCY MEDICAL TREATMENT AND FIRST AID

Call 911 immediately. On-site emergency medical response requires the same rapid assessment of the patient as any other situation, but requires the responders to be aware of other considerations that may affect the way they handle the patient. These considerations include the following:

- The potential for contamination of the patient, responders, and equipment should be addressed. Responders should arrange to treat all patients AFTER the injured party has been decontaminated according to the Site Safety Plan.
- Site personnel should make the initial assessment of the patient and determine the severity of the injury/illness.
- If the treatment needed is critical care or "life saving" treatment, rapid decontamination of the injured/ill party should be started. Refer to the Site Safety Plan for steps to be taken in an "abbreviated" decontamination for medical treatment.
- The need for full decontamination should be carefully weighed against the need for prompt medical treatment.
- The ambulance responding to medical emergencies shall be contacted as soon as possible and instructed exactly where to respond when needed and the nature of the contaminant. Telephone reference is provided in Annexes.
- Material Safety Data Sheet information will be available from the Incident Commander and should be provided to medical personnel to alert them of decontamination requirements.
- Report all injuries, incidents or close calls.
- If emergency medical treatment is needed, the Incident Commander or Safety Officer, or his designated representatives, will request assistance from trained medical personnel.

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4.0 RESPONSE TEAMS

4.1 Introduction

4.2 Qualified Individual

4.3 Initial Response Team (IRT)

4.4 Regional Emergency Preparedness Team (REPT)

4.5 Incident Command System (ICS)

4.6 Unified Command

4.7 ICS Roles and Responsibilities

Figure 4.1 Incident Command System

Figure 4.2 Operational Period Planning Cycle

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4.1 INTRODUCTION

This Section describes organizational features and duties of the local responders, the Regional Emergency Preparedness Team (EPT), and the broader Emergency Management Team (EMT) as defined in TransCanada's Incident Management System (IMS). The Incident Management System integrates Incident Management, Emergency Management and Crisis Management and is maintained separately.

The key to an effective emergency response is a rapid, coordinated, tiered response by the affected Facility, the Regional Emergency Operations Center, and the Corporate Emergency Operations Center, consistent with the magnitude of an incident.

First response to an incident at the Facility will be provided by the local responders. The Regional EOC will respond, to the degree necessary, to incidents exceeding local capability.

Our response teams will use the National Incident Management System (NIMS) Incident Command System (ICS) to manage the emergency response activities. Because Incident Commander System is a management tool that is readily adaptable to incidents of varying magnitude, it will typically be used for all emergency incidents. Staffing levels will be adjusted to meet specific response team needs based on incident size, severity, and type of emergency.

An explanation of Incident Commander System and the roles and responsibilities for primary members of the response teams are provided in Section 4.7 per Canadian Standards Association (CSA)-2731-03. The United States Coast Guard (USCG) Incident Management Handbook (IMH) contains an in-depth description of all Incident Commander System positions, Incident Commander System development, response objectives and strategies, command responsibilities, Incident Commander System specific glossary/acronyms, resource typing, the Incident Action Plan process, and meetings. The IMH can be located on the USCG's Homeport Website.

4.2 QUALIFIED INDIVIDUAL

It is the responsibility of the Qualified Individual (QI) or his/her designee to coordinate with the Federal On-Scene Coordinator (FOSC) and State On-Scene Coordinator (SOSC) throughout the response, if applicable.

Vital duties of the Qualified Individual (QI) include:

- Notify all response personnel, as needed.
- Identify the character, exact source, amount, and extent of the release, as well as the other items needed for notification.
- Assess the interaction of the spilled substance with water and/or other substances stored at the Facility and notify response personnel at the scene of that assessment.
- Assess the possible hazards to human health and the environment due to the release. This assessment must consider both the direct and indirect effects of the release (i.e., the effects of any toxic, irritating, or asphyxiating gases that may be generated, or the effects of any hazardous surface water runoffs from water or chemical agents used to control fire and heat-induced explosion).
- Assess and implement prompt removal actions to contain and remove the substance released.

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- Coordinate rescue and response actions as previously arranged with all response personnel.
- Activate and engage in contracting with oil spill removal organizations.
- Use authority to immediately access Company funding to initiate cleanup activities.
- Direct cleanup activities until properly relieved of this responsibility.
- Arrangements will be made to ensure that the Qualified Individual (QI) or the Alternate Qualified Individual (AQI) is available on a 24-hour basis and is able to arrive at the Facility in a reasonable time.
- The AQI shall replace the QI in the event of his/her absence and have the same responsibilities and authority.

4.3 INITIAL RESPONSE TEAM (IRT)

The first Company person on scene (First Responder) will function as the Incident Commander and person-in-charge until relieved by an authorized supervisor who will then assume the position of Incident Commander (IC). Transfer of command will take place as more senior management contract support respond to the incident. For response operations within the control of the Initial Response Team, the role of IC will typically be assumed and retained by the Qualified Individual.

The number of positions/personnel required to staff the Incident Management Team will depend on the size and complexity of the incident. The duties of each position may be performed by the IC directly or delegated as the situation demands. The IC is always responsible for directing the response activities and will assume the duties of all the primary positions until the duties can be delegated to other qualified personnel.

A complete functional ICS organization is shown in Figure 4.1. The Incident Commander should try to fill the necessary positions within the Incident Management Team and request additional support from both the Regional and Corporate Emergency Operations Centers to fill/back up all the positions as the incident may dictate. Detailed job descriptions of the primary response team positions are provided in Section 4.7.

4.4 REGIONAL EMERGENCY PREPAREDNESS TEAM (EPT)

The Emergency Preparedness Team (EPT) will activate a Regional Emergency Operations Center (EOC) to support the Initial Response Team/Incident Management Team. The number of positions/personnel required to staff the Regional EOC will depend on the size and complexity of the incident.

The Regional EOC is staffed by personnel from various Regional locations. The Regional EOC provides necessary information to the appropriate Federal, State/Province, and Local authorities with designated response roles, including the National Response Center (NRC), the Canadian National Energy Board (NEB), if necessary, State Emergency Response Commission (SERC) Provincial Ministry, and local response agencies.

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4.5 INCIDENT COMMAND SYSTEM (ICS)

The Incident Command System is intended to be used as an emergency management tool to aid in mitigating all types of emergency incidents. This system is readily adaptable to very small emergency incidents as well as more significant or complex emergencies. The Incident Command System utilizes the following criteria as key operational factors:

- Assigns overall authority to one individual..
- Provides structured authority, roles and responsibilities during emergencies.
- The system is simple and familiar, and is used routinely at a variety of incidents.
- Communications are structured.
- There is a structured system for response and assignment of resources.
- The system provides for expansion, escalation, and transfer/transition of roles and responsibilities.
- The system allows for "Unified Command" where agency involvement at the command level is required.

Effective establishment and utilization of the Incident Command System during response to all types of emergencies can:

- Provide for increased safety.
- Shorten emergency mitigation time by providing more effective and organized mitigation.
- Cause increased confidence and support from local, State, Federal, and public sector emergency response personnel.
- Provide a solid cornerstone for emergency planning efforts.

Section 4.7 provides a comprehensive list of every response team member's duty assignment.

4.6 UNIFIED COMMAND

As a component of an Incident Commander System, the Unified Command (UC) is a structure that brings together the Incident Commanders of all major organizations involved in the incident to coordinate an effective response while still meeting their own responsibilities. The Unified Command links the organizations responding to the incident and provides a forum for the Responsible Party and responding agencies to make consensus decisions. Under the Unified Command, the various jurisdictions and/or agencies and responders may blend together throughout the organization to create an integrated response team. The Incident Commander System process requires the Unified Command to set clear objectives to guide the on-scene response resources.

Multiple jurisdictions may be involved in a response effort utilizing Unified Command. These jurisdictions could be represented by any combination of:

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- Geographic boundaries;
- Government levels;
- Functional responsibilities; and
- Statutory responsibilities.

The participants of Unified Command for a specific incident will be determined taking into account the specifics of the incident and existing response plans and/or decisions reached during the initial meeting of the Unified Command. The Unified Command may change as an incident progresses, in order to account for changes in the situation.

The Unified Command is responsible for overall management of an incident. The Unified Command directs incident activities and approves and releases resources. The Unified Command structure is a vehicle for coordination, cooperation and communication which is essential to an effective response.

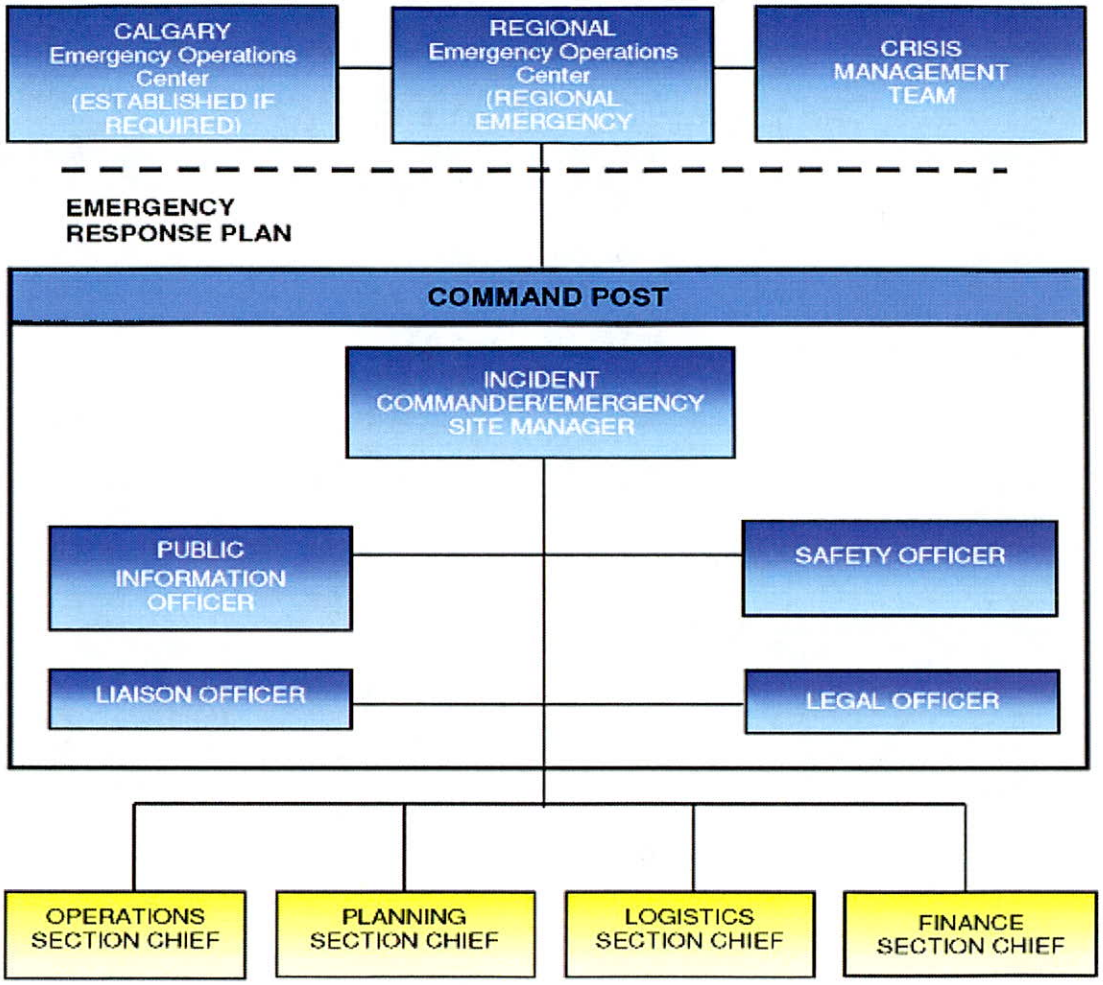
Unified Command representatives must be able to:

- Agree on common incident objectives and priorities.
- Have the capability to sustain a 24-hour-7-day-per-week commitment to the incident.
- Have the authority to commit agency or Company resources to the incident.
- Have the authority to spend agency or Company funds.
- Agree on an incident response organization.
- Agree on the appropriate Command and General Staff assignments.
- Commit to speak with "one voice" through the Public Information Officer or Joint Information Center.
- Agree on logistical support procedures.
- Agree on cost-sharing procedures.

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FIGURE 4.1

INCIDENT COMMAND SYSTEM
INCIDENT MANAGEMENT SYSTEM



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4.7 ICS ROLES AND RESPONSIBILITIES

COMMON RESPONSIBILITIES

The following is a checklist applicable to all personnel in an Incident Commander System organization:

- Receive assignment, including:
  - Job assignment
  - Resource order number and request number
  - Reporting location
  - Reporting time
  - Travel instructions
  - Special communications instructions
- Upon arrival, check-in at designated check-in location.
- Receive briefing from immediate supervisor.
- Acquire work materials.
- Supervisors maintain accountability for assigned personnel.
- Organize and brief subordinates.
- Know your assigned radio frequency(s) and ensure communications equipment is operating properly.
- Use clear text and Incident Commander System terminology (no codes) in all communications.
- Complete forms and reports required of the assigned position and send to Documentation Unit.
- Maintain unit records, including Unit Log (ICS Form 214).
- Respond to demobilization orders and brief subordinates regarding demobilization.

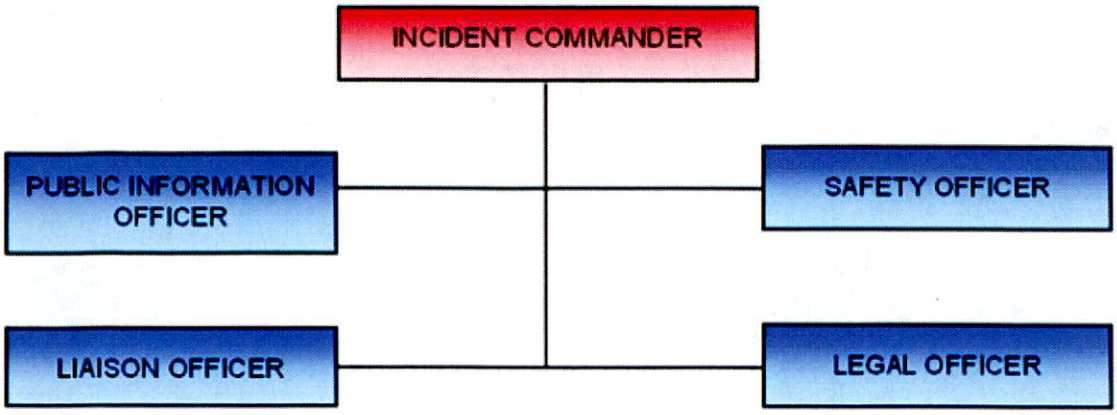
UNIT LEADER RESPONSIBILITIES

In Incident Commander System, a Unit Leader's responsibilities are common to all units in all parts of the organization. Common responsibilities of Unit Leaders are listed below.

- Review common responsibilities.
- Receive briefing from Incident Commander, Section Chief or Branch Director (as appropriate).
- Participate in incident planning meetings, as required.
- Determine current status of unit activities.
- Order additional unit staff, as appropriate.
- Determine resource needs.
- Confirm dispatch and estimated time of arrival of staff and supplies.
- Assign specific duties to staff; supervise staff.
- Develop and implement accountability, safety and security measures for personnel and resources.
- Supervise demobilization of unit, including storage of supplies.
- Provide Supply Unit Leader with a list of supplies to be replenished.
- Maintain unit records, including Unit Log (ICS Form 214).

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COMMAND



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INCIDENT COMMANDER

- Assess the situation and/or obtain a briefing from the prior Incident Commander.
- Determine Incident Objectives and strategy.
- Establish the immediate priorities.
- Establish an Incident Command Post.
- Brief Command Staff and Section Chiefs.
- Review meetings and briefings.
- Establish an appropriate organization.
- Ensure planning meetings are scheduled as required. (Refer to Figure 4.3 "Operational Period Planning Cycle" for assistance).
- Approve and authorize the implementation of an Incident Action Plan.
- Ensure that adequate safety measures are in place.
- Coordinate activity for all Command and General Staff.
- Coordinate with key people and officials.
- Approve requests for additional resources or for the release of resources.
- Keep agency administrator informed of incident status.
- Approve the use of trainees, volunteers, and auxiliary personnel.
- Authorize release of information to the news media.
- Ensure incident Status Summary (ICS Form 209-CG) is completed and forwarded to appropriate higher authority.
- Order the demobilization of the incident when appropriate.
- Assign any of the Incident Commander roles and responsibilities to a Deputy Incident Commander as needed.

PUBLIC INFORMATION OFFICER

- Determine from the Incident Commander if there are any limits on information release.
- Develop material for use in media briefings.
- Obtain Incident Commander approval of media releases.
- Inform media and conduct media briefings.
- Arrange for tours and other interviews or briefings that may be required.
- Obtain media information that may be useful to incident planning.
- Maintain current information summaries and/or displays on the incident and provide information on the status of the incident to assigned personnel.

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LIAISON OFFICER

- Be a contact point for Agency Representatives.
- Maintain a list of assisting and cooperating agencies and Agency Representatives. Monitor check-in sheets daily to ensure that all Agency Representatives are identified.
- Assist in establishing and coordinating interagency contacts.
- Keep agencies supporting the incident aware of incident status.
- Monitor incident operations to identify current or potential inter-organizational problems.
- Participate in planning meetings, providing current resource status, including limitations and capability of assisting agency resources.
- Coordinate response resource needs for Natural Resource Damage Assessment and Restoration (NRDAR) activities with the Operations during oil and HAZMAT responses.
- Coordinate response resource needs for incident investigation activities with the Operations.
- Ensure that all required agency forms, reports and documents are completed prior to demobilization.
- Coordinate activities of visiting dignitaries.

SAFETY OFFICER

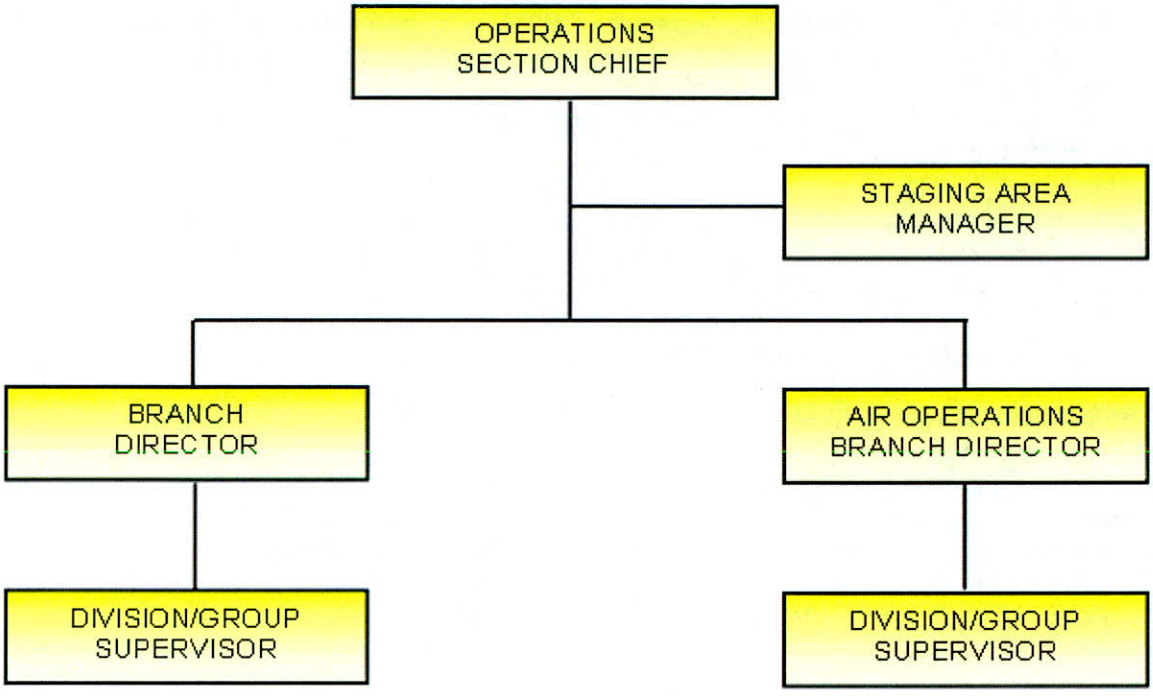
- Participate in planning meetings.
- Identify hazardous situations associated with the incident.
- Review the Incident Action Plan for safety implications.
- Exercise emergency authority to stop and prevent unsafe acts.
- Investigate accidents that have occurred within the incident area.
- Review and approve the medical plan.
- Develop the Site Safety Plan and publish Site Safety Plan summary (ICS Form 208) as required.

LEGAL OFFICER

- Participate in planning meetings, if requested.
- Advise on legal issues relating to in-situ burning, use of dispersants, and other alternative response technologies.
- Advise on legal issues relating to differences between Natural Resource Damage Assessment Restoration (NRDAR) and response activities.
- Advise on legal issues relating to investigations.
- Advise on legal issues relating to finance and claims.
- Advise on legal issues relating to response.

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OPERATIONS



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OPERATIONS SECTION GENERAL FUNCTIONS

- Responsible for managing tactical operations at the incident site directed toward reducing the immediate hazard, saving lives and property, establishing situational control, and restoring normal operations.
- Directs and coordinates all incident tactical operations.
- Executes the Incident Action Plan.

OPERATIONS SECTION CHIEF

- Develop operations portion of Incident Action Plan.
- Brief and assign Operations Section personnel in accordance with the Incident Action Plan.
- Supervise Operations Section.
- Determine need and request additional resources.
- Review suggested list of resources to be released and initiate recommendation for release of resources.
- Assemble and disassemble strike teams assigned to the Operations Section.
- Report information about special activities, events, and occurrences to the Incident Commander.
- Respond to resource requests in support of National Resource Damage Assessment and Restoration activities.

BRANCH DIRECTOR

- Develop with subordinates alternatives for Branch control operations.
- Attend planning meetings at the request of the Operations.
- Review Assignment List (ICS Form 204-CG) for Divisions/Groups within the Branch. Modify lists based on effectiveness of current operations.
- Assign specific work tasks to Division/Group Supervisors.
- Supervise Branch operations.
- Resolve logistic problems reported by subordinates.
- Report to Operations when: the Incident Action Plan is to be modified; additional resources are needed; surplus resources are available; or hazardous situations or significant events occur.
- Approve accident and medical reports originating within the Branch.

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DIVISION/GROUP SUPERVISOR

- Implement Incident Action Plan for Division/Group.
- Provide the Incident Action Plan to Strike Team Leaders, when available.
- Identify increments assigned to the Division/Group.
- Review Division/Group assignments and incident activities with subordinates and assign tasks.
- Ensure that the Incident Commander and/or Resources Unit is advised of all changes in the status of resources assigned to the Division/Group.
- Coordinate activities with adjacent Division/Group.
- Determine need for assistance on assigned tasks.
- Submit situation and resources status information to the Branch Director or the Operations.
- Report hazardous situations, special occurrences, or significant events (e.g., accidents, sickness, discovery of unanticipated sensitive resources) to the immediate supervisor.
- Ensure that assigned personnel and equipment get to and from assignments in a timely and orderly manner.
- Resolve logistics problems within the Division/Group.
- Participate in the development of Branch plans for the next operational period.

STAGING AREA MANAGER

- Establish Staging Area layout.
- Determine any support needs for equipment, feeding, sanitation and security.
- Establish check-in function as appropriate.
- Post areas for identification and traffic control.
- Request maintenance service for equipment at Staging Area as appropriate.
- Respond to request for resource assignments.
- Obtain and issue receipts for radio equipment and other supplies distributed and received at Staging Area.
- Determine required resource levels from the Operations.
- Advise the Operations when reserve levels reach minimums.
- Maintain and provide status to Resource Unit of all resources in Staging Area.
- Demobilize Staging Area in accordance with the Incident Demobilization Plan.

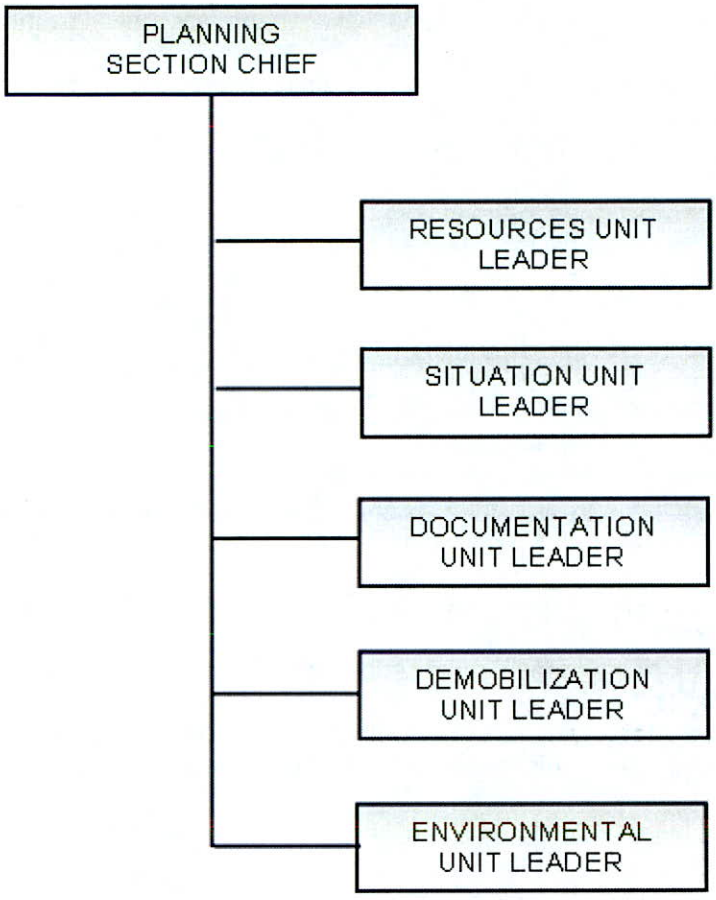
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AIR OPERATIONS BRANCH DIRECTOR

- Organize preliminary air operations.
- Request declaration (or cancellation) of restricted air space.
- Participate in preparation of the Incident Action Plan through the Operations. Insure that the air operations portion of the Incident Action Plan takes into consideration the Air Traffic Control requirements of assigned aircraft.
- Perform operational planning for air operations.
- Prepare and provide Air Operations Summary (ICS Form 220) to the Air Support Group and Fixed-Wing Bases.
- Determine coordination procedures for use by air organization with ground Branches, Divisions, or Groups.
- Coordinate with appropriate Operations Section personnel.
- Supervise all air operations activities associated with the incident.
- Evaluate helibase locations.
- Establish procedures for emergency reassignment of aircraft.
- Schedule approved flights of non-incident aircraft in the restricted air space area.
- Coordinate with the Operations Coordination Center (OCC) through normal channels on incident air operations activities.
- Inform the Air Tactical Group Supervisor of the air traffic situation external to the incident.
- Consider requests for non-tactical use of incident aircraft.
- Resolve conflicts concerning non-incident aircraft.
- Coordinate with Federal Aviation Administration.
- Update air operations plans.
- Report to the Operations on air operations activities.
- Report special incidents/accidents.
- Arrange for an accident investigation team when warranted.

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PLANNING



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PLANNING SECTION GENERAL FUNCTIONS

- Responsible for gathering, evaluating, and disseminating tactical information and intelligence critical to the incident.
- Maintaining incident documentation and providing documentation services.
- Preparing and documenting Incident Action Plans.
- Conducting long-range and/or contingency planning.
- Developing alternative strategies.
- Tracking resources assigned to the incident.
- Developing plans for waste disposal.
- Developing plans for demobilization.

PLANNING SECTION CHIEF

- Collect and process situation information about the incident.
- Supervise preparation of the Incident Action Plan.
- Provide input to the Incident Commander and the Operations in preparing the Incident Action Plan.
- Chair planning meetings and participate in other meetings as required. (Refer to Figure 4.2 "Operational Planning P" for assistance).
- Reassign out-of-service personnel already on-site to Incident Commander System organizational positions as appropriate.
- Establish information requirements and reporting schedules for Planning Section Units (e.g., Resources, Situation Units).
- Determine the need for any specialized resources in support of the incident.
- If requested, assemble and disassemble Strike Teams and Task Forces not assigned to Operations.
- Establish special information collection activities as necessary (e.g., weather, environmental, toxics, etc.).
- Assemble information on alternative strategies.
- Provide periodic predictions on incident potential.
- Report any significant changes in incident status.
- Compile and display incident status information.
- Oversee preparation and implementation of the Incident Demobilization Plan.
- Incorporate plans (e.g., Wildlife Rehab., Waste Management, Traffic, Medical, Communications, Site Safety, and Demobilization) into the Incident Action Plan.

RESOURCES UNIT LEADER

- Establish the check-in function at incident locations.
- Prepare Organization Assignment List (ICS Form 203-CG) and Incident Organization (ICS Form 207-CG).
- Prepare appropriate parts of Assignment List (ICS Form 204).
- Prepare and maintain the Incident Command Post display (to include organization chart and resource allocation and deployment).
- Maintain and post the current status and location of all resources.
- Maintain master roster of all resources checked in at the incident.

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SITUATION UNIT LEADER

- Begin collection and analysis of incident data as soon as possible.
- Prepare, post, or disseminate resource and situation status information as required, including special requests.
- Prepare periodic predictions or as requested by the Planning Section Chief.
- Prepare the Incident Status Summary (ICS Form 209-CG).
- Provide photographic services and maps if required.

DOCUMENTATION UNIT LEADER

- Set up work area; begin organization of incident files.
- Establish duplication service; respond to requests.
- File all official forms and reports.
- Review records for accuracy and completeness; inform appropriate units of errors or omissions.
- Provide incident documentation as requested.
- Store files for post-incident use.

DEMOBILIZATION UNIT LEADER

- Participate in planning meetings as required.
- Review incident resource records to determine the likely size and extent of demobilization effort.
- Based on the above analysis, add additional personnel, workspace, and supplies as needed.
- Coordinate demobilization with Agency Representatives.
- Monitor the on-going Operations Section resource needs.
- Identify surplus resources and probable release time.
- Develop incident check-out function for all units.
- Evaluate logistics and transportation capabilities to support demobilization.
- Establish communications with off-incident facilities, as necessary.
- Develop an Incident Demobilization Plan detailing specific responsibilities and release priorities and procedures.
- Prepare appropriate directories (e.g., maps, instructions, etc.) for inclusion in the demobilization plan.
- Distribute demobilization plan (on and off-site).
- Provide status reports to appropriate requestors.
- Ensure that all Sections/Units understand their specific demobilization responsibilities.
- Supervise execution of the Incident Demobilization Plan.
- Brief the Planning Section Chief on demobilization progress.

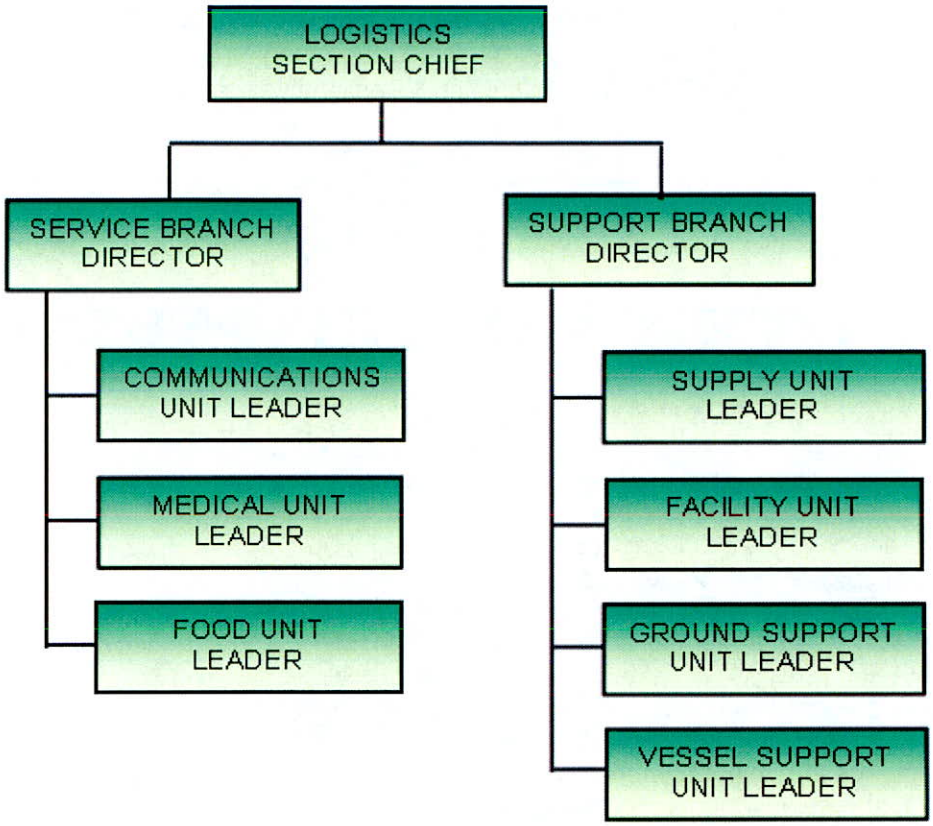
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ENVIRONMENTAL UNIT LEADER

- Participate in Planning Section meetings.
- Identify sensitive areas and recommend response priorities.
- Following consultation with natural resource trustees, provide input on wildlife protection strategies (e.g., removing oiled carcasses, pre-emptive capture, hazing, and/or capture and treatment).
- Determine the extent, fate and effects of contamination.
- Acquire, distribute and provide analysis of weather forecasts.
- Monitor the environmental consequences of cleanup actions.
- Develop shoreline cleanup and assessment plans. Identify the need for, and prepare any special advisories or orders.
- Identify the need for, and obtain, permits, consultations, and other authorizations including Endangered Species Act (ESA) provisions.
- Following consultation with the Federal OnScene Commander's Historical/Cultural Resources Technical Specialist identify and develop plans for protection of affected historical/cultural resources.
- Evaluate the opportunities to use various response technologies.
- Develop disposal plans.
- Develop a plan for collecting, transporting, and analyzing samples.

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LOGISTICS



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LOGISTICS SECTION GENERAL FUNCTIONS

- Responsible for all support requirements needed to facilitate effective and efficient incident management, including ordering resources from off-incident locations.
- Ordering, obtaining, maintaining, and accounting for essential personnel, equipment, and supplies.
- Providing communication planning and resources.
- Setting up food services.
- Setting up and maintaining incident facilities.
- Providing support transportation.
- Providing medical services to incident personnel.

LOGISTICS SECTION CHIEF

- Plan the organization of the Logistics Section.
- Assign work locations and preliminary work tasks to Section personnel.
- Notify the Resources Unit of the Logistics Section units activated including names and locations of assigned personnel.
- Assemble and brief Branch Directors and Unit Leaders.
- Participate in preparation of the Incident Action Plan.
- Identify service and support requirements for planned and expected operations.
- Provide input to and review the Communications Plan, Medical Plan and Traffic Plan.
- Coordinate and process requests for additional resources.
- Review the Incident Action Plan and estimate Section needs for the next operational period.
- Advise on current service and support capabilities.
- Prepare service and support elements of the Incident Action Plan.
- Estimate future service and support requirements.
- Receive Incident Demobilization Plan from Planning Section.
- Recommend release of Unit resources in conformity with Incident Demobilization Plan.
- Ensure the general welfare and safety of Logistics Section personnel.

SERVICE BRANCH DIRECTOR

- Determine the level of service required to support operations.
- Confirm dispatch of Branch personnel.
- Participate in planning meetings of Logistics Section personnel.
- Review the Incident Action Plan.
- Organize and prepare assignments for Service Branch personnel.
- Coordinate activities of Branch Units.
- Inform the Logistic Section Chief of Branch activities.
- Resolve Service Branch problems.

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COMMUNICATIONS UNIT LEADER

- Prepare and implement the Incident Radio Communications Plan (ICS Form 205-CG).
- Ensure the Incident Communications Center and the Message Center is established.
- Establish appropriate communications distribution/maintenance locations within the Base/Camp (s).
- Ensure communications systems are installed and tested.
- Ensure an equipment accountability system is established.
- Ensure personal portable radio equipment from cache is distributed per Incident Radio Communications Plan.
- Provide technical information as required on:
    - Adequacy of communications systems currently in operation.
    - Geographic limitation on communications systems.
    - Equipment capabilities/limitations.
    - Amount and types of equipment available.
    - Anticipated problems in the use of communications equipment.
- Supervise Communications Unit activities.
- Maintain records on all communications equipment as appropriate.
- Ensure equipment is tested and repaired.
- Recover equipment from Units being demobilized.

MEDICAL UNIT LEADER

- Participate in Logistics Section/Service Branch planning activities.
- Prepare the Medical Plan (ICS Form 206-CG).
- Prepare procedures for major medical emergency.
- Declare major emergency as appropriate.
- Respond to requests for medical aid, medical transportation, and medical supplies.
- Prepare and submit necessary documentation.

FOOD UNIT LEADER

- Determine food and water requirements.
- Determine the method of feeding to best fit each facility or situation.
- Obtain necessary equipment and supplies and establish cooking facilities.
- Ensure that well-balanced menus are provided.
- Order sufficient food and potable water from the Supply Unit.
- Maintain an inventory of food and water.
- Maintain food service areas, ensuring that all appropriate health and safety measures are being followed.
- Supervise caterers, cooks, and other Food Unit personnel as appropriate.

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SUPPORT BRANCH DIRECTOR

- Determine initial support operations in coordination with the Loigistic Section Chief and Service Branch Director.
- Prepare initial organization and assignments for support operations.
- Assemble and brief Support Branch personnel.
- Determine if assigned Branch resources are sufficient.
- Maintain surveillance of assigned units work progress and inform the Loigistic Section Chief of their activities.
- Resolve problems associated with requests from the Operations Section.

SUPPLY UNIT LEADER

- Participate in Logistics Section/Support Branch planning activities.
- Determine the type and amount of supplies en route.
- Review the Incident Action Plan for information on operations of the Supply Unit.
- Develop and implement safety and security requirements.
- Order, receive, distribute, and store supplies and equipment.
- Receive and respond to requests for personnel, supplies, and equipment.
- Maintain an inventory of supplies and equipment.
- Service reusable equipment.
- Submit reports to the Support Branch Director.

FACILITY UNIT LEADER

- Review the Incident Action Plan.
- Participate in Logistics Section/Support Branch planning activities.
- Determine requirements for each facility, including the Incident Command Post (See Figure 2.6 for list of hotels).
- Prepare layouts of incident facilities.
- Notify Unit Leaders of facility layout.
- Activate incident facilities.
- Provide Base and Camp Managers and personnel to operate facilities.
- Provide sleeping facilities.
- Provide security services.
- Provide facility maintenance services (e.g., sanitation, lighting, clean up).
- Demobilize Base and Camp facilities.
- Maintain facility records.

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GROUND SUPPORT UNIT LEADER

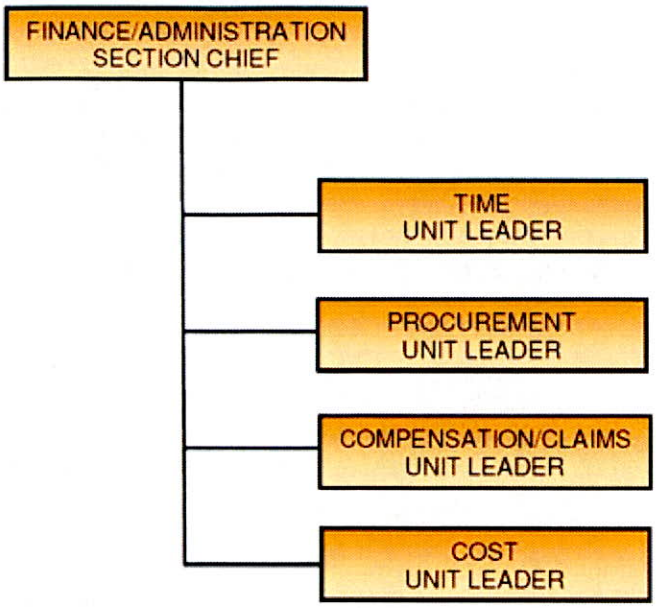
- Participate in Support Branch/Logistics Section planning activities.
- Develop and implement the Traffic Plan.
- Support out-of-service resources.
- Notify the Resources Unit of all status changes on support and transportation vehicles.
- Arrange for and activate fueling, maintenance, and repair of ground resources.
- Maintain Support Vehicle Inventory and transportation vehicles (ICS Form 218).
- Provide transportation services, In accoradance with requests from the Loigistic Section Chief or Support Branch Director.
- Collect information on rented equipment.
- Requisition maintenance and repair supplies (e.g., fuel, spare parts).
- Maintain incident roads.
- Submit reports to Support Branch Director as directed.

VESSEL SUPPORT UNIT LEADER

- Participate in Support Branch/Logistics Section planning activities.
- Coordinate development of the Vessel Routing Plan.
- Coordinate vessel transportation assignments with the Protection and Recovery Branch or other sources of vessel transportation.
- Coordinate water-to-land transportation with the Ground Support Unit, as necessary.
- Maintain a prioritized list of transportation requirements that need to be scheduled with the transportation source.
- Support out-of-service vessel resources, as requested.
- Arrange for fueling, dockage, maintenance and repair of vessel resources, as requested.
- Maintain inventory of support and transportation vessels.

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FINANCE/ADMINISTRATION



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FINANCE/ADMINISTRATION SECTION GENERAL FUNCTIONS

- Responsible for all financial and cost analysis aspects of an incident. (Note: Not all incidents will require a separate Finance/Administration Section. In cases that require only one specific function (e.g., cost analysis), this service may be provided by a member of the Planning Section.)
- Administering any contract negotiation.
- Providing cost analysis as it pertains to the Incident Action Plan.
- Maintaining cost associated with the incident.
- Tracking personnel and equipment time.
- Addressing compensation for injury or damage to property issues.

FINANCE/ADMINISTRATION SECTION CHIEF

- Attend planning meetings as required.
- Manage all financial aspects of an incident.
- Provide financial and cost analysis information as requested.
- Gather pertinent information from briefings with responsible agencies.
- Develop an operating plan for the Finance/Administration Section; fill supply and support needs.
- Determine the need to set up and operate an incident commissary.
- Meet with assisting and cooperating agency representatives, as needed.
- Maintain daily contact with agency(s) administrative headquarters on Finance/ Administration matters.
- Ensure that all personnel time records are accurately completed and transmitted, according to policy.
- Provide financial input to demobilization planning.
- Ensure that all obligation documents initiated at the incident are properly prepared and completed.
- Brief administrative personnel on all incident-related financial issues needing attention or follow-up prior to leaving incident.

TIME UNIT LEADER

- Determine incident requirements for time recording function.
- Determine resource needs.
- Contact appropriate agency personnel/representatives.
- Ensure that daily personnel time recording documents are prepared and in compliance with policy.
- Establish time unit objectives.
- Maintain separate logs for overtime hours.
- Establish commissary operation on larger or long-term incidents as needed.
- Submit cost estimate data forms to the Cost Unit, as required.
- Maintain records security.
- Ensure that all records are current and complete prior to demobilization.
- Release time reports from assisting agency personnel to the respective Agency Representatives prior to demobilization.
- Brief the Finance/Administration Section Chief on current problems and recommendations, outstanding issues, and follow-up requirements.

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PROCUREMENT UNIT LEADER

- Review incident needs and any special procedures with Unit Leaders, as needed.
- Coordinate with local jurisdiction on plans and supply sources.
- Obtain the Incident Procurement Plan.
- Prepare and authorize contracts and land-use agreements.
- Draft memoranda of understanding as necessary.
- Establish contracts and agreements with supply vendors.
- Provide for coordination between the Ordering Manager, agency dispatch, and all other procurement organizations supporting the incident.
- Ensure that a system is in place that meets agency property management requirements. Ensure proper accounting for all new property.
- Interpret contracts and agreements; resolve disputes within delegated authority.
- Coordinate with the Compensation/Claims Unit for processing claims.
- Coordinate use of impress funds, as required.
- Complete final processing of contracts and send documents for payment.
- Coordinate cost data in contracts with the Cost Unit Leader.
- Brief the Finance/Administration Section Chief on current problems and recommendations, outstanding issues, and follow-up requirements.

COMPENSATION/CLAIMS UNIT LEADER

- Establish contact with the incident Security Officer and Liason Officer (or Agency Representatives if no Liason Officer is assigned).
- Determine the need for Compensation for Injury and Claims Specialists and order personnel as needed.
- Establish a Compensation for Injury work area within or as close as possible to the Medical Unit.
- Review Medical Plan (ICS Form 206-CG).
- Ensure that Compensation/Claims Specialists have adequate workspace and supplies.
- Review and coordinate procedures for handling claims with the Procurement Unit.
- Brief the Compensation/Claims Specialists on incident activity.
- Periodically review logs and forms produced by the Compensation/Claims Specialists to ensure that they are complete, entries are timely and accurate and that they are in compliance with agency requirements and policies.
- Ensure that all Compensation for Injury and Claims logs and forms are complete and routed appropriately for post-incident processing prior to demobilization.
- Keep the Finance/Administration Section Chief briefed on Unit status and activity.
- Demobilize unit in accordance with the Incident Demobilization Plan.

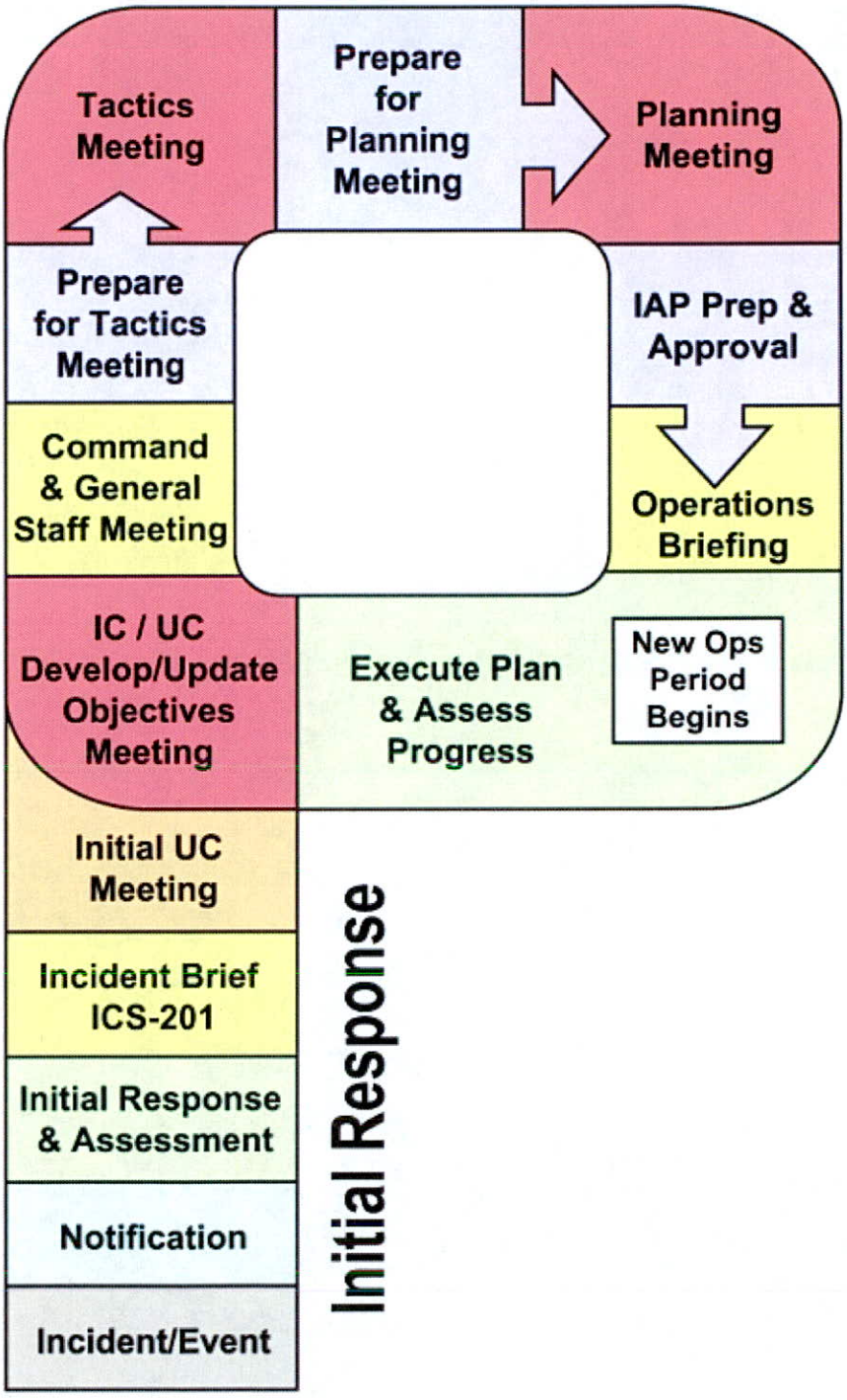
COST UNIT LEADER

- Coordinate cost reporting procedures.
- Collect and record all cost data.
- Develop incident cost summaries.
- Prepare resources-use cost estimates for the Planning Section.
- Make cost-saving recommendations to the Finance/Administration Section Chief.
- Ensure all cost documents are accurately prepared.
- Maintain cumulative incident cost records.
- Complete all records prior to demobilization.
- Provide reports to the Finance/Administration Section Chief.

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FIGURE 4.2

The Operational Planning P



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5.0 RESPONSE PLANNING

5.1 Incident Action Plan

5. 2 Site Safety Plan

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5.1 INCIDENT ACTION PLAN

Emergency response activities are planned and coordinated through the use of an Incident Action Plan (IAP), which is developed for each Operational Period of a response by the Initial Response Team. For small responses, an ICS 201 may be used as the IAP and, for all incidents, the ICS 201 will serve as the initial IAP.

For larger or more complex incidents, a more complete IAP will be necessary. These IAPs are generally created through the completion and compilation of several standard Incident Command System forms. These forms include, but are not limited to:

ICS FORM NUMBER	FORM TITLE	PREPARED BY
IAP Cover Sheet	ICS IAP Cover Sheet	**Planning Section** - Situation Unit Leader
201-CG	Incident Briefing	**Command Section** - Initial Response Incident Commander
202-CG	Incident Objectives	**Planning Section** - Planning Section Chief
203-CG	Organization Assignment List	**Planning Section** - Resources Unit Leader
204-CG	Assignment List	**Operations Section** - Chief & Resources Unit Leader
204a-CG	Assignment List Attachment	**Operations Section** - Chief & Resources Unit Leader
205-CG	Incident Radio Communication Plan	**Logistics Section** - Communication Unit Leader
205a-CG	Communications List	**Logistics Section** - Communication Unit Leader
206-CG	Medical Plan	**Logistics Section** - Medical Unit Leader
207-CG	Incident Organization	**Planning Section** - Resources Unit Leader
209-CG	Incident Status Summary	**Command Section** - Incident Commander
211-CG	Check-In List	
213-RR CG	Resource Request Message	
214-CG	Unit Log	**Planning Section** - Situation Unit Leader
215-CG	Operational Planning Worksheet	
215A-CG	Incident Action Plan Safety Analysis	
218	Support Vehicle Inventory	**Logistics Section** - Ground Support Unit Leader
220-CG	Air Operations Summary	**Operations Section** - Air Operations Branch Director
230-CG	Daily Meeting Schedule	
232-CG	Resources at Risk Summary	**Planning Section** - Situation Unit Leader
232a-CG	ACP Site Index	
233-CG	Incident Open Action Tracker	
234-CG	Work Analysis Matrix	
235-CG	Facility Needs Assessment Worksheet	
	Site Safety Plan	**Command Section** - Safety Officer
	Employee Certification Page	
	Media Statement	

Depending on the nature and severity of the emergency, additional documents may be included in the Incident Action Plan. These may include:

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- Sensitivity Maps (Provided in Section 6)
- Waste Management and Disposal Plans (Provided in Appendix E)
- Plans for use of Alternative Technologies (Dispersant/In-situ Burning/ Bioremediation)
- Security Plans
- Decontamination Plans
- Traffic Plans

5.2 SITE SAFETY PLAN

Site Safety Plans (SSPs) are required by United States Occupational Safety and Health Administration (29 CFR 1910.120(b)(4)) for all hazardous waste operations. The Site Safety Plan should address all on-site operations and hazardous as well as on-site emergency procedures.

The Site Safety Plan is typically prepared by the Safety Officer and approved by the Incident Commander. All personnel must be familiar with the contents of the Site Safety Plan and the Site Safety Plan must be updated as conditions, operations and hazards associated with the response change.

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1. Incident Name	2. Operational Period to be covered by IAP (Date/Time)	IAP COVER SHEET
	From: To:	

3. Approved by:

FOSC

SOSC

RPIC

INCIDENT ACTION PLAN

The items checked below are included in this Incident Action Plan:

- ☐ ICS 202-OS (Response Objectives)
- ☐ ICS 203-OS (Organization List) – OR – ICS 207-OS (Organization Chart)
- ☐ ICS 204-OSs (Assignment Lists)
  One Copy each of any ICS 204-OS attachments:
  - ☐ Map
  - ☐ Weather forecast
  - ☐ Tides
  - ☐ Shoreline Cleanup Assessment Team Report for location
  - ☐ Previous day's progress, problems for location
- ☐ ICS 205-OS (Communications List)
- ☐ ICS 206-OS (Medical Plan)
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

4. Prepared by: Date/Time

IAP COVER SHEET June 2000

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1. Incident Name [redacted]	2. Prepared by: (name) [redacted] Date: [redacted] Time: [redacted]	INCIDENT BRIEFING ICS 201-CG

3. Map/Sketch (include sketch, showing the total area of operations, the incident site/area, overflight results, trajectories, impacted shorelines, or other graphics depicting situational and response status)

[redacted]

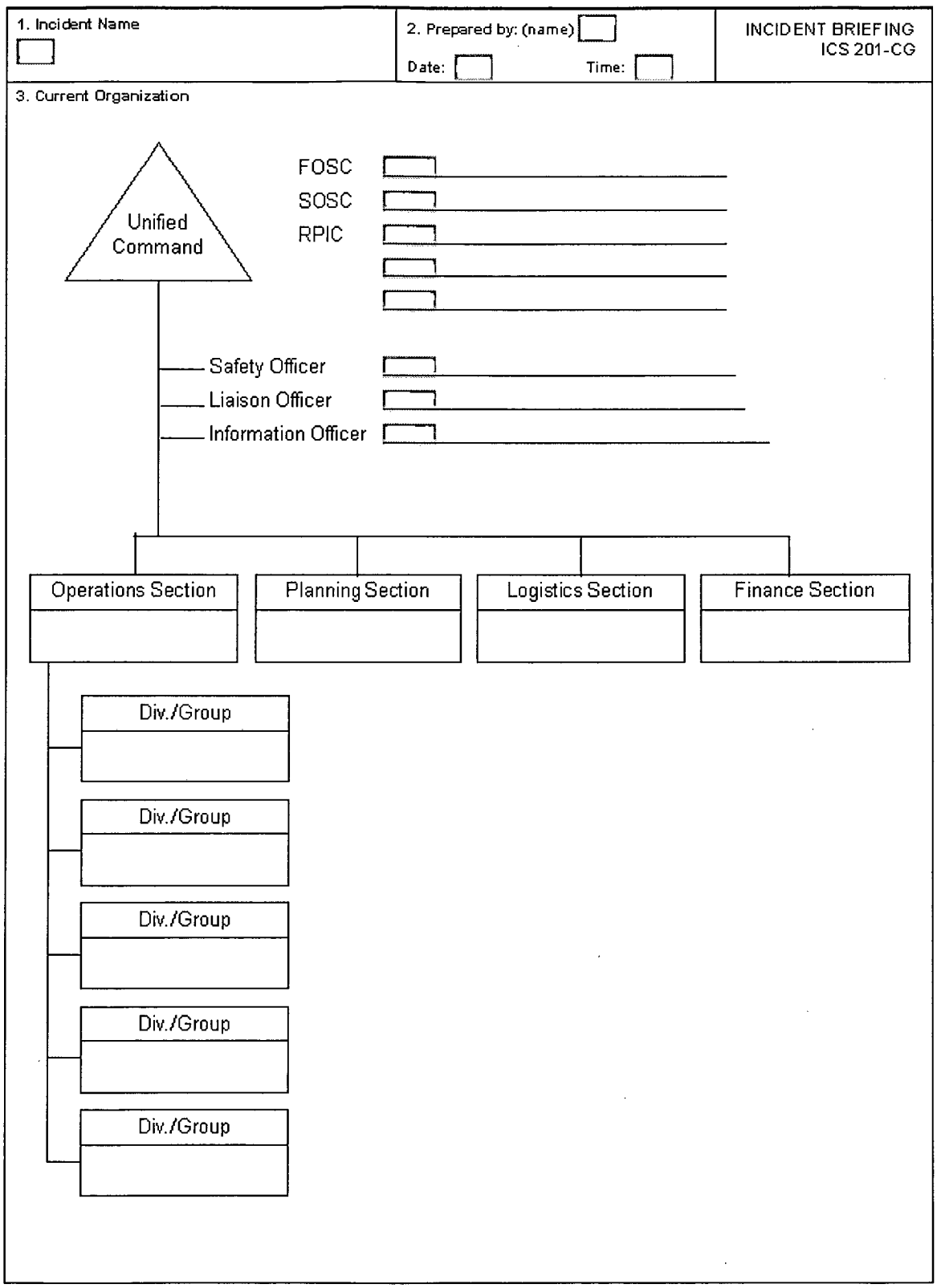
4. Current Situation: [redacted]

[redacted]

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1. Incident Name [redacted]	2. Prepared by: (name) [redacted] Date: [redacted] Time: [redacted]	INCIDENT BRIEFING ICS 201-CG

5. Initial Response Objectives, Current Actions, Planned Actions	
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]



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1. Incident Name	2. Prepared by: (name) Date: Time:	INCIDENT BRIEFING ICS 201-CG

7. Resources Summary Resource	Resource Identifier	Date Time Ordered	ETA	On-Scene (X)	NOTES: (Location/Assignment/Status)

1. Incident Name	2. Operational Period (Date/Time)	INCIDENT OBJECTIVES ICS 202-CG
	From: To:	

3. Objective(s)

4. Operational Period Command Emphasis (Safety Message, Priorities, Key Decisions/Directions)

Approved Site Safety Plan Located at:

5. Prepared by: (Planning Section Chief) Date/Time

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1. Incident Name	2. Operational Period (Date/Time) From: To:	ORGANIZATION ASSIGNMENT LIST ICS 203-CG

3. Incident Commander(s) and Staff		
Agency	IC	Deputy
Safety Officer:		
Information Officer:		
Liaison Officer:		

4. Agency Representatives	
Agency	Name

5. PLANNING/INTEL SECTION	
Chief	
Deputy	
Resources Unit	
Situation Unit	
Environmental Unit	
Documentation Unit	
Demobilization Unit	
Technical Specialists	

6. LOGISTICS SECTION	
Chief	
Deputy	
a. Support Branch	
Director	
Supply Unit	
Facilities Unit	
Vessel Support Unit	
Ground Support Unit	
b. Service Branch	
Director	
Communications Unit	
Medical Unit	
Food Unit	

7. OPERATION SECTION	
Chief	
Deputy	
Deputy	
Staging Area Manager	
Staging Area Manager	
Staging Area Manager	
a. Branch – Division Groups	
Branch Director	
Deputy	
Division Group	
Division Group	
Division Group	
Division/Group	
Division/Group	
b. Branch – Division/Groups	
Branch Director	
Deputy	
Division/Group	
Division/Group	
Division/Group	
Division/Group	
Division/Group	
c. Branch – Division/Groups	
Branch Director	
Deputy	
Division/Group	
Division/Group	
Division/Group	
Division/Group	
Division/Group	
d. Air Operations Branch	
Air Operations Br. Dir	
Helicopter Coordinator	

8. FINANCE/ADMINISTRATION SECTION	
Chief	
Deputy	
Time Unit	
Procurement Unit	
Compensation/Claims Unit	
Cost Unit	

9. Prepared By: (Resources Unit)	Date/Time

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NRC Incident No. #_____

1. Incident Name	2. Operational Period (Date / Time) From: To:	MEDICAL PLAN ICS 206-CG

3. Medical Aid Stations

Name	Location	Contact #	Paramedics On site (Y/N)

4. Transportation

Ambulance Service	Address	Contact #	Paramedics On board (Y/N)

5. Hospitals

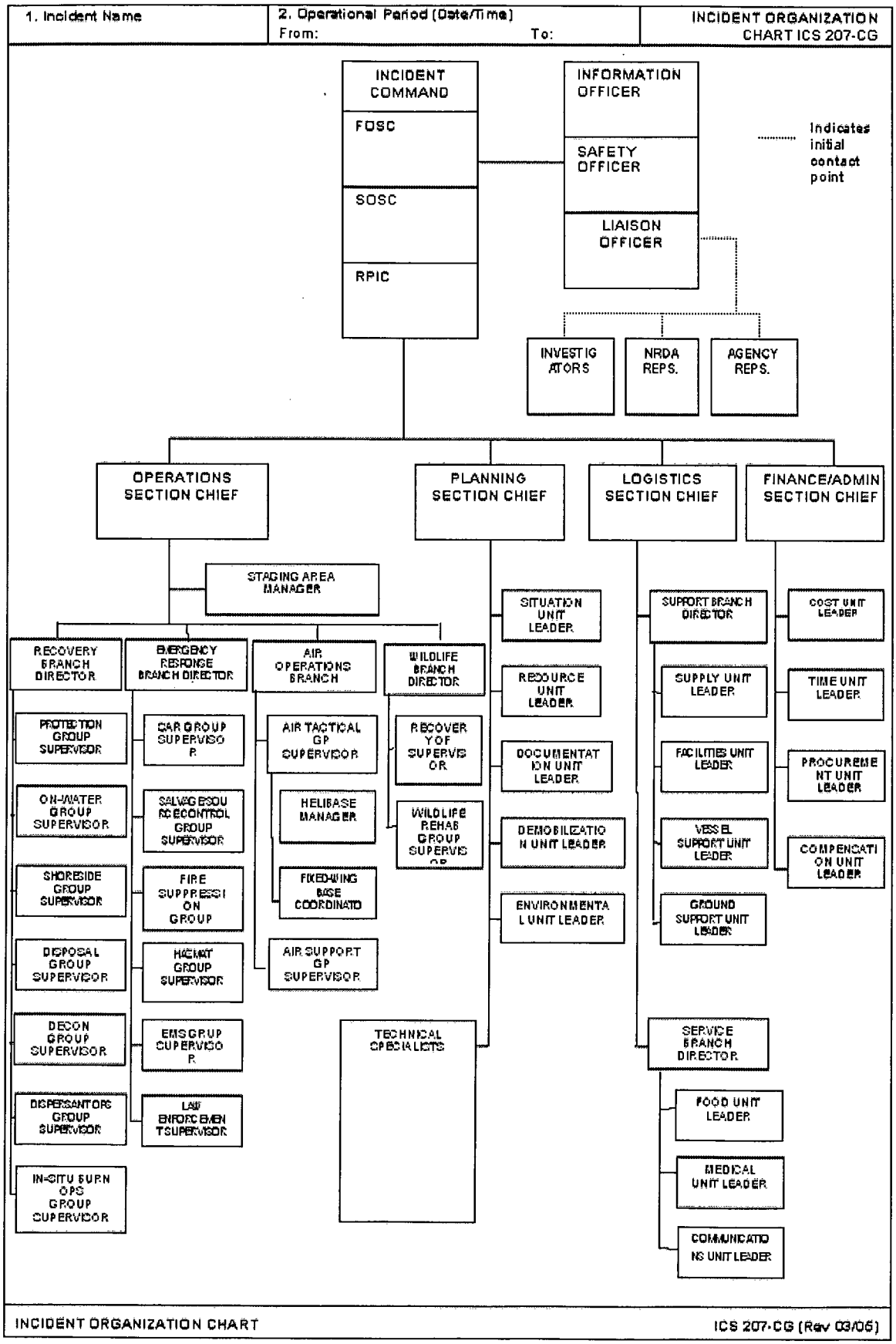
Hospital Name	Address	Contact #	Travel Time		Burn Ctr?	Heli-Pad?
			Air	Ground		

6. Special Medical Emergency Procedures

7. Prepared by: (Medical Unit Leader) Date/Time	8. Reviewed by: (Safety Officer) Date/Time

MEDICAL PLAN ICS 206-CG (Rev.07/04)

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SITE SAFETY PLAN

I. General

☐ Pump Station ☐ Pipeline Spill ☐ Spill to Water ☐ Excavation ☐ Other: _____

Location: _____

Work to be performed: _____

Issuing Date: _____ Time: _____
Temperature: ___° Wind Direction: ___
Humidity: _____

II. Hazards to be Evaluated

Y	N		Y	N		SPECIFIC HAZARDS Y	N	
☐	☐	Oxygen Deficient/Enriched	☐	☐	Ingestion / Skin Absorption	☐	☐	Crude Oil
☐	☐	Flammable Atmosphere	☐	☐	Frostbite	☐	☐	Other* ( )
		(Explosion Fire)	☐	☐	Chemical/MSDS # _____			
☐	☐	Toxic Atmosphere: _____			(Must be attached)			
☐	☐	Boat Operations	☐	☐	Physical Hazard _____			
☐	☐	Confined Space	☐	☐	Traffic _____			
			☐	☐	Vapor Cloud			

III. Testing & Monitoring (Check required items)

Tests are to be performed in the order listed.

Y	N		Continuous		Frequency
☐	☐	Oxygen Level	☐Y	☐N	_____ every ____.
☐	☐	LEL	☐Y	☐N	_____ every ____.
☐	☐	Hydrogen Sulfide	☐Y	☐N	_____ every ____.
☐	☐	Benzene	☐Y	☐N	_____ every ____.
☐	☐	Total Hydrocarbons	☐Y	☐N	_____ every ____.
☐	☐	Other: _____	☐Y	☐N	_____ every ____.

ACCEPTABLE ENTRY CONDITION: ENTRY LEAVE AREA

SPECIAL WORK PRACTICES OR PPE REQUIRED	WORK ACTIVITIES SHOULD BE CONDUCTED AT REDUCING CONCENTRATIONS
19.5 – 23.0% O2 in air	< 19.5% or 23.0% O2 in air
< 10% LEL in air	≥ 10.0 but < 20.0% LEL in air
< 10 ppm	≥ 10 but < 100 ppm
< 5 ppm	≥ 5 but < 10 ppm
< 300 ppm -	≥ 300 but < 750 ppm

≤ 16.0 or ≥ 23.5% O2 in air
≥ 20.0% LEL in air
≥ 100 ppm
≥ 10 ppm
≥ 750 ppm

IV. Required Personal Protective Equipment (Check for required use)

General	Eye Prot.	Respiratory Prot.	Hearing Prot.	Gloves	Footwear	Clothing
☐ Hard Hat	☐ Safety Glasses	☐ SCBA/Air Line w/Escape	☐ Ear Plugs	☐ Leather	☐ Steel-toes	☐ FR Coveralls
☐ Safety Harness	☐ Goggles	☐ Air Line	☐ Ear Muffs	☐ Rubber	☐ Rubber	☐ Tyvek
☐ PFD	☐ Face-shield	☐ Air Purifying (Full Mask)	☐ Combination	☐ Nitrile	☐ Hip-boots	☐ Coated Tyvek
	☐ Tinted Lens	Cartridge Type: ☐ OV	☐ Hepa-OV	☐ PVC	☐ _____	☐ Saranyx
				☐		☐ _____

Any other special PPE: _____

V. Emergency Information and Rescue Services

Emergency Contact Person: _____ Contact by: _____
Fire Department: _____ Contact by: _____
Ambulance: _____ Contact by: _____
Hospital: _____ Contact by: _____
Rescue Services: _____ Contact by: _____
(if not provided by above)

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VI. Required Safety & Rescue Equipment (on site)

☐ Lights	☐ Fall Protection	☐ First Aid Kit	☐ Drinking Water	☐ Fire Extinguisher	☐ Tripod	☐ **Other:**
☐ Ladder	☐ Retrieval Lines	☐ Resuscitator	☐ **Communication Method**			

VII. Comments or Special Work Procedures

VIII. Report All Injuries Immediately

IX. Control Measures

• Isolation & Lockout (identify items to be locked out)	• Ventilation ☐ Natural ☐ Mechanical
• Establish Work Zones when completed	Continuous ☐ No ☐ Yes
☐ Hot Zone = Red Ribbon	• Flagman / Watchman ☐
☐ Warm Zone = Yellow Ribbon	• Confined Space – Safety Watch ☐
☐ Cold Zone = Blue Ribbon	(See Exhibit "B" for Permit)
	• Evacuation Routes – (Identify on Map)
	☐ Air Horn – Emergency
	☐ Primary Route
	☐ Secondary Route

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X. Monitoring Results	Zone													
Oxygen	Time													
	Level													
	By													
LEL	Time													
	Level													
	By													
Hydrogen Sulfide	Time													
	Level													
	By													
Benzene	Time													
	Level													
	By													
VOC	Time													
	Level													
	By													
	Time													
	Level													
	By													
	Time													
	Level													
	By													
	Time													
	Level													
	By													
	Time													
	Level													
	By													

Equipment: Type:_____ Mfger:_____Calibration / Expiration: _____
Type:_____ Mfger:_____Calibration / Expiration: _____

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NRC Incident No. #_____

1. Incident Name	2. Operational Period (Date/Time) From: To:	UNIT LOG ICS 214-CG
3. Unit Name/Designators	4. Unit Leader (Name and ICS Position)	

5. Personnel Assigned

NAME	ICS POSITION	HOME BASE

6. Activity Log (Continue on Reverse)

TIME	MAJOR EVENTS

7. Prepared by: Date/Time

UNIT LOG ICS 214-CG (Rev 6/05)

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NRC Incident No. #_____

1. Incident Name	2. Operational Period (Date/Time) From: To:	UNIT LOG (CONT.) ICS 214-CG

6. Activity Log (Continue on Reverse)

TIME	MAJOR EVENTS

7. Prepared by: Date/Time:

UNIT LOG ICS 214-CG (Rev 6/05)

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6.0 SPILL IMPACT CONSIDERATIONS

6.1 Critical Areas to Protect

6.2 Environmental/Socio-Economic Sensitivities

6.3 Fisheries and Wildlife Protection

6.4 Staging Areas

6.5 Containment and Recovery of Spilled Product

6.6 Vulnerability Analysis

6.7 Alternative Response Strategies

Figure 6.1 On-Water Response Flowchart

Figure 6.2 Environmental Sensitivity Maps

Figure 6.3 Endangered/Threatened Species Listing

Figure 6.4 Aquifers

Figure 6.5 Affected HCA/Environmental

Figure 6.6 Drain Tiles

Figure 6.7 Reference Websites

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6.1 CRITICAL AREAS TO PROTECT

The critical areas to protect are classified as high, moderate, and low sensitivity to oil for non-coastal/inland environments. The Federal, Province/State, and Local authorities will further clarify these categories at the time of the response. The categories are defined as follows:

HIGH SENSITIVITY

- Areas which are high in productivity, abundant in many species, extremely sensitive, difficult to rehabilitate, or inhabited by threatened/endangered species.
- Areas which consist of populated areas, rural water systems, well head or source water protection areas or drinking water wells.
- Areas which consist of forested areas, brush/grassy areas, wooded lake areas, freshwater marshes, wildlife sanctuaries/refuges, and vegetated river/stream banks.

MODERATE SENSITIVITY

- Areas of moderate productivity, somewhat resistant to the effects of oiling.
- Areas which consist of degraded marsh habitat, clay/silt banks with vegetated margins, and gravel/cobble beaches.

LOW SENSITIVITY

- Areas of low productivity, man-made structures, and/or high energy.
- Areas which consist of gravel, sand, or clay material, barren/rocky riverbanks and lake edges, man-made structures, and concrete/compacted earthen drainage ditches.

6.2 ENVIRONMENTAL/SOCIO-ECONOMIC SENSITIVITIES

Environmental/Socio-economic sensitivities are of extreme importance when planning a response effort.The health and safety of the public and the environment, as well as the protection of the various socio-economic sensitivities, must be promptly addressed in order to mitigate the extent of damage and minimize the cost of the clean-up effort.

It is important to protect archeological sites and heritage resources (e.g. National Parks, National Marine Conservation Areas, and National Historic Sites). Impacted archeological sites or heritage resources of an area need to be identified and the likely impacts that result from the activities should be addressed. Specific consideration should be given to access to, and general use and disturbance of areas. The assessment should consider both direct and indirect impacts, cultural protocols and strategies for minimizing impacts. Consultation with local indigenous communities should occur as part of the planning process.

The Company will explore, where appropriate, equivalent environmental protection systems, methods, devices, or technologies that maintain or may be less damaging to the character of heritage resources or archeological sites. If a release from the pipeline impacts a heritage resource, the Company will respond as outlined in Section 3.0, report to the appropriate authority prescribed by law, cleanup and restore the area as required by regulation, and conduct such sampling, analyses, or associated monitoring during and after restoration.

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All environmental/socio-economic sensitivities are worthy of protection, but must be prioritized during a response effort. When making decisions on which areas to designate as collection areas and which to protect, the following sources may be consulted:

- Canadian Wildlife Services, U.S. Fish and Wildlife Service and related province/ state agencies;
- Applicable Area Contingency Plans;
- Other industry and private experts; and
- Indigenous groups.

The environmental and socio-economic sensitivities in the vicinity of the Pipeline have been broken down into specific categories and identified in this Section. To further clarify the location of the sensitive areas of concern, references to published Area Contingency Plans and Environmental Sensitivity Maps are also provided in this section.

6.3 FISHERIES AND WILDLIFE PROTECTION

The Company will work with Federal, Province/State, and local agency personnel to provide labor and transportation to retrieve, clean, and rehabilitate birds and wildlife affected by an oil spill, as necessary. Oversight of the Company's wildlife preservation activities and coordination with Federal, Province/State, and Local agencies during an oil spill is the responsibility of the Incident Commander.

Protecting fish habitat (e.g. spawning and rearing grounds) is important to both consumers and commercial fisheries. Beyond typical response strategies, other options could include moving floating facilities, temporarily sinking facilities using cages designed for this purpose, temporary suspension of water intakes, or closing sluice gates to isolate the facilities from contamination.

Special consideration should be given to the protection and rehabilitation of endangered species and other wildlife and their habitat in the event of an oil spill and subsequent response. Jurisdictional authorities should be notified and worked with closely on all response/clean-up actions related to wildlife protection and rehabilitation. Laws with significant penalties are in place to ensure appropriate protection of these species.

Wildlife Rescue

The Company will work with Federal, Province/State, and Local agency personnel to provide labor and transportation to retrieve, clean, and rehabilitate wildlife affected by an oil spill, as the situation demands.

The following are items which should be considered for wildlife rescue and rehabilitation during a spill response:

- Bird relocation can be accomplished using a variety of deterrents, encouraging birds to avoid areas of spilled oil. Bird relocation can be accomplished by utilizing deterrent methods including:
  - Use of visual stimuli, such as inflatable bodies, owls, stationary figures, or helium balloons, etc.
  - Use of auditory stimuli, such as propane cannons, recorded sounds, or shell crackers.
  - Use of herding with aircraft, boats, vehicles, or people (as appropriate).Use of capture and relocation.

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Search and Rescue - Points to consider

- **The Company's involvement should be limited to offering assistance as needed or requested by the agencies.**
- Prior to initiating any organized search and rescue plan, **authorization must be obtained from the appropriate Federal/State agency.**
- **Initial search and rescue efforts, if needed, should be left up to the appropriate agencies.**They have the personnel, equipment, and training to immediately begin capturing contaminated wildlife.
- With or without authorization, it must be anticipated that volunteer citizens will aid distressed/contaminated wildlife on their own. It is important to communicate that it may be illegal to handle wildlife without express authority from appropriate agencies. Provisions should be made to support an appropriate rehabilitator; however, **no support should be given to any unauthorized volunteer rescue efforts.**
- The regulatory agencies and response personnel should be provided the name and location of a qualified rehabilitator in the event contaminated wildlife is captured.
- Resources and contacts that can assist with wildlife rescue and rehabilitation are provided in Section 2.0. This list includes:
  - Outside rehabilitation organizations;
  - Local regulatory agencies; and
  - Other resources.

6.4 STAGING AREAS

When establishing personnel and equipment staging areas for a response to a Pipeline discharge, the following criteria should be evaluated:

- Access to waterborne equipment launching facilities and/or land equipment.
- Access to open space for staging/deployment of heavy equipment and personnel.
- Access to public services utilities (electricity, potable water, public phone, restroom and washroom facilities, etc.).
- Access to the environmental and socio-economically sensitive areas which are projected for impact.

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6.5 CONTAINMENT AND RECOVERY OF SPILLED PRODUCT

General descriptions of various specific response techniques that may be applied during a response effort are discussed below. Company responders are free to use all or any combination of these methods as incident conditions require, provided they meet the appropriate safety standards and other requirements relative to the situation encountered. Data was obtained from reports, manuals and pamphlets prepared by the American Petroleum Institute, Environmental Protection Agency, and the United States Coast Guard. The most effective cleanup of a product spill will result from an integrated combination of clean-up methods. Each operation should complement and assist related operations and not merely transfer spillage problems to areas where they could be more difficult to handle.

The spill should be assessed as soon as possible to determine the source, extent and location of travel. Terrain and other physical conditions downgradient of the spill site will determine the methods of control at a point in advance of the moving product. Often, the bulk of a spill can be contained at a single location or a few key locations in the immediate vicinity of the source point. When possible, the execution of this type of initial containment strategy helps confine a spill to a relatively limited area.

Spill on Land / Source Control

- **Containment Methods**

  After safety, the highest priority for TransCanada during a spill response is to prevent product from reaching water and mitigate migration of oil out of the source area. To accomplish this there are many different ways to contain or deflect product. Product can be trapped in ditches and gullies by earth dams. Where excavating machinery is available, dams can be bulldozed to contain lakes of product. Dams, small and large, should be effectively employed to protect priority areas such as inlets to drains, sewers, ducts and watercourses. These can be constructed of earth, sandbags, absorbents, planks, pillow (inflatable with air/water) dams or any other effective method. If time does not permit a large dam, many small ones can be made, each one holding a portion of the spill as it advances. The terrain will dictate the placement of the dams. If the spill is minor, natural dams or earth absorption will usually stop the product before it advances a significant distance. Cleanup is the main concern in such situations.

  Whenever possible, potential routes of migration should be closed off by the use of sandbags, planks, earth or other dams. This is used as a preventative measure in case precipitation begins and the product starts to migrate.

  In urban locations such as city streets or concrete drainage ditches, a combination of sorbent booms in front with a layer sandbags behind holding the boom in place can be used as a very effective means to create containment along with some collection.

  Instead of building up dikes and dams, another method of containment is to dig collection pits. By creating a new low point for the oil to run it provides an excellent recovery point for removal.

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- **Removal Methods**

The best approaches to remove oil from urban infrastructure include:

- Removal with suction equipment to tank truck if concentrated in volumes large enough to be picked up. Channels can be formed to drain pools of product into storage pits. The suction equipment can then be used.
- Small areas can be cleaned by hand. Use of sorbent pads to soak up the oil is the preferred method.
- If safe, controlled burning presents the possibility of a fast, simple, and inexpensive method of destruction of the remainder of the product. If all other options have been executed and the site is still unsafe for further activity because explosive vapors persist, the vapors may need to be intentionally ignited to prevent an accumulation sufficient to become an explosive mixture, provided the other requirements of these guidelines for controlled burning are met.

Intentional ignition to remove released product should be utilized only if all of the following conditions are met:

- Other steps and procedures have been executed and a determination has been made that this is the safest remaining method of control.
- Intentional burning will not unduly damage pipelines, adjacent property, or the environment.
- Controlled burning is permitted by Federal and State/Provincial government authorities. Local government authorities to be contacted may include city council, county board of commissioners, city or county fire chiefs, the county forestry commission or fire tower, and the local environmental protection agency. In seeking permission from these authorities, be prepared to convince them that adequate safety precautions have been and will be taken during the operation. Also be ready to conduct water or soil sampling upon completion as may be required.
- Controlled burning is conducted with the consent of local land owners.
- Safety must always be a prime consideration when considering controlled burning of product. Sparks and heat radiation from large fires can start secondary fires and strong winds make fire control difficult. There must be no danger of the fire spreading beyond control limits. All persons must be at a safe distance from the edge of the inflammable area. Remember that all burning must be controlled burning.

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Spill on Lake or Pond (Calm or Slow-Moving Water)

- **Containment Methods**

A lake or pond offers the best conditions for removal of product from water. Although the removal is no easy task, the lake or pond presents the favorable conditions of low or no current and low or no waves.

The movement of product on a lake or pond is influenced mainly by wind. The product will tend to concentrate on one shore, bank or inlet. Booms should be set up immediately to hold the product in the confined area in the event of a change in wind direction.

If the spill does not concentrate itself on or near a shore (no wind effect), then a sweeping action using boats and floating booms will be necessary.

The essential requirement for this operation is that it be done very slowly. The booms should be moved at not more than 40 feet per minute. Once the slick is moved to a more convenient location (near shore), the normal operations of removal should begin.

If the slick is small and thin (rainbow effect) and not near the shoreline, an absorbent boom instead of a regular boom should be used to sweep the area very slowly and absorb the slick. The product may not have to be moved to the shoreline. See Figure 6.1 for on-water rcovery decision tree.

- **Removal Methods**

If the Containment slick is thick enough, regular suction equipment may be used first; however, in most instances, a floating skimmer should be used.

If the floating skimmer starts picking up excess water (slick becomes thin), drawing the boom closer to the bank as product is removed will also keep film of product thicker. However, when the slick becomes too thin, the skimmer should be stopped and an absorbent applied (with a boat if necessary) to remove the final amounts. The floating skimmer (if speed is a must) or hand skimmers (if water is shallow enough) or both can be used to pick up the product-soaked absorbent. Before pumping the product-soaked absorbent with a floating skimmer, ensure that the absorbent in question can be pumped and will not harm the pump. Several types are nonabrasive to pump internals. If the floating skimmer is used first, the product-soaked absorbent/water mixture should be pumped into a tank truck.

A better method of retrieving the product-soaked absorbent is to draw it in as close to the shore as possible with the booms used to confine the product initially. The absorbent can then be hand skimmed from the water surface and placed in drums, on plastic sheets or in lined roll-off boxes. It should then be disposed of by acceptable means.

The final rainbow on the surface can be removed with additions of more absorbent.

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Spill on Small to Medium Size Streams (Fast-Flowing Creeks)

- **Containment Methods**

The techniques used for product containment on fast-flowing shallow streams are quite different from the ones used on lakes, ponds, or other still bodies of water. The containment and removal processes require a calm stretch of water to allow the product to separate onto the surface of the water. If a calm stretch of water does not exist naturally, a deep slow-moving area should be created by damming. The dam can be constructed by using sandbags, planks or earth. If a dam is required, it should be situated at an accessible point where the stream has high enough banks. The dam should be constructed soundly and reinforced to support the product and water pressure.

- Underflow dam - The underflow dam is one method that can be used, especially on small creeks. The water is released at the bottom, of the dam using a pipe or pipes which are laid during construction of the dam. The flow rate through the pipe must be sufficient to keep the dam from overflowing. One method is to lay the pipe at an angle through the dam (while dam is being constructed) so that the height of the downstream end of the pipe will determine the height the water will rise behind the dam.

  Another method used with the underflow dam is having the pipe or pipes sized to carry only a portion of the flow needed. The pipe would be placed at the bottom of the dam and level with the creek bed. The remaining flow of the creek could be siphoned or preferably pumped around the dam from a point away from the dam and from the deepest portion of the pool. The pumping or siphoning can be controlled to maintain the desired water level at the dam. The key is the removal of water through or around the dam at the lowest point in the basin. This prevents the oil from escaping with the released water.

- Overflow dam - Another method of containment is the overflow type dam. The dam is constructed so that water flows over the dam, but a deep pool is created which slows the surface velocity of the water. Therefore, the condition of a calm stretch of water is met. The overflow dam may be used where larger flow rates (medium size creeks) of water are involved

  With this type dam, a separate barrier (floating or stationary boom) must be placed across the pool created by the dam. The separate barrier arrests the surface layer of product. At the same time, the water is flowing under the barrier and over the top of the dam. The barrier should be placed at an angle of 45 % across the pool to decrease the effective water velocity beneath it. Also, it helps to concentrate the product at the bank and not all along the barrier. A second barrier should be placed approximately 10 to 15 feet downstream of the first one as a secondary back-up.

  The stationary boom type barrier should be made of wood planks or other suitable material. The stationary boom should be soundly constructed and sealed against the bank. The ends of the planks can be buried in the banks of the stream and timber stakes driven into the stream bed for support as needed. The necessary length of the boom will be approximately 1-1/2 times the width of the waterway.

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The plank boom should extend six to eight inches deep into the water and about two inches or higher above the water level. If the increase in velocity under the stationary boom is causing release of trapped product, it should be moved upward slightly. At no time should barrier be immersed more than 20% of the depth of the pool at the barrier location; that is, if the pool created by damming is three feet deep, do not exceed an immersion depth of seven inches with the barrier at the position the barrier is installed.

A floating boom can be used in place of the stationary type if the created pool's size (bank to bank) and depth will permit. Since changing the depth and/or length of a standard floating boom in a small stream is difficult, the use of the separation of product and water. The advantages of using a floating boom are the speed of deployment and the fact that there is not need for additional support as with the stationary boom.

- Multiple Impoundments - Since emergency built dams (either underflow or overflow) are seldom perfect, a series of dams is usually required. The first one or two will trap the bulk and the ones that are downstream will trap the last traces of product. Precautions should be taken to ensure that the foundations of emergency dams are not washed away by the released water. If earth is used to construct an overflow dam, a layer of earth-filled bags should be placed on top of the dam so erosion will not take place. See Figure 6.1 for on-water recovery decision tree.

- **Removal Methods**

Once the containment dams are constructed, the problem or removal of the product from the water surface should be the prime consideration. The removal must be continuous or else build-up of product behind the dams or booms might lead to product escaping the traps.

The type of removal procedures used depends largely on the amount of product being trapped in a given span of time, if the amount of product moving down the stream is of sufficient quantity, the first dam or fixed boom would quite possibly trap enough for the floating skimmer to work efficiently. The skimmer will pump the product and possibly some water to a tank truck or other holding tank. Separated water may be released from the bottom of the tank truck if it becomes necessary. The absorbents could then be used at downstream dams or booms. It is inadvisable to place an absorbent in the stream prior to or at the first dam in anticipation of the arriving product. Let the product accumulate at the first dam and use the floating skimmer to recover the product.

Disposal of gross amount of product-soaked absorbent would not then be a problem. Follow directions on use of each absorbent. Some are designed to be placed on water before product arrives; others are intended only to be placed on the product after it accumulates on the water. Plastic sheets should be used to place the product- soaked absorbent on as it is hand skimmed from the water. Alternatively, the material may be placed in drums or lined roll-off boxes.

The containment and removal of spilled product on small to medium fast-flowing streams might require a combination of underflow or overflow dams, fixed booms, skimmers, and absorbents, to ensure a complete cleanup.

Spill on Large Streams and Rivers

- **Containment Methods**

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The containment techniques differ considerably on large streams and rivers versus small streams. First, the smooth calm area of water necessary for product-water separation must be found along the stream or river rather than making one as with small streams. Floating booms (rather than fixed booms or dams) must be used to trap the surfaced product.

Local conditions of current and wind must be considered when selecting the site for the boom. A point with a low water velocity near the bank, sufficient depth to operate the product removal equipment, and good access are required. The fact that wind may tend to concentrate the product against one bank must be considered. A smooth, undisturbed area of water is required immediately upstream of the boom to ensure that the product has opportunity to separate out onto the surface. The boom should be positioned where the current is at a minimum. It is more effective to boom at a wide, slow position than on a narrow, fast stretch of water.

If the boom are positioned straight across a river or stream, at right angles to the flow, surface water tends to dive beneath the barrier (boom) when current velocities exceed about ½ knot (0.8 ft./sec.). However, if the current of the entire river is ½ knot or less, then a boom can be positioned straight across the river or large stream, but angled slightly in relation of the banks. By placing the boom at an angle to the banks, product on the surface is diverted along the boom to the side of the river.

The current velocity is usually much slower near the river bank than in the center and the product will move along the boom toward the bank for removal. A water-tight seal between the bank and the boom is essential. A secondary boom should be set up immediately downstream of the first one to capture the amounts that escape the upstream boom. A boom can be employed parallel to the river flow at the bank to form the seal with the booms used to trap the product.

Where the current velocity of the chosen site exceeds ½ knot, the boom should be positioned in two smooth curves from a point of maximum velocity (usually the center of the river) to both banks. However, this double-boom required product to be removed from both sides of the river. To determine the appropriate angle of boom placement and support (mooring) needed to hold the booms in position, the current velocity should be measured by timing a floating object which is 80% submerged over a distance of 100 feet. A time of 60 seconds over this distance indicates a water current of approximately 1 knot.

For currents from 1 to 2.5 knots (1.7 to 4.2 ft./sec.), the more the boom will have to be angled acute to the bank because of oil entrainment. The length of the boom will have to be such to reach the center of the river. For currents between ½ and 1 knot (0.8 and 1.7 ft./sec.), the angle of employment can be enlarged.

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The major load on the boom is taken by the terminal moorings, particularly the one in the center of the river. However, intermediate moorings are also required both to maintain the smooth curve of the boom to prevent breaking of the boom and to assist with preventing skirt deflection. The intermediate moorings are preferably positioned every 25 feet and must be adjusted to avoid the formation of indentations in the boom profile. These trap product in pockets, prevent its deflection to the bank, and also encourage diving currents. The moorings? ropes should be five times the water depth.

In certain situations, it might be advantageous to position booms to deflect the approaching spilled product to a slower moving area. Naturally, additional booms would have to be positioned around this slower moving area prior to deflecting the product to the area. This approach has been used along river which has lagoons, etc., with a very low current action. The recovery would take place in the lagoons and not along the river bank. See Figure 6.1 for on-water rcovery decision tree.

- **Removal Methods**

The product collected upstream of the floating booms in a large stream or river should be removed from the water surface as it accumulates. Regular suction equipment, a floating skimmer, and/or absorbents (including absorbent booms) should be used to remove the product as appropriate to the quantity being trapped in a given span of time. If the amount moving down the stream is of sufficient quantity, the primary floating boom would possibly trap enough for the floating skimmer to work efficiently. The skimmer will pump the product and some water to a tank truck or other holding tank.

The absorbents would then be used upstream of the secondary boom to absorb the underflow from the primary boom. An absorbent boom can also be placed between the primary and secondary booms to help the other absorbents control the underflow from the primary boom.

It is best to hand skim the saturated absorbents and place on plastic sheets. However, if the absorbent used can be pumped after product absorption and speed of removal is a necessity, the floating skimmer can be used to remove the product-soaked absorbent.

The disadvantage of pumping the product-soaked absorbent to a truck is the volume that will accumulate (skimmer will pump excess water) and the disposal problems associated with the large water/product-soaked absorbent mixture.

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Spill on Stream which Flows into Lake or Pond

In certain locations where streams (small and large ones) flow into lakes or ponds at relatively short distances, it is conceivable that a spill could reach the lake before containment and recovery operations are set up. If time permits for containment operations to be set up on the stream in question, it then would be handled as described above depending upon the stream size involved.

However, if product in the stream is near the lake site or if product is flowing into the lake with a significant amount yet to arrive, a different containment should be employed.

- **Containment Methods**

  Product on a stream flowing into a lake should be boomed as close to the entrance as possible. The boom should be positioned on the lake at an angle to the residential stream current so as to direct the surface water to a slower moving area. The area where the product is being deflected should be enclosed by booms to contain it. An additional boom for sweeping the product to the bank will be required. This area of containment should not have a current velocity of more than 1/2 knot (0.8 ft./sec.), preferably less. See Figure 6.1 for on-water rcovery decision tree.

- **Removal Methods**

  The removal of product from the lake or pond?s surface would be handled as described earlier.

  For sizable releases, collected product will usually be pumped into tank trucks and transported to a storage facility. Tank trucks are available at several locations throughout.

Sinking or Submerged Oil

- **Containment Methods**

  Sinking and submerged oil can be contained. Oil that is heavier than water will become submerged in the water column or sink to the bottom. Oil that sinks to the bottom may act much like oil on dry land, collecting in low lying areas and thus containing itself on the bottom. Sinking or submerged oil is simply oil that has not reached the bottom yet or has been disturbed and is currently suspended in the water column by tide or current. In water with a current of less than 0.7 knots oil that is heavier than water will tend to sink to the bottom. Any current above 0.7 knots has the potential to remove oil from its resting place on the bottom and carry the oil downstream. Types of equipment used to contain oil that is sunken or submerged include net booms, bottom hugging weighted boom and Watergate dams, silt curtains, gabion baskets lined with impermeable membranes, filter fences such as Turner Valley Gates which can also be lined with impermeable membranes, and boom with deep skirts to help resurface submerged oil.

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Methods to detect submerged oil include the use of Sonar which has been used in an attempt to locate submerged oil with some success. Remote and diver operated underwater video detection systems have proved to be useful but is dependent on visibility. Visual observation can be used in shallow water although expert analysis is essential for this technique as aquatic biota (vegetation) in the water may be mistaken for oil. Currently the best method for sampling for submerged oil is to drop weighted sorbent materials such as "pom-pom" snare boom or sorbent chain drags into low areas for short distances and then visually inspected for oil to map oil distribution. This provides a bottom sample indicating whether or not oil is present. Gabion baskets filled with sorbent materials are also used for detection of sunken and mobile oil. These sorbent filters allow water to flow through them thus capturing any suspended or sunken oil. By examining the filter, it can be determined if submerged or sunken oil is present. Collection of core samples can also be a method to detect sunken oil. The sampling area of the core may be too small to be effective but has been historically used for subsurface contamination assessments.

- **Removal Methods**

The most effective method to recover oil is the use of drivers with vacuum system to collect concentrations of submerged oil on the bottom. The diver can direct the pumping of oil and can detect when the oil has been recovered.

Another common method is to dredge the bottom and remove the oil along with some of the bottom substrate. Dredging is a common method currently used to remediate contaminated sites but may generate a large amount of waste material that must be properly managed and disposed of.

Both diver-directed pumping and dredging only work for completely sunken oil. To capture suspended oil an underwater filter can be constructed. This filter is created using some form of porous container such as a Gabion Basket, prawn or crab traps, silt fences and even chicken wire. The container is filled with sorbent material such as oil snares, weighted down, and submerged into the water column. The sorbent materials are monitored and replaced as needed to continue recovery of oil.

Trawl nets have also been specifically designed for spill recovery in response to the increased transport of heavy crude oils by cargo ship.

In shallow water, where oil can be seen from the surface, dip nets or pool nets have been successfully used as the most effective way to collect oil. This method is useful if the oil has emulsified or is thick enough to scoop up with nets.

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Spill in Urban Areas

Oil spills in urban areas can greatly impact recreational use, human health, wildlife habitat(s), and potential beach or park closures. Manmade structures along waterways require unique protection strategies. Manmade structures could include vertical shore protection structures such as seawalls, piers, and bulkheads, as well as riprap revetments and groins, breakwaters, and jetties. Vertical structures can be constructed of concrete, wood, and corrugated metal. They usually extend below the water surface, although seawalls can have beaches or riprap in front of them. These structures are very common along developed shores, particularly in harbors, marinas, and residential areas. The range in degree of exposure to waves and currents varies widely, from very low in dead-end canals, to very high on offshore breakwaters. Boat wakes can generate wave energy in otherwise sheltered areas. Maintaining shipping or other kinds of vessel traffic through navigation channels or waterways during a spill response is a difficult consideration because there is usually economic and political pressure to re-establish normal operations as soon as possible. This consideration extends to vehicular traffic through urban areas. Deploying booms and skimmers or constructing recovery sites can conflict with such traffic for several days. Also, passage of deep-draft vessels through the waterway can suddenly change water level and flow or create wakes, causing booms to fail. For these reasons, recovery efforts must be coordinated through the Unified Command to ensure the cooperation of all parties involved.

- **Containment Methods**

  Containment techniques in an urban area depend greatly on the ability to deploy equipment due to obstacles presented by the urban area. Most booming and containment techniques will work with slight modifications such as direct anchoring instead of the use of booming buoys. Often, debris and other obstacles cause gaps in containment or clog up the flow of oil in diversion booming. Vessel traffic can also cause containment to fail, due to splash over from vessel wakes.

- **Removal Methods**

  Normal recovery techniques work when recovering oil in an urban area. However, recovery can be hampered by several situations. Floating debris clogging skimming equipment is the main cause for low recovery rates. Another problem for recovery in an urban area is lack of storage space. Often traffic problems or lack of access prevent storage equipment such as frac tanks and vacuum trucks from approaching the recovery zone.

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Spill Under Ice

- **Containment Methods**

The traditional strategy for dealing with oil under the ice in a river or lake is to cut a slot to aid in recovery. Ice slots can be cut using chain saws, handsaws, ice augers or some form of trencher. Another effective variation of this technique is the diversionary plywood barrier method which is also discussed below. See Figure 6.1 for on-water decision tree.

- **Removal Methods**

Ice slotting is a very basic technique used to gain access to oil trapped beneath the ice. In ice slotting, a J shaped outline is sketched into the ice at a 30 degree angle to the current. The slight J hook or curve is necessary at the upstream side to provide flow towards the recovery area. In general, the slot width should be 1.5 times the thickness of the ice. Remember, a block of ice is heavy and the width of the slot must be taken into consideration so it can be safely removed or pushed under if the water beneath the ice is sufficiently deep. The length of the slot will be determined by the width of the river and strategy.

This technique is a successful strategy to implement. However, there are a few pit falls to be aware off. First, responders will fatigue rapidly if required to cut the slot or slots by hand using a chain saw or hand held saw. This can present a problem if there are not a sufficient number of Hazmat technicians available. Secondly, when cutting with chain saws, large volumes of water are kicked up by the moving chain onto the responder. This is a safety problem when the responders get wet in extreme cold weather conditions. Wearing rain gear however can reduce this problem.

A second technique is to slot the ice and use plywood to help divert oil beneath the ice to a recovery area. This technique is called the diversionary plywood barrier method. In this technique, a narrow slot is made through the ice and 4' x 8' sheets of plywood or equivalent are dropped into the slot to create a barrier and force the oil to follow along it to the collection area. This is the same principal employed when using floating boom.

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The slot can be cut or drilled depending on the equipment available at the time of the response. If drilling is required, a gas powered ice auger can be used. In this scenario a series of 8" or 10" holes are drilled next to each other in the J pattern.

A chain saw can be used to connect the holes if an ice bridge exists between two auger holes. After the ice auguring is complete, plywood can be dropped into the augured slot.

Again, river ice is dirty and chipper blades on the augers may only last long enough to complete a single auger hole. This technique requires a large inventory of chipper blades. Extra auger flights can be used, which reduces down time to change blades. A real plus to slotting the ice with an ice auger is the limited exposure of responders to water. The water is generally restricted to the area around the responder's feet.

If an ice auger is not available, a chain saw can be used to cut a narrow slot. After the slot has been cut and ice removed, plywood can be inserted. When using a chainsaw that makes a 3/8" cut, a 1/8"-1/4" plywood or outdoor siding can be inserted into the slot and effectively be used to create the barrier. Again, the down side when using a large chain saws is fatigue and splash from water being kicked up by the chain. However, this problem is not as bad as cutting large slots as described above. Since only a single slot is made, the number of responders can be reduced and extra personal protective equipment in the form of rain gear can be used to minimize the water splash.

Spill on Ice

When managing an oil spill on ice special consideration must be given to several safety factors. Thickness of the ice and general accessibility of equipment must be considered when planning for on-ice recovery. Ice that is too thin to safely traverse or broken ice may prevent active recovery.

- **Containment Methods**

  For ice-covered on-land or on- water spills, snow or earthen berms may be constructed to contain oil around the leak, if terrain permits. Dikes filled with sorbent materials may be used on spills in smaller streams to create a manmade dam to prevent the further migration of the oil.

  Oil may become encapsulated due to melting and refreezing of the ice. Oil may then be more difficult to access and remove. See Figure 6.1 for on-water recovery decision tree.

- **Removal Methods**

  Generally, on-ice recovery consists of the manual removal of the product from the spill site. If conditions permit, vacuum trucks or suction pumps may be used to remove pools of oil that may have collected. Often, product removal will be done by hand using brooms, shovels and rakes. Manually moving the oil/snow mixture into piles for collection where it is either vacuum or manually collected into storage containers.

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Spill in Wetland Areas

Wetlands, which include upland and inland marshes, swamps and bogs, are highly sensitive to spills because they collect run-off from surrounding environments, and because they are home to many commercially and ecologically important species. Wetlands are very susceptible to damage and are a high priority to protect. Precautions should be taken so that the recovery effort does not cause more damage than that cause by the release.

- **Containment Methods**

  Containment booms can be strategically deployed to contain or divert the product into recovery areas where skimmers and vacuums can be used to remove the product. Berms can also be built to contain or divert the product. Consideration must be given to the damage that can be caused by holding the product in the wetland areas. Often, allowing the product to flow to natural collection areas and possibly assisting the flow by the use of high volume low pressure water pumps may be the best course of action.

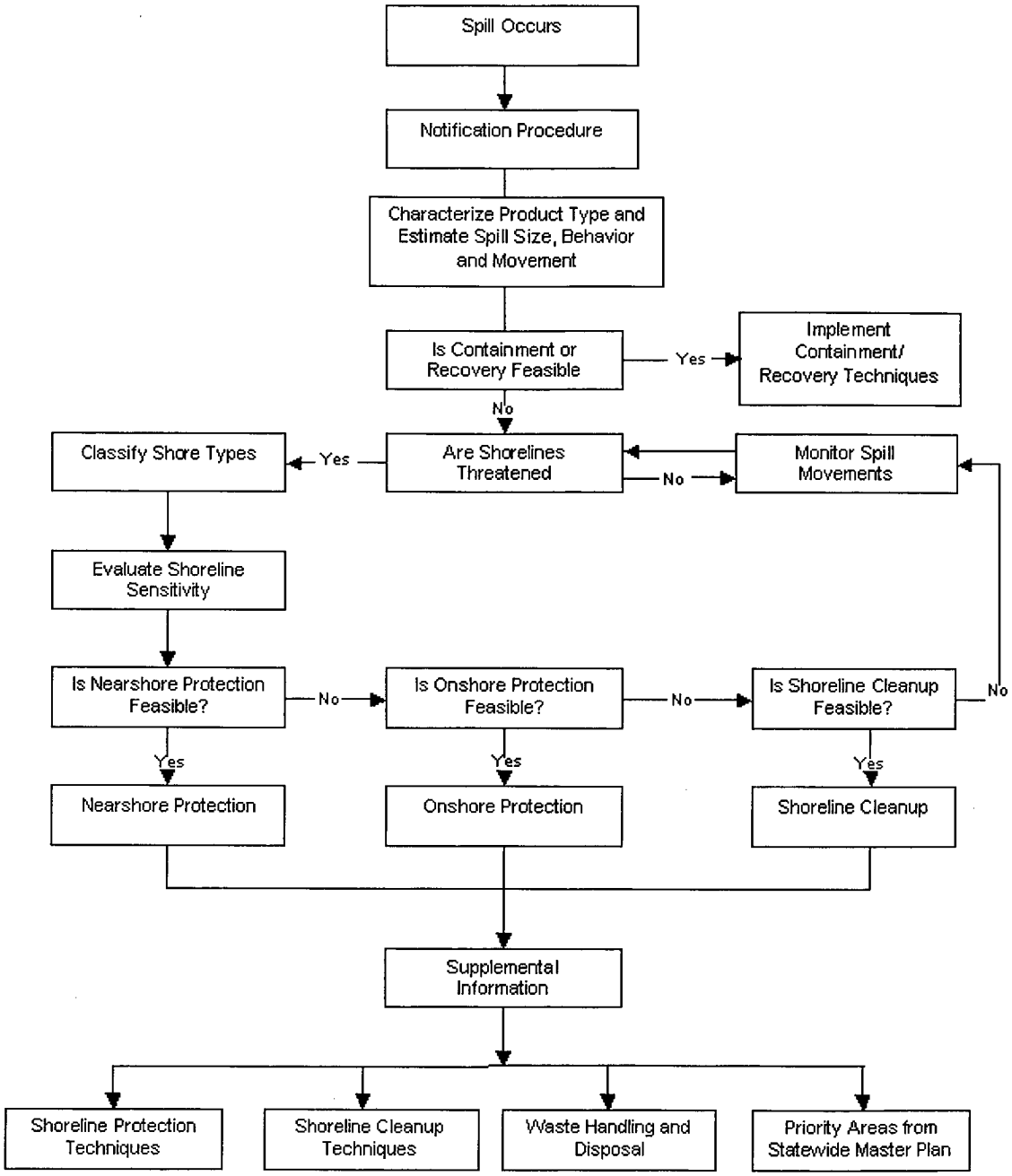
- **Removal Methods**

  Skimmers and vacuums can be deployed to recover contained oil. Other acceptable response techniques might include bioremediation, sorbents and in-situ burning. The use of heavy equipment is often not practical because of the damage it can cause to plant and animal life. During recovery, specially designed flat bottom shallow draft vessels and the use of plywood or boards may be used to reduce the damage caused by recovery personnel. If the water table is high and the oil will not permeate the soil, shallow trenches may be dug to collect oil for removal.

  The Unified Command must balance the need to remove the product with the damage caused by active removal. Considerations for long term passive recovery should be considered.

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FIGURE 6.1
ON-WATER RESPONSE FLOWCHART



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6.6 VULNERABILITY ANALYSIS

The thorough examination of published Area Contingency Plans (ACPs) was conducted to identify sensitive areas in all the response zones.

The Environmental Sensitivity Maps located in Figure 6.2 identify sensitive areas along the Pipeline. The appropriate Area Contingency Plan maps are also included to provide more detailed information on sensitivities and possible potential response options.

6.7 ALTERNATIVE RESPONSE STRATEGIES

There are no pre-approved response options for inland spills within the United States. Any plans to use dispersants or in situ burn by the Company must be approved of by the Unified Command and submitted to the Federal On-Scene Coordinator for Regional Response Team approval prior to such action being taken.

IN SITU BURNING

When considering the use of in situ burning the following considerations should be evaluated. In most cases, an agency application with further considerations will need to be completed before burning will be approved by the agency.

Size, Nature, and Product Spilled

- Flammability of the product. (Will the product burn?)
- Location of spill. (Distance and direction to nearest human use areas.)
- Volume of product released.
- Estimate of the surface area covered by the spill.
- How long has oil been exposed?
- Will burning cause more hazardous by-products?

Weather and Forecast

- Current weather conditions. (Rain / Heat)
- Wind speed and direction.
- 24-hour forecast.
- 48-hour forecast.

Evaluate the Response Operations

- Is there time enough to conduct burning?
- Is safety equipment available?
- Is adequate personnel available for monitoring / emergency response?
- Is mechanical recovery more intrusive than burning?

Habitats Impacted and Resources at Risk

- Have local agency / officials been contacted?
  - Public Health
  - Land Owner / Manager
  - Local Fire Management (Fire Marshall)
  - Historic Property Specialist

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Province / State Resource Agency
Aboriginal / Native American interests
- What is / will be the impact to surface water intakes and wells.
- Are endangered habitats / endangered species present?
- Is area used by migratory animals?
- What wildlife is present?

Burn Plan

- How much of the oil is expected to burn?
- How long will it be expected to burn?
- How will burn be ignited?
- How will burn be extinguished?
- How will burned oil residue be collected?
- What are the monitoring protocols?

DISPERSANT USE

Dispersants are not commonly used on inland spills. Working closely with Federal, Province / State and local agencies will be necessary for gaining approval to use dispersants. Since dispersants do not eliminate the oil, only break up and spread the oil throughout the water column, it is important to look at the total effect the oil will have on the environment while considering the use of dispersants. Water sampling may be required to analyze the effects of the dispersant in the water column.

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FIGURE 6.2
ENVIRONMENTAL SENSITIVITY MAPS

Remember these maps are to be utilized as guidelines only. During a real response effort Federal, Province/State, and local agencies should be contacted to provide further assistance in the proper identification and protection of the various environmental and socio-economic sensitive areas

Canada ESM Map 1
Canada ESM Map 2
Canada ESM Map 3
Canada ESM Map 4
Canada ESM Map 5
Canada ESM Map 6
Canada ESM Map 7
Canada ESM Map 8
Canada ESM Map 9
Canada ESM Map 10
Canada ESM Map 11
Canada ESM Map 12
Canada ESM Map 13
Canada ESM Map 14
Canada ESM Map 15
Canada ESM Map 16
Canada ESM Map 17
Canada ESM Map 18
Canada ESM Map 19
Canada ESM Map 20
Canada ESM Map 21
Canada ESM Map 22
Canada ESM Map 23
Canada ESM Map 24
Canada ESM Map 25
Canada ESM Map 26
Canada ESM Map 27
Canada ESM Map 28
US ESM Map 1
US ESM Map 2
US ESM Map 3
US ESM Map 4
US ESM Map 5
US ESM Map 6
US ESM Map 7
US ESM Map 8
US ESM Map 9
US ESM Map 10
US ESM Map 11
US ESM Map 12
US ESM Map 13
US ESM Map 14
US ESM Map 15

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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

US ESM Map 16
US ESM Map 17
US ESM Map 18
US ESM Map 19
US ESM Map 20
US ESM Map 21
US ESM Map 22
US ESM Map 23
US ESM Map 24
US ESM Map 25
US ESM Map 26
US ESM Map 27
US ESM Map 28
US ESM Map 29
US ESM Map 30
US ESM Map 31
US ESM Map 32
US ESM Map 33
US ESM Map 34
US ESM Map 35
US ESM Map 36
US ESM Map 37
US ESM Map 38
USL Index Map
USL Map 2
USL Map 3
USL Map 3C1
USL Map 3D1
USL Map 3D2
USL Map 3D3
USL Map 3D4
USL Map 5P51
USL Map 5P53
USL Map 5P54
USL Map 5P62
USL Map 6
USL Map 6P61
USL Map 8
USL Map 9
USL Map 10
USL Map 11
USL Map 12
USL Map 12A2

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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

USL Map 12A3
USL Map 12C2
USL Map 12D2
USL Map 13
USL Map 18
USL Map 19
USL Map 24
Cushing Extension ESM 1
Cushing Extension ESM 2
Cushing Extension ESM 3
Cushing Extension ESM 4
Cushing Extension ESM 5
Cushing Extension ESM 6
Cushing Extension ESM 7
Cushing Extension ESM 8
Cushing Extension ESM 9
Cushing Extension ESM 10
Cushing Extension ESM 11
Gulf Coast Project ESM 1
Gulf Coast Project ESM 2
Gulf Coast Project ESM 3
Gulf Coast Project ESM 4
Gulf Coast Project ESM 5
Gulf Coast Project ESM 6
Gulf Coast Project ESM 7
Gulf Coast Project ESM 8
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Gulf Coast Project ESM 10
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Gulf Coast Project ESM 12
Gulf Coast Project ESM 13
Gulf Coast Project ESM 14
Gulf Coast Project ESM 15
Gulf Coast Project ESM 16
Gulf Coast Project ESM 17
Gulf Coast HCA Index
Gulf Coast HCA Map 1
Gulf Coast HCA Map 2
Gulf Coast HCA Map 3
Gulf Coast HCA Map 4
Gulf Coast HCA Map 5
Gulf Coast HCA Map 6
Gulf Coast HCA Map 7

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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

Gulf Coast HCA Map 8
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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

Complete Maps Sabine Lake Area_Page_161
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Complete Maps Sabine Lake Area_Page_168

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FIGURE 6.3

ENDANGERED/THREATENED SPECIES LISTING

Canada

Common Name	Scientific Name
Animals	
Burrowing Owl	Athene cunicularia
Olive-backed Pocket Mouse	Perognathus fasciatus
Long-billed Curlew	Numenius americanus
Short-eared Owl	Asio flammeus
Northern Leopard Frog	Rana pipiens
Sprague's Pipit	Anthus spragueii
Plants	
Bushy cinquefoil	Potentilla paradoxa
Chaffweed	Anagallis minima
Common tickseed	Coreopsis tinctoria
Dillen's wood sorrel	Oxalis dillenii
Endolepis	Atriplex suckleyi
Few-flowered aster	Aster pauciflorus
Few-flowered salt-meadow grass	Torreyochloa pallida var pauciflora
Lance-leaved loosestrife	Lysimachia hybrida
Little-seed rice grass	Oryzopsis micrantha
Low townsedia	Townsendia exscapa
Nevada rush	Juncus nevadensis
Pale blue-eyed grass	Sisyrinchium septentrionale
Rush-pink	Stephanomeria runcinata
Salt-marsh sand spurry	Spergularia salina
Short-stalk mouse-ear chickweed	Cerastium brachypodum
Shrubby evening-primrose	Calylophus serrulatus
American pellitory	Parietaria pensylvanica
American lopseed	Phryma leptostachya
Fox sedge	Fox sedge
Honewort	Cryptotaenia canadensis
Rice cutgrass	Leersia oryzoides
Yellow water crowfoot	Ranunculus flabellaris
Other	
None Listed	N/A

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Illinois

Common Name	Scientific Name
Animals	
Bald Eagle	Haliaeetus leucocephalus
Loggerhead Shrike	Lanius ludovicianus
Indiana Bat	Myotis sodalis
Black-crowned Night Heron	Nycticorax nycticorax
Eastern Massasauga	Sistrurus catenatus catenatus
Western Sand Darter	Ammocrypta clarum
Kirtland's Snake	Clonophis kirtlandi
Least Bittern	Lxobrychus exilis
Greater Prairie Chicken	Tympanuchus cupido
Barn Owl	Tyto alba
Lake Sturgeon	Acipenser fulvescens
Timber Rattlesnake	Crotalus horridus
Little Blue Heron	Egretta caerulea
Butterfly	Ellipsaria lineolata
Peregrine Falcon	Falco peregrinus
Common Moorhen	Gallinula chloropus
Bigeye Shiner	Notropis boops
Yellow-crowned Night Heron	Nyctanassa violacea
Illinois Chorus Frog	Pseudacris streckeri
Pallid Sturgeon	Scaphirhynchus albus
Royal Catchfly	Silene regia
Lined Snake	Tropidoclonion lineatum
Yellow-headed Blackbird	Xanthocephalus xanthocephalus
Henslow's SparrowAmmodramus henslowii	Ammodramus henslowii
Short-eared Owl	Asio flammeus
Upland Sandpiper	Bartramia longicauda
Northern Harrier	Circus cyaneus
King Rail	Rallus elegans
Barn Owl	Tyto alba
Plants	
Prairie Rose Gentian	Sabatia campestris
Ear-leafed Foxglove	Tomanthera auriculata
Sedge	Carex bromoides
Fibrous-rooted Sedge	Carex communis
Drooping Sedge	Carex prasina
Blazing Star	Liatris scariosa var. nieuwlandii
Prairie Rose Gentian	Sabatia campestris
Grass-leaved Lily	Stenanthium gramineum
Ear-leafed Foxglove	Tomanthera auriculata
Spring Ladies' Tresses	Spiranthes vernalis
Prairie Spiderwort	Tradescantia bracteata

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Decurrent False Aster	Boltonia decurrens
Other	
None Listed	N/A

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Kansas

Common Name	Scientific Name
Animals	
American Burying Beetle	Nicrophorus americanus
Bald Eagle	Haliaeetus leucocephalus
Eastern Spotted Skunk	Spilogale putorius
Eskimo Curlew	Numenius borealis
Least Tern	Sterna antillarum
Peregrine Falcon	Falco peregrinus
Piping Plover	Charadrius melodus
Snowy Plover	Charadrius alexandrinus
Western Silvery Minnow	Hybognathus argyritis
Chestnut Lamprey	Ichthyomyzon castaneus
Flathead Chub	Platygobio gracilis
Pallid Sturgeon	Scaphirhynchus albus
Sicklefin Chub	Macrhybopsis meeki
Silver Chub	Macrhybopsis storeriana
Silverband Shiner	Notropis shumardi
Smooth Earth Snake	Virginia valeriae
Sturgeon Chub	Macrhybopsis gelida
Topeka Shiner	Notropis topeka
Whooping Crane	Grus americana
Sharp Hornsnail	Pleurocera acuta
Arkansas Darter	Etheostoma cragini
Arkansas River Shiner	Notropis girardi
Arkansas River Speckled Chub	Macrhybopsis tetranema
Flutedshell Mussel	Lasmigona costata
Plants	
None Listed	N/A
Other	
None Listed	N/A

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Missouri

Common Name	Scientific Name
Animals	
Indiana Bat	Myotis sodalis
Bald Eagle	Haliaeetus leucocephalus
Pallid Sturgeon	Scaphirhynchus albus
Interior Least Tern	Sterna antillarum athalassos
Eastern Massasauga	Sistrurus catenatus catenatus
Spectaclecase	Cumberlandia monodonta
Plants	
Running Buffalo Clover	Trifolium stoloniferum
Decurrent False Aster	Boltonia decurrens
Other	
None Listed	N/A

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North Dakota

Common Name	Scientific Name
Animals	
Horned Grebe	Podiceps auritus
American White Pelican	Pelecanus erythrorhynchos
American Bittern	Botaurus lentiginosus
Swainson's Hawk	Buteo swainsoni
Ferruginous Hawk	Buteo regalis
Yellow Rail	Coturnicops noveboracensis
Willet	Catoptrophorus semipalmatus
Upland Sandpiper	Bartramia longicauda
Long-billed Curlew	Numenius americanus
Marbled Godwit	Limosa fedoa
Wilson's Phalarope	Phalaropus tricolor
Franklin's Gull	Larus pipixcan
Black Tern	Chlidonias niger
Black-billed Cuckoo	Coccyzus erythropthalmus
Sprague's Pipit	Anthus spragueii
Grasshopper Sparrow	Ammodramus savannarum
Baird's Sparrow	Ammodramus bairdii
Nelson's Sharp-tailed Sparrow	Ammodramus nelsonii
Lark Bunting	Calamospiza melanocorys
Chestnut-collared Longspur	Calcarius ornatus
Canadian Toad	Bufo hemiophrys
Plains Spadefoot	Spea bombifrons
Smooth Green Snake	Liochlorophis vernalis
Western Hognose Snake	Heterodon nasicus
Black-tailed Prairie Dog	Cynomys ludovicianus
Sturgeon Chub	Macrhybopsis gelida
Sicklefin Chub	Macrhybopsis meeki
Pearl Dace	Margariscus margarita
Blue Sucker	Cycleptus elongatus
Northern Pintail	Anas acuta
Canvasback	Aythya valisineria
Redhead	Aythya americana
Northern Harrier	Circus cyaneus
Golden Eagle	Aquila chrysaetos
Bald Eagle	Haliaeetus leucocephalus
Prairie Falcon	Falco mexicanus
Sharp-tailed Grouse	Tympanuchus phasianellus
Greater Prairie Chicken	Tympanuchus cupido
Greater Sage-grouse	Centrocercus urophasianus
Piping Plover	Charadrius melodus
American Avocet	Recurvirostra americana

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Least Tern	Sterna antillarum
Short-eared Owl	Asio flammeus
Burrowing Owl	Athene cunicularia
Red-headed Woodpecker	Melanerpes erythrocephalus
Loggerhead Shrike	Lanius ludovicianus
Sedge Wren	Cistothorus platensis
Dickcissel	Spiza americana
Le Conte's Sparrow	Ammodramus leconteii
Bobolink	Dolichonyx oryzivorus
Common Snapping Turtle	Chelydra serpentina
Short-horned Lizard	Phrynosoma douglassi
Northern Redbelly Snake	Storeria occipitomaculata
Pygmy Shrew	Sorex hoyi
Richardson's Ground Squirrel	Spermophilus richardsonii
Swift Fox	Vulpes velox
River Otter	Lutra canadensis
Black-footed Ferret	Mustela nigripes
Paddlefish	Polyodon spathula
Pallid Sturgeon	Scaphirhynchus albus
Silver Chub	Macrhybopsis storeriana
Northern Redbelly Dace	Phoxinus eos
Flathead Chub	Platygobio gracilis
Trout-perch	Percopsis omiscomaycus
Threeridge	Amblema plicata
Wabash Pigtoe	Fusconaia flava
Mapleleaf	Quadrula quadrula
Black Sandshell	Ligumia recta
Creek Heelsplitter	Lasmigona compressa
Pink Heelsplitter	Potamilus alatus
Whooping Crane	Grus americana
Peregrine Falcon	Falco peregrinus
Brewer's Sparrow	Spizella breweri
McCown's Longspur	Calcarius mccownii
Smooth Softshell Turtle	Apalone mutica
False Map Turtle	Graptemys pseudogeographica
Northern Prairie Skink	Eumeces septentrionalis
Northern Sagebrush Lizard	Sceloporus graciosus
Arctic Shrew	Sorex arcticus
Western Small-footed Myotis	Myotis ciliolabrum
Long-eared Myotis	Myotis evotis
Long-legged Myotis	Myotis volans
Plains Pocket Mouse	Perognathus flavescens
Hispid Pocket Mouse	Chaetodipus hispidus
Sagebrush Vole	Lemmiscus curtatus
Eastern Spotted Skunk	Spilogale putoris

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Gray Wolf	Canis lupis
Chestnut Lamprey	Ichthyomyzon castaneus
Silver Lamprey	Ichthyomyzon unicuspis
Central Stoneroller	Campostoma anomalum
Hornyhead Chub	Nocomis biguttatus
Pugnose Shiner	Notropis anogenus
Blacknose Shiner	Notropis heterolepis
Rosyface Shiner	Notropis rubellus
Finescale Dace	Phoxinus neogaeus
Yellow Bullhead	Ameiurus natalis
Flathead Catfish	Pylodictis olivaris
Logperch	Percina caprodes
River Darter	Percina shumardi
Pink Papershell	Potamilus ohiensis
Plants	
None Listed	N/A
Other	
None Listed	N/A

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Nebraska

Common Name	Scientific Name
Animals	
Eskimo Curlew	Numenius borealis
Whooping Crane	Grus americana
Interior Least Tern	Sterna antillarum athalassos
Bald Eagle	Haliaeetus leucophalus
Piping Plover	Charadrius melodus
Mountain Plover	Charadrius montanus
Black-footed Ferret	Mustela nigripes
Swift Fox	Vulpes velox
River Otter	Lutra canadensis
Southern Flying Squirrel	Glaucomys volans
Black-tailed Prairie Dog	Cynomys ludovicianus
Pallid Sturgeon	Scaphirhyncus albus
Topeka Shiner	Notropis topeka
Sturgeon chub	Macrhybopsis gelida
Blacknose shiner	Notropis heteropis
Lake sturgeon	Acipenser fulvescens
Northern Redbelly Dace	Phoxinus eos
Finescale Dace	Phoxinus neogaeus
American Burying Beetle	Nicrophorus americanus
Massasauga	Sistrurs catenatus
Scaleshell Mussel	Leptodea leptodon
Plants	
Hayden's (blowout) penstemon	Penstemon haydenii
Colorado Butterfly Plant	Gaura neomexicana coloradensis
Saltwort	Salicornia rubra
Western Prairie Fringed Orchid	Platanthera praeclara
Ute Lady's Tresses	Spiranthes diluvialis
Ginseng	Panax quinquefolium
Small White Lady's Slipper	Cypripedium candidum
Other	
None Listed	N/A

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South Dakota

Common Name	Scientific Name
Animals	
American Burying Beetle	Nicrophorus americanus
Scaleshell	Leptodea leptodon
Higgins Eye	Lampsilis higginsii
Dakota Skipper	Hesperia dacotae
Banded Killifish	Fundulus diaphanus
Blacknose Shiner	Notropis heterolepis
Finescale Dace	Phoxinus neogaeus
Longnose Sucker	Catostomus catostomus
Northern Redbelly Dace	Phoxinus eos
Pallid Sturgeon	Scaphirhynchus albus
Pearl Dace	Margariscus margarita
Sicklefin Chub	Macrhybopsis meeki
Sturgeon Chub	Macrhybopsis gelida
Topeka Shiner	Notropis topeka
Eastern Hognose Snake	Heterodon platirhinos
False Map Turtle	Graptemys pseudogeographica
Lined Snake	Tropidoclonion lineatum
American Dipper	Cinclus mexicanus
Bald Eagle	Haliaeetus leucocephalus
Eskimo Curlew	Numenius borealis
Interior Least Tern	Sterna antillarum athalassos
Osprey	Pandion haliaetus
Peregrine Falcon	Falco peregrinus
Piping Plover	Charadrius melodus
Whooping Crane	Grus americana
Black-footed Ferret	Mustela nigripes
Gray Wolf	Canis lupus
River Otter	Lontra canadensis
Swift Fox	Vulpes velox
Western Prairie Fringed Orchid	Platanthera praeclara
Plants	
None Listed	N/A
Other	
None Listed	N/A

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Oklahoma

Common Name	Scientific Name
Animals	
Mississippi Alligator	Alligator mississippiensis
Gray Bat	Myotis grisescens
Indian Bat	Myotis sodalis
Ozark Bat	Corynorhinus townsendii ingens
Ozark Cavefish	Amblyopsis rosae
Whopping Crane	Grus americana
Eskimo Curlew	Numenius borealis
Leopards Darter	Percina pantherina
Bald Eagle	Haliaeetus leucocephalus
Neosho Madtom	Noturus placidus
Pipping Plover	Charadrius melodus
Ouachita Rock Pocketbook	Arkansia wheeleri
Arkansas River Shiner	Notropis girardi
Least Tern	Sterna antillarum
Black-Capped Vireo	Vireo atricapillus
Red-Cockaded Woodpecker	Picoides borealis
Plants	
Western Prairie Fringed Orchid	Platanthera praeclara
Other	

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Texas

Common Name	Scientific Name
Animals	
Houston Toad	Anaxyrus houstonensis
Salado Salamander	Eurycea chisholmensis
Cascade Caverns Salamander	Eurycea latitans
San Marcos Salamander	Eurycea nana
Georgetown Salamander	Eurycea naufragia
Texas Blind Salamander	Eurycea rathbuni
Blanco Blind Salamander	Eurycea robusta
Barton Springs Salamander	Eurycea sosorum
Jollyville Salamander	Eurycea tonkawae
Comal Blind Salamander	Eurycea tridentifera
Austin blind salamander	Eurycea waterlooensis
Sheep Frog	Hypopachus variolosus
White-lipped Frog	Leptodactylus fragilis
Black-spotted Newt	Notophthalmus meridionalis
Mexican Burrowing Toad	Rhinophrynus dorsalis
South Texas Siren (large form)	Siren sp. 1
Mexican Treefrog	Smilisca baudinii
Bachman's Sparrow	Aimophila aestivalis
Botteri's Sparrow	Aimophila botterii arizonae
Texas Botteri's Sparrow	Aimophila botterii texana
Sprague's Pipit	Anthus spragueii
White-tailed Hawk	Buteo albicaudatus
Zone-tailed Hawk	Buteo albonotatus
Gray Hawk	Buteo nitidus
Red Knot	Calidris canutus
Northern Beardless-tyrannulet	Camptostoma imberbe
Piping Plover	Charadrius melodus
Western Yellow-billed Cuckoo	Coccyzus americanus occidentails
Golden-cheeked Warbler	Dendroica chrysoparia
Reddish Egret	Egretta rufescens
Swallow-tailed Kite	Elanoides forficatus
Southwestern Willow Flycatcher	Empidonax traillii extimus
Northern Aplomado Falcon	Falco femoralis septentrionalis
American Peregrine Falcon	Falco peregrinus anatum
Cactus Ferruginous Pygmy-owl	Glaucidium brasilianum cactorum
Whooping Crane	Grus americana
Bald Eagle	Haliaeetus leucocephalus
Wood Stork	Mycteria americana
Eskimo Curlew	Numenius borealis
Rose-throated Becard	Pachyramphus aglaiae
Tropical Parula	Parula pitiayumi

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Red-cockaded Woodpecker	Picoides borealis
White-faced Ibis	Plegadis chihi
Interior Least Tern	Sterna antillarum athalassos
Sooty Tern	Sterna fuscata
Mexican Spotted Owl	Strix occidentalis lucida
Attwater's Greater Prairie Chicken	Tympanuchus cupido attwateri
Lesser Prairie-Chicken	Tympanuchus pallidicinctus
Black-capped Vireo	Vireo atricapilla
River Goby	Awaous banana
Mexican Stoneroller	Campostoma ornatum
Mexican Goby	Ctenogobius claytonii
Blue Sucker	Cycleptus elongatus
Proserpine Shiner	Cyprinella proserpina
Leon Springs Pupfish	Cyprinodon bovinus
Comanche Springs Pupfish	Cyprinodon elegans
Conchos Pupfish	Cyprinodon eximius
Pecos Pupfish	Cyprinodon pecosensis
Devils River Minnow	Dionda diaboli
Creek Chubsucker	Erimyzon oblongus
Fountain Darter	Etheostoma fonticola
Rio Grande Darter	Etheostoma grahami
San Felipe Gambusia	Gambusia clarkhubbsi
Big Bend Gambusia	Gambusia gaigei
San Marcos Gambusia (species extinct)	Gambusia georgei
Clear Creek Gambusia	Gambusia heterochir
Pecos Gambusia	Gambusia nobilis
Blotched Gambusia (extinct in the wild)	Gambusia senilis
Rio Grande Chub	Gila pandora
Rio Grande Silvery Minnow	Hybognathus amarus
Opossum Pipefish	Microphis brachyurus
Chihuahua Shiner	Notropis chihuahua
Arkansas River Shiner	Notropis girardi
Bluntnose Shiner (species extinct)	Notropis simus
Blackside Darter	Percina maculata
Smalleye Shiner	Notropis buccula
Sharpnose Shiner	Notropis oxyrhynchus
Paddlefish	Polyodon spathula
Smalltooth Sawfish	Pristis pectinata
Bluehead Shiner	Pteronotropis hubbsi
Widemouth Blindcat	Satan eurystomus
Shovelnose Sturgeon	Scaphirhynchus platorynchus
Toothless Blindcat	Trogloglanis pattersoni
Pecos assiminea Snail	Assiminea pecos
Coffin Cave Mold Beetle	Batrisodes texanus
Helotes Mold Beetle	Batrisodes venyivi

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Robber Baron Cave Meshweaver	Cicurina baronia
Madla Cave Meshweaver	Cicurina madla
Bracken Bat Cave Meshweaver	Cicurina venii
Government Canyon Bat Cave Meshweaver	Cicurina vespera
Warton Cave Meshweaver	Cicurina wartoni
Texas Pigtoe	Fusconaia askewi
Triangle Pigtoe	Fusconaia lananensis
Diminuitie Amphipod	Gammarus hyalleloides
Comal Springs Riffle Beetle	Heterelmis comalensis
Texas Fatmucket	Lampsilis bracteata
Sandbank Pocketbook	Lampsilis satura
Government Canyon Bat Cave Spider	Neoleptoneta microps
Tooth Cave Spider	Neoleptoneta myopica
American Burying Beetle	Nicrophorus americanus
Southern Hickorynut	Obovaria jacksoniana
Louisiana Pigtoe	Pleurobema riddellii
Texas Hornshell	Popenaias popeii
Texas Heelsplitter	Potamilus amphichaenus
Salina Mucket	Potamilus metnecktayi
Phantom Cave Snail	Pyrgulopsis texana
Golden Orb	Quadrula aurea
Smooth Pimpleback	Quadrula houstonensis
False Spike	Quadrula mitchelli
Texas Pimpleback	Quadrula petrina
A Ground Beetle	Rhadine exilis
A Ground Beetle	Rhadine infernalis
Tooth Cave Ground Beetle	Rhadine persephone
Peck's Cave Amphipod	Stygobromus pecki
Comal Springs Dryopid Beetle	Stygoparnus comalensis
Tooth Cave Pseudoscorpion	Tartarocreagris texana
Kretschmarr Cave Mold Beetle	Texamaurops reddelli
Cokendolpher Cave Harvestman	Texella cokendolpheri
Reddell Harvestman	Texella reddelli
Bone Cave Harvestman	Texella reyesi
Mexican Fawnsfoot	Truncilla cognata
Texas Fawnsfoot	Truncilla macrodon
Phantom Spring Snail	Tryonia cheatumi
Gonzales Springsnail	Tryonia circumstriata
Finback Whale	Balaenoptera physalus
Gray Wolf	Canis lupus
Red Wolf	Canis rufus
Rafinesque's Big-eared Bat	Corynorhinus rafinesquii
Texas Kangaroo Rat	Dipodomys elator
Spotted Bat	Euderma maculatum

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Pygmy Killer Whale	Feresa attenuata
Short-finned Pilot Whale	Globicephala macrorhynchus
Jaguarundi	Herpailurus yaguarondi
Pygmy Sperm Whale	Kogia breviceps
Dwarf Sperm Whale	Kogia simus
Southern Yellow Bat	Lasiurus ega
Ocelot	Leopardus pardalis
Margay	Leopardus wiedii
Mexican Long-nosed	Leptonycteris nivalis
Humpback Whale	Megaptera novaeangliae
Gervais' Beaked Whale	Mesoplodon europaeus
White-nosed Coati	Nasua narica
Killer Whale	Orcinus orca
Coues' Rice Rat	Oryzomys couesi
Jaguar	Panthera onca
Palo Duro Mouse	Peromyscus truei comanche
False Killer Whale	Pseudorca crassidens
Atlantic Spotted Dolphin	Stenella frontalis
Rough-toothed Dolphin	Steno bredanensis
West Indian Manatee	Trichechus manatus
Black Bear	Ursus americanus
Louisiana Black Bear	Ursus americanus luteolus
Goose-beaked Whale	Ziphius cavirostris
Loggerhead Sea Turtle	Caretta caretta
Scarlet Snake	Cemophora coccinea
Green Sea Turtle	Chelonia mydas
Reticulated Gecko	Coleonyx reticulatus
Black-striped Snake	Coniophanes imperialis
Timber (Canebrake) Rattlesnake	Crotalus horridus
Reticulate Collared Lizard	Crotaphytus reticulatus
Leatherback Sea Turtle	Dermochelys coriacea
Texas Indigo Snake	Drymarchon melanurus erebennus
Speckled Racer	Drymobius margaritiferus
Atlantic Hawksbill Sea Turtle	Eretmochelys imbricata
Texas Tortoise	Gopherus berlandieri
Cagle's Map Turtle	Graptemys caglei
Chihuahuan Mud Turtle	Kinosternon hirtipes murrayi
Kemp's Ridley Sea Turtle	Lepidochelys kempii
Northern Cat-eyed Snake	Leptodeira septentrionalis
Smooth Green Snake	Liochlorophis vernalis
Alligator Snapping Turtle	Macrochelys temminckii
Brazos Water Snake	Nerodia harteri
Texas Horned Lizard	Phrynosoma cornutum
Mountain Short-horned Lizard	Phrynosoma hernandesi
Louisiana Pine Snake	Pituophis ruthveni

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Chihuahuan Desert Lyre Snake	Trimorphodon vilkinsonii
Plants	
Large-fruited Sand-verbena	Abronia macrocarpa
South Texas Ambrosia	Ambrosia cheiranthifolia
Star Cactus	Astrophytum asterias
Texas Ayenia	Ayenia limitaris
Texas Poppy-mallow	Callirhoe scabriuscula
Bunched Cory Cactus	Coryphantha ramillosa ssp. ramillosa
Terlingua Creek Cat's-eye	Cryptantha crassipes
Chisos Mountains Hedgehog Cactus	Echinocereus chisoensis var. chisoensis
Davis' Green Pitaya	Echinocereus davisii
Black Lace Cactus	Echinocereus reichenbachii var. albertii
Nellie's Cory Cactus	Escobaria minima
Sneed's Pincushion Cactus	Escobaria sneedii var. sneedii
Guadalupe Fescue	Festuca ligulata
Johnston's Frankenia	Frankenia johnstonii
Earth Fruit	Geocarpon minimum
Pecos Sunflower	Helianthus paradoxus
Neches River Rose-mallow	Hibiscus dasycalyx
Slender Rushpea	Hoffmannseggia tenella
Texas Prairie Dawn	Hymenoxys texana
Texas Golden Gladecress	Leavenworthia texana
Walker's Manioc	Manihot walkerae
Texas Trailing Phlox	Phlox nivalis ssp. texensis
White Bladderpod	Physaria pallida
Zapata Bladderpod	Physaria thamnophila
Little Aguja Pondweed	Potamogeton clystocarpus
Hinckley's Oak	Quercus hinckleyi
Chaffseed	Schwalbea americana
Tobusch Fishhook Cactus	Sclerocactus brevihamatus ssp. tobuschii
Lloyd's Mariposa Cactus	Sclerocactus mariposensis
Navasota Ladies'-tresses	Spiranthes parksii
Bracted Twistflower	Streptanthus bracteatus
Texas Snowbells	Styrax platanifolius spp. texanus
Ashy Dogweed	Thymophylla tephroleuca
Texas Wild-rice	Zizania texana
Other	

Note: Country and Province information is maintained separately from the plan for emergency responder use.

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FIGURE 6.4

AQUIFERS		
NAME	COUNTY/STATE	PROVINCE
Johsbourgh Valley & Empress	-----	SK
Buried Sand Gravel		
Swift Current Valley	-----	SK
Gravebourgh Valley	-----	SK
Neidpath Valley	-----	SK
Condie Moraine	-----	SK
Great Sand Hills	-----	SK
Upper Foral Formation Sands and Gravels	-----	SK
Empress Buried Valley Group	-----	SK
Aquifers and Interglacial Aquifers		SK
Judith River Formation		SK
Winkler	-----	MB
Pembina River	Cavalier & Pembina, ND	-----
Icelandic	Cavalier, Pembina, ND	-----
Pembina Delta	Cavalier, Pembina, ND	-----
Edinburg	Pembina & Walsh, ND	-----
Eliot	Ransom, ND	-----
Englevale	Sargent, ND	-----
Spiritwood A.D. System	Sargent, ND	-----
Brampton	Sargent, ND	-----
High Plains	Nebraska	-----
Lower Cretacous	Marshall, Kansas	-----
Ozark Plateaus	Missouri	-----
Mississippian	Madison, Illinois	-----

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FIGURE 6.4 (Cont'd)

AQUIFERS		
NAME	**COUNTY/STATE**	**PROVINCE**
Oklahoma Major Aquifers		
Vamoods Ada	Payne, Creek, Lincoln, Okfuskee, Hughes, Seminole/OK	-----
Garber Wellington	Payne, Lincoln/OK	-----
Antlers	Bryan, Johnston, Atoka/OK	-----
Arbuckle Simpson	Johnston, Pontotoc, Coal/OK	--
Gerty Sand	Pontotoc/OK	-----
Canadian River	Seminole, Pontotoc, Hughes/OK	-----
North Canadian River	Okfuskee, Seminole/OK	-----
Salt Fork of the Arkansas River	Kay, Noble Co.s OK	-----
Arkansas River	Kay, Noble, Osage, and Pawnee Co.s OK	-----
Vamoosa-Ada	Payne, Lincoln Co.s OK	-----
Oklahoma Minor Aquifers		
East Central Oklahoma	Okfuskee, Hughes/OK	-----
Pennsylvanian	Coal/OK	-----
Kiamichi	Atoka/OK	-----
Woodbine, Red River	Bryan/OK	-----
Texas Major Aquifers		
Trinity (subcrop)	Fannin, Lamar, Delta/TX	-----
Carrizo Wilcox	Hopkins, Franklin/TX	-----
Carrizo Wilcox, Carrizo Wilcox (sub crop)	Wood/TX	-----
Carrizo Wilcox (sub crop)	Upshur/TX	-----
Carrizo Wilcox, Carrizo Wilcox (sub crop)	Rusk, Smith, Cherokee, Nacogdoches/TX	-----
Carrizo Wilcox (sub crop)	Angelina/TX	-----
Gulf Coast	Polk, Hardin, Liberty, Orange, Jefferson/TX	-----
Texas Minor Aquifers		
Woodbine, Woodbine (subcrop)	Fannin/TX	-----
Woodbine, Woodbine (subcrop), Blossom, Blossom (subcrop)	Lamar/TX	-----
Nacatoch	Delta, Franklin/TX	-----
Nacatoch, Nacatoch (subcrop)	Hopkins/TX	-----
Queen City	Wood, Upshur,Smith, Rusk /TX	-----
Queen City, Sparta	Cherokee/TX	-----

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FIGURE 6.4 (Cont'd)

AQUIFERS		
NAME	COUNTY/STATE	PROVINCE
Texas Minor Aquifers, Cont'd		
Queen City, Queen City(subcrop),Sparta, Sparta (subcrop), Yegua-Jackson	Nacogdoches/TX	-----
Queen City (subcrop), Sparta (subcrop), Yegua-Jackson	Angelina/TX	-----
Yegua-Jackson	Polk/TX	-----
Kansas Aquifers		
Glacial Drift Aquifer	Washington Co., KS	-----
Dakota Aquifer	Washington, Clay, Dickenson, & Marion Co.s, KS	-----
Alluvial Aquifer	Washington, Clay, Riley, Dickenson, Marion, Butler, Cowley, & Sumner Co.s, KS	-----

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HYDRAULICALLY SENSITIVE AREAS AND OPERATOR DESIGNATED HCAs	
NAME	LOCATION
Winkler Aquifer	Winkler, Manitoba
Middle James Aquifer	Marshall County, SD
Kickapoo Indian Reservation	Brown County, KS
Seward Wellhead Protection Area	Seward, NE

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FIGURE 6.5

US ENVIRONMENTAL SENSITIVE AREAS			
ID	SOURCE	ORGANIZATION	MAP SHEET
365	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
368	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
412	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
640	SDNHPPT	South Dakota Natural Heritage Database	
826	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
828	NENHPPT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
842	NENHPPT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
458	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
125	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
131	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
132	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
140	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
141	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
142	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
143	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
144	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
145	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
146	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
153	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
187	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
210	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
211	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
232	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
233	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
234	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
254	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
257	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
272	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
273	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
274	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
275	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
276	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
277	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
292	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
326	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
344	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
345	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
722	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
723	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
724	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
725	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
726	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
751	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
775	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
776	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
777	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
778	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
779	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
805	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16

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US ENVIRONMENTAL SENSITIVE AREAS (Cont'd)			
ID	SOURCE	ORGANIZATION	MAP SHEET
433	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
445	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map sheet 13
800	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
865	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
792	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
825	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
283	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
284	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
614	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
615	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
1027	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 24
1028	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 24
223	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
224	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
285	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
286	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
287	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
312	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
361	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
539	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
540	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
551	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
616	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
617	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
618	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
644	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
768	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 18
780	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
587	NDNHPPT	North Dakota Natural Heritage Program	U.S. Map sheet 7
109	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
110	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
115	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
119	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
120	MONHPPT	Missouri Natural Heritage Program	U. S. Map sheet 36
129	MONHPPT	Missouri Natural Heritage Program	U. S. Map sheet 36
130	MONHPPT	Missouri Natural Heritage Program	U. S. Map sheet 36
1227	ILNHPPT	Illinois Natural Heritage Database Program	U. S. Map sheet 36
1273	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
1282	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
1283	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
239	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1057	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1058	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1059	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1066	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1067	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
186	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 31
187	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 32
194	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 28
195	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 28

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US ENVIRONMENTAL SENSITIVE AREAS (Cont'd)			
ID	SOURCE	ORGANIZATION	MAP SHEET
203	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 32
204	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 32
214	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 32
227	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
245	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
246	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
249	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
253	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
254	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
258	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1230	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
1232	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
1261	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
1286	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
20	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
556	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 32
560	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 28
1060	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1062	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1063	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1065	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1069	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
48	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
145	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
181	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
417	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
142	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 24
203	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 24
226	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
424	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
425	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
427	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
428	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
45	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 36
521	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
522	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
527	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
537	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
554	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
555	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
556	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
562	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
563	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
103	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
132	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
416	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
536	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
539	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
540	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
541	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36

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US ENVIRONMENTAL SENSITIVE AREAS (Cont'd)			
ID	SOURCE	ORGANIZATION	MAP SHEET
180	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 38
378	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 38
381	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 38
436	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 38
508	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
557	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
559	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
560	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
561	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
564	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
438	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
954	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
1466	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 11
1608	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
2298	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
557	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
840	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 14
976	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2384	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2559	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2925	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 14
71	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
145	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
152	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
199	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
200	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
857	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
858	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
1246	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
1292	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 10
1401	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 9
1477	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 12
1647	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 9
1731	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 12
1757	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2046	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2057	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 10
2109	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 14
2169	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2237	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 15
2394	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 12
2407	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2579	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 9
2583	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 14
2663	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2846	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 14
2958	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
3017	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 9
3018	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 9

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US ENVIRONMENTAL SENSITIVE AREAS (Cont'd)			
ID	SOURCE	ORGANIZATION	MAP SHEET
3180	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
3183	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
3209	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
3211	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
3217	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
3218	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
532	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
137	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
141	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
144	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
155	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
173	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
194	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
321	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
322	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
410	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 5
202	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 5
210	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
361	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
387	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
390	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
396	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 4
478	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
570	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
713	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
715	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
725	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
728	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 4
729	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
737	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
738	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
770	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
796	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
797	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
816	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
826	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
316	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
323	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
325	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 10
333	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
349	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
357	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
660	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 10
688	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 9
695	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 9
716	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 10
738	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 9
806	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
808	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 9
810	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11

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US ENVIRONMENTAL SENSITIVE AREAS (Cont'd)			
ID	SOURCE	ORGANIZATION	MAP SHEET
811	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
813	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
821	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
824	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 9
64	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
76	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
87	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
90	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
112	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 3
113	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
125	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 8
134	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 3
144	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
166	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
168	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
170	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
181	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 3
184	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
189	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 8
197	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
200	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 3
201	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 8
202	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 7
203	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 2
206	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
211	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
212	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
216	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
217	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 6
219	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 7
239	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
244	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
246	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 3
248	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 7
252	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
260	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
261	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
325	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 7
349	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 8

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US HIGH POPULATED AREAS				
HPA ID	NAME	COUNTY NAME	STATE NAME	MAP SHEET
737	St. Joseph, MO-KS	Buchanan	Missouri	U. S. Map Sheet 27
887	Alton, IL	Madison	Illinois	U. S. Map Sheet 36
888	St. Louis, MO-IL	Madison	Illinois	U. S. Map Sheet 36

US POPULATED AREAS				
ID	NAME	COUNTY NAME	STATE NAME	MAP SHEET
4048	Yankton	Yankton	South Dakota	U. S. Map Sheet 16
4150	Roswell	Miner	South Dakota	U. S. Map Sheet 13
4204	Iroquois	Kingsbury	South Dakota	U. S. Map Sheet 12
4220	Menno	Hutchinson	South Dakota	U. S. Map Sheet 15
4323	Raymond	Clark	South Dakota	U. S. Map Sheet 11
9956	Hoskins	Wayne	Nebraska	U. S. Map Sheet 18
9957	Sholes	Wayne	Nebraska	U. S. Map Sheet 17
10011	Seward	Seward	Nebraska	U. S. Map Sheet 21
10369	Leigh	Colfax	Nebraska	U. S. Map Sheet 19
10405	Randolph	Cedar	Nebraska	U. S. Map Sheet 17
10429	Garrison	Butler	Nebraska	U. S. Map Sheet 20
10526	Lankin	Walsh	North Dakota	U. S. Map Sheet 3
10639	Walhalla	Pembina	North Dakota	U. S. Map Sheet 1
12318	Renick	Randolph	Missouri	U. S. Map Sheet 32
12480	Middletown	Montgomery	Missouri	U. S. Map Sheet 34
12556	Cave	Lincoln	Missouri	U. S. Map Sheet 34
12560	Moscow Mills	Lincoln	Missouri	U. S. Map Sheet 35
12561	Old Monroe	Lincoln	Missouri	U. S. Map Sheet 35
12563	Troy	Lincoln	Missouri	U. S. Map Sheet 34
12832	Gower	Clinton	Missouri	U. S. Map Sheet 28
12836	Plattsburg	Clinton	Missouri	U. S. Map Sheet 28
12877	Brunswick	Chariton	Missouri	U. S. Map Sheet 30
12880	Keytesville	Chariton	Missouri	U. S. Map Sheet 31
12952	Cowgill	Caldwell	Missouri	U. S. Map Sheet 29
12955	Kingston	Caldwell	Missouri	U. S. Map Sheet 29
12961	Agency	Buchanan	Missouri	U. S. Map Sheet 27
12965	Gower	Buchanan	Missouri	U. S. Map Sheet 28
16649	Severance	Doniphan	Kansas	U. S. Map Sheet 26
16754	Robinson	Brown	Kansas	U. S. Map Sheet 26
17901	Vernon	Marion	Illinois	U. S. Map Sheet 38
18793	Keyesport	Bond	Illinois	U. S. Map Sheet 38
18797	Pierron	Bond	Illinois	U. S. Map Sheet 37
18798	Pocahontas	Bond	Illinois	U. S. Map Sheet 37
	Cushing	Payne	Oklahoma	U.S. Map Sheet 1
	Perkins		Oklahoma	U.S. Map Sheet 1
	Quay		Oklahoma	U.S. Map Sheet 1
	Ripley		Oklahoma	U.S. Map Sheet 1
	Stillwater		Oklahoma	U.S. Map Sheet 1
	Yale		Oklahoma	U.S. Map Sheet 1
	Depew	Creek	Oklahoma	U.S. Map Sheet 1
	Drumright		Oklahoma	U.S. Map Sheet 1
	Oilton		Oklahoma	U.S. Map Sheet 1
	Shamrock		Oklahoma	U.S. Map Sheet 1

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US POPULATED AREAS (Cont'd)				
ID	NAME	COUNTY NAME	STATE NAME	MAP SHEET
	Agra	Lincoln	Nebraska	U.S. Map Sheet 1
	Chandler		Nebraska	U.S. Map Sheet 1
	Davenport		Nebraska	U.S. Map Sheet 1
	Kendrick		Nebraska	U.S. Map Sheet 1
	Prauge		Nebraska	U.S. Map Sheet 1
	Sparks		Nebraska	U.S. Map Sheet 1
	Stroud		Nebraska	U.S. Map Sheet 1
	Tryon		Nebraska	U.S. Map Sheet 1
	Bearden	Okfuskee	Oklahoma	U.S. Map Sheet 2
	Boley		Oklahoma	U.S. Map Sheet 2
	Castle		Oklahoma	U.S. Map Sheet 2
	Okemah		Oklahoma	U.S. Map Sheet 2
	Paden		Oklahoma	U.S. Map Sheet 2
	Atwood	Hughes	Oklahoma	U.S. Map Sheet 3
	Calvin		Oklahoma	U.S. Map Sheet 3
	Gerty		Oklahoma	U.S. Map Sheet 4
	Holdenville		Oklahoma	U.S. Map Sheet 3
	Horntown		Oklahoma	U.S. Map Sheet 3
	Spaulding		Oklahoma	U.S. Map Sheet 3
	Wetumka		Oklahoma	U.S. Map Sheet 3
	Yeager		Oklahoma	U.S. Map Sheet 3
	Bowlegs	Seminole	Oklahoma	U.S. Map Sheet 3
	Cromwell		Oklahoma	U.S. Map Sheet 3
	Lima		Oklahoma	U.S. Map Sheet 3
	Sasakwa		Oklahoma	U.S. Map Sheet 3
	Seminole		Oklahoma	U.S. Map Sheet 3
	Wewoka		Oklahoma	U.S. Map Sheet 3
	Allen	Pontotoc	Oklahoma	U.S. Map Sheet 4
	Fancis		Oklahoma	U.S. Map Sheet 4
	Stonewall		Oklahoma	U.S. Map Sheet 4
	Centrahoma	Coal	Oklahoma	U.S. Map Sheet 4
	Coalgate		Oklahoma	U.S. Map Sheet 4
	Lehigh		Oklahoma	U.S. Map Sheet 5
	Phillips		Oklahoma	U.S. Map Sheet 4
	Tupelo		Oklahoma	U.S. Map Sheet 4
	Bromide	Johnston	Oklahoma	U.S. Map Sheet 5
	Kenefic		Oklahoma	U.S. Map Sheet 5
	Wapanucka		Oklahoma	U.S. Map Sheet 5
	Atoka	Atoka	Oklahoma	U.S. Map Sheet 5
	Caney		Oklahoma	U.S. Map Sheet 5
	Stringtown		Oklahoma	U.S. Map Sheet 5
	Tushka		Oklahoma	U.S. Map Sheet 5
	Bennington	Bryan	Oklahoma	U.S. Map Sheet 6
	Bokchito		Oklahoma	U.S. Map Sheet 6
	Caddo		Oklahoma	U.S. Map Sheet 5
	Paris	Lamar	Texas	U.S. Map Sheet 7
	Reno		Texas	U.S. Map Sheet 7
	Roxton		Texas	U.S. Map Sheet 7
	Toco		Texas	U.S. Map Sheet 7

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US POPULATED AREAS (Cont'd)				
ID	NAME	COUNTY NAME	STATE NAME	MAP SHEET
	Honey Grove	Fannin	Texas	U.S. Map Sheet 7
	Cooper	Delta	Texas	U.S. Map Sheet 7
	Pecan Gap		Texas	U.S. Map Sheet 7
	Mount Vernon	Franklin	Texas	U.S. Map Sheet 8
	Winnsboro		Texas	U.S. Map Sheet 9
	Como	Hopkins	Texas	U.S. Map Sheet 8
	Sulphur Springs		Texas	U.S. Map Sheet 8
	Tira		Texas	U.S. Map Sheet 8
	Hawkins	Wood	Texas	U.S. Map Sheet 10
	Quitman		Texas	U.S. Map Sheet 9
	Big Sandy	Upshur	Texas	U.S. Map Sheet 10
	Gilmer		Texas	U.S. Map Sheet 10
	Arp	Smith	Texas	U.S. Map Sheet 10
	New Chapel Hill		Texas	U.S. Map Sheet 10
	Troup		Texas	U.S. Map Sheet 11
	Tyler		Texas	U.S. Map Sheet 10
	Whitehouse		Texas	U.S. Map Sheet 10
	Winona		Texas	U.S. Map Sheet 10
	Henderson	Rusk	Texas	U.S. Map Sheet 11
	New London		Texas	U.S. Map Sheet 11
	Overton		Texas	U.S. Map Sheet 11
	Alto	Cherokee	Texas	U.S. Map Sheet 12
	Gallatin		Texas	U.S. Map Sheet 11
	New Summerfield		Texas	U.S. Map Sheet 11
	Reklaw		Texas	U.S. Map Sheet 11
	Rusk		Texas	U.S. Map Sheet 11
	Wells		Texas	U.S. Map Sheet 12
	Cushing	Nacogdoches	Texas	U.S. Map Sheet 12
	Nacogdoches		Texas	U.S. Map Sheet 12
	Burke	Angelina	Texas	U.S. Map Sheet 13
	Diboll		Texas	U.S. Map Sheet 13
	Hudson		Texas	U.S. Map Sheet 13
	Lufkin		Texas	U.S. Map Sheet 13
	Corrigan	Polk	Texas	U.S. Map Sheet 14
	Goodrich		Texas	U.S. Map Sheet 14
	Livingston		Texas	U.S. Map Sheet 14
	Seven Oaks		Texas	U.S. Map Sheet 14
	West Livingston		Texas	U.S. Map Sheet 14

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US POPULATED AREAS (Cont'd)				
ID	NAME	COUNTY NAME	STATE NAME	MAP SHEET
	Ames	Liberty	Texas	U.S. Map Sheet 16
	Daisetta		Texas	U.S. Map Sheet 16
	Dayton Lakes		Texas	U.S. Map Sheet 16
	Devers		Texas	U.S. Map Sheet 16
	Hardin		Texas	U.S. Map Sheet 16
	Kenefick		Texas	U.S. Map Sheet 16
	Liberty		Texas	U.S. Map Sheet 16
	Lumberton	Hardin	Texas	U.S. Map Sheet 16
	Pinewood Estates		Texas	U.S. Map Sheet 16
	Sour Lake		Texas	U.S. Map Sheet 16
	Bridge City	Orange	Texas	U.S. Map Sheet 17
	Mauriceville		Texas	U.S. Map Sheet 17
	Orange		Texas	U.S. Map Sheet 17
	Rose City		Texas	U.S. Map Sheet 17
	Vidor		Texas	U.S. Map Sheet 17
	West Orange		Texas	U.S. Map Sheet 17
	Beaumont	Jefferson	Texas	U.S. Map Sheet 17
	Bevil Oaks		Texas	U.S. Map Sheet 17
	Central Gardens		Texas	U.S. Map Sheet 17
	China		Texas	U.S. Map Sheet 16
	Groves		Texas	U.S. Map Sheet 17
	Nome		Texas	U.S. Map Sheet 16
	Pine Forest		Texas	U.S. Map Sheet 17
	Port Arthur		Texas	U.S. Map Sheet 17
	Port Neches		Texas	U.S. Map Sheet 17
	Nederland		Texas	U.S. Map Sheet 17

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US DAMS				
DAM NAME	COUNTY	RIVER	STATE	MAP SHEET
Unnamed	Doniphan	TR-Missouri River	KS	U.S. Map Sheet 27
Ksnoname 4213	Doniphan	TR-Brush Creek	KS	U.S. Map Sheet 27
Upper Turtle R. Fld. Ret #2	Grand Forks	Skunk Coulee	ND	U.S. Map Sheet 3
Tydol	Creek	TR-Tiger CR	OK	Cushing Map Sheet 11
SCS-Stillwater Creek Site-01	Payne	Deer Creek	OK	Cushing Map Sheet 11
SCS-Stillwater Creek Site-40	Noble	North Stillwater Creek	OK	Cushing Map Sheet 10
SCS-Stillwater Creek Site-41	Noble	TR-North Stillwater Creek	OK	Cushing Map Sheet 10
SCS-Lower Black Bear Creek Site-19M	Pawnee	Black Bear Creek	OK	Cushing Map Sheet 10
SCS-Lower Black Bear Creek Site-23	Pawnee	TR-Camp Creek	OK	Cushing Map Sheet 10
SCS-Lower Black Bear Creek Site-16	Pawnee	TR-Pepper Creek	OK	Cushing Map Sheet 10
SCS-Lower Black Bear Creek Site-04	Pawnee	Skedee CR	OK	Cushing Map Sheet 10
Sooner	Pawnee	Greasy CR	OK	Cushing Map Sheet 10
Kaw Lake	Kay	Arkansas River	OK	Cushing Map Sheet 9
Ponca	Kay	Turkey Creek	OK	Cushing Map Sheet 9
Winfield, City Of, Timber Creek MPD No 29	Cowley	Timber Creek	KS	Cushing Map Sheet 7
Muddy Creek WJD No 27, FRD No 4-6	Butler	Muddy Creek	KS	Cushing Map Sheet 7
Augusta, City Of, Santa Fe Lake Dam	Butler	Dry Creek	KS	Cushing Map Sheet 7
El Dorado Lake	Butler	Walnut River	KS	Cushing Map Sheet 6
Marion County	Marion	TR-Cottonwood River	KS	Cushing Map Sheet 5
Marion Lake	Marion	Cottonwood River	KS	Cushing Map Sheet 5
Herington, City Of, Multiple Purpose Dam #6	Dickinson	Lyon Creek	KS	Cushing Map Sheet 4
Lyons Creek MPD #6	Dickinson	Lyon Creek	KS	Cushing Map Sheet 4
Kansas F F and Game Commission (Kansas Dept. Of Wildlife & Parks)	Geary	TR-Lyon Creek	KS	Cushing Map Sheet 4
Milford Dam	Geary	Republican River	KS	Cushing Map Sheet 3
Franklin County Dam	Franklin	Big Cypress Creek	TX	U.S. Map Sheet 9
Lake Loma Dam	Upshur	Big Sandy Creek	TX	U.S. Map Sheet 10
Lake Striker Dam	Rusk	Striker Creek	TX	U.S. Map Sheet 11
Bayou Loco Dam	Nacogdoches	Loco Bayou	TX	U.S. Map Sheet 12

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US LAKES		
NAME	STATE	MAP SHEET
Lake Ashtabula	ND	U.S. Map Sheet 5
Lone Tree Lake	ND	U.S. Map Sheet 7
Carlyle Lake	IL	U.S. Map Sheet 38
Stroud Lake	OK	U.S. Map Sheet 1
Antwine Lake	OK	Cushing Map Sheet 9
Horseshoe Lake	OK	Cushing Map Sheet 9
Indian Hills Lake	OK	Cushing Map Sheet 9
Cushing Lake	OK	Cushing Map Sheet 11
Hazen Lake	OK	Cushing Map Sheet 10
Lake McMurtry	OK	Cushing Map Sheet 10
Sanborn Lake	OK	Cushing Map Sheet 10
Yost Reservoir	OK	Cushing Map Sheet 10
Boomer Lake	OK	Cushing Map Sheet 10
Feaster Lake	OK	Cushing Map Sheet 10
Pawnee Lake	OK	Cushing Map Sheet 10
Tydol Lake	OK	Cushing Map Sheet 11
Stroud Lake	OK	Cushing Map Sheet 11
Callan Lake	OK	Cushing Map Sheet 1
Washington County State Lake	OK	Cushing Map Sheet 1
Ash Lake	OK	Cushing Map Sheet 1
Lake Herington	OK	Cushing Map Sheet 4
Marion Reservoir	OK	Cushing Map Sheet 5
Marion County Lake	OK	Cushing Map Sheet 5
Stillwater Lake	OK	Cushing Map Sheet 2
Clay County Lake	OK	Cushing Map Sheet 3
Terrapin Lake	OK	Cushing Map Sheet 4
Geary County State Lake	OK	Cushing Map Sheet 4
Wentz Lake	OK	Cushing Map Sheet 9
Timber Creek Lake	OK	Cushing Map Sheet 7
Newkirk Country Club Lake	OK	Cushing Map Sheet 9
Newkirk Lake	OK	Cushing Map Sheet 8
Lake Wynds	OK	Cushing Map Sheet 8
Harvey County East Park Lake	OK	Cushing Map Sheet 6
Santa Fe Lake	OK	Cushing Map Sheet 7
Beech Lake	OK	Cushing Map Sheet 7
Augusta Lake	OK	Cushing Map Sheet 7
El Dorado Lake	OK	Cushing Map Sheet 6
Big Cypress Creek	TX	U.S. Map Sheet 9
Big Sandy Lake	TX	U.S. Map Sheet 10
Lake Striker	TX	U.S. Map Sheet 11
Fiberboard Lake	TX	U.S. Map Sheet 13
Yellow Bluff Lake	TX	U.S. Map Sheet 13
Ryan Lake	TX	U.S. Map Sheet 13
Black Cat Lake	TX	U.S. Map Sheet 13
Sabine Lake	TX	U.S. Map Sheet 17

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US RIVERS AND STREAMS			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream	Pembina River	ND	U. S. Map Sheet 1
Stream	Tongue River	ND	U. S. Map Sheet 2
Stream	Cart Creek	ND	U. S. Map Sheet 2
Stream	North Branch Park River	ND	U. S. Map Sheet 2
Stream	Middle Branch Park River	ND	U. S. Map Sheet 2
Stream	South Branch Park River	ND	U. S. Map Sheet 2
Stream	North Branch Forest River	ND	U. S. Map Sheet 3
Stream		ND	U. S. Map Sheet 3
Stream	Middle Branch Forest River	ND	U. S. Map Sheet 3
Stream	South Branch Forest River	ND	U. S. Map Sheet 3
Stream Intermittent	Skunk Coulee	ND	U. S. Map Sheet 3
Stream Intermittent	North Branch Turtle River	ND	U. S. Map Sheet 3
Stream Intermittent	Goose Creek	ND	U. S. Map Sheet 4
Stream	Goose River	ND	U. S. Map Sheet 4
Stream	Sheyenne River	ND	U. S. Map Sheet 7
Stream Intermittent	Crow Creek	ND	U. S. Map Sheet 9
Stream Intermittent		SD	U. S. Map Sheet 9
Stream Intermittent	Antelope Creek	SD	U. S. Map Sheet 9
Stream Intermittent		SD	U. S. Map Sheet 10
Stream	Mud Creek	SD	U. S. Map Sheet 10
Stream Intermittent	Foster Creek	SD	U. S. Map Sheet 11
Stream Intermittent		SD	U. S. Map Sheet 11
Stream Intermittent	Pearl Creek	SD	U. S. Map Sheet 12
Stream Intermittent	South Pearl Creek	SD	U. S. Map Sheet 12
Stream Intermittent		SD	U. S. Map Sheet 12
Stream Intermittent	West Redstone Creek	SD	U. S. Map Sheet 12
Stream Intermittent	Redstone Creek	SD	U. S. Map Sheet 13
Stream Intermittent	Jim Creek	SD	U. S. Map Sheet 13
Stream Intermittent	Rock Creek	SD	U. S. Map Sheet 13
Stream Intermittent	Wolf Creek	SD	U. S. Map Sheet 14
Stream	James River	SD	U. S. Map Sheet 15
Stream Intermittent	Beaver Creek	SD	U. S. Map Sheet 16
Stream	James River	SD	U. S. Map Sheet 16
Stream	West Bow Creek	NE	U. S. Map Sheet 16
Stream	Bow Creek	NE	U. S. Map Sheet 17
Stream	Middle Logan Creek	NE	U. S. Map Sheet 17
Stream	Dog Creek	NE	U. S. Map Sheet 17
Stream	Elk Horn River	NE	U. S. Map Sheet 18
Stream	Elk Horn River	NE	U. S. Map Sheet 18
Stream	Union Creek	NE	U. S. Map Sheet 18
Stream	West Fork Maple Creek	NE	U. S. Map Sheet 19
Stream	Shell Creek	NE	U. S. Map Sheet 19
Stream	Lost Creek	NE	U. S. Map Sheet 19
Stream	North Branch Big Blue River	NE	U. S. Map Sheet 20
Stream	Big Blue River	NE	U. S. Map Sheet 20
Stream	Lincoln Creek	NE	U. S. Map Sheet 21
Stream	West Fork Big Blue River	NE	U. S. Map Sheet 21
Stream	Turkey Creek	NE	U. S. Map Sheet 21
Stream	Swan Creek	NE	U. S. Map Sheet 22

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US RIVERS AND STREAMS (cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream Intermittent	Cub Creek	NE	U. S. Map Sheet 22
Stream Intermittent	Big Indian Creek	NE	U. S. Map Sheet 23
Stream	Big Indian Creek	NE	U. S. Map Sheet 23
Stream	Little Blue River	NE	U. S. Map Sheet 23
Stream	Little Blue River	KS	U. S. Map Sheet 23
Stream	Big Blue River	KS	U. S. Map Sheet 24
Stream	Horseshoe Creek	KS	U. S. Map Sheet 24
Stream	Walnut Creek	KS	U. S. Map Sheet 26
Stream	Wolf River	KS	U. S. Map Sheet 26
Stream	Robidoux Creek	KS	U. S. Map Sheet 24
Stream	Delaware River	KS	U. S. Map Sheet 25
Stream Intermittent	Craig Creek	KS	U. S. Map Sheet 25
Stream	South Fork Big Nemaha River	KS	U. S. Map Sheet 25
Stream	Shoal Creek	MO	U. S. Map Sheet 29
Stream	Independence Creek	KS	U. S. Map Sheet 26
Stream	Shoal Creek	MO	U. S. Map Sheet 28
Stream	Castile Creek	MO	U. S. Map Sheet 28
Stream	Platte River	MO	U. S. Map Sheet 27
Stream	Mud Creek	MO	U. S. Map Sheet 29
Stream	Grand River	MO	U. S. Map Sheet 30
Stream	Big Creek	MO	U. S. Map Sheet 30
Stream	Grand River	MO	U. S. Map Sheet 30
Stream	Chariton River	MO	U. S. Map Sheet 31
Stream	Mussel Fork	MO	U. S. Map Sheet 31
Stream	Little Platte River	MO	U. S. Map Sheet 28
Stream	Chariton River	MO	U. S. Map Sheet 31
Stream	Turkey Creek	MO	U. S. Map Sheet 29
Stream	Coon Creek	MO	U. S. Map Sheet 32
Stream	Reese Fork	MO	U. S. Map Sheet 32
Stream	Middle Fork Little Chariton River	MO	U. S. Map Sheet 31
Stream	East Fork Little Chariton River	MO	U. S. Map Sheet 31
Stream	Old Channel Chariton River	MO	U. S. Map Sheet 31
Stream	Saling Creek	MO	U. S. Map Sheet 32
Stream	Youngs Creek	MO	U. S. Map Sheet 32
Stream	Long Branch	MO	U. S. Map Sheet 32
Stream	South Fork Salt River	MO	U. S. Map Sheet 33
Stream	Littleby Creek	MO	U. S. Map Sheet 33
Stream	West Fork Cuivre River	MO	U. S. Map Sheet 33
Stream	West Fork Cuivre River	MO	U. S. Map Sheet 34
Stream	West Fork Cuivre River	MO	U. S. Map Sheet 34
Stream	Cuivre Slough	MO	U. S. Map Sheet 35
Stream	Elkhorn Creek	MO	U. S. Map Sheet 34
Stream	Brick House Slough	MO	U. S. Map Sheet 36
Stream	Cuivre River	MO	U. S. Map Sheet 35
Stream	Cuivre River	MO	U. S. Map Sheet 35
Stream	Dardenne Creek	MO	U. S. Map Sheet 35
Dam	Lock and Dam Number 26	MO	U. S. Map Sheet 36
Stream		MO	U. S. Map Sheet 35
Stream	Cora Island Chute	MO	U. S. Map Sheet 36

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US RIVERS AND STREAMS (cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream	Big Creek	MO	U. S. Map Sheet 35
Stream	Cahokia Creek	IL	U. S. Map Sheet 36
Stream	Indian Creek	IL	U. S. Map Sheet 36
Stream	Cahokia Creek	IL	U. S. Map Sheet 36
Stream	Peruque Creek	MO	U. S. Map Sheet 35
Dam	Dam Number 27	MO	U. S. Map Sheet 36
Stream	North Fork Kaskaskia Creek	IL	U. S. Map Sheet 38
Stream	Dardenne Creek	MO	U. S. Map Sheet 35
Stream	East Fork Silver Creek	IL	U. S. Map Sheet37
Stream	Silver Creek	IL	U. S. Map Sheet 37
Stream	Beaver Creek	IL	U. S. Map Sheet 37
Stream	Shoal Creek	IL	U. S. Map Sheet 37
Stream	Sugar Creek	IL	U. S. Map Sheet 37
Stream	Euchee Creek	OK	U. S. Map Sheet 1
Stream	Rattlesnake Creek	OK	U. S. Map Sheet 1
Stream	Turkey Creek	OK	U. S. Map Sheet 1
Stream	Lilly Creek	OK	U. S. Map Sheet 1
Stream	Salt Creek	OK	U. S. Map Sheet 1
Stream	Little Hilliby Creek	OK	U. S. Map Sheet 2
Stream	North Canadian River	OK	U. S. Map Sheet 2
Stream	Sand Creek	OK	U. S. Map Sheet 3
Stream	Little Wewoka Creek	OK	U. S. Map Sheet 3
Stream	Big Wewoka Creek	OK	U. S. Map Sheet 3
Stream	Wewoka Creek	OK	U. S. Map Sheet 3
Stream	Jacobs Creek	OK	U. S. Map Sheet 3
Stream	Bird Creek	OK	U. S. Map Sheet 3
Stream	Canadian River	OK	U. S. Map Sheet 3
Stream	Arbeca Creek	OK	U. S. Map Sheet 3
Stream	Little Sandy Creek	OK	U. S. Map Sheet 4
Stream	Big Sandy Creek	OK	U. S. Map Sheet 4
Stream	Sandy Creek	OK	U. S. Map Sheet 4
Stream	Peach Creek	OK	U. S. Map Sheet 4
Stream	Owl Creek	OK	U. S. Map Sheet 4
Stream	Little Caney Boggy Creek	OK	U. S. Map Sheet 4
Stream	Coon Creek	OK	U. S. Map Sheet 4
Stream	French Henry Creek	OK	U. S. Map Sheet 5
Stream	Fronter house Creek	OK	U. S. Map Sheet 5
Stream	Clear Boggy Creek	OK	U. S. Map Sheet 5
Stream	Cowpen Creek	OK	U. S. Map Sheet 5
Stream	Little Cowpen Creek	OK	U. S. Map Sheet 5
Stream	Long Branch	OK	U. S. Map Sheet 5
Stream	Pine Creek	OK	U. S. Map Sheet 5
Stream	Straight Creek	OK	U. S. Map Sheet 5
Stream	Cowpen Creek	OK	U. S. Map Sheet 6
Stream	Straight Creek	OK	U. S. Map Sheet 6
Stream	Rock Branch	OK	U. S. Map Sheet 6
Stream	Sassafras Creek	OK	U. S. Map Sheet 6
Stream	Sulphur Creek	OK	U. S. Map Sheet 6
Stream	McGee Creek	OK	U. S. Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream	Winters Creek	OK	U. S. Map Sheet 6
Stream	Whitesand Creek	OK	U. S. Map Sheet 6
Stream	Slash Creek	OK	U. S. Map Sheet 6
Stream	Wolf Creek	OK	U. S. Map Sheet 6
Stream	Frazier Creek	OK	U. S. Map Sheet 6
Stream	Whitegrass Creek	OK	U. S. Map Sheet 6
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Stillwater Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Brush Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Elm Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Elm Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Elm Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Spring Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Spring Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Artificial Path	Boomer Creek	OK	Cushing Map Sheet 10
Artificial Path	Boomer Creek	OK	Cushing Map Sheet 10
Artificial Path	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Artificial Path	Boomer Creek	OK	Cushing Map Sheet 10
Artificial Path	Boomer Creek	OK	Cushing Map Sheet 10
Artificial Path	Deer Creek	OK	Cushing Map Sheet 11
Artificial Path	Deer Creek	OK	Cushing Map Sheet 11
Artificial Path	Deer Creek	OK	Cushing Map Sheet 11
Artificial Path	Deer Creek	OK	Cushing Map Sheet 11
Artificial Path	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Long Branch	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Artificial Path	Dry Creek	OK	Cushing Map Sheet 10
Artificial Path	Dry Creek	OK	Cushing Map Sheet 10
Artificial Path	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	North Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Artificial Path	Otoe Creek	OK	Cushing Map Sheet 10
Artificial Path	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 10
Stream/River	Otoe Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Otoe Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Willow Creek	OK	Cushing Map Sheet 10
Stream/River	Otoe Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Willow Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Panther Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Peters Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Peters Creek	OK	Cushing Map Sheet 10
Stream/River	Peters Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Panther Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Stream/River	Pepper Creek	OK	Cushing Map Sheet 10
Stream/River	Lion Creek	OK	Cushing Map Sheet 10
Stream/River	Panther Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Artificial Path	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Feather Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Feather Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Feather Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Dugout Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Artificial Path	Walnut Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Spring Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Headquarters Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Sand Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Dugout Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Dugout Creek	OK	Cushing Map Sheet 11
Stream/River	Dugout Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Dugout Creek	OK	Cushing Map Sheet 11
Stream/River	Dugout Creek	OK	Cushing Map Sheet 11
Stream/River	Walnut Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Walnut Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	East Fork Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Dog Creek	OK	Cushing Map Sheet 11
Stream/River	Dog Creek	OK	Cushing Map Sheet 11
Stream/River	Wild Horse Creek	OK	Cushing Map Sheet 11
Stream/River	Dosie Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Artificial Path	East Spring Creek	OK	Cushing Map Sheet 11
Artificial Path	Wild Horse Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	West Spring Creek	OK	Cushing Map Sheet 11
Stream/River	West Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Dosie Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Wild Horse Creek	OK	Cushing Map Sheet 11
Stream/River	Dosie Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Possum Trot Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 11
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 11
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Turkey Creek	OK	Cushing Map Sheet 11
Stream/River	Rattlesnake Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Rattlesnake Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Turkey Creek	OK	Cushing Map Sheet 11
Stream/River	Rattlesnake Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	North Branch Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Turkey Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dosie Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	North Branch Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cabin Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cabin Creek	OK	Cushing Map Sheet 11
Artificial Path	Cabin Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Short Creek	OK	Cushing Map Sheet 11
Stream/River	Short Creek	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 11
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 11
Stream/River	Polecat Creek	OK	Cushing Map Sheet 11
Stream/River	Polecat Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Artificial Path	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Euchee Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Buckeye Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Lilly Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Lilly Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Lilly Creek	OK	Cushing Map Sheet 11
Stream/River	Lilly Creek	OK	Cushing Map Sheet 11
Stream/River	Gray Horse Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Mud Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Mud Creek	OK	Cushing Map Sheet 11
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11
Stream/River	Mud Creek	OK	Cushing Map Sheet 11
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Mud Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Mud Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 10
Artificial Path	Salt Creek	OK	Cushing Map Sheet 10
Artificial Path	Long Branch	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Council Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Short Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11
Stream/River	Mud Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Lagoon Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Lagoon Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Lagoon Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Lagoon Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Eagle Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Eagle Creek	OK	Cushing Map Sheet 10
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Little Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Pepper Creek	OK	Cushing Map Sheet 10
Stream/River	Pepper Creek	OK	Cushing Map Sheet 10
Stream/River	Pepper Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Swan Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Little Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Artificial Path	Little Catfish Creek	OK	Cushing Map Sheet 11
Artificial Path	Little Catfish Creek	OK	Cushing Map Sheet 11
Artificial Path	Catfish Creek	OK	Cushing Map Sheet 11
Artificial Path	Little Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Little Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 2
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Parsons Creek	OK	Cushing Map Sheet 2
Artificial Path	Parsons Creek	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Scribner Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Scribner Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Mulberry Creek	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 2
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 2
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Pinkerton Branch	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Jones Creek	OK	Cushing Map Sheet 1
Stream/River	Jones Creek	OK	Cushing Map Sheet 1
Stream/River	Gray Branch	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Gray Branch	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Iowa Creek	OK	Cushing Map Sheet 2
Stream/River	Turkey Creek	OK	Cushing Map Sheet 1
Stream/River	Stub Creek	OK	Cushing Map Sheet 1
Stream/River	Iowa Creek	OK	Cushing Map Sheet 2
Stream/River	Iowa Creek	OK	Cushing Map Sheet 2
Stream/River	Iowa Creek	OK	Cushing Map Sheet 2
Stream/River	Iowa Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Plum Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Jones Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Iowa Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Melvin Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Buffalo Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Iowa Creek	OK	Cushing Map Sheet 1
Stream/River	Melvin Creek	OK	Cushing Map Sheet 1
Stream/River	Buffalo Creek	OK	Cushing Map Sheet 1
Stream/River	Melvin Creek	OK	Cushing Map Sheet 2
Stream/River	Buffalo Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Buffalo Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Artificial Path	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 1
Stream/River	Turkey Creek	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Joy Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Jones Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Connector	School Creek	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	School Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 1
Stream/River	Cedar Creek	OK	Cushing Map Sheet 1
Stream/River	Cedar Creek	OK	Cushing Map Sheet 1
Stream/River	Cedar Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Lane Branch	OK	Cushing Map Sheet 1
Stream/River	Lane Branch	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Lane Branch	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Mercer Creek	OK	Cushing Map Sheet 2
Stream/River	Malone Creek	OK	Cushing Map Sheet 2
Stream/River	Beaver Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Beaver Creek	OK	Cushing Map Sheet 2
Stream/River	Beaver Creek	OK	Cushing Map Sheet 2
Stream/River	Malone Creek	OK	Cushing Map Sheet 2
Stream/River	Mercer Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Deadman Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Deadman Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Five Creek	OK	Cushing Map Sheet 3
Artificial Path	Five Creek	OK	Cushing Map Sheet 3
Artificial Path	Huntress Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Finney Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Lincoln Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 2
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	Finney Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	Finney Creek	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Finney Creek	OK	Cushing Map Sheet 3
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Huntress Creek	OK	Cushing Map Sheet 3
Stream/River	Finney Creek	OK	Cushing Map Sheet 3
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Connector	Dry Creek	OK	Cushing Map Sheet 2
Connector	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Crooked Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 2
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 2
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Smith Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Smith Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Smith Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Smith Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Brawner Creek	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Whisky Run	OK	Cushing Map Sheet 1
Stream/River	Whisky Run	OK	Cushing Map Sheet 1
Stream/River	Whisky Run	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Whisky Run	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Brawner Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Brawner Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Brawner Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Brawner Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Brawner Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Artificial Path	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Connector	Cub Creek	OK	Cushing Map Sheet 1
Artificial Path	Bottle Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Bottle Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Connector	Big Indian Creek	OK	Cushing Map Sheet 1
Connector	Big Indian Creek	OK	Cushing Map Sheet 1
Artificial Path	Elm Creek	OK	Cushing Map Sheet 1
Artificial Path	Elm Creek	OK	Cushing Map Sheet 1
Artificial Path	Elm Creek	OK	Cushing Map Sheet 1
Artificial Path	Elm Creek	OK	Cushing Map Sheet 1
Artificial Path	Spring Creek	OK	Cushing Map Sheet 1
Artificial Path	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Artificial Path	Bottle Creek	OK	Cushing Map Sheet 1
Stream/River	Bottle Creek	OK	Cushing Map Sheet 1
Stream/River	Bottle Creek	OK	Cushing Map Sheet 1
Artificial Path	Sicily Creek	OK	Cushing Map Sheet 1
Artificial Path	Sicily Creek	OK	Cushing Map Sheet 1
Artificial Path	Sicily Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Artificial Path	Bottle Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Bills Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Sulphur Creek	OK	Cushing Map Sheet 2
Stream/River	Swede Creek	OK	Cushing Map Sheet 2
Stream/River	North Otter Creek	OK	Cushing Map Sheet 2
Stream/River	North Otter Creek	OK	Cushing Map Sheet 2
Stream/River	North Otter Creek	OK	Cushing Map Sheet 2
Stream/River	School Branch	OK	Cushing Map Sheet 2
Stream/River	School Branch	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Crooked Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Crooked Creek	OK	Cushing Map Sheet 2
Stream/River	Crooked Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 3
Stream/River	Walnut Creek	OK	Cushing Map Sheet 3
Stream/River	Walnut Creek	OK	Cushing Map Sheet 3
Stream/River	Mill Creek	OK	Cushing Map Sheet 3
Stream/River	Mill Creek	OK	Cushing Map Sheet 3
Stream/River	Mill Creek	OK	Cushing Map Sheet 3
Stream/River	School Branch	OK	Cushing Map Sheet 2
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 1
Stream/River	Cedar Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Walnut Creek	OK	Cushing Map Sheet 1
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Little Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Little Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	Raemer Creek	OK	Cushing Map Sheet 1
Stream/River	Mountain Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	East Fork Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Bolling Creek	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Bolling Creek	OK	Cushing Map Sheet 2
Stream/River	Little Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Little Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	Meadow Creek	OK	Cushing Map Sheet 1
Stream/River	Mountain Creek	OK	Cushing Map Sheet 1
Stream/River	Raemer Creek	OK	Cushing Map Sheet 1
Stream/River	Hop Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Artificial Path	West Branch Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	West Branch Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Walnut Creek	OK	Cushing Map Sheet 6
Artificial Path	West Branch Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	West Branch Whitewater River	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	West Branch Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Walnut Creek	OK	Cushing Map Sheet 6
Artificial Path	Walnut Creek	OK	Cushing Map Sheet 6
Artificial Path	Walnut Creek	OK	Cushing Map Sheet 6
Artificial Path	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut Creek	OK	Cushing Map Sheet 6
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	Beaver Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Walnut Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Walnut Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Artificial Path	West Wildcat Creek	OK	Cushing Map Sheet 6
Artificial Path	Sand Creek	OK	Cushing Map Sheet 6
Artificial Path	Sand Creek	OK	Cushing Map Sheet 6
Artificial Path	Sand Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	West Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Sand Creek	OK	Cushing Map Sheet 6
Stream/River	Sand Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	West Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Prairie Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	West Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Chisholm Creek	OK	Cushing Map Sheet 6
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Artificial Path	Middle Branch	OK	Cushing Map Sheet 4
Artificial Path	Middle Branch	OK	Cushing Map Sheet 4
Artificial Path	Middle Branch	OK	Cushing Map Sheet 4
Stream/River	Middle Branch	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Middle Branch	OK	Cushing Map Sheet 4
Stream/River	Middle Branch	OK	Cushing Map Sheet 5
Stream/River	Middle Branch	OK	Cushing Map Sheet 5
Stream/River	Middle Branch	OK	Cushing Map Sheet 5
Stream/River	Middle Branch	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Stony Brook	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Cress Creek	OK	Cushing Map Sheet 5
Stream/River	Cress Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Artificial Path	Middle Branch	OK	Cushing Map Sheet 5
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 5
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 5
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Connector	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Camp Creek	OK	Cushing Map Sheet 4
Stream/River	Camp Creek	OK	Cushing Map Sheet 4
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 4
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Artificial Path	Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Connector	Diamond Creek	OK	Cushing Map Sheet 6
Connector	Fourmile Creek	OK	Cushing Map Sheet 6
Connector	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Brush Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Brush Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Brush Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Holland Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Basket Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	Pinkerton Branch	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	Basket Creek	OK	Cushing Map Sheet 3
Stream/River	Basket Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Basket Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Lone Tree Creek	OK	Cushing Map Sheet 4
Stream/River	Lone Tree Creek	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Lone Tree Creek	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Basket Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Republican River	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 4
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Connector	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Fourmile Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 3
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 3
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 3
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Goose Creek	OK	Cushing Map Sheet 3
Stream/River	Goose Creek	OK	Cushing Map Sheet 3
Stream/River	Goose Creek	OK	Cushing Map Sheet 3
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Mud Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	East Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Artificial Path	East Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	East Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	East Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	East Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Middle Branch	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Lone Tree Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Lone Tree Creek	OK	Cushing Map Sheet 4
Stream/River	Lone Tree Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Connector	Carry Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Chapman Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Schuler Branch	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Schuler Branch	OK	Cushing Map Sheet 4
Stream/River	Schuler Branch	OK	Cushing Map Sheet 4
Stream/River	Schuler Branch	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Schuler Branch	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Artificial Path	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Diamond Creek	OK	Cushing Map Sheet 4
Stream/River	Diamond Creek	OK	Cushing Map Sheet 4
Stream/River	Camp Creek	OK	Cushing Map Sheet 4
Artificial Path	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Threemile Creek	OK	Cushing Map Sheet 4
Stream/River	Threemile Creek	OK	Cushing Map Sheet 4
Stream/River	Diamond Creek	OK	Cushing Map Sheet 4
Stream/River	Diamond Creek	OK	Cushing Map Sheet 4
Stream/River	Threemile Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 4
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 4
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Otter Creek	OK	Cushing Map Sheet 4
Stream/River	Otter Creek	OK	Cushing Map Sheet 4
Stream/River	Otter Creek	OK	Cushing Map Sheet 4
Stream/River	Otter Creek	OK	Cushing Map Sheet 4
Stream/River	Otter Creek	OK	Cushing Map Sheet 4
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Lyon Creek	OK	Cushing Map Sheet 4
Artificial Path	Lyon Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 3
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Little Arkansas Creek	OK	Cushing Map Sheet 3
Stream/River	Wind Creek	OK	Cushing Map Sheet 3
Stream/River	Wind Creek	OK	Cushing Map Sheet 3

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Sevenmile Creek	OK	Cushing Map Sheet 3
Stream/River	Sevenmile Creek	OK	Cushing Map Sheet 3
Stream/River	Threemile Creek	OK	Cushing Map Sheet 3
Stream/River	Threemile Creek	OK	Cushing Map Sheet 3
Stream/River	Little Arkansas Creek	OK	Cushing Map Sheet 3
Stream/River	Wind Creek	OK	Cushing Map Sheet 3
Artificial Path	Gilmore Branch	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Gilmore Branch	OK	Cushing Map Sheet 6
Stream/River	Gilmore Branch	OK	Cushing Map Sheet 6
Stream/River	Gilmore Branch	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Coon Creek	OK	Cushing Map Sheet 5
Stream/River	Coon Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Turkey Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Middle Creek	OK	Cushing Map Sheet 6
Stream/River	Middle Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Artificial Path	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Coon Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Artificial Path	French Creek	OK	Cushing Map Sheet 5
Artificial Path	French Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 5
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 5
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 5
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 5
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 5
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 5
Stream/River	Camp Creek	OK	Cushing Map Sheet 4
Stream/River	Camp Creek	OK	Cushing Map Sheet 5
Stream/River	Diamond Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 5
Stream/River	Stribby Creek	OK	Cushing Map Sheet 5
Stream/River	Stribby Creek	OK	Cushing Map Sheet 5
Stream/River	Stribby Creek	OK	Cushing Map Sheet 5
Stream/River	Stribby Creek	OK	Cushing Map Sheet 5
Stream/River	Stribby Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Artificial Path	Chikaskia River	OK	Cushing Map Sheet 9
Artificial Path	Scatter Creek	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Dry Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Dry Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Dry Creek	OK	Cushing Map Sheet 9
Stream/River	Dry Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Bitter Creek	OK	Cushing Map Sheet 9
Stream/River	Scatter Creek	OK	Cushing Map Sheet 9
Stream/River	Dry Creek	OK	Cushing Map Sheet 9
Stream/River	Bitter Creek	OK	Cushing Map Sheet 9
Stream/River	Doe Creek	OK	Cushing Map Sheet 9
Stream/River	Bitter Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Bitter Creek	OK	Cushing Map Sheet 9
Stream/River	Lost Creek	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Lost Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Scatter Creek	OK	Cushing Map Sheet 9

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Duck Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Connector	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Grassy Creek	OK	Cushing Map Sheet 9
Stream/River	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Grassy Creek	OK	Cushing Map Sheet 9
Stream/River	Grassy Creek	OK	Cushing Map Sheet 9
Stream/River	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 10
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 10
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 10
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 10
Stream/River	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Connector	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Middle Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Middle Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Middle Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Dry Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Middle Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Little Osage Creek	OK	Cushing Map Sheet 8
Artificial Path	Osage Creek	OK	Cushing Map Sheet 8
Artificial Path	Osage Creek	OK	Cushing Map Sheet 8
Artificial Path	Chilocco Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Deer Creek	OK	Cushing Map Sheet 8
Artificial Path	Sweetwater Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Stream/River	Sweetwater Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Lost Creek	OK	Cushing Map Sheet 8
Stream/River	Duck Creek	OK	Cushing Map Sheet 8
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Spring Creek	OK	Cushing Map Sheet 9
Stream/River	Duck Creek	OK	Cushing Map Sheet 9
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 8
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Spring Creek	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Otter Creek	OK	Cushing Map Sheet 8
Stream/River	Otter Creek	OK	Cushing Map Sheet 8
Stream/River	Otter Creek	OK	Cushing Map Sheet 8
Stream/River	Otter Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Deer Creek	OK	Cushing Map Sheet 8
Stream/River	Little Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Little Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Deer Creek	OK	Cushing Map Sheet 8
Stream/River	Deer Creek	OK	Cushing Map Sheet 8
Connector	Chilocco Creek	OK	Cushing Map Sheet 8
Artificial Path	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Middle Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Spring Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Negro Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Walnut River	OK	Cushing Map Sheet 8
Artificial Path	Walnut River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Salt Creek	OK	Cushing Map Sheet 8
Artificial Path	Salt Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Spring Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Negro Creek	OK	Cushing Map Sheet 8
Stream/River	Negro Creek	OK	Cushing Map Sheet 8
Stream/River	Negro Creek	OK	Cushing Map Sheet 8
Stream/River	Negro Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Walnut River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Connector	Skinny Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Coon Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Charley Creek	OK	Cushing Map Sheet 9
Artificial Path	Charley Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Houston Creek	OK	Cushing Map Sheet 9
Artificial Path	Simpkins Creek	OK	Cushing Map Sheet 9
Artificial Path	Simpkins Creek	OK	Cushing Map Sheet 9
Artificial Path	Little Drum Creek	OK	Cushing Map Sheet 9
Artificial Path	Prettyhair Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Little Drum Creek	OK	Cushing Map Sheet 9
Artificial Path	Little Drum Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Simpkins Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Stream/River	Arkansas River	OK	Cushing Map Sheet 9
Stream/River	Charley Creek	OK	Cushing Map Sheet 9
Stream/River	Charley Creek	OK	Cushing Map Sheet 9
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Houston Creek	OK	Cushing Map Sheet 9
Stream/River	Houston Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Stream/River	Cat Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Bird Creek	OK	Cushing Map Sheet 9
Stream/River	Skinny Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Houston Creek	OK	Cushing Map Sheet 9
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 9

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 9
Stream/River	Bird Creek	OK	Cushing Map Sheet 9
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Little Drum Creek	OK	Cushing Map Sheet 9
Stream/River	Prettyhair Creek	OK	Cushing Map Sheet 9
Stream/River	Simpkins Creek	OK	Cushing Map Sheet 9
Stream/River	Little Drum Creek	OK	Cushing Map Sheet 9
Stream/River	Prettyhair Creek	OK	Cushing Map Sheet 9
Stream/River	Little Drum Creek	OK	Cushing Map Sheet 9
Stream/River	Simpkins Creek	OK	Cushing Map Sheet 9
Stream/River	Big Drum Creek	OK	Cushing Map Sheet 9
Stream/River	Coon Creek	OK	Cushing Map Sheet 9
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Coon Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 9
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Deadman Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Cowskin Creek	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Birds Nest Creek	OK	Cushing Map Sheet 9
Artificial Path	Birds Nest Creek	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Deadman Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Duck Creek	OK	Cushing Map Sheet 9
Stream/River	East Cattle Creek	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Cowskin Creek	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	East Cattle Creek	OK	Cushing Map Sheet 9
Stream/River	West Cattle Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Big Drum Creek	OK	Cushing Map Sheet 9
Artificial Path	Big Drum Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Mud Creek	OK	Cushing Map Sheet 10
Artificial Path	Brush Creek	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Walker Creek	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Rock Creek	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Red Rock Creek	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Greasy Creek	OK	Cushing Map Sheet 10
Artificial Path	Walker Creek	OK	Cushing Map Sheet 10
Artificial Path	Greasy Creek	OK	Cushing Map Sheet 10
Artificial Path	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Brush Creek	OK	Cushing Map Sheet 9
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Brush Creek	OK	Cushing Map Sheet 9
Stream/River	Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Mud Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Walker Creek	OK	Cushing Map Sheet 10
Stream/River	Walker Creek	OK	Cushing Map Sheet 10
Stream/River	Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Walker Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Connector	Whitewater River	OK	Cushing Map Sheet 7
Connector	Whitewater River	OK	Cushing Map Sheet 7
Connector	Whitewater River	OK	Cushing Map Sheet 7
Connector	Whitewater River	OK	Cushing Map Sheet 7
Connector	Whitewater River	OK	Cushing Map Sheet 7
Artificial Path	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Badger Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Badger Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Badger Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Bitter Creek	OK	Cushing Map Sheet 7
Artificial Path	Short Creek	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 8
Stream/River	Ninnescah River	OK	Cushing Map Sheet 8
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Turner Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Cowskin Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Bitter Creek	OK	Cushing Map Sheet 7
Stream/River	Cowskin Creek	OK	Cushing Map Sheet 7
Stream/River	Cowskin Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Winser Creek	OK	Cushing Map Sheet 8
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Winser Creek	OK	Cushing Map Sheet 8
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Winser Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 7
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 7
Artificial Path	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Prairie Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Middle Fork Chisholm Creek	OK	Cushing Map Sheet 6
Connector	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Dry Creek	OK	Cushing Map Sheet 7
Artificial Path	Spring Creek	OK	Cushing Map Sheet 7
Artificial Path	Spring Creek	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Connector	Walnut River	OK	Cushing Map Sheet 7
Connector	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Republican Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Republican Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Branch	OK	Cushing Map Sheet 7
Stream/River	Spring Branch	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Branch	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Maple Creek	OK	Cushing Map Sheet 7
Stream/River	Maple Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Connector	Spring Branch	OK	Cushing Map Sheet 6
Artificial Path	Whitewater Creek	OK	Cushing Map Sheet 6
Artificial Path	Fourmile Creek	OK	Cushing Map Sheet 7
Artificial Path	Fourmile Creek	OK	Cushing Map Sheet 7
Artificial Path	Republican Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Prairie Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Prairie Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Prairie Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Republican Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Republican Creek	OK	Cushing Map Sheet 7
Artificial Path	Spring Branch	OK	Cushing Map Sheet 6
Artificial Path	Spring Branch	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Constant Creek	OK	Cushing Map Sheet 6
Artificial Path	Constant Creek	OK	Cushing Map Sheet 6
Artificial Path	Elm Creek	OK	Cushing Map Sheet 6
Artificial Path	Elm Creek	OK	Cushing Map Sheet 7
Artificial Path	Elm Creek	OK	Cushing Map Sheet 7
Artificial Path	Elm Creek	OK	Cushing Map Sheet 7
Artificial Path	Spring Branch	OK	Cushing Map Sheet 6
Artificial Path	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Elm Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Elm Creek	OK	Cushing Map Sheet 7
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Sutton Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Sutton Creek	OK	Cushing Map Sheet 6
Stream/River	Sutton Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Elm Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Sutton Creek	OK	Cushing Map Sheet 6
Stream/River	Elm Creek	OK	Cushing Map Sheet 6
Stream/River	Elm Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Turkey Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Turkey Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Elm Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Muddy Creek	OK	Cushing Map Sheet 7
Artificial Path	Muddy Creek	OK	Cushing Map Sheet 7
Artificial Path	Muddy Creek	OK	Cushing Map Sheet 7
Artificial Path	Muddy Creek	OK	Cushing Map Sheet 7
Artificial Path	Muddy Creek	OK	Cushing Map Sheet 7
Artificial Path	Swisher Branch	OK	Cushing Map Sheet 7
Artificial Path	Swisher Branch	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Swisher Branch	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Swisher Branch	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Swisher Branch	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Richland Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Crooked Creek	OK	Cushing Map Sheet 7
Stream/River	Crooked Creek	OK	Cushing Map Sheet 7
Stream/River	Crooked Creek	OK	Cushing Map Sheet 7
Stream/River	Foos Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Foos Creek	OK	Cushing Map Sheet 8
Stream/River	Foos Creek	OK	Cushing Map Sheet 8
Stream/River	Crooked Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Connector	Dutch Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Lost Creek	OK	Cushing Map Sheet 8
Artificial Path	Lost Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Spring Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Beaver Creek	OK	Cushing Map Sheet 8
Artificial Path	Beaver Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Slate Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Lone Elm Creek	OK	Cushing Map Sheet 8
Stream/River	Lone Elm Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Lost Creek	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Artificial Path	Ninnescah River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Stream/River	Sanford Creek	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Cowskin Creek	OK	Cushing Map Sheet 7
Artificial Path	Cowskin Creek	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 8
Stream/River	Maple Creek	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Maple Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Coon Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Coon Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Sanford Creek	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Sanford Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Bitter Creek	OK	Cushing Map Sheet 7
Stream/River	Short Creek	OK	Cushing Map Sheet 7
Stream/River	Short Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Sanford Creek	OK	Cushing Map Sheet 7
Stream/River	Sanford Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Artificial Path	Durham Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Durham Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Durham Creek	OK	Cushing Map Sheet 7
Stream/River	Durham Creek	OK	Cushing Map Sheet 7
Stream/River	Swisher Branch	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Stalter Branch	OK	Cushing Map Sheet 7
Stream/River	Stalter Branch	OK	Cushing Map Sheet 7
Stream/River	Stalter Branch	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Stalter Branch	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Foos Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Lone Elm Creek	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	East Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	East Badger Creek	OK	Cushing Map Sheet 8
Stream/River	East Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	West Badger Creek	OK	Cushing Map Sheet 8
Stream/River	East Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	West Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	West Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	East Badger Creek	OK	Cushing Map Sheet 8
Stream/River	West Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Snake Creek	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Snake Creek	OK	Cushing Map Sheet 8
Stream/River	Snake Creek	OK	Cushing Map Sheet 8
Stream/River	Snake Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Pebble Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Harper Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Snake Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Richland Creek	OK	Cushing Map Sheet 7
Stream/River	Richland Creek	OK	Cushing Map Sheet 7
Artificial Path	Richland Creek	OK	Cushing Map Sheet 7
Artificial Path	Richland Creek	OK	Cushing Map Sheet 7
Artificial Path	Richland Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Lower Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Cedar Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Bird Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Bird Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Mud Creek	OK	Cushing Map Sheet 10
Stream/River	Mud Creek	OK	Cushing Map Sheet 10
Stream/River	Coal Creek	OK	Cushing Map Sheet 10
Stream/River	Mud Creek	OK	Cushing Map Sheet 10
Stream	Red River	TX	U. S. Map Sheet 6
Stream	Slough Creek	TX	U. S. Map Sheet 6
Stream	Sanders Creek	TX	U. S. Map Sheet 7
Stream	Cottonwood Creek	TX	U. S. Map Sheet 7
Stream	Bergher Creek	TX	U. S. Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream	Doss Creek	TX	U. S. Map Sheet 7
Stream	Maxey Creek	TX	U. S. Map Sheet 7
Stream	West Fork Cottonwood Creek	TX	U. S. Map Sheet 7
Stream	Maxwell Creek	TX	U. S. Map Sheet 7
Stream	Mallory Creek	TX	U. S. Map Sheet 7
Stream	Justiss Creek	TX	U. S. Map Sheet 7
Stream	Cherry Creek	TX	U. S. Map Sheet 7
Stream	Robertson Creek	TX	U. S. Map Sheet 7
Stream	Lake Creek	TX	U. S. Map Sheet 7
Stream	McGuyer Branch	TX	U. S. Map Sheet 7
Stream	South Sulphur River	TX	U. S. Map Sheet 8
Stream	Wolfpen Creek	TX	U. S. Map Sheet 8
Stream	Crosstimber Creek	TX	U. S. Map Sheet 8
Stream	Briar Branch	TX	U. S. Map Sheet 8
Stream	Stouts Creek	TX	U. S. Map Sheet 8
Stream	Greenwood Creek	TX	U. S. Map Sheet 8
Stream	Huggins Creek	TX	U. S. Map Sheet 8
Stream	Little Cypress Creek	TX	U. S. Map Sheet 8
Stream	Coon Creek	TX	U. S. Map Sheet 9
Stream	Glade Branch	TX	U. S. Map Sheet 9
Stream	Brushy Creek	TX	U. S. Map Sheet 9
Stream	Briary Creek	TX	U. S. Map Sheet 9
Stream	Ready Creek	TX	U. S. Map Sheet 9
Stream	Mill Creek	TX	U. S. Map Sheet 9
Stream	Blue Branch	TX	U. S. Map Sheet 9
Stream	Gin Creek	TX	U. S. Map Sheet 9
Stream	Rogers Creek	TX	U. S. Map Sheet 10
Stream	Kay Creek	TX	U. S. Map Sheet 10
Stream	Sabine River	TX	U. S. Map Sheet 10
Stream	Hills Creek	TX	U. S. Map Sheet 10
Stream	Glade Creek	TX	U. S. Map Sheet 10
Stream	Prairie Creek	TX	U. S. Map Sheet 10
Stream	Kickapoo Creek	TX	U. S. Map Sheet 11
Stream	Denton Creek	TX	U. S. Map Sheet 11
Stream	Beaver Run	TX	U. S. Map Sheet 11
Stream	Grissom Creek	TX	U. S. Map Sheet 11
Stream	Mill Creek	TX	U. S. Map Sheet 11
Stream	Johnson Creek	TX	U. S. Map Sheet 11
Stream	Campground Creek	TX	U. S. Map Sheet 11
Stream	Boggy Branch	TX	U. S. Map Sheet 11
Stream	Hudspeth Creek	TX	U. S. Map Sheet 11
Stream	Boggy Branch	TX	U. S. Map Sheet 11
Stream	Autry Branch	TX	U. S. Map Sheet 11
Stream	Striker Creek	TX	U. S. Map Sheet 11
Stream	Indian Creek	TX	U. S. Map Sheet 11
Stream	Angelina River	TX	U. S. Map Sheet 12
Stream	Beech Creek	TX	U. S. Map Sheet 12
Stream	Legg Creek	TX	U. S. Map Sheet 12
Stream	Bingham Creek	TX	U. S. Map Sheet 12

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream	Beaver Creek	TX	U. S. Map Sheet 12
Stream	Stokes Creek	TX	U. S. Map Sheet 12
Stream	Doyle Creek	TX	U. S. Map Sheet 12
Stream	Red Bayou	TX	U. S. Map Sheet 12
Stream	Watson Branch	TX	U. S. Map Sheet 12
Stream	Durham Creek	TX	U. S. Map Sheet 13
Stream	Buncombe Creek	TX	U. S. Map Sheet 13
Stream	Neches River	TX	U. S. Map Sheet 13
Stream	Crawford Creek	TX	U. S. Map Sheet 13
Stream	Zed Creek	TX	U. S. Map Sheet 13
Stream	Moccasin Creek	TX	U. S. Map Sheet 13
Stream	Hackberry Creek	TX	U. S. Map Sheet 13
Stream	White Oak Creek	TX	U. S. Map Sheet 13
Stream	Lower Sulphur Creek	TX	U. S. Map Sheet 13
Stream	Piney Creek	TX	U. S. Map Sheet 13
Stream	Sandy Branch	TX	U. S. Map Sheet 13
Stream	McManus Creek	TX	U. S. Map Sheet 13
Stream	Creeds Creek	TX	U. S. Map Sheet 13
Stream	Bear Creek	TX	U. S. Map Sheet 13
Stream	Dry Creek	TX	U. S. Map Sheet 13
Stream	Brushy Creek	TX	U. S. Map Sheet 14
Stream	Kennedy Creek	TX	U. S. Map Sheet 14
Stream	Johnson Creek	TX	U. S. Map Sheet 14
Stream	Bundix Branch	TX	U. S. Map Sheet 14
Stream	Big Sandy Creek	TX	U. S. Map Sheet 14
Stream	Bluff Creek	TX	U. S. Map Sheet 14
Stream	Mathis Branch	TX	U. S. Map Sheet 14
Stream	Beech Creek	TX	U. S. Map Sheet 14
Stream	Dry Branch	TX	U. S. Map Sheet 14
Stream	Menard Creek	TX	U. S. Map Sheet 14
Stream	Yellow Branch	TX	U. S. Map Sheet 14
Stream	Williams Creek	TX	U. S. Map Sheet 15
Stream	Beef Head Creek	TX	U. S. Map Sheet 15
Stream	Trinity River	TX	U. S. Map Sheet 15
Stream	Batiste Creek	TX	U. S. Map Sheet 15
Stream	Mayhaw Creek	TX	U. S. Map Sheet 16
Stream	West End Slough	TX	U. S. Map Sheet 16
Stream	Six-Ten Slough	TX	U. S. Map Sheet 16
Stream	Pine Island Bayou	TX	U. S. Map Sheet 16
Stream	Cotton Creek	TX	U. S. Map Sheet 16
Stream	Willow Marsh Bayou	TX	U. S. Map Sheet 17
Stream	Neches River	TX	U. S. Map Sheet 17
Stream	Grays Bayou	TX	U. S. Map Sheet 17
Stream	Bird Island Bayou	TX	U. S. Map Sheet 17

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ALBERTA, CANADA SENSITIVITY AREAS		
OBJECT ID	SITE NAME	MAP SHEET
389	Silver Heights (wetlands only)	Ca. Map Sheet 2
395	Ribstone Creek – Nose Hill	Ca. Map Sheet 2
405	Neutral Hills	Ca. Map Sheet 2
413	Middle Lakes	Ca. Map Sheet 2
421	Gooseberry Lake	Ca. Map Sheet 3
433	Grassy Island Native Prairie	Ca. Map Sheet 3
440	Muddy Buttes	Ca. Map Sheet 3
449	Muddy Buttes Badlands	Ca. Map Sheet 3
450	Grassy Island Native Prairie	Ca. Map Sheet 3
460	Sounding Creek Native Prairie	Ca. Map Sheet 4
479	Alkali Creek Moraine	Ca. Map Sheet 5
493	Red Deer River – Alkali Creek/Dune Point	Ca. Map Sheet 5
501	Remount	Ca. Map Sheet 6
504	South Saskatchewan Canyon	Ca. Map Sheet 7

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CANADIAN WILDLIFE		
WOP ID	OBSERVATION	MAP SHEET
Alb06WOP1	Plains Spadefoot Toad	Ca. Map Sheet 6
Alb06WOP3	Plains Spadefoot Toad	Ca. Map Sheet 6
Alb06WOP5	Plains Spadefoot Toad & Great Plains To	Ca. Map Sheet 6
Alb06WOP12	Loggerhead Shrike nest	Ca. Map Sheet 6
Alb06WOP13	Loggerhead Shrike nest	Ca. Map Sheet 6
Alb07WOP3	Northern Leopard Frog (wetland)	Ca. Map Sheet 6
Alb07WOP4	Potential Amphian Breeding Wetland	Ca. Map Sheet 6
Alb07WOP6	Unidentified	Ca. Map Sheet 2
Alb07WOP7	Raptor sp.	Ca. Map Sheet 3
Alb07WOP9	Raptor sp.	Ca. Map Sheet 3
Alb07WOP10	Burrowing Owl	Ca. Map Sheet 6
Alb07WOP11	Sharp-tailed Grouse	Ca. Map Sheet 4
Man06WOP2	Northern Leopard Frog	Ca. Map Sheet 28
Man06WOP3	Northern Leopard Frog	Ca. Map Sheet 28

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CANADIAN POPULATED AREAS				
PLACE ID	PROVIDENCE	GEONAME	CONCISE	MAP SHEET
581	Manitoba	Reinland	Unincorporated area	Ca. Map Sheet 28
611	Manitoba	Brookdale	Unincorporated area	Ca. Map Sheet 23
1230	Saskatchewan	Caronport	Village	Ca. Map Sheet 13
2459	Manitoba	Miniota	Unincorporated area	Ca. Map Sheet 21

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CANADIAN MANUFACTURING WATERWELLS				
WELL_ID	WELL_OWNER	AQUIFER	WELL_USE	MAP SHEET
110879	G Neufeld	Sand and Gravel	Production	Ca. Map Sheet 26
120590	T Barber	Sand and Gravel	Production	Ca. Map Sheet 26
120592	Unknown	Sand and Gravel	Production	Ca. Map Sheet 26
120639	Unknown	Shale	Production	Ca. Map Sheet 26
120885	Unknown	Sand and Gravel	Production	Ca. Map Sheet 26
120887	S Moffat	Limestone or Dolomite	Production	Ca. Map Sheet 26
160562	Robinson	Sand and Gravel	Production	Ca. Map Sheet 27
160564	Robinson & McClomnel	Sand and Gravel	Production	Ca. Map Sheet 27
181435	Unknown	Shale	Production	Ca. Map Sheet 25
210553	J Swanton	Sand and Gravel	Production	Ca. Map Sheet 27

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CANADIAN MUNICIPAL WELLS			
WATER USE	WELL USE	Sask_ID	MAP SHEET
Municipal	Water Test Hole	7403	Ca. Map Sheet 17
Municipal	Water Test Hole	26975	Ca. Map Sheet 13
Municipal	Withdrawal	28444	Ca. Map Sheet 10
Municipal	Water Test Hole	28445	Ca. Map Sheet 10
Municipal	Water Test Hole	28446	Ca. Map Sheet 10
Municipal	Water Test Hole	28447	Ca. Map Sheet 10
Municipal	Water Test Hole	28448	Ca. Map Sheet 10
Municipal	Withdrawal	28449	Ca. Map Sheet 10
Municipal	Water Test Hole	28450	Ca. Map Sheet 10
Municipal	Observation	28451	Ca. Map Sheet 10
Municipal	Water Test Hole	28452	Ca. Map Sheet 10
Municipal	Withdrawal	28453	Ca. Map Sheet 10
Municipal	Observation	28454	Ca. Map Sheet 10
Municipal	Water Test Hole	31129	Ca. Map Sheet 7
Municipal	Withdrawal	77323	Ca. Map Sheet 10

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CANADIAN LAKES		
NAME	Lake ID	MAP SHEET
Chaplin Lake	Chaplin Lake (ID956)	Ca. Map Sheet 12

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CANADIAN RIVERS & STREAMS	
NAME	**MAP SHEET**
Battle River	Ca. Map Sheet 1
Battle River	Ca. Map Sheet 1
Ribstone Creek	Ca. Map Sheet 2
Monitor Creek	Ca. Map Sheet 3
Sounding Creek	Ca. Map Sheet 4
Alkali Creek	Ca. Map Sheet 5
Alkali Creek	Ca. Map Sheet 5
Red Deer River	Ca. Map Sheet 6
South Saskatchewan River	Ca. Map Sheet 7
Miry Creek	Ca. Map Sheet 9
Thunder Creek	Ca. Map Sheet 13
9787107	Ca. Map Sheet 13
Thunder Creek	Ca. Map Sheet 13
Swift Current Creek	Ca. Map Sheet 11
Moose Jaw River	Ca. Map Sheet 14
Wascana Creek	Ca. Map Sheet 15
Thunder Creek	Ca. Map Sheet 13
10656107	Ca. Map Sheet 15
Pipestone Creek	Ca. Map Sheet 18
11701107	Ca. Map Sheet 20
Pipestone Creek	Ca. Map Sheet 18
11948107	Ca. Map Sheet 19
Arrow River	Ca. Map Sheet 21
12233107	Ca. Map Sheet 21
Assiniboine River	Ca. Map Sheet 21
Boggy Creek	Ca. Map Sheet 23
12527107	Ca. Map Sheet 21
Little Saskatchewan River	Ca. Map Sheet 22
12589107	Ca. Map Sheet 21
Oak River	Ca. Map Sheet 22
Whitemud River	Ca. Map Sheet 23
13019107	Ca. Map Sheet 24
13199107	Ca. Map Sheet 24
12959107	Ca. Map Sheet 22
Assiniboine River	Ca. Map Sheet 25
Assiniboine River	Ca. Map Sheet 25
13416107	Ca. Map Sheet 24
13333107	Ca. Map Sheet 24
13577107	Ca. Map Sheet 25
13379107	Ca. Map Sheet 23
13826107	Ca. Map Sheet 25
Assiniboine River	Ca. Map Sheet 25
Boyne River	Ca. Map Sheet 27
Boyne River	Ca. Map Sheet 27
Boyne River	Ca. Map Sheet 27
14914107	Ca. Map Sheet 27
14990107	Ca. Map Sheet 27
15172107	Ca. Map Sheet 27
15266107	Ca. Map Sheet 27

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CANADIAN RIVERS & STREAMS (Cont'd)	
NAME	**MAP SHEET**
15321107	Ca. Map Sheet 27
15329107	Ca. Map Sheet 27
15606107	Ca. Map Sheet 28
15601107	Ca. Map Sheet 27
15776107	Ca. Map Sheet 28
15867107	Ca. Map Sheet 28
16006107	Ca. Map Sheet 28
16034107	Ca. Map Sheet 28

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FIGURE 6.6

DRAIN TILES

"Consideration needs to be given to the presence of drain tiles and how they could provide a hydraulic conduit for the migration of the product off the right of way."

SPREAD 3B DRAIN TILE LOCATIONS - NORTH OF 197TH STREET								
POINT	STATION	ANGLE	DESCRIPTION	DC FILE	TRACT NO.	MILE POST	LAT	LONG
307767	16743+49	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109B	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53200896	-97.89247984
307770	16744+14	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109B	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53183143	-97.89245705
307772	16744+67	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109B	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53168576	-97.89243408
307776	16745+93	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109B	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53134183	-97.89239009
307779	16746+57	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109B	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53116714	-97.89236812
356839	16748+83	85-90	PVC_CLAY-FLEX "RUBBER"	LM081109	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53055093	-97.89228272
356844	16749+73	85-90	PVC_CLAY-FLEX "RUBBER"	LM081109	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53030697	-97.89225127
356846	16750_36	85-90	PVC_CLAY-FLEX "RUBBER"	LM081109	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53013350	-97.89222979
307788	16750+94	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52997441	-97.89221202
307793	16752+40	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52957499	-97.89215925
307797	16753+60	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52924885	-97.89211328
307799	16754+23	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52907604	-97.89209397
307802	16754+83	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52891223	-97.89207042
307805	16755+50	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52872737	-97.89204441
307807	16756+05	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52857692	-97.89202495
307810	16756+65	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52841262	-97.89200039
307812	16757+27	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52824298	-97.89197686
356861	16757+95	85-90	PVC_CLAY-FLEX "RUBBER"	LM081109A	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52806164	-97.89193937
RANDOM LOCATION								
313489	18802+85	85-90	1" BLACK RUBBER HOSE	JR090209A	786 - THOMAS E. JOHNSON	356.5	43.99016912	-97.70254357

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FIGURE 6.7

REFERENCE WEBSITES

The following is a list of websites that can be used as reference material during an incident.

EPA Region 5 - Regional Contingency Plan **http://www.rrt5.org/plans.php**
EPA Region 6 - Regional Contingency Plan **http://www.epaosc.org/site/site_profile.aspx?site_id=5087**
EPA Region 7 - Regional Contingency Plan
http://www.rrt7.nrt.org/production/NRT/RRTHome.nsf/AllPages/rrt_vii-ricp.htm?OpenDocument
EPA Region 8 - Regional Contingency Plan
http://www.rrt8.nrt.org/production/NRT/RRTHome.nsf/Web+Pages/rrt_viii_ricp.htm
U.S. National Oil and Hazardous Substances Pollution Contingency Plan (NCP) **http://www.ecfr.gov/cgi-bin/text-idx?**
Canada - United States Joint Inland Pollution Contingency Plan - Annex II
http://www.epa.gov/oem/docs/chem/canusplain.pdf
CA National Environmental Emergencies Contingency Plan **http://www.ec.gc.ca/ee-ue/default.asp**
Greater St. Louis Sub-Area Plan **http://www.umrba.org/hazspills/greaterstlouisplan.pdf**

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APPENDIX A

RESPONSE EQUIPMENT / RESOURCES

A.1 Company Owned Response Equipment

A.2 Other Company Resources

A.3 Contract Resources

A.4 Cooperative/Mutual Aid Resources

A.5 Volunteers

A.6 Communications

Figure A.1 Company Owned Spill Response Equipment

Figure A.2 Response Resources

Figure A.3 USCG OSRO Classifications

Figure A.4 Coop Agreements/OSRO Contracts

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A.1 COMPANY OWNED RESPONSE EQUIPMENT

The Company owns and operates oil spill response equipment contained within response trailers staged throughout the pipeline system. This equipment is maintained according to manufacturer's recommendations by Company and/or contracted personnel. An equipment summary detailing locations, type and amount stored in the response trailers is listed in Figure A.1. The Company also has contracts in place with Oil Spill Removal Organizations and other clean-up contractors that are capable of responding to all discharges along the Pipeline. Figure A.2 lists the contracted Oil Spill Removal Organizations.

Equipment trailers are located at strategic points along the pipeline. The locations of each trailer is listed in the response zone annex. The equipment inventory for each trailer is listed in Figure A.1.

The Qualified Individual has the authority to activate other private contractors, experts, and consultants as the situation demands.

All Pipeline personnel who might be involved in an oil spill have been informed that detergents or other surfactants are prohibited from being used on an oil spill in the water and that dispersants can only be used with the approval of the Canadian Regional Environmental Emergency Team (REET) or US Regional Response Team, the interagency group composed of Federal and State agency representatives that coordinates oil spill response.

A.2 OTHER COMPANY RESOURCES

Additional Company spill response equipment and manpower resources are not available to supplement the response operation; however, third party contractors will be activated on an as needed basis.

A.3 CONTRACT RESOURCES

The resources will be secured from a Company approved contractor. Management will typically handle notification/implementation of these resources. Figure A.2 provides a quick reference to the Oil Spill Removal Organizations and details their response capability and estimated response times. **Telephone reference is provided in Figure 2.5.** *(Note: The Company will ensure that each OSRO has a comprehensive maintenance program and applicable training / drills programs in place at contract renewal.)*

A.4 COOPERATIVE/MUTUAL AID RESOURCES

The Company is a member of the following Oil Spill Cooperatives or mutual aid groups:

- Western Canadian Spill Services Ltd.
- Alberta - Area U and S Oil Spill Cooperatives
- Saskatchewan - Area 3, 6, and 4 & 5 Oil Spill Cooperatives

A.5 VOLUNTEERS

Volunteers will not be utilized by the Company for the response operations. In the U.S., all volunteers will be referred to the Federal Regional Response Team.

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A.6 COMMUNICATIONS

Effective and efficient communications systems are essential for emergency response at every level. The communications system will be utilized to gather information and current status reports as well as to provide coordination and direction to widely separated work groups involved in search, containment/diversion, repair, traffic control, public control or evacuation, and restoration.

The Company's overall Emergency Notification Chart (Figure 2.2) indicates individuals within the Company and governmental agencies who must be contacted in the event of an emergency.

Notification information for the Qualified Individuals, Alternate Qualified Individuals, emergency response contractors, and governmental agencies is located in Section 2.0 and the Response Zone Annexes.

Lines of communication between the Incident Commander, local personnel, and contractors are demonstrated in the organization charts provided in Figures 4.1 and 4.2. Communication of the overall spill response operation between the Company and the responsible government agencies will occur between the Incident Commander and the Federal On-Scene Coordinator.

Central Communications System

Prearranged communication channels are of the utmost importance in dealing with Company emergencies. The notification procedures and telephone contacts documented in Section 2.0 will be reviewed in accordance with the earlier documented updating procedures. The predetermined communications channels include the following:

- A list of emergency telephone numbers for internal management and emergency response personnel (Figures 2.2 and 2.5).
- A list of emergency telephone numbers for various external resources such as the Fire Departments, Public Officials and local agencies is provided in the Annexes.
- A list of emergency telephone numbers for contract response resources (Figure 2.5).

Communications Equipment

Field communications during a spill response will be handled via radios, telephones, cellular phones, fax machines, and computers, which will be maintained by Company personnel. In the event of a Worst Case Discharge, field communications will be enhanced with contract resources as the situation demands.

Communications Type

Voice communications may be conducted over the public telephone system or Company provided two-way radio equipment.

Radios - Hand-held and vehicle-mounted radio sets are the most effective means of communication for the field response operation. The units are battery operated, multi-channeled, and have a typical range that will cover the area of the response operation. Additional radio sets and battery packs/charges will be necessary in the event of a prolonged response operation.

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Telephone (Conventional) - Conventional land line telephones are the most effective means of communication for regulatory and advisory notifications during a spill response operation. Additional telephone lines can be installed in the event of a prolonged response operation. All major facilities have access to standard telephone service.

Cellular - Cellular telephones are useful during spill events giving the user the ability to travel while using the communication system.

FAX Machines - FAX machines allow for a rapid transfer of information/documentation such as status reports/updates, written notifications, and purchase orders. All administrative office have facsimile machines.

Computers - Computers are commonly used in networks which allow access to various other locations and company personnel. Computers also speed the consolidation of information and preparation of a written report.

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FIGURE A.1

COMPANY OWNED RESPONSE EQUIPMENT

Click to view the file - Hardisty Trailer

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Hardisty 20' Boom Trailer Inventory **INVENTORY**

Seacor Environmental Products Trailer #1

	Equiptment Trailer and Component Description	Item #	Quantity per Trailer	Unit	Removed	Returned	Condition of equipment
1	20' Trailer/Model JT820TA2	1TRAIEN820	1	EA			
2	Simplex 6"x6"x100"	31100	10	EA			
3	Tow Bridles w/Bullet Floats	540030	4	EA			
4	Anchor Systems 40 lb	510001	4	EA			
5	Anchor Systems 24 lb	510001	10	EA			
6	118 Hydraulic Skimmer, Grooved	0SKIMUN340G	1	EA			
7	Power Pac w.Whhels & Speed count	0POWEYA507	1	EA			
8	Kit Hose Petro 3"x60'	0KIT-HO132	1	EA			
	Includes						
	Hose Discharge 3"x10'	4HOSEDI025	1	EA			
	Hose Discharge 3"x15'	4HOSEDI026	2	EA			
	Hose Discharge 3"x20'	4HOSEDI027	1	EA			
	Float House 3"	4FLOAH048	1	EA			
9	Hose, Return Hyd. 3/4"x 50'	4HOSERE012	1	EA			
10	Hose, Pressure Hyd. 1/2"x 50'	4HOSERPR008	1	EA			
11	Fence Post, U-Style		6	EA			
12	Single Head Tent Stakes		4	EA			
13	Fire Extinguisher, Mounted w/Brac		1	EA			
14	First Aid Kit		1	EA			
15	Package of Absorbent Pads		5	EA			
16	Package of Absorbent Boom 5"x1'		5	EA			
17	Tool Box RE: Packing list on Tool						
	Includes						
	Hacksaw		1	EA			
	Screwdriver, #1 Phillips		1	EA			
	Screwdriver, #2 Phillips		1	EA			
	Screwdriver, #1/2"Slotted		1	EA			
	Screwdriver, #3/8" Slotted		1	EA			
	Screwdriver, #5/16" Slotted		1	EA			
	Screwdriver, #3/16 Cabinet		1	EA			
	Wrench, Adjustable		1	EA			
	Diagonal Cutter		1	EA			
	Pliers, Tongue/Groove		1	EA			
	Pliers, Slip Joint		1	EA			
	Pliers, Locking		1	EA			
	Utility Knife		2	EA			
	Measuring Tape		1	EA			
18	Totes RE: Packing list on Totes		2	EA			
19	500 Gal Open Top Tank		1	EA			
20	Diaghram Pump		1	EA			
	Adapter 3" Male	6225214848	2	EA			
21	30 Gal Drum w/Lid & Ring		1	EA			
22	16 lb Hammer		1	EA			
23	8 lb Hammer		1	EA			
24	Load Lock w/4 Hoops		2	EA			
25	Safety Cones		2	EA			

26	Ratchet Straps		6	EA			
27	5 Gal Diesel Container		1	EA			
28	D-rings		12	EA			
29	Incident Command GO BOX & Printer		1	EA			
[illegible]	Funnel		1	EA			
	letal Files		2	EA			
32	Pack of Large Zip ties		1	EA			
33	Emergency air horn		1	EA			
34	Shovels		4	EA			
35	Eye wash bottle		1	EA			
36	Large Traffic Cones		10	EA			
37	6000 Watt diesel Generator		1	EA			
38	Trolley line kit		1	EA			
39	5 Gallon Gasoline jerry ca		1	EA			
40	5 Gallon Diesel jerry can		1	EA			
	Boom Trailer Support Equiptment Kit 1						
1	Pump Spare Parts Kit		1	EA			
2	Anchor Bridles w/alpine Hooks		10	EA			
3	Hand Pump		1	EA			
4	Coupler, Cam loc 3"		3	EA			
5	Plug, 3"		1	EA			
6	Wiper Kit		1	EA			
7	Safety Vest		4	EA			
8	Spool 1/4"x600' Rope		1	EA			
9	Spool1/2"x600' Rope		1	EA			
[illegible]	**oom Trailer Support Equiptment Kit 2**						
	Wheel chock		4	EA			
2	Banjo Ball Valve/Poly 3"		1	EA			
3	Male Adapters, 3"		2	EA			
4	Nipple, 3"		3	EA			
4	Okit-SP048 Spare filter Kit		1	EA			
6	1/4"x1200' Twine		1	EA			
	Modifications to the Trailer						
1	Axel Upgrades to 5500lbs. Each (11,000 lbs.)						
2	Intereior wall moved to center of trailer						
3	Man door ramp installed from right side						
4	Non slip coating applied to front and rear ramps						
5	Racks for anchors installed						
6	Racks for Motor installed						
7	Shelving for tools and absorbents installed						
8	Hooks for Buoys and ropes installed						
9	Tie downs for large equipment installed						
10	5 Rope reels installed						
	Boom and Associated Equipment						
1	700' of new fast water boom						
2	Shoreline Straight Pin Anchors		5	EA			
	horeline Auger Anchors		5	EA			
4	Shoreline Wing Anchors		5	EA			
5	Yellow Metal Buoys		3	EA			
6	Tow Bridles C/W floats		4	EA			

7	Paravane tow assemblies		2	EA			
8	Spare boom connectors		4	EA			
9	Hand line bridles with plastic spacer bars		15	EA			
10	Hand line bridles with metal spacer bars		5	EA			
11	400' of 25' x 1" rope with end quick connectors on rope reel						
12	500' of 50' x 1" rope with end quick connectors on rope reel						
13	1000' of 100' x 1" rope with end quick connectors on rope reel						
14	1000' of 200' x 1" rope with end quick connectors on rope reel						
15	600' of 300' x 1" rope with end quick connectors on rope reel						
16	50' Grey rope for rope reels		7	EA			
17	Hand cranks for rope reels		2	EA			
18	12' Zodiac		1	EA			
19	20hp Honda 4 Stroke for Zodiac		1	EA			
20	Gas tank for Zodiac		1	EA			
21	Bag of Zodiac parts, and repair kit		1	EA			
	Secondary Containment						
1	Portable Fold Down berms, various sizes, in individual sizes, orange, marked bags						
2	Skimmer station		1	EA			
3	Fuel Station		1	EA			
4	Generator Statotion		1	EA			
5	Pump Station		1	EA			

Regina 20' Boom Trailer Inventory **INVENTORY**

Seacor Environmental Products Trailer #2

	Equiptment Trailer and Component Description	Item #	Quantity per Trailer	Unit	Removed	Returned	Condition of equpment
1	20' Trailer/Model JT820TA2 (Serial# 40LAB20279P156448)	1TRAIEN820	1	EA			
2	Simplex 6"x6"x100"	31100	10	EA			
3	Tow Bridles w/Bullet Floats	540030	4	EA			
4	Anchor Systems 40 lb	510001	4	EA			
5	Anchor Systems 24 lb	510001	10	EA			
6	118 Hydraulic Skimmer, Grooved (Serial# TSDH11809248)	0SKIMUN340G	1	EA			
7	Power Pac w.Whhels & Speed count (Serial# D4090016)	0POWEYA507	1	EA			
8	Kit Hose Petro 3"x60'	0KIT-HO132	1	EA			
	Includes						
	Hose Discharge 3"x10'	4HOSEDI025	1	EA			
	Hose Discharge 3"x15'	4HOSEDI026	2	EA			
	Hose Discharge 3"x20'	4HOSEDI027	1	EA			
	Float House 3"	4FLOAH048	1	EA			
9	Hose, Return Hyd. 3/4"x 50'	4HOSERE012	1	EA			
10	Hose, Pressure Hyd. 1/2"x 50'	4HOSERPR008	1	EA			
11	Fence Post, U-Style		6	EA			
12	Single Head Tent Stakes		4	EA			
13	Fire Extinguisher, Mounted w/Brac		1	EA			
14	First Aid Kit		1	EA			
15	Package of Absorbent Pads		5	EA			
16	Package of Absorbent Boom 5"x1'		5	EA			
17	Tool Box RE: Packing list on Tool						
	Includes						
	Hacksaw		1	EA			
	Screwdriver, #1 Phillips		1	EA			
	Screwdriver, #2 Phillips		1	EA			
	Screwdriver, #1/2"Slotted		1	EA			
	Screwdriver, #3/8" Slotted		1	EA			
	Screwdriver, #5/16" Slotted		1	EA			
	Screwdriver, #3/16 Cabinet		1	EA			
	Wrench, Adjustable		1	EA			
	Diagonal Cutter		1	EA			
	Pliers, Tongue/Groove		1	EA			
	Pliers, Slip Joint		1	EA			
	Pliers, Locking		1	EA			
	Utility Knife		2	EA			
	Measuring Tape		1	EA			
18	Totes RE: Packing list on Totes		2	EA			
19	500 Gal Open Top Tank		1	EA			
20	Diaghram Pump		1	EA			
	Adapter 3" Male	6225214848	2	EA			
21	30 Gal Drum w/Lid & Ring		1	EA			
22	16 lb Hammer		1	EA			
23	8 lb Hammer		1	EA			
24	Load Lock w/4 Hoops		2	EA			
25	Safety Cones		2	EA			
26	Ratchet Straps		6	EA			
27	5 Gal Diesel Container		1	EA			
28	D-rings		12	EA			
	Boom Trailer Support Equiptment Kit 1						
1	Pump Spare Parts Kit		1	EA			
2	Anchor Bridles w/alpine Hooks		10	EA			
3	Hand Pump		1	EA			
4	Coupler, Cam loc 3"		3	EA			
5	Plug, 3"		1	EA			

6	Wiper Kit		1	EA			
7	Safety Vest		4	EA			
8	Spool 1/4"x600' Rope		1	EA			
9	Spool1/2"x600' Rope		1	EA			
	Boom Trailer Support Equiptment Kit 2						
	Vheel chock		4	EA			
2	Banjo Ball Valve/Poly 3"		1	EA			
3	Male Adapters, 3"		2	EA			
4	Nipple, 3"		3	EA			
4	Okit-SP048 Spare filter Kit		1	EA			
6	1/4"x1200' Twine		1	EA			
	Boom and Associated Equipment						
1	700' of new fast water boom						
2	Shoreline Straight Pin Anchors		5	EA			
3	Shoreline Auger Anchors		5	EA			
4	Shoreline Wing Anchors		5	EA			
5	Yellow Metal Buoys		3	EA			
6	Tow Bridles C/W floats		4	EA			
7	Paravane tow assemblies		2	EA			
8	Spare boom connectors		4	EA			
9	Hand line bridles with plastic spacer bars		15	EA			
10	Hand line bridles with metal spacer bars		5	EA			
11	400' of 25' x 1" rope with end quick connectors on rope reel						
12	500' of 50' x 1" rope with end quick connectors on rope reel						
13	1000' of 100' x 1" rope with end quick connectors on rope reel						
14	1000' of 200' x 1" rope with end quick connectors on rope reel						
15	600' of 300' x 1" rope with end quick connectors on rope reel						
16	50' Grey rope for rope reels		7	EA			
17	Hand cranks for rope reels		2	EA			
	Modifications to the Trailer						
	ıxel Upgrades to 7000lds. Each (14,000lbs.)						
2	Interior wall movable to 8', 10', or 12' from rear door						
3	48" door with ramp installed front left side						
4	Full width rear double door with ramp						
5	Non slip coating applied to front and rear ramps						
6	2 x 7' x 10' aluminium containment troughs designed as the cover 500 Gallons capacity each.						

KEYSTONE EQUIPMENT TRAILER	INVENTORY

Trailer 2 VIN: 5N6200S3691025773

Original Checklist — **Winnipeg**

	Equipment Trailer and Component Description	Qty per Trailer	Unit	Removed	Returned	Condition
1	34' 18,000 GVW Trailer, with 3 axles	1	ea			
2	28' x 8' Cargo Area plus 7' x 8' Office	1	ea			
3	16" Wheels and Tires TA4 235/80 R16	6	ea			
	lectric Brake System	1	ea			
	nterchangeable Hitch (Ball & Pintle)	1	ea			
6	7000lb Drop Leg Jack	1	ea			
7	Mounteed Wheel and Spare Tire	1	ea			
8	Chains, Lug Wrench, 3 Ton Jack	1	ea			
9	Heavy Duty Door Ramp	1	ea			
10	36" Side Door with lock and keys	1	ea			
11	Stone Guard across front of trailer	4	ea			
12	Stabilizer Scissor Jacks on corners	1	ea			
13	Ladder Racks installed on Roof	1	ea			
14	Roof Racks for 14' Boat and 500' Boom	2	ea			
15	Interior Roof Vents	5	ea			
16	Fluorescent Lighting in Office and Cargo area	4	ea			
17	12V Lights in Office and Cargo area	9	ea			
18	Electrical Outlets in Office and Cargo area	1	ea			
19	50amp Service Panel with 240V cord w/120 Adapter	1	ea			
20	Generator/Shore Power Interface	2	ea			
21	500W Quartz Exterior Lights	3	ea			
22	Heaters/Thermoistats Office (2) Cargo Area (1)	1	ea			
23	Exterior GFI Outlet	1	ea			
24	36" x 15" Office Window	1	ea			
25	Office Door with Window	1	ea			
26	Wrap-Around Desk	1	ea			
27	Base and Upper Storage Cabinets in Office	1	ea			
28	3 Drawer File Cabinet	1	ea			
29	Vinyl Flooring in Office	1	ea			
30	25' Awning on curb side of trailer	1	ea			
31	D-Rings installed C/L of Floor	6	ea			
32	Alarm System with backup battery	1	ea			
33	Exterior LED Lighting	1	ea			

	nunications Equipment Descriptions	Qty per Trailer	Unit			
1	Vilson Dual Band Wireliee Amplifier #801245 Procom Dual Band Antenna 32ft. #301135 BOM/ Keystone - All wiring to office per requirements - All per Keystone revised specification					
2	Midland 2-Way Radios. 22 Chanel FRS/.GMRS with 30 mile range and J1S4 Water-Resistant					
3	AA Batteries 48 Pack					
4	Iridium 9505a Portable Docking Unit with Antena					
5	Scanner, copier, printr all-in-one unit HP Deskjet F4280					

	Containment Equipment	Qty per Trailer	Unit			
1	Simplex Section Boom 6" x 6" x 33' mounted on Equipment Trailer roof rack (495 ft)	15	ea			
2	Bundle Strapsw Fitted 3 per Section	45	ea			
3	Spare Bundle Straps	44	ea			
4	Tow bridles with Bullet Floats	6	ea			
5	Water Barrier 28" x 50ft	1	ea			
6	Add Release Holes / Velcro to Barrier	1	set			
7	PVC Pipe, 3" x 10-ft, Sch-40 for Megasecur Dam	4	ea			
8	Fitted cover for boom rack (TransCanada Blue)	1	ea			
9	Containment Boom Accessory Kit Containing:					
	Storage Container	1	ea			
	Ring Buoy Throw Bag with Line	5	ea			
	Steel Stakes, Approx 1" x 3-ft.	10	ea			
	Boom Connector Pins, Spare	4	ea			
	Duckbill Anchors	10	ea			
	Duckbill Driver (Stored outside of Boom AccKit)	1	ea			
	OP Locking Standard "D" Carabineers	15	ea			
	Petzel Ascenders (Right)	5	ea			
	Petzel Acsenders (Left)	5	ea			
	Pulleys, Climbing/Puller, Rope, 4.5" x 2.5", for 1/2", poly line. CMI RC104	5	ea			
	ledge Hammer 8-lb. 9 (Stored outside of Boom kit)	2	ea			
	~~00' Pier Brindle per Seacor Spec~~	1	ea			

	Recovery Equipment Description	Qty per Trailer	Unit			
	Elastec Skimmer System	1	ea			
	Suction Hose, 3" x 20 ft - 3 x 20' sections for a total of 60', w/Camlok Faittings	1	ea			
1	Power Pack D4 with wheels	1	ea			

	Skimmer Unit 118 Hyd with Grooved Dums	1	ea			
	Hydraulic Pressure Hose 1/2" x 50-ft with Quick Disconnect Couplings	1	ea			
	Hydraulic Return Hose 3/4" x 50' w/o Return Tee	1	ea			
2	Spare Filters	4	ea			
3	Anchor Brides with Alpine hooks	5	ea			
4	~~24 lb Anchor Systems~~	5	ea			
5	~~40 lb Anchor Systems~~	4	ea			
NOTE:	anchor with safety wired galv. Shackle 8ft / 2.43m x 3/8" (10mm) galvanize steel chain lower rode. 2 x 50 ft / 5/8" (16mm) polypropylene rope upper rode with thimbles. Buoy - standard 15" / 38 cm inflatable - 6 ft. / 1.82 m x 5/.8" / 16mm polypropylene painter rope with thimble and					
6	1" Rigid Manta Ray Skimmer head with 3" female cardlock	1	ea			
7	3" female to 3" female aluminum coupling adapter	1	ea			
8	3" Diaphragm Pump with camlocks and wheels	2	ea			
9	Spare diaphragm and valve kit for pumps	2	ea			
10	Hardware Kit for Diaphragm Pumps	2	ea			
11	Flapper Valve	4	ea			
12	Fuel Filter	2	ea			
13	Oil Strainer	2	ea			
14	3" x 20' Oil Res Suction Hose with camlock	1	ea			
15	2 set 3" x 25' Oil Res/Lay Flat with camlock	1	ea			
16	hose pkg. -2 x 25ft discharge & 1x20 suction, oil resistant with plugs/caps, **(2ea) Hose floats**	1	ea			
17	HW Meltblown Pads, 19 x 15 100 Sheets per Bale	10	bales			
18	Socknet Booms, 5" x 10' 4 per Bale	10	bales			
19	Trash Bags, 38" x 65", 50/box	5	bx			
20	Drip Pan, 24" x 24" for 18" Absorbant Pads	2	ea			
21	Oily Debris Bags 36" x 60" x 6 mil (50 ea/bx)	1	bx			
20	7 x Can. Coast Guard approved Mustang Survival MCV 10, "Life Jackets"	7	ea			
21	10 x 10' extendible blue and white reflective cone rails	10	ea			
22	10 x battery operated, white flashing LCD strobe cone lights C/W cone inserts	10	ea			

Storage Equpment Description		**Qty per Trailer**	**Unit**			
1	Tank, Canflex, 2000 Gallon Standard Accessories (Per Tank) (2 ea) 3-inch Anodized Alumninum Fittings (5 ea) D-Ring Anchor Points (5 ea) Handles (2 ea) 3-inch Poly Ball Valves (1 ea tank cover) (1 ea) ground sheet Cover Tie Downs	1	ea			
2	~~Tank, Canflex~~, 500 gallon Open Top Tank Standard Accessories (Per Tank): (2 ea) 3-inch Anodized Aluminum Fittings (5 ea) D-Ring Anchor Points (5 ea) Handles (2 ea) 3-inch Poly Ball Valves (1 ea tank cover) (1 ea) ground sheet Cover Tie Downs	1	ea			

Personal Protection Equipment (PPE) Description		**Qty per Trailer**	**Unit**			
1	Safety Goggles	12	ea			
2	Ear Pulgs 100/ctn	1	ctn			
3	Hard Hats with Chin Straps White	12	ea			
4	Hard Hat Chin Straps	12	ea			
5	Hard had liners	12	ea			
6	Safety Glasses, Visitor-Clear	12	ea			
7	Insect Repellent	2	ea			
8	Safety Glasses / work (clear)	12	ea			
9	Organic Vapor Respirators Medium 5JG98	6	ea			
10	Organic Vapor Respirators Large 5JG98	6	ea			
11	Organic Vapor cartridges (2/ctn)	6	ea			
12	Eye Rinse Solution, 8-oz ea	4	btl			
13	Disposal Repirators Dust Large (20/pkg)	1	pkg			
14	Disposal Repirators Dust Med Dust (20/pkg)	1	pkg			
15	Polar Gloves, Winter Foam Lined, LG	6	pr			
16	Polar Gloves, Winter Foam Lined, XL	6	pr			
17	Nitrile Gloves (100 pr/ctn) Size L	1	ctn			
18	Nitrile Gloves (100 pr/ctn) Size XL	1	ctn			
19	Gloves, Cotton	12	pr			
20	Leather gloves	6	pr			
21	Vinyl 5 mil Gloves, Un-Powered Large (100 ea/box)	1	bx			
22	Tyvek - Disp. Coveralls Size L, Yellow (12 ea/ctn)	2	ctn			

23	Tyvek - Disp. Coveralls Size XL, Yellow (12 ea/ctn)	2	ctn			
24	Tyvek - Disp. Coveralls Size 2X, Yellow (12 ea/ctn)	2	ctn			
25	Latex Over Boot Covers	20	ea			
26						
27	Personal Flotation Device USG Type III Size M	2	ea			
28	Personal Flotation Device USG Type III Size L	4	ea			
29	Personal Flotation Device USG Type III Size XL	4	ea			
	ersonal Flotation Device USG Type III Size XXL	2	ea			
	lip Boots, Assorted, Size 8	1	ea			
32	Hip Boots, Assorted, Size 9	1	ea			
33	Hip Boots, Assorted, Size 10	2	ea			
34	Hip Boots, Assorted, Size 11	2	ea			
35	Hip Boots, Assorted, Size 12	1	ea			
36	Hip Boots, Assorted, Size 13	1	ea			
37	Chaps for Chain saw Large	1	pr			
38	Chaps for Chain Saw Extra Large	1	pr			
39	Ice Sandles with Metal Screws (Mens 7-9)	1	pr			
40	Ice Sandles with Metal Screws (Mens 10-12)	6	pr			
41	Ice Sandles with Metal Screws (Mens 13-15)	1	pr			
42	Rubber Gloves, Insulated, Hi-Viz, Orange	10	pr			
43	Goggles, Snow Machine	2	ea			
44	Face Shield Frame, Clear fits on Hard Hats	2	ea			
45	Visor/Face Shield	4	ea			
46	First Aid Kit, Large	1	ea			
47	Yellow Barricade Flagging, CAUTION, 1000-ft. Roll	1	rl			
48	Flaggin Tape, Orange 150-ft Roll	2	rl			
49	Traffic cones - orange	6	ea			
50	Wheel Chocks	4	ea			
51	Fire Extinguisher - Dry Chemical 10 lb	2	ea			
52	Wall Mount Bracket for Fire Extinguisher	2	ea			
53	Rain Jackets Size L	3	ea			
54	Rain Jackets Size XL	3	ea			
55	Rain Jackets Size XXL	1	ea			
56	Rain Jackets/Bibs Size L	3	ea			
57	Rain Jackets/Bibs Size XL	3	ea			
58	Rain Jackets/Bibs Size XXL	1	ea			
59	Safety Harnesses, Full Body (XL-LG)	2	ea			
60	Safety Vaests Universal Size	6	ea			

	nal Decontamination Equipment Description	**Qty per Trailer**	**Unit**			
1	2 Compartment Decon Pool 8' x 10' x 8"	1	ea			
2	Decon Pool Carrying Bag	1	ea			
3	Storage Container	1	ea			
4	Barricade, Eaasel W/O Barricade Light	1	ea			
5	PVC Ground Cloth/Liner, approx. 6-ft x 18-ft.	1	ea			
6	Wash Brushes, Long Handle	2	ea			
7	1-gallon Galvanized Bucket	3	ea			
8	Degreaser, Simple Green, 1 gal.	1	ea			
9	Protective Hand Lotion, minimum of 16-0z	2	ea			
10	Splash proof goggles	6	ea			
11	Pressurized Spray Can-water, 2 gallon, w/42"Hose	1	ea			
12	Duct Tape, 2" x 60 yd	5	ea			

Support Equipment Description		**Qty per Trailer**	**Unit**			
	Diesel Generator 6KW	1	ea			
	Wheel Kit	1	ea			
1	Spare Fuel Filter	2	ea			
	Recoil Assembly	1	ea			
	Spare Keys	1	ea			
	Oil Strainer	1	ea			
2	50' Generator Cord	1	ea			
	Stihl Chainsaw 36" with Bar Guard	1	ea			
	Spare Bar	1	ea			
	Ice Chain	2	ea			
3	Wood Chain	1	ea			
	Bar Oil	1	ea			
	Spare Spark Plug	1	ea			
	Chain Sharpening File	1	ea			
4	Gas Brush Cutter-Line Trimmer & Brush Blade	1	ea			
	' Gal Gas Can for 2 Cycle	2	ea			
	-Cycle Oil-40/1 (6 per Pkg)	1	ea			
5	Ice Thickness Kit-(1) / 1 Meter Auger Flights, (1) 1/2 Meter Extension (1) Drill Bit. Hand Brace, Cutting Bits,Drill Adapter, Thickness gauge to 4.5 ft and Carrying Case	1	ea			
	Ice Auger 8", 2 cyl, Gas, w/Spare Plug & Starter Rope	1	ea			
6	Ice tong - 300lb 16 1/2"	1	ea			

7	Ice Lifting Chain WLL 2000lbs @ 90 degrees + Bag	1	ea			
8	Toolbox, Yellow Plastic	2	ea			
9	Socket Set with Raqtchet, 3/8" or 1/2"	1	ea			
10	Hack Kit	1	ea			
11	Tie Wire	1	ea			
12	Cable Ties (Zip Ties) Pkg 50,24"	1	ea			
13	Aluminum Pipe Wrench, approx. 18" - 36"	1	ea			
14	Screwdriver Phillips, #1, 6"	1	ea			
15	Screwdriver Phillips, #2, 6"	1	ea			
16	Screwdriver Flat, 10"	1	ea			
17	Screwdriver Flat, 8"	1	ea			
18	Screwdriver Flat, 6"	1	ea			
19	Screwdriver Flat, Cabinet Tip, 10"	1	ea			
20	Adjustable Wrench, 10"	2	ea			
21	Measuring Tape, Fiberglass, 100-ft.	1	ea			
22	Measuring Tape, 25'	1	ea			
23	Cutters, Wire, Diagonal, 7"	1	ea			
24	File Flat, Mill Bastard	1	ea			
25	File Flat, Mill, Cut 6"	1	ea			
26	Pliers, Lineman, Flat Nose, 10"	1	ea			
27	Slip Joint Pliers, 8 1/8 in L	1	ea			
28	Vise Grip, Straight Jaws, 10"	1	ea			
29	Spark Plug Wrench for Auger	1	ea			
30	Claw Hammer	1	ea			
31	Rubber Mallet	1	ea			
32	Utility Knives	2	ea			
33	Flahlights /2D Cell	6	ea			
34	D cell batteries (6/ctn)	2	ea			
35	Cordless Drill with charger	1	ea			
36	Drill Bit Set	1	ea			
37	Screwdriver Bit Set	1	ea			
38	Steel drum	1	ea			
39	20 lb. sledge hammer	1	ea			
40	Machete	2	ea			
41	Pruner, long handle	1	ea			
42	Scoop Shovels, with drilled holes approx 1/2"	2	ea			
43	Ice Scrapers	2	ea			
44	Bolt cutter	1	ea			
45	Pry Bars, 3 ft	2	ea			
46	Steel rakes	2	ea			
47	Round point shovels	2	ea			
48	Snow Shovels	2	ea			
49	Squeegee with tapered ends	2	ea			
50	Post Driver	1	ea			
51	Steel 6' fence stakes	10	ea			
52	Screened pitchforks/debris	2	ea			
53	Steel stakes, 36" x 1"	6	ea			
54	6' Step Ladder	1	ea			
55	Hand truck with ratchet strap separate	1	ea			
56	Hand truck Extensions	1	ea			
57	Come Along, 1 ton	1	ea			
58	Ratchet Straps, 1 in	16	ea			
59	Ratchet Straps, 2 in	16	ea			
60	5 gallon diesel can-yellow	1	ea			
61	Safety gas can 5 gallon - red	1	ea			
62	Monkey Fist	2	ea			
63	Rags, box cotton	1	ea			
64	Portable light stands 110V with Halogens	2	ea			
65	50 ft. extension cords	2	ea			
66	600 ft spool, 1/4" Manila Line	1	ea			
67	600 ft spool, 1/4 Poly Line	1	ea			
68	600 ft spool, 1/2" Poly Line	1	ea			
69	600 ft spool 1/2" Blue Steel Poly Line	1	ea			
70	Padlocks for Doors, Spare Tire and Ramp	4	ea			
71	Padlock for Hitch	1	ea			
72	1000 watt Honda generator	1	ea			
73	30" life ring	1	ea			
74	48" rescue Can with tow strap	1	ea			
75	2x rescue throw floats c/w 50' of attached line	2	ea			
76	Two eye wash bottles c/w two bottles eye wash solution	2	ea			
77	1x 5.4 liter bottle of fast orange cleanser	1	ea			
78	1 flammable storage cabinet	1	ea			
79	1 48" wind sock c/w pole and accessories	1	ea			
80	Two aluminum seating benches	2	ea			
81	one 21' aluminum articulating ladder	1	ea			
82	1x box FR tyvek	1	box			
83	12x XL and 12x 2XL coveralls	24	ea			

84	6x 36" Traffic cones	6	ea			
85	1 environmental sample kit consisting of 2 coolers of sample bottles					
86	1 sand bag fill scoop c/w 100 sandbags	1	ea			
87	1 Fuel filling station pop up berm	1	ea			
88	1 generator pop up berm	1	ea			
89	1 Trolley line deployment kit C/W:	1	ea			
	1 x Trolley	1	ea			
	' x 4" pulley block	1	ea			
	2 x 12' 2500 lb, ratchet straps	2	ea			
	3 x 3" screw type chain connectors	3	ea			
	2 x 3" swivel safety snap hooks	2	ea			
	3 x 3" shackles	3	ea			
	2 x 15' lengths of 3/8" chain with 3" safety snap hooks each end	2	ea			

	Boat and Equipment Description	Qty per Trailer	Unit			
3	14 ft boat w/9.8 HP engine	1	ea			
5	Oars, Gas Tank, Hose	1	ea			
6	Towing Eyes (Shipped Loose/Not Installed)	1	ea			
7	Tow Bridle (Shipped Loose/Not Installed)	1	ea			

	Equipment Trailer Shelving and Container Description	Qty per Trailer	Unit			
1	4' x 2' Starter with 3 Shelves	1	ea			
2	4' x 3' Starter with 3 Shelves	1	ea			
3	6' x 2' Add-on with 3 Shelves	1	ea			
4	6' x 2' Shelving	1	ea			
5	6' x 3' Add-on with 3 Shelves	1	ea			
6	8' x 2' Add-on with 3 Shelves	1	ea			
7	8' x 3' Add-on with 3 Shelves	2	ea			
8	Shelf (No Decking) 2 x 6	2	ea			
9	Shelf (No Decking) 2 x 8	5.5	ea			
10	Shelf (No Decking) 3 x 4	3	ea			
11	Shelf (No Decking) 3 x 6	2	ea			
12	Stack Tote Bin.L31 1/2,W19 3/4.32 Gal	4	ea			
13	Stack Tote Bin.L39 1/2,W24 1/2.50 Gal	1	ea			
14	Container, Shipping	10	ea			
15	Container, Shipping	8	ea			
16	Container, Shipping	3	ea			

	›ment Trailer Miscellaneous	Qty per Trailer	Unit			
	ROC Barrier and Refill in Equipment Trailer	1	ea			
2						
3	Dymo Printer 1/2", 3/4" and 1" Tape	0.25	ea			
4	Boom Trolley	1	ea			
5	Non-Skid Tape	1	ea			
6	D-Rings	2	ea			
7	L-Braces	12	ea			
8	1/4" Stainless Sheet Metal Screws 3/4"	1.5	ea			
9	1/4" Stainelss Sheet Metal Screws 1"	2	ea			
10	1/4" Stainless Sheet Metal Screws 1-1/2"	2	ea			
11	1/4-20 Pan Head Machine Screws 3/4"	0.25	ea			
12	1/4 20 Locknut, Tooth Washer	0.5	ea			
13	1/4" Flat Washer, 9/32ID X 5/8 OD	0.25	ea			
14	1/4" Fender Washer, 9/32ID x 1 1-1/4 OD	2	ea			
15	#3 Phillips Tip 3"	0.5	ea			
16	#3 Phillips Tip 6"	0.5	ea			
17	Drill Bit Set	0.25	ea			
18	Stretch Bungee Adjustable 6" - 40"	8	ea			
19	Bungee Assorted (15 pc)	2	ea			
20	Ratchet Tie Down 1000 lb 1-1/2" x 6', Pk 2	2	ea			
21	Ratchet Tie Down 1000 lb 1-1/2" x 15'	5	ea			
22	All Operaton/Maintenance Manuals and Warranty Cards shipped in bottom drawer in Office	1	set			

	SEACOR Pack List	Qty per Trailer	Unit			
1	Hand-held air horn 5.5 oz marine type	1	ea			
2	5.5 oz air horn refill	1	ea			
3	Cable ties, plastic zip ties 25/pack	2	ea			
4	Polypropylene rope 1/4"x 600	1	ea			
5	Wooden Stakes 2" x 2" x 24"	25	bdle			
	fallet #3	1	ea			
	Mylar Flash Tape 1/2" x 200-300 rolls	20	set			
8	Bird Hazing Assembly	1	ea			
9	Empty Propane gas tank, fiberglass #20	1	ea	Empty	Empty	Empty
10	Scare-eye Ballons, red-blk-yel mix	20	set			
11	Crescent Wrench 10-12"	1	ea			
12	HD Industrail Paper Towels, Roll	2	ea			

13	PPE-KIT, 4Person -Includes: Tyvek suits, Safety glasses, ear plugs	1	ea			
14	Multi-use Scary man, Inflatable scarecrow	1	ea			
15	Hand-Held In-Situ Start Kit	1	ea			
16	Black Half Tote w/Lid	1	ea			

	Signage and Marking	Qty per Trailer	Unit			
1	Heavy Duty Sign Posts	12	ea			
2	Box wing nuts, plates, and bolts for signs	1	ea			
3	Metal "No Smoking" signs	6	ea			
4	Metal " Smoking Area" signs	6	ea			
5	Metal "TransCanada" double sided signs	6	ea			
6	Metal "TransCanada Incident/ Exercise" double sided signs	6	ea			
7	Metal "Hot Zone" signs	4	ea			
8	Metal "Warm Zone" signs	4	ea			
9	Metal " Cold Zone" signs	4	ea			
10	Large tub Containing:	1	ea			
	Large triangular inflatable marker buoys in dry bags	4	ea			
	flashing 80 hour LED lights for buoys at night	12	ea			
As Part of this assembly;						
	Plastic "TransCanada Incident/ Exercise" double sided signs	12	ea			
	Anchors for marker buoys c/w 50" rope and attachment clips	4	ea			

	General Equiptment	Qty per Trailer	Unit			
1	95 Gallon overpack drums containing:	2	ea			
	Roll, 150'x36", oil only absorbent pad	1	ea			
	10'x3" oil only absorbent socks	8	ea			
	15"x15" oil only absorbent pillows	10	ea			
2	Large pylons	6	ea			
3	Power air blower for inflating buoys, boom, zodiac, etc.	1	ea			
4	1000 watt Honda portable gas powered generator	1	ea			
5	Rolls poly, 20'x100', 6mil	3	ea			
6	bales 2'x2' oil absorent pads (100 per bale)	12	ea			
7	bales 10'x5" oil absorbent boom (4perbale)	6	ea			
8	35 gallon plastic (overpack/waste/decon) drums c.w lids and ring closures	2	ea			
9	box 6 mil liners for waste drums	1	ea			
10	set large ice tongs	1	set			
11	ice thickness measuring device	1	ea			
12	windstock with 12' pole (mount on side of trailer at top left of ladder)	1	ea			
13	rolls 50' snow fleece	2	ea			
14	roll 50' chicken wire	2	ea			
15	48" aluminum fold down benches	2	ea			
16	16' articulating ladder	1	ea			
17	sand bag scoops c/w 100 sandbags	2	ea			
18	flammable liquids cabinet	1	ea			

	Water Safety	Qty per Trailer	Unit			
1	40" life saving throw ring	1	ea			
2	36" life saving, life guard can	1	ea			
3	rope bags with 100"rope (tag lines)	4	ea			
4	throw balls with self deploying rope	2	ea			
5	12" pool reach	1	ea			

	Secondary Containment	Qty per Trailer	Unit			
1	Portable fold down berms, various sizes, in individual, orange, marked bags;					
	skimmer station	1	ea			
	fuel station	2	ea			
	generator station	1	ea			
	pump station	2	ea			

	Initial Environmental sampling kit	Qty per Trailer	Unit			
1	Large cooler of sampling containers	1	ea			
2	small cooler of sampling containers	1	ea			
3	box of extra sample vials	1	ea			

	Incident Command Equiptment	Qty per Trailer	Unit			
1	ICS role Kit box	1	ea			
2	ICS go box	1	ea			
3	6' Folding Tables	4	ea			
4	folding 4'x8' status board c/w hooks and clip boards	1	ea			
5	Incident Command Structure Board	1	ea			
6	easels	2	ea			
7	folding chairs	6	ea			
8	electrical surge protector	1	ea			

9	Personal Accountability tags (PAS) 25 BLACK for TC guests and VIP's, 75 RED for Contactors	1	set			

	Modifications to the Trailer	Qty per Trailer	Unit			
1	Continual Roof top, Fold don, Fall protection	1	ea			
2	New Rooftop rear Storage area (this is where the ladders are, PVC 6" pipe, and hose is now stored)	1	ea			
	Tarps cover the boom storage area, and ladder/hose storage area					
	Wind stock mount (at rear top left of ladder)					

Hardisty 20' Boom Trailer Inventory **INVENTORY**

Seacor Environmental Products Trailer #1

	Equiptment Trailer and Component Description	Item #	Quantity per Trailer	Unit	Removed	Returned	Condition of equipment
	'0' Trailer/Model JT820TA2	1TRAIEN820	1	EA			
	Simplex 6"x6"x100"	31100	10	EA			
3	Tow Bridles w/Bullet Floats	540030	4	EA			
4	Anchor Systems 40 lb	510001	4	EA			
5	Anchor Systems 24 lb	510001	10	EA			
6	118 Hydraulic Skimmer, Grooved	0SKIMUN340G	1	EA			
7	Power Pac w.Whhels & Speed count	0POWEYA507	1	EA			
8	Kit Hose Petro 3"x60'	0KIT-HO132	1	EA			
	Includes						
	Hose Discharge 3"x10'	4HOSEDI025	1	EA			
	Hose Discharge 3"x15'	4HOSEDI026	2	EA			
	Hose Discharge 3"x20'	4HOSEDI027	1	EA			
	Float House 3"	4FLOAH048	1	EA			
9	Hose, Return Hyd. 3/4"x 50'	4HOSERE012	1	EA			
10	Hose, Pressure Hyd. 1/2"x 50'	4HOSERPR008	1	EA			
11	Fence Post, U-Style		6	EA			
12	Single Head Tent Stakes		4	EA			
13	Fire Extinguisher, Mounted w/Brac		1	EA			
14	First Aid Kit		1	EA			
15	Package of Absorbent Pads		5	EA			
16	Package of Absorbent Boom 5"x1'		5	EA			
	'ool Box RE: Packing list on Tool						
	Includes						
	Hacksaw		1	EA			
	Screwdriver, #1 Phillips		1	EA			
	Screwdriver, #2 Phillips		1	EA			
	Screwdriver, #1/2"Slotted		1	EA			
	Screwdriver, #3/8" Slotted		1	EA			
	Screwdriver, #5/16" Slotted		1	EA			
	Screwdriver, #3/16 Cabinet		1	EA			
	Wrench, Adjustable		1	EA			
	Diagonal Cutter		1	EA			
	Pliers, Tongue/Groove		1	EA			
	Pliers, Slip Joint		1	EA			
	Pliers, Locking		1	EA			
	Utility Knife		2	EA			
	Measuring Tape		1	EA			
18	Totes RE: Packing list on Totes		2	EA			
19	500 Gal Open Top Tank		1	EA			
20	Diaghram Pump		1	EA			
	Adapter 3" Male	6225214848	2	EA			
	30 Gal Drum w/Lid & Ring		1	EA			
	.6 lb Hammer		1	EA			
23	8 lb Hammer		1	EA			
24	Load Lock w/4 Hoops		2	EA			
25	Safety Cones		2	EA			

26	Ratchet Straps		6	EA			
27	5 Gal Diesel Container		1	EA			
28	D-rings		12	EA			
29	Incident Command GO BOX & Printer		1	EA			
30	Funnel		1	EA			
31	Metal Files		2	EA			
32	Pack of Large Zip ties		1	EA			
33	Emergency air horn		1	EA			
34	Shovels		4	EA			
35	Eye wash bottle		1	EA			
36	Large Traffic Cones		10	EA			
37	6000 Watt diesel Generator		1	EA			
38	Trolley line kit		1	EA			
39	5 Gallon Gasoline jerry ca		1	EA			
40	5 Gallon Diesel jerry can		1	EA			
	Boom Trailer Support Equiptment Kit 1						
1	Pump Spare Parts Kit		1	EA			
2	Anchor Bridles w/alpine Hooks		10	EA			
3	Hand Pump		1	EA			
4	Coupler, Cam loc 3"		3	EA			
5	Plug, 3"		1	EA			
6	Wiper Kit		1	EA			
7	Safety Vest		4	EA			
8	Spool 1/4"x600' Rope		1	EA			
9	Spool1/2"x600' Rope		1	EA			
	Boom Trailer Support Equiptment Kit 2						
1	Wheel chock		4	EA			
2	Banjo Ball Valve/Poly 3"		1	EA			
3	Male Adapters, 3"		2	EA			
4	Nipple, 3"		3	EA			
4	Okit-SP048 Spare filter Kit		1	EA			
6	1/4"x1200' Twine		1	EA			
	Modifications to the Trailer						
1	Axel Upgrades to 5500lbs. Each (11,000 lbs.)						
2	Intereior wall moved to center of trailer						
3	Man door ramp installed from right side						
4	Non slip coating applied to front and rear ramps						
5	Racks for anchors installed						
6	Racks for Motor installed						
7	Shelving for tools and absorbents installed						
8	Hooks for Buoys and ropes installed						
9	Tie downs for large equipment installed						
10	5 Rope reels installed						
	Boom and Associated Equipment						
1	700' of new fast water boom						
2	Shoreline Straight Pin Anchors		5	EA			
3	Shoreline Auger Anchors		5	EA			
4	Shoreline Wing Anchors		5	EA			
5	Yellow Metal Buoys		3	EA			
6	Tow Bridles C/W floats		4	EA			

7	Paravane tow assemblies		2	EA			
8	Spare boom connectors		4	EA			
9	Hand line bridles with plastic spacer bars		15	EA			
10	Hand line bridles with metal spacer bars		5	EA			
	400' of 25' x 1" rope with end quick connectors on rope reel						
	00' of 50' x 1" rope with end quick connectors on rope reel						
13	1000' of 100' x 1" rope with end quick connectors on rope reel						
14	1000' of 200' x 1" rope with end quick connectors on rope reel						
15	600' of 300' x 1" rope with end quick connectors on rope reel						
16	50' Grey rope for rope reels		7	EA			
17	Hand cranks for rope reels		2	EA			
18	12' Zodiac		1	EA			
19	20hp Honda 4 Stroke for Zodiac		1	EA			
20	Gas tank for Zodiac		1	EA			
21	Bag of Zodiac parts, and repair kit		1	EA			
	Secondary Containment						
1	Portable Fold Down berms, various sizes, in individual sizes, orange, marked bags						
2	Skimmer station		1	EA			
3	Fuel Station		1	EA			
4	Generator Statotion		1	EA			
5	Pump Station		1	EA			

EQUIP TYPE	EQUIP ID	VIN / SER#	REGION	LOCATION	REGISTRATION	INSURANCE	TITLE NUMBER
ER TRAILER, 34'	ERT34-001			Yankton, SD			
DRUM SKIMMER	DS-34-001			Yankton, SD			
POWER PACK	PP-34-001			Yankton, SD			
PUMP, 3"	PU-34-001			Yankton, SD			
BOOM, RIVER 8"	BM8-34-001			Yankton, SD			
ER TRAILER, 34'	ERT34-002			St. Joseph, MO			
DRUM SKIMMER	DS-34-002			St. Joseph, MO			
POWER PACK	PP-34-002			St. Joseph, MO			
PUMP, 3"	PU-34-002			St. Joseph, MO			
BOOM, RIVER 8"	BM8-34-002			St. Joseph, MO			
ER TRAILER, 34'	ERT34-003			Middletown, MO			
DRUM SKIMMER	DS-34-003			Middletown, MO			
POWER PACK	PP-34-003			Middletown, MO			
PUMP, 3"	PU-34-003			Middletown, MO			
BOOM, RIVER 8"	BM8-34-003			Middletown, MO			
ER TRAILER, 20'	ERT20-001			Valley City, ND			
DRUM SKIMMER	DS-20-001			Valley City, ND			
POWER PACK	PP-20-001			Valley City, ND			
PUMP, 3"	PU-20-001			Valley City, ND			
BOOM, RIVER 8"	BM8-20-001			Valley City, ND			
ZODIAK	ERT20-001-ZK			Valley City, ND			
ER TRAILER, 20'	ERT20-002			Roxana, IL			
DRUM SKIMMER	DS-20-002			Roxana, IL			
POWER PACK	PP-20-002			Roxana, IL			
PUMP, 3"	PU-20-002			Roxana, IL			
BOOM, RIVER 8"	BM8-20-002			Roxana, IL			
ZODIAK	ERT20-002-ZK			Roxana, IL			
ER TRAILER, 20'	ERT20-003			Fairbury, NE			
DRUM SKIMMER	DS-20-003			Fairbury, NE			
POWER PACK	PP-20-003			Fairbury, NE			
PUMP, 3"	PU-20-003			Fairbury, NE			
BOOM, RIVER 8"	BM8-20-003			Fairbury, NE			
ZODIAK	ERT20-003-ZK			Fairbury, NE			
ER TRAILER, 20'	ERT20-004			Wichita, KS			
DRUM SKIMMER	DS-20-004			Wichita, KS			
POWER PACK	PP-20-004			Wichita, KS			
PUMP, 3"	PU-20-004			Wichita, KS			
BOOM, RIVER 8"	BM8-20-004			Wichita, KS			
ZODIAK	ERT20-004-ZK			Wichita, KS			
ER TRAILER, 20'	ERT20-005			Ponca City, OK			
DRUM SKIMMER	DS-20-005			Ponca City, OK			
POWER PACK	PP-20-005			Ponca City, OK			
PUMP, 3"	PU-20-005			Ponca City, OK			
BOOM, RIVER 8"	BM8-20-005			Ponca City, OK			
ZODIAK	ERT20-005-ZK			Ponca City, OK			
OPEN TRAILER, 20'	OT-001			Yankton, SD			
BOOM, RIVER 10"	BM10-OT-001			Yankton, SD			

OPEN TRAILER, 20'	OT-002			St. Joseph, MO			
BOOM, RIVER 10"	BM10-OT-002			St. Joseph, MO			
OPEN TRAILER, 20'	OT-003			Ponca City, OK			
BOOM, RIVER 10"	BM10-OT-003			Ponca City, OK			
BOAT TRAILER	TMUN-001			Yankton, SD			
OSRV - MUNSON	MUN-001			Yankton, SD			
BOAT TRAILER	TMUN-002			St. Joseph, MO			
OSRV - MUNSON	MUN-002			St. Joseph, MO			
BOAT TRAILER	TMUN-003			Tyler, TX			
OSRV - MUNSON	MUN-003			Tyler, TX			
BOAT TRAILER	TMUN-004			Tyler, TX			
OSRV - MUNSON	MUN-004			Tyler, TX			
BOAT TRAILER	TWB-001			Valley City, ND			
WORK BOAT, 20'	WB-001			Valley City, ND			
BOAT TRAILER	TWB-002			Yankton, SD			
WORK BOAT, 20'	WB-002			Yankton, SD			
BOAT TRAILER	TWB-003			Fairbury, NE			
WORK BOAT, 20'	WB-003			Fairbury, NE			
BOAT TRAILER	TWB-004			St. Joseph, MO			
WORK BOAT, 20'	WB-004			St. Joseph, MO			
BOAT TRAILER	TWB-005			Middletown, OH			
WORK BOAT, 20'	WB-005			Middletown, OH			
BOAT TRAILER	TWB-006			Roxana, IL			
WORK BOAT, 20'	WB-006			Roxana, IL			
BOAT TRAILER	TWB-007			Wichita, KS			
WORK BOAT, 20'	WB-007			Wichita, KS			
BOAT TRAILER	TWB-008			Ponca City, OK			
WORK BOAT, 20'	WB-008			Ponca City, OK			

Storage of equipment will be at Durant, OK - Tyler, TX – Liberty, TX – Nederland, TX

Each location will have the following kits.

- **Sandbag Kit**
  - 50 Sandbags
  - 5 Supersaks
  - 3 Spade Shovels
  - 2 Flat Shovels
  - 1 Pry Bar
  - 2 Sets Hip Waiters
  - 20 Rebar
  - 1 Large Sledgehammer
  - 1 Small Sledgehammer
  - 100' Poly Rope
  - 1 Safety Throw Line
  - 2 PFD's
- **Underflow Dam Kit** (Various size PVC based on local geography)
  - 10 6' Sections of PVC pipe
  - 5 PVC Elbows
  - 5 PVC Ball Valves
  - 5 Cargo Straps
  - Sawzall
  - 300' Poly Rope
  - 2 PFD's
- **Boom/Sorbent Kit**
  - 50' 6" Creek Boom
  - 100' Sausage Boom
  - 4 Bales of Sorbent Pads
  - 2 Bags of Snare
  - 200' Poly Rope
  - 2 Sets Hip Waiters
  - 1 Safety Throw Line
  - 1 Roll Sweep Boom
  - 100' Orange Fence
  - 2 PFD's
- **Culvert Blocking Kit**
  - Various size Plugs
  - 50 Rebar
  - Sawzall
  - 1 Large Sledgehammer
  - 1 Medium Sledghammer
  - 2 Sets Hip Waiters
  - 2 Safety Throw Line
  - 100' Poly Rope
  - 5 Sheets 4x8 Plywood (Stored at Shop)
  - 2 PFD's

Additional Sorbent Materials and assorted PPE will be stored at each location and available for response.
Information accurate as of 7/30/13

FIGURE A.2

RESPONSE RESOURCES

Zone : Hardisty Pump Station/ Regina Pump Station

COOPERATIVES
Western Canadian Spill Services Ltd.
Albert - Area U and S Oil Spill Cooperatives
Saskatchewan - Area 3 and 6 Oil Spill Cooperatives
National Response Corporation (OSRO, not a Cooperative)

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Zone : Regina Pump Station / Haskett Pump Station

COOPERATIVES
National Response Corporation (OSRO, not a Cooperative)
Western Canadian Spill Services Ltd.
Saskatchewan - Area 6 and 4 & 5 Oil Spill Cooperatives

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Zone : North Dakota, South Dakota, Nebraska

Area : North Dakota, South Dakota, Nebraska

OSRO Name	Contract Number	Environment Type	Facility Classification Level			
			MM	W1	W2	W3
National Response Corporation	TBD	River/Canal	X	X	X	X
		Inland	X	X	X	X
		Open Ocean	X	X	X	X
		OffShore	X	X	X	X
		Near Shore	X	X	X	X
		Great Lakes				

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Zone : Kansas, Missouri, Illinois

Area : Kansas, Missouri, Illinois

OSRO Name	Contract Number	Environment Type	Facility Classification Level			
			MM	W1	W2	W3
National Response Corporation	TBD	River/Canal	X	X	X	X
		Inland	X	X	X	X
		Open Ocean	X	X	X	X
		OffShore	X	X	X	X
		Near Shore	X	X	X	X
		Great Lakes				

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Zone : Cushing Extension

Area : Cushing Extension Area

OSRO Name	Contract Number	Environment Type	Facility Classification Level			
			MM	W1	W2	W3
National Response Corporation	TBD	River/Canal	X	X	X	X
		Inland	X	X	X	X
		Open Ocean	X	X	X	X
		OffShore				
		Near Shore	X	X	X	X
		Great Lakes	X	X	X	X

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Zone : Gulf Coast

Area : Gulf Coast

OSRO Name	Contract Number	Environment Type	Facility Classification Level			
			MM	W1	W2	W3
National Response Corporation	TBD	River/Canal	X	X	X	X
		Inland	X	X	X	X
		Open Ocean	X	X	X	X
		OffShore				
		Near Shore	X	X	X	X
		Great Lakes	X	X	X	X

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FIGURE A.3

USCG OSRO CLASSIFICATIONS

The USCG has classified OSROs according to their response capabilities, within each Captain of the Port (COTP) zone, for vessels and for facilities in four types of environments. Response capabilities are rated MM, W1, W2, or W3 as described below:

MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATIONS			
Classification	Resource Quantity Guidelines	Maximum Facility Response Times	Maximum Vessel Response Times
Rivers/Canals			
MM	Protective Boom: 4,000*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 25,000*ft EDRC: 1,875 bbls TSC: 3,750 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 25,000*ft EDRC: 3,750 bbls TSC: 7,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 25,000*ft EDRC: 7,500 bbls TSC: 15,000 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports: 60 hours Other Ports: 72 hours
Great Lakes			
MM	Protective Boom: 6,000*ft EDRC: 1,250 bbls TSC: 2,500 bbls	All Ports: 6 hours	All Ports: 12 hours
W1	Protective Boom: 30,000*ft EDRC: 6,250 bbls TSC: 12,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 30,000*ft EDRC: 12,500 bbls TSC: 25,000 bbls	All Ports: 36 hours	All Ports: 42 hours
W3	Protective Boom: 30,000*ft EDRC: 25,000 bbls TSC: 50,000 bbls	All Ports: 60 hours	All Ports: 66 hours

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MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATIONS			
Classification	**Resource Quantity Guidelines**	**Maximum Facility Response Times**	**Maximum Vessel Response Times**
Inland			
MM	Protective Boom: 6,000*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 30,000*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 25,000*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 25,000*ft EDRC: 50,500 bbls TSC: 100,500 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports: 60 hours Other Ports: 72 hours
Great Lakes			
MM	Protective Boom: 8,000*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 30,000*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 30,000*ft EDRC: 25,500 bbls TSC: 50,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 30,000*ft EDRC: 50,000 bbls TSC: 100,000 bbls	High Volume Ports: 54 hours Other Ports: 60 hours (for open ocean, plus travel time from shore)	High Volume Ports: 60 hours Other Ports: 72 hours (for open ocean, plus travel time from shore)

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MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATIONS			
Classification	**Resource Quantity Guidelines**	**Maximum Facility Response Times**	**Maximum Vessel Response Times**
Offshore			
MM	Protective Boom: 6,000*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 15,000*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 24 hours Other Ports: 48 hours	High Volume Ports: 24 hours Other Ports: 48 hours
W2	Protective Boom: 15,000*ft EDRC: 25,000 bbls TSC: 50,000 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 15,000*ft EDRC: 50,000 bbls TSC: 100,000 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports: 60 hours Other Ports: 72 hours
Open Ocean			
MM	Protective Boom: 0*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 0*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 0*ft EDRC: 25,000 bbls TSC: 50,000 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 0*ft EDRC: 50,000 bbls TSC: 100,000 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports: 60 hours Other Ports: 72 hours

1. Rivers/canals include bodies of water, including the Intracoastal Waterway and other bodies artificially created for navigation, confined within an inland area and having a project depth of 12 feet (3.66 meters).
2. EDRC stands for "effective daily recovery capacity," or the calculated recovery capacity of oil recovery devices determined by using a formula that takes into account limiting factors such as daylight, weather, sea state, and emulsified oil in the recovered material.
3. TSC stands for "temporary storage capacity," meaning sufficient storage capacity equal to twice the EDRC of an OSRO. Temporary storage may include inflatable bladders, rubber barges, certified barge capacity, or other temporary storage that can be utilized on scene at a spill response and which is designed and intended for the storage of flammable or combustible liquids. It does not include vessels or barges of opportunity for which no pre-arrangements have been made. Fixed shore-based storage capacity, ensured available by contract or other means, will be acceptable.

* In addition, 1,000 feet of containment boom plus 300 feet per skimming system.

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FIGURE A.4

AGREEMENTS/CONTRACTS

Click to view the file - National Response Corporation

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SPILL RESPONSE CONTRACT CERTIFICATION

National Response Corporation (NRC) certifies that **TransCanada USA Operations Inc.** has "ensured, by contract or other approved means, the availability of private personnel and equipment necessary to respond, to the maximum extent practicable, to a worst case or medium case discharge" for the below named Facilities. NRC agrees that the Client has the right to name NRC and its resources, including those within its Independent Contractor Network (ICN) for Oil Pollution Act of 1990 (OPA) coverage for the below named Facilities. NRC has filed its Spill Response Plan Appendix with the U.S. Coast Guard, and that the Client is authorized to reference this Appendix in their Facility Response Plan. This Appendix presently covers all ports in the U.S. East, West, Inland Region, Gulf Coasts, Great Lakes and the U.S. Caribbean. NRC reserves the right to rescind this authorization in the event of termination of its contractual arrangements with the Facilities.

Entered Facilities & Pipeline Systems:

TransCanada Keystone Pipeline System

Acknowledged by: Date: **August 16, 2013**

National Response Corporation

President

NRC • 3500 Sunrise Highway • Great River, New York 11739 • +1 631 224 9141
www.nrcc.com

MASTER SUPPLY AGREEMENT – FIELD SERVICES No. 11935

This Agreement for the provision of services is entered into this 1st day of April 2013 (**"Effective Date"**) between:

TransCanada USA Operations, Inc.
a Corporation formed under the laws of Delaware and having an office at 717 Texas Street, Houston, Texas 77002
(**"Company"**)

- and -

National Response Corporation,
a Corporation formed under the laws of Delaware and having an office at 3500 Sunrise Highway, Suite T103,
Great River, NY 11739
(**"Supplier"**).

1. REPRESENTATIVES

1.1 The Company's Representative is Michael O'Neill or such other individual or individuals as may be named by the Company from time to time in a Work Authorization or Change Order or otherwise upon notice to the Supplier. The Company's Representative shall have the authority to give any notices, approvals and directions that may be given by the Company pursuant to this Agreement.

1.2 The Supplier's Representative is Deborah Wick. The Supplier shall not change its Representative, except with the prior approval of the Company. The Supplier's Representative has the authority to bind the Supplier on all matters relating to the Work and this Agreement. A communication to or with the Supplier's Representative shall be deemed **to** be communications to or with the Supplier.

2. TERM

2.1 The term of this Agreement shall commence on April 1, 2013 and subject to adjustment as provided in this Agreement, shall terminate on April 1, 2014 (the "Term").

3. MASTER AGREEMENT

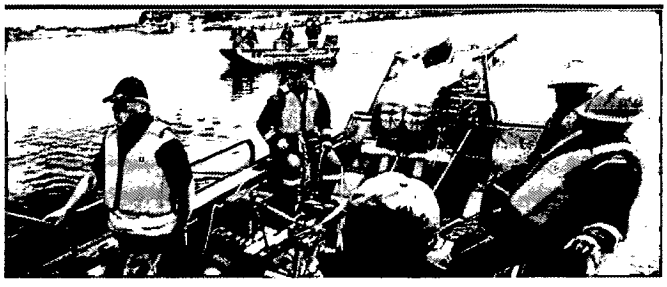
3.1 Contractor's Federal Tax ID number, applicable State Tax ID and State License number(s) are to be provided on each Release Order entered into by the Parties.

3.2 The Parties agree that any entity that is a Company may issue a Release Order to have Work performed for it by the Contractor under this Master Agreement, and that both Parties will be bound by the terms of this Master Agreement.

3.3 Where Work is performed by the Contractor for the Company, the Contractor will look solely to the entity named in the Release Order for the performance of those obligations of the Company that arise out of or are related to such Work and Release Order, including, without limitation, payment and indemnification obligations.

4. NOTICES

4.1 Notices and other communications pursuant to this Agreement shall be in writing and sent by first class, certified or registered mail (postage prepaid), facsimile, electronic (E-mail) or courier to the Representative at the address tor the Company or the Supplier noted below. Notices shall be deemed delivered when received (or when receipt is refused) or if sent by facsimile or courier, on the first business day following the date of transmission.



WESTERN CANADIAN SPILL SERVICES LTD.

24 HOUR EMERCENCY CONTACT 1-866-541-8888

MEMBERSHIP CHARTER

PURPOSE

The purpose of Western Canadian Spill Services Ltd. (WCSS) is to provide spill preparedness and response support services that meet regulatory requirements for licensees of wells and pipeline that are members in good standing of WCSS oil spill cooperatives in Alberta, NE British Columbia and Area 1 in Saskatchewan.

MEMBERSHIP

Membership is available to all upstream petroleum licensees in Alberta, NE British Columbia and in the Saskatchewan portion of the VR1 Oil Spill Cooperative for the following types of operations:

- Licensed wells - including gas wells that produce > 2m3 liquid hydrocarbon/month
- Licensed pipelines/km

MEMBERSHIP OBLIGATION

- WCSS members must pay their annual membership fees based on a flat fee, well counts and kilometres of licensed pipelines.
- WCSS members are required to sign an equipment use agreement prior to utilizing WCSS spill equipment for training purposes and/or spill response activities. In the event that the member is unable to sign the agreement prior to dispatching the equipment to the site; that member will be held responsible (same conditions as WCSS Equipment Use Agreement) for the equipment until such time as that member signs the equipment use agreement.

WCSS members should:

- Strive to be in compliance with regulatory requirements related to spill preparedness; including training requirements (i.e. attending annual Oil Spill Cooperative exercises).
- Conduct a spill risk assessment for their operations and implement adequate risk control measures where required.
- Maintain a copy of the WCSS Oil Spill Contingency Manual that is specific to each of the Oil Spill Cooperatives where that member operates; area updates are available on the WCSS website (www.wcss.ab.ca).
- Familiarize themselves with oil spill control points in surface water downstream from potential uncontrolled release sites.
- Identify local external spill response resources that may be required to supplement internal resources and those provided by WCSS.
- Participate in Oil Spill Cooperative activities where possible

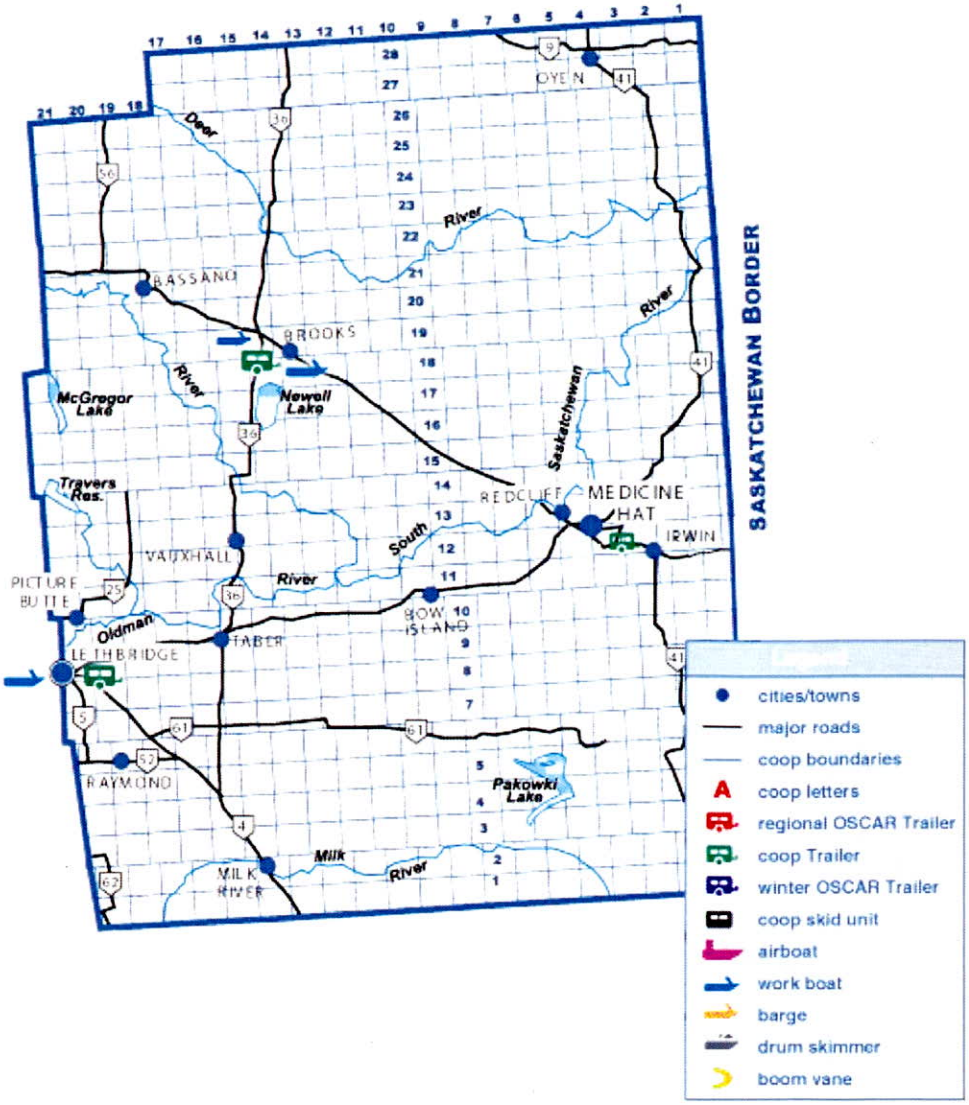
TransCanada (Annual) Membership Renewed March 3, 2013

Albert Area 1S Oil Spill Cooperative

The Province of Alberta is divided into 6 oil spill cooperative zones. Each zone is then divided into areas. The designation 1S means area S of zone 1. The TransCanada Keystone Pipeline system traverses the north east corner of this area. The cooperative is run by a managing committee with custodians who are responsible for storage and maintenance of the response equipment.

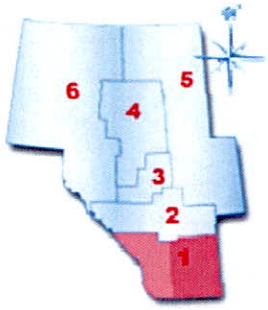
Through the preceding agreement TransCanada Keystone Pipeline system will have the ability to use the cooperatives equipment, if available, during an incident.

The equipment list, contact information and maps are included in this document.



Zone 1 - Coop Area S

Regional Custodian



Adrian Schuurman
Mid-West Pumps (90) Ltd.
Ph: (403) 329-0427
24-HR:(403) 329-0427
Fax: (403) 327-4660

Ed Carpenter

Equipment Location
Lethbridge

Equipment Summary

- Mini-OSCAR (3/4-ton truck with 2 5/16" ball hitch)
- Muskrat (1/2-ton truck with 2" ball hitch)
- Marathon Workboat (1/2-tin with 2" ball hitch)

Coop Custodian

Equipment Location
NE 34-18-15 W4M Brooks, AB

Mike Wenner
P&H Oilfield Maintenance
24-HR Ph: (403) 362-6551
Fax: (403) 362-0107
Cell: (403) 793-1420

Equipment Summary

- 45' Trailer (Tractor Truck)
- Muskrat Workboat (1/2-ton with 2" ball hitch)

Directions
From Brooks, take Castle Road heading west towards Hwy 36 for 5 kms. Yard is located on south side of road, or Junction of Hwy 1 and Hwy 36. Head south of Hwy 36 until you reach Castle Road , yard is located on south side.

Mike Wenner
P&H Oilfield Maintenance
24-HR Ph: (403) 362-6551
Fax: (403) 362-0107
Cell: (403) 793-1420

Equipment Location
15-7-13-5-W4 Enerplus site North of Medicine Hat, AB

Equipment Summary

- C-Can Skid Unit (Bed Truck)

Albert Area 2U Oil Spill Cooperative

The Province of Alberta is divided into 6 oil spill cooperative zones. Each zone is then divided into areas. The designation 2U means area U of zone 2. The TransCanada Keystone Pipeline system begins and travels south through this area. The cooperative is run by a managing committee with custodians who are responsible for storage and maintenance of the response equipment.

Through the preceding agreement TransCanada Keystone Pipeline system will have the ability to use the cooperatives equipment, if available, during an incident.

The equipment list, contact information and maps are included in this document.

Zone 2 - Coop Area U

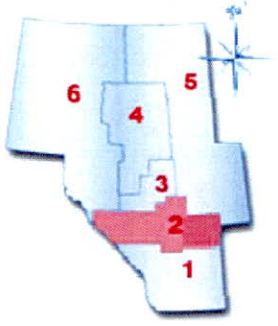
COOP Custodian

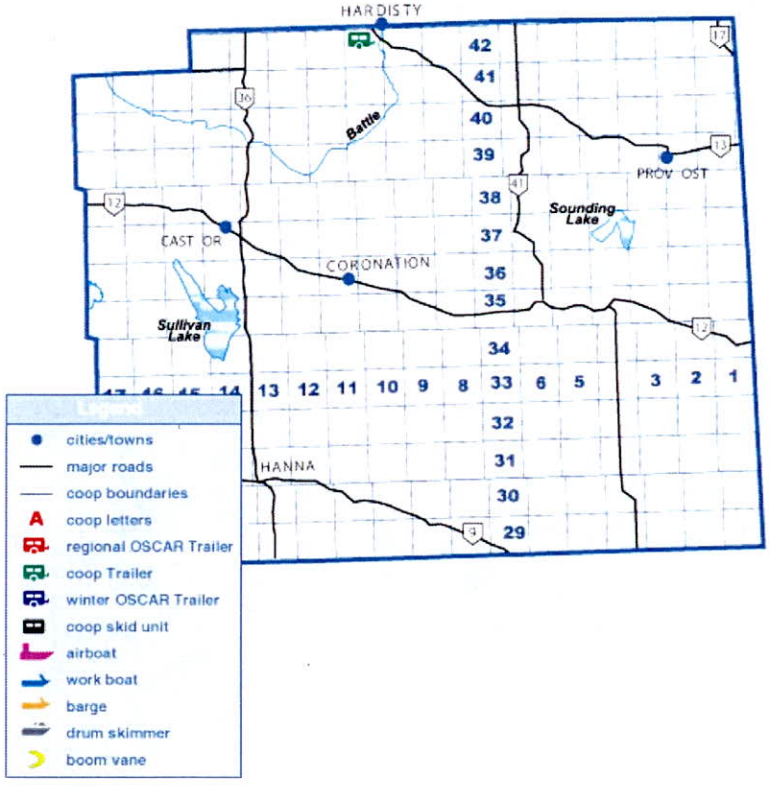
Greg Schmidt/Trevor Bitzer
Greg's Contracting Services Ltd.
Ph : (780) 888-3845
After Hours: Max Devey
(780) 209-7363

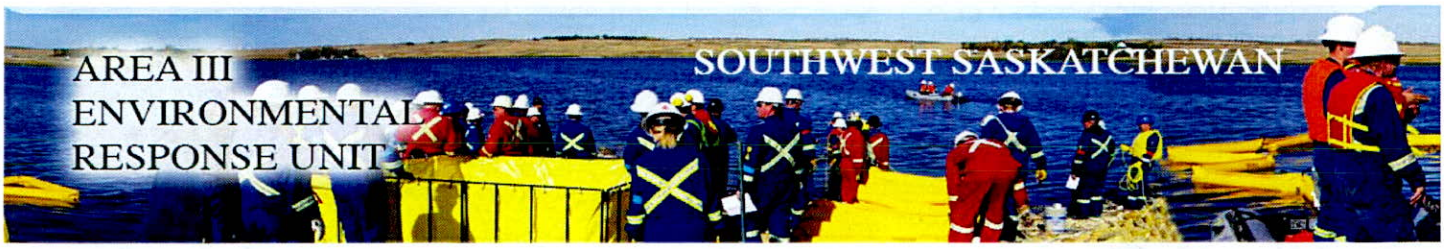
Equipment Location
Greg's Contracting Services Ltd. Box 29 4616A 47 Street
Hardisty, AB T0B 1V0

Equipment Summary

- OSCAR Trailer







AREA III
ENVIROMENTAL RESPONSE UNIT
CONSTITUTION

1.0 NAME:
This organization shall be known as the Area III Environmental Response Unit.

2.0 MANDATE:
2.1 To develop a system of mutual aid among the members for initial response to an unknown or known member's pipeline emergency, until the member company is in a position with its own resources to control the emergency.
2.2 To facilitate collective interaction and support between industry, government agencies, emergency services and the community in emergency preparedness.
2.3 To assure that the mutual aid system is functional through yearly emergency exercises and communication tests with the objective to improve any deficiencies.
2.4 To collectively communicate to the public the safety achievements and goals of the industry.

3.0 MEMBERSHIP:
3.1 Members will be admitted with the approval of the membership at large and payment of annual dues.
3.2 Resource Groups: Government agencies and emergency services may become members upon approval of the membership. These members have no voting privileges and may not hold any office position. There will be no membership dues charged.
3.3 Resignation: Any member may resign at any time by notifying the chairperson in writing.
3.4 Interested Parties: Certain parties may attend meetings upon approval of the executive.

Membership entitles use of the trailers and the equipment contained within for a period of 1 week following deployment. Equipment cleaning, replacement of supplies and us of the equipment for a period longer than 1 week will be billed at an additional cost.

The Area #3 ERU has one fully equipped trailer located in Gull Lake, Saskatchewan ready for emergency response to all companies who are members in good standing and located within the Area #3 ERU boundaries. A second trailer was recently purchased and the membership fees will be used in part to purchase additional equipment to supply the second trailer. Both trailers are stored at the **Karis Contracting Ltd. (306. 672.3333) compound located at 5th St. and Conrad Avenue in Gull Lake, Saskatchewan.**

TransCanada (Annual) Membership Renewed March 3, 2013

AREA 3 Emercency Response Unit



Trailer Location:

06-08-011-18w3 Bench Oil Battery – Husky Energy Inc.

Steering Committee:

Title	Name	Office	Phone
CHAIRMAN:	Gilbert Cadrain	Husky Energy Inc.	773-0234 741-8922
SECRETARY:	Gary Hammer	Plains Marketing	773-9381
TREASURER:	Garry Zinger	Focus Energy	741-6778
COMMITTEE:	Ron Dolter	S.I.R	778-8252
	Darcy Thoreson	Equipment Custodian	672-3723
	Dave Knipfel	Huskey Energy	741-2772
	Jeff Seffern	Talisman Energy Inc.	297-2601
	Rob Forester	Crescent Point	626-3557
	Tim Stevenson	Penn West	672-3875
	Blake Barsness	Acclaim Energy	

Boundry Map:



AREA III ENVIRONMENTAL RESPONSE TRAILER UNIT

The following equipment is stored in a 8' x 28' tandem axle trailer c/w pintle hitch.

EMERGENCY RESPONSE TELEPHONE NUMBERS

EMERGENCY 911

COMPANY	CONTACT	PHONE
Ambulance (non-emergency)	Swift Current	(306)773-2666
	Cabri	(306)587-2552
	Gull Lake	(306)672-4704
	Shaunavon	(306)297-2644
Air Ambulance		1-888-782-8247
	Saskatoon (Information)	(306)933-5255
Fire Department (non-emergency)	Swift Current	(306)778-2760
	Cabri	(306)587-2200
	Shaunavon (Kevin)	(306)297-2424 (306)297-3870 hor
	Gull Lake	(306)672-3200
Hospitals		
Cabri Health Centre	Cabri	(306)587-2623
Gull Lake Health Centre	Gull Lake	(306)672-4700
S. C. Union Hospitz	Swift Current	(306)778-9400
Shaunavon Union Hospital	Shaunavon	(306)297-2644
Royal Canadian Mounted Police	Swift Current	(306)778-5550
	Gull Lake	(306)672-3140
	Shaunavon	(306)297-5550
	Cabri	(306)587-2667
Saskatchewan Pow Corporation Elec. Swift Current	Emergencies 24 Hour	310-2220 1-888-757-6937
Gas		
Swift Current	24 Hour	(306)773-9098
Shaunavon	24 Hour	1-888-757-6937
Cabri	24 Hour	1-888-757-6937

Website Address for Spill Cooperatives:

www.area3eru.com
http://areatwo.sasktelhosting.net/
http://www.saskoilspill.com/
http://www.saskoilspill.com/main.htm
http://www.area6sask.com/

INITIAL SPILL REPONSE FLOW CHART

SPILL OBSERVED ? RESPONSE

1. ASSESS THE SPILL OCCURRENCE:

- ASSESS IMMEDIATE HAZARDS TO:
  - PERSONAL SAFETY
  - PUBLIC SAFETY
  - PROPERTY
  - ENVIRONMENTAL

2. ASSESS THE SPILL OCCURRENCE:

- ASSESS AND REPORT SOURCE
- ASSESS AND REPORT SPILL TYPE
  - OIL
  - SALT WATER
  - CHEMICAL
- ASSESS AND REPORT SPILL SIZE
- ASSESS SPILL AND REPORT FLOW DIRECTION AND FURTHER CONTAMINATION

3. NOTIFY IMMEDIATE SUPERVISOR:

- IDENTIFY LOCATION OF SPILL
- NOTE TIME SPILL DISCOVERED
- NOTE ADVERSE WEATHER CONDITIONS
  - WEATHER
  - TERRAIN
  - DOWNSTREAM WATER USERS
- POTENTIAL TO STOP FLOW FROM SOURCE
- POTENTIAL TO CONTAIN SPILL FLOW
- COMMUNICATE ON SITE RESPONSE ACTION PLAN

SPILL REPORTED ? IMMEDIATE SUPERVISOR IS NOW THE INTERIM ON-SCENE COMMANDER.

1. ACTIVATE OIL SPILL CONTINGENCY PLAN

- SET THE RESPONSE UNIT INTO MOTION
- ESTABLISH THE ON-SCENE COMMANDER

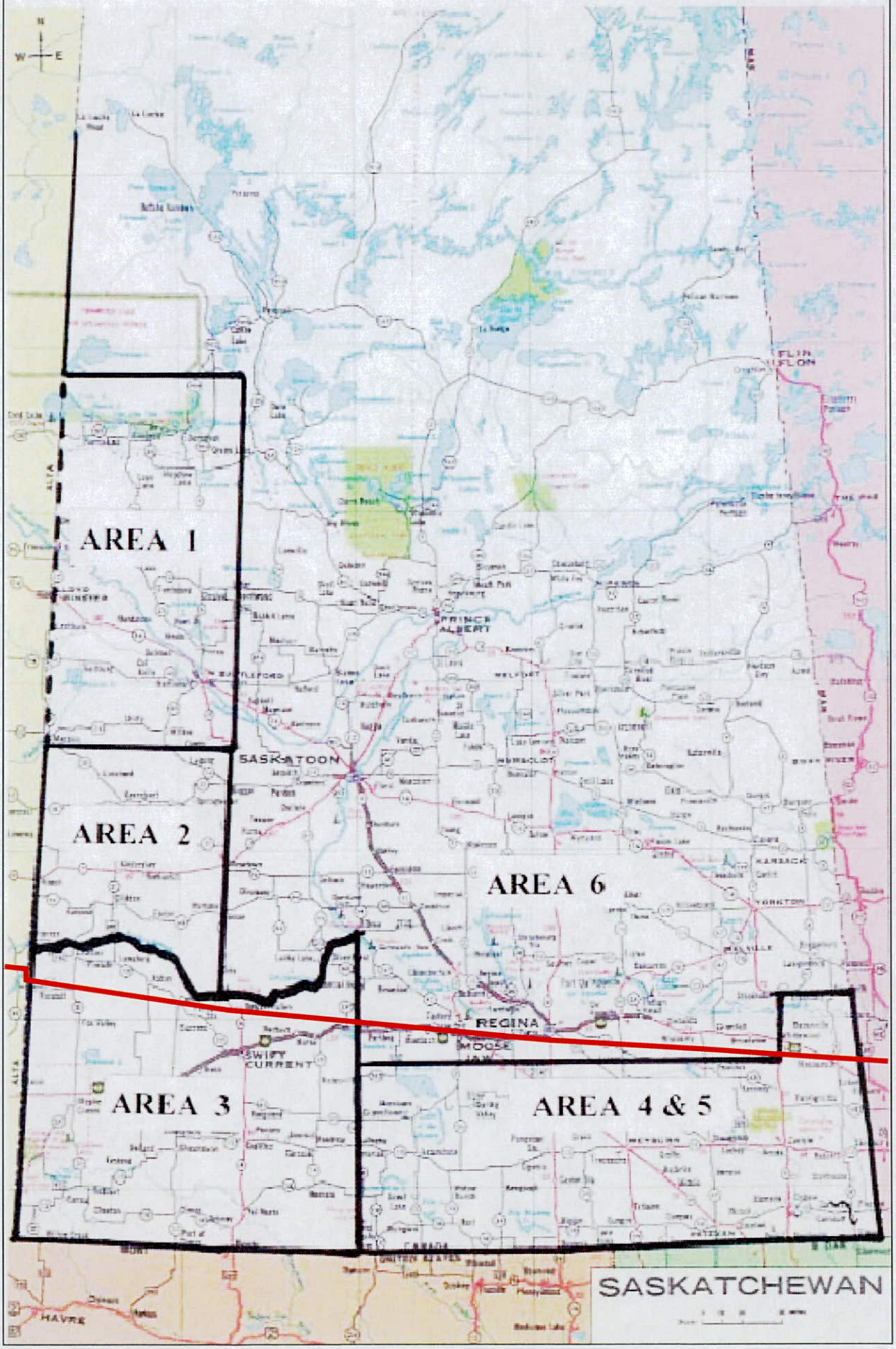
AREA III MOBILIZATION TO SPILL SITE ? ON-SCENE COMMANDER

1. ESTABLISH AND MAINTAIN COMPLETE CONTROL OF THE OPERATION:

- SET UP A COMMAND POST FOR OPERATIONS
- DISPATCH FIELD STAFF TO SPILL SITE TO VERIFY THE SPILL LOCATION, THE EXTENT OF THE SPILL AND PROCEED WITH SHUT-IN PROCEDURES
- MOBILIZE THE AREA III EQUIPMENT ?(COMBINATION #1, 2, 3, 4.)
- CALL KEY PERSONNEL AND REGULATORY AGENCIES
- ORGANIZE AND ACTIVATE CONTINGENCY PLAN AS PER AREA III SPILL CONTINGENCY MANUAL FOR CONTAINMENT AND CLEANUP OF SPILL.

SASK. AREA SPILL CO-OPS BOUNDARIES

April 28, 2005





Oil Spill Contingency Groups #4 & #5
Box 267
Estevan, Sask. S4A 2A3
Phone 306-634-6277
chairperson@sasktel.com
contact@saskoilspill.com
www.saskoilspill.com

The Oil Spill Contingency Groups #4 & #5 mandate is to provide instruction towards training and contingency planning to minimize risks and environmental damage in the event of an oil spill. The Groups have two trailers: trailer one is fully equipped and trailer two is equipped with booms and skimmers. The trailers are located in Weyburn, Saskatchewan, readily available for emergency response to all member companies located in Areas #4 and #5 (see area boundaries on home page of web site: www.saskoilspill.com). The Oil Spill Contingency Groups #4 & #5 provide a two-day training session in the Weyburn area and a two day training session in the Alameda area. Registration is free for the training seminars.

According to the Ministry of Energy and Resources of Saskatchewan, it is a standard condition of all facility licenses that the licensee of the facility be a member in good standing with the local spill response unit. If the licensee fails to uphold their membership, any facilities licensed to them can be suspended for noncompliance with the license conditions. As well, under Section 2.3 of the Saskatchewan Upstream Petroleum Industry Storage Standards, S-01, all operators must maintain their membership with the area spill response unit and participate in the annual spill training exercise(s).

OIL SPILL CONTINGENCY AREA 4 & 5 CALL OUT SCHEDULE

Below is a list of 7 committee members that have agreed to take calls on behalf of the Oil Contingency Group Area #4 and Area #5.

The first four members need to be called first. When you call these 4 numbers please call their cell phones and leave a message. If you do not get a call back in 15 minutes, please continue down the list.

It was decided that we would just include everyone's cell numbers in this list because it will be the quickest way to get a response.

1. Darren Delorme, Longview Oil Corporation- 861-8228 cell – Executive Member (Equipment questions)
2. Daryl McFadden, Dino Mite Consulting - 861-2320 cell – Custodian (Equipment questions)
3. Jonas Fenn, Matrix Solutions – 861-4532 cell – Executive Member (Equipment questions)
4. Laurel Mohl, COR Safety Solutions - 842-8151 – Chairperson (All general inquiries)

Please wait 15 minutes for a response from the first 4 members. Then continue.

5. Wayne Irwin, Plains Midstream Canada – 306 458-7315 (Equipment questions)
6. Chuck, Hignett, Enerplus Corporation – 306 861-3360 – Executive Member (Equipment questions)
7. Marious Erickson, Coast Resources – 306 452-7293 (Equipment questions)
8. Sonja Bush, 306 421-5241 – (Membership questions)

Once you have called all 7 numbers on the list and left a message there is no need to continue calling. Someone will get back to you.

Please give a call back number when you are leaving messages and ensure you document who called (phone number) with the inquiry.

Updated: 01/20/13

TransCanada (Annual) Membership Renewed Jun 5, 2013

EQUIPMENT LOCATION	DATE LAST REVISED: 08-Feb-26
OIL SPILL CONTINGENCY AREA 4&5 FIRST RESPONSE FOR EQUIPMENT/TRAILER AND LOCATION	

OIL SPILL FIRST RESPONSE

Phone: **(306) 634-6277** to notify the Oil Spill Contingency that you will need the trailer and to make arrangements to pick up the trailer.

EQUIPMENT LOCATION

Oil spill equipment is stored in a 32 foot trailer.

TRAILER LOCATION

Redigo Construction Company Limited
44 Hwy 39 East
Estevan, Saskatchewan

DRIVER QUALIFICATION AND VEHICLE RATING REQUIREMENTS

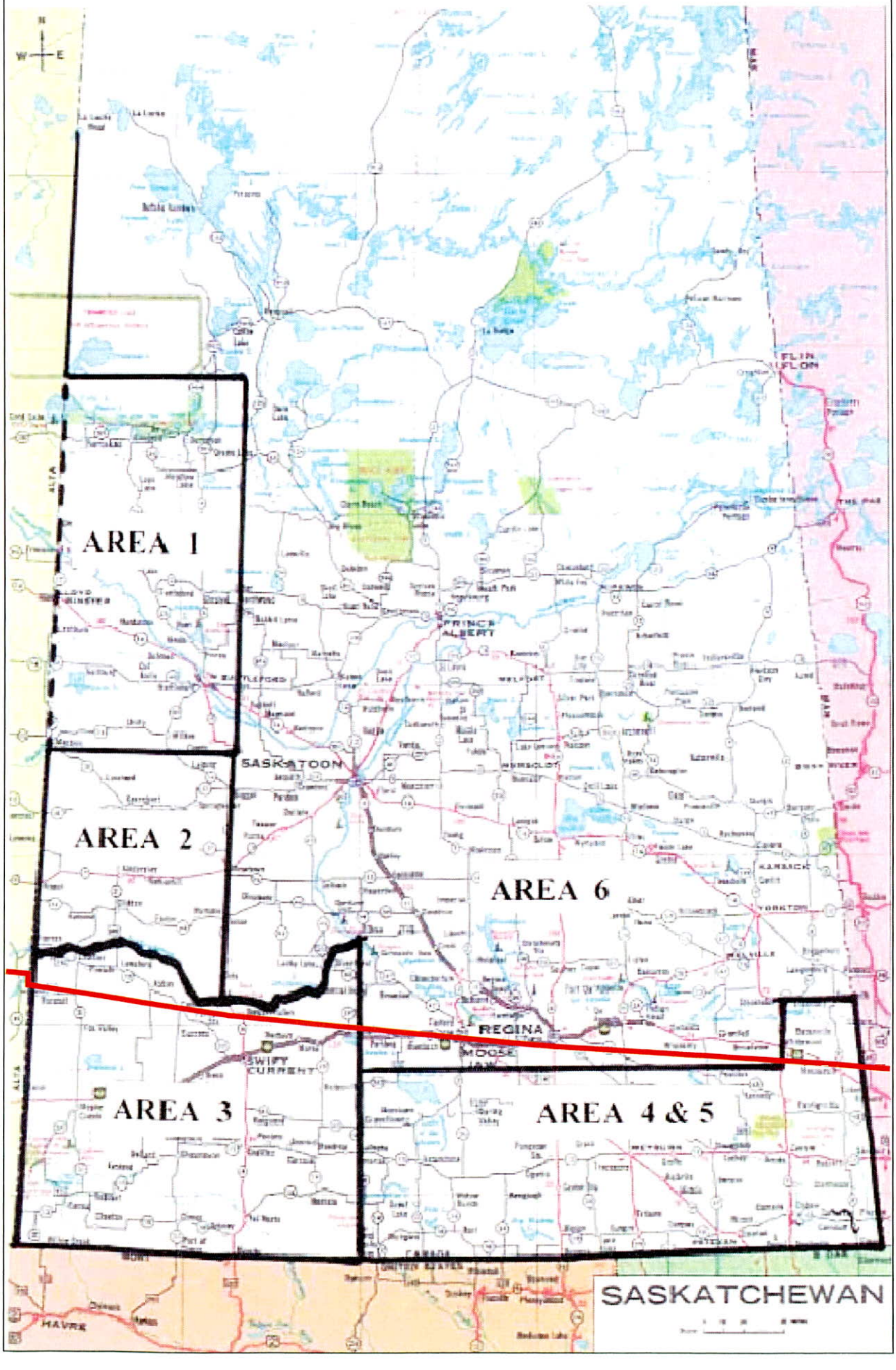
As the trailer is greater than 10,000 lb (actual weight approx. 13,000 lb), drivers must possess a minimum of a Class 1G license, as per SGI requirements. Also, vehicles must be rated accordingly. Below is a list of contractors with qualified drivers and vehicles. Any other contractors with qualified drivers and vehicles may also be used to mobilize and de-mobilize the trailer.

Murray Towing and Boosting Service, Estevan 306-637-2007
Carson Welding & Maintenance , Lampman -306-487-2281
Jerry Mainil Limited, Weyburn- 306-842-5412

The ball for the hitch is located just inside the side door.

SASK. AREA SPILL CO-OPS BOUNDARIES

April 28, 2005





CONSTITUTION

1.0 NAME:

This organization shall be known as the Area 6 Emergency Response Co-op.

2.0 MANDATE:

2.1 To develop a system of mutual aid among the members for initial response to an unknown or known member's pipeline emergency, until the member company is in a position with its own resources to control the emergency.

2.2 To facilitate collective interaction and support between industry, government agencies, emergency services and the community in emergency preparedness.

2.3 To assure that the mutual aid system is functional through yearly emergency exercises and communication tests with the objective to improve any deficiencies.

2.4 To collectively communicate to the public the safety achievements and goals of the industry.

3.0 MEMBERSHIP:

3.1 Members will be admitted with the approval of the membership at large and payment of annual dues.

3.2 Resource Groups: Government agencies and emergency services may become members upon approval of the membership. These members have no voting privileges and may not hold any office position. There will be no membership dues charged.

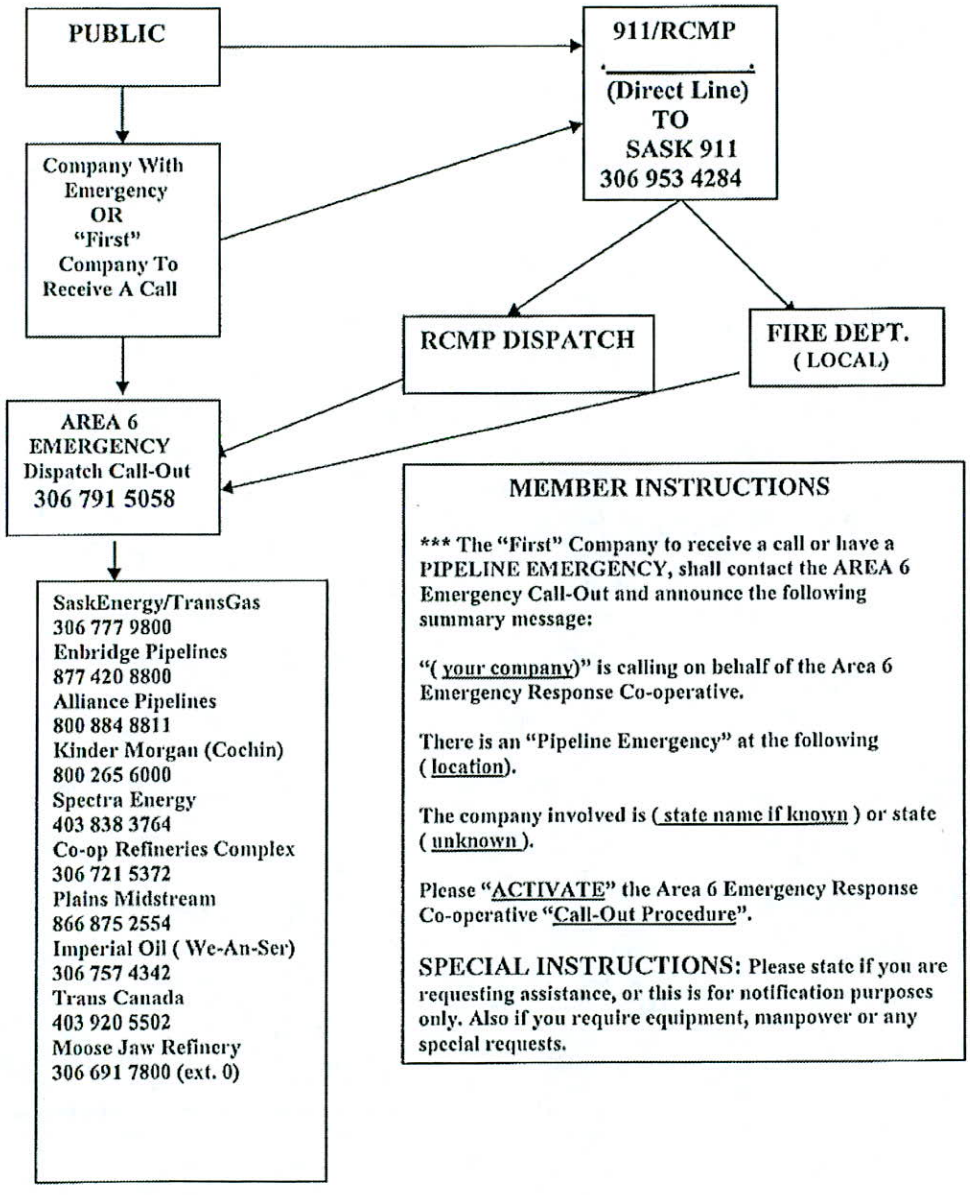
3.3 Resignation: Any member may resign at any time by notifying the chairperson in writing.

3.4 Interested Parties: Certain parties may attend meetings upon approval of the executive.

December 6, 2012

AREA 6 EMERGENCY RESPONSE CO-OPERATIVE

CALL-OUT CHART



MEMBER INSTRUCTIONS

*** The "First" Company to receive a call or have a PIPELINE EMERGENCY, shall contact the AREA 6 Emergency Call-Out and announce the following summary message:

"(your company)" is calling on behalf of the Area 6 Emergency Response Co-operative.

There is an "Pipeline Emergency" at the following (location).

The company involved is (state name if known) or state (unknown).

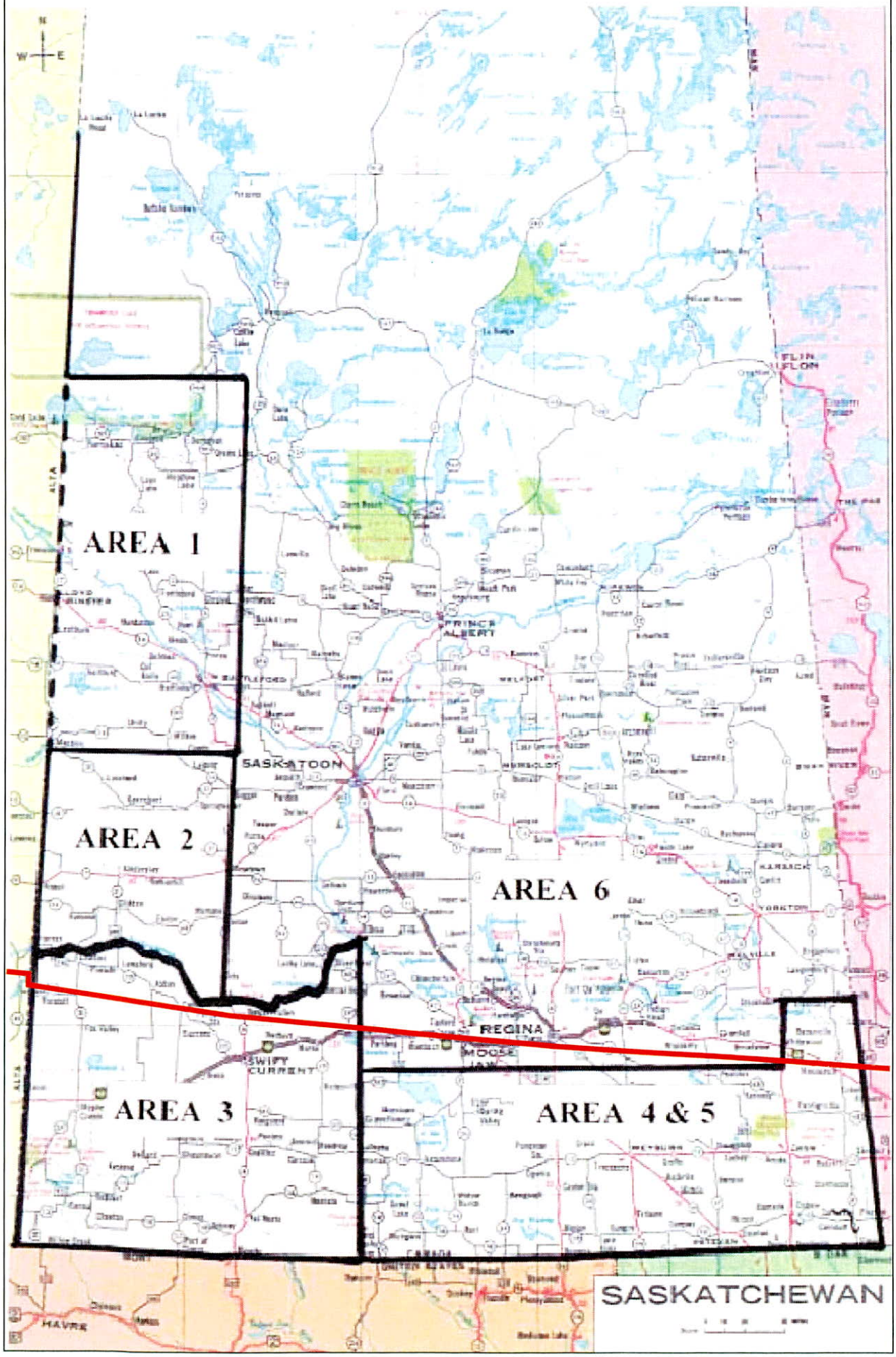
Please "ACTIVATE" the Area 6 Emergency Response Co-operative "Call-Out Procedure".

SPECIAL INSTRUCTIONS: Please state if you are requesting assistance, or this is for notification purposes only. Also if you require equipment, manpower or any special requests.

TransCanada (Annual) Membership Renewed Jan 7, 2013

SASK. AREA SPILL CO-OPS BOUNDARIES

April 28, 2005



Manitoba Producers Oil Spill Cooperative
Box 2302
Virden, Manitoba R0M 2C0

Contact Darwin White (MPOSC Chariperson / Emergency Contact#1)
1-204-748-2886 Home or 1-204-748-7029 Cell

Allan Gevin – Emergency Contact #2
1-204-748-3595 Home or 1-204-851-0441Cell

1. Membership

The mandate and purpose of the MPOSC is to provide oil spill response capability and training for all member companies in the event of an actual spill on water. The cooperative is not an oil spill clean-up service but supplies equipment for cured oil containment and recover under Manitoba conditions.

It is the responsibility of a member company to ensuer that a representative(s) within their company is trained and capable of responding to an event that requires the spill equipment.

The cooperative equipment is not suitable for clean-up of hazardous material or refined petroleum produces.

The current fees for membership in the MPOSC are as follows:

- Members in good standing with the cooperative will continue to pay #300.00 per year
- New members will pay $200.00 to join the cooperative
- Members who do not pay their membership fee by the due date will have their membership cancelled. To rejoin the cooperative, the $200.00 new membership fee would have to be paid plus the outstanding #300.00 for a total of $500.
- The maximum rejoining fee would be $500.00

In 1998 it was decided to invoice for 2 years at a time to make it more convenient for everyone involved.

2. Equipment

The MPOSC has acquired the majority of the equipment that it requires for clean-up of an oil spill on a moving body of water. There were some purchases and upgrades in 2011.

All equipment is available to members of the cooperative, equipment is also available to non members at the following costs:

1. $1,500 for the first day
2. $500.00 for each additional day
3. Replacement cost of consumables and damaged equipment
4. Costs to clean equipment if not returned in satisfactory condition
5. All equipment will be made available at the discretion of the Coop Chairperson.

The MPOSC equipment is contained in mobile trailers located at the Enbridge Pipelines (Sask) Inc. yard just off highway #1 in Virden.

TransCanada (2 Year) Membership Renewal Feb 16, 2013
(Membership fees for 2012 & 2013)

EUROWAY INDUSTRIAL SERVICE CO. LTD.
245 TRANSPORT ROAD, BOX 4, GROUP 582, RR5, WINNIPEG, MANITOBA, R2C 2Z2
TELEPHONE (204)661-0500 FAX = (204) 661-3933

September 24, 2010

Euroway is offering water way response service to the industry by membership.

Membership fees are $3000.00* per year for a minimum three year contract renewed annually and would include:

- Guaranteed no price increase with contract membership.
- No charge for water & land based equipment when required up to 20 days per incident. All other standard charges including tractor rental apply as per rate sheet. Equipment required after 21 days would be charged out at 50% of regular rental rate.
- Priority deployment.
- No charge participation in Euroway's annual spill exercise.

Water way response is also available for ***non member companies***; however the cost of equipment rental is based on the current rate at time of incident. In the event a member requires emergency response and spill equipment, our equipment will be relocated to the member's emergency. Should a *non member company* wish to participate in our annual spill exercise a fee of $100.00 would apply.

*A reduced fee may be available dependant on membership.

TransCanada (Annual) Membership Renewed Apr 1, 2013

TABLE A.5.1

METROPOLITAN AREAS WITH POPULATION GREATER THAN 50,000

STATE	AREA	2000 CENSUS	2010 CENSUS
Iowa	Cedar Rapids	201,853	257,940
Iowa	Davenport-Moline- Rock Island	376,019	379,690
Iowa	Des Moines	481,394	569,633
Iowa	Dubuque	92,384	93,653
Iowa	Iowa City	111,006	152,586
Iowa	Omaha-Council Bluffs	767,041	865,350
Iowa	Sioux City	143,053	143,577
Iowa	Waterloo-Cedar Falls	163,706	167,819
Kansas	Kansas City	1,836,038	2,035,334
Kansas	Lawrence	99,962	110,826
Kansas	Topeka	224,551	233,870
Kansas	Wichita	571,166	623,061
Missouri	Columbia	145,666	172,786
Missouri	Jefferson City	140,052	149,807
Missouri	Joplin	157,322	175,518
Missouri	Kansas City	1,836,038	2,035,334
Missouri	St. Joseph	122,336	127,329
Missouri	St. Louis	2,698,687	2,812,896
Missouri	Springfield	368,374	436,712
Nebraska	Lincoln	266,787	302,157
Nebraska	Omaha-Council Bluffs	767,041	865,350
Nebraska	Sioux City	143,053	143,577

FIGURE A.5.1

POPULATION CHANGE - IOWA

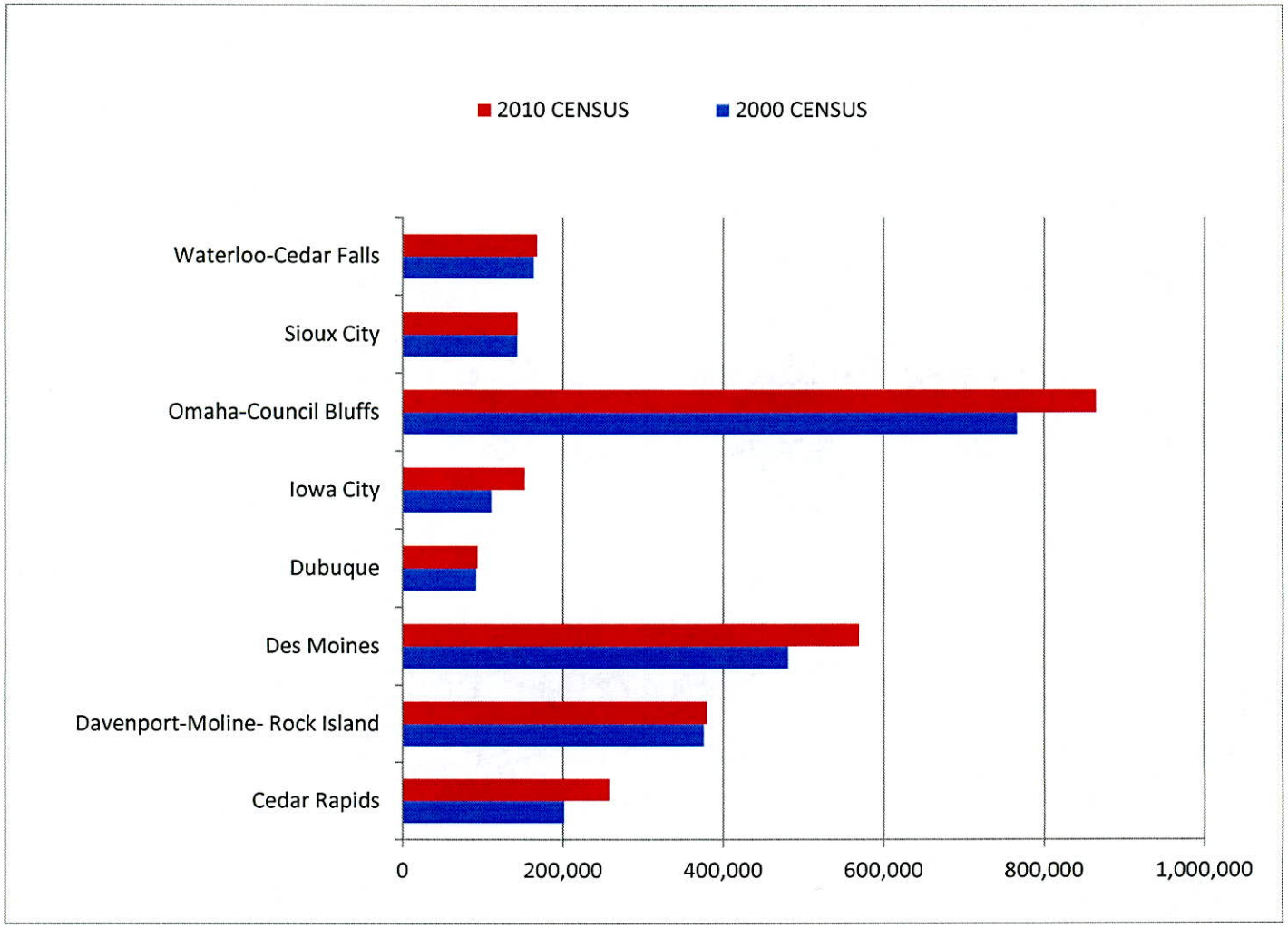


FIGURE A.5.2

POPULATION CHANGE - KANSAS

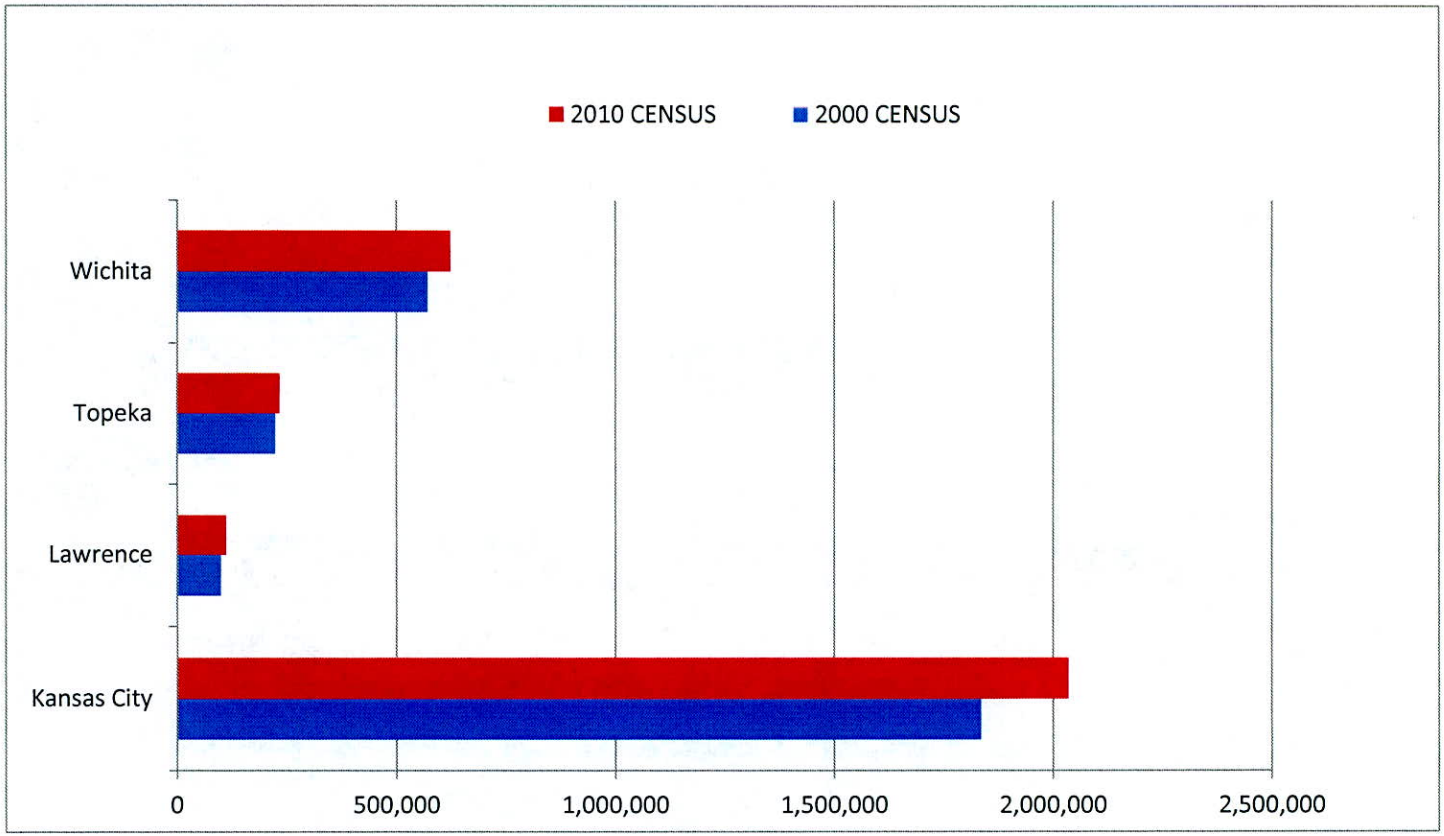


FIGURE A.5.3

POPULATION CHANGE - MISSOURI

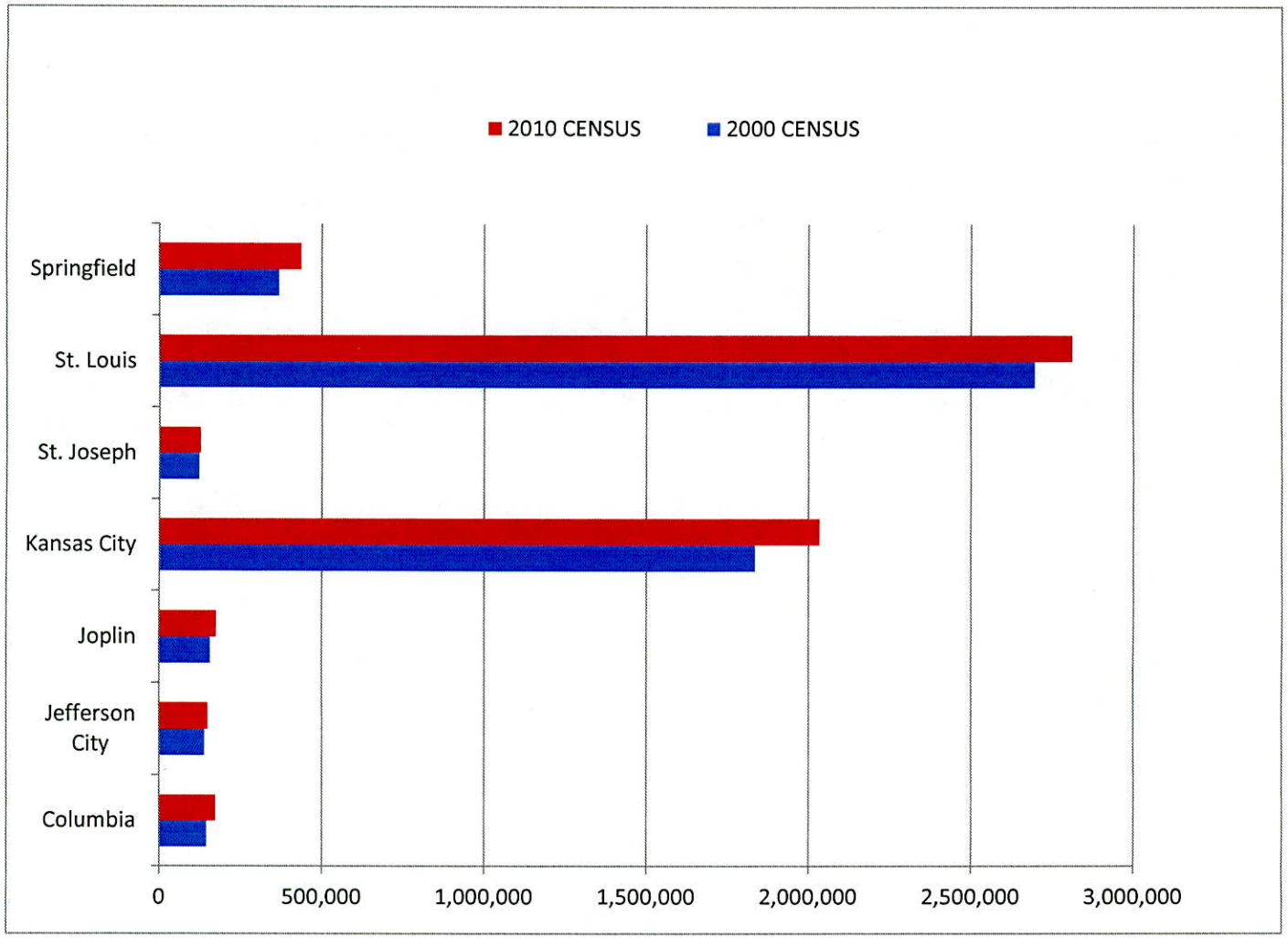
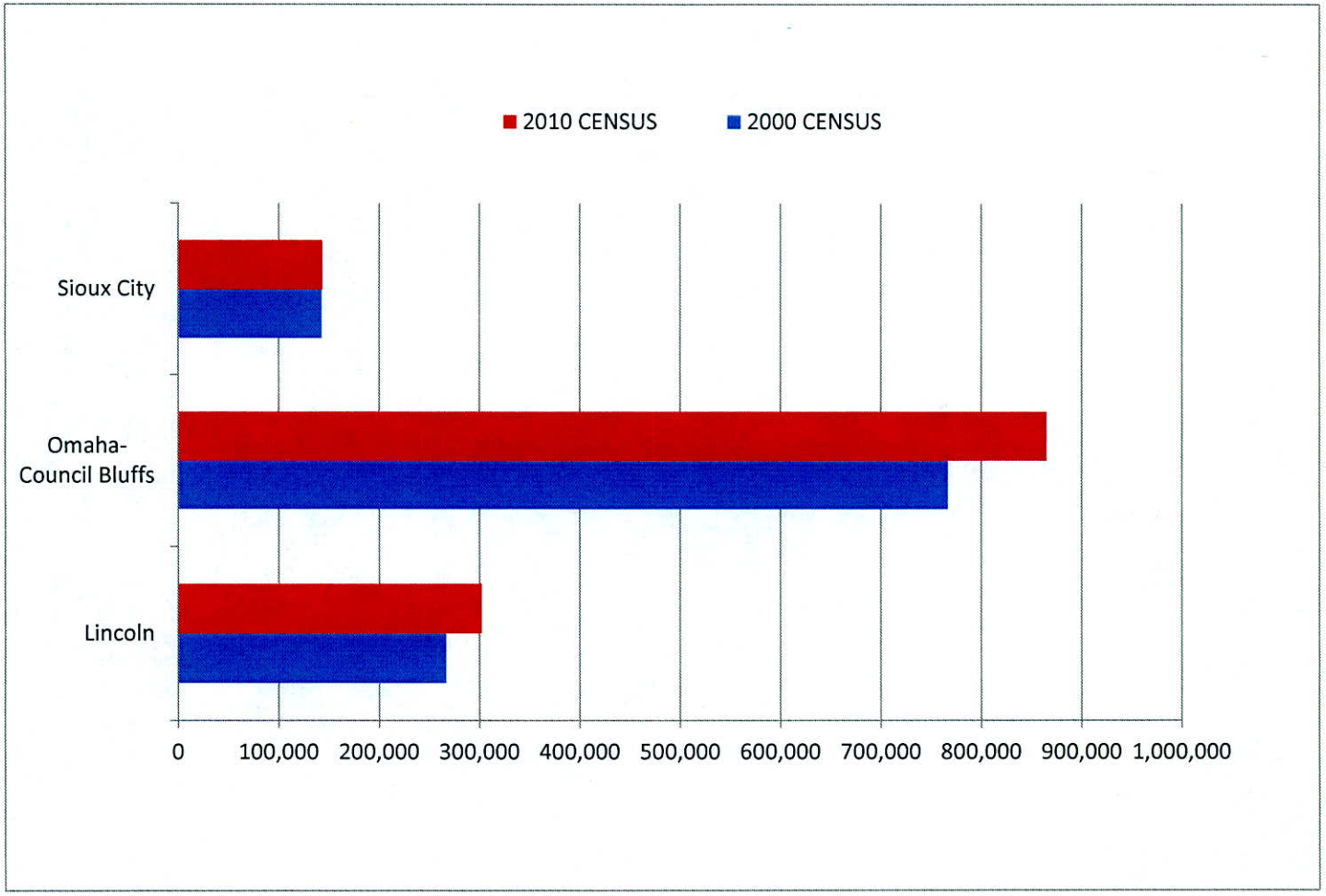


FIGURE A.5.4

POPULATION CHANGE - NEBRASKA



August 26, 2013

TransCanada Pipelines
450-1 Street SW
Calgary, Alberta
T2P 5H1

Attention: Niki Affleck

RE: Emergency Response Coverage - Keystone

This letter is to confirm that Quantum Murray LP is presently in negotiations with TransCanada Pipelines Ltd. to solidify a contract for Emergency Response Services. QMLP continues to provide services under the RFI submitted on November 4, 2010.

QMLP's services offered under this RFI are for the Emergency Response and Remediation services required following an incident on their Keystone Pipeline. QMLP is trained and equipped to work within TransCanada Pipeline's Incident command structure to fulfill operational goals in the following areas:

- On water and on land protection
- On water and on land collection
- Decontamination
- Waste management
- Shoreline cleanup
- Water remediation
- Soil remediation
- ICS Facilitation

If there are any questions or if 3rd parties need additional information beyond what has been provided please do not hesitate to contact me at the numbers below.

Best regards,

Mark Jasper
Vice President – Emergency response
Quantum Murray LP

APPENDIX B

WORST CASE DISCHARGE ANALYSIS AND SCENARIOS

Introduction

Hardisty Pump Station/ Regina Pump Station

- Worst Case Discharge
- Planning Volume Calculations

Regina Pump Station / Haskett Pump Station

- Worst Case Discharge
- Planning Volume Calculations

North Dakota, South Dakota, Nebraska

- Worst Case Discharge
- Planning Volume Calculations

Kansas, Missouri, Illinois

- Worst Case Discharge
- Planning Volume Calculations

Cushing Extension

- Worst Case Discharge
- Planning Volume Calculations

Gulf Coast

- Worst Case Discharge
- Planning Volume Calculations

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INTRODUCTION

This Appendix identifies potential causes for oil discharges and discusses the response efforts that are necessary for successful mitigation. Included in this Appendix are hypothetical scenarios for various types of spills that have the potential to occur along the system. It is anticipated that the Company will respond to spills in a consistent manner regardless of the location. Therefore, the guidelines discussed in this appendix will apply to all spills whenever possible.

United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Discharge Volume Calculation

- **Worst Case Discharge**

  The largest volume (Bbls) of the following:

  - *Pipeline's maximum release time (hrs), plus the maximum shutdown response time (hrs), multiplied by the maximum flow rate (bph), plus the largest line drainage volume after shutdown of the line section.*

  --OR--

  - *Largest foreseeable discharge for the line section is based on the maximum historic discharge, if one exists, adjusted for any subsequent corrective action or preventive action taken.*

  --OR--

  - *Capacity of the single largest breakout tank or battery of tanks within a single secondary containment system, adjusted for the capacity or size of the secondary containment system.*

Scenario Types

The occurrence of a Worst Case Discharge (WCD) could be the result of any number of scenarios along the pipeline system including:

- Piping rupture.
- Piping leak, under pressure and not under pressure.
- Explosion or fire.
- Equipment failure (e.g. pumping system failure, relief valve failure, or other general equipment relevant to operational activities associated with internal or external facility transfers).

The response actions to each of these scenarios are outlined in Section 3.1 and Figure 3.1. The response resources are identified in a quick reference format in Figure 2.5. Pipeline response personnel list/telephone numbers and other internal/external resources telephone numbers are detailed in Figures 2.2 and 2.5.

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RESPONSE CAPABILITY SCENARIOS

Hardisty Pump Station/ Regina Pump Station

PHMSA Worst Case Discharge = 39,723 Bbls

A worst case discharge for the Hardisty Pump Station/ Regina Pump Station is considered to be discharge that does not exceed 39,723 barrels.

Pipeline Worst Case Discharge = 39,723 Bbls

Description

The pipeline-based Worst Case Discharge is projected as a scenario 18,768.506 meters downstream of valve BELPL+06_4-A0-MLV-001 (MLV 15-1).

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as accurate as-built elevation profile data. The outflow is modeled as a full bore rupture located on the bottom side of the pipe which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation
Phase 2 - Pump Shutdown
Phase 3 - Valve Closure
Phase 4 - Gravity Drainage

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes).

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is modeled as a decrease from 100% flow rate and pressure to 0% flow rate and pressure in 9 minutes.

During this isolation phase, the valves travel from fully open to fully closed. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. The valves were modeled on an individual basis to reflect their individual valve closure profiles.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for Non-High Volume areas (Tier 1 = 12 hours; Tier 2 = 36 hours; Tier 3 = 60 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 0 Bbls
Volume
There are no breakout tanks in the Response Zone, therefore there is no volume calculations.

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Hardisty Pump Station/ Regina Pump Station

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			Non-High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			39,723
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			39,723
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			19,862
Shoreline Recovery Volume (bbls)			19,862
Shoreline Cleanup Volume (bbls)			39,724
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	5,958	9,931	15,889
Shallow Water Resp Cpblty (bbls/day)	1,192	1,986	3,178
Storage Capacity (bbls/day)	11,916	19,862	31,778
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	12	36	60

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RESPONSE CAPABILITY SCENARIOS

Regina Pump Station / Haskett Pump Station

PHMSA Worst Case Discharge = 47,782 Bbls

A worst case discharge for the Regina Pump Station / Haskett Pump Station is considered to be discharge that does not exceed 47,782 barrels.

Pipeline Worst Case Discharge = 47,782 Bbls

Description

The pipeline-based Worst Case Discharge is projected as a scenario 4.98 meters upstream of valve MOSMI+30_0-A0-MLV-001.

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as accurate as-built elevation profile data. The outflow is modeled as a full bore rupture located on the bottom side of the pipe which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation
Phase 2 - Pump Shutdown
Phase 3 - Valve Closure
Phase 4 - Gravity Drainage

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes).

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is modeled as a decrease from 100% flow rate and pressure to 0% flow rate and pressure in 9 minutes.

During this isolation phase, the valves travel from fully open to fully closed. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. The valves were modeled on an individual basis to reflect their individual valve closure profiles.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for Non-High Volume areas (Tier 1 = 12 hours; Tier 2 = 36 hours; Tier 3 = 60 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 0 Bbls

Description

There are no breakout tanks in the Response Zone.

Volume

No reductions were calculated into the Worse Case Discharge for the breakeout tanks in the response zone. Therefore, the WCD volume is 0 Bbls.

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Regina Pump Station / Haskett Pump Station

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			Non-High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			47,782
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			47,782
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			23,891
Shoreline Recovery Volume (bbls)			23,891
Shoreline Cleanup Volume (bbls)			47,782
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	7,167	11,946	19,113
Shallow Water Resp Cpblty (bbls/day)	1,433	2,389	3,823
Storage Capacity (bbls/day)	14,334	23,892	38,226
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	12	36	60

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RESPONSE CAPABILITY SCENARIOS

North Dakota, South Dakota, Nebraska

PHMSA Worst Case Discharge = 33,058 Bbls

A worst case discharge for the North Dakota, South Dakota, Nebraska is considered to be discharge that does not exceed 33,058 barrels.

Pipeline Worst Case Discharge = 33,058 Bbls

Description

This response zone is considered a non-High Volume Area. The pipeline-based Worst Case Discharge is projected as a scenario 20,897.055 feet downstream of valve LUDDE+23_8-A0. After comparing this with the worst historical release of 450-500 barrels, NRC #975573, the pipeline based Worst Case Discharge will be used.

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as issued for construction profile data. The outflow is modeled as a full bore rupture which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation 4,583 bbls
Phase 2 - Pump Shutdown 4,125 bbls
Phase 3 - Valve Closure 34 bbls
Phase 4 - Gravity Drainage 24,316 bbls

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes). The flow rate that was used for the full operation phase is 660,000 bbls per day, with a pipeline diameter of 30 inches.

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is a decrease from 100% flow rate and pressure to 0% flow rate and pressure through the course of 9 minutes. For this calculation, flow rate is calculated at 100% for the full 9 minutes as per PHMSA regulations.

During this isolation phase, the valves travel from fully open to fully closed. During this phase, the drain down volumes are dependent on the elevation profile across the entire pump section. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. A valve closure time of 6 minutes was used.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. During this phase, the drain down volumes are solely dependent on the elevation of the valve section which the rupture is being modeled with the use of specialized software developed by Dynamic Risk Assessment Systems, Inc. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for Non-High Volume areas (Tier 1 = 12 hours; Tier 2 = 36 hours; Tier 3 = 60 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 0 Bbls
Volume
There are no breakout tanks in the Response Zone, therefore there is no volume calculations.

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North Dakota, South Dakota, Nebraska

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			Non-High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			33,058
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			33,058
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			16,529
Shoreline Recovery Volume (bbls)			16,529
Shoreline Cleanup Volume (bbls)			33,058
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	4,959	8,264	13,223
Shallow Water Resp Cpblty (bbls/day)	992	1,653	2,645
Storage Capacity (bbls/day)	9,918	16,528	26,446
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	12	36	60

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RESPONSE CAPABILITY SCENARIOS

Kansas, Missouri, Illinois

PHMSA Worst Case Discharge = 28,787 Bbls

A worst case discharge for the Kansas, Missouri, Illinois is considered to be discharge that does not exceed 28,787 barrels.

Pipeline Worst Case Discharge = 28,787 Bbls

Description

This response zone is considered a High Volume Area because it crosses the Missouri River at St. Joseph, Missouri. The pipeline-based Worst Case Discharge is projected as a scenario 93,205 feet downstream from Centralia Pump Station. After comparing this with the worst historical release of less than 10 barrels, NRC # 977695, the pipeline based Worst Case Discharge will be used.

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as issued for construction profile data. The outflow is modeled as a full bore rupture which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation 4,583 bbls
Phase 2 - Pump Shutdown 4,125 bbls
Phase 3 - Valve Closure 885 bbls
Phase 4 - Gravity Drainage 19,194 bbls

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes). The flow rate that was used for the full operation phase is 660,000 bbls per day, with a pipeline diameter of 30 inches.

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is a decrease from 100% flow rate and pressure to 0% flow rate and pressure through the course of 9 minutes. For this calculation, flow rate is calculated at 100% for the full 9 minutes as per PHMSA regulations.

During this isolation phase, the valves travel from fully open to fully closed. During this phase, the drain down volumes are dependent on the elevation profile across the entire pump section. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. A valve closure time of 4 minutes was used.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. During this phase, the drain down volumes are solely dependent on the elevation of the valve section which the rupture is being modeled with the use of specialized software developed by Dynamic Risk Assessment Systems, Inc. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for High Volume areas (Tier 1 = 6 hours; Tier 2 = 30 hours; Tier 3 = 54 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 0 Bbls
Volume
There are no breakout tanks in the Response Zone, therefore there is no volume calculations.

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Kansas, Missouri, Illinois

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			28,787
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			28,787
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			14,394
Shoreline Recovery Volume (bbls)			14,394
Shoreline Cleanup Volume (bbls)			28,788
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	4,318	7,197	11,515
Shallow Water Resp Cpblty (bbls/day)	864	1,439	2,303
Storage Capacity (bbls/day)	8,636	14,394	23,030
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	6	30	54

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RESPONSE CAPABILITY SCENARIOS

Cushing Extension

PHMSA Worst Case Discharge = 105,000 Bbls

A worst case discharge for the Cushing Extension is considered to be discharge that does not exceed 105,000 barrels.

Pipeline Worst Case Discharge = 50,253 Bbls

Description

This response zone is considered a High Volume Area because it crosses the Smokey Hill River at the Abilene, Kansas. The pipeline-based Worst Case Discharge is projected as a scenario 1,283,000 (242.99 miles) feet downstream of Station Steele City. After comparing the calculations with the worst historical release of 12 barrels, NRC # 970232, the breakout tank based Worst Case Discharge will be used.

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as issued for construction profile data. The outflow is modeled as a full bore rupture which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation 4,583 bbls
Phase 2 - Pump Shutdown 4,125 bbls
Phase 3 - Valve Closure 18,476 bbls
Phase 4 - Gravity Drainage 23,069 bbls

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes). The flow rate that was used for the full operation phase is 660,000 bbls per day, with a pipeline diameter of 36 inches.

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is a decrease from 100% flow rate and pressure to 0% flow rate and pressure through the course of 9 minutes. For this calculation, flow rate is calculated at 100% for the full 9 minutes as per PHMSA regulations.

During this isolation phase, the valves travel from fully open to fully closed. During this phase, the drain down volumes are dependent on the elevation profile across the entire pump section. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. A valve closure time of 4 hours (manual) was used.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. During this phase, the drain down volumes are solely dependent on the elevation of the valve section which the rupture is being modeled with the use of specialized software developed by Dynamic Risk Assessment Systems, Inc. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for High Volume areas (Tier 1 = 6 hours; Tier 2 = 30 hours; Tier 3 = 54 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 105,000 Bbls

Description

This size discharge would most likely occur due to a natural disaster or catastrophic event. Examples may include, but not limited to: a) Tank Fire, b) Catastrophic tank shell failure. The type of material that could be discharged is Crude Oil.

Volume

The worst case discharge scenario involving breakout tankage uses the single largest volume tank in the response zone, adjusted for the size of the secondary containment system. Applicable adjustment(s) for the largest tank include:

Spill Prevention Measures	Percent Reduction Allowed
Built Repaired to API standards	10%
Overfill protection standards	5%
Testing/cathodic protection	5%
Secondary containment capacity greater than 100% capacity of tank and designed according to NFPA 30	50%

The maximum level of the largest tank allows for a maximum fill volume of 350,000 barrels. Thus, a 70 % reduction yields a Worst Case Discharge amount of 105,000 Bbls.
A catastrophic discharge can orignate from a line section. However, the maximum amount does not exceed the amount that could be released from the largest storage tank.

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Cushing Extension

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			105,000
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			105,000
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			52,500
Shoreline Recovery Volume (bbls)			52,500
Shoreline Cleanup Volume (bbls)			105,000
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	15,750	26,250	42,000
Shallow Water Resp Cpblty (bbls/day)	3,150	5,250	8,400
Storage Capacity (bbls/day)	31,500	52,500	84,000
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	3,250	1,250	0
Response Time (hrs)	6	30	54

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RESPONSE CAPABILITY SCENARIOS

Gulf Coast

PHMSA Worst Case Discharge = 34,539 Bbls

A worst case discharge for the Gulf Coast is considered to be discharge that does not exceed 34,539 barrels.

Pipeline Worst Case Discharge = 34,539 Bbls

Description

This response zone is considered a High Volume Area because it crosses the Red River near Bonham, Texas. The pipeline-based Worst Case Discharge is projected as a scenario 194,389.76 ft. downstream from Corrigan Pump Station. This response zone has no historical releases.

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as issued for construction profile data. The outflow is modeled as a full bore rupture which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation 2,778 bbls
Phase 2 - Pump Shutdown 2,500 bbls
Phase 3 - Valve Closure 1,464 bbls
Phase 4 - Gravity Drainage 27,617 bbls

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes). The flow rate that was used for the full operation phase is 400,000 bbls per day, with a pipeline diameter of 36 inches.

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is a decrease from 100% flow rate and pressure to 0% flow rate and pressure through the course of 9 minutes. For this calculation, flow rate is calculated at 100% for the full 9 minutes as per PHMSA regulations.

During this isolation phase, the valves travel from fully open to fully closed. During this phase, the drain down volumes are dependent on the elevation profile across the entire pump section. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. A valve closure time of 4.6 minutes was used.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. During this phase, the drain down volumes are solely dependent on the elevation of the valve section which the rupture is being modeled with the use of specialized software developed by Dynamic Risk Assessment Systems, Inc. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for High Volume areas (Tier 1 = 6 hours; Tier 2 = 30 hours; Tier 3 = 54 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 0 Bbls
Volume
There are no breakout tanks in the Response Zone, therefore there is no volume calculations.

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Gulf Coast

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			34,539
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			34,539
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			17,270
Shoreline Recovery Volume (bbls)			17,270
Shoreline Cleanup Volume (bbls)			34,540
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	5,181	8,635	13,816
Shallow Water Resp Cpblty (bbls/day)	1,036	1,727	2,763
Storage Capacity (bbls/day)	10,362	17,270	27,632
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	6	30	54

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APPENDIX C

EMERGENCY PRE-PLANNING

C.1 Release Detection

C. 2 Leak Detection Systems

C. 3 Discharge Prevention Systems

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EMERGENCY PRE-PLANNING

Leak detection and discharge prevention is accomplished through safe operating procedures and maintenance procedures outlined in the Company Operations and Maintenance (O&M) Manual. The Company Operations and Maintenance Manual is designed to meet the requirements found in Statory Orders and Regulations /99-294 S27, National Energy Board, Operation and Maintenance Manuals, and Title 49, US Code of Federal Regulations, Part 195, Transportation of Hazardous Liquids by Pipeline.

C.1 RELEASE DETECTION

- The Keystone Oil Control Center and Company Field Employees are responsible for ensuring the integrity of facilities and detecting releases.
- There are four primary types of indications that a release may be occurring:
    - An unexplained hydraulic upset condition observed in the Pipeline system operating data.
    - A consistent unexplainable Pipeline system shortage occurring over several check time periods.
    - An alarm from a Supervisory Control and Data Acquisition-based leak detection system.
    - A report of a direct observation of a release or released product received from an employee or the public.
- All indications, including supposedly direct observation, are subject to confirmation; however, the Company policy is to shut down if any doubt exists as to the integrity of the Pipeline system. The simultaneous occurrence of two or more of the indicators above greatly increases the probability that the Pipeline system has lost integrity.
- Specific guidance for response to abnormal operating conditions and determining the location of a suspected pipeline release may be found in the Company's Operations and Maintenance Manual, maintained separately.
- A form for recording conversations with an observer who reports an emergency is located in Appendix F of this Plan. Copies of this form should be kept readily accessible at telephones.
- Routine actions to be taken by Company Field Employees to ensure facility integrity and detect releases are listed as follows:
    - OCC Monitors Pressures using Supervisory Control and Data Acquisition
    - Routine Station/ROW Checks Performed
    - Routine Aerial Surveillance
    - 24 Hour Emergency Reporting Phone Number Monitored

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C.2 LEAK DETECTION SYSTEMS

Leak detection systems utilized along the Pipeline include:

- System-level indication is accomplished through usage of a Supervisory Control and Data Acquisition (SCADA) system. This system is capable of monitoring flow rates, pressure, metering information (delivery / receipt volumes), temperature, and valve positions. The Supervisory Control and Data Acquisition system is monitored on a 24-hour per day basis by both the centralized Pipeline Control Center and Secondary Control points.

The location of a spill caused by a catastrophic break, which may be indicative of a Worst Case Discharge, can be inferred by Supervisory Control and Data Acquisition personnel down to a Pipeline section between operating pump stations. This inference is based upon rapid and abrupt changes in operating conditions.

C.3 DISCHARGE PREVENTION SYSTEMS

Pipeline pump stations are designed in a manner that maximizes the containment of leaks on-site and deters the migration of leaks off-site. Discharge prevention is accomplished through the following measures:

- Pipelines and related structures have grounding systems to reduce the possibility of accidental ignition due to lightning.
- Discharge prevention is also accomplished through the use of general housekeeping procedures and leak inspection system.

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APPENDIX D

TRAINING AND DRILLS

D.1 Response Team Training

Emergency Response Plan Review
Oil Control Center Training and Procedures
Hazardous Waste Operations and Emergency Response (29 CFR 1910.120)
Incident Command System
Training Records Maintenance
Contractor Training
Training Qualifications

D.2 Response Team Exercises

Quarterly QI Notification Exercise
Annual Equipment Deployment Exercise
Annual Response Team Tabletop Exercise
Government-Initiated Unannounced Exercise
Area Exercises
Exercise Documentation

D.3 Purpose of Review and Evaluation

Outline of Review
Detection
Notification
Assessment/Evaluation
Mobilization
Response - Strategy
Response - Resources Used
Response - Effectiveness
Command Structure
Measurement
Government Relations
Public Relations

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D.1 RESPONSE TEAM TRAINING

The Company provides training related to discharge prevention, testing and response, including measures to repair Pipeline ruptures and mitigate discharges. The training methods address oil discharges from the Pipeline from several perspectives: human health and safety, rupture control and repair operations, pollution control, and overall (crisis) management of the emergency.

The competency of each training program is closely monitored by the Training Section through observation of and/or participation in actual training sessions.

Through the various training methods described below the Company's training program is intended to ensure the following results:

That all personnel know:

- Their responsibilities under the Plan.
- The name, address and procedures for contacting the operator on a 24-hour basis.
- The name of and procedures for contacting the Qualified Individual on a 24-hour basis.

That all reporting personnel know:

- The Pipelines and Response Zone details for the affected area (Response Zones Annexes).
- The telephone number of the Federal Provincial/State and local agencies and other required notifications (Section 2.0).
- The notification process. (Section 2.0).

That all response personnel know:

- The characteristics and hazards of the oil discharged (Section 3.0 and Appendix G - MSDS).
- The conditions that is likely to worsen emergencies, including the consequences of pipeline malfunctions, and the appropriate corrective actions.
- The steps necessary to control any accidental discharge of oil and to minimize the potential for fire, explosion, toxicity or environmental damage (Section 3.0).
- The proper firefighting procedures and use of equipment, fire suits, and breathing apparatus (Section 3.0). Only trained persons will be utilized. Company personnel are only trained on the use of handheld Ansul 30# fire extinguisher units for small incipient fires.

Emergency Response Plan Review

All Response Team Members should review their Emergency Response Plan whenever their job position or responsibilities change under the Plan. A copy of this Plan will be available at all times to Team Members.

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Oil Control Center Training and Procedures

- Training and certification ensures Controllers recognize all manners of pipeline operation, including start-up and shutdown, steady state and transient operations and leak detection operations. Controllers are not permitted to operate the system on their own until they have successfully achieved the necessary competency and have been appropriately certified. Regular re-training and re-certification ensures skills and awareness of procedures are maintained;
- Training takes place on a state-of-the-art simulator that fully represents the pipeline and includes a fully integrated leak detection system; enabling training on real world scenarios, including simulated leaks. Any significant changes to the actual pipeline system are first implemented in the simulator and Controllers are fully trained on the change prior to pipeline system implementation;
- A dedicated leak detection controller with responsibility for monitoring the leak detection system and making decisions regarding response to leak indications, including line shutdown. Two other controllers are also in the control room at all times; one dedicated to pipeline operation and one dedicated to terminal and delivery facility operation. Controllers are adjacent to one another and are in constant communication. Team training and a team culture within the control room ensures a collaborative response to anomalous events;
- The line is to be immediately shutdown when an anomaly suggesting a leak event that cannot be definitively evaluated and explained as a non-leak event within 10 minutes;
- Controllers are empowered to shut down the pipeline at their discretion. All non-routine alerts or concerns are investigated immediately by pipeline controllers and field staff. Line start up after an anomaly is identified cannot occur until the anomaly is explained and re-start is approved by the Control Center manager.

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HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE (29 CFR 1910.120)

Federal and State regulations require that Response Team Members maintain up-to-date Hazardous Waste Operations and Emergency Response training necessary to function in their assigned positions. At a minimum, team members will receive "First Responder Awareness Level" training. All personnel responding to an incident must satisfy the applicable Hazardous Waste Operations and Emergency Response training requirements of 29 CFR 1910.120.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE TRAINING REQUIREMENTS		
Responder Classification	**Required Training Hours**	**Refresher**
29CFR 1910.120(q) Emergency Response		
First Responder - Awareness Level	2-4 hrs demonstration of competency	same
First Responder - Operations Level	8 hrs	8 hrs
Hazardous Materials Technician	24 hrs plus competency	8 hrs
Hazardous Materials Specialist	24 hrs plus competency in specialized areas	8 hrs
Incident Commander	24 hrs plus competency	8 hrs
29CFR 1910.120(e) Clean Up Sites		
General Site Workers	40 hrs / 3 days on the job training	8 hrs
Occasional Workers (Limited Tasks)	24 hrs / 1 day on the job training	8 hrs
General Site Workers (Low Hazard)	24 hrs / 1 day on the job training	8 hrs
Supervisors	8 hrs supervisor training	8 hrs
* Previous work experience and/or training certified as equivalent by employer.		

Incident Command System

Response Team Members will receive Incident Command System training and may also receive supplemental training in other related general topics.

Training Records Maintenance

Emergency response training records are maintained at the Company's office. Training records for response personnel will be maintained for as long as personnel have duties in this Emergency Response Plan.

Contractor Training

The Company also recognizes that contract personnel must also have sufficient training to respond emergency response situations. The Company communicates this training need to its key contractors during contract negotiations and often specifically spells out this requirement in its contracts. The Company also tends to use well-known spill response contractors whose reputation and experience levels help ensure personnel who respond will be trained to appropriate levels.

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Training Qualifications

As no formalized method of certifying training instructors has been provided by Occupational Safety and Health Administration, the Company ensures the competency of its instructors and training organizations by selecting trainers and/or organizations with professional reputations and extensive hands-on and classroom experience in their subject matter. The Company personnel with responsibility to coordinate the training program also conduct periodic informal audits of training courses selected for the Company training program to ensure their suitability for the program.

D.2 RESPONSE TEAM EXERCISES

Spill Management Team members, government agencies, contractors, and other resources must participate in response exercises required by Federal, State, or local regulations and as detailed in the "National Preparedness for Response Exercise Program (PREP) Guidelines." The Company (through the Community, Safety and Environment Department) will conduct announced drills to maintain compliance, and each plan-holder must participate in at least one exercise annually. The following table lists the triennial exercise cycle for facilities (see National Preparedness for Response Exercise Program Guidelines for full details).

TRIENNIAL CYCLE		
Total Number	**Frequency**	**Exercise Type/Description**
12	Quarterly	Qualified Individual Notification Exercise
3	Annually	Equipment Deployment Exercise *(Facility-owned equipment)*
3	Annual	Response Team Tabletop Exercise
3	Annual	Equipment Deployment Exercise *(facilities with Oill Spill Removal Organization-owned equipment)*
3	3 per Triennial Cycle	Unannounced Exercise *(not a separate exercise)* Actual response can be considered as an unannounced exercise. Credit can also be given for unannounced equipment deployment and Response Team tabletop exercises.
NOTES: 1) All Emergency Response Plan components must be exercised at least once in the Cycle.		

Quarterly QI Notification Exercise

- **Scope:**Exercise communication between Pipeline personnel and the Qualified Individual(s) and/or designated alternate(s). At least once each year, one of the notification exercises should be conducted during non-business hours.
- **Objective:**Contact must be made with a Qualified Individual or designated alternate, as identified in the Plan.
- **General:**All personnel receiving notification shall respond to the notification and verify their receipt of the notification. Personnel who do not respond should be contacted to determine whether or not they received the notification.

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Annual Equipment Deployment Exercise (for operator and/or Oill Spill Removal Organization equipment)

- **Scope:**Demonstrate ability to deploy spill response equipment identified in the Emergency Response Plan.

  May consist entirely of operator owned equipment, or a combination of OSRO and operator equipment.
  The number of equipment deployment exercises conducted should be such that equipment and personnel assigned to each Response Zone are exercised at least one a year. If the same personnel and equipment respond to multiple zones, they need only exercise once per year. If different personnel and equipment response to various Response Zones, each must participate in an annual equipment deployment exercise.

- **Objective:**Demonstrate personnel's ability to organize and to deploy and operate response equipment. Ensure that the response equipment is in proper working order.

- **General:**The Facility may take credit for actual equipment deployment to a spill, or for training sessions, as long as the activities are properly documented.

Annual Response Team Tabletop Exercise

- **Scope:**Exercise the response team's organization, communication, and decision-making in managing a spill response. Each team identified within the Plan must conduct an annual Response Team Tabletop Exercise.

- **Objective:**Exercise the response team in a review of the following:

  - Knowledge of the Plan;
  - Ability to organize team members to effectively interface with unified command;
  - Communications capability; and
  - Coordination for response capability as outlined in the response plan.

- **General:** A minimum of one Response Team Tabletop Exercise in a triennial cycle will involve a Worst Case Discharge scenario.

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Government-Initiated Unannounced Exercise

- **Scope:** Demonstrate ability to respond to a Worst Case Discharge spill event.

- **Objectives:** Designated Emergency Response Team Members should demonstrate adequate knowledge of their Emergency Response Plan and the ability to organize, communicate, coordinate, and respond in accordance with that Plan.

- **General:** Annually, the Pipeline and Hazardous Materials Safety Administration may conduct up to 20 unannouced exercises throughout the U.S. for the pipeline industry as a whole. A single owner or operator will not be required to participate in a PHMSA-initiated unannounced exercise if they have already participated in one within the previous 36 months.

Area Exercises

- **Objective:** The purpose of the area exercise is to exercise the entire response community in a particular area. An area is defined as "that geographic area for which a separate and distinct Area Contingency Plan has been prepared, as described in Oil Pollution Act 90." The response community includes the Federal, State, and local government and industry. The area exercises are designed to exercise the government and industry interface for spill response.

- **General:** The goal is to ensure that all areas of the country are exercised triennially. All of the area exercises will be developed by an exercise design team. The exercise design team is comprised of representatives from the Federal, State, and local government and industry. A lead plan holder would lead each area exercise. The lead plan holder is the organization (government or industry) that holds the primary plan that is exercised in the area exercise. The lead plan holder would have the final word on designing the scope and scenario of the exercise.

Exercise Documentation

- All exercises should be documented and maintained at the Company office; documentation should specify:

    - The type of exercise;
    - Date and time of the exercise;
    - A description of the exercise;
    - The objectives met in the exercise;
    - The components of the response plan exercised; and
    - Lessons learned.

- Exercise documentation should be kept on file for the required length of time depending on the regulating agency (three (3) years for the U.S. Coast Guard and five (5) years for the Pipeline and Hazardous Materials Safety Administration and the U.S. Environmental Protection Agency).

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D.3 PURPOSE OF REVIEW AND EVALUATION

This Section provides procedures and information useful to responders for post incident/exercise review and evaluation. Post incident/exercise reviews should be conducted in a timely manner following an incident/exercise. The Plan should be evaluated to determine its usefulness during the incident/exercise and appropriate revisions should be made. All incident/exercise documentation should be included in the Plan evaluation process.

Outline of Review

Given below are items a team composed of outside people knowledgeable in spill response and key members of the response teams should examine. These questions are intended as guidelines only; many other questions are likely to be appropriate at each stage of a critique.

Detection

- Was the spill detected promptly?
- How was it detected? By whom?
- Could it have been detected earlier? How?
- Are any instruments or procedures available to consider which might aid in spill detection?

Notification

- Were proper procedures followed in notifying government agencies? Were notifications prompt?
- Was management notified promptly/response appropriate?
- Was the Pipeline owner/operator notified promptly? If so, why, how, and who? If not, why not?

Assessment/Evaluation

- Was the magnitude of the problem assessed correctly at the start?
- What means were used for this assessment?
- Are any guides or aids needed to assist spill evaluation?
- What sources of information were available on winds and on water currents?
- Is our information adequate?
- Was this information useful (and used) for spill trajectory forecasts? Were such forecasts realistic?
- Do we have adequate information on product properties?
- Do we need additional information on changes of product properties with time, i.e., as a result of weathering and other processes?

Mobilization

- What steps were taken to mobilize spill countermeasures?
- What resources were used?
- Was mobilization prompt?
- Could it have been speeded up or should it have been?
- What about mobilization of manpower resources?
- Was the local spill cooperative used appropriately?
- How could this be improved?

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- Was it appropriate to mobilize the Pipeline owner/operator resources and was this promptly initiated?
- What other resources are available and have they been identified and used adequately?

Response - Strategy

- Is there an adequate Spill Response Plan for the location?
- Is it flexible enough to cope with unexpected spill events?
- Does the Plan include clear understanding of local environmental sensitivities?
- What was the initial strategy for response to this spill?
- Is this strategy defined in the Spill Plan?
- How did the strategy evolve and change during this spill and how were these changes implemented?
- What caused such changes?
- Are there improvements needed? More training?

Response - Resources Used

- What resources were mobilized?
- How were they mobilized?
- How did resource utilization change with time? Why?
- Were resources used effectively?
    - Contractors
    - Government agencies
    - Company resources
    - Cooperatives
    - Volunteers
    - Consultants
    - Other (e.g., bird rescue centers)
- What changes would have been useful?
- Do we have adequate knowledge of resource availability?
- Do we have adequate knowledge of waste disposal capabilities?

Response - Effectiveness

- Was containment effective and prompt?
- How could it have been improved?
- Should the location or the local cooperative have additional resources for containment?
- Was recovery effective and prompt?
- How could it have been improved?
- Should the location or the local cooperative have additional resources for recovery of spilled product?
- Was contaminated equipment disposed promptly and safely?
- Was there adequate in-house product separation, recovery, and disposal?
- How could it have been improved?
- Was there adequate outside disposal resources available?

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Command Structure

- Who was initially in charge of spill response?
- What sort of organization was initially set up?
- How did this change with time? Why?
- What changes would have been useful?
- Was there adequate surveillance?
- Should there be any changes?
- Were communications adequate?
- What improvements are needed? Hardware, procedures, etc.
- Was support from financial services adequate? Prompt?
- Should there be any changes?
- Is more planning needed?
- Should financial procedures be developed to handle such incidents?

Measurement

- Was there adequate measurement or estimation of the volume of product spilled?
- Was there adequate measurement or estimation of the volume of product recovered?
- Was there adequate measurement or estimation of the volume of product disposed?
- Should better measurement procedures be developed for either phase of operations?
- If so, what would be appropriate and acceptable?

Government Relations

- What are the roles and effects of the various government agencies which were involved?
- Was there a single focal point among the government agencies for contact?
- Should there have been better focus of communications to the agencies?
- Were government agencies adequately informed at all stages?
- Were too many agencies involved?
- Are any changes needed in procedures to manage government relations?
- Examples of affected U.S. agencies (there may be others):
    - U.S. Coast Guard
    - Environmental Protection Agency
    - National Oceanic and Atmospheric Administration
    - Dept of Fish and Wildlife
    - State Parks
    - Harbors and Marinas
    - States
    - Cities
    - Counties
- Was there adequate agreement with the government agencies on disposal methods?
- Was there adequate agreement with the government agencies on criteria for cleanup?
- How was this agreement developed?
- Were we too agreeable with the agencies in accepting their requests for specific action items (e.g., degree of cleanup)?
- Should there be advance planning of criteria for cleanup, aimed at specific local environmentally sensitive areas? (Such criteria should probably also be designed for different types of product.)

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Public Relations

- How were relations with the media handled?
- What problems were encountered?
- Are improvements needed?
- How could public outcry have been reduced? Was it serious?
- Would it be useful to undertake a public information effort to "educate" reporters about product and effects to it if spilled?
- These areas should be investigated shortly after the incident to assure that actions taken are fresh in peoples' minds.

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APPENDIX E

DISPOSAL PLAN

E.1 Overview

E.2 Waste Classification

E.3 Waste Handling

E.4 Waste Storage

E.5 Waste Disposal

Figure E.1 Temporary Storage Methods

Figure E.2 Oily Waste Separation and Disposal Methods

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E.1 OVERVIEW

A major oil spill response would generate significant quantities of waste materials ranging from oily debris and sorbent materials to sanitation water and used batteries. All these wastes need to be classified and segregated (i.e., oily, liquid, etc.), transported from the site, and treated and/or disposed at approved disposal sites. Each of these activities demands that certain health and safety precautions be taken, which are strictly controlled by Federal and State Laws and Regulations. This Section provides an overview of the applicable State Regulations governing waste disposal, and a discussion of various waste classification, handling, transfer, storage, and disposal techniques. It is the responsibility of the Environmental Unit to manage waste disposal needs during an oil spill cleanup.

E.2 WASTE CLASSIFICATION

Oily- Liquid Wastes

Oily liquid wastes (i.e., oily water and emulsions) that would be handled, stored, and disposed during response operations are very similar to those handled during routine storage and transfer operations. The largest volume of oily liquid wastes would be produced by recovery operations (e.g., through the use of vacuum devices or skimmers). In addition, oily water and emulsions would be generated by vehicle operations (e.g., spent motor oils, lubricants, etc.), and equipment cleaning operations.

Non-Oily - Liquid Wastes

Response operations would also produce considerable quantities of non-oily liquid wastes. Water and other non-oily liquid wastes would be generated by the storage area and stormwater collection systems, equipment cleaning (i.e., water contaminated with cleaning agents), and office and field operations (i.e., sewage, construction activities).

Solid Wastes

A solid waste is defined as any discarded material provided that it is not specifically excluded under the regulations. These exclusions cover materials such as domestic sewage and mixtures of sewage discharged through a sewer system or industrial wastewater point source discharges.

A discarded material is any material which is abandoned (disposed, burned or incinerated) or accumulated, stored or treated prior to being abandoned. A discarded material is also any material recycled or any material considered inherently wastelike. Recycled material is considered solid waste when used in a manner constituting disposal, placed on land or burned for energy recovery.

A solid waste may be considered a hazardous waste. A solid waste, as defined above, may be a hazardous waste if it is not excluded from regulation and is either a listed hazardous waste or exhibits the characteristics of a hazardous waste. A solid waste exhibits the characteristics of a hazardous waste if it exceeds the thresholds established in determining the following:

1. ignitability
2. corrosivity
3. reactivity
4. toxicity

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A solid waste may also become a hazardous waste if it is mixed with a listed hazardous waste or, in the case of any other waste (including mixtures), when the waste exhibits any of the characteristics identified above.

Oily - Solid / Semi-Solid Wastes

Oily solid/semi-solid wastes that would be generated by containment and recovery operations include damaged or worn-out booms, disposable/soiled equipment, used sorbent materials, saturated soils, contaminated beach sediments, driftwood, and other debris.

Non-Oily - Solid / Semi-Solid Wastes

Non-oily solid/semi-solid wastes would be generated by emergency construction operations (e.g., scrap, wood, pipe, and wiring) and office and field operations (i.e., refuse). Vessel, vehicle, and aircraft operations also produce solid wastes.

E.3 WASTE HANDLING

A primary concern in the handling of recovered oil and oily debris is contaminating unaffected areas or recontaminating already cleaned areas. Oily wastes generated during the response operations would need to be separated by type and transferred to temporary storage areas and/or transported to incineration or disposal sites. Proper handling of oil and oily wastes is imperative to ensure personnel health and safety.

Safety Considerations

Care shall be taken to avoid or minimize direct contact with oily wastes. All personnel handling or coming into contact with oily wastes shall wear protective clothing. A barrier cream can be applied prior to putting on gloves to further reduce the possibility of oily waste absorption. Safety goggles shall be worn by personnel involved in waste handling activities where splashing might occur. Any portion of the skin exposed to oily waste should be washed with soap and water as soon as possible. Decontamination zones should be set up during response operations to ensure personnel are treated for oil exposure.

Wastes Transfer

During response operations, it may be necessary to transfer recovered oil and oily debris from one point to another several times before the oil and oily debris are ultimately recycled, incinerated or disposed at an appropriate disposal site. Depending on the location of response operations, any or all of the following transfer operations may occur:

- From portable or vessel-mounted skimmers into flexible bladder tanks, storage tanks of the skimming vessel itself, or a barge.
- Directly into the storage tank of a vacuum device.
- From a skimming vessel or flexible bladder to a barge.
- From a vacuum device storage tank to a barge.
- From a barge to a tank truck.
- From a tank truck to a processing system (e.g., oil/water separator).
- From a processing system to a recovery system and/or incinerator.
- Directly into impermeable bags that, in turn, are placed in impermeable containers.
- From containers to trucks.

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There are four general classes of transfer systems that may be employed to affect oily waste transfer operations:

- **Pumps:** Rotary pumps, such as centrifugal pumps, may be used when transferring large volumes of oil, but they may not be appropriate for pumping mixtures of oil and water. The extreme shearing action of centrifugal pumps tends to emulsify oil and water, thereby increasing the viscosity of the mixture and causing low, inefficient transfer rates. The resultant emulsion would also be more difficult to separate into oil and water fractions. Lobe or "positive displacement" pumps work well on heavy, viscous oils, and do not emulsify the oil/water mixture. Double-acting piston and double acting diaphragm pumps are reciprocating pumps that may also be used to pump oily wastes.
- **Vacuum Systems:** A vacuum truck may be used to transfer viscous oils but they usually pick up a very high water/oil ratio.
- **Belt/Screw Conveyors:** Conveyors may be used to transfer oily wastes containing a large amount of debris. These systems can transfer weathered debris laden oil either horizontally or vertically for short distances (i.e., 10 feet) but are bulky and difficult to set up and operate.
- **Wheeled Vehicles:** Wheeled vehicles may be used to transfer liquid wastes or oily debris to storage or disposal sites. These vehicles have a limited transfer volume (i.e., 100 barrels) and require good site access.

E.4 WASTE STORAGE

Interim storage of recovered oil, oily and non-oily waste would be considered to be an available means of holding the wastes until a final management method is selected. In addition, the segregation of wastes, according to type, would facilitate the appropriate method of disposal. The storage method used would depend upon:

- The type and volume of material to be stored.
- The duration of storage.
- Access.

During an oil spill incident, the volume of oil that can be recovered and dealt with effectively depends upon the available storage capacity. Typical short-term storage options are summarized in Figure E-1. The majority of these options can be used either onshore or offshore.

If storage containers such as bags or drums are used, the container must be clearly marked with the proper Canadian Transport Dangerous Goods/United States Department of Transportation marking to indicate the type of material/waste contained and/or the ultimate disposal option.

Fuel barges may be the best option for temporary storage of oil recovered in open waters and frac tanks for inland spills. Depending on size, these vessels may be able to hold up to 6,000 barrels of oil and water and frac tanks may hold up to 500-550 barrels. The barge deck can be used as a platform for operating oil spill clean-up equipment and storing containment boom.

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Steel or rubber tanks can be used to store oil recovered near the shoreline. To facilitate offloading, demulsifiers may be used to break emulsions prior to placing the recovered substance into the barges or storage tanks.

Use of any site for storage is dependent on the approval of the local authorities. The following elements affect the choice of a potential storage site:

- Geology.
- Ground water.
- Soil.
- Flooding.
- Surface water.
- Slope.
- Covered material.
- Capacity.
- Climatic factors.
- Land use.
- Toxic air emissions.
- Security.
- Access.
- Public contact.

E.5 WASTE DISPOSAL

Techniques for Disposal of Recovered Oil

Recovery, reuse, and recycling are the best choices for remediation of a spill, thereby reducing the amount of oily debris to be bermed onsite or disposed of at a solid waste landfill. Treatment is the next best alternative, but incineration and burning for energy recovery have more options within the state. There are some limitations and considerations in incinerating for disposal. Environmental quality of incineration varies with the type and age of the facility. Therefore, when incineration becomes an option during an event, local air quality authorities would be contacted for advice about efficiency and emissions of facilities within their authority. Approval of the local air authorities is a requirement for any incineration option. Landfilling is the last option. Final disposal at a solid or dangerous waste landfill is the least environmentally sound method of dealing with a waste problem such as oily debris.

Note: Prior to the disposal of ANY waste products, the Incident Commander or his designee must contact the Keystone / TransCanada Community, Safety and Environmental Department to receive direction and guidence on the proper disposal methods and procedures.

During an oil spill incident, the Company would consult with the proper regulating agency to identify the acceptable disposal methods and sites appropriately authorized to receive such wastes. The Company maintains a list of approved disposal sites that satisfy local, Province/State, and Federal Regulations and Company requirements. This identification of suitable waste treatment and disposal sites would be prepared by the Environmental Unit in the form of an Incident Disposal Plan which must be authorized by the USCG and/or the EPA or NEB and any authorizing state agency.

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An Incident Disposal Plan would include predesignated interim storage sites, segregation strategies, methods of treatment and disposal for various types of debris, and the locations/contacts of all treatment and disposal site selections. Onsite treatment/disposal is preferred.

In order to obtain the best overall Incident Disposal Plan, a combination of methods should be used. There is no template or combination of methods that can be used in every spill situation. Each incident should be reviewed carefully to ensure that an appropriate combination of disposal methods is employed.

The different types of wastes generated during response operations would require different disposal methods. To facilitate the disposal of wastes, they should be separated by type for temporary storage, transport and disposal. Figure E-2 lists some of the options that would be available to segregate oily wastes. The figure also depicts methods that may be employed to separate free and/or emulsified water from the oily liquid waste.

The following is a brief discussion of some disposal techniques available for recovered oil and oily debris.

Recycling

This technique entails removing water from the oil and blending the oil with uncontaminated oil. Recovered oil can be shipped to refineries provided that it is exempt from hazardous waste regulations. There it can be treated to remove water and debris, and then blended and sold as a commercial product.

The Company's designated Disposal Specialist is responsible for ensuring that all waste materials be disposed at an internally approved disposal site.

Incineration

This technique entails the complete destruction of the recovered oil by high temperature thermal oxidation reactions. There are licensed incineration facilities as well as portable incinerators that may be brought to a spill site. Incineration may require the approval of the local Air Pollution Control Authority. Factors to consider when selecting an appropriate site for onsite incineration would include:

- Proximity to recovery locations.
- Access to recovery locations.
- Adequate fire control.
- Approval of the local air pollution control authorities.

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In Situ Burning / Open Burning

Burning techniques entail igniting oil or oiled debris and allowing it to burn under ambient conditions. These disposal techniques are subject to restrictions and permit requirements established by federal, province/state and local laws. They would not be used to burn Polychlorinated biphenyls, waste oil containing more than 1,000 parts per million of halogenated solvents, or other substances regulated by the Environmental Protection Agency or Environment Canada. Permission for in situ burning may be difficult to obtain when the burn takes place near populated areas.

As a general rule, in situ burning would be appropriate only when atmospheric conditions will allow the smoke to rise several hundred feet and rapidly dissipate. Smoke from burning oil will normally rise until its temperature drops to equal the ambient temperature. Afterwards, it will travel in a horizontal direction under the influence of prevailing winds.

Landfill Disposal

This technique entails burying the recovered oil in an approved landfill in accordance with regulatory procedures. Landfill disposal of free liquids is prohibited by Federal Law in the United States.

With local health department approval, non-burnable debris, which consists of oiled plastics, gravel and oiled seaweed, kelp, and other organic materials, may be transported to a licensed, lined, approved municipal or private landfill and disposed of in accordance with the landfill guidelines and regulations. Landfill designation would be planned only for those wastes that have been found to be unacceptable by each of the other disposal options (e.g., waste reduction, recycling, energy recovery). Wastes will be disposed only at Company-approved disposal facilities. The Disposal Specialist is responsible for ensuring that all waste materials are disposed at a Company internally approved disposal site. Disposal at a non-approved facility would require approval by the Disposal Specialist prior to sending any waste to such a facility.

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FIGURE E-1

TEMPORARY STORAGE METHODS

CONTAINER	ONSHORE	OFFSHORE	SOLIDS	LIQUIDS	NOTES
Barrels	x	x	x	x	May require handling devices. Covered and clearly marked.
Tank Trucks	x	x		x	Consider road access. Barge-mounted offshore.
Dump/Flat Bed Trucks-Roll-offs	x		x		May require impermeable liner and cover. Consider flammability of vapors at mufflers.
Barges		x	x	x	Liquids only in tanks. Consider venting of tanks.
Oil Storage Tanks	x	x		x	Consider problems of large volumes of water in oil.
Bladders	x	x		x	May require special hoses or pumps for oil transfer.
Frac Tanks	x			x	Consider road access.

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FIGURE E-2

OILY WASTE SEPARATION AND DISPOSAL METHODS

TYPE OF MATERIAL	SEPARATION METHODS	DISPOSAL METHODS
LIQUIDS		
Non-emulsified oils	• Gravity separation of free water	• Incineration • Use of recovered oil as refinery/production facility feedstock
Emulsified oils	• Emulsion broken to release water by: o heat treatment o emulsion breaking chemicals o mixing with sand o centrifuge o filter/belt press	• Use of recovered oil as refinery/production facility feedstock
SOLIDS		
Oil mixed with sand and soil	• Collection of liquid oil leaching from sand during temporary storage • Extraction of oil from sand by washing with water or solvent • Removal of solid oils by sieving	• Incineration • Use of recovered oil as refinery/production facility feedstock • Direct disposal • Stabilization with inorganic material • Degradation through land farming or composting
Oil mixed with cobbles or pebbles	• Screening • Collection of liquid oil leaching from materials during temporary storage • Extraction of oil from materials by washing with water or solvent	• Incineration • Direct Disposal • Use of recovered oil as refinery/production facility feedstock
Oil mixed with wood and sorbents	• Screening • Collection of liquid oil leaching from debris during temporary storage • Flushing of oil from debris with water	• Incineration • Direct disposal • Degradation through land farming or composting for oil mixed with seaweed or natural sorbents

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APPENDIX F

MISCELLANEOUS FORMS

Forms and Exercise Documentation File Maintenance Procedures
• Forms and exercise documentation records should be maintained in a separate file in the Facility's office filing system. • These files must be available for presentation upon request by regulatory agency personnel.

F 7000-1

Click to view the file

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Date: _____ NRC Incident No. #_____

PHMSA F 7000-1 Accident Report – Hazardous Liquid Pipeline Systems Form

© Response Management Associates, Inc.

Date: _____ NRC Incident No. #_____

NOTICE: This report is required by 49 CFR Part 195. Failure to report can result in a civil penalty not to exceed $25,000 for each violation for each day that such violation persists except that the maximum civil penalty shall not exceed $500,000 as provided in 49 USC 60122 Form Approved OMB No. 2137-0047

U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

ACCIDENT REPORT – HAZARDOUS LIQUID PIPELINE SYSTEMS

Report Date _____
No. _____
(DOT Use Only)

INSTRUCTIONS

Important: *Please read the separate instructions for completing this form before you begin. They clarify the information requested and provide specific examples. If you do not have a copy of the instructions, you can obtain one from the Office Of Pipeline Safety Web Page at http://ops.dot.gov.*

PART A – GENERAL REPORT INFORMATION

Check: ☐ **Original Report** ☐ **Supplemental Report** ☐ **Final Report**

1. a. Operator's OPS 5-digit Identification Number (if known) /___/___/___/___/___/
   b. If Operator does not own the pipeline, enter Owner's OPS 5-digit Identification Number (if known) /___/___/___/___/___/
   c. Name of Operator _____
   d. Operator street address _____
   e. Operator address _____
   City, County, State and Zip Code

IMPORTANT: IF THE SPILL IS SMALL, THAT IS, THE AMOUNT IS AT LEAST 5 GALLONS BUT IS LESS THAN 5 BARRELS, COMPLETE THIS PAGE ONLY, UNLESS THE SPILL IS TO WATER AS DESCRIBED IN 49 CFR §195.52(A)(4) OR IS OTHERWISE REPORTABLE UNDER §195.50 AS REVISED IN CY 2001.

2. Time and date of the accident
   /___/___/___/___/ /___/___/ /___/___/ /___/___/
   hr. month day year

3. Location of accident
   (If offshore, do not complete a through d. See Part C.1)
   a. Latitude: _____ Longitude: _____
   (if not available, see instructions for how to provide specific location)
   b. _____
   City, and County or Parish
   c. _____
   State and Zip Code
   d. Mile post/valve station O or survey station no. O
   (whichever gives more accurate location)
   _____

4. Telephone report
   /___/___/___/___/___/___/___/ /___/___/ /___/___/ /___/___/
   NRC Report Number month day year

5. Losses *(Estimated)*

Public/Community Losses reimbursed by operator:

Public/private property damage	$_____
Cost of emergency response phase	$_____
Cost of environmental remediation	$_____
Other Costs	$_____
(describe) _____	

Operator Losses:

Value of product lost	$_____
Value of operator property damage	$_____
Other Costs	$_____
(describe) _____	
Total Costs	$_____

6. Commodity Spilled OYes O No
(If Yes, complete Parts a through c where applicable)

a. Name of commodity spilled _____

b. Classification of commodity spilled:
- O HVLs /other flammable or toxic fluid which is a gas at ambient conditions
- O CO_2 or other non-flammable, non-toxic fluid which is a gas at ambient conditions
- O Gasoline, diesel, fuel oil or other petroleum product which is a liquid at ambient conditions
- O Crude oil

a. Estimated amount of commodity involved :
- O **Barrels**
- O **Gallons (check only if spill is less than one barrel)**

Amounts:
Spilled : _____
Recovered: _____

CAUSES FOR SMALL SPILLS ONLY (5 gallons to under 5 barrels) :

(For large spills [5 barrels or greater] see Part H)

O **Corrosion** O **Natural Forces** O **Excavation Damage** O **Other Outside Force Damage**
O **Material and/or Weld Failures** O **Equipment** O **Incorrect Operation** O **Other**

PART B – PREPARER AND AUTHORIZED SIGNATURE

_____ _____
(type or print) Preparer's Name and Title Area Code and Telephone Number

_____ _____
Preparer's E-mail Address Area Code and Facsimile Number

_____ _____ _____ _____
Authorized Signature (type or print) Name and Title Date Area Code and Telephone Number

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Date: _____ NRC Incident No. #_____

PART C – ORIGIN OF THE ACCIDENT (Check all that apply)

1. Additional location information
   a. Line segment name or ID _____
   b. Accident on Federal land other than Outer Continental Shelf O Yes O No
   c. Is pipeline interstate? O Yes O No

Offshore: O Yes O No *(completed if offshore)*
d. Area _____ Block # _____
State / / / or Outer Continental Shelf ☐

2. Location of system involved *(check all that apply)*
   ☐ Operator's Property
   ☐ Pipeline Right of Way
   ☐ High Consequence Area (HCA)?
   Describe HCA_____

3. Part of system involved in accident
   O Above Ground Storage Tank
   O Cavern or other below ground storage facility
   O Pump/meter station; terminal/tank farm piping and equipment, including sumps
   O Other *Specify:* _____
   O Onshore **pipeline**, including valve sites
   O Offshore **pipeline**, including platforms

*If failure occurred on **Pipeline**, complete items a - g:*

4. Failure occurred on

O Body of Pipe	O Pipe Seam	O Scraper Trap
O Pump	O Sump	O Joint
O Component	O Valve	O Metering Facility
O Repair Sleeve	O Welded Fitting	O Bolted Fitting
O Girth Weld		

Other *(specify)* _____

Year the component that failed was installed: / / / / /

5. Maximum operating pressure *(MOP)*
   a. Estimated pressure at point and time of accident: _____ *PSIG*
   b. MOP at time of accident: _____ *PSIG*
   c. Did an over pressurization occur relating to the accident? OYes O No

a. Type of leak or rupture
   OLeak: O Pinhole O Connection Failure *(complete sec. H5)*
   O Puncture, diameter *(inches)* _____
   ORupture: O Circumferential – Separation
   O Longitudinal – Tear/Crack, length *(inches)* _____
   Propagation Length, total, both sides *(feet)* _____
   ON/A
   OOther _____

b. Type of block valve used for isolation of immediate section:
   Upstream: ☐ Manual ☐ Automatic ☐ Remote Control ☐ Check Valve
   Downstream: ☐ Manual ☐ Automatic ☐ Remote Control ☐ Check Valve

c. Length of segment isolated _____ ft
d. Distance between valves _____ ft
e. Is segment configured for internal inspection tools? OYes O No
f. Had there been an in-line inspection device run at the point of failure? O Yes O No O Don't Know
   O Not Possible due to physical constraints in the system
g. If Yes, type of device run *(check all that apply)*
   ☐ High Resolution Magnetic Flux tool Year run: _____
   ☐ Low Resolution Magnetic Flux tool Year run: _____
   ☐ UT tool Year run: _____
   ☐ Geometry tool Year run: _____
   ☐ Caliper tool Year run: _____
   ☐ Crack tool Year run: _____
   ☐ Hard Spot tool Year run: _____
   ☐ Other tool Year run: _____

PART D – MATERIAL SPECIFICATION

1. Nominal pipe size *(NPS)* / / / / / in.
2. Wall thickness / / / / / in.
3. Specification _____ SMYS / / / / / /
4. Seam type _____
5. Valve type _____
6. Manufactured by _____ in year / / / / /

PART E – ENVIRONMENT

1. Area of accident
   O In open ditch
   O Under pavement
   O Above ground
   O Underground
   O Under water
   O Inside/under building
   O Other _____

2. Depth of cover: _____ inches

PART F – CONSEQUENCES

1. **Consequences** ***(check and complete all that apply)***

a.	Fatalities	Injuries
Number of operator employees:		
Contractor employees working for operator:		
General public:		
Totals:		

b. Was pipeline/segment shutdown due to leak? OYes O No
If Yes, how long? _____ days _____ hours _____ minutes

c. Product ignited OYes O No d. Explosion OYes O No
e. ☐ Evacuation *(general public only)* / / / / / people
Reason for Evacuation:
O Precautionary by company
O Evacuation required or initiated by public official

f. Elapsed time until area was made safe:
/ / / hr. / / / min.

2. **Environmental Impact**
   a. Wildlife Impact: Fish/aquatic O Yes O No; Birds O Yes O No; Terrestrial O Yes O No
   b. Soil Contamination O Yes O No
   If Yes, estimated number of cubic yards: _____
   c. Long term impact assessment performed: O Yes O No
   d. Anticipated remediation O Yes O No
   If Yes, check all that apply: ☐ Surface water ☐ Groundwater ☐ Soil ☐ Vegetation ☐ Wildlife

e. Water Contamination: O Yes O No (*If Yes, provide the following*)
   Amount in water _____ barrels

Ocean/Seawater	O No	O Yes
Surface	O No	O Yes
Groundwater	O No	O Yes
Drinking water	O No	O Yes (*If Yes, check below.*)

O Private well O Public water intake

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Date: _____ NRC Incident No. #_____

PART G – LEAK DETECTION INFORMATION

1. Computer based leak detection capability in place? O Yes O No

2. Was the release initially detected by? (check one):
O CPM/SCADA-based system with leak detection
O Static shut-in test or other pressure or leak test
O Local operating personnel, procedures or equipment
O Remote operating personnel, including controllers
O Air patrol or ground surveillance
O A third party O Other (specify) _____

3. Estimated leak duration days ____ hours ____

PART H – APPARENT CAUSE

Important: *There are 25 numbered causes in this Part H. Check the box corresponding to the primary cause of the accident. Check one circle in each of the supplemental categories corresponding to the cause you indicate. See the instructions for guidance.*

H1 – CORROSION

1. ☐ External Corrosion

2. ☐ Internal Corrosion

(Complete items a – e where applicable.)

a. Pipe Coating
O Bare
O Coated

b. Visual Examination
O Localized Pitting
O General Corrosion
O Other _____

c. Cause of Corrosion
O Galvanic O Atmospheric
O Stray Current O Microbiological
O Cathodic Protection Disrupted
O Stress Corrosion Cracking
O Selective Seam Corrosion
O Other _____

d. Was corroded part of pipeline considered to be under cathodic protection prior to discovering accident?
O No O Yes, Year Protection Started: /___/___/___/___/

e. Was pipe previously damaged in the area of corrosion?
O No O Yes ⇒ Estimated time prior to accident: /___/___/ *years* /___/___/ *months* *Unknown* ☐

H2 – NATURAL FORCES

3. ☐ Earth Movement ⇒ O Earthquake O Subsidence O Landslide O Other _____
4. ☐ Lightning
5. ☐ Heavy Rains/Floods ⇒ O Washouts O Flotation O Mudslide O Scouring O Other _____
6. ☐ Temperature ⇒ O Thermal stress O Frost heave O Frozen components O Other _____
7. ☐ High Winds

H3 – EXCAVATION DAMAGE

8. ☐ Operator Excavation Damage (including their contractors/Not Third Party)
9. ☐ Third Party *(complete a-f)*

a. Excavator group
O General Public O Government O Excavator other than Operator/subcontractor

b. Type: O Road Work O Pipeline O Water O Electric O Sewer O Phone/Cable
O Landowner-not farming related O Farming O Railroad
O Other liquid or gas transmission pipeline operator or their contractor
O Nautical Operations O Other _____

c. Excavation was: OOpen Trench O Sub-strata (boring, directional drilling, etc...)

d. Excavation was an ongoing activity (Month or longer) OYes O No If Yes, Date of last contact /___/___/___/

e. Did operator get prior notification of excavation activity?
O Yes; Date received: /___/___/ mo. /___/___/ day /___/___/___/___/ yr. O No
Notification received from: O One Call System O Excavator O Contractor O Landowner

f. Was pipeline marked as result of location request for excavation? O No O Yes *(If Yes, check applicable items i - iv)*
i. Temporary markings: O Flags O Stakes O Paint
ii. Permanent markings: O
iii. Marks were (check one) : O Accurate O Not Accurate
iv. Were marks made within required time? O Yes O No

H4 – OTHER OUTSIDE FORCE DAMAGE

10. ☐ Fire/Explosion as primary cause of failure ⇒ Fire/Explosion cause: O Man made O Natural
11. ☐ Car, truck or other vehicle not relating to excavation activity damaging pipe
12. ☐ Rupture of Previously Damaged Pipe
13. ☐ Vandalism

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Date: _____ NRC Incident No. #_____

H5 – MATERIAL AND/OR WELD FAILURES

Material

14.☐ Body of Pipe	⇒	O Dent	O Gouge	O Bend	O Arc Burn	O Other _____
15.☐ Component	⇒	O Valve	O Fitting	O Vessel	O Extruded Outlet	O Other _____
16.☐ Joint	⇒	O Gasket	O O-Ring	O Threads		O Other _____

Weld

17.☐ Butt	⇒	O Pipe	O Fabrication			O Other _____
18.☐ Fillet	⇒	O Branch	O Hot Tap	O Fitting	O Repair Sleeve	O Other _____
19.☐ Pipe Seam	⇒	O LF ERW	O DSAW	O Seamless	O Flash Weld	
		O HF ERW	O SAW	O Spiral		O Other _____

*Complete a-g if you indicate **any** cause in part H5.*

a. Type of failure:
O Construction Defect ⇒ O Poor Workmanship O Procedure not followed O Poor Construction Procedures
O Material Defect

b. Was failure due to pipe damage sustained in transportation to the construction or fabrication site? O Yes O No

c. Was part which leaked pressure tested before accident occurred? O Yes, *complete d-g* O No

d. Date of test: /__/__/__/__/ yr. /__/__/ mo. /__/__/ day

e. Test medium: O Water O Inert Gas O Other _____

f. Time held at test pressure: /__/__/ hr.

g. Estimated test pressure at point of accident: _____ *PSIG*

H6 – EQUIPMENT

20. ☐ Malfunction of Control/Relief Equipment	⇒	O Control valve	O Instrumentation	O SCADA	O Communications	
		O Block valve	O Relief valve	O Power failure	O Other _____	
21. ☐ Threads Stripped, Broken Pipe Coupling	⇒	O Nipples	O Valve Threads	O Dresser Couplings	O Other _____	
22. ☐ Seal Failure	⇒	O Gasket	O O-Ring	O Seal/Pump Packing	O Other _____	

H7 – INCORRECT OPERATION

23. ☐ Incorrect Operation
a. Type: O Inadequate Procedures O Inadequate Safety Practices O Failure to Follow Procedures
O Other _____

b. Number of employees involved who failed a post-accident test: drug test: /__/__/__/ alcohol test /__/__/__/

H8 – OTHER

24. ☐ Miscellaneous, *describe:* _____

25. ☐ Unknown
O Investigation Complete O Still Under Investigation *(submit a supplemental report when investigation is complete)*

PART I – NARRATIVE DESCRIPTION OF FACTORS CONTRIBUTING TO THE EVENT *(Attach additional sheets as necessary)*

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TransCanada
In business to deliver

date

Transportation Safety Board of Canada
Place du Centre, 4th Floor
200 Promenade du Portage
Hull, Québec
K1A 1K8

Attention: Mr. Larry Gales, P. Eng.

Dear Sir:

Re: Preliminary Incident Report involving event type on the TransCanada PipeLines Limited ("TransCanada") Canadian Mainline at Station/MLV Location, near Town, Province, on date of occurrence

Further to our verbal report of date to Board Staff Member Mr. x, the following is TransCanada's Preliminary Incident Report in accordance with the requirements of Section 52 of the National Energy Board's Onshore Pipeline Regulations and Section 5 of the Transportation Safety Board Regulations.

(a) describe the incident, including the events leading up to and following the incident;

(b) list all relevant agencies contacted and persons affected by the incident;

(c) summarize any losses or impacts to people (e.g., injury, fatalities), environment (e.g., terrain, habitats, animals), production (e.g., interruption or reduction in service), and property;

If this were a gas release incident, use the following canned statement:

The environmental impact of this gas release is related to greenhouse gas emissions to atmosphere. This incident resulted in a maximum emission of _____ kt of methane which corresponds to _____ kt of CO_2 equivalents. The gas released from this incident will be included in our annual green house gas emission report to Statistics Canada.

DRAFT

Aside: Following is the formula for calculating kilotonnes of methane and kilotonnes of CO_2:

$$\frac{10^3\ m^3 \times 0.71}{1000} = \text{kt Methane}$$

$$\text{kt Methane} \times 21 = \text{kt } CO_2 \text{ equivalents}$$

(d) identify any unsafe acts or conditions contributing to or causing the incident;

(e) provide details on any emergency response,

(f) state any corrective actions taken or planned to be taken to minimize the effects of the incident.

Yours very truly,
TransCanada PipeLines Ltd.

Original signed

R.P. Lancée, P. Eng.
Senior Regulatory Compliance Specialist

cc: (appropriate Regional Director)
(appropriate Compliance Manager)
(appropriate Area Manager)

J. Baggs	(all reports)
K. Black	(all reports)
D. King	(all reports)
B. McConaghy	(if safety, health or environment related)
G. Scaman	(all reports)
J. Scott	(Legal review)
D. Wishart	(all reports)

Incident & Issue Tracking No. _____

DRAFT

TransCanada
In business to deliver

date

Transportation Safety Board of Canada
Place du Centre, 4th Floor
200 Promenade du Portage
Hull, Québec
K1A 1K8

Attention: Mr. Larry Gales, P. Eng.

Dear Sir:

Re: Detailed Incident Report involving event type on the TransCanada PipeLines Limited ("TransCanada") Canadian Mainline, Station/MLV Location, near Town, Province, on date of occurrence

The following is TransCanada's Detailed Incident Report, in accordance with the requirements of Section 52 of the National Energy Board's Onshore Pipeline Regulations, 1999 and Section 5 of the Transportation Safety Board Regulations.

Board Staff Member Mr. (name) was notified of the event type on date of occurrence. The Preliminary Incident Report was filed with the Board on date.

a) provide any details regarding the failure mechanism and detailed analysis of the failed component (if necessary);

(b) identify the underlying causes of the incident;

(c) update the progress of any corrective actions taken or planned to be taken to minimize the effects of the incident;

(d) state any actions taken or planned to be taken to prevent a similar incident.

DRAFT

Yours very truly,
TransCanada PipeLines Limited

Original signed

R.P. Lancée, P. Eng.
Senior Regulatory Compliance Specialist

cc: (appropriate Regional Director)
(appropriate Compliance Manager)
(appropriate Area Manager)

J. Baggs	(all reports)
K. Black	(all reports)
D. King	(all reports)
B. McConaghy	(if safety, health or environment related)
G. Scaman	(all reports)
J. Scott	(legal review)
D. Wishart	(all reports)

Incident & Issue Tracking No. _____

DRAFT

TransCanada
In business to deliver

450 - 1st Street S.W
Calgary, Alberta, Canada T2P 5H1
tel 403.920-7069
fax 403.920-2319
E-mail roel_lancee@transcanada.com

Date

National Energy Board
444 Seventh Avenue S.W.
Calgary, Alberta
T2P 0X8

Attention: Ms. Claudine Dutil-Berry, Secretary

Dear Madame:

Re: Unauthorized event type at TransCanada PipeLines Limited ("TransCanada") Canadian Mainline Station/MLV Location, near Town, Province, on date of occurrence

TransCanada PipeLines Limited ("TransCanada") files this Incident Report to report unauthorized mechanical excavation activities pursuant to the reporting requirements of Section 13 of the National Energy Board's Pipeline Crossing Regulations Part II.

Board Staff Member _____ was initially notified of the unauthorized_____ on date of notification.

a.) Date of Occurrence

b.) Location of occurrence (Legal Land Description, MLV, mileage post, etc)

c.) Indicate whether the activity involved mechanical excavation

d.) Location of pipeline markers with respect to the unauthorized activity

e.) Indicate whether a permit was issued by pipeline company (yes or no)

f.) Name of landowner or facility owner, address and contact information (phone, fax, e-mail if applicable)

Draft

g.) Name of excavator or contractor, address and contact information (phone, fax, e-mail if applicable)

h.) Name of Pipeline company representative dealing with violation and contact information (phone, fax, e-mail if applicable)

i.) Concerns the pipeline company may have regarding the safety of the pipeline as a result of the construction or installation or of the excavation

j.) Any action the company intends to take or has taken

Mr. _____ met with Mr. _____ on date and discussed the requirements of notifying Info-Excavation prior to undertaking any mechanical excavation activities within the province and of having a Company Representative present to locate the pipeline and monitor the excavation when excavating on or within 30-metres of the TQM pipeline Right-of-Way. Mr. _____ provided Mr. _____ with a copy of the Integrated Public Awareness Package to remind him of their discussions.

Yours very truly,
TransCanada PipeLines Limited

R.P. Lancée, P. Eng.
Senior Regulatory Compliance Specialist

cc: (appropriate Regional Director)
(appropriate Compliance Manager)
(appropriate Area Manager
(appropriate Land Representative)
J. Baggs
K. Black
D. King
B. McConaghy
G. Scaman
J. Scott
D. Wishart

cc: S. Berthelet National Energy Board

Incident & Issue Tracking No. _____

Project

1.1 SUPPLEMENTAL EMERGENCY RESPONSE AND EQUIPMENT STATEMENT

The purpose of this is to fulfill the South Dakota Department of Environment and Natural Resources request for additional information regarding TransCanada – Keystone Pipeline's ability to respond to a spill specifically in South Dakota

- Detail description of company owned assets is found in appropriately marked Appendix A: RESPONSE EQUIPMENT/RESOURCES. Additional information is linked to Appendix F. The trailer for the Keystone Response Zone 3, North Dakota, South Dakota, and Nebraska is appropriately located in Yankton, South Dakota.

- Keystone Pipeline's primary contractor, National Response Corporation, is strategically aligned with Coteau Environmental based in Watertown, SD. Currently, no other National Response Corporation assets or Sub-Contractors reside inside of South Dakota borders.

- Keystone Pipeline fully expects to have the required assets for a spill within the four (4) hour time frame previously stated in the Response Plan.

Storm: _____

HURRICANE PREPAREDNESS/RESPONSE CHECKLIST			
Phase 1 **Credible Threat to Port of Brownsville Terminal**			
Complete	**Date**	**Time**	
			Terminal Manager and Corporate begin dialogue on storm.
			Notify personnel that the Terminal has moved to Phase 1.
			Notify the Spill Management Team members in case of activation.

HURRICANE PREPAREDNESS/RESPONSE CHECKLIST			
Complete	**Date**	**Time**	
Phase 2 **Category 1, 2 = 58 hours, Category 3+ = 84 hrs ETL 74 mph winds.**			
			Communicate to Terminal personnel that Phase 2 has been initiated and expected timing of further response activities.
			Identify personnel that will serve as the shutdown crew.
			Notify Terminal Manager to release shutdown time.
			Release non-essential personnel.

HURRICANE PREPAREDNESS/RESPONSE CHECKLIST			
Phase 3			
Complete	**Date**	**Time**	
			Send notification that Terminal has moved into Phase 3.
			Confirm storm category for response plan.
			Coordinate shutdown.
			Develop timeline of activities to finish on site based on onset of 39, 58 and 74 mph winds.
			As soon as storm passes develop plans for initial hazard assessment of the Terminal.
			Following initial hazard assessment develop plan for initial damage assessments.
			Evaluate initial hazard and damage assessments. Determine ongoing PPE requirements for outside work.

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HAZARD / DAMAGE ASSESSMENT STATUS FORM

Hazard / Damage Assessment Status Form

INCIDENT NAME: _____

Area	Checklist Complete	Time/ Date	COMMENTS
Tank Farm			
Tank #1			
Tank #2			
Tank #3			
Tank #4			
Tank #5			
Tank #6			
Tank #7			
Tank #8			
Tank Farm Berm			
Debris			
Erosion			
Cinder Block Walls			
Presence of spilled or leaking material			
Terminal Assets			
Transfer Stations			
Security Fencing			
Lighting			

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ANNEX IX

GUIDANCE FOR USING BIOREMEDIATION IN RESPONSE TO OIL SPILLS IN REGION 8

TABLE OF CONTENTS

PAGE #

1.0 INTRODUCTION 1
1.1 PURPOSE AND SCOPE OF THIS GUIDANCE 1
1.2 APPLICABLE FEDERAL, STATE, LOCAL, AND TRIBAL REGULATIONS 2
1.2.1 Federal Regulations 2
1.2.2 State, Local, and Tribal Regulations and Policies 4
2.0 PROJECT SELECTION AND INITIATION 7
2.1 DECISION TO USE BIOREMEDIATION 7
2.2 FEASIBILITY ASSESSMENT CRITERIA 9
2.2.1 Contaminant Characteristics 10
2.2.2 Soil Characteristics 12
2.2.3 Habitat Characteristics 12
2.2.4 Logistical Concerns 13
2.3 PLANNING FOR BIOREMEDIATION IMPLEMENTATION 14
2.3.1 Notification of Proposed Bioremediation 14
2.3.2 Development of Project Implementation Plan 14
2.3.3 Plan Review and Concurrence 14
2.3.4 Plan Implementation 15
2.3.5 Monitoring 15
3.0 BIOREMEDIATION SYSTEMS FOR TERRESTRIAL ENVIRONMENTS 15
3.1 BIOSTIMULATION VS. BIOAUGMENTATION 15
3.2 *IN SITU* VS. *EX-SITU* TREATMENT 16
3.3 *IN SITU* SYSTEMS 16
3.3.1 Landfarming 17
3.3.2 Bioventing 17
3.3.3 Aquifer Renovation 18
3.4 EX-SITU SYSTEMS 18
3.4.1 Prepared Bed 19
3.4.2 Composting 19
3.4.3 Slurry Reactor 20
3.4.4 Bioreactor 20
3.5 SELECTING A BIOREMEDIATION SYSTEM 21
3.6 DESIGNING A BIOREMEDIATION SYSTEM 22
4.0 BIOREMEDIATION AGENTS AND AGENT SELECTION 22
4.1 BACKGROUND 22
4.2 TYPES OF AGENTS 23
4.3 AGENT EVALUATION PROCEDURE 24
4.3.1 Base Tier Go/No Go Requirements and Information 24
4.3.2 Tier I Feasibility Assessment 25
4.3.3 Tier II Laboratory-Scale Data 26
4.3.4 Tier III Simulated Field Test Demonstration 27
4.3.5 Tier IV Limited Field-Scale Demonstration of the Agent 27
4.4 AGENT SELECTION 28
5.0 IMPLEMENTATION OF BIOREMEDIATION IN TERRESTRIAL ENVIRONMENTS 30

6.0 MONITORING BIOREMEDIATION USE IN TERRESTRIAL ENVIRONMENTS 31
6.1 MONITORING OBJECTIVES 31
6.2 MONITORING PARAMETERS 33
6.2.1 Reconnaissance and Assessment 33
6.4.2 Sampling 34
6.4.4 Laboratory Analysis 36
6.4.3 Other Visual Observations and System Monitoring 37
6.5 DATA QUALITY REQUIREMENTS 39
7.0 LIST OF REFERENCES 40

EXHIBITS

Exhibit 1 Bioremediation Feasibility Assessment Process
Exhibit 2 Suggested Monitoring Parameters for a Bioremediation Treatment System
Exhibit 3 Optional Methods for Monitoring Matrix Parameters for Water Samples
Exhibit 4 Bioremediation Use Authorization Form
Exhibit 5 Advisability of Various Bioremediation Treatment Systems Given Various Situational Factors

1.0 INTRODUCTION

Biodegradation is a natural process in which microorganisms (primarily bacteria and fungi) chemically alter and break down organic molecules into other substances such as fatty acids, carbon dioxide, and water in order to obtain energy and nutrients. The basis for this process is relatively simple: microorganisms require minerals and sources of carbon, as well as water and other elements, to survive and function. The process can involve one step or a series of steps that proceed through the formation of molecules with successively fewer carbons. Excluding environmental constraints, the extent to which a particular organic molecule is biodegradable and the rate of degradation depend on the molecule's structural characteristics: chain length, amount of branching, number and arrangement of rings, and stereochemistry (Anderson 1990; Atlas 1981; Portier 1990).

Bioremediation is a treatment technology that utilizes biodegradation to reduce the concentration and/or toxicity of chemical substances such as petroleum products and other hydrocarbons. Because microbes capable of degrading hydrocarbons are commonly found in nature, most untreated hydrocarbon spills eventually are removed from the environment by microbial degradation and other processes. Giving the right conditions and time, bioremediation, however, seeks to accelerate natural biodegradation processes by applying specially chosen nutrients and/or microbes to spilled or released substances.

Bioremediation is only one of several response options that exist for any spill or release situation; the decision of whether or not to use bioremediation relies ultimately on the discretion of the Federal On-Scene Coordinator (FOSC) with approval of the RRT.

1.1 PURPOSE AND SCOPE OF THIS GUIDANCE

The general purpose of this document is to enhance preparedness to use bioremediation in response to oil spills or hazardous substance releases in U.S. Environmental Protection Agency (EPA) Region 8. Specifically, the guidance serves to:

X Outline a process by which FOSCs or Remedial Project Managers (RPMs) in Region 8 may request authorization to use bioremediation in response to oil spills. Procedures for requesting authorization will be consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), state, local and tribal regulations;

X Define the types of information necessary to determine if bioremediation is feasible; and

X Describe how to implement and monitor a bioremediation project.

This guidance is intended to be used primarily by FOSCs and the Region 8 Regional Response Team (RRT). State, local and tribal governments, responsible parties and their contractors, fire departments, and other response managers may also find use for the information outlined in this guidance.

This guidance provides only limited direction on choosing and designing bioremediation systems. It primarily discusses the types of systems that are available for use in terrestrial environments and the process for assessing the general feasibility of using bioremediation. Selecting a bioremediation system to use and optimizing system operating parameters can be complicated and highly technical. [This guidance assumes that such decisions made by the FOSC will most often be based on the site-specific recommendation of technical experts familiar with system design and operation].

1.2 APPLICABLE FEDERAL, STATE, LOCAL, AND TRIBAL REGULATIONS

Legislation and policies at the federal, state, local, and tribal levels may affect the decision to use bioremediation. Section 1.2.1 summarizes applicable federal regulations. Section 1.2.2 discusses state and tribal policies and regulations identified through preliminary research.

1.2.1 Federal Regulations

At the federal level, the primary legislation or regulations governing the use of bioremediation are the NCP and the Resource Conservation and Recovery Act (RCRA).

National Oil and Hazardous Substance Pollution Contingency Plan (NCP)

Subpart J of the NCP, "Use of Dispersants and Other Chemicals", governs the use of chemical and biological agents C which include bioremediation agents C in responding to oil spills in navigable waters or in areas where a spill might affect navigable waters or affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States. Specifically, the Subpart:

X Restricts the use of chemical and biological agents that may affect U.S. waters and/or natural resources to those listed on the NCP Product Schedule;

X Specifies technical product information that must be submitted to EPA for an agent to be added to the Schedule; and

X Establishes conditions for obtaining authorization to use chemical or biological agents in a response action.

Subpart J does not apply to terrestrial related spills if no waters are threatened unless the spill affects federally managed or protected natural resources (e.g., federally administered lands, listed threatened and endangered species and their habitats, migratory birds and their habitats).

The FOSC, with concurrence of the EPA representative to the RRT and the RRT representative(s) from the state(s) affected by the spill, may authorize the use of any agent listed on the NCP Product Schedule. In addition, when appropriate and practicable, the FOSC should consult with the Federal Natural Resource Trustees (U.S. Department of the Interior (DOI), U.S. Department of Agriculture (DOA), U.S. Department of Energy (DOE), or U.S. Department of Defense (DOD)) as well as any other applicable land management agencies and Natural Resource Trustees, before making a decision to bioremediate a spill. The RRT may preauthorize the use of any agent on the NCP Product Schedule in specific locations under specific circumstances with approval by the EPA representative, the RRT representatives from the states affected, and Natural Resource Trustees. If the use of particular products is approved in advance under certain specified circumstances and such pre-approval is specified in the Region 8 Regional Contingency Plan, the FOSC may authorize use of those products for bioremediation without consulting the RRT or the federal Natural Resource Trustees.

Resource Conservation and Recovery Act (RCRA)

RCRA governs the management of newly generated hazardous wastes, including their treatment, storage, and disposal. The Act:

X Prohibits the land disposal of all hazardous wastes by certain dates unless the wastes are treated to certain levels of safety, or unless no migration of the wastes will occur for as long as the wastes remain hazardous; and

X Allows EPA to specify performance levels or methods of treatment that substantially reduce the toxicity or mobility of hazardous wastes based on the performance of the best demonstrated available technology (BDAT).

These provisions of RCRA may affect the use of bioremediation in three ways:

X Bioremediation of contaminated soil performed *in situ* may be limited because the practice may be considered land-disposal.

X Microbial waste treatment, in some instances, may not be able to meet the established BDAT treatment standards.

X A specific technology other than biological treatment may be required for treating particular wastes, thereby excluding microbial waste treatment as an option.

1.2.2 State, Local, and Tribal Regulations and Policies

Each state, local, and tribal government may have its own regulations that affect the use of bioremediation. However, at this time it appears that most states and local governments (including Indian tribes) do not have regulations specifically addressing bioremediation. State, local, and tribal government oversight of bioremediation projects in the Region commonly takes the form of permit requirements. Generally, the RRT representative from the affected state or tribal land will be responsible for coordinating state, local, and tribal requirements with the FOSC. Appropriate tribal officials should be notified and invited to participate in bioremediation activities.

The following is a summary of preliminary research into state regulations and policies that are likely to be relevant to bioremediation projects.

Colorado

Three state agencies maintain oversight for responses to oil spills in Colorado, depending on the source and location of the spill: (1) the Colorado Oil and Gas Conservation Commission oversees responses to spills from oil well sites or equipment operated in conjunction with well sites; (2) the State Oil Inspection Section, Department of Labor, oversees responses to spills at gasoline stations resulting from leaking tanks or pipes; and (3) the Water Quality Control Commission of the Colorado Department of Public Health and the Environment (CDPHE) oversees responses to spills in water. All agencies follow the requirements set forth in the Colorado Water Quality Control Act (25-8-201,204) and the Oil and Gas Conservation Act, 1953 (34-60-106, Sections 1c and 9). References in the Acts to discharges of oil are limited, and neither Act specifically addresses bioremediation. CDPHE, however, has published a guidance document that addresses corrective action and state clean-up levels for soil, surface water, and groundwater contamination resulting from underground storage tank releases.

On-site bioremediation treatment is regulated differently than off-site treatment. Off-site treatment requires a Certification of Designation submitted to CDPHE and approved by the local government. The Certification of Designation is part of the Colorado regulation pertaining to solid waste disposal (6 CCR 1007-2). When the material is treated on site, the Certification of Designation may not be required, but specific issues (such as nuisance conditions and impacts to groundwater) must be addressed.

Montana

Bioremediation is allowed after review and approval by the Montana Department of Environmental Quality, Remediation Division. Approval will be granted on a case-by-case basis upon demonstration of the feasibility of bioremediation at the site. Monitoring of intrinsic characteristics will be required for a length of time determined by the Remediation Division.

North Dakota

North Dakota's water quality standards are defined in the North Dakota Century Code and in Chapter 33-16-02 of the North Dakota Administrative Code. These standards require a permit for bioremediation projects from the North Dakota Department of Health, Division of Water Quality. A NDPES permit is required if the pollutant will be discharged to surface or groundwater. An Underground Injection Control permit may be required if injection of a bioremediation agent(s) is proposed. Division of Water Quality permits will be contingent on showing no impact on the beneficial use of water resources. If there is no discharge, notification to the Division of Water Quality is still required.

A permit may also be required from the North Dakota Department of Health, Division of Waste Management, if ex-situ treatment is proposed. A permit is not required for single-application land farming, but a Land Treatment Variance Application must be provided to the Division of Waste Management prior to treatment. Division of Waste Management requirements for other forms of bioremediation are determined on a case-by-case basis.

South Dakota

South Dakota has no defined state policy regarding bioremediation; however, bioremediation is allowed on a case-by-case basis. The Interstate Technology and Regulatory Cooperation (ITRC) Work Group guidance documents, available through the Western Governors Association, (303) 623-9378, are used as guidance for bioremediation projects.

Utah

Utah's Water Pollution Control Act, Chapter 126, 26-11, can be applied to oil pollution and, by extension, to bioremediation. Utah's "Guidelines for Estimating Numeric Cleanup Levels and Petroleum-Contaminated Soil at Underground Storage Tank Release Sites" specify that in the absence of existing applicable cleanup standards, sites must be characterized by applying "evaluation criteria" so that appropriate cleanup levels can be established. Approval to use bioremediation must be granted by the Office of Underground Storage Tanks for stationary plumes, and by the Utah Department of Environmental Quality, Water Quality Bureau if water is affected.

Wyoming

Chapter 4 of the Wyoming Water Quality Rules and Regulations addresses releases of oil and hazardous substances into waters of the state. Section 4 specifies that "except in cases of extreme fire danger or unique hazardous circumstances, physical removal of the released oil or hazardous substance may be required". Section 7 states that "No chemicals shall be used to disperse, coagulate, collect, sink, or otherwise treat oil or hazardous substances releases except in emergency situations which are a danger to health and welfare. These chemicals must be used in a manner authorized by the Wyoming Department of Environmental Quality in coordination with the U.S. Environmental Protection Agency".

The Wyoming Department of Environmental Quality, Solid and Hazardous Waste Division offers "Solid Waste Guideline #2, Petroleum Contaminated Soils" to describe the treatment and disposal of soils contaminated with petroleum products. Addition of fertilizer and tilling contaminated soils to enhance *in situ* bioremediation is the primary treatment method described in Guideline #2. Regulatory requirements may also be met by other methods (such as addition of bioremediation agents other than fertilizer) with concurrence by the Solid and Hazardous Waste Division. It will be necessary to obtain authorization and/or permits from the Solid and Hazardous Substance Division for treatment and disposal of petroleum-contaminated soils. A one-time authorization to treat and dispose of petroleum contaminated soils on site may be granted by the Solid and Hazardous Waste Division. All state and federal treatment and disposal standards must be met.

2.0 PROJECT SELECTION AND INITIATION

This section describes the steps that must be taken to select and prepare for a bioremediation project. It provides guidelines for assessing the general feasibility of bioremediation for spill/release response in terrestrial environments. Information in this section is organized in three parts: (1) a general discussion of decision tools to assist FOSCs, (2) bioremediation feasibility assessment criteria, and (3) steps to initiate a bioremediation project.

2.1 DECISION TO USE BIOREMEDIATION

Choosing the most appropriate method or technology, such as bioremediation, for cleaning up a spill/release can be a complex process, particularly considering the number of response alternatives

available. In some cases more than one response method may be warranted, further complicating the decision process.

In deciding whether to use bioremediation, the following factors should be considered:

X Any prohibitions or restrictions on the use of bioremediation established by regulations or policies governing cleanup or remedy selection (see Section 1.2 of this plan);

X Characteristics (e.g., nature, type, concentration) of the contaminant that may limit the extent to which the contaminant is biodegradable;

X Geological (e.g. soil matrix) and/or hydrogeological factors that may complicate implementation and success of bioremediation treatment;

X Presence of indigenous flora and/or fauna that may be affected by bioremediation implementation and impacts due to bioremediation use; and

X Availability of personnel, equipment, facilities, and coordinating infrastructure necessary to conduct a proper operation.

In assessing the appropriateness of bioremediation versus other, more traditional cleanup technologies such as excavation and subsequent landfill disposal or incineration, or when assessing various bioremediation systems, the following issues should be considered and incorporated into the decision process:

X Desirability and feasibility of on-site treatment;

X Removal efficiencies;

X Cleanup levels determined by state, local, tribal, or federal agencies;

X Depth of contaminants;

X Relative cost (actual costs of treatment may vary depending on the concentration of contaminants, amount of contaminated soil or water, whether treatment is performed on site, and the distance contaminated material must be transported for disposal);

X Burden to water resource availability (if applicable);

X Impacts to natural resources; and

X Time available for performing treatment (the average time frame for an *ex-situ* bioremediation project is from 60 to 90 days, whereas the average time frame for an *in situ* bioremediation project is 12 to 24 months) (Calabrese 1989).

The following tools have been developed to assist FOSCs and the RRT in evaluating spills/releases for bioremediation treatment and to document the basis for response decision making regarding bioremediation:

X A flow chart outlining the decision process for FOSCs to follow when deciding whether to use bioremediation or to provide concurrence on a plan for implementing bioremediation (see Exhibit 1); and

X A form for applying for authorization to use bioremediation (see Exhibit 4).

A completed application form should be transmitted to the FOSC through the EPA RRT representative, who will forward it to the RRT for review, in requesting authorization to proceed with a bioremediation project.

2.2 FEASIBILITY ASSESSMENT CRITERIA

The most logical first step in evaluating the general feasibility of bioremediation (a baseline "go" or "no go" evaluation) is to consider possible constraints of existing regulations and policies. Assuming there are no regulations forbidding the use of bioremediation, assessing the feasibility of bioremediation should be approached in two stages:

(1) Determine whether characteristics of the contaminant, affected soils, and affected habitats make the spill/release a good candidate for bioremediation treatment.

(2) Determine whether bioremediation can be implemented effectively given various logistical concerns, such as the availability of needed equipment and personnel.

A discussion of these criteria is offered below.

2.2.1 Contaminant Characteristics

The chemical elements that must be considered in the decision to select bioremediation are the extent to which the chemical constituents of the contaminant are biodegradable and the extent to which the contaminants are toxic to microorganisms and pose a threat to other life forms. If, for example, the target contaminant, or one of its components or degradation products, is toxic to microbes, the microbes will likely become ineffective for purposes of bioremediation long before the contaminant is gone. Also, if there is a mixture of contaminants, the effectiveness of bioremediation may be limited because most microbes only degrade particular contaminants. Thus, knowing the identity and characteristics of the targeted contaminant is crucial to predicting the likely success of any bioremediation response strategy.

For oil, the constituents can generally be divided into four categories of hydrocarbons: (1) saturates (which includes *n*-alkanes, branched alkanes, and cycloalkanes); (2) aromatics; (3) asphaltenes; and (4) resins (Atlas 1988). Rates of biodegradation are typically the highest for *n*-alkanes, followed by branched or cycloalkanes, and then low-molecular-weight aromatic compounds; rates for high-molecular-weight aromatic compounds, asphaltenes, and resins tend to be very low (Atlas 1988; Leahy 1990). In addition, many of the low-molecular-weight saturated and aromatic compounds are highly volatile, tending to evaporate quickly, as well as toxic to microorganisms and other forms of life.

Some general characteristics of crude oil and various refined petroleum products are presented below.

Crude oil may vary widely both in physical properties and chemical composition, depending on its source. Crude oil often is designated by its country or region of origin, and specific types of crude generally represent a blend of oils from multiple wells. Although the particular composition of any given crude oil designate, such as South Louisiana crude, may vary from one shipment to the next, crudes from the same area will exhibit some general characteristics that make them unique. Hydrocarbon compounds constitute 50 to 90 percent of crude oil, the remainder of which is composed chiefly of oxygen, nitrogen, or sulfur compounds (McGraw-Hill 1990). A crude oil is typically categorized as light, medium, or heavy based on its specific gravity and viscosity (a heavy crude has a higher specific gravity and is more viscous than a light or medium crude), which are directly related to the composition of the particular crude oil. In general, lighter crudes are better candidates for

bioremediation than are heavier crudes because of their greater proportion of low-molecular-weight and straight-chain hydrocarbons.

Gasoline are typically mixtures of hydrocarbons containing 4 to 12 carbon atoms. Gasoline may evaporate completely in a few hours under temperate conditions. They pose a risk of fire and explosion associated with their high volatility, and are generally more toxic than crude oil because of their high concentration of low-molecular weight compounds. Because of their potential toxicity to microorganisms and high volatility, gasoline and other very light oils may not be good candidates for bioremediation.

Kerosene, often used for jet fuel, primarily contain hydrocarbons with 10 to 16 carbon atoms and tend to evaporate relatively quickly, but slower than gasoline. Kerosene and other light oils can generally be considered as potential candidates for bioremediation.

Diesel fuels and ***bunkering fuels*** contain a greater percentage of hydrocarbons with increasing numbers of carbon atoms. They also contain greater proportions of substances other than hydrocarbons. They have low volatilities and persist in the environment for an increasing period of time as the "weight" of the material increases. These medium to heavy oils can generally be considered as potential candidates for bioremediation; however, they have been reported as less susceptible to biodegradation than lighter oils, particularly if they are weathered (Atlas 1981).

If, based on the analysis of a contaminant's characteristics, the target contaminant is determined not to be a good candidate for microbial treatment, further consideration of bioremediation should be halted at this point.

2.2.2 Soil Characteristics

After evaluating the spilled/released contaminant's susceptibility to and suitability for biotreatment, the types of soils in affected areas should be identified and characterized. Characterizations of soil are based in part on the total organic content of the soil and the size of the mineral particles in the soil. These two factors can dramatically affect the success of a bioremediation system. The size of the soil's mineral particles also affects the availability of oxygen. Soils with larger mineral particles are more permeable by air, as well as water, and thus may be a rather hospitable environment for microbes. For this reason, sandy and loamy soils are often amendable to bioremediation, while soils high in clay concentrations may not be ideally suited to bioremediation without amendments (Bluestone 1986). However, the process control available in some forms of *ex-situ* treatment systems can mitigate some of the effects of soil on the feasibility of bioremediation. The success of in-situ bioremediation as a process is dependent on optimizing soil characteristics thru soil amendments and active soil management program.

2.2.3 Habitat Characteristics

The sensitivity of flora and fauna in the affected habitat should also be assessed, in consultation with the Natural Resource Trustees, relative to other treatment options or the "no treatment" option. Three questions in particular should be considered:

(1) Could the trampling, digging, and other physically disruptive actions often associated with traditional methods of clean-up exacerbate or be worse for the affected habitat than the adverse effects of the contaminant? If so, consider bioremediation and the "no treatment" option. Note that optimizing bioremediation can be very disruptive if land treatment practices are required. Successful bioremediation will likely require active soil management.

(2) Does the affected habitat have a sophisticated and fragile ecosystem that could be seriously disrupted by the introduction and/or stimulation of a microbial strain? If so, *in situ* bioremediation systems are probably not feasible.

(3) Could the potentially physically and/or chemically disruptive activities associated with applying bioremediation agents and monitoring applications, or removing soil

for *ex-situ* treatment, be worse than the "no treatment" option? If so, bioremediation is probably not feasible.

Answers to these questions may be provided in whole or in part by referring to the Region 8 Regional Contingency Plan (RCP) and Sub-Area Contingency Plans, which identify sensitive areas, endangered species, and other relevant information. Efforts to answer these questions should be coordinated with the FOSC, particularly with regard to determining whether a question is relevant to the incident under consideration. Natural Resource Trustees are valuable resources for these habitat-related issues.

2.2.4 Logistical Concerns

The general logistical feasibility of implementing bioremediation should be evaluated before selecting and designing a specific bioremediation system. Questions to consider in evaluating logistical feasibility include the following:

X What is the scale of the proposed bioremediation project in terms of the size of the application area or the amount of contaminated material to be treated, and what role will bioremediation play in the entire cleanup strategy?

X What types of agents and how much of those agents are required to implement bioremediation, and are those agents available in sufficient quantities?

X What application method is best suited for applying agents to the affected area or contaminated material, and are the necessary personnel and equipment resources available for effective application?

X What types of equipment and personnel are necessary to monitor the bioremediation response effort, and are those resources available for the length of time required for the entire bioremediation response effort.

2.3 PLANNING FOR BIOREMEDIATION IMPLEMENTATION

If bioremediation is determined to be a feasible option for treating all or portions of a spill/release (or contaminated material), then the next step is to select, design and implement an appropriate bioremediation system C including selecting any specific bioremediation agents for use as may be appropriate.

2.3.1 Notification of Proposed Bioremediation

The initial request to conduct a bioremediation project according to this guidance must be submitted to the FOSC through the EPA representative to the RRT. The FOSC may also initiate a request to conduct a bioremediation project. The state representative to the RRT will provide notifications to all interested state agencies and coordinate permitting/approval requirements. The form for applying for authorization to use bioremediation can be found in Exhibit 4.

2.3.2 Development of Project Implementation Plan

Application for concurrence to conduct a bioremediation project requires that a project implementation plan, or Action Plan, be developed. Site inspections and other assessment activities will need to be performed by various agencies and potentially responsible parties to collect data in support of preparing this plan. The Action Plan should describe the project in detail and address procedures for site control, agent application, and project monitoring. A site-specific health and safety plan should be prepared in compliance with Occupational Safety and Health Administration (OSHA) and EPA regulations.

2.3.3 Plan Review and Concurrence

The FOSC will coordinate the review of and concurrence on the Action Plan with the appropriate RRT members and other appropriate parties, such as Natural Resource Trustees, the staff of EPA's Environmental Response Team and consulting contractors. Concurrence on the Action Plan by the State/Tribal RRT member(s) will be contingent upon provisions for obtaining necessary authorizations and permits.

2.3.4 Plan Implementation

Once concurrence on the Action Plan has been obtained, the bioremediation project can be initiated. Oversight by several agencies, in addition to the "lead", may occur.

2.3.5 Monitoring

Ongoing monitoring as specified in the Action Plan will be expected throughout the bioremediation project. Section 6.0 of this plan describes the development of a monitoring plan for a bioremediation project.

The basic components of an Action Plan are available from other sources. The remainder of this plan provides a review of the components of the Action Plan and Monitoring Plan that are specific to bioremediation projects.

3.0 BIOREMEDIATION SYSTEMS FOR TERRESTRIAL ENVIRONMENTS

Bioremediation seeks to accelerate natural degradation processes through the application of specially chosen nutrients (biostimulation) and/or microorganisms (bioaugmentation) to contaminated soil, water, or sludge. A number of systems exist for employing the technology, some of which involve treating contaminated material without removing it from its original location. This section presents a discussion of these systems.

3.1 BIOSTIMULATION VS. BIOAUGMENTATION

Biostimulation involves fertilizing (applying nutrients) and/or oxygenating contaminated material in order to increase the concentration of indigenous microbes and to encourage the degradative activity of these microbes by providing the essential elements they need for growth. This strategy may offer convenience because indigenous microbes are already adapted to the environmental conditions of the contaminated material. It may be inefficient, however, for several reasons: (1) the microbes may be poor degraders of the target contaminants, (2) the microbes may need time to become acclimated to the presence of new pollutants in their environment so that they can better consume these pollutants (such as may be the case following a spill), or (3) the microbial population may be small such that initial biodegradation rates will be very low. Any of these conditions may result in a lag in the response, and can lead to spreading of pollution and a longer cleanup period.

Bioaugmentation involves choosing a strain or consortium of commercially-grown microbes that (1) has demonstrated an ability to consume the target contaminants, and (2) thrives in environments similar to the one that must be cleaned. The microbes are then introduced into the contaminated materials or site, and cared for through the provision of water, fertilizer, and/or oxygen (or an oxygen source). The primary advantage to using bioaugmentation rather than biostimulation is that the microbes best suited to degrade a target contaminant can be utilized (Gebhart 1988). One potential drawback of bioaugmentation is that foreign microbes could disturb the ecology of a particular area and have unforeseen pernicious consequences (Bluestone 1986). Another drawback is that the foreign microbes may not compete well with indigenous microbes for nutrients and water. As a result, regular additions of microbes to contaminated material may be required to sustain desired biodegradation rates.

3.2 *IN SITU* VS. *EX-SITU* TREATMENT

In situ treatment refers to treating contaminated material without removing it from the ground. *Ex-Situ* treatment refers to bioremediation systems implemented above ground and involves moving contaminated material from its original location. To be effective, any bioremediation system C whether implemented *in situ* or *ex-situ* C must meet two requirements: (1) nourish microbes with their essentials for life, including oxygen (where appropriate), water, and nutrients such as nitrogen and phosphorous and (2) provide conditions favorable for microbial growth, such as favorable temperature and pH. The ability to meet these two requirements is a major factor in deciding which type of treatment technique to use.

3.3 *IN SITU* SYSTEMS

In situ bioremediation systems generally are best suited to sites where contaminants are near the ground's surface or can easily be accessed from the surface, or where the geography of the site makes removal of materials impossible (Gebhart 1988). There are two principal advantages of *in situ* systems. First, the general physical layout of contaminated sites is not greatly altered. Second, *in situ* systems do not involve excessive movement of contaminated material, so transportation costs may be less than with other methods of clean-up. A disadvantage of *in situ* systems is that they may take more time than either *ex-situ* systems or conventional mechanical means of clean-up.

The three main systems of *in situ* bioremediation are land farming, bioventing, and aquifer renovation. (Note: The descriptions that follow are applicable to both biostimulation and bioaugmentation).

3.3.1 Land farming

Land farming, sometimes called biofarming, shares similarities with conventional farming except that the products being grown are bacteria and/or fungi rather than plants for harvesting. During land farming, contaminated soil is spread over an area of land and adjusted to optimum levels of moisture, pH, and nutrient concentration so as to create an ideal environment for optimizing bacterial growth with simultaneous degradation of soil contaminants. Physical characteristics of the soil are optimized through amendments of organic and inorganic agents e.g. sand, biosolids, wood chips, and chopped straw. The soil is then tilled to promote aeration. Optimum growth conditions are maintained by periodically adjusting soil parameters and tilling the soil over the duration of the treatment period, or until treatment endpoints are reached. To control runoff and leaching of contaminants, the farmed plot may be equipped with water collection or leachate collection facilities. Optimum moisture levels must be maintained via active watering or irrigation.

Land farming is best suited to conditions where (1) the climate is warm enough to promote bacterial growth, (2) the amount of contaminated material is large such that the cost of transporting it would be prohibitive, (3) little or no danger exists that contaminants will migrate over the course of the treatment period, and (4) contamination is concentrated in the top 6 to 12 inches of soil (EPA 1991). It should be noted that land farming does cause some disruption to a contaminated site through the treatment and tilling of the soil. This can alter the vegetation and therefore the habitat available for wildlife. Land farming can also be conducted *ex-situ* by removing soil/sediment to an off-site location.

3.3.2 Bioventing

Bioventing is a system that can be used to treat organic contaminants (such as fuels and solvents) located in the vadose zone (The vadose zone is the part of the earth's crust that holds water but is located above the permanent groundwater level). It attempts to encourage biodegradation of contaminants in the ground while minimizing stripping of volatile constituents. The system is comprised primarily of a series of injection wells through which air is delivered to contaminated soils, where it can be used by indigenous aerobic microorganisms. Water and nutrients also may be pumped into the soil through the injection wells to aid in microbe growth. In some situations, extraction wells may be installed to help draw the air through and then out of the soil.

Air can be delivered mechanically with a compressor or blower, or passively by allowing atmospheric air to pass through the injection wells and into the contaminated zone. Air should be injected at relatively low rates so that it does not simply blow through the contaminated area and lead to cross-media (air or water) contamination with volatile organic compounds. In setting air flow rates, oxygen needs of soil microorganisms need to be balanced with potential production of off gases. This will help to minimize the need for off gas capture and decontamination. If such gases are generated, it may be necessary to use an off gas treatment system.

Bioventing generally is well-suited as a cleanup technique in porous unsaturated soils offering conditions suitable for microbe survival, but where oxygen is a limiting factor.

3.3.3 Aquifer Renovation

Aquifer renovation, also referred to as *in situ* stimulation, is a method of treating contaminated groundwater. This system involves adding oxygen and/or nutrients to the contaminated water in order to enhance microbial degradation of the contaminants. Characteristics of the contaminated site determine how the oxygen and nutrients should be mixed into the water. Mixing generally is accomplished through the use of injection and extraction wells. Extraction wells may be built to draw the groundwater out so that oxygen (often in the form of surface air or hydrogen peroxide) and/or nutrients can be added above ground. The enriched water would then be returned to the aquifer through injection wells. In some cases, the groundwater may be retained in a bioreactor (see Section 3.4.4) containing microbes before being returned to the aquifer. Oxygen may be introduced to the groundwater by injecting a chemical that releases oxygen (such as hydrogen peroxide) or installing a subsurface drain.

An aquifer renovation system's effluent (consisting of clean water, oxygen and nutrients) can either be recirculated or disposed of, depending on the nature of the site.

3.4 EX-SITU SYSTEMS

Ex-Situ bioremediation systems offer greater control over the treatment process than do *in situ* systems. Temperature, environmental conditions, direction of leachate and runoff, the flow of off gases or vapors, and microbial contact with contaminated material can all be manipulated and controlled much more thoroughly in *ex-situ* systems than *in-situ* systems. However, *ex-situ* systems

necessitate at least some physical disruption of contaminated sites as well as some transportation costs.

The four main types of *ex-situ* bioremediation systems are prepared beds, composting, slurry reactors, and bioreactors.

3.4.1 Prepared Bed

Prepared bed treatment is similar in many ways to land farming except the soil to be treated is moved to a lined treatment bed specially designed to collect soil runoff and leachate. The soil is spread on the bed to a depth that facilitates the flow of oxygen as well as the distribution of moisture and nutrients. Ideal or nearly ideal oxygen concentrations, moisture levels, pH, and nutrients levels are maintained throughout the treatment period. Prepared beds may be built under cover or indoors to protect them from the weather and to give operators control over the climate and/or vapors.

Prepared bed systems would be preferable to land farming in colder climates or colder months of the year, or in situations where site and/or contaminant characteristics present the danger of contaminant migration, vapor releases, or uncontrolled runoff and leachate.

3.4.2 Composting

Composting involves mixing contaminated soil with an organic bulking agent, such as straw or wood chips, placing the resulting mix in large piles, and aerating the piles. The compost piles trap heat in while allowing moisture and air to circulate, and thus create a favorable environment for bacteria to grow. One approach to aerating the piles involves placing them onto bases containing perforated pipes attached to blowers; this approach is known as static pile composting (EPA 1991). Another approach is simply to periodically turn the composting material. Roofs may be built over compost piles to protect them from the weather as well as to control climate. Small drains or trenches may be installed to collect runoff.

3.4.3 Slurry Reactor

In a slurry reactor, the contaminated soil is suspended in water in a container or tank to form slurry. The container itself need not be complex: an open or closed basin with an installed liner can suffice (Zitrides 1990). The slurry is oxygenated by moving the container or mixing the slurry, and/or through sparging the slurry with air. Nutrients are typically added to the slurry, and pH and temperature controlled to aid in bacterial growth.

After the period of treatment is complete, the soil and water are separated in a clarifier or settling tank. The clean soil is generally left on site; the water can either be disposed of or reused.

A slurry reactor is an attractive bioremediation system because it enables the operator to have almost complete control over every factor involved. Thus, it can be very effective for degrading particularly difficult contaminants or soils with higher concentrations of contaminants (EPA 1989). Also, slurry reactors can be used when the land space required for land farming or prepared bed treatment is unavailable.

3.4.4 Bioreactor

A bioreactor is used for cleaning contaminated groundwater. Like a slurry reactor is for soil, a bioreactor is a highly effective system for decontaminating water because of the high degree of control it offers the operator. Though there are several different types of bioreactors, including activated sludge, trickling filter, fixed film, and activated carbon, bioreactor systems share many characteristics. Each bioreactor is essentially a container that holds contaminated water while allowing it to be mixed, aerated and maintained at favorable temperatures, pH, and nutrient levels. After treatment is complete, the clean water is separated from the excess biomass within it and then disposed; the biomass consists of a heterogeneous microbial culture and can be disposed or recycled. The proper disposal of the biomass should be evaluated on a case-by-case basis and will depend upon the types of microbes utilized, and the concentration of contaminants that were not degraded.

3.5 SELECTING A BIOREMEDIATION SYSTEM

A number of *in situ* and *ex-situ* systems exist for implementing bioremediation, any of which may be the most practical under certain situations. Some of the issues to consider in selecting a particular bioremediation system for use in response to a spill/release include the following:

Type of contaminant. Certain contaminants may need more carefully controlled conditions (e.g., moisture, oxygen, pH, temperature) to biodegrade efficiently; this control may only be achieved with *ex-situ* systems.

Amount of contaminated material. *In situ* systems may be better suited to treating large volumes of contaminated material.

Available land space. *Ex-situ* systems, particularly slurry reactors, bioreactors, and compost piles, generally require less land space to implement effectively than do *in situ* systems, and therefore may be more practical where land space is limited.

Dryness of the environment. Arid locations and climates may make *in situ* treatment systems less attractive because of the relatively high moisture needs of microorganisms; these needs may be better met with *ex-situ* systems unless provisions for watering are incorporated into the operating plan.

Depth of contamination. Deep contamination may be difficult to excavate for purposes of *ex-situ* treatment; and is also difficult to treat using *in situ* treatment.

Type of contaminated media. Certain fine-particle soils (clays) may restrict the ability to get oxygen to microbes with some *in situ* systems, and groundwater may not be practically treated using certain *in situ* or *ex-situ* systems. Fine sand and other amendment materials may have to be mixed in to optimize the matrix for bioremediation.

Temperature. In situations where external environmental temperatures are extreme, *ex-situ* systems may allow for closer to optimal rates of biodegradation.

Time constraints. Because *ex-situ* systems provide the opportunity to better optimize conditions for biodegradation, they may be preferable to *in situ* systems in situations where faster rates of degradation are needed.

In selecting a bioremediation system, refer to the advisability matrix in Exhibit 5, which indicates some of the conditions under which each type of system may be most appropriate.

3.6 DESIGNING A BIOREMEDIATION SYSTEM

The information above provides an overview of the types of systems available for bioremediation. This overview is insufficient for designing a system for a particular incident. A contractor with relevant experience should be used to design the system and determine operating parameters. Design parameters should then be chosen to optimize the conditions for treating contaminated soil, water, or sludge using bioremediation while simultaneously protecting human health and the environment from adverse effects of the treatment.

4.0 BIOREMEDIATION AGENTS AND AGENT SELECTION

This section describes the various types of bioremediation agents, a procedure for evaluating them, and guidelines for selecting the appropriate agent for use in a particular situation. Because adding bioremediation agents may not be necessary under certain circumstances with some terrestrial bioremediation systems, information in this section is only relevant when the addition of agents is necessary to achieve desired response efficiencies.

4.1 BACKGROUND

Section 311 of the Clean Water Act requires that the EPA prepare a schedule of dispersants and other chemicals that may be used in preparing for and responding to discharges of oil and releases of hazardous substances, as provided for in the NCP, 40 CFR Part 300. This schedule is known as the NCP Product Schedule. The Schedule lists agents that may be authorized for use in accordance with the procedures set forth in Section 300.910 of the NCP. (Authorization of use requires that the FOSC considering the use of a dispersant or other agent, such as a biodegradation-enhancing agent, seek the concurrence of the RRT prior to the agent's application.) Any agent considered for application to a spill or release must be listed on the NCP Product Schedule.

The NCP Product Schedule currently divides chemical and biological agents into six categories: (1) dispersants, (2) surface washing agents, (3) surface collecting agents, (4) bioremediation agents, (5) burning agents, and (6) miscellaneous oil spill control agents. Most bioremediation agents, including those that are solely nutrients, are listed as biological additives, as the designed purpose of these agents is to enhance the rate of contaminant biodegradation by increasing microbial activity. There

are also bioremediation agents listed as dispersants; these agents are water-based products that claim to enhance the rate of oil biodegradation by emulsifying spilled oil thereby making it more "bio-available". Additionally, other products that do not fit a current regulatory definition because of their unique nature may be listed as miscellaneous agents. Use of any of these agents should be consistent with the RRT's general guidelines for their application and use.

4.2 TYPES OF AGENTS

Currently, a variety of agents are available that claim to enhance the rate of biodegradation. Although there are no current regulatory definitions for every type of bioremediation agent, the following are broad definitions for those available:

Microbial agents are concentrated cultures of contaminant-degrading microorganisms grown on a contaminant-containing medium that have been air- or freeze-dried onto a carrier (e.g., bran, cornstarch, oatmeal). In some cases, the microorganisms may be raised in bioreactors at the spill site. All commercially available agents use naturally-occurring microorganisms. Some agents may also contain nutrients to help assure the activity of their microbial cultures. Microbial agents are intended to provide massive inoculums of contaminant-degrading microbes to the affected area thereby increasing the population of microbes to a level whereby the target contaminant will be used as a primary source of food or energy. Microbial agents are designed to enhance the biodegradation of contaminants, particularly hydrocarbons, at any location and are probably most useful in areas where the population of microbes capable of degrading the target contaminant is small.

Nutrients are agents comprised of nitrogen and/or phosphorous (and possibly other chemical substances) that are used as the primary means to enhance the rate of growth of contaminant-degrading microorganisms. The purpose of this type of agent is to provide the nutrients necessary to maintain or increase microbial activity and the natural biodegradation rate of the target contaminant.

Enzymatic agents are bio-catalysts designed to enhance the emulsification and/or dispersion of oil and make it more available to microorganisms as a source of food or energy. These agents are generally liquid concentrates, which may be mixed with surfactants and nutrients that are manufactured through fermentation. This type of agent is intended to enhance biodegradation of contaminants by indigenous microorganisms.

Other agents do not fall under the above definitions, such as application mechanism agents, that are designed to have an affinity for oil and bring together the elements needed for enhanced oil

degradation. Examples of application mechanism agents include time release capsules, liposomes, timed-release fertilizers (e.g., Custom Blend), and agents that make oil more hydrophilic.

4.3 AGENT EVALUATION PROCEDURE

In considering bioremediation agents listed on the NCP Product Schedule, it is important that response decision-makers evaluate the various characteristics of agents, particularly their safety and efficacy. From the perspective of planning for bioremediation use, probably the most appropriate time to evaluate agents is before spills/releases occur. Provided below is a suggested procedure designed specifically to aid in identifying bioremediation agents that will be safe and effective in field applications. There may be circumstances, however, under which there is not adequate time to perform thorough agent evaluations before a decision regarding bioremediation use must be made. In these instances, the procedure below could be used as a guide to determine whether existing information on individual agents is adequate to support further consideration of their use.

The procedure described in this subsection for evaluating bioremediation agents is based on draft protocols developed by a panel of recognized national experts from industry, academia, and government at the request of EPA. The panel was brought together under the auspices of the University of Pittsburgh Trust's National Environmental Technology Applications Corporation (NETAC), which has been working with EPA on the development of bioremediation agent screening protocols since November 1989. A full description of the development process may be found in the NETAC panel's "Oil Spill Bioremediation Products Testing Protocol Methods Manual", dated February 1992.

The evaluation procedure follows a "tiered" approach. Ideally this procedure will be conducted for bioremediation agents during pre-planning, prior to the occurrence of a spill/release. Following the procedure will not assure that a tested agent will be effective in cleanup; however, following the procedure should help to increase the level of confidence that use of a particular bioremediation agent will be effective and safe.

4.3.1 Base Tier "Go" / "No Go" Requirements and Information

Under this tier, information on a bioremediation agent would be collected from the agent vendor and an initial screening of the information performed. Objectives of this screening are to:

X Obtain basic information on a bioremediation agent's makeup;

X Ensure that required regulatory approvals are satisfied;

X Certify that the agent is free of pathogenic, carcinogenic, or hazardous substances or microorganisms normally considered unacceptable for release into the environment; and

X Ensure that the agent is listed on EPA's NCP Product Schedule.

Information needed from the agent vendor to perform this initial screening includes the agent's exact chemical and biological makeup as well as formulation characteristics, and proof of the agent's listing on the NCP Product Schedule.

4.3.2 Tier I - Feasibility Assessment

Under this tier, additional vendor information on a bioremediation agent would be collected to support a preliminary assessment of the feasibility of using a particular agent. The objectives of this tier and assessment are to obtain an understanding of a vendor's capabilities; an agent's availability, contents, and proposed method of use; and an agent's history of use, where applicable. Agent information needed from the vendor to perform this assessment includes the following:

X Application rates and methods;

X Mode of biodegradation and calculated efficiency;

X History of use at previous cleanups, especially for similar situations and environments;

X Chemical properties, fate, and persistence, and potential toxicity to or bio-accumulation by humans, mammals, fish, and birds based on a review of published literature and chemical databases;

X Acute or chronic toxicity to mammalian species, with rodent species recommended to be included; and, where available,

X Effectiveness in enhancing biodegradation over a baseline standard or control demonstrated by descriptions and quantitative analytical results of any laboratory or field studies performed (such as results of gas chromatographic analyses of treated and untreated samples for alkanes and/or aromatics).

A description of the management structure and qualifications of the vendor's organization would also be desirable. A technical bulletin providing the above information is available for each product on the NCP Product Schedule and is available by calling 202-260-2342.

4.3.3 Tier II - Laboratory-Scale Data

The specific objectives of this tier are to (1) evaluate the relative ability of a bioremediation agent to degrade the target contaminant or stimulate the rate of its biodegradation under defined and controlled laboratory conditions, and (2) determine the potential toxicity associated with the agent's use through the performance of standard toxicity tests. In obtaining laboratory-scale data, standard laboratory methods would be used to develop data on an agent's toxicity and its ability to stimulate the biodegradation of a contaminant. In the case of oil, standard oil should be used. Analytical methods developed or approved by EPA should be used to perform these laboratory studies.

The approach to evaluate an agent's relative effectiveness at degrading a target contaminant is intended to:

X Provide sufficient information to indicate with a firm degree of confidence that the agent is degrading oil constituents or another target contaminant;

X Provide an indicator of total microbial activity; and

X Assure the viability of the culture being tested, where applicable.

It would be helpful to include temperature, salinity, and nutrient testing to document the conditions under which an agent's ability to degrade a standard type of oil or other contaminant was determined.

In evaluating an agent's toxicity, a comprehensive review of literature on the avian, aquatic, and mammalian toxicity of the agent, if available, or of its constituents, is recommended. This information would be particularly valuable in determining whether any special precautions need be taken with regard to application methods, rates, or timing to protect persons applying agents as well as indigenous wildlife. Performing actual toxicity tests on appropriate mammalian species is recommended, although these tests are generally more expensive and more time consuming to perform than tests on marine species.

4.3.4 Tier III - Simulated Field Test Demonstration

Based on findings of previous tiers, microcosm systems would be used under this tier to perform simulated field test demonstrations on a bioremediation agent, as appropriate. The objective of this tier is to predict a bioremediation agent's effectiveness at degrading or enhancing the degradation of oil, petroleum products, or other environmental contaminants in specific terrestrial settings or habitats.

Although EPA-approved microcosm systems for performing such simulated field test demonstrations are not available at the time of this writing, the approach for performing these tests is to use microcosm systems that simulate actual biodegradation field kinetics. This approach would aid in determining the relative effectiveness and toxicity of an agent under conditions that cannot be modeled in standard laboratory methods, such as those proposed in Tier II of the procedure. It is recommended that microcosm systems for simulated field test demonstrations of agents consider various soil types in the Region.

4.3.5 Tier IV - Limited Field-Scale Demonstration of the Agent

Depending on the results of the simulated field test demonstration in Tier III, if available, the next tier of the procedure would involve conducting a limited field-scale demonstration of the bioremediation agent. The main objective of this field demonstration is to test the effectiveness and toxicity of the bioremediation agent in actual field tests. Another objective is to verify the accuracy of Tier III laboratory results, if available, in predicting field efficacy using the actual field monitoring data obtained. The approach for performing these demonstrations would be to collect information during active field testing to support an evaluation to confirm the bioremediation agent's estimated environmental safety and efficacy.

At this time, EPA-approved protocols for performing limited field-scale demonstrations in various terrestrial settings are not available. Until such protocols become available, the guidelines suggested in Section 6.0 for monitoring field applications of bioremediation agents in terrestrial environments could be used for evaluating limited field-scale demonstrations of agents.

4.4 AGENT SELECTION

Primarily because specific research and testing standards for bioremediation agents are very limited, selecting a bioremediation agent that will enhance the rate of contaminant biodegradation is going to require the use of professional judgment. For most of the bioremediation agents currently on the NCP Product Schedule, there are only limited comparative data by which to measure their relative efficacy and safety. Until there is widespread access to data from completed bioremediation projects, agent selection should be determined by the answers to the questions below:

(1) Has the target contaminant ever been treated by bioremediation?

- X If so, what type of agent or specific agent was used in each instance?
- X What were the conditions for use?
- X Was a significant level of degradation measured (based on chemical and biological tests) that could be attributed to the treatment?

(2) Is the agent listed on the NCP Product Schedule? Does it contain a known pathogen?

(3) To what Tier-level equivalent has the agent been formally evaluated?

(4) Is there corroborated [laboratory or field] data indicating that the agent enhances biodegradation and that it should be safe to use in the affected spill environment?

(5) Has the agent been used previously?

- X If so, what contaminant was targeted in each instance and what were its characteristics and/or initial concentration levels?

- X Under what conditions or system was the agent employed?

X Was a significant level of degradation measured (based on chemical and biological tests) that could be attributed to use of the agent?

X Is a reference available? (If so, make contact.)

(6) For any agent being considered, what is the recommended application rate for the agent and how frequently would it need to be re-applied?

(7) Is sufficient quantity of agent available, considering potential re-applications, to adequately treat contaminated material?

(8) Is there sufficient contractor support to assist with the initial application and any re-applications if necessary?

(9) What precautions would need to be taken to reduce the likelihood of improper agent handling and application and to reduce potential adverse effects related to the application procedure?

5.0 IMPLEMENTATION OF BIOREMEDIATION IN TERRESTRIAL ENVIRONMENTS

This section contains guidelines for implementing bioremediation treatment systems in terrestrial environments. It assumes that bioremediation has already been determined to be a feasible option for treating spilled/released contaminants. It also assumes that in most cases a contractor will be responsible for addressing most implementation issues.

A bioremediation system should be implemented in accordance with an approved Action Plan. The purpose of the Action Plan is to ensure the safe, coordinated, and well-documented implementation of the selected treatment system (or systems).

Typically, an Action Plan is specific for a particular cleanup project, although Action Plans for any response could have many similar components. The Action Plan should address the following issues:

Public safety. Inform the public in affected areas of response activities, address safety issues related to the presence of hazardous materials in populated areas, and analyze weather data to ensure that there is no chance of agents or hazardous materials drifting into populated areas.

Worker safety. Ensure that all OSHA and EPA regulations are followed.

Site safety. Ensure that operations are conducted in a careful, intelligent manner in accordance with OSHA regulations, equipment manufacturer's suggestions, and common sense.

Desired and/or required cleanup levels. Ensure that any bioremediation system adequately cleans contaminated sites to acceptable levels, or that alternative methods will be employed to achieve these levels.

Documentation requirements. Keep complete written records of all agents applied, size of treated areas, frequency and method of application, personnel involved in response, weather conditions, equipment used, and observed effects of bioremediation agents;

Agent application protocols. Follow protocol suggestions of agent vendor, contractor, and/or response team.

Monitoring requirements. Ensure that appropriate observations are conducted and that samples are taken and analyzed to evaluate the safety and efficacy of the treatment system as well as to support response management decisions (refer to Section 6.0 for guidelines on monitoring).

Environmental protectiveness. Ensure that any biological agent and/or chemical agent proposed does not have the potential to adversely affect fish or wildlife resources or their habitats or other sensitive environments.

6.0 MONITORING BIOREMEDIATION USE IN TERRESTRIAL ENVIRONMENTS

This section presents information that may be used to plan and implement monitoring activities designed to enable objective evaluation of bioremediation use in terrestrial environments. Once a bioremediation technology is selected, a site-specific monitoring plan should be developed. The monitoring plan is intended to determine the effectiveness and impacts of the bioremediation project.

The primary use of monitoring data is to support response-management decisions by the FOSC. Specific uses of monitoring are to:

X Identify and correct problems in the biological treatment process;

X Determine whether bioremediation end-points have been reached; and

X Ensure that biotreatment is less environmentally harmful than the "no action" alternative.

6.1 MONITORING OBJECTIVES

Objectives of monitoring activities and the major elements of each objective include the following:

Objective 1: Determine the efficacy of the selected bioremediation treatment system in enhancing the degradation of spilled/released contaminants.

X If bioremediation agents are used, certify the viability of microorganisms in and/or nutrient composition of agents in a laboratory setting before or concurrent with the initial application.

X If bioremediation agents are used, certify the ability of agents to degrade or enhance the degradation of spilled/released contaminants in a laboratory setting before or concurrent with the initial application (this requirement may be waived after the efficacy of an agent has been thoroughly demonstrated using the procedures described in Section 5.0). Monitoring of bench scale tests is often used to demonstrate the efficiency of an agent.

X Determine the extent to which the bioremediation treatment system has enhanced the rate of contaminant biodegradation as compared to an untreated, contaminated site.

Objective 2: Measure the environmental impact of bioremediation treatment for the duration of the bioremediation project, or another specified time period.

X Determine the extent to which bioremediation agents used, if any, increase or decrease the toxicity of spilled/released contaminants.

X Document adverse physical effects attributable to treatment system implementation and monitoring activities.

X Determine the extent to which bioremediation agents used, if any, alter the nutrient dynamics of the treated habitat.

Objective 3: Ensure the comparability of data collected during the monitoring of bioremediation projects conducted in the Region, for use in a Regional bioremediation data base.

X Employ standard methods and operating procedures when implementing all monitoring plans.

X Conduct sampling both at replicate treated and untreated (control) set aside sites for all bioremediation projects, unless replication is specifically ruled out on the basis of informed judgment by the FOSC or the monitoring Project Director. (Sampling from replicate sites is suggested to establish variance of means among sites.)

6.2 MONITORING PARAMETERS

The type and extent of monitoring for a given project will vary depending on the bioremediation system selected for use. Chemical parameters are the ultimate measure for success.

Suggested parameters for monitoring bioremediation treatment systems are presented in Exhibit 2. Some parameters are noted as "optional" because system design, site characteristics, and/or contaminant characteristics may make monitoring these parameters unnecessary.

The monitoring plan developed for a specific project should describe how each monitoring activity will be carried out to address the project's objectives. In addition, the plan should demonstrate that the scale of the monitoring effort proposed is adequate to produce scientifically and statistically sound results to the extent possible, given the size and/or complexity of the bioremediation project.

6.2.1 Reconnaissance and Assessment

Reconnaissance and assessment of the spill/release site is the initial step in preparing a site-specific monitoring plan, particularly when *in situ* bioremediation systems may be used. It is important to designate uniform treatment and control areas, determine resource needs, and establish baselines for evaluating the effects of bioremediation treatment.

Reconnaissance activities should emphasize the collection of qualitative information on characteristics of a spill/release and the surrounding area. Reconnaissance activities might include:

X Assessing the presence, location, and abundance of spilled oil/released hazardous substances;

X Evaluating movement of the contaminants and potential transport routes;

X Observing and recording the types, abundance, and condition of local vegetation and organisms; and

X Identifying and evaluating potential logistical problems posed by the physical habitat.

Generally, this type of information is collected during the initial response.

Assessment of environmental parameters should focus on weather conditions (e.g., precipitation, wind, weather predictions), soil characteristics (e.g., pH, oxygen concentration, moisture levels, nutrient levels), and/or groundwater or surface water characteristics (e.g., pH, dissolved oxygen concentration, nutrient levels) that may influence the success of bioremediation treatment or the ability to monitor a given project.

6.2.2 Sampling

Sampling refers to the collection of soil, water, and/or soil-water-slurry specimens (or samples) on which to perform various chemical, microbial, and/or toxicity analyses. The purpose of sampling is to collect a relatively small number of samples that once analyzed will yield valid inferences about the characteristics of or activity occurring within the matrix from which they came. The goal of sampling is to address the Monitoring Objectives

A sampling plan should be prepared enumerating the type and number of samples, analytical parameters, sampling objectives, data quality objectives, and specific sample collection techniques to be used.

Control areas should be carefully designated so a comparison can be made between activity in the untreated and treated areas. Treatment and corresponding control areas should exhibit similar chemical and physical characteristics to support their comparability. They should be relatively uniform in their nutrient availability, topographical features, geological and/or hydro-geological features, ecological characteristics, and contaminant concentration and distribution. A number of unique treatment and control areas should be selected for each significantly different habitat intended for bioremediation treatment.

In determining the total number of test samples to collect, the following factors should be considered:

X Number of unique habitats proposed for treatment;

X Number of unique matrices proposed for treatment;

X Variability in the distribution and/or concentration of contaminants in each sample matrix;

X Bioremediation system proposed for use;

X Types and number of analyses that will be performed on samples;

X Types of statistical tests that will be run on the data;

X Desired power for the statistical tests; and

X Cost and time for conducting sampling and sample analyses.

To estimate variability, some initial screening samples should be taken to the extent possible. Alternatively, a review of historical data on similar spills may provide adequate information for assessing the variability present. In some cases, professional judgment and visual inspection can assist in assessing variability, although they are not recommended as the sole determinants because of the possibility of grossly-underestimating the needed number of samples. In general, as variability increases so should the number of samples collected. Beginning and end of the growing season sampling is the minimum for assessing degradation during this period.

Unless otherwise stipulated or requested by the FOSC, only approved sampling procedures should be used. Recommended methods for sampling soil are described in EPA's *Removal Program Representative Sampling Guidance, Volume 1: Soil* (EPA 1991). Optional methods that may be used in monitoring selected matrix parameters for water and other contaminated samples are presented in Exhibit 3.

Sample collection procedures selected for use with various matrices and bioremediation treatment systems should be implemented on a schedule designed specifically to capture evidence of contaminant biodegradation. This schedule should consider the potential lag period of days to months required for growth and/or natural selection of microorganisms capable of degrading target contaminants. A lag period is most common with *in situ* bioremediation treatment systems that involve biostimulation. Samples should be collected over the duration of a bioremediation project, or until endpoints are reached.

The organization or contractor supplying bioremediation agents and/or designing the treatment system should provide a reasonable schedule for collecting samples based on past performance of the treatment system proposed, or an appropriate treatability study.

6.2.3 Laboratory Analysis

In recognition of the varied environments and habitats that can be impacted by oil spills and hazardous material releases, various types of standardized laboratory analyses can be performed on samples to help meet the objectives of a bioremediation project. These analyses can be divided into three categories: (1) chemical analyses, (2) microbial analyses, and (3) toxicity analyses. To evaluate the efficacy of bioremediation treatment systems, a combination of chemical and microbial analyses will provide a more complete evaluation than would result from performing either chemical or microbial analyses alone.

Chemical analyses are performed to measure relative changes in the composition and amount of spilled/released contaminants, as well as nutrient concentrations and other environmental conditions important to obtaining and sustaining desired levels of microbial activity. Examples of chemical analyses include:

X Fingerprinting by gas chromatography (GC) with flame ionization detection;
X Fingerprinting by gas chromatography coupled with mass spectrometry (GC/MS);
X Nitrogen analyses;
X Phosphorous analysis;
X Dissolved oxygen concentration; and
X pH determination.

Microbial analyses are performed to quantify increases in microbial populations and to measure some aspect of the metabolic activity of contaminant-degrading microorganisms. Examples of microbial analyses include:

X Viable cell counts;
X Most probable number;
X Biochemical oxygen demand; and
X Carbon dioxide (CO_2) generation.

Toxicity analyses are performed to assess and/or confirm any acute and chronic toxic effects on native organisms caused by application of bioremediation agents compared the effects caused only by the spilled/released contaminants. These analyses would likely be most applicable to projects in which bioremediation agents are used in the open environment, as opposed to when they are used in closed or well-controlled systems. However, it may be appropriate to conduct an aquatic toxicity test if there are potential pathways to surface water. The toxic potential of agents should have been evaluated during the agent selection and system design processes; so whether toxicity analyses should be performed as part of bioremediation projects needs to be assessed on a project-specific basis. Examples of toxicity analyses used to evaluate toxicity in soil systems include:

X Ames *Salmonella typhimurium* mammalian microsome assay;

X Microtox™ test;

X Seed germination experiments; and

X Plant growth studies.

Standard EPA-approved laboratory protocols or other validated and accepted methods generally are available for performing the types of analyses described above and should be used, unless otherwise directed by the FOSC. All sampling and laboratory analyses, including those of government or contract laboratories, should follow approved methods unless otherwise stipulated or requested by the FOSC.

6.2.4 Other Visual Observations and System Monitoring

For most *in situ* and *ex-situ* bioremediation projects, collection of samples should be accompanied by collection of qualitative information on environmental characteristics through visual observations. This information will assist in evaluating effects associated with implementation of the selected bioremediation treatment system and in ensuring that the spill/release situation and ensuing response are documented thoroughly and completely. Visual observations should assess the following, as appropriate given the design of the proposed bioremediation system:

X Readily discernable effects of spilled/released contaminants and any bioremediation agents used on indigenous biota;

X Physical effects of treatment system implementation and monitoring activities on the environment;

X Presence, location, and abundance of spilled/released contaminants;

X Appearance changes (such as change in color, stickiness, and consistency) in spilled/released contaminants and treated materials;

X Distribution and movement of spilled/released contaminants and bioremediation agents (where applicable); and

X Soil moisture content and temperature.

Visual observations should be conducted and documented over the duration of a bioremediation project. If adverse effects on fish and wildlife resources or other sensitive environments are observed, the bioremediation system should be evaluated expeditiously and, after consultation with the appropriate natural resource trustee, termination of the project should be considered.

Some projects may also require periodic monitoring of various system parameters, such as vacuum pressure (aquifer renovation, bioventing), airflow rates (aquifer renovation, bioventing, and prepared bed), leachate composition (composting and prepared bed), and vapor content (conceivably every non-contained system). Monitoring and, in some cases, controlling these parameters is important to optimizing system performance and determining whether additional treatment activities are necessary. Monitoring of these parameters should be performed and documented as appropriate based on the bioremediation treatment system being proposed.

Water is a common effluent in many of the bioremediation techniques discussed. Water should be tested prior to disposal. Appropriate state, local, tribal and/or federal agencies should be consulted to determine the proper treatment of disposal method and to pursue any required permitting.

6.3 DATA QUALITY REQUIREMENTS

All data collection activities should be conducted to produce data of known and acceptable quality. To help ensure that this goal and the objectives of monitoring are met, all contractors performing work as part of the monitoring effort for a bioremediation project should submit a quality assurance plan to the FOSC prior to sample collection.

Sampling from treatment and control areas, and collection of field replicates and other quality assurance/quality control (QA/QC) samples as part of monitoring are highly recommended to help ensure representativeness and comparability of sample analytical results.

7.0 LIST OF REFERENCES

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Exhibit 1
Bioremediation Feasibility Assessment Process

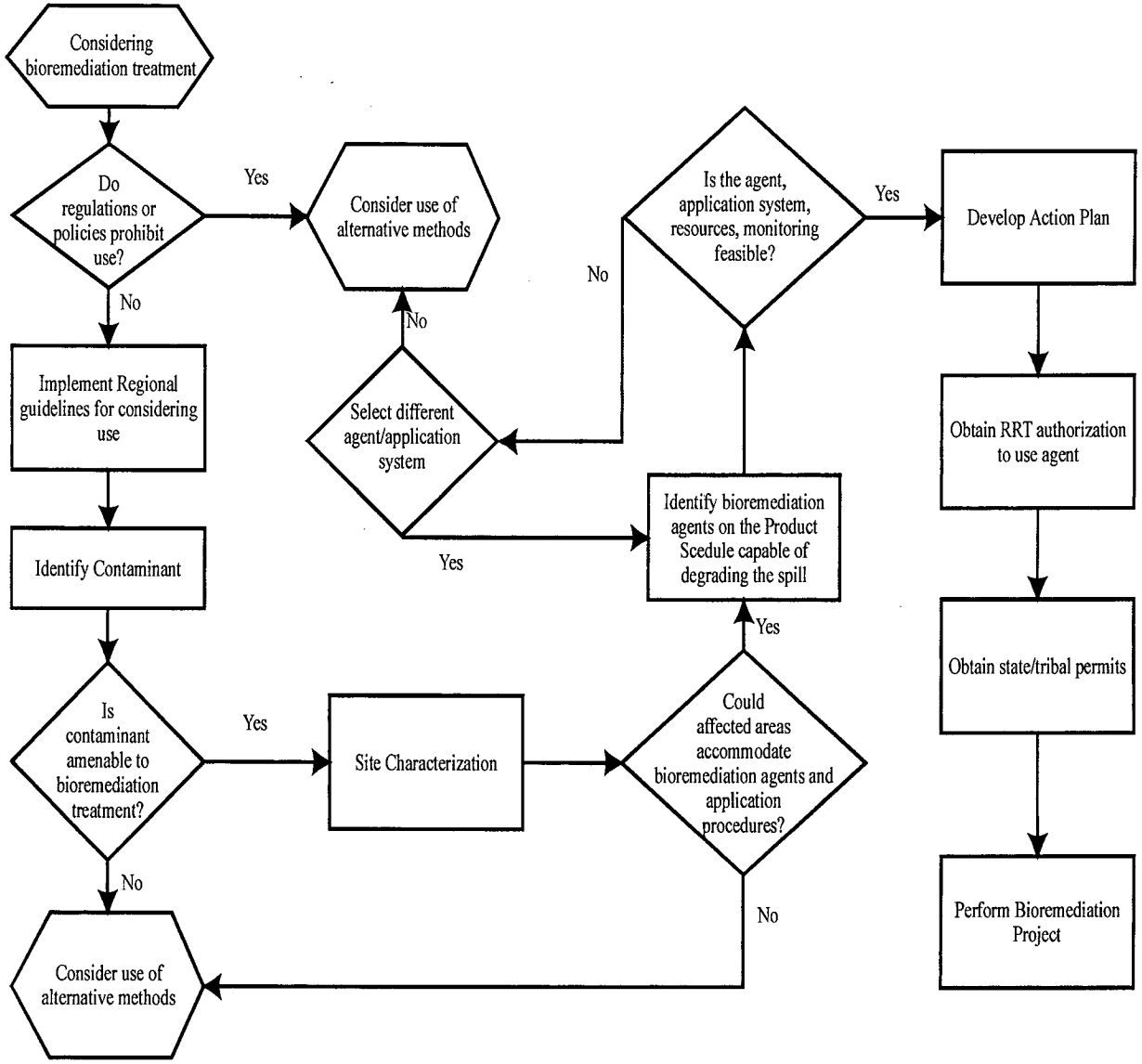


EXHIBIT 2

Suggested Monitoring Parameters for Bioremediation Treatment Systems

Monitoring Parameter	Treatment System						
	Land farming	**Bioventing**	**Aquifer Renovation**	**Prepared Bed**	**Composting**	**Slurry Reactor**	**Bioreactor**
Contaminant Concentration	T	T	T	T	T	T	T
Total Organic Carbon			T			T	T
Microbial Population	T	T	T	T	T	T	T
Nutrient Concentration	T	T	T	T	T	T	T
pH	T	T	T	T	T	T	T
Oxygen Consumption		T		T (optional)	T (optional)	T (optional)	T (optional)
Dissolved Oxygen Concentration			T			T	T
CO_2 Generation		T		T (optional)	T (optional)	T (optional)	T (optional)
Temperature	T			T (optional)	T (optional)	T	T
Moisture Content	T	T		T	T		
Other System Parameters							
Vapors	T (optional)	T		T (optional)	T (optional)	T (optional)	T (optional)
Leachate Composition	T (optional)			T (optional)	T (optional)		
Air Flow Rates		T	T	T	T (optional)		
Vacuum Pressure		T (optional)	T				

EXHIBIT 3

Optional Methods For Monitoring Matrix Parameters for Water Samples

MONITORING PARAMETER	ANALYTICAL METHOD
Contaminant Concentration	
Fingerprinting by GC with IR	ASTM Method D3328
Fingerprinting by GC/MS	ASTM Method D3328
Total Organic Carbon	
Total Petroleum Hydrocarbons Analysis	EPA 600, Method 418.1
Nutrient Concentration	
Nitrate-Nitrogen (Total)	EPA 600, Method 300.0
Nitrogen Ammonia Analysis	EPA 600, Method 350.1-350.3
Total Nitrogen, Kjeldahl	EPA 600, Method 351.1-351.4
Nitrogen Nitrate Analysis	EPA 600, Method 352.1
Nitrogen, Nitrate-Nitrite Analysis	EPA 600, Method 353.1-353.3
Nitrogen Nitrite Analysis	EPA 600, Method 354.1
Phosphorous analysis	EPA 600, Method 365.1-365.4
pH	EPA 600, Method 150.1
Oxygen Consumption	
Biochemical Oxygen Demand	EPA 600, Method 405.1
Dissolved Oxygen Uptake	EPA 600, Method 213A
Dissolved Oxygen Concentration	EPA 600, Method 360.1-360.2

EXHIBIT 4

Bioremediation Use Authorization Form

A. DETAILS OF SPILL/RELEASE -- TO BE PROVIDED AT TIME OF SPILL/RELEASE BY POTENTIALLY RESPONSIBLE PARTY (IF KNOWN), HIS AGENT, OR BY THE FOSC. ATTACH ADDITIONAL SHEETS IF NECESSARY.

1. SPILL/RELEASE DATA
   a. Circumstances (fire, grounding, collision, etc.)
   _____
   _____
   b. Location of spill/release (report all available details)
   Distance and direction from nearest navigable water _____
   Latitude and longitude _____
   Habitats affected _____
   Brief Description of topography _____
   Soil type (i.e., sandy, clay) _____
   c. Time and date of spill/release _____
   d. Potentially responsible party _____
   Name of company _____
   Address _____
   Individual to contact _____
   Telephone_____ Fax _____
   e. Product spilled/released (the name or type of product spilled/released may be useful in establishing answers requested in Sections A.2 and A.3, below)
   Type of product (crude oil, refined product, etc.) _____
   Name of crude or product (if known) _____
   Volume released (if known) _____
   f. Type of release (instantaneous, continuous, intermittent, belching, etc.)
   _____

2. PROPERTIES OF THE SPILLED OIL (IF KNOWN) (NOTE: General oil property information is discussed in Section 4.2.1 of the Bioremediation Guidance document.)
   a. Specific gravity or API gravity _____
   b. Viscosity, cp. _____ at temperature, EF _____
   c. Pour point, EF _____
   d. Sulfur content, %w _____
   PROPERTIES OF THE RELEASED HAZARDOUS SUBSTANCE (IF KNOWN): _____
   _____
   _____

3. IS OIL/HAZARDOUS SUBSTANCE EXPECTED TO BE AMENABLE TO BIOREMEDIATION?
   9 Easily 9 Moderately 9 With difficulty
   How was this estimate made (e.g., from known contaminant properties, from constituent characteristics, from field trials, from laboratory tests, from historical use information)?
   _____
   _____

B. SPILL/RELEASE AND WEATHER -- TO BE PROVIDED AT TIME OF SPILL/RELEASE BY POTENTIALLY RESPONSIBLE PARTY (IF KNOWN), HIS OR HER AGENT, OR BY THE FOSC. ATTACH ADDITIONAL SHEETS IF NECESSARY. (NOTE: Some of this information may be available from the PRP, the FOSC, or other interested parties.)

1. Weather conditions and forecast:
   a. Air temperature: Day _____ Night _____
   b. Other _____
   _____

C. DETAILS OF BIOREMEDIATION PLAN -- TO BE PROVIDED AT TIME OF SPILL BY SPILLER (IF KNOWN), HIS AGENT, OR THE FOSC

1. Specific location proposed for treatment _____
2. Bioremediation agent proposed for use
   Name _____
   Exact chemical and biological makeup and formulation characteristics of the agent
   _____
   _____
   Type of agent (nutrient or microbe) _____
   Potential toxicity or bio-accumulation by humans, mammals, fish, birds, plants, etc.___
   _____
   Specific environmental conditions for optimum results (i.e. Temperature, moisture) __
   _____
   How will the above necessary conditions be achieved _____
   _____
   _____
   Is agent on the NCP Product Schedule? 9 Yes 9 No
   To what Tier-level has it been evaluated? 9 Tier I 9 Tier II 9 Tier III 9 Tier IV
   Source of bioremediation agent _____
   Estimated amount needed _____
   Amount available _____
3. Have you verified that the agent is able to degrade the substance spilled/released? 9Yes 9 No
4. History of use at previous cleanups, especially for similar situations and environments.
5. Equipment to be used for applying bioremediation agent
   Type (backpack spray, sprinkler, etc.) _____
   Available from: Name _____
   Address _____
   Telephone _____
   Name of equipment (if known) _____
   Time (in hours) needed for transport to the spill/release site, after preparation_____
6. Has equipment been calibrated for use with bioremediation agents? _____
7. Planned rate of application _____ gal/acre
   How frequently will agent be reapplied? _____
   Mode of biodegradation and calculated efficiency _____
8. Summarize the bioremediation application/operation plan. Attach copy.

   _____
9. Summarize the monitoring plan. Attach copy.

   _____
   _____
10. Do special precautions need to be taken to prevent improper handling or application of the agent? If so, what are they? _____

    _____
    _____

EXHIBIT 5

Advisability of Various Bioremediation Treatment Systems Given Various Situational Factors

Situational Factor	Treatment System						
	Land farming	Bioventing	Aquifer Renovation	Prepared Bed	Composting	Slurry Reactor	Bioreactor
Recalcitrant contaminants						T	T
Large quantity contaminated material	T	T	T				
Deep contamination		T	T				
Soil contamination	T	T		T	T	T	
Water contamination			T				T
Fine-particle soil	T			T		T	
Extreme temperature				T	T	T	T
Arid environment				T	T	T	T
Extreme pH				T	T	T	T
Danger of contaminant migration				T	T	T	T
Time constraints				T	T	T	T
Limited funds	T				T		

Note: The information contained in this matrix indicates only some of the situational factors that might make one system better suited for use in a response than another system. Ultimately, the particular requirements of a specific spill situation and the judgment of the FOSC will determine which system is chosen.

APPENDIX A.1

FISH AND WILDLIFE AND SENSITIVE ENVIRONMENTS PLAN

FISH AND WILDLIFE AND SENSITIVE ENVIRONMENTS PLAN

APPENDIX A.1 TO REGION 7 INTEGRATED CONTINGENCY PLAN

TABLE OF CONTENTS

Section **Page**

1.0 PURPOSE 1

2.0 SCOPE 1

3.0 OBJECTIVES 2

3.1 Identify and Establish Priorities for Resources at Risk 2
3.2 Determine Environmental Effects of Response and Countermeasures 2
3.3 Identify Fish and Wildlife Response Capabilities 2
3.4 Evaluate the Interface of the RICP with Non-Federal Plans 2

4.0 PRIORITIZATION OF RESOURCES AT RISK 3

4.1 Notification of and Consultation with Natural Resource Trustees 3
4.2 Consultation with Natural Resource Managers 5
4.3 Regional Description and Sensitive Areas 5

4.3.1 Threatened and Endangered Species 6
4.3.2 Freshwater Environments 6

4.4 Areas of Economic Significance 8
4.5 Areas of Historic/Archeological Significance 8

5.0 DETERMINING THE ENVIRONMENTAL EFFECTS OF RESPONSE AND COUNTERMEASURES 8

5.1 Impacts of Response Methods on Sensitive Environments and Habitats 9
5.2 Appropriate Response for Specific Sensitive Environments and Habitats 9
5.3 Monitoring Response Effectiveness - Monitoring Plans 11

5.3.1 Monitoring Plan Outline 11

6.0 FISH AND WILDLIFE RESPONSE CAPABILITIES 15

6.1 Technical Expertise and Assistance 15
6.2 Wildlife Protection 15
6.3 Wildlife Rescue and Rehabilitation 16
6.4 Endangered Species Act Consultation 21
6.5 Law Enforcement 23
6.6 Other Roles and Responsibilities of Natural Resource Trustees 23

7.0 HISTORIC/ARCHEOLOGICAL RESOURCE RESPONSE 24

7.1 Technical Expertise and Assistance 25
7.2 Historic Site Protection 25

8.0 EVALUATING THE INTERFACE OF THE RICP WITH NON-FEDERAL PLANS 25

TABLE OF CONTENTS (Continued)

FIGURES

Figure **Page**

FIGURE A.1.1 PROTECTION PRIORITIES MECHANISM 4

TABLES

Table **Page**

Table A.1.1 RELATIVE IMPACT OF RESPONSE METHODS IN THE ABSENCE OF OIL 10

1.0 PURPOSE

Oil or hazardous substances spilled into the environment may have a wide range of ecological consequences. The severity of the consequences varies depending on the material spilled and the ability of the ecosystem to degrade or resist the spilled product. Reducing the overall ecological impact of a spill event and the impacts associated with response activities is the goal of this Fish and Wildlife and Sensitive Environments Plan (FWSEP, also referred to as "annex").

The purpose of this annex is to provide the Federal On-Scene Coordinators (OSCs) in U.S. EPA Region 7 (Region 7) with the information he/she needs to identify sensitive environments and provide appropriate response strategies for limiting the overall negative environmental effects of a spill. The annex will also aid in the development of Facility Response Plans required by 40 CFR 112.20. The FWSEP also assists FOSCs and Incident Commanders in protecting threatened and endangered species and their supporting habitats from the effects of response measures, and fulfilling their consultation responsibilities under the Endangered Species Act, implementing regulations, and the *Interagency Memorandum of Agreement Regarding Oil Spill Planning and Response Activities under the Federal Water Pollution Control Act's National Oil and Hazardous Substances Pollution Contingency Plan and the Endangered Species Act* (ESA MOA, Annex V).

2.0 SCOPE

The Region 7 FWSEP develops a general overview of the sensitive areas and provides the OSC with information to assist in the sensitive environment identification process. Deciding on response techniques before a spill occurs is imperative to provide for a coordinated, immediate and effective response. The FWSEP aids in the selection of the appropriate spill protection, recovery and cleanup techniques that will help to minimize the ecological impacts of a spill.

The task of identifying all the environmentally sensitive areas in Region 7 and prioritizing them is an enormous undertaking, and will be done gradually. The FWSEP helps to identify sensitive environments that could be impacted by spills into water bodies within the Region.

The FWSEP also establishes procedures and policy for meeting the objectives set forth in the National Contingency Plan (NCP); and should be used to aid responders and planners in prioritizing and evaluating response techniques for spills in various freshwater environments and shoreline habitats. This annex aids the Area Committee in identifying special areas of concern. Those special areas of concern will be examined in detail in the Sub-Area planning phase of the Regional Integrated Contingency Plan (RICP)

development. The FWSEP also assists FOSCs and Incident Commanders in protecting threatened and endangered species and their supporting habitats from the effects of response measures, and fulfilling their consultation responsibilities under the Endangered Species Act, implementing regulations, and the Interagency Memorandum of Agreement Regarding Oil Spill Planning and Response Activities under the Federal Water Pollution Control Act's National Oil and Hazardous Substances Pollution Contingency Plan and the Endangered Species Act (ESA MOA, Annex V).

3.0 OBJECTIVES

The National Contingency Plan (40 CFR 300.210(c)(4)(I)) delineates the objectives of this annex. The objectives have been organized into four general sections:

3.1 IDENTIFY AND ESTABLISH PRIORITIES FOR RESOURCES AT RISK

Natural resources, other sensitive resources, and appropriate resource trustees are identified. Agencies to be notified and consulted in establishing incident-specific priorities for the protection of these resources are provided. Sensitive resources identified include environmentally sensitive lands, freshwater environments, and areas of economic significance (Section 4.0).

3.2 DETERMINE ENVIRONMENTAL EFFECTS OF RESPONSE AND COUNTERMEASURES

The probable impacts of various response methods on general environments and habitats are provided. Methods for determining and approving the appropriate response techniques for specific environments and habitats, and monitoring the effectiveness of response activities are outlined (Section 5.0).

3.3 IDENTIFY FISH AND WILDLIFE RESPONSE CAPABILITIES

State and Federal response capabilities and the contacts for permitting wildlife rescue and rehabilitation are outlined. Prearranging and acquiring the appropriate response equipment, personnel and mutual aid agreements and defining the OSHA training requirements for volunteers assigned to fish and wildlife rescue are also discussed (Section 6.0).

3.4 EVALUATE THE INTERFACE OF THE RICP WITH NON-FEDERAL PLANS

The compatibility of this annex with non-Federal response plans on issues affecting fish, wildlife, their habitats and sensitive environments is evaluated (Section 7.0).

4.0 PRIORITIZATION OF RESOURCES AT RISK

To ensure that proper measures are taken to minimize the impacts of a spill on ecological and economic resources, the OSC or Responsible Party must be aware of sensitive environments and/or important resource areas. Identifying sensitive areas should be accomplished before a spill event occurs. Environmentally sensitive areas were identified by the various Natural Resource Trustees and other natural resource management agencies. Response strategies vary depending on the material spilled and the spill location. It is critical that responders realize that an immediate, but improper response, may be more damaging than waiting for the mobilization of a proper response. Critical to choosing an appropriate response is understanding the aquatic environments and habitats, and their sensitivities. It is also important to recognize the value and importance of any historic properties/sites that may be affected by response activities.

4.1 NOTIFICATION OF AND CONSULTATION WITH NATURAL RESOURCE TRUSTEES

Prompt notification of and consultation with the natural resource trustees and other natural resource management agencies is imperative so that their expertise can be utilized in identifying and protecting sensitive environments. Figure 1 assist with the protection priorities.

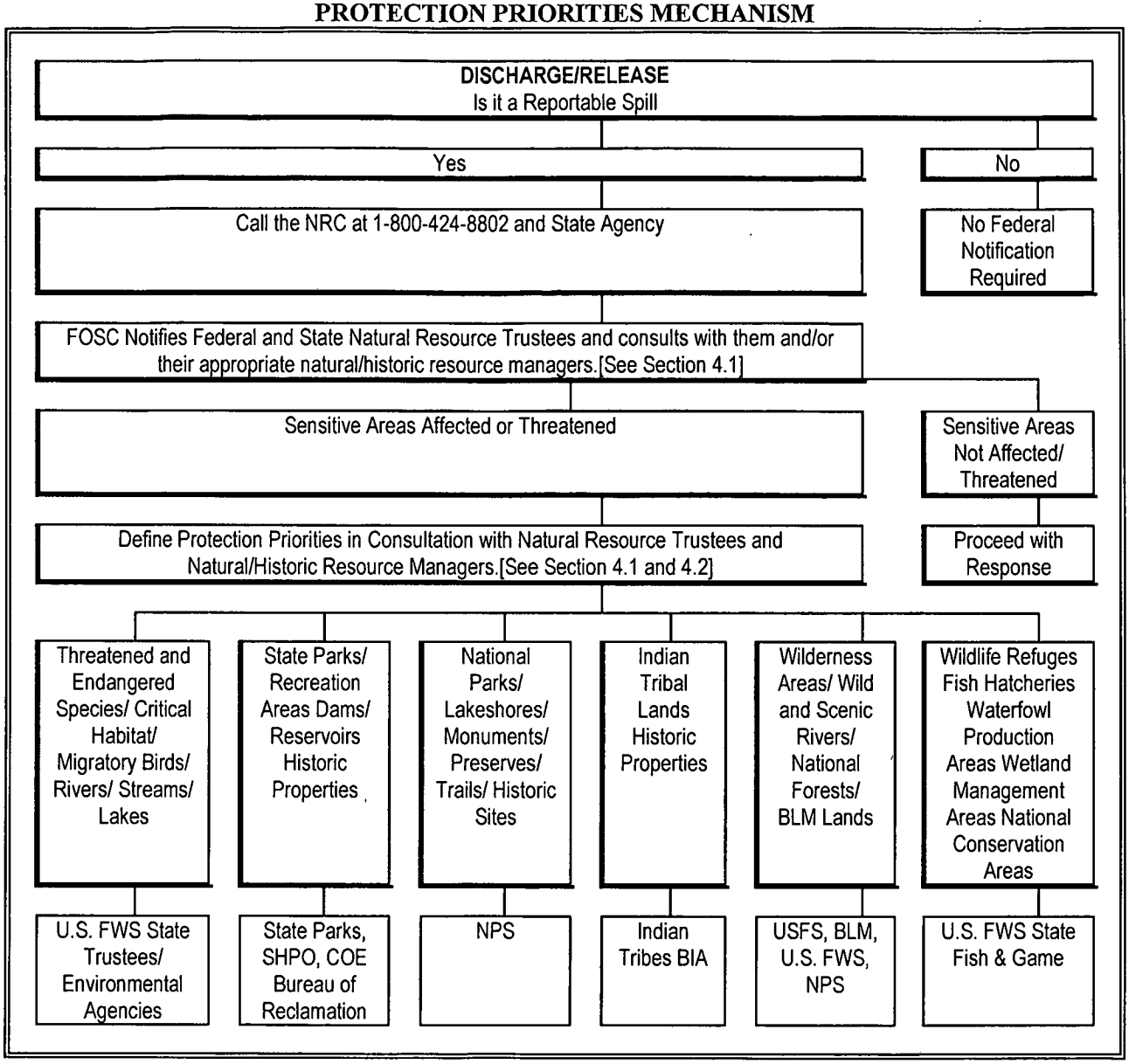
Pursuant to Subpart G of the National Contingency Plan, the following agencies have been designated as trustees for natural resources:

- Department of the Interior
- Department of Agriculture, Forest Service
- Department of Defense
- Department of Energy
- Kansas Department of Health and Environment
- Nebraska Department of Environmental Quality
- Iowa Department of Natural Resources
- Missouri Department of Natural Resources

Appropriate contacts within these agencies are included in Appendix D.

FIGURE A.1.1

PROTECTION PRIORITIES MECHANISM



4.2 CONSULTATION WITH NATURAL RESOURCE MANAGERS

In addition to the designated natural resource trustees, there are numerous Federal and State agencies with land and resource management responsibilities and/or expertise which need to be consulted regarding removal actions:

- Department of the Interior
- U.S. Fish and Wildlife Service (USFWS)
- National Park Service
- Bureau of Reclamation
- Bureau of Land Management
- Bureau of Indian Affairs
- Department of Agriculture
- Forest Service
- State of Iowa
- Department of Natural Resources
- State of Kansas
- Wildlife and Parks Department
- State of Nebraska
- Game and Parks Commission
- Natural Resources Commission
- Department of Water Resources
- State of Missouri
- Department of Natural Resources
- Department of Conservation

Appropriate contacts within these agencies are included in Appendix D.

4.3 REGIONAL DESCRIPTION AND SENSITIVE AREAS

There are many wildlife refuges, hatcheries, wild and scenic river reaches, water fowl production areas, wetland management areas, national and state parks, monuments, preserves, recreational areas, primitive archaeological and historical sites, heritage program areas and other important resources located on or near the rivers and lakes of Region 7.

Appendix A divides the Region by state and lists threatened and endangered species, critical habitats, environmentally sensitive areas, recreation areas, public and private water intakes. The Natural Resource Trustee or other contact is listed in Appendix D, and the phone numbers for contacts who should be notified and consulted. The appendix can be used by responders to quickly identify the location of sensitive areas.

4.3.1 Threatened and Endangered Species

Threatened and endangered (T&E) species inhabit or are located near, almost every major body of water in Region 7. The U.S. Fish and Wildlife Service (USFWS) provides an updated list of T&E species by county for the Region annually.

Additional information on compliance with the Endangered Species Act, implementing regulations, and the ESA MOA is provided in Section 6.4.

4.3.2 Freshwater Environments

Freshwater environments can be divided into three broad categories: standing water, such as lakes and ponds; and flowing water, which includes streams and rivers; and wetlands.

Lakes and Ponds

The near shore areas of standing freshwater environments usually support large quantities of various animals and plants. Due to the water's relative stillness, spilled oil would tend to collect and not be dispersed by wind, waves or currents. Lakes, ponds and their dependent populations are, therefore, more vulnerable to an oil spill than freshwater environments that are constantly moving, such as streams and rivers.

Streams and Rivers

Oil entering a stream or river will typically move downstream. Oil entering slower flowing streams tends to remain on the surface while oil discharged to a high velocity turbulent stream disperses throughout the entire stream water column. As a result of the turbulent agitation, oil may become trapped in sediment along the stream bed, resulting in increased fatalities of benthic organisms.

Stream reaches can be subdivided into three categories: low gradient; moderate gradient; and high gradient.

- Low gradient portions of a stream are characterized by: meandering channels; moderate currents; wide zones of associated riparian vegetation; sand bars; intermediate oil residence time; numerous collection sites; and restricted mixing into the water column.
- Moderate gradient portions of a stream are characterized by: intermittent rapids; moderately wide channels; associated riparian vegetation; brisk currents; sand and gravel bars; short oil residence time; few collection sites; and significant mixing into the water column.
- High gradient portions of a stream are characterized by: numerous rapids; narrow associated riparian vegetation; strong currents; coarse gravel sediments; short oil residence time; no collection sites; and intense mixing into the water column.

Wetlands

Wetlands are highly sensitive to oil spills. Wetlands such as freshwater swamps, marshes and prairie potholes act as natural hatcheries, nesting areas, food sources, and watering areas for terrestrial and aquatic wildlife. Therefore, they are crucial areas for wildlife support.

The Region's seasonality is a major consideration in preparing and planning for a response. Ice and snow in the winter, fluctuations of river and stream water levels, and the migratory patterns of wildlife all need to be addressed.

Classification

The classification of environmentally sensitive areas, their administering agencies and the statutory authority include, but are not limited to:

- **Critical Areas under the Clean Lakes Program** [EPA, States, section 314 Clean Water Act, (33 USC '1324)];
- **Critical Habitats for Federal Designated Endangered or Threatened Species** [USFWS, Endangered Species ACT, (16 USC '1531, et seq.; 50 CFR 424.02)];
- **Designated Federal Wilderness Areas** [BLM, USFS, NPS, USFWS, National Wilderness Preservation Act (16 USC '1131, et seq.)];
- **Federal Designated or Proposed Endangered or Threatened Species** [USFWS, Endangered Species Act (16 USC '1531, et seq.; 50 CFR 424.02)]
- **Federal and State Designated Wild and Scenic Rivers** [BLM, USFS, NPS, USFWS, States, National Wild and Scenic Rivers Act, (16 USC "1271-1287)];
- **National Conservation Areas** [USFWS, Refuge Recreation Act, (16 USC ' 460k, et seq.)];
- **National Wildlife Refuges** [USFWS, National Wildlife Refuge Administration Act of 1966 (16 USC " 668dd-668ee) or comparable state law];
- **National Parks, National Monuments, National Lakeshore Recreational Areas** [NPS, Act of August 25, 1916 (16 USC '1, et seq.)];

- **Waterfowl Management Areas** are designated for the protection of habitat important to waterfowl and are designated within the states' **Wildlife Management Areas**;
- Other areas of concern are wetlands which generally include swamps, marshes, bogs and similar areas. Wetlands are defined in 40 CFR 230.3 and by USFWS. **Waterfowl Production Areas** administered by the USFWS are crucial habitats for waterfowl production.

[Relevant State statutes to be added.]

4.4 AREAS OF ECONOMIC SIGNIFICANCE

Responders need to identify and protect areas of economic importance. Public drinking water intakes, industrial water users, aquaculture sites and agricultural water users could be adversely impacted by a discharge of oil or other hazardous materials. Water intakes in shallow lakes and rivers are at greatest risk to an oil spill. Timely response procedures which identify water users and notify them of an on coming spill is imperative. With prompt notification, water intakes/diversions can be shut down or boomed off. Water users other than municipal drinking water intakes are still being identified.

Tourism is also of importance with numerous important fishing streams, boating and canoeing areas, and other recreational activities associated with the Region's rivers and lakes. Identifying and protecting these economic resources is critical to response considerations.

4.5 AREAS OF HISTORIC/ARCHEOLOGICAL SIGNIFICANCE

As required under the *Programmatic Agreement on Protection of Historic Properties During Emergency Response under the National Oil and Hazardous Substances Contingency Plan (Programmatic Agreement)*, plans shall ensure the inclusion of information on consideration of historic properties. This should be developed in consultation with the appropriate parties for the immediate and effective protection of, and the minimization of risk of damage to historic properties, that may be jeopardized by a discharge. Specific requirements are outlined in Annex VI.

5.0 DETERMINING THE ENVIRONMENTAL EFFECTS OF RESPONSE AND COUNTERMEASURES

Decisions on appropriate response and countermeasures should take into account the relative impact of response methods on sensitive areas. Using the information collected on downstream sensitive areas and spill response guidelines, informed decisions on appropriate protective measures can be made. When deciding on a method of response, the most important consideration should be the effectiveness of protecting habitats and removing spills of oil or other hazardous materials.

5.1 IMPACTS OF RESPONSE METHODS ON SENSITIVE ENVIRONMENTS AND HABITATS

The American Petroleum Institute and the National Oceanic and Atmospheric Administration (API/NOAA) collaborated on a study for Inland Oil Spills and finalized their findings in May of 1994. This is the first comprehensive guidance on responding to freshwater inland spills. API/NOAA classified specific oil response methods and their relative impacts on given environments and habitats. Physical, chemical and biological response methods are discussed and response impacts on the environment are classified as low impact, moderate impact, high impact and ineffective or inapplicable.

Table A.1.1, taken from the API/NOAA document, includes the findings for response method impacts on water environments and shoreline habitats.

5.2 APPROPRIATE RESPONSE FOR SPECIFIC SENSITIVE ENVIRONMENTS AND HABITATS

Many of the issues dealing with appropriate response methods will be addressed in detail during the Sub-Area Planning. Response sections of Sub-Area plans will include:

- Identifying specific areas of concern throughout the region and pre-planning for the products most commonly spilled and the locations where spills most commonly occur;
- Response methods for habitats and sensitive areas using the API/NOAA guidance, Options for Minimizing the Environmental Impacts of Freshwater Spill Response;
- Pre-approving appropriate removal actions including the use of chemicals and dispersants per 40 CFR Subpart J - Use of Dispersant and Other Chemicals, '300.910.
- Locating access points, staging areas and boom anchor locations.

[Note - Additional guidance on response techniques is under development.]

TABLE A.1.1

RELATIVE IMPACT OF RESPONSE METHODS IN THE ABSENCE OF OIL

	WATER ENVIRONMENT				SHORELINE HABITAT							
RESPONSE METHOD	OPEN WATER	SMALL LAKES/PONDS	LARGE RIVERS	SMALL RIVERS/ STREAMS	BEDROCK	MAN MADE	SAND	VEGETATED SHORES	SAND AND GRAVEL	GRAVEL	MUD	WETLANDS
PHYSICAL RESPONSE METHODS												
Natural Recovery	-	-	-	-	-	-	-	-	-	-	-	-
Booming	L	L	L	L	-	-	-	-	-	-	-	-
Skimming	L	L	L	L	-	-	-	-	-	-	-	-
Barriers/Berms	-	-	-	H	-	-	-	-	-	-	-	-
Physical Herding	L	L	L	L	-	-	-	-	-	-	-	-
Manual Oil Removal/Cleaning	L	H	L	M	L	L	L	H	M	M	H	H
Mechanical Removal	L	H	H	H	-	M	M	H	M	M	H	H
Sorbents	L	L	L	L	L	L	L	L	L	L	M	M
Vacuum	L	L	L	L	L	L	L	M	L	L	H	M
Debris Removal	-	L	L	L	L	L	L	L	L	L	M	M
Sediment Reworking	-	H	-	H	-	-	M	H	M	M	H	H
Vegetation Removal	L	H	M	H	-	-	-	H	-	-	-	H
In-situ Burning	L	M	L	M	L	L	M	M	M	M	H	M
Flooding	-	-	-	-	L	L	L	L	M	L	L	L
Low-Pressure, Cold-Water Flushing	-	-	-	-	L	L	M	L	L	M	H	L
High-Pressure, Cold-Water Flushing	-	-	-	-	L	L	H	H	H	H	H	H
Low-Pressure Hot-Water Flushing	-	-	-	-	M	L	H	H	M	M	H	H
High Pressure, Hot-Water Flushing	-	-	-	-	M	L	H	H	H	H	H	H
Steam Cleaning	-	-	-	-	M	L	H	H	M	M	H	H
Sand Blasting	-	-	-	-	H	M	-	-	-	-	-	-
CHEMICAL RESPONSE METHODS												
Dispersants	L	H	L	H	-	-	-	-	-	-	-	-
Demulsifiers	L	L	L	M	-	-	-	-	-	-	-	-
Visco-Elastic Agents	L	M	L	L	-	-	-	-	-	-	-	-
Herding Agents	L	M	L	H	-	-	-	-	-	-	-	-
Solidifiers	L	L	L	L	L	L	M	M	M	L	M	M
Chemical Shoreline Pretreatment	-	-	-	-	I	I	I	I	I	I	I	I
Shoreline Cleaners	-	-	-	-	M	L	M	I	M	M	M	I
BIOLOGICAL RESPONSE METHODS												
Nutrient Enrichment	L	M	L	L	L	L	L	L	L	L	L	L
Natural Microbe Seeding	I	I	I	I	I	I	I	I	I	I	I	I

5.3 MONITORING RESPONSE EFFECTIVENESS - MONITORING PLANS

An oil spill is dynamic and cleanup efforts must change as conditions change. Over time, the oil will spread, move downstream, and oil can chemically change due to weathering. Climatic and geographic conditions may also change. A continual monitoring program to ensure the maximum removal of oil and protection of the environment throughout the duration of the cleanup is essential.

The OSC, in consultation with the natural resource trustees and the responsible party, will monitor the effectiveness of response activities in protecting sensitive habitats and removing discharges of oil or releases of hazardous substances. The OSC will consult with natural resource trustees and natural resource agency managers regarding the need for and methods of an incident-specific long-term monitoring plan. Efforts to control, contain and clean up the oil typically involve a number of containment and recovery methods. These methods may include booms, barriers, skimmers, sorbents, chemical agents, and manual recovery. As each of these methods has limitations associated with them, continued monitoring is necessary to ensure a successful cleanup. Monitoring will also be necessary to ensure that ecological impacts associated with the response actions do not cause more harm than good. Monitoring activities may include visual observation, sampling, data collection and evaluation, and replacement of saturated or defective material. Consultation with the natural resource agencies is essential to minimize injury to fish and wildlife and their habitats or other sensitive environments.

5.3.1 Monitoring Plan Outline

Section 300.210(E) of the NCP requires that the FWSEA provide monitoring plan(s) to evaluate the effectiveness of different countermeasures or removal actions in protecting the environment. This is an outline for such plans. Specific plans for each response need to be developed in consultation with natural resource trustees and natural resource agency managers.

5.3.1.1 Objectives and Scope

Determine the effectiveness of the selected countermeasures or removal actions in counteracting the effects of the discharge or release. Evaluate the environmental impact of these activities.

5.3.1.2 Monitoring Plan Design

5.3.1.2.1 Monitoring Intensity Levels

The intensity of monitoring efforts may be adjusted to the intensity of the response. Field activities consisting of reconnaissance, environmental parameters assessment, sampling and documentation efforts, and laboratory activities should be conducted on a scale appropriate to the response.

5.3.1.2.2 Selection of Treated and Untreated Sites

Treated and untreated (or control) sites should exhibit similar chemical and physical characteristics to support their comparability. The following criteria should be considered: (1) environmental parameters, (2) physical habitat and geological morphology, and (3) degree of contamination with the released substance and probability of further contamination.

5.3.1.3 Monitoring Parameters and Collection Frequency

Sampling at each site, water depth (as appropriate), and time should be performed in triplicate. The size of samples collected should be based on the requirements of the analytical methods to be used for their analysis.

5.3.1.4 Data Quality Requirements and Assessments

All data collection activities must be planned and conducted to produce data of known and acceptable quality. To help ensure that these objectives are met, all contractors performing work as part of the monitoring effort must submit a quality assurance plan. Parameters for defining data quality include appropriateness of analytes, detection limits, precision, accuracy, representativeness, comparability, and completeness. Representativeness and comparability should be designed into the monitoring plan through provisions for replicate sampling from remediated and control areas and the use of standard, approved methods for sampling and laboratory analyses.

5.3.1.5 Sample Custody Procedures

Accurate identification and proper control of samples is important to help ensure the acceptability and usability of the resulting analytical data. Having standard sample custody procedures is particularly important where the individuals performing sample collection may vary and where individuals collecting samples will not be the ones analyzing the samples. Where the monitoring program is conducted by a contractor, the contractor should designate a sample custodian who will ensure tracking of samples and that custody procedures are properly followed.

5.3.1.6 Sampling and Analytical Methods

All sampling and laboratory analyses should be developed in consultation with natural resource trustees and natural resource managers and should follow EPA or other approved methods unless otherwise stipulated or requested by the OSC.

5.3.1.7 Response Organization and Resource Requirements

The decision to implement a monitoring plan is made in accordance with the NCP and the Region 7 RICP. A project manager, under the direction of the OSC, is responsible for implementing the plan.

5.3.1.7.1 Project Manager

Specific responsibilities of the project manager include: obtaining approval from the OSC for the monitoring plan, assembling teams to perform observations and sampling as appropriate, coordinating activities with the OSC to ensure operations do not interfere with response operations, naming a sample custodian to handle sample transfers and chain of custody concerns, ensuring representation from each RRT member agency that wishes to participate, ensuring consultation with the natural resource trustees and natural resource managers, ensuring and documenting data quality, and ensuring the preparation and submission of all required reports. Other personnel required will be dependent on the size of the spill and of the monitoring effort.

5.3.1.7.2 Equipment Requirements

Equipment requirements will be determined by the scope of the monitoring effort. However, sufficient equipment to complete required sampling and photo documentation must be available.

5.3.1.8 Data Validation

All data will be subject to a thorough check by the OSC and the monitoring Project Manager, or their designated representative, for errors in transcription, calculation, or computer input. In addition, the Project Manager will review all incident logs, sample logs, and data forms to ensure that requirements for documentation and data quality assessment have been met.

5.3.1.9 Performance and System Audits

To help ensure that work is being performed - whether by contractor, EPA, or state personnel - is progressing in accordance with the monitoring plan and specified objectives and procedures, the OSC,

through the monitoring project manager, maintains the right to conduct performance or system audits of field and laboratory collection activities. The categories of audits are described below:

Management System Reviews -- Evaluate the Quality Assurance Program of an organization, such as a firm contracted to conduct a monitoring project or a laboratory sample analyses. The purpose of this review is to verify whether the quality assurance management procedures stated by the contractor are in place prior to a contract award.

Data Quality Audits -- Evaluate a data set, or all data sets, of a particular project, by comparing the data set against specified data quality requirements for that data set.

Technical System Audits -- Evaluate the actual environmental measurement data-collection systems and their associated quality control systems. These audits involve on-site auditing of field sampling activities, field measurement activities, and laboratory analytical procedures.

Performance Audits -- Evaluate analytical methods and procedures of a laboratory. These audits are conducted by submitting performance evaluation samples to a laboratory for analysis. The samples should contain specific pollutants in known matrices whose concentration and identity are unknown to the testing laboratory.

5.3.1.10 Documentation and Reporting

During the course of response activities and accompanying monitoring efforts, the following reports should be prepared and submitted to the OSC:

Activity reports - Provide descriptions of the response activity area, weather, unique observations, and activities undertaken, as well as the names, affiliations and signatures of persons on site. Activity reports should be prepared whenever activities on a site are undertaken.

Analytical reports -- Provide laboratory analysis results of environmental and control samples. Analytical reports should be prepared and submitted by the analytical lab within 10 days after receipt of environmental samples for analysis.

After action report -- Provides a description of the overall bioremediation activity and accompanying monitoring effort, including results of both field and laboratory activities.

5.3.1.11 Revising Plans and Procedures

Monitoring plans should include provisions for modifications, including additional consultation with natural resource trustees and natural resource managers.

6.0 FISH AND WILDLIFE RESPONSE CAPABILITIES

In addition to consultation and coordination with natural resource trustees and other natural resource management agencies during the pre-spill planning phase to identify and understand potential natural resource concerns, consultation and coordination with these agencies during the response is also essential. Fish and wildlife response capabilities include:

6.1 TECHNICAL EXPERTISE AND ASSISTANCE

During a response, natural resource trustees and managers will provide technical assistance and expertise on potential effects of oil on fish and wildlife and their habitats or other sensitive environments that can be found in the impacted area. They are familiar with the area or habitats affected and are able to provide recommendations on the best locations for staging areas, access points, or anchor locations. They will recommend specific habitats where protective measures should be taken and provide advice on response actions to be taken. They can assist in the development of a monitoring plan and subsequent collection of data. Finally, the U.S. Fish and Wildlife Service and the State wildlife agency will direct or provide oversight for the protection, rescue, and rehabilitation of fisheries and wildlife.

6.2 WILDLIFE PROTECTION

When an oil spill occurs, natural resource trustees or managers will provide timely advice on the necessary measures to protect wildlife from exposure to oil and the priority and timing of such measures. Protective measures may include all or a combination of the following:

- Prevent the oil from reaching areas where migratory birds and other wildlife are located by either containing or recovering the oil, or
- Deter birds or other wildlife from entering areas already affected by oil by using wildlife hazing devices or methods.

Wildlife hazing devices or methods are generally grouped into visual or auditory, or a combination of both. In an emergency, the USFWS, the State wildlife agency, or a local animal damage control agent may be able to locate and provide these devices.

6.3 WILDLIFE RESCUE AND REHABILITATION

If exposure of birds and other wildlife to oil cannot be prevented, an immediate decision will need to be made whether to capture and rehabilitate oiled birds and other wildlife. The Department of the Interior (DOI) has statutory responsibilities for the protection of migratory birds and Federally-listed threatened and endangered species, which are carried out by the USFWS. If animals other than migratory birds or Federally-listed threatened or endangered species are found injured, the responsible agency would typically be the State wildlife agency. The decision to rescue and rehabilitate oiled wildlife must be made in consultation with the applicable State and Federal natural resource agencies as State and Federal permits are required by law.

State and Federal permits are required to collect, possess, treat and band migratory birds and threatened and endangered species. The laws and regulations that require such permits are as follows:

- **Migratory Bird Treaty Act of 1918, as amended, 16 U.S.C. 703 et seq**. No person shall take, possess, import, export, transport, sell, purchase or barter, any migratory bird, or the parts, nests, or eggs of such bird except as permitted under the terms of a valid permit issued by U.S. Fish and Wildlife Service pursuant to the provisions of 50 CFR 21 and 50 CFR 13. Enforcement authority and penalties for violations are provided.
- **Bald Eagle Protection Act of 1940, as amended, 16 U.S.C. 668 et seq**. No person shall take, possess, or transport any bald eagle or any golden eagle, or the parts, nests, or eggs of such birds except as permitted under the terms of a valid permit issued by USFWS pursuant to 50 CFR 22 and 50 CFR 13. Enforcement authority and penalties for violations are provided.
- **Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq**. It is unlawful for any person to commit, attempt to commit, solicit another to commit, or cause to be committed the import or export, take, possession, sale or offer for sale any endangered species except as permitted under the terms of a valid permit issued by the U.S. Fish and Wildlife Service pursuant to 50 CFR 17. Enforcement authority and penalties for violations are provided.

[Relevant State laws are to be added].

If rescue and rehabilitation efforts are deemed worthwhile, one Federal permit is required for oiled migratory birds and one Federal permit is required for oiled threatened and endangered species. Each of these permits may encompass more than one species. If a bird is considered a migratory bird, but is also a threatened or endangered species, it should be listed under the threatened and endangered species permit.

USFWS personnel will handle all federal permit activities through the field office responsible for the area where the spill occurs. State permits must be handled through the applicable state agency office. The offices that should be contacted to initiate the permitting process are:

Iowa	U.S. Fish and Wildlife Service 4469 48th Avenue Court Moline, Illinois 61201	309-757-5800 Fax: 757-5807
	Iowa Department of Natural Resources Licensing Bureau Wallace State Building East 9th and Grand Street Des Moines, Iowa 50319-0035	515-281-8688 Fax 281-6794
Kansas	U.S. Fish and Wildlife Service 2609 Anderson Ave Manhattan, Kansas 66502	785-539-3474 Fax 539-8567
	Division of Fisheries and Wildlife Kansas Dept. of Wildlife, Parks and Tourism 512 Southeast 25th Avenue Pratt, Kansas 67124-8174	620-672-5911 Fax 672-6020
Missouri	U.S. Fish and Wildlife Service 101 Park Drive, Suite A Columbia, Missouri 65203	573-234-2132 Fax 234-2181
	Wildlife Division Missouri Department of Conservation P.O. Box 180 Jefferson City, Missouri 65102	573-751-4115 Ext. 150 Fax 526-4663
Nebraska	U.S. Fish and Wildlife Service 203 West Second Street Federal Building, 2nd Floor Grand Island, Nebraska 68801	308-382-6468 Fax 384-8835
	Law Enforcement Division Nebraska Game and Parks Commission 2200 North 33rd Street Lincoln, Nebraska 68503	402-471-0641 Fax 471-5528

All rescue and rehabilitation efforts will be directed by the USFWS and the State wildlife agency, including the notification of a qualified wildlife rehabilitation organization and obtaining the necessary permits. The following criteria will be used by the USFWS and State wildlife agencies in selecting a rehabilitator.

Guidelines for Selection of Wildlife Rehabilitator

- Wildlife rehabilitator must have, or be able to obtain, the appropriate Federal and State permits and licenses to collect, possess, treat, and band migratory birds or threatened and endangered species.
- Wildlife rehabilitator must demonstrate high standards of practice, treatment, conduct, and ethics as reflected by organization such as the National Wildlife Rehabilitator Association, the American Veterinarian Association and the American Society for Prevention of Cruelty to Animals.
- Wildlife rehabilitator must have adequate liability insurance to protect both staff and volunteers.
- Wildlife rehabilitator should have a proven record and experience in rescue and rehabilitation of oiled wildlife.
- Wildlife rehabilitator must comply with all applicable Federal (Occupational Safety and Health Administration, etc.) and state safety regulations to protect staff and volunteers. Two organizations, International Bird Rescue in Berkeley, California, and Tri-State Bird Rescue and Research, Inc. in Newark, Delaware, have become recognized experts in oiled bird rehabilitation:

Tri-State Bird Rescue and Research, Inc. 110 Possum Hollow Road Newark, Delaware 19711	302-737-9543 (9 am – 5 pm EST daily) Fax: 302-737-9562 24 hr pager 800-710-0695 or 0696
International Bird Rescue Research Center 4369 Cordelia Rd. Fairfield, California 94534	707-207-0380 Fax 707-207-0395

Both organizations have extensive experience in bird rescue and rehabilitation and have worked both with government and industry. In addition, other more local, less well known bird rehabilitation organizations may also have such expertise in this area. Veterinarians and researchers from USFWS, other federal agencies, and state wildlife agencies and universities may also provide assistance and expertise during rehabilitation efforts.

All rescue and rehabilitation efforts will be directed by the USFWS and the State wildlife agency, including the notification of a qualified wildlife rehabilitation organization and obtaining the necessary permits.

Health and Safety Concerns in Wildlife Rescue and Rehabilitation

Additional information can be found in the USFWS "Best Practices for Migratory Bird Care During Oil Spill Response", which discusses techniques for preventing oiling of birds as well as good practices for cleaning, caring for, and releasing recovered birds. This document is available at: http://www.fws.gov/contaminants/OtherDocuments/best_practices.pdf.

Two Occupational Safety and Health Administration (OSHA) regulations cover the majority of occupational health and safety issues encountered during wildlife rescue and rehabilitation:

The Hazardous Wastes Operations and Emergency Response (29 CFR 1910.120) regulates organizations or individuals directly involved in on-site (hot-zone) retrieval or clean-up efforts. In addition, each state may have its own worker safety requirements; coordination with the appropriate state agency should be conducted to ensure these requirements are also met. The Hazard Communication Standard (29 CFR 1910.1200), also known as "Right to Know Law" or "HazCom" requires that all chemicals in the work place be fully evaluated for possible physical or health hazards and that all information relating to these hazards be made available to all workers. HazCom applies to rehabilitation organizations because petroleum is considered a human health hazard.

Rehabilitation organizations are legally required to educate and protect all employees, including volunteers. Individuals working with oiled animals need information of all potential hazards associated with the handling of these animals. The following minimum requirements should be applied to wildlife rescue and rehabilitation personnel, including volunteers:

- **Wildlife rescue and rehabilitation management personnel** are the core team of certified rehabilitators who will direct operations. These people must have 24 hours of classroom training in hazardous waste operations and emergency response.
- **Rehabilitation facility volunteers** work under the direction of the facility management team and are not allowed on-scene, nor in the hot-zone, unless additional training is provided (see Retrieval volunteers). Volunteers working in this category must receive four hours of training in the Hazard Communication Program before they can begin work.
- **Retrieval volunteers** work under the direction of the search and rescue management team and are allowed on-scene, but not in the hot zone. Volunteers working in this category must receive between 4-8 hours of training in the Hazard Communication Program before they can begin work.
- **Any hot-zone retrieval of animals** would need to be performed by someone with 40 hours of classroom safety training for hazardous waste workers that meets OSHA guidelines, including eight hour annual refresher training.

The OSC, in consultation with OSHA's representative to the Regional Response Team, has responsibility for making assessments when training requirements are in question.

(The NCP 300.210 (c) II (H) states that the annex will identify and secure the means of providing, if needed, the minimum required OSHA and EPA training for volunteers, including those who assist with injured wildlife.)

A **Hazard Communication Program** should contain all of the following elements:

- the nature of the oil and how its composition may change with the effect of weathering,
- the nature of other hazardous chemicals that may be contacted during rehabilitation efforts,
- routes of entry of these chemicals
- signs and symptoms of chemical exposure
- protective measures, including work practices and personal protective equipment (PPE, with training on how to properly use)
- environmental monitoring equipment
- importance of personal hygiene
- how to read a Material Safety Data Sheet and know what it means
- first aid protocols and identification of medically trained personnel and first aid stations
- storage and disposal of hazardous waste, including medical waste and PPE
- training records of written curriculum, date and hours of instruction, instructor and student names

Besides chemical hazards, other hazards such as mechanical, physical and biological hazards are also present during rescue and rehabilitation activities. Workers must also be trained on these hazards as well. In addition to the above, training elements may include the following:

Facility concerns:

- behavior of oiled birds
- proper animal restraint
- personal protective equipment and clothing to protect from bloodborne pathogens and zoonoses
- proper heavy lifting techniques
- safe working practices, e.g. no slippery or messy floors
- electrical safety

Field concerns (in addition to the above):

- climatic conditions (e.g. cold, heat)
- terrain
- proper retrieval methods
- vehicle safety (4-WD vehicle, boat)
- water hazards
- response operations hazards

Other safety concerns may occur at either the spill site or the rehabilitation facility. These concerns should be addressed on a site-specific basis.

6.4 ENDANGERED SPECIES ACT CONSULTATION

The following is a summary of FOSC and USFWS responsibilities under the Endangered Species Act, implementing regulations, and the ESA MOA. For detailed information of ESA consultation requirements and procedures, see Annex V (ESA MOA).

PRE-SPILL PLANNING

Area/Sub-Area Committee Chair Responsibilities

- Request (in writing) endangered species expertise, a species list, and a description of their habitats from USFWS.
- Engage in informal and, as necessary, formal consultation on the Area Contingency Plan (ACP) and Sub-Area Plans.
- Upon receipt, distribute updated species information to all holders of the RICP and Sub-Area Plans. Distribute updated Threatened and Endangered Species sections of the Fish and Wildlife and Sensitive Environments Plan and all Sub-Area plans at least semiannually.

USFWS Responsibilities

- In response to request, provide species list and a description of their habitats, and identify a listed species expert to assist the Area/Sub-Area Committee.
- Engage in informal and, as necessary, formal consultation on the ACP and Sub-Area Plans.
- As changes occur, but no less than semiannually, provide updated species information to the Area/Sub-Area Committee Chairs, through the DOI RRT/Area Committee Representative.

DURING SPILL RESPONSE

FOSC Responsibilities

- If fish and wildlife resources may be affected by a discharge or release, notify Federal and State natural resource trustees and managers, and consult with them on removal actions to be taken.
- If listed species and/or critical habitat are or could be present, immediately contact USFWS to initiate emergency consultation pursuant to the Endangered Species Act, implementing regulations, and the ESA MOA.
- Keep USFWS and the DOI RRT/Area Committee Representative apprized of ongoing response actions.
- Document any adverse effects (including incidental take) to listed species or their habitat.
- Maintain a record of all oral and written communications with the USFWS during the response.

USFWS Responsibilities

- Provide the FOSC with timely recommendations on actions to avoid or minimize impacts to listed species and/or their habitats throughout the duration of the response.
- Respond to requests for emergency consultation pursuant to the Endangered Species Act, implementing regulations, and the ESA MOA.
- If "incidental take" is anticipated, so advise the FOSC.
- Upon request, participate in the ICS/UC.
- Maintain a record of all oral and written communications with the FOSC during the response.

POST RESPONSE

FOSC Responsibilities

- If listed species or critical habitat have been adversely affected by response activities, initiate formal consultation of the effect of these activities pursuant to the Endangered Species Act, implementing regulations, and the ESA MOA. See Annex V to the RICP (ESA MOA) for specific requirements and procedures.

USFWS Responsibilities

- Respond to requests for formal consultation in accordance with the Endangered Species Act, implementing regulations, and the ESA MOA.

6.5 LAW ENFORCEMENT

The U.S. Fish and Wildlife Service's Division of Law Enforcement (DLE) is responsible for investigating suspected and alleged violations of Federal wildlife laws including the Migratory Bird Treaty Act, 16 USC 703 *et seq.*, the Endangered Species Act, 16 USC 1538 *et seq.*, the Eagle Protection Act, 16 USC 668a *et seq.*, the National Wildlife Refuge Act, 16 USC 668dd *et seq.*, and several others.

Wildlife injuries, mortalities, and habitat impacts resulting from spills can constitute violations of DLE-enforced laws. Special Agents of the DLE or Refuge Officers of the Division of Refuges (when USFWS lands are involved) may be required to initiate investigations during the spill response phase in order to document violations and collect evidence in a timely manner. These law enforcement officers will coordinate their activities with the OSC or other on- scene law enforcement personnel. Additionally, the Special Agents will insure that responders possess the necessary federal permits (Section 6.3) and that wildlife-related response activities are accomplished in accordance with applicable law and permit provisions.

Special Agents and Refuge Officers often have detailed knowledge of the local terrain and can provide timely, site specific information to response personnel. In many cases, the DLE and other USFWS responders have shared and similar interests and will work cooperatively on collecting or sampling, recording, storage, transportation, and laboratory analysis of injured or dead wildlife. When necessary, additional personnel operating under the guidance and direction of the DLE may be brought on scene to assist with wildlife handling or collection.

6.6 OTHER ROLES AND RESPONSIBILITIES OF NATURAL RESOURCE TRUSTEES

In the event of a spill, it may be necessary for natural resource trustees and managers to initiate a Natural Resource Damage Assessment (NRDA) . NRDA is the process by which trustees collect, compile and evaluate data, information and statistics to determine the extent of injury to natural resources. This information is used to assess damages, the dollar amount necessary to restore injured natural resources and compensate for lost use as a result of the injury, and then to seek recovery of those damages from the responsible party.

At the same time removal actions undertaken to contain and remove oil and wildlife rescue and rehabilitation activities are occurring, the natural resource trustees may initiate NRDA activities. These activities are usually initiated to acquire data and materials that are likely to be lost if not collected during or immediately after a spill has occurred. Such field sampling and data collection is typically limited to:

- Samples necessary to preserve perishable materials likely to have been affected or contain evidence of the oil. These samples will generally be biological material that is either dead or has been visible injured by the oil.
- Samples of other ephemeral conditions or materials, such as surface water, sediments, soil, or the oil itself, which are necessary for identification and measurement of concentrations. These samples would otherwise be lost because of such factors as dilution, movement, decomposition, or leaching if not taken immediately.
- Counts of dead or visibly injured organisms, which if delayed may not be possible because of factors such as decomposition, scavengers, sinking, or water movement.

In certain circumstances, a natural resource trustee may undertake emergency restoration efforts consistent with its existing authority to prevent or reduce the immediate migration of oil onto or into a trust resource. Emergency restoration would be undertaken by the trustee only if the responsible party does not do it or the EPA is precluded under statutory authority from conducting response and removal actions rapidly enough to protect natural resources.

Because initiation of natural resource damage assessment activities may occur concurrently with removal actions as part of the response, all sampling and field work conducted by the natural resource trustees must be coordinated with the lead response agency so as to minimize any interference with response operations or duplication of sampling and data collection efforts. Prior OSC approval is required for any work conducted in support of removal activities and before any associated costs will be reimbursed by the Oil Spill Liability Trust Fund. Other activities performed as part of initiation of damage assessments are reimbursable by the Oil Spill Liability Trust Fund as long as these activities are approved in advance by the Fund Center.

7.0 HISTORIC/ARCHEOLOGICAL RESOURCE RESPONSE

Although the NCP does not include language specific to protection of historic properties, there are several laws that require consultation to prevent impact to these resources. Additionally, various federal agencies including the EPA, DOI, U.S. Coast Guard (USCG), NOAA, Department of Energy (DOE), Department of Defense (DOD) and Department of Agriculture (USDA) signed the *Programmatic Agreement on Protection of Historic Properties during Emergency Response under the National Oil and Hazardous Substances Contingency Plan*. This Agreement ensures that historic properties are taken into account in the planning for and conduct of emergency response. Many states also have laws defining and protecting historic properties. Consultation with the State Historic Preservation Officer (SHPO), Indian Tribes, or other State and Federal land management agencies during pre-emergency response planning and/or in the course of an emergency response will enable the FOSC to avoid or minimize impacts on these important resources. (See Annex VI for a copy of the *Programmatic Agreement*).

7.1 TECHNICAL EXPERTISE AND ASSISTANCE

During a response, historic resource managers/specialists can provide technical assistance and expertise on potential effects of oil on sensitive archeological and/or historic environments that can be found in the impacted area. They are familiar with the area and are able to provide recommendations on the best locations for staging areas and access points. They will recommend specific protective measures and provide advice on response actions to be taken. They can assist in the development of a monitoring plan and subsequent collection of data.

7.2 HISTORIC SITE PROTECTION

When an oil spill occurs, historic resource managers can provide timely advice on the necessary measures to protect protected sites from exposure to oil and the priority and timing of such measures. Protective measures are often site specific.

Applicable laws and regulations governing historic property protection include, but are not limited to:

- **The Historic Sites Act (HSA) of 1935**, which established the National Park Service as the Federal governments' paramount historic preservation advocate.
- **The Archeological Resources Protection Act (ARPA)**, which prohibits the unauthorized excavation, removal, or defacement of "archeological resources" on federal and Indian lands. "Archeological resources" are comprehensively defined to include archeological sites, structural remains, artifacts, bones, debris, etc. The Act provides stiff penalties for violators, and spell out permit requirements (uniform regulations jointly issued by the DOI, DOA and DOD).
- **The American Indian Religious Freedom Act (AIRFA)** is a joint Congressional resolution declaring that the U.S. government will protect the inherent rights of Indian tribes to the free exercise of their traditional religions. Generally, this requires agencies to consult with tribes when any action is contemplated that might affect the practice of traditional religion.
- **Executive Order 13007** requires agencies to avoid, to the best of their abilities, physical damage to Indian sacred sites on federal and Indian land.

8.0 EVALUATING THE INTERFACE OF THE RICP WITH NON-FEDERAL PLANS

The final rule on Oil Pollution Prevention for Non-Transportation-Related Onshore Facilities, 40 CFR Part 112, requires facilities with a total oil storage capacity greater than or equal to one million gallons to submit response plans if located at a distance such that a discharge of oil could cause injury (as defined at 40 CFR 112.2) to fish, wildlife, sensitive environments and public water intakes.

Facility owners or operators must determine the distance at which an oil spill could cause injury to fish and wildlife and sensitive environments and have a plan for mitigating a discharge's adverse effect. The plan must be consistent with the requirements of the NCP and this RICP Annex.

EPA will review and approve Facility Response Plans for compatibility with this Annex; pipeline plans in Region 7 will be reviewed and approved by RSPA. Participation by facilities in the Area and Subarea Committees is encouraged. Joint exercises will be conducted to test facility plans and their interface with this Annex.

FEDERAL TRUSTEE CONTACTS

Department of the Interior
Robert F. Stewart
U.S. Department of the Interior
Building 56, Room 1003
Box 25007 (D-108)
Denver, CO 80225-0007
Telephone 303 445-2500, Fax 303 445-6320

Department of Agriculture

Department of Defense

STATE TRUSTEE CONTACTS

State of Iowa
Patricia L. Boddy, Interim Director
Iowa Department of Natural Resources
Wallace Building
502 E. 9th Street
Des Moines, IA 50319
515-281-8694, Fax 515-281-8895

State of Kansas
Robert Moser, MD, Secretary
Kansas Department of Health and Environment
Staff Contact: Leo G. Henning, Director, Bureau of Environmental Field Services,
Kansas Department of Health and Environment
1000 SW Jackson, Suite 410
Topeka, KS 66612-1290
Telephone 785-296-5572, Fax 785-296-4823
Emergency Spill Response (24 hr) 785-296-1679

State of Missouri
Mr. Tim Rielly, NRD Coordinator
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102
Staff Contact: Frances Klahr, NRD Coordinator
Telephone 573-526-3353, Fax 573-751-9277

State of Nebraska
Mr. Mike Linder, Director
Nebraska Department of Environmental Quality
Box 98922
Lincoln, NE 68509-8922
Telephone 402-471-4231, Fax 402-471-2909

APPENDIX A.2

ENVIRONMENTALLY SENSITIVE AREAS

ENVIRONMENTALLY SENSITIVE AREAS

APPENDIX A.2 TO REGION 7 INTEGRATED CONTINGENCY PLAN

TABLE OF CONTENTS

Section		Page
1.0	INTRODUCTION	1
2.0	ENVIRONMENTALLY SENSITIVE AREAS	2

TABLES

Table		Page
TABLE A.2.1	RECOMMENDED ENVIRONMENTALLY SENSITIVE AREAS AND CURRENT STATUS IN REGION 7 RICP	1
TABLE A.2.2	ENVIRONMENTALLY SENSITIVE AREAS – IOWA	2
TABLE A.2.3	ENVIRONMENTALLY SENSITIVE AREAS – KANSAS	13
TABLE A.2.4	ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI	30
TABLE A.2.5	ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA	44

1.0 INTRODUCTION

Appendix A.2 contains a listing of Environmentally Sensitive Areas (ESA) in Region 7. The list has been accumulated by requesting information from Federal, state and local agencies regarding their areas of responsibility as recommended by the Oil Pollution Prevention; Non-Transportation-Related Onshore Facilities; Final Rule, 40 CFR Part 112. (See Table A.2.1)

TABLE A.2.1

RECOMMENDED ENVIRONMENTALLY SENSITIVE AREAS AND CURRENT STATUS IN REGION 7 RICP

ENVIRONMENTALLY SENSITIVE AREAS	RESPONSIBLE FEDERAL AGENCY	STATUS IN REGION 7 RICP
Wetlands, as defined in 40 CFR 230.3	EPA	Available. See #1 Wetlands
Critical habitat for designated or proposed endangered/threatened species	FWS	Listed
Habitat used by designated or proposed endangered/threatened species or marine mammals defined as depleted	FWS	Underdevelopment
National parks	DOI/NPS	Listed
Federal wilderness areas	USDA	Listed
Clean lakes program critical areas	EPA	Underdevelopment
National monuments	DOI/NPS	Listed
National lakeshore recreational areas	DOI/NPS	Listed
National preserves	DOI/NPS	Listed
National wildlife refuges	FWS	Listed
National river reach designated as Recreational	EPA	Listed
Federal or state designated scenic or wild river	DOI/NPS	Listed
Hatcheries	DOI/FWS	Listed
Waterfowl production areas	DOI/FWS	Listed
Wildlife Management Areas	State Wildlife Agencies	Listed only for Nebraska

Notes:

"Listed" is currently listed in this Appendix A.2
"See #" is referenced and available through EPA Region 7

DOI - Department of Interior
EPA - Environmental Protection Agency
FWS - Fish and Wildlife Service
NA = Not applicable in Region 7
NPS - National Park Service
USDA - United State Department of Agriculture

To aid responders operating within ESA, EPA in conjunction with the Upper Mississippi River Basin Association has developed Habitat Fact Sheets to guide oil response activities. Each fact sheet contains tips for operations within each habitat and their sensitivity to oil spills. The fact sheets address unique

habitat considerations and scientific references. Final drafts of the habitat fact sheets are available at http://umrba.org/spillplans.htm. An example fact sheet for Deep Marsh Annual is included at the end of this section. A list of example fact sheets includes the following:

- Deep Marsh Annual
- Deep Marsh Perennial
- Open Water
- Populus Community
- Rooted-Floating Aquatics
- Sedge Meadow
- Shallow Marsh Annual
- Shallow Marsh Perennial
- Submersed Vegetation
- Wet Meadow

2.0 ENVIRONMENTALLY SENSITIVE AREAS

The following list identifies Environmentally Sensitive Areas in EPA Region 7 by state, county , agency, type and name. The database is a growing bank of information to be utilized with the understanding that is limited in its data. Updates will be made periodically to acknowledge new Environmentally Sensitive Areas or to add information that may have been missed.

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Hardin	Iowa Dept. of Natural Resources	State Park	Pine Lake	0.5 Mi. N.E. Eldora - IA 118
Dickinson	IDNR	State Park	Gull Point	3.5 Mi. W. Milford - IA 32
Davis	IDNR	State Park	Lake Wapello	6 Mi. W. Drakesville - IA 273
Buna Vista	IDNR	State Park	Wanata	0.5 Mi. S. Peterson - IA 10
Taylor	IDNR	State Park	Lake of Three Fires	3 Mi. N.E. Bedford - IA 49
Washington	IDNR	State Park	Lake Darling	3 Mi. W. Brighton IA 78 & 1
Boone	IDNR	State Park	Ledges	6 Mi. S. Boone - IA 164
Warren	IDNR	State Park	Lake Ahquabi	5.5 Mi. SW Indianola - IA 349
Jasper	IDNR	State Park	Rock Creek	6 Mi. N.E. Kellogg - Co. Rd.
Black Hawk	IDNR	State Park	George Wyth Memorial	Adjoining Cedar Falls - US 57
Lucas	IDNR	State Park	Shimek Forest Camping	1 Mi. E Farmington - IA 2
Kossuth	IDNR	State Park	Ambrose A. Call	1.5 Mi. W. Algona
Guthrie	IDNR	State Park	Springbrook	8 Mi. NE Guthrie Center - IA 25 & 384
Calhoun	IDNR	State Park	Twin Lakes	7.5 MI N. Rockwell City - I 4 & 124
Monona	IDNR	State Park	Preparation Canyon	5 Mi. S.W. Moorhead - IA 372

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Fremont	IDNR	State Park	Waubonsie	7 Mi. SW Sidney - IA 239 - 2
Muscatine	IDNR	State Park	Wildcat Den	10 Mi. E. Muscatine - IA 22
Pottawattamie	IDNR	State Park	Wilson Island Rec. Area	5 Mi. W. Loveland IA 362
Allamakee	IDNR	State Park	Yellow River Forest Camping	14 MI. SE Waudon - IA 76
Monona	IDNR	State Park	Lewis & Clark	3 MIl NW Onawa - IA 342
Clayton	IDNR	State Park	Pikes Peak	2.5 Mi. SW Spirt Lake - IA 9
Dickinson	IDNR	State Park	Marble Beach	2 Mi. NW Orleans - IA 276
Cerro Gordo	IDNR	State Park	McIntosh Woods	0.75 Mi. E. Ventura - US 18
Dubuque	IDNR	State Park	Mines of Spain	S.edge of Dubuque - US 52
Dickinson	IDNR	State Park	Mini-Wakan	N. shore Spirt Lake
Decutar	IDNR	State Park	Nine Eagles	6 Mi. SE Davis City - Co. RD.
Emmet	IDNR	State Park	Okamanpedan	3 Mi. N.E. Dolliver-Co. Rd.
Linn	IDNR	State Park	Palisades-Kepier	3.5 Mi. W. Mt Vernon - US 30
Dickinson	IDNR	State Park	Lower Gar Access	0.5 Mi S.E. Arnolds Park US - 71
Jackson	IDNR	State Park	Maquoketa Caves	7 Mi. N.W. Maquoketa - IA 428
Hancock	IDNR	State Park	Pilot Knob	4 Mi E. Forest City - IA 9
Winneshiek	IDNR	State Park	Fort Atkins	Adjoins Ft. Atkinson - IA 24
Linn	IDNR	State Park	Pleasant Creek	4 Mi. N. & .5 Mi. W. Palo
Shelby	IDNR	State Park	Prairie Rose	6 Mi. S. E. Harlan
Jones	IDNR	State Park	Wapsipinicon	Adjoins Anomosa - E 34
Lucas	IDNR	State Park	Red Haw	1 Mi. E Chariton - US 34
Montgomery	IDNR	State Park	Viking Lake	4 Mi. S.E. Stanton - Co. Rd.
Polk	IDNR	State Park	Walnut Woods	4 Mi. SW Des Moines - IA 5
Van Buren	IDNR	State Park	Lacey-Kesauqua	Adjoins Keosauqua - IA 1
Appanose	IDNR	State Park	Honey Creek	0.5 MI. W/ 3.5 S.E. Moravia Hwy. 142
Winnebago	IDNR	State Park	Rice Lake	2.5 Mi. SE Lake Mills - Co. Rd. IA
Dickinson	IDNR	State Park	Tempiar Park Rec. Area	3 Mi. N.W. Spirtlake-IA 276
Buchanan	IDNR	State Park	Cedar Rock	3 Mi. N.W. Quasqueton
Plymoth	IDNR	State Park	Stone	8 Mi. NW Sioux City - IA 12
Van Buren	IDNR	State Park	Stephens Forest Camping	W. Lucas, E. Chariton - US 65 - 34
Pottawattamie	IDNR	State Park	Lake Manawa	1 Mi. S. Council Bluffs - IA 92
Lee	IDNR	State Park	Stephens Forest Camping	W. Lucas, E. Chariton - US 65 - 34
Henry	IDNR	State Park	Geode	4 Mi. SW Danville - Co. Rd.
Mahaska	IDNR	State Park	Lake Keomah	5 MI E. Oskaloosa - IA 371
Johnson	IDNR	State Park	Lake MacBride	4 Mi. W. Solon - IA 382
Cass	IDNR	State Park	Lake Anita	5 Mi. S. Anita Interchange - I 80
Tama	IDNR	State Park	Union Grove	4 Mi. S.W. Gladbrooke - Co. Rd.
Dickinson	IDNR	State Park	Trappers Bay	Adjoins Lake Park - IA 219
Fayette	IDNR	State Park	Volga River Rec. Area	4 Mi. n Fayette - IA 150
Various counties	National Parks Service (NPS)	National Historic Trail	Lewis & Clark National Historic Trail	Generally following the Missouri River

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Various counties	NPS	National Historic Trail	Mormon Pioneer National Historic Trail	From Nauvoo, IL, westward across southern IA toward Omaha.
Cherokee	The Nature Conservancy (TNC)	Project Area	Steele Prairie	
Winneshiek	TNC	Project Area	Finch Memorial Forest	Upper Iowa River
Howard	TNC	Project Area	Crossman Prairie	
Johnson	TNC	Project Area	Williams Prairie	
Warren	TNC	Project Area	Berry Woods	
Allamakee	TNC	Project Area	Moutain Maple Hollow	NE Iowa
Story	TNC	Project area	Ames High Prairie	
Scott	TNC	Project Area	Lock & Dam #14 Eagle Area	
Woodbury	TNC	Project Area	Sioux City Prairie	
Clayton	TNC	Project Area	Retz Menorial Forest	
Black Hawk	TNC	Project area	Cedar Hill Sand Prairie	
Clayton	TNC	Project Area	Bluebell Hollow	
Dickinson	TNC	Project Area	Freda Haffner Reserve	
Linn	TNC	Project Area	Behrens Ponnd & Woodland	
Muscatine	TNC	Projects Area	Red Cedar Woodland	
Muscatine	TNC	Projects Area	Greiner Family Nature Preserve	N. of Muscatine
Henry	TNC	Projects areas	Savage Memorial Woods	
Clayton	TNC	Projects Area	Roggman Boreal Slopes	
Dubuque	TNC	Projects Area	Kaufmann Avenue Prairie	Dubuque
Linn	TNC	Project Area	Hanging Bog	
Cerro Gordo	TNC	Project Area	Hoffman Prairie	
Allamakee	U.S. Fish and Wildlife Service (FWS)	National Wildlife Refuge	Upper Mississippi River Natl. Wildlife Refuge (NWR)	
Allamakee	NPS	National Monument	Effigy Mounds Nat. Monument	3 MI. N. of Marquette
Allamakee	FWS	National Wildlife Refuge	Driftless Area NWR	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Allamakee	NPS	Identified in NPS Nationwide Rivers Inventory	Upper Iowa River	Kendallville to Highway 76 crossing
Allamakee	NPS	Identified in NPS Nationwide Rivers Inventory	Yellow River	Mississippi river to Hwy W 60 near Myron
Appanoose	U.S. Army Corps of Engineers (COE)	Large Reservoir	Rathbun Lake	
Black Hawk	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Bremer	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Bremer	TNC	Project Area	Brayton-Horsley Prairie	
Buchanan	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Buena Vista	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Butler	TNC	Project Area	Big Marsh	near Allison
Calhoun	FWS	Topeka shiner Critical Habitat	West Cedar Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	East Cedar Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Purgatory Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Cedar Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Prairie Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Lake Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Camp Creek West Fork	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Calhoun	FWS	Topeka shiner Critical Habitat	Hardin Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Camp Creek	
Carroll	FWS	Topeka shiner Critical Habitat	North Racoon River	
Cedar	NPS	National Historic Site	Herbert Hoover Historic Site	8 Mi. E of Iowa City
Cedar	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Cerro Gordo	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Cerro Gordo	IDNR	State Park	Clear Lake	2 Mi S. Clear Lake - IA 106
Chickasaw	TNC	Project Area	Schrieder Prairie & Fen	
Clark	FWS	National Wildlife Refuge	Mark Twain NWR	
Clay	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Clay	NPS	Nat NPS Rural Landmark	Dewey Pasture & Smith's Slough	4 Mi. NW of Ruthven
Clay	TNC	Project Area	Lindstron-Simons Fen	
Clayton	FWS	National Wildlife Refuge	Upper Mississippi River NWR	
Clayton	FWS	National Wildlife Refuge	Driftless Area NWR	
Clayton	IDNR	State Park	Bixby	2 Mi. N Edgewood
Clayton	NPS	Identified in NPS Nationwide Rivers Inventory	Turkey River	Mississippi River to Vernon Springs
Clinton	FWS	National Wildlife Refuge	Upper Mississippi River NWFR	
Clinton NPS	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Dallas	COE	Large Reservoir	Saylorville Lake	
Dallas	FWS	Topeka shiner Critical Habitat	Elm Branch	
Dallas	FWS	Topeka shiner Critical Habitat	Swan Lake Branch	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Dallas		Identified in NPS Nationwide Rivers Inventory	Middle Raccoon River	Panora to city of Redfield dam
Dallas	TNC	Project Area	Dilvers-Smith Woods	access to Raccoon River
Delaware	IDNR	State Park	Backbone	4 Mi SW Strawberry Point - IA 410
Dickenson	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Dickinson	IDNR	State Park	Emerson Bay	2.5 Mi. N. Milford - IA 32
Dickinson	NPS	Natural Landmark	Caylar Prairie	5 Mi. NW of West Okaboji
Dickinson	TNC	Project Area	Silver Lake Fen	
Dickinson	TNC	Project Area	Halbur Fen	
Dubuque	FWS	National Wildlife Refuge	Upper Mississippi River NWFR	
Dubuque	FWS	National Wildlife Refuge	Driftless Area NWR	
Dubuque	NPS	Natural Landmark	White Pine Hollow Preserve	20 Mi/ NW of Dubuque
Emmet	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Emmet	IDNR	State Park	Fort Defiance	1 MI. W. Esterville - IA 9
Fayette	NPS	Identified in NPS Nationwide Rivers Inventory	Turkey River	Mississippi River to Vernon Springs
Franklin	IDNR	State Park	Beeds Lake	3 MI. N.W. Hampton-Co. Rd.
Greene	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Greene	FWS	Topeka shiner Critical Habitat	North Racoon River	
Greene	FWS	Topeka shiner Critical Habitat	East Buttrick Creek	
Greene	FWS	Topeka shiner Critical Habitat	Short Creek	
Greene	FWS	Topeka shiner Critical Habitat	Hardin Creek	
Greene	FWS	Topeka shiner Critical Habitat	Buttrick Creek	
Greene	FWS	Topeka shiner Critical Habitat	Cedar Creek	
Greene	FWS	Topeka shiner Critical Habitat	West Buttrick Creek	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Guthrie	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Raccoon River	Panora to city of Redfield dam
Guthrie	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Hamilton	FWS	Topeka shiner Critical Habitat	Eagle Creek	
Hamilton	NPS	Identified in NPS Nationwide Rivers Inventory	Boone River	From Webster City to confluence with Des Moines River
Hamilton	NPS	Natural Landmark	Anderson Goose Lake	1 Mi. E. of Jewell
Hancock	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Harrison	FWS	National Wildlife Refuge	DeSoto NWR	
Harrison	NPS	Natural Landmark	Loess Hill	Turin & Little Sioux/Smith Lake
Howard	NPS	Identified in NPS Nationwide Rivers Inventory	Turkey River	Mississippi River to Vernon Springs
Howard	NPS	Natural Landmark	Hayden Prairie	12 Mi. NW of Cresco
Iowa	FWS	National Wildlife Refuge	Mark Twain NWR	
Jackson	FWS	National Wildlife Refuge	Upper Mississippi River NWFR	
Jackson	FWS	National Wildlife Refuge	Driftless Area NWR	
Jackson	IDNR	State Park	Bellevue	2.5 Mi. S. Belleuve - US 52
Jackson	NPS	Identified in NPS Nationwide Rivers Inventory	Maquoketa River	Mississippi River to US 151 Bridge
Jasper	FWS	National Wildlife Refuge	Neal Smith NWR	
Johnson	COE	Large Reservoir	Coralville Lake	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Jones	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Jones	NPS	Identified in NPS Nationwide Rivers Inventory	Maquoketa River	Mississippi River to US 151
Kossuth	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Kossuth	FWS	National Wildlife Refuge	Union Slough NWR	
Linn	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Louisa	FWS	National Wildlife Refuge	Mark Twain NWR	
Louisa	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar River	Iowa River to Highway 6
Lyon	FWS	Topeka shiner Critical Habitat	Kanaranzi Creek	From its confluence with the Rock River (T100N, R45W, Sec. 28), upstream to the Iowa/Minnesota State border (T100N, R45W, Sec. 11)
Lyon	FWS	Topeka shiner Critical Habitat	Rock River	From its confluence with Kanaranzi Creek (T100N, R45W, Sec. 28), upstream to the Iowa/Minnesota State border (T100N, R45W, Sec. 8)
Madison	IDNR	State Park	Badger Creek Rec. Area	6 Mi. SE Van Meter
Marion	COE	Large Reservoir	Lake Red Rock	
Marion	IDNR	State Park	Elk Rock (Red Rock)	7 MI. N Knoxville - IA 14
Monona	NPS	Natural Landmark	Loess Hills	Turin * Little Souix/Smith Lake
Muscatine	IDNR	State Park	Fairport	5 Mi. E. Muscatine - IA 22
Muscatine	IDNR	State Fish Hatchery	Fairport SFH	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Louisa	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar River	Iowa River to Highway 6
Osceola	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Osceola	FWS	Topeka shiner Critical Habitat	Little Rock River	From State Highway 9 (T100N, R43W, Sec. 34), upstream to the Iowa/Minnesota State border (T100N, R42W, Sec. 7)
Palo Alto	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Palo Alto	NPS	Natural Landmark	Dewey Pasture & Smith's Slough	4 Mi. NW of Ruthven
Pike	FWS	National Wildlife Refuge	Mark Twain NWR	
Plymouth	TNC	Project Area	Broken Kettle Grasslands	Loess Hills
Plymouth	TNC	Project Areas	Five Ridge Preserve	
Polk	COE	Large Reservoir	Saylorville Lake	
Polk	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Polk	IDNR	State Park	Big Creek	2 Mi. N. Polk City - IA 415
Pottawattamie	FWS	National Wildlife Refuge	DeSoto NWR	
Sac	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Sac	FWS	Topeka shiner Critical Habitat	Outlet Creek	From Black Hawk Lake from its confluence with Ditch 57 (T86N, R36W, Sec. 1), upstream to lake outlet (T87N, R35W, Sec. 35)
Sac	FWS	Topeka shiner Critical Habitat	Ditch 57	Tributary to Indian Creek, from their confluence (T87N, R35W, Sec. 23), upstream to the confluence with the outlet creek from Black Hawk Lake (T86N, R36W, Sec. 1)
Sac	FWS	Topeka shiner Critical Habitat	Indian Creek	From its confluence with the North Raccoon River (T87N, R35W, Sec. 24), upstream through T87N, R35W, Sec. 29
Sac	FWS	Topeka shiner Critical Habitat	North Racoon River	
Sac	IDNR	State Park	Black Hawk	Lake View - IA 175 & 71

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Scott	FWS	National Wildlife Refuge	Upper Mississippi River NWFR	
Scott	FWS	National Wildlife Refuge	Upper Mississippi River NWFR	
Scott	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Scotts Bluff	TNC	Project Area	Scotts Bluff Monument	
Tama	BIA	Federal Indian Reservation	Sac & Fox	
Tama	FWS	National Wildlife Refuge	Mark Twain NWR	
Thomas	USFS	Research Area	Signal Hill	
VanBuren	TNC	Project Area	Reno Timber	
Wayne	IDNR	State Park	Bobwhite	1 Mi. W. Allerton - IA 40
Webster	FWS	Topeka shiner Critical Habitat	Buttrick Creek	
Webster	FWS	Topeka shiner Critical Habitat	Ditch 57	
Webster	IDNR	State Park	Brushy Creek Rec. Area	4 Mi. E Lehigh - Co. Rd.
Webster	IDNR	State Park	Dolliver Memorial	3 Mi. NW Lehigh - IA 50
Webster	NPS	Identified in NPS Nationwide Rivers Inventory	Boone River	From Webster City to confluence with Des Moines River
Winnebago	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Winnesheik	NPS	Natural Landmark	Cold Water Cave	
Winneshiek	NPS	Identified in NPS Nationwide Rivers Inventory	Turkey River	Mississippi River to Vernon Springs
Winneshieck	NPS	Identified in NPS Nationwide Rivers Inventory	Upper Iowa River	Kendallville to Highway 76 crossing
Worth	FWS	National Wildlife Refuge	Iowa Wetland Management District	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Wright	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Wright	FWS	Topeka shiner Critical Habitat	Eagle Creek	
Wright	FWS	Topeka shiner Critical Habitat	Ditch 19	From its confluence with Ditch 3 (T91N, R26W, Sec. 31), upstream through T91N, R26W, Sec. 31
Wright	FWS	Topeka shiner Critical Habitat	Ditch 3	From its confluence with the Boone River (T91N, R26W, Sec. 32), upstream through T91N, R26W, Sec. 30

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Sedgwick	Kansas Dept. of Wildlife and Parks (KDWP)	State Park	Cheney	RR 1, Box 167A, Chenney 67025
Douglas	KDWP	State Park	Clinton	798 N. 1415 RD, Lawrence, 66049
Crawford	KDWP	State Park	Crawford	Farlington, 66734
Trego	KDWP	State Park	Cedar Bluff	P.O. 76A, Ellis, 67637
Osage	KDWP	State Park	Eisenhower	RR 2, Box 306, Osage City, 66523
Butler	KDWP	State Park	El Dorado	RR3, Box 29A, El Dorado, 67402
Montgomery	KDWP	State Park	Elk City	Box 845, Independence, 67301
Greenwood	KDWP	State Park	Fall River	RR 1, Box 44, Toronto, 66777
Mitchell	KDWP	State Park	Glen Elder	Box 162A, Glen Elder, 67446
Miami	KDWP	State Park	Hillsdale	26001 W. 255th St., Paola, 66071
Ellsworth	KDWP	State Park	Kanopolis	RR 1 Box 26d, Marquette, 67464
Jewell	KDWP	State Park	Lovewell	RR1, Box 66A, Webber, 66970
Meade	KDWP	State Park	Meade	Box K, Meade, 67864
Riley	KDWP	State Park	Milford	8881 State Park, Milford, 66514
Ellsworth	KDWP	State Park	Mushroom Rock	RR 1, Box 26D, Marquette, 67464
Jefferson	KDWP	State Park	Perry	RR 1, Box 464A Ozawkie, 66070
Osage	KDWP	State Park	Pomona	RR 1, Box 118, Vassar, 66543
Norton	KDWP	State Park	Prairie Dog	Box 431, Norton, 67654
Harvey	KDWP	State Park	Sand Hills	4207 E. 56th, Rt 5, Hutchinson, 67502
Scott	KDWP	State Park	Scott	RR1, Box 50, Scott City, 67871
Riley	KDWP	State Park	Tuttle Creek	5020-B, Tuttle Cr. Blvd., Manhattan 66502
Rooks	KDWP	State Park	Webster	RR 2, Box 153, Stockton, 67669
Russell	KDWP	State Park	Wilson	RR 1, Box 181, Sylvan Grove, 67481
Various counties	National Parks Service (NPS)	National Historic Trail	California National Historic Trail	Developed over a period of years, and contains numerous cutoffs and alternate routes. General route began at Various jumping off points in MO, including Independence and St. Joseph, and headed westward following the routes of the Oregon and Santa Fe Trails through KS and the Platte River through NE.
Various counties	NPS	National Historic Trail	Lewis & Clark National Historic Trail	Generally following the Missouri River
Various counties	NPS	National Historic Trail	Oregon National Historic Trail	From Independence, MO to Topeka. The trail then headed generally northwestward, parallel to the Little Blue River, toward NE.

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Various counties	NPS	National Historic Trail	Pony Express National Historic Trail	Most of original trail has been obliterated through time. Some Pony Express Stations still exist. Trail started in Independence, MO, following the route of the Oregon Trail through KS toward the Platte River and the West.
Various counties	NPS	National Historic Trail	Santa Fe National Historic Trail	From Independence, MO, generally southwestward, across the state to Ft. Larned NHS. The trail then split, either following the Arkansas River or on a direct overland route toward the SW corner of the state.
Allen	Kansas Dept. of Health and Environment (KDHE)	Stream	Bloody Run	Special Aquatic Life Use Waters
Allen	KDHE	Stream	Marmaton River	Special Aquatic Life Use Waters
Allen	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Allen	KDHE	Stream	Little Osage River	Special Aquatic Life Use Waters
Allen	KDHE	Stream	Onion Creek	Special Aquatic Life Use Waters
Allen	KDHE	Stream	Little Osage River, Middle Fork	Special Aquatic Life Use Waters
Anderson	KDHE	Stream	Pottawatomie Creek	Special Aquatic Life Use Waters
Anderson	KDHE	Stream	Little Osage River, Middle Fork	Special Aquatic Life Use Waters
Anderson	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Anderson	KDHE	Stream	Pottawatomie Creek, S Fork	Special Aquatic Life Use Waters
Anderson	KDHE	Stream	Little Indian Creek	Special Aquatic Life Use Waters
Atchison	KDHE	Stream	Whiskey Creek	Special Aquatic Life Use Waters
Atchison	KDHE	Stream	White Clay Creek	Special Aquatic Life Use Waters
Atchison	KDHE	Stream	Missouri River	Special Aquatic Life Use Waters
Atchison	KDHE	Wetland	Muscotah Marsh	
Barber	KDHE	Stream	Elm Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Elm Creek, North	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Elm Creek, South	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Elm Creek, South E Branch	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Bear Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Elm Creek,South W Branch	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Medicine Lodge River	Special Aquatic Life Use Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Barber	KDHE	Stream	Mulberry Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Mule Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Amber Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Turkey Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Sand Creek	Special Aquatic Life Use Waters
Barber		Identified in NPS Nationwide Rivers Inventory	Medicine (Lodge) River	KS/OK line to Gerlane
Barber		Identified in NPS Nationwide Rivers Inventory	Medicine (Lodge) River	Gerlane to Belvidere
Barton	U.S. Fish and Wildlife Service (FWS)	Whooping Crane Critical Habitat	Cheyenne Bottoms	
Barton	KDHE	Stream	Deception Creek	Special Aquatic Life Use Waters
Barton	KDHE	Stream	Little Cheyenne Creek	Special Aquatic Life Use Waters Exceptional State Waters
Barton	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Barton	KDHE	Stream	Blood Creek	Special Aquatic Life Use Waters Exceptional State Waters
Barton	KDHE	Wetland	Cheyenne Bottoms	
Barton	The Nature Conservancy (TNC)	Project Area	Cheyenne Bottoms Wildlife Area	near Great Bend
Bourbon	KDHE	Stream	Marmaton River	Special Aquatic Life Use Waters
Bourbon	KDHE	Stream	Little Osage River	Special Aquatic Life Use Waters
Bourbon	NPS	National Historic Site	Fort Scott Nat. Historic Site	Adjacent to Fort Scott bus. district
Brown	Bureau of Indian Affairs (BIA)	Federal Indian Reservation	Iowa	
Brown	BIA	Federal Indian Reservation	Kickapoo	
Brown	BIA	Federal Indian Reservation	Sac & Fox	
Butler	U.S. Army Corps of Engineers (COE)	Large Reservoir	El Dorado Lake	
Butler	KDHE	Stream	Walnut River	Special Aquatic Life Use Waters Exceptional State Waters
Butler	KDHE	Stream	Cottonwood River, S Fork	Special Aquatic Life Use Waters Exceptional State Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Butler	KDHE	Stream	Grouse Creek	Special Aquatic Life Use Waters Exceptional State Waters
Butler	FWS	Topeka shiner Critical Habitat	Cottonwood River and tributaries	
Chase	FWS	Topeka shiner Critical Habitat	Cottonwood River and tributaries	
Chase	FWS	Topeka shiner Habitat	Fox Creek, and tributaries	
Chase	FWS	Topeka shiner Habitat	Diamond Creek and tributaries	
Chase	FWS	Topeka shiner Habitat	Middle Creek and tributaries	
Chase	KDHE	Stream	Jacob Creek	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Collett Creek	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Cottonwood River	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Cottonwood River, S Fork	Special Aquatic Life Use Waters Exceptional State Waters
Chase	KDHE	Stream	Bloody Creek	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Little Cedar Creek	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Cedar Creek	Special Aquatic Life Use Waters Exceptional State Waters
Chase	NPS	National Preserve	Tallgrass Prairie National Preserve	
Chase		Identified in NPS Nationwide Rivers Inventory	Cedar Creek	Cottonwood River to Chase county line
Chase		Identified in NPS Nationwide Rivers Inventory	South Fork Cottonwood River	Cottonwood River to Little Cedar Creek
Chautauqua	FWS	Burying Beetle Habitat		upland prairie
Chautauqua	KDHE	Stream	Caney River	Special Aquatic Life Use Waters Exceptional State Waters
Chautauqua	KDHE	Stream	Otter Creek	Special Aquatic Life Use Waters Exceptional State Waters
Chautauqua		Identified in NPS Nationwide Rivers Inventory	Caney River	KS/OK line to source
Cherokee	KDHE	Stream	Brush Creek	Special Aquatic Life Use Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Cherokee	KDHE	Stream	Shoal Creek	Special Aquatic Life Use Waters Exceptional State Waters
Cherokee	KDHE	Stream	Spring River	Special Aquatic Life Use Waters Exceptional State Waters
Cherokee	KDHE	Stream	Taylor Branch	Special Aquatic Life Use Waters
Cherokee	KDHE	Stream	Turkey Creek	Special Aquatic Life Use Waters
Cherokee	KDHE	Stream	Cow Creek	Special Aquatic Life Use Waters
Cherokee	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters Exceptional State Waters
Cherokee		Identified in NPS Nationwide Rivers Inventory	Shoal Creek	Spring River to source
Cherokee		Identified in NPS Nationwide Rivers Inventory	Spring River	Hwy. 96 to Hwy. 44
Cheyenne	KDHE	Stream	Republican River, S Fork	Special Aquatic Life Use Waters
Cheyenne	KDHE	Stream	Arikaree River	Special Aquatic Life Use Waters
Cheyenne		Identified in NPS Nationwide Rivers Inventory	Arikaree River	KS/NE line to Alder Creek
Clark	KDHE	Lake	Clark Co. SFL	
Clark	KDHE	Lake	St. Jacobs Well (Big Basin W.	
Clark	KDHE	Stream	Kiowa Creek, West	Special Aquatic Life Use Waters
Clark	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Clark	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters Exceptional State Waters
Clark	KDHE	Stream	Bluff Creek	Special Aquatic Life Use Waters
Clark		Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. of Liberal to CO/KS Line
Clark	NPS	Natural Landmark	Big Basin Preserve	13 Mi. WNW of Ashland
Clay	COE	Large Reservoir	Milford Lake	
Clay	KDHE	Stream	Republican River	Special Aquatic Life Use Waters
Cloud	KDHE	Stream	Republican River	Special Aquatic Life Use Waters
Cloud	KDHE	Wetland	Jamestown W.A.	

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Coffey	COE	Large Reservoir	John Redmond Res.	
Coffey	FWS	National Wildlife Refuge	Flint Hills NWR	Neosho River Valley
Coffey	KDHE	Stream	Little Indian Creek	Special Aquatic Life Use Waters
Coffey	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Coffey	KDHE	Stream	Frog Creek	Special Aquatic Life Use Waters
Coffey	KDHE	Stream	Long Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters Exceptional State Waters
Comanche	KDHE	Stream	Bluff Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Kiowa Creek, Middle	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Kiowa Creek, West	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Mule Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Cavalry Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Kiowa Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Nescatunga Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Wiggins Creek	Special Aquatic Life Use Waters
Comanche		Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy. 23 E. of Liberal to CO/KS line
Cowley	KDHE	Stream	Beaver Creek	Special Aquatic Life Use Waters Exceptional State Waters
Cowley	KDHE	Stream	Grouse Creek	Special Aquatic Life Use Waters Exceptional State Waters
Cowley	KDHE	Stream	Little Beaver Creek	Special Aquatic Life Use Waters
Cowley	KDHE	Stream	Otter Creek	Special Aquatic Life Use Waters Exceptional State Waters
Cowley	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Cowley	KDHE	Stream	Walnut River	Special Aquatic Life Use Waters Exceptional State Waters
Cowley	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Crawford	KDHE	Stream	Taylor Branch	Special Aquatic Life Use Waters
Crawford	KDHE	Stream	Cow Creek	Special Aquatic Life Use Waters
Crawford	KDHE	Stream	First Cow Creek	Special Aquatic Life Use Waters
Crawford	KDHE	Stream	Cow Creek, East	Special Aquatic Life Use Waters
Crawford	KDHE	Stream	Brush Creek	Special Aquatic Life Use Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Crowley	NPS	Identified in NPS Nationwide Rivers Inventory	Grouse Creek	Arkansas River to Cowley county line
Dickinson	KDHE	Lake	Herington Reservoir	
Dickinson	KDHE	Stream	Lime Creek	Special Aquatic Life Use Waters
Dickinson	KDHE	Stream	Lyon Creek	Special Aquatic Life Use Waters Exceptional State Waters
Dickinson	KDHE	Stream	Lyon Creek, W Branch	Special Aquatic Life Use Waters
Dickinson	KDHE	Stream	Carry Creek	Special Aquatic Life Use Waters
Dickinson	NPS	Identified in NPS Nationwide Rivers Inventory	Lyon Creek	Smoky Hill River to RR bridge S. of Woodbine
Dickinson	FWS	Topeka shiner Habitat	Lyon Creek and tributaries	
Doniphan	KDHE	Stream	Missouri River	Special Aquatic Life Use Waters
Douglas	COE	Large Reservoir	Clinton Lake	
Douglas	KDHE	Lake	Clinton Lake	
Douglas	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Douglas	KDHE	Stream	Tauy Creek	Special Aquatic Life Use Waters
Douglas	KDHE	Stream	Appanoose Creek	Special Aquatic Life Use Waters
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	Kansas River	I-635 to Delaware River
Douglas	NPS	Natural Landmark	Baldwin woods	11 Mi. S. of Lawrence
Douglas	NPS	Natural Landmark	Baker University Wetlands	3 Mi. S of Lawrence
Edwards	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Elk	FWS	Burying Beetle Habitat		Upland prairie
Elk	KDHE	Stream	Fall River	Special Aquatic Life Use Waters Exceptional State Waters
Elk	KDHE	Stream	Grouse Creek	Exceptional State Waters
Elk	KDHE	Stream	Caney River	Special Aquatic Life Use Waters Exceptional State Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Elk	NPS	Identified in NPS Nationwide Rivers Inventory	Fall River	Verdigris River to Fall River Lake
Ellis	KDHE	Stream	Saline River	Exceptional State Waters
Ellsworth	KDHE	Stream	Smoky Hill River	Exceptional State Waters
Finney	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Ford	KDHE	Stream	Kiowa Creek, West	Special Aquatic Life Use Waters
Ford	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Ford	KDHE	Stream	Bluff Creek	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Marais des Cygnes River	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Ottawa Creek	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Pottawatomie Creek	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Appanoose Creek	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Pottawatomie Creek	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Tauy Creek	Special Aquatic Life Use Waters
Geary	COE	Large Reservoir	Milford Lake	
Geary	FWS	Topeka shiner Habitat	Clarks Creek and tributaries	
Geary	FWS	Topeka shiner Habitat	Lyon Creek and tributaries	
Geary	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Geary	KDHE	Stream	Lyon Creek	Special Aquatic Life Use Waters Exceptional State Waters
Geary	KDHE	Stream	Lyon Creek, W Branch	Special Aquatic Life Use Waters
Geary	KDHE	Stream	Mill Creek, W Branch	Special Aquatic Life Use Waters
Geary	KDHE	Stream	Republican River	Special Aquatic Life Use Waters
Geary	KDHE	Stream	Carry Creek	Special Aquatic Life Use Waters
Geary	NPS	Identified in NPS Nationwide Rivers Inventory	Lyon Creek	Smoky Hill River to RR bridge S. of Woodbine
Gove	NPS	Natural Landmark	Monument Rocks Natural Area	23 Mi. S of Oakley
Graham	NPS	National Historic Site	Brown v. Board of Ed. National Historic Site	
Grant	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters Exceptional State Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Grant	NPS	Identified in Nationwide Rivers Inventory	Cimarron River	Hwy. 23 E. of Liberal to Co/KS line
Greeley	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Greeley	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Greenwood	FWS	Topeka shiner Critical Habitat	Cottonwood River and tributaries	
Greenwood	KDHE	Stream	Fall River , E Branch	Special Aquatic Life Use Waters
Greenwood	KDHE	Stream	Fall River, W Branch	Special Aquatic Life Use Waters Exceptional State Waters
Greenwood	KDHE	Stream	Otter Creek	Special Aquatic Life Use Waters Exceptional State Waters
Greenwood	KDHE	Stream	Otter Creek, S Branch	Special Aquatic Life Use Waters
Greenwood	KDHE	Stream	Verdigris River	Special Aquatic Life Use Waters
Greenwood	KDHE	Stream	Fall River	Special Aquatic Life Use Waters Exceptional State Waters
Greenwood	NPS	Identified in NPS Nationwide Rivers Inventory	Otter Creek and N. Branch	Fall River Reservoir to Hwy 96/NW of Blodgett
Hamilton	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Harper	KDHE	Stream	Chikaskia River	Special Aquatic Life Use Waters Exceptional State Waters
Harper	KDHE	Stream	Sand Cr	Special Aquatic Life Use Waters
Harper	NPS	Identified in NPS Nationwide Rivers Inventory	Chikaskia River	KS/OK line to Hwy 2, NE of Runnymede
Haskell	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters
Haskell	NPS	Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. Of Liberal, KS to CO/KS line
Jackson	BIA	Federal Indian Reservation	Potawatomi	
Jefferson	COE	Large Reservoir	Perry Lake	
Jefferson	KDHE	Lake	Perry Lake	
Jefferson	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Jefferson	KDHE	Stream	Buck Creek	Special Aquatic Life Use Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Jefferson	NPS	Identified in NPS Nationwide Rivers Inventory	Kansas River	I-635 to Delaware River
Jewell	U.S. Department of Interior (DOI)/Bureau of Reclamation (BuRec)	Lake	Lovewell Reservoir	
Jewell	KDHE	Stream	Republican River	Special Aquatic Life Use Waters
Johnson	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Johnson	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Johnson	NPS	Identified in NPS Nationwide Rivers Inventory	Kansas River	I-635 to Delaware River
Kearney	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Allen Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Chikaskia River	Special Aquatic Life Use Waters Exceptional State Waters
Kingman	KDHE	Stream	Chikaskia River, N Fork	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Duck Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Nester Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Ninnescah River, S Fork	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Painter Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Pat Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Sand Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Silver Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Smoots Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Kiowa Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Kiowa Creek, Middle	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Kiowa Creek, West	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Medicine Lodge River	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Mule Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Cavalry Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Soldier Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Thompson Creek	Special Aquatic Life Use Waters Exceptional State Waters
Kiowa	KDHE	Stream	Wiggins Creek	Special Aquatic Life Use Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Kiowa	NPS	Identified in NPS Nationwide Rivers Inventory	Medicine (Lodge) River	Gerlane to Belvidere
Labette	KDHE	Stream	Labette Creek	Special Aquatic Life Use Waters
Labette	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters Exceptional State Waters
Leavenworth	KDHE	Stream	Missouri River	Special Aquatic Life Use Waters
Leavenworth	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Leavenworth	KDHE	Stream	Salt Creek	Special Aquatic Life Use Waters
Leavenworth	KDHE	Stream	Missouri River	Special Aquatic Life Use Waters
Leavenworth	NPS	Identified in NPS Nationwide Rivers Inventory	Kansas River	I-635 to Delaware River
Linn	KDHE	Stream	Richland Creek	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Muddy Creek	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Marais des Cygnes River	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Big Sugar Creek	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Sugar Creek, North	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Elm Creek	Special Aquatic Life Use Waters
Linn	KDHE	Wetland	Marais des Cygnes Wildlife Area (WA)	
Linn	FWS	National Wildlife Refuge	Marais des Cygnes National Wildlife Refuge (NWR)	
Logan	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Logan	KDHE	Stream	Depperschmidt Draw	Special Aquatic Life Use Waters
Logan	KDHE	Stream	Chalk Creek	Special Aquatic Life Use Waters
Logan	KDHE	Stream	Twin Butte Creek	Special Aquatic Life Use Waters
Logan	KDHE	Stream	Smoky Hill River	Special Aquatic Life Use Waters
Lyon	KDHE	Stream	Cottonwood River	Special Aquatic Life Use Waters
Lyon	KDHE	Stream	Elm Creek	Special Aquatic Life Use Waters
Lyon	KDHE	Stream	Jacob Creek	Special Aquatic Life Use Waters
Lyon	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Marion	COE	Large Reservoir	Marion Lake	
Marion	FWS	Topeka shiner Habitat	Mud Creek	From the south section line of T19S, R3E, Sec. 13, upstream through T18S, R3E, Sec. 28

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Marion	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Marion	KDHE	Stream	Lyon Creek	Special Aquatic Life Use Waters
Marion	KDHE	Stream	Mud Creek	Special Aquatic Life Use Waters
Marion	KDHE	Stream	Catlin Creek	Special Aquatic Life Use Waters
Marion	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Marshall	FWS	Topeka shiner Habitat	North Elm Creek	From its confluence with the Big Blue River (T1S, R7E, Sec. 11), upstream through T1S, R8E, Sec. 21
Marshall	FWS	Topeka shiner Habitat	Clear Fork Creek	From its confluence with Jim Creek (T5S, R9E, Sec. 17), upstream through T6S, R10E, Sec. 18
Marshall	KDHE	Stream	Black Vermillion R, Clear Fk	Special Aquatic Life Use Waters
Marshall	KDHE	Stream	Manley Creek	Special Aquatic Life Use Waters
Marshall	COE	Large Reservoir	Tuttle Creek	
Meade	KDHE	Lake	Lake Meade State Park	
Meade	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters
Meade	KDHE	Stream	Crooked Creek	Special Aquatic Life Use Waters
Meade	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Meade	KDHE	Stream	Stumpie Arroyo	Special Aquatic Life Use Waters
Meade	NPS	Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. Of Liberal, KS to CO/KS line
Miami	KDHE	Lake	Hillsdale Lake	
Miami	KDHE	Stream	Marais des Cygnes River	Special Aquatic Life Use Waters
Miami	KDHE	Stream	Pottawatomie Creek	Special Aquatic Life Use Waters
Miami	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Mitchell	DOI/BuRec	Lake	Glen Elder Reservoir	
Montgomery	FWS	Burying Beetle Habitat		Upland prairie
Montgomery	KDHE	Stream	Onion Creek	Special Aquatic Life Use Waters
Montgomery	KDHE	Stream	Verdigris River	Special Aquatic Life Use Waters
Morris	FWS	Topeka shiner Habitat	Diamond Creek and tributaries	
Morris	COE	Lake	Council Grove Reservoir	
Morris	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Morris	KDHE	Stream	Lime Creek	Special Aquatic Life Use Waters
Morris	KDHE	Stream	Mill Creek, W Branch	Special Aquatic Life Use Waters
Morris	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Morris	KDHE	Stream	Six Mile Creek	Special Aquatic Life Use Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Morton	KDHE	Lake	Moss Lake East	
Morton	KDHE	Lake	Moss Lake Middle	
Morton	KDHE	Lake	Moss Lake West	
Morton	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters
Morton	KDHE	Stream	Cimarron River, N Fork	Special Aquatic Life Use Waters
Morton	NPS	Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. Of Liberal, KS to CO/KS line
Nemaha	KDHE	Stream	Big Nemaha River, S Fork	Special Aquatic Life Use Waters
Nemaha	KDHE	Stream	Manley Creek	Special Aquatic Life Use Waters
Neosho	KDHE	Stream	Flat Rock Creek	Special Aquatic Life Use Waters
Neosho	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Neosho	KDHE	Wetland	Neosho WA	
Norton	DOI/BuRec	Lake	Keith Sebelius Reservoir	
Osage	KDHE	Stream	Long Creek	Special Aquatic Life Use Waters
Osage	KDHE	Stream	Frog Creek	Special Aquatic Life Use Waters
Osage	KDHE	Stream	Appanoose Creek	Special Aquatic Life Use Waters
Ottawa	NPS	Natural Landmark	Rock City	2.5 Mi. SW of Minneapolis
Pawnee	NPS	National Historic Site	Fort Larned Nat. Historic Site	6 MI. W. Larned - Hwy 156
Phillips	KDHE/DOI/BuRec	Lake	Kirwin Lake	
Phillips	FWS	National Wildlife Refuge	Kirwin NWR	N. Fork of Soloman River Valley
Pottawatomie	FWS	Topeka shiner Critical Habitat	Clear Fork Creek	Continuation of item #41 above
Pottawatomie	KDHE	Stream	Bucksnort Creek	Special Aquatic Life Use Waters
Pottawatomie	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Pottawatomie	KDHE	Stream	Black Vermillion River, Clear Fork	Special Aquatic Life Use Waters
Pottawatomie	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Pottawatomie	KDHE	Stream	Bluff Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Mulberry Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Amber Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Chikaskia River	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Chikaskia River, N Fork	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Elm Creek, North	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Elm Creek, South E Branch	Special Aquatic Life Use Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Pratt	KDHE	Stream	Elm Creek , South W Branch	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Turkey Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Natrona Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Ninnescah River, S Fork	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Ninnescah River, W Branch of S Fork	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Painter Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Sand Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Silver Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Wetland	Texas Lake WA.	
Reno	DOI/BuRec/KDHE	Lake	Cheney Reservoir	
Reno	FWS	National Wildlife Refuge	Quivira NWR	South-central Kansas
Reno	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Reno	KDHE	Stream	Ninnescah River, N Fork	Special Aquatic Life Use Waters
Reno	KDHE	Stream	Peace Creek	Special Aquatic Life Use Waters
Reno	KDHE	Stream	Red Rock Creek	Special Aquatic Life Use Waters
Reno	KDHE	Stream	Silver Creek	Special Aquatic Life Use Waters
Reno	KDHE	Stream	Smoots Creek	Special Aquatic Life Use Waters
Reno	FWS	Wetland	Quivira Little Salt Marsh	
Republic	KDHE	Stream	Republican River	Special Aquatic Life Use Waters
Republic	KDHE	Wetland	Jamestown WA.	
Rice	FWS	National Wildlife Refuge	Quivira NWR	South-central Kansas
Rice	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Rice	KDHE	Stream	Peace Creek	Special Aquatic Life Use Waters
Rice	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Riley	FWS	Topeka shiner Habitat	Walnut Creek	from the east section line of T7S, R6E, Sec. 19, upstream through T8S, R5E, Sec. 1
Riley	FWS	Topeka shiner Habitat	Deep Creek and tributaries	
Riley	FWS	Topeka shiner Habitat	Wildcat Creek and tributaries	
Riley	KDHE	Stream	Deep Creek	Special Aquatic Life Use Waters
Riley	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Riley	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Riley	KDHE	Stream	Wildcat Creek	Special Aquatic Life Use Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Riley	COE	Large Reservoir	Tuttle Creek	
Riley	TNC, Kansas State University (KSU)	Project Area, Biosphere Reserve	Konza Prairie	S. of Manhattan
Rooks	DOI/BuRec	Lake	Webster Reservoir	
Rush	KDHE	Stream	Blood Creek	Special Aquatic Life Use Waters
Russell	COE	Large Reservoir	Wilson Lake	
Russell	NPS	Identified in NPS Nationwide Rivers Inventory	Saline River	Wilson Lake to Fairport
Russell	KDHE	Stream	Smoky Hill River	Special Aquatic Life Use Waters
Russell	KDHE	Stream	Saline River	Special Aquatic Life Use Waters
Scott	KDHE	Lake	Lake Scott State Park	
Scott	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Chisolm Creek	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Clearwater Creek	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Nester Creek	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Ninnescah River	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Ninnescah River, S Fork	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Sand Creek	Special Aquatic Life Use Waters
Seward	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters
Seward	NPS	Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. Of Liberal, KS to CO/KS line
Shawnee	FWS	Topeka shiner Habitat	Mission Creek	From Interstate Highway 70 (T11S, R14E, Sec. 33), upstream to the confluence of North Branch Mission Creek and South Branch Mission Creek (T13S, R12E, Sec. 1)
Shawnee	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Shawnee	KDHE	Stream	Mill Creek	Special Aquatic Life Use Waters
Shawnee	NPS	National Historic Site	Nicodemus National Historic Site	
Stafford	FWS	National Wildlife Refuge	Quivira NWR	South-central Kansas

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Stafford	FWS	Whooping crane Critical Habitat	Quivira NWR	
Stafford	KDHE	Stream	Peace Creek	Special Aquatic Life Use Waters
Stafford	KDHE	Stream	Ninnescah River, N Fork	Special Aquatic Life Use Waters
Stafford	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Stafford	FWS	Wetland	Quivira Little Salt Marsh	NWR
Stafford	FWS	Wetland	Quivira Big Salt Marsh	NWR
Stevens	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters
Stevens	NPS	Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. Of Liberal, KS to CO/KS line
Sumner	KDHE	Stream	Ninnescah River	Special Aquatic Life Use Waters
Sumner	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Sumner	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Sumner	KDHE	Stream	Chikaskia River	Special Aquatic Life Use Waters
Sumner	NPS	Identified in NPS Nationwide Rivers Inventory	Chikaskia River	KS/OK line to Hwy 2, NE of Runnynede
Trego	DOI/BuRec	Lake	Cedar Bluff Reservoir	
Wabaunsee	FWS	Topeka shiner Habitat	Mill Creek and tributaries	
Wabaunsee	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Deep Creek	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Elm Creek	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Illinois Creek	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Mill Creek, W Branch	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Locust Creek	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Mill Creek	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Mill Creek, E Branch	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Mill Creek, S Branch	Special Aquatic Life Use Waters
Wallace	FWS	Topeka shiner Habitat	Willow Creek	From its confluence with the Smoky Hill River (T13S, R41W, Sec. 17), upstream through T13S, R42W, Sec. 3
Wallace	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Capper Draw	Special Aquatic Life Use Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Wallace	KDHE	Stream	Chalk Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Coon Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Depperschmidt Draw	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Eagletail Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Pond Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Rose Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Smoky Hill River	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Twin Butte Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Willow Creek	Special Aquatic Life Use Waters
Wichita	KDHE	Stream	Chalk Creek	Special Aquatic Life Use Waters
Wichita	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Wilson	FWS	Burying Beetle habitat		Upland prairie
Wilson	KDHE	Stream	Fall River	Special Aquatic Life Use Waters
Wilson	KDHE	Stream	Verdigris River	Special Aquatic Life Use Waters
Wilson	NPS	Identified in NPS Nationwide Rivers Inventory	Fall River	Verdigris River to Fall river Lake
Woodson	KDHE	Lake	Woodson Co. State Fishing Lake (SFL)	
Woodson	KDHE	Lake	Circle Lake	
Woodson	KDHE	Lake	Leonard's Lake	
Woodson	KDHE	Stream	Bloody Run	Special Aquatic Life Use Waters
Woodson	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Woodson	KDHE	Stream	Owl Creek, South	Special Aquatic Life Use Waters
Woodson	KDHE	Stream	Verdigris River	Special Aquatic Life Use Waters
Woodson	KDHE	Wetland	Woodson WA.	
Wyandotte	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Wyandotte	KDHE	Stream	Little Turkey Creek	Special Aquatic Life Use Waters
Wyandotte	KDHE	Stream	Missouri River	Special Aquatic Life Use Waters
Wyandotte	NPS	Identified in NPS Nationwide Rivers Inventory	Kansas River	I-635 to Delaware River

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Hickory	U.S. Army Corps of Engineers (COE)	Large Reservoir	Pomme De Terre Lake	
Clay	COE	Large Reservoir	Smithville Lake	
	COE	Large Reservoir	Harry S. Truman Lake	
	COE	Large Reservoir	Mark Twain Lake	
	COE	Large Reservoir	Stockton Lake	
	COE	Large Reservoir	Table Rock Lake	
	COE	Large Reservoir	Wappapello Lake	
Various counties	National Parks Service (NPS)	National Historic Trail	California National Historic Trail	Developed over a period of years, and contains numerous cutoffs and alternate routes. General route began at Various jumping off points in MO, including Independence and St. Joseph, and headed westward following the routes of the Oregon and Santa Fe Trails through KS and the Platte River through NE.
Various counties	NPS	National Historic Trail	Lewis & Clark National Historic Trail	Generally follows the Missouri River
Various counties	NPS	National Historic Trail	Oregon National Historic Trail	Started in Independence, MO, and headed westward.
Various counties	NPS	National Historic Trail	Pony Express National Historic Trail	Most of original trail has been obliterated through time. Some Pony Express Stations still exist. Trail started in Independence, MO, following the route of the Oregon Trail through KS toward the Platte River and the West.
Various counties	NPS	National Historic Trail	Santa Fe National Historic Trail	
Various counties	NPS	National Historic Trail	Trail of Tears National Historic Trail	In an arc through southern MO, from just north of Cape Girardeau, northwestward to the present-day route of I-44, and then southwestward toward Tahlequah, AR.
	U.S. Forest Service (USFS)	National Forest	Mark Twain Nat. Forest	Numerous counties in south-central Missouri
	USFS	National Wilderness Area	Devil's Backbone	
	USFS	National Wilderness Area	Hercules Glades	
	USFS	National Wilderness Area	Irish	

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
	USFS	National Wilderness Area	Paddy Creek	
	USFS	National Wilderness Area	Piney Creek	
	USFS	National Wilderness Area	Rockpile Mountain	
	USFS	National Wilderness Area	Bell Mountain	
Barry	NPS	Identified in NPS Nationwide Rivers Inventory	Shoal Creek	Spring River to source
Barton	NPS	Natural Landmark	Golden Prairie	16 Mi. NE of Carthage
Barton	The Nature Conservancy (TNC)	St Conservancy Preserve	Shelton L Cook Memorial Meadow	
Barton	TNC	St Conservancy Preserve	Tri-Sho Prairie	
Barton	TNC	St Conservancy Preserve	Hunkah Prairie	
Barton	TNC	St Conservancy Preserve	Pawhuska Prairie	
Benton	TNC	St Conservancy Preserve	Rockhill Prairie	
Bollinger	U.S. Fish and Wildlife Service (FWS)	National Wildlife Refuge	Mingo National Wildlife Refuge (NWR)	Watershed drains into Refuge
Bollinger	NPS	Identified in NPS Nationwide Rivers Inventory	Castor River	
Boone	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar Creek	Missouri River to Hwy WW
Boone	TNC	St Conservancy Preserve	Hinkson Valley	
Butler	NPS	Identified in NPS Nationwide Rivers Inventory	Little Black River	S36,T25N, R2E to MO-AR state line

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Callaway	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar Creek	Missouri River to Hwy WW
Callaway	NPS	Natural Landmark	Tucker Prairie	7 Mi. NNw of Fulton
Camden	NPS	Natural Landmark	Carroll Cave	Private
Carter	NPS	National Scenic Riverway	Ozark National Scenic Riverway	134 Mi. of Jacks Fork & Current Rivers
Carter	NPS	Identified in NPS Nationwide Rivers Inventory	Current River	Entire segment within Ozark National Scenic Riverways
Cedar	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar Creek	Sac river to source
Cedar	TNC	St Conservancy Preserve	Mo-Ko Prairie	
Cedar	TNC	St Conservancy Preserve	Monegaw Prairie	
Chariton	FWS	National Wildlife Refuge	Swan Lake NWR	
Chariton	NPS	Identified in NPS Nationwide Rivers Inventory	Locust Creek	Grant River to Hwy. 36
Christian	NPS	Identified in NPS Nationwide Rivers Inventory	Swan Creek	From S4, T26N, R18W to Bull Shoals Lake
Clark	FWS	National Wildlife Refuge	Great River NWR	Fox Island Division
Clark	FWS	National Wildlife Refuge	Mark Twain NWR	
Clay	NPS	Natural Landmark	Maple Woods Natural Area	
Clinton	TNC	St Conservancy Preserve	Trice-Dedman Memorial Woods	
Cooper	FWS	National Wildlife Refuge	Big Muddy NWR	Overton Bottoms North Unit

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Crawford	NPS	Identified in NPS Nationwide Rivers Inventory	Huzzah Creek	Meramec River to Dillard
Crawford	NPS	Identified in NPS Nationwide Rivers Inventory	Courtois Creek	Huzzah Creek to Brazil
Crawford	NPS	Identified in NPS Nationwide Rivers Inventory	Meramec River	Meramec State Park to Cook Station
Crawford	NPS	Identified in NPS Nationwide Rivers Inventory	Bourbeuse River	Noser Hill to Hwy B
Crawford	NPS	Natural Landmark	Onondag Cave	5 Mi. SW of Leasburg
Crawford	TNC	St Conservancy Preserve	Zahorsky Woods	
Dade	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar Creek	Sac river to source
Dade	TNC	St Conservancy Preserve	Niawthe Prairie	
Dade	TNC	St Conservancy Preserve	N. B. Altvater Corry Flatrocks	
Dade	TNC	St Conservancy Preserve	Greenfield Glade	
Dallas	NPS	Identified in NPS Nationwide Rivers Inventory	Little Niangua River	S20, T35N, R19W to Lake of the Ozarks
Dallas	NPS	Identified in NPS Nationwide Rivers Inventory	Niangua River	Bennet Spring Branch to Camden/Dallas county line
Daviess	NPS	Identified in NPS Nationwide Rivers Inventory	Marrowbone Creek	Hwy 13 to I-35

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Dent	NPS	Identified in NPS Nationwide Rivers Inventory	Current River	Entire segment within Ozark National Scenic Riverways
Dent	NPS	Identified in NPS Nationwide Rivers Inventory	Little Piney Creek	S21, T34N, R8W to Gasconade River
Dent	TNC	St Conservancy Preserve	Hyer Woods	
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	Beaver Creek	S24,T26N, R17W to Bull Shoals Lake
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	Bryant Creek	N. Fork White River to Hwy. 14
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	Indian Creek	North Fork of the White River to source
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	North Fork White River	Norfork Lake to source
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	Spring Creek	S24, T26N, R10W to S34, T25N, R11W, almost entirely within the Mark Twain NF
Douglas	TNC	St Conservancy Preserve	Alma Peterson Azalea Memorial	
Douglas	TNC	St Conservancy Preserve	Williams Memorial Woods	
Franklin	NPS	Identified in NPS Nationwide Rivers Inventory	Bourbeuse River	Noser Mill to Hwy 8

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Franklin	NPS	Identified in NPS Nationwide Rivers Inventory	Meramec River	Meramec State Park to Cook Station
Gasconade	NPS	Identified in NPS Nationwide Rivers Inventory	Bourbeuse River	Noser Mill to Hwy. 8
Gasconade	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source
Greene	NPS	National Battlefield	Wilson Creek Nat. Battlefield	10 MI. SW of Springfield
Hickory	NPS	Identified in NPS Nationwide Rivers Inventory	Little Niangua River	S20, T35N, R19W to Lake of the Ozarks
Holt	FWS	National Wildlife Refuge	Squaw Creek	
Holt	TNC	St Conservancy Preserve	J. C. McCormack Loess Mounds	
Howard	FWS	National Wildlife Refuge	Big Muddy NWR	Lisbon Bottoms Unit
Howell	NPS	Identified in NPS Nationwide Rivers Inventory	Indian Creek	North Fork of the White River to source
Howell	NPS	Identified in NPS Nationwide Rivers Inventory	Spring Creek	S24, T26N, R10W to S34, T25N, R11W, almost entirely within the Mark Twain NF
Howell	NPS	Identified in NPS Nationwide Rivers Inventory	Spring River and Warm Fork	From confluence with Black River to headwaters near West Plains, MO
Howell	NPS	Identified in NPS Nationwide Rivers Inventory	Spring River, South Fork	From confluence with Spring River to headwaters south of South Fork, Mo
Iron	FWS	National Wildlife Refuge	Pilot Knob NWR	Administered by Mingo NWR

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Jackson	FWS	National Wildlife Refuge	Big Muddy NWR	Jackass Bend Unit
Jackson	NPS	National Historic Site	Harry Truman Nat. Historic Site	Truman Rd & Main, Independence
Jasper	NPS	Identified in NPS Nationwide Rivers Inventory	Spring River	Highway 96 to Highway 44
Jasper	TNC	St Conservancy Preserve	Wha-Sha-She Prairie	
Jefferson	FWS	National Wildlife Refuge	Middle Mississippi River NWR	Harlow Island District
Jefferson	TNC	St Conservancy Preserve	Victoria Glade	
Jefferson	TNC	St Conservancy Preserve	N. B. Altwater LaBarque Hills	
Knox	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Fabius River & N. Fork	N. Fabius River to source
Knox	NPS	Identified in NPS Nationwide Rivers Inventory	South Fabius River	Count Hwy. E to confluence of N. & S. Forks
Laclede	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source
Laclede	NPS	Identified in NPS Nationwide Rivers Inventory	Niangua River	Bennet Spring Branch to Camden/Dallas county line
Laclede	NPS	Identified in NPS Nationwide Rivers Inventory	Osage Fork of the Gasconade River	South of High Prairie to S23, T35N, R14W
Laclede	TNC	St Conservancy Preserve	Bennett Spring Savanna	
Lafayette	FWS	National Wildlife Refuge	Big Muddy NWR	Baltimore Bottoms Unit
Lawrence	FWS	National Wildlife Refuge	Ozark Cavefish NWR	Administered by Mingo NWR

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Lawrence	NPS	Identified in NPS Nationwide Rivers Inventory	Spring River	Highway 96 to Hwy 44
Lawrence	TNC	St Conservancy Preserve	Mount Vernon Prairie	
Lewis	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Fabius River & N. Fork	N. Fabius River to source
Lewis	TNC	St Conservancy Preserve	Accola Woods	
Lincoln	NPS	Identified in NPS Nationwide Rivers Inventory	West Fork Cuivre River	Cuivre River to County Hwy AC
Linn	NPS	Identified in NPS Nationwide Rivers Inventory	Locust Creek	Grant River to Hwy 36
Livingston	NPS	Identified in NPS Nationwide Rivers Inventory	Locust Creek	Grant River to Hwy 36
Madison	NPS	Identified in NPS Nationwide Rivers Inventory	Castor River	
Madison	NPS	Identified in NPS Nationwide Rivers Inventory	Little St. Francois River	Northwest of Fredericktown to St. Francois River
Madison	NPS	Identified in NPS Nationwide Rivers Inventory	St Francis River	Lake Wappapello to Syenite
Maries	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Marion	NPS	Natural Landmark	Mark Twain & Cameron Caves	2 Mi. SE of Hannibal
McDonald	NPS	Identified in NPS Nationwide Rivers Inventory	Big Sugar Creek	S35,T22N, R30W to Pineville. Joins Little Sugar Creek to form the Elk River.
McDonald	NPS	Identified in NPS Nationwide Rivers Inventory	Elk River	From Pineville to the MO-OK state line
Mississippi	NPS	Natural Landmark	Big Oak Tree	Big Oak Tree State Park
Montgomery	NPS	Identified in NPS Nationwide Rivers Inventory	West Fork Cuivre River	Cuivre River to County Hwy AC
Newton	FWS	National Wildlife Refuge	Mingo NWR - Neosho Unit	Spring containing Ozark cavefish habitat
Newton	FWS	National Fish Hatchery	Neosho National Fish Hatchery (NFH)	
Newton	NPS	National Park	George Washington Carver Nat. Monument	7. Mi s of I-44
Newton	NPS	Identified in NPS Nationwide Rivers Inventory	Shoal Creek	
Newton	FWS	National Research Facility	Columbia Environmental & Contaminants Research Ctr.	
Nodaway	TNC	St Conservancy Preserve	Dobbins Woodlands	
Oregon	NPS	Identified in NPS Nationwide Rivers Inventory	Spring River and Warm Fork	From confluence with Black River to headwaters near West Plains, MO
Oregon	NPS	National Scenic River	Eleven Point	Downstream from Thomasville to State Highway 142
Oregon	NPS	Natural Landmark	Grand Gulf	8 Mi. W of Thayer
Oregon	NPS	Natural Landmark	Greer Spring	52 Mi. W of Poplar Bluff

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Osage	FWS	National Wildlife Refuge	Big Muddy NWR	St. Aubert=s Island Unit
Osage	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source
Ozark	NPS	Identified in NPS Nationwide Rivers Inventory	Bryant Creek	N. Fork White River to Hwy 14
Ozark	NPS	Identified in NPS Nationwide Rivers Inventory	North Fork White River	Norfork Lake to source
Phelps	NPS	Identified in NPS Nationwide Rivers Inventory	Bourbeuse River	Noser Mill to Hwy B
Phelps	NPS	Identified in NPS Nationwide Rivers Inventory	Big Piney River	Gasconade River to Hwy 63
Phelps	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source
Phelps	NPS	Identified in NPS Nationwide Rivers Inventory	Little Piney Creek	S21, T34N, R8W to Gasconade River
Phelps	NPS	Identified in NPS Nationwide Rivers Inventory	Meramec River	Meramec State Park to Cook Station
Phelps	NPS	Natural Landmark	Maramec Spring	8 Mi. SE of St. James
Pike	FWS	National Wildlife Refuge	Great River NWR	Clarence Cannon Refuge
Pike	FWS	National Wildlife Refuge	Mark Twain NWR	

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Pulaski	NPS	Identified in NPS Nationwide Rivers Inventory	Big Piney River	Gasconade River to Hwy 63
Pulaski	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source
Reynolds	NPS	Identified in NPS Nationwide Rivers Inventory	Black River	Hwy K to source
Reynolds	TNC	St Conservancy Preserve	Lily Pond	
Reynolds	TNC	St Conservancy Preserve	N.B. Altvater Grasshopper Holl	
Ripley	NPS	Identified in NPS Nationwide Rivers Inventory	Little Black River	S36, T25N, R2E to MO-AR state line
Ripley	NPS	Natural Landmark	Cupola Pond	Mark Twain Nat. Forest
Ripley	TNC	St Conservancy Preserve	N.B. Altvater Pondberry	
Saline	FWS	National Wildlife Refuge	Big Muddy NWR	Jameson Island Unit
Schuyler	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Fabius River & N. Fork	N. Fabius River to source
Scotland	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Fabius River & N. Fork	N. Fabius River to source
Shannon	NPS	National Scenic Riverway	Ozark National Scenic Riverway	134 Mi. of Jacks Fork & Current Rivers
Shannon	NPS	Identified in NPS Nationwide Rivers Inventory	Current River	Entire segment within Ozark National Scenic Riverways

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Shannon	NPS	Identified in NPS Nationwide Rivers Inventory	Jacks Fork	Entire segment within Ozark National Scenic Riverways
Shannon	TNC	St Conservancy Preserve	N.B. Altvater Shut-in-Mntn Fen	
St. Charles	FWS	National Wildlife Refuge	Mark Twain NWR	
St. Clair	FWS	National Wildlife Refuge	Swan Lake	
St. Charles	FWS	National Wildlife Refuge	Big Muddy NWR	Boone=s Crossing Unit
St. Francois	NPS	Identified in NPS Nationwide Rivers Inventory	St. Francis River	Lake Wappapello to Syenite
St. Genevieve	NPS	Natural Landmark	Pickle Springs	7 Mi. E. of Farmington
St. Clair	NPS	Natural Landmark	Taberville Prairie	2.5 Mi. N of Taberville
St. Clair	TNC	St Conservancy Preserve	Wah'Kon-Tah Prairie	
St. Clair	TNC	St Conservancy Preserve	Lichen Glade	
St. Francis	TNC	St Conservancy Preserve	Silas Dees Azalea & Wildflower	
St. Louis	NPS	National Memorial	Jefferson Nat. Expansion Memorial	Mississippi Riverfront, St. Louis
St. Louis	NPS	National Historic Site	Ulysses S. Grant Historic Site	9060 White Haven Dr. St. Louis
Stoddard	FWS	National Wildlife Refuge	Mingo NWR	
Stone	NPS	Natural Landmark	Marvel Cave	50 Mi. S of Springfield
Sullivan	NPS	Identified in NPS Nationwide Rivers Inventory	Locust Creek	End channelization to sect. 28
Taney	NPS	Identified in NPS Nationwide Rivers Inventory	Beaver Creek	S24,T26N, R17W to Bull Shoals Lake

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Taney	NPS	Identified in NPS Nationwide Rivers Inventory	Swan Creek	S4, T26N, R18W to Bull Shoals Lake
Taney	NPS	Natural Landmark	Tumbling Creek Cave	
Texas	NPS	Identified in NPS Nationwide Rivers Inventory	Big Piney River	Gasconade River to Hwy 63
Texas	NPS	Identified in NPS Nationwide Rivers Inventory	Jacks Fork	Entire segment within Ozark National Scenic Riverways
Texas	NPS	Identified in NPS Nationwide Rivers Inventory	North Fork White River	Norfork Lake to source
Texas	NPS	National Scenic Riverway	Ozark National Scenic Riverway	134 Mi. of Jacks Fork & Current Rivers
Vernon	TNC	St Conservancy Preserve	Marmaton River Bottoms Wet Prairie	
Vernon	TNC	St Conservancy Preserve	Little Osage Prairie	
Vernon	TNC	St Conservancy Preserve	Gamagrass Meadows	
Warren	NPS	Natural Landmark	Wegener Woods	.25 Mi N of Holstein
Washington	NPS	Identified in NPS Nationwide Rivers Inventory	Mineral Fork	Big River to Hwy F
Washington	NPS	Identified in NPS Nationwide Rivers Inventory	Courtois Creek	Huzzah Creek to Brazil
Washington	NPS	Identified in NPS Nationwide Rivers Inventory	Meramec River	Meramec State Park to Cook Station
Wayne	FWS	National Wildlife Refuge	Mingo NWR	

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Wayne	NPS	Identified in NPS Nationwide Rivers Inventory	Castor River	
Wayne	NPS	Identified in NPS Nationwide Rivers Inventory	St. Francis River	Lake Wappapello to Syerite
Webster	NPS	Identified in NPS Nationwide Rivers Inventory	Osage Fork of the Gasconade River	South of High Prairie to S23, T35N, R14W
Wright	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source County Lake

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Various counties	National Parks Service (NPS)	National Historic Trail	California National Historic Trail	Developed over a period of years, and contains numerous cutoffs and alternate routes. General route began at Various jumping off points in MO, including Independence and St. Joseph, and headed westward following the routes of the Oregon and Santa Fe Trails through KS and the Platte River through NE.
Various counties	NPS	National Historic Trail	Lewis and Clark National Historic Trail	Generally follows the Missouri River
Various counties	NPS	National Historic Trail	Mormon Pioneer National Historic Trail	Generally follows the Platte River on north side of the channel, from near Omaha to Scotts Bluff in western Nebraska.
Various counties	NPS	National Historic Trail	Oregon National Historic Trail	Enters southeast Nebraska west of Odell, and generally follows the Blue River to Ayr. Then the trail cuts northwest toward Kearney and the Platte River, which it follows westward to Scotts Bluff. The trail generally follows the south side of the channel. West of Ogallala, a portion of the trail follows the S. Platte and the route of I-80 to Sydney, before cutting north again along the route of US-385 back toward the N. Platte.
Various counties	NPS	National Historic Trail	Pony Express National Historic Trail	Most of original trail has been obliterated through time. Some Pony Express Stations still exist. Trail started in Independence, MO, and went generally westward to San Francisco, CA, following the Platte River.
Adams	U.S. Fish and Wildlife Service (FWS)	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Adams	FWS	Waterfowl Production Area	Weseman Waterfowl Production Area (WPA)	
Adams	FWS	Waterfowl Production Area	Kenesaw WPA	
Adams	Nebraska Game and Parks Commission (NGPC)	State Recreation Area	Crystal Lake State Recreation Area (SRA)	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Adams	NGPC	State Recreation Area	DLD SRA	
Adams	NGPC	State Recreation Area	Prairie Lake SRA	
Adams	The Nature Conservancy (TNC)	Project Area	Various Platte River	
Antelope	NGPC	State Historical Park	Ashfall Fossil Beds State Historic Park (SHP)	
Antelope	NGPC	Wildlife Management Area	Hackberry Creek WMA	
Antelope	NGPC	Wildlife Management Area	Grove Lake WMA	
Antelope	NGPC	Wildlife Management Area	Red Wing WMA	
Arthur	TNC	Project Area	Arapaho Prairie	
Arthur	TNC	Project Area	Arapaho Prairie	Managed by University of NE
Banner	NGPC	Wildlife Management Area	Wildcat Hills WMA	
Banner	NGPC	Wildlife Management Area	Buffalo Creek WMA	
Blain	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Loup River	Milburn diversion Dam to source
Blaine	NGPC	Wildlife Management Area	Milburn Diversion Dam WMA	
Blaine	NPS	Identified in NPS Nationwide Rivers Inventory	Dismal River	Middle Loup River to source
Boone	NGPC	Wildlife Management Area	Beaver Bend WMA	
Boyd	FWS	Piping Plover Critical Habitat	Niobrara River and Missouri River	Niobrara R. from Norden Bridge to mouth at Missouri River. Missouri River from S.D border to river mile 252.2 (at Ponca).
Boyd	FWS	National Wildlife Refuge	Karl E. Mundt National Wildlife Refuge (NWR)	
Boyd	NGPC	Wildlife Management Area	Hull Lake WMA	
Boyd	NGPC	Wildlife Management Area	Parshall Bridge WMA	
Boyd	NPS	National Recreational River	Missouri River	Fort Randall Dam (SD) downstream to Knox county line
Boyd	NPS	National Scenic River	Niobrara River	76 miles downstream of Valentine
Boyd	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Boyd	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Missouri River to Keya Paha River (omit Spencer Dam & Reservoir)
Brown	FWS	Piping Plover Critical Habitat	Niobrara River	Niobrara R. from Norden Bridge to mouth at Missouri River
Brown	NGPC	State Recreation Area	Long Lake SRA	
Brown	NGPC	State Recreation Area	Keller Park SRA	
Brown	NGPC	State Recreation Area	Long Pine SRA	
Brown	NGPC	Wildlife Management Area	Pine Glen WMA	
Brown	NGPC	Wildlife Management Area	Bobcat WMA	
Brown	NGPC	Wildlife Management Area	Keller Park/School Land WMA	
Brown	NGPC	Wildlife Management Area	Plum Creek Valley	1.5 miles S. of Johnstown
Brown	NGPC	Wildlife Management Area	Long Pine WMA	
Brown	NGPC	Wildlife Management Area	South Twin Lake WMA	
Brown	NGPC	Wildlife Management Area	American Game Marsh WMA	
Brown	NGPC	Wildlife Management Area	Willow Lake (Brown Co) WMA	
Brown	NGPC	Wildlife Management Area	South Pine WMA	12 miles S. of Long Pine
Brown	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek
Brown	NPS	Identified in NPS Nationwide Rivers Inventory	Calamus	North Loup River to source
Brown	NPS	Identified in NPS Nationwide Rivers Inventory	Long Pine Creek	Niobrara River to source
Brown	TNC	Project Area	Niobrara Valley Preserve	Parts of T32-R23 and R24, T33-R23 and R24
Buffalo	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Buffalo	FWS	Whooping Crane Critical Habitat	Platte River	Platte River from Lexington to Denman
Buffalo	FWS	Endangered Species Act (ESA) Mitigation Land	Wyoming property	2 miles E, 1 mile S of Kearney; owned by WY state for mitigation purposes

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Buffalo	FWS	Farmers Home Administration (FmHA) easement under the NWR	Wize	Section 12, T12N, R14W
Buffalo	FWS	FmHA easement under the NWR	Altmaier, Freddie	Section 31, T10N, R17W
Buffalo	NAS	Wildlife Sanctuary	Lillian Annette Rowe Wildlife Sanctuary	South of Gibbon
Buffalo	NGPC	State Recreation Area	War Axe SRA	
Buffalo	NGPC	State Recreation Area	Union Pacific SRA	
Buffalo	NGPC	State Recreation Area	Windmill SRA	
Buffalo	NGPC	Wildlife Management Area	Bufflehead WMA	3.25 mile W of Minden INT
Buffalo	NGPC	Wildlife Management Area	Bassway Strip WMA	
Buffalo	NGPC	Wildlife Management Area	Coot Shallows WMA	1.75 mile W of Odessa INT
Buffalo	NGPC	Wildlife Management Area	Blue Hole WMA	
Buffalo	NGPC	Wildlife Management Area	Kea Lake WMA	SW Quad, Kearney INT
Buffalo	NGPC	Wildlife Management Area	Kea West WMA	N I-80, 1 mile W of Kearney INT
Buffalo	NGPC	Wildlife Management Area	East Odessa WMA	
Buffalo	NGPC	Wildlife Management Area	Denman Island WMA	
Buffalo	Nebraska Public Power District (NPPD)	ESA Mitigation Land	Elm Creek Island	
Buffalo	TNC	Project Area	Various Platte River	Parts of T8-R15
Burt	NGPC	State Recreation Area	Pelican Point SRA	
Burt	NGPC	State Recreation Area	Summit Lake SRA	
Burt	NGPC	Wildlife Management Area	Middle Decatur Bend WMA	4 miles E of Decatur
Butler	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Butler	NGPC	Wildlife Management Area	Skull Creek #1 WMA	2.5 miles N, 0.75 E of Brainard
Butler	NGPC	Wildlife Management Area	Skull Creek #2 WMA	2 miles N, 0.5 W of Abie
Butler	NGPC	Wildlife Management Area	Redtail WMA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Cass	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Cass	NGPC	State Recreation Area	Louisville Lakes SRA	
Cass	NGPC	State Park	Platte River State Park (SP)	
Cass	NGPC	State Park	Eugene T. Mahoney SP	
Cass	NGPC	Wildlife Management Area	Randall W. Schilling WMA	
Cass	NGPC	Wildlife Management Area	Cedar Creek Island	River Access NE of Cedar
Cass	NGPC	Wildlife Management Area	Rakes Creek WMA	
Cass	NGPC	Wildlife Management Area	Rhoden WMA	NE of Plattsmouth
Cass	NGPC	Wildlife Management Area	William Gilmour (Tobacco Island)	3 miles S, 0.5 E of Plattsmouth
Cedar	FWS	Piping Plover Critical Habitat	Missouri River	From S.D. border to river mile 252.2 (at Ponca)
Cedar	NGPC	Wildlife Management Area	Wiseman WMA	
Cedar	NGPC	Wildlife Management Area	Tatanka WMA	
Cedar	NGPC	Wildlife Management Area	Chalkrock WMA	
Cedar	NPS	National Recreational River	Missouri River	Gavin=s Point Dam downstream to Dixon county line
Chase	NGPC	State Recreation Area	Champion Lake SRA	
Chase	NGPC	State Recreation Area	Enders Reservoir SRA	
Chase	NGPC	State Historical Park	Champion Mill SHP	
Chase	NGPC	Wildlife Management Area	Enders Reservoir WMA	
Chase	NGPC	Wildlife Management Area	Wanamaker WMA	
Cherry	FWS	National Wildlife Refuge	Fort Niobrara NWR	
Cherry	FWS	National Wildlife Refuge	Valentine NWR	
Cherry	FWS	National Wilderness Area	Fort Niobrara	
Cherry	NGPC	State Historical Park	Bowring Ranch SHP	
Cherry	NGPC	State Park	Smith Falls SP	
Cherry	NGPC	State Recreation Area	Cottonwood Lake SRA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Cherry	NGPC	State Recreation Area	Merritt Reservoir SRA	
Cherry	NGPC	Wildlife Management Area	Willow Lake WMA	
Cherry	NGPC	Wildlife Management Area	Ballards Marsh WMA	
Cherry	NGPC	Wildlife Management Area	Merritt Reservoir WMA	
Cherry	NGPC	Wildlife Management Area	Anderson Bridge WMA	
Cherry	NGPC	Wildlife Management Area	Rat and Beaver Lakes WMA	
Cherry	NGPC	Wildlife Management Area	Shell Lake WMA	
Cherry	NGPC	Wildlife Management Area	Cottonwood/Steverson WMA	27 miles N of Hyannis
Cherry	NGPC	Wildlife Management Area	Big Alkali Lake WMA	
Cherry	NGPC	Wildlife Management Area	Borman Bridge WMA	
Cherry	NGPC	Wildlife Management Area	Schlagel Creek WMA	11 miles S, 4 W of Valentine
Cherry	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Loup River	Milburn Diversion Dam to source
Cherry	NPS	National Scenic River	Niobrara River	From Valentine downstream 76 miles
Cherry	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek (Omit Cornell Dam and Reservoir)
Cherry	NPS	Identified in NPS Nationwide Rivers Inventory	Snake River	Niobrara River to source
Cherry	TNC	Project Area	Niobrara Valley Preserve	
Cherry	TNC	Project Area	Niobrara Valley Preserve/Horse Creek Fen	Parts of T27-R31, T33-R25 and R26, T34-R25 and R26
Cherry	U.S. Forest Service (USFS)	National Forest	Samuel McKelvie National Forest	
Clay	FWS	National Wildlife Refuge	McMurtrey Marsh NWR	
Clay	FWS	Waterfowl Production Area	Harvard WPA	
Clay	FWS	Waterfowl Production Area	Hultine WPA	
Clay	FWS	Waterfowl Production Area	Verona WPA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Clay	FWS	Waterfowl Production Area	Lange WPA	
Clay	FWS	Waterfowl Production Area	Theesen WPA	
Clay	FWS	Waterfowl Production Area	Glenvil WPA	
Clay	FWS	Waterfowl Production Area	Massie WPA	
Clay	FWS	Waterfowl Production Area	Harms WPA	
Clay	FWS	Waterfowl Production Area	Moger WPA	
Clay	FWS	Waterfowl Production Area	Meadowlark WPA	
Clay	FWS	Waterfowl Production Area	Green Acres WPA	
Clay	FWS	Waterfowl Production Area	Eckhardt WPA	
Clay	FWS	Waterfowl Production Area	Schuck WPA	
Clay	FWS	Waterfowl Production Area	Smith WPA	
Clay	FWS	Waterfowl Production Area	Hansen WPA	
Clay	NGPC	Wildlife Management Area	Greenwing WMA	
Clay	NGPC	Wildlife Management Area	Bulrush WMA	
Clay	NGPC	Wildlife Management Area	Bluewing WMA	
Clay	NGPC	Wildlife Management Area	White-front WMA	
Clay	NGPC	Wildlife Management Area	Greenhead WMA	
Clay	NGPC	Wildlife Management Area	Kissinger Basin WMA	
Colfax	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Colfax	NGPC	Wildlife Management Area	Whitetail WMA	
Cuming	NGPC	Wildlife Management Area	Black Island WMA	
Custer	FWS	FmHA easement under the NWR	Scott, John J.	Section 10, T17N, R18W
Custer	FWS	FmHA easement under the NWR	Thorton	Section 9, T15N, R20W
Custer	NGPC	State Recreation Area	Arnold Lake SRA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Custer	NGPC	State Recreation Area	Victoria Springs SRA	
Custer	NGPC	Wildlife Management Area	Pressey WMA	
Custer	NGPC	Wildlife Management Area	Arcadia Diversion Dam WMA	
Custer	NGPC	Wildlife Management Area	Myrtle E. Hall WMA	
Dakota	NGPC	Wildlife Management Area	Basswood Ridge WMA	
Dakota	NGPC	Wildlife Management Area	Omadi Bend WMA	2 miles E, 1 N of Homer
Dawes	NGPC	State Park	Chadron SP	
Dawes	NGPC	State Recreation Area	Box Butte Reservoir SRA	
Dawes	NGPC	State Park	Fort Robinson SP	
Dawes	NGPC	Wildlife Management Area	Ponderosa WMA	
Dawes	NGPC	Wildlife Management Area	Big Horn WMA	
Dawes	NGPC	Wildlife Management Area	Whitney Inlet WMA	4 miles W. of Whitney
Dawes	NGPC	Wildlife Management Area	Bordeaux WMA	3 miles E of Chadron
Dawes	TNC	Project Area	Carter Ranch	Parts of T31-R50
Dawes	USFS	National Forest	Oglala National Grassland	
Dawes	USFS	National Forest	Nebraska National Forest - Pine Ridge District	
Dawson	Central Nebraska Public Power and Irrigation District (CNPPID)	ESA Mitigation Land	Jeffrey Island	
Dawson	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Dawson	FWS	Whooping Crane Critical Habitat	Platte River	Platte River from Lexington to Denman
Dawson	NGPC	State Recreation Area	Johnson Lake SRA	
Dawson	NGPC	State Recreation Area	Gallagher Canyon SRA	
Dawson	NGPC	Wildlife Management Area	E. Willow Island WMA	
Dawson	NGPC	Wildlife Management Area	Willow Island WMA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Dawson	NGPC	Wildlife Management Area	Cozad WMA	
Dawson	NGPC	Wildlife Management Area	W. Cozad WMA	
Dawson	NGPC	Wildlife Management Area	East Cozad WMA	S I-80, 1.5 miles E of Cozad
Dawson	NGPC	Wildlife Management Area	Dogwood WMA	
Dawson	NGPC	Wildlife Management Area	Darr WMA	NW Quad, Darr INT
Dawson	NGPC	Wildlife Management Area	East Darr WMA	0.5 miles E of Darr INT
Dawson	NGPC	Wildlife Management Area	Bitterns Call WMA	
Dawson	NGPC	Wildlife Management Area	Overton WMA	NW Quad Oveton INT
Dawson	NGPC	Wildlife Management Area	Blue Heron WMA	
Dawson	NGPC	Wildlife Management Area	Darr Strip WMA	
Dawson	NGPC	Wildlife Management Area	Plum Creek WMA	10 SW of Lexington
Dawson	NGPC	Wildlife Management Area	West Elm Creek WMA	N I-80, SW Elm Creek
Dawson	NGPC	Wildlife Management Area	East Gothenburg WMA	4 E Gothenburg INT
Dawson	NPPD	ESA Mitigation Land	Cottonwood Ranch	
Dawson	NPPD	ESA Mitigation Land	Overton Island	
Dawson	NPPD	ESA Mitigation Land	Lexington Island	
Deuel	NGPC	Wildlife Management Area	Goldenrod WMA	1 mile S, 2 E of Chappel
Deuel	NGPC	Wildlife Management Area	Bittersweet WMA	
Deuel	NGPC	Wildlife Management Area	Goldeneye WMA	
Dixon	FWS	Piping Plover Critical Habitat	Missouri River	From S.D. border to river mile 252.2 (at Ponca)
Dixon	NGPC	State Park	Ponca SP	
Dixon	NGPC	Wildlife Management Area	Buckskin Hills WMA	
Dixon	NGPC	Wildlife Management Area	Mulberry Bend WMA	4 mile N, 3 W of Newcastle
Dixon	NPS	National Recreational River	Missouri River	From Cedar county line downstream to Ponca State Park (NE)

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Dodge	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Dodge	FWS	FmHA easement under the NWR	Thomsen, Vern	Section 32, T19N, R7E
Dodge	FWS	FmHA easement under the NWR	Tuma	SE 1/4 Section 23, T19N, R5E
Dodge	FWS	Waterfowl Production Area	Haseman WPA	
Dodge	NGPC	State Recreation Area	Dead Timber SRA	
Dodge	NGPC	State Recreation Area	Fremont Lakes SRA	
Dodge	NGPC	Wildlife Management Area	Powder Horn WMA	
Douglas	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Douglas	NGPC	State Recreation Area	Two Rivers SRA	
Douglas	NGPC	Wildlife Management Area	Two Rivers WMA	
Dundy	FWS	FmHA easement under the NWR	Jones, Daniel	Sections 29, 20, T1N, R41/42W
Dundy	NGPC	State Recreation Area	Rock Creek Lake SRA	
Fillmore	FWS	Waterfowl Production Area	Real WPA	
Fillmore	FWS	Waterfowl Production Area	Griess WPA	
Fillmore	FWS	Waterfowl Production Area	Rauscher WPA	
Fillmore	FWS	Waterfowl Production Area	Rolland WPA	
Fillmore	FWS	Waterfowl Production Area	Morphy WPA	
Fillmore	FWS	Waterfowl Production Area	Brauning WPA	
Fillmore	FWS	Waterfowl Production Area	Wilkins WPA	
Fillmore	FWS	Waterfowl Production Area	Krause WPA	
Fillmore	FWS	Waterfowl Production Area	Mallard Haven WPA	
Fillmore	FWS	Waterfowl Production Area	Millers Pond WPA	
Fillmore	NGPC	Wildlife Management Area	Bluebill WMA	
Fillmore	NGPC	Wildlife Management Area	Sandpiper WMA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Fillmore	NGPC	Wildlife Management Area	Redhead WMA	
Fillmore	NGPC	Wildlife Management Area	Sora WMA	
Fillmore	NGPC	Wildlife Management Area	Marsh Hawk WMA	
Fillmore	TNC	Project Area	Marsh Hawk WMA	
Fillmore	TNC	Project Area	Real WMA	
Franklin	FWS	Waterfowl Production Area	Ritterbush WPA	
Franklin	FWS	Waterfowl Production Area	Macon Lakes WPA	
Franklin	FWS	Waterfowl Production Area	Quadhamer WPA	
Franklin	NGPC	Wildlife Management Area	Limestone Bluffs WMA	
Franklin	NGPC	Wildlife Management Area	Ash Grove WMA	
Frontier	NGPC	State Recreation Area	Red Willow Reservoir SRA	
Frontier	NGPC	State Recreation Area	Medicine Creek SRA	
Frontier	NGPC	Wildlife Management Area	Red Willow Reservoir WMA	
Frontier	NGPC	Wildlife Management Area	Medicine Creek WMA	
Furnas	FWS	FmHA easement under the NWR	Avon Arms	Sections 2, 11, 10, T4N, R23W
Furnas	NGPC	Wildlife Management Area	Oxford WMA	
Furnas	NGPC	Wildlife Management Area	Burton's Bend WMA	Along the Republican River
Gage	FWS	FmHA easement under the NWR	Arlington, Norman	Section 10, T2N, R7E
Gage	FWS	FmHA easement under the NWR	Meints	Sections 25, 26, T2N, R6E
Gage	FWS	FmHA easement under the NWR	Virmar Farms	Sections 3, 4, 33, T2N, R5E
Gage	NGPC	State Recreation Area	Rockford SRA	
Gage	NGPC	Wildlife Management Area	Iron Horse Trail (IHT) WMA	
Gage	NGPC	Wildlife Management Area	Arrowhead WMA	
Gage	NGPC	Wildlife Management Area	Diamond Lake WMA	
Gage	NGPC	Wildlife Management Area	Donald Whitney Memorial WMA	3.5 miles W of Odell

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Gage	NPS	National Monument	Homestead National Monument of America	4.5 miles west of Beatrice
Garden	FWS	National Wildlife Refuge	Crescent Lake NWR	
Garden	NGPC	State Historical Park	Bluewater Battlefield SHP	
Garden	NGPC	State Historical Park	Ash Hollow SHP	
Garden	TNC	Project Area	Graves Ranch	Parts of T20-R45
Garfield	NGPC	State Recreation Area	Calamus Reservoir SRA	
Garfield	NGPC	Wildlife Management Area	Mirdan Canal WMA	
Garfield	NPS	Identified in NPS Nationwide Rivers Inventory	Calamus River	North Loup River to source
Gosper	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Gosper	FWS	Whooping Crane Critical Habitat	Platte River	Platte River from Lexington to Denman
Gosper	FWS	Waterfowl Production Area	Elley WPA	
Gosper	FWS	Waterfowl Production Area	Peterson WPA	
Gosper	FWS	Waterfowl Production Area	Victor Lakes WPA	
Gosper	NGPC	State Recreation Area	East Phillips Canyon SRA	8 miles S of Lexington
Gosper	NGPC	State Recreation Area	Johnson Lake SRA	
Gosper	NGPC	State Recreation Area	Elwood Reservoir SRA	
Gosper	NGPC	Wildlife Management Area	Plum Creek WMA	
Grant	NGPC	Wildlife Management Area	Frye Lake WMA	
Grant	NGPC	Wildlife Management Area	De Fair Lake WMA	1.5 miles E, 3 S of Hyannis
Grant	NPS	Natural Landmark	Nebraska Sandhills	Immediately S. of Hyannis
Greeley	NGPC	Wildlife Management Area	Davis Creek WMA	
Hall	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Hall	FWS	FmHA easement under the NWR	Hannon	Sections 9, 10, T9N, R12W
Hall	FWS	Waterfowl Production Area	Hannon WPA	
Hall	NGPC	State Recreation Area	Cheyenne SRA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Hall	NGPC	State Recreation Area	Mormon Island SRA	
Hall	NGPC	Wildlife Management Area	Cornhusker Farm WMA	
Hall	NGPC	Wildlife Management Area	Cattail WMA	3 miles W Alda INT
Hall	NGPC	Wildlife Management Area	Wood River West WMA	4 miles S. of Wood River
Hall	NGPC	Wildlife Management Area	Martin's Reach WMA	
Hall	NGPC	Wildlife Management Area	Loch Linda WMA	
Hall	TNC	Project Area	Various Platte River	Parts of T9-R11, T10-R10
Hamilton	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Hamilton	FWS	FmHA easement under the NWR	Mowitz, Eldred	Section 10, T12N, R5W
Hamilton	FWS	FmHA easement under the NWR	Larson, Steven	Section 18, T10N, R6W
Hamilton	FWS	Waterfowl Production Area	Troester Basin WPA	
Hamilton	FWS	Waterfowl Production Area	Springer WPA	
Hamilton	FWS	Waterfowl Production Area	Nelson WPA	
Hamilton	NGPC	Wildlife Management Area	Deep Well WMA	
Hamilton	NGPC	Wildlife Management Area	Pintail WMA	
Hamilton	NGPC	Wildlife Management Area	Gadwall WMA	
Harlan	COE	Large Reservoir	Harlan County Lake	
Harlan	NGPC	Wildlife Management Area	Burton's Bend WMA	Along the Republican River
Harlan	NGPC	Wildlife Management Area	Southeast Sacramento WMA	
Harlan	NGPC	Wildlife Management Area	South Sacramento WMA	
Hayes	NGPC	Wildlife Management Area	Frenchman WMA	1.5 miles N of Palisade
Hayes	NGPC	Wildlife Management Area	Hayes Center WMA	
Hitchcock	NGPC	State Recreation Area	Swanson Reservoir SRA	
Hitchcock	NGPC	Wildlife Management Area	Swanson Reservoir WMA	
Holt	FWS	Piping Plover Critical Habitat	Niobrara River	Niobrara R. from Norden Bridge to mouth at Missouri River

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Holt	NGPC	State Recreation Area	Atkinson Lake SRA	
Holt	NGPC	Wildlife Management Area	Dry Creek WMA	
Holt	NGPC	Wildlife Management Area	Redbird WMA	
Holt	NGPC	Wildlife Management Area	Spencer Dam WMA	22 miles N of O'Neill
Holt	NGPC	Wildlife Management Area	Goose Lake WMA	2 miles N of Royal
Holt	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek
Holt	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Missouri River to Keya Paha River
Hooker	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Loup River	Milbourn Diversion Dam to source
Howard	FWS	Piping Plover Critical Habitat	Loup River	Loup River (proper - not the North, South, or Middle Loup - i.e., mainstem of Loup River)
Howard	FWS	FmHA easement under the NWR	Gillilavd	Section 1, T14N, R12W
Howard	NGPC	State Recreation Area	North Loup SRA	
Howard	NGPC	Wildlife Management Area	Harold W. Andersen WMA	
Howard	NGPC	Wildlife Management Area	Loup Bottoms/Junction WMA	
Howard	NGPC	Wildlife Management Area	Leonard A. Koziol WMA	1.5 miles E, 3 N of St. Paul
Howard	NGPC	Wildlife Management Area	Marsh Wren WMA	1.5 miles S, 2 E of Elba
Jefferson	NGPC	State Recreation Area	Rock Creek Station SRA	
Jefferson	NGPC	State Recreation Area	Alexandria Lakes SRA	
Jefferson	NGPC	State Historical Park	Rock Creek Station SHP	
Jefferson	NGPC	Wildlife Management Area	Rock Glen WMA	
Jefferson	NGPC	Wildlife Management Area	Rose Creek WMA	
Jefferson	NGPC	Wildlife Management Area	Alexandria Lakes WMA	
Jefferson	NGPC	Wildlife Management Area	Flathead WMA	1 mile S. of Fairbury

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Johnson	NGPC	Wildlife Management Area	Hickory Ridge WMA	
Johnson	NGPC	Wildlife Management Area	Osage WMA	
Johnson	NGPC	Wildlife Management Area	Twin Oaks WMA	
Kearney	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Kearney	FWS	Whooping Crane Critical Habitat	Platte River	Platte River from Lexington to Denman
Kearney	FWS	ESA Mitigation Land	Wyoming property	2 miles E, 1 mile S of Kearney; owned by WY state for mitigation purposes
Kearney	FWS	FmHA easement under the NWR	Nickels Brothers	NW 1/4 Section 7, T7N, R15W
Kearney	FWS	FmHA easement under the NWR	Johansen, Bruce	Section 11, T6N, R14W
Kearney	FWS	Waterfowl Production Area	Killdeer WPA	
Kearney	FWS	Waterfowl Production Area	Clark WPA	
Kearney	FWS	Waterfowl Production Area	Youngson WPA	
Kearney	FWS	Waterfowl Production Area	Frerichs WPA	
Kearney	FWS	Waterfowl Production Area	Lindau WPA	
Kearney	FWS	Waterfowl Production Area	Jensen WPA	
Kearney	FWS	Waterfowl Production Area	Gleason WPA	
Kearney	FWS	Waterfowl Production Area	Bluestem WPA	
Kearney	FWS	Waterfowl Production Area	Prairie Dog WPA	
Kearney	NGPC	State Recreation Area	Fort Kearney SRA	
Kearney	NGPC	State Historical Park	Fort Kearney SHP	
Kearney	NGPC	Wildlife Management Area	Northeast Sacramento WMA	
Keith	NGPC	State Recreation Area	Lake McConaughy SRA	
Keith	NGPC	State Recreation Area	Lake Ogallala SRA	
Keith	NGPC	Wildlife Management Area	Big Springs WMA	0.5 mile E of Big Springs
Keith	NGPC	Wildlife Management Area	Clear Creek WMA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Keith	NGPC	Wildlife Management Area	Ogallala Strip WMA	
Keya Paha	FWS	Piping Plover Critical Habitat	Niobrara River	Niobrara R. from Norden Bridge to mouth at Missouri River
Keya Paha	FWS	FmHA easement under the NWR	Johnson, Cecil	Section 5, T34N, R30W
Keya Paha	FWS	FmHA easement under the NWR	Mead, Darrell	Sections 20, 21, 28, 29, T32N, R19W
Keya Paha	FWS	FmHA easement under the NWR	Johnson, Cecil	Section 32, T35N, R30W
Keya Paha	NGPC	Wildlife Management Area	Thomas Creek WMA	
Keya Paha	NGPC	Wildlife Management Area	Holt Creek WMA	6 miles W, 5 N of Burton
Keya Paha	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek (Omit Cornell Dam & Reservoir)
Keya Paha	NPS	National Scenic River	Niobrara River	From Valentine 76 miles downstream
Keya Paha	TNC	Project Area	Niobrara Valley Preserve	Parts of T33-R23 and R-24
Kimball	NGPC	State Recreation Area	Oliver Reservoir SRA	
Knox	BIA	Indian Reservation	Santee Indian Reservation	
Knox	FWS	Piping Plover Critical Habitat	Niobrara River and Missouri River	Niobrara R. from Norden Bridge to mouth at Missouri River; Missouri R. from S.D. border to river mile 252.2 (at Ponca)
Knox	FWS	FmHA easement under the NWR	Wagner, Raymond 11C	Section 8, T29N, R6W
Knox	FWS	FmHA easement under the NWR	Wagner, Raymond 10C	SE 1/4 Section 6, T29N, R6W
Knox	FWS	FmHA easement under the NWR	Larson Farms	Sections 19, 20, T31N, R5W
Knox	NGPC	State Recreation Area	Lewis and Clark SRA	
Knox	NGPC	State Park	Niobrara SP	
Knox	NGPC	Wildlife Management Area	Greenvale WMA	
Knox	NGPC	Wildlife Management Area	Niobrara WMA	
Knox	NGPC	Wildlife Management Area	Bazile Creek WMA	
Knox	NGPC	Wildlife Management Area	Bohemia Prairie WMA	
Knox	NGPC	Wildlife Management Area	Ferry Landing WMA	3 miles E of Niobrara

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Knox	NGPC	Wildlife Management Area	Verdel Landing WMA	2 miles E, 2 N of Verdel
Knox	NPS	National Recreational River	Missouri River	Running Water SD to Fort Randall Dam
Knox	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Missouri River to Keya Paha River
Lancaster	NGPC	State Recreation Area	Conestoga Lake SRA	
Lancaster	NGPC	State Recreation Area	Stagecoach Lake SRA	
Lancaster	NGPC	State Recreation Area	Bluestem Lake SRA	
Lancaster	NGPC	State Recreation Area	Olive Creek Lake SRA	
Lancaster	NGPC	State Recreation Area	Pawnee Lake SRA	
Lancaster	NGPC	State Recreation Area	Branched Oak Lake SRA	
Lancaster	NGPC	State Recreation Area	Wagon Train Lake SRA	
Lancaster	NGPC	Wildlife Management Area	Wildwood WMA	
Lancaster	NGPC	Wildlife Management Area	Arbor Lake WMA	Saline wetlands of eastern Nebraska; unique habitat for Salt Creek Tiger Beetle (federally listed) & saltwort (state listed)
Lancaster	NGPC	Wildlife Management Area	Branched Oak Lake WMA	
Lancaster	NGPC	Wildlife Management Area	Yankee Hill WMA	
Lancaster	NGPC	Wildlife Management Area	Jack Sinn Memorial WMA	Saline wetlands of eastern Nebraska; unique habitat for Salt Creek Tiger Beetle (federally listed) & saltwort (state listed)
Lancaster	NGPC	Wildlife Management Area	Killdeer WMA	
Lancaster	NGPC	Wildlife Management Area	Hedgefield WMA	
Lancaster	NGPC	Wildlife Management Area	Teal Lake WMA	
Lancaster	TNC	Project Area	Little Salt Fork Marsh	Parts of T11 and 12-R6; Saline Wetlands of eastern Nebraska
Lincoln	NGPC	State Historical Park	Buffalo Bill Ranch SHP	
Lincoln	NGPC	State Recreation Area	Lake Maloney Reservoir SRA	
Lincoln	NGPC	State Recreation Area	Sutherland Reservoir SRA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Lincoln	NGPC	State Recreation Area	Buffalo Bill Ranch SRA	
Lincoln	NGPC	Wildlife Management Area	West Gothenburg WMA	N & S I-80, 3 miles W of Brady
Lincoln	NGPC	Wildlife Management Area	Sutherland Reservoir WMA	
Lincoln	NGPC	Wildlife Management Area	East Sutherland WMA	
Lincoln	NGPC	Wildlife Management Area	Brady WMA	SE Quad, Brady INT
Lincoln	NGPC	Wildlife Management Area	West Brady WMA	S I-80, 3 miles W of Brady
Lincoln	NGPC	Wildlife Management Area	North River WMA	
Lincoln	NGPC	Wildlife Management Area	Muskrat Run WMA	
Lincoln	NGPC	Wildlife Management Area	Hershey WMA	
Lincoln	NGPC	Wildlife Management Area	East Hershey WMA	
Lincoln	NGPC	Wildlife Management Area	West Hershey WMA	N I-80, 0.5 mile W Hershey INT
Lincoln	NGPC	Wildlife Management Area	Birdwood Lake WMA	
Lincoln	NGPC	Wildlife Management Area	Platte WMA	
Lincoln	NGPC	Wildlife Management Area	Box Elder Canyon WMA	
Lincoln	NGPC	Wildlife Management Area	Wellfleet WMA	
Lincoln	NGPC	Wildlife Management Area	Pawnee Slough WMA	
Lincoln	NGPC	Wildlife Management Area	Cottonwood Canyon WMA	
Lincoln	NGPC	Wildlife Management Area	Chester Island WMA	
Lincoln	NGPC	Wildlife Management Area	Jeffrey Canyon WMA	
Lincoln	NGPC	Wildlife Management Area	Hansen Memorial Reserve WMA	
Lincoln	NGPC	Wildlife Management Area	Cedar Valley WMA	
Lincoln	NGPC	Wildlife Management Area	Fremont Slough WMA	N I-80, 4.5 miles E of North Platte
Lincoln	NGPC	Wildlife Management Area	West Maxwell WMA	N I-80, 1 mile W Maxwell INT
Lincoln	NPS	Natural Landmark	Kissected Loess Plains	17 miles SSW of Brady
Lincoln	TNC	Project Area	Muskrat Run WMA	302 acres, N Platte River
Lincoln	TNC	Project Area	Kelly Ranch	Parts of T14-R33 and R34

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Loup	NGPC	State Recreation Area	Calamus Reservoir SRA	
Loup	NGPC	Wildlife Management Area	Calamus Reservoir WMA	
Loup	NGPC	Wildlife Management Area	Almeria Meadow WMA	
Loup	NGPC	Wildlife Management Area	Kent Diversion Dam WMA	
Loup	NGPC	Wildlife Management Area	Myrtle E. Hall WMA	
Loup	NPS	Identified in NPS Nationwide Rivers Inventory	Calamus River	North Loup River to source
Madison	FWS	FmHA easement under the NWR	Muhs	Section 24, T23N, R2W
Madison	FWS	Topeka Shiner Critical Habitat	Taylor Creek	the 6 mi. upstream from confluence w/ Union Creek
Madison	NGPC	Wildlife Management Area	Oak Valley WMA	
Madison	NGPC	Wildlife Management Area	Elkhorn WMA	N edge of Norfolk
Madison	NGPC	Wildlife Management Area	Yellowbanks WMA	
Merrick	FWS	Piping Plover Critical Habitat	Platte River and Loup River	Platte River from Lexington to mouth at Missouri River; Loup River (proper - not the North, South, or Middle Loup - i.e., mainstem of Loup River)
Merrick	NGPC	Wildlife Management Area	Bruce Cowgill WMA	1.5 mile E of Silver Creek
Merrick	NGPC	Wildlife Management Area	Lone Tree WMA	inaccessible (island?)
Merrick	NGPC	Wildlife Management Area	Silver Creek WMA	
Morrill	NGPC	State Recreation Area	Bridgeport SRA	
Morrill	NGPC	Wildlife Management Area	Chet and Jane Fliesbach WMA	
Morrill	NGPC	Wildlife Management Area	Trupp WMA	
Morrill	NPS	National Historic Site	Chimney Rock National Historic Site	19 miles east of Gering on Hwy 92
Nance	FWS	Piping Plover Critical Habitat	Loup River	Loup River (proper - not the North, South, or Middle Loup - i.e., mainstem of Loup River)
Nance	NGPC	Wildlife Management Area	Loup Lands (Loup River PPD) WMA	
Nance	NGPC	Wildlife Management Area	Sunny Hollow WMA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Nance	NGPC	Wildlife Management Area	Council Creek WMA	6.5 miles W of Genoa
Nance	NGPC	Wildlife Management Area	Prairie Wolf WMA	
Nemaha	NGPC	State Park	Indian Cave SP	
Nemaha	NGPC	State Recreation Area	Brownville SRA	
Nemaha	NGPC	Wildlife Management Area	Peru Bottoms WMA	1 mile E, 1 N of Peru
Nemaha	NGPC	Wildlife Management Area	Aspinwall Bend WMA	
Nuckolls	NGPC	Wildlife Management Area	Smartweed Marsh West WMA	
Nuckolls	NGPC	Wildlife Management Area	Smartweed Marsh WMA	
Otoe	NGPC	State Recreation Area	Riverview Marina SRA	
Otoe	NGPC	State Historical Park	Arbor Lodge SHP	
Otoe	NGPC	Wildlife Management Area	Triple Creek WMA	
Otoe	NGPC	Wildlife Management Area	Wilson Creek WMA	2 mile N, 2 W, 0.5 N of Dunbar
Otoe	NGPC	Wildlife Management Area	Hamburg Bend WMA	1 mile S, 4.5 E, 1 S, 0.5 E of Nebraska City
Pawnee	NGPC	Wildlife Management Area	Burchard WMA	
Pawnee	NGPC	Wildlife Management Area	Bowwood WMA	
Pawnee	NGPC	Wildlife Management Area	Iron Horse Trail WMA	
Pawnee	NGPC	Wildlife Management Area	Mayberry WMA	
Pawnee	NGPC	Wildlife Management Area	Table Rock WMA	
Pawnee	NGPC	Wildlife Management Area	Taylor's Branch WMA	
Pawnee	NGPC	Wildlife Management Area	Pawnee Prairie WMA	
Pawnee	NGPC	Wildlife Management Area	Prairie Knoll WMA	
Pawnee	NGPC	Wildlife Management Area	Lores Branch WMA	
Pawnee	TNC	Project Area	Pawnee Prairie WMA	
Phelps	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Phelps	FWS	Whooping Crane Critical Habitat	Platte River	Platte River from Lexington to Denman

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Phelps	FWS	Waterfowl Production Area	Johnson WPA	
Phelps	FWS	Waterfowl Production Area	Funk WPA	
Phelps	FWS	Waterfowl Production Area	Atlanta WPA	
Phelps	FWS	Waterfowl Production Area	Jones WPA	
Phelps	FWS	Waterfowl Production Area	Cottonwood WPA	
Phelps	FWS	Waterfowl Production Area	Linder WPA	
Phelps	NGPC	State Recreation Area	Sandy Channel SRA	
Phelps	NGPC	Wildlife Management Area	High Basin WMA	
Phelps	NGPC	Wildlife Management Area	West Sacramento WMA	
Phelps	NGPC	Wildlife Management Area	Sacramento - Wilcox WMA	
Phelps	NPPD	ESA Mitigation Land	Cottonwood Ranch	
Phelps	TNC	Project Area	Anderson	Part of T8-R19
Pierce	NGPC	State Recreation Area	Willow Creek SRA	
Platte	FWS	Piping Plover Critical Habitat	Platte River and Loup River	Platte River from Lexington to mouth at Missouri River; Loup River (proper - not the North, South, or Middle Loup - i.e., mainstem of Loup River)
Platte	NGPC	Wildlife Management Area	Lookingglass Creek WMA	
Platte	NGPC	Wildlife Management Area	George Syas WMA	
Platte	NGPC	Wildlife Management Area	Flat Water Landing WMA	1 mile S. of Columbus
Platte	NGPC	Wildlife Management Area	Wilkinson WMA	5 miles W, 1 N of Columbus
Polk	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Polk	FWS	FmHA easement under the NWR	Viergutz, James R.	Sections 11, 12, 13, T14N, R4W
Polk	FWS	FmHA easement under the NWR	Warner Farms	Section 33, T13N, R3W
Polk	FWS	FmHA easement under the NWR	Anderson, Bruce L.	SE 1/4 Section 34, T14N, R2W
Polk	NGPC	Wildlife Management Area	Flatsedge WMA	2.5 miles W, 2 N of Shelby

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Red Willow	NGPC	State Recreation Area	Red Willow Reservoir SRA	
Red Willow	NGPC	Wildlife Management Area	Bartley Diversion Dam WMA	
Red Willow	NGPC	Wildlife Management Area	Burton's Bend WMA	Along the Republican River
Red Willow	NGPC	Wildlife Management Area	Red Willow Reservoir WMA	
Red Willow	NGPC	Wildlife Management Area	Red Willow Diversion Dam WMA	
Richardson	NGPC	State Recreation Area	Verdon Lake SRA	
Richardson	NGPC	State Park	Indian Cave SP	
Richardson	NGPC	Wildlife Management Area	Four-Mile Creek WMA	
Richardson	NGPC	Wildlife Management Area	Margrave WMA	
Richardson	NGPC	Wildlife Management Area	Iron Horse Trail WMA	
Richardson	NGPC	Wildlife Management Area	South Fork WMA	2.5 miles S, 3.5 W of Dawson
Richardson	NGPC	Wildlife Management Area	Kinters Ford WMA	
Richardson	TNC	Project Area	Rulo Bluffs	
Richardson	TNC	Project Area	Rulo Bluffs	Parts of T1-R18
Rock	FWS	Piping Plover Critical Habitat	Niobrara River	Niobrara R. from Norden Bridge to mouth at Missouri River
Rock	FWS	National Wildlife Refuge	John W. & Louise Seier NWR	
Rock	NAS	Wildlife Sanctuary	Niobrara River	
Rock	NGPC	Wildlife Management Area	Fred Thomas WMA	11.5 miles N of Bassett on Hwy 7
Rock	NGPC	Wildlife Management Area	Twin Lakes (Rock) WMA	20 miles S. of Bassett
Rock	NPS	Identified in NPS Nationwide Rivers Inventory	Lone Pine Creek	Niobrara River to source
Rock	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek
Rock	NPS	Identified in NPS Nationwide Rivers Inventory	Calamus River	North Loup River to source
Saline	FWS	Waterfowl Production Area	Schwisow WPA	
Saline	NGPC	Wildlife Management Area	Swan Creek WMA	
Saline	NGPC	Wildlife Management Area	Divoky Acres WMA	9 miles W, 2.5 N of Wilber

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Saline	NGPC	Wildlife Management Area	Shady Trail WMA	1 mile W, 4 N, 0.5 W, 0.5 N of Crete
Sarpy	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Sarpy	NGPC	State Recreation Area	Schramm Park SRA	
Sarpy	NGPC	Wildlife Management Area	Louisville WMA	0.5 mile NW of Louisville
Sarpy	NPS	Natural Landmark	Fontenelle Forest	1 Mile S. of Omaha
Saunders	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Saunders	FWS	FmHA easement under the NWR	Keller, Lynn	Section 1, T16N, R7E
Saunders	FWS	FmHA easement under the NWR	Thomas Farms	Sections 12,13, T13N, R9E
Saunders	FWS	FmHA easement under the NWR	Keller, Lynn	Section 6, T16N, R8E
Saunders	NGPC	State Recreation Area	Pioneer SRA	
Saunders	NGPC	State Recreation Area	Memphis Lake SRA	
Saunders	NGPC	Wildlife Management Area	Jack Sinn Memorial WMA	Saline wetlands of eastern Nebraska; unique habitat for Salt Creek Tiger Beetle (federally listed) & saltwort (state listed)
Saunders	NGPC	Wildlife Management Area	Memphis Lake WMA	
Saunders	NGPC	Wildlife Management Area	Bramble WMA	
Saunders	NGPC	Wildlife Management Area	Catfish Run WMA	1.2 mile E of Ashland
Saunders	NGPC	Wildlife Management Area	Larkspur WMA	3 miles W of Valparaiso
Scotts Bluff	FWS	National Wildlife Refuge	North Platte NWR	
Scotts Bluff	NGPC	State Recreation Area	Lake Minitare SRA	
Scotts Bluff	NGPC	State Recreation Area	Wildcat Hills SRA	
Scotts Bluff	NGPC	Wildlife Management Area	Nine Mile Creek WMA	
Scotts Bluff	NGPC	Wildlife Management Area	Kiowa WMA	
Scotts Bluff	NGPC	Wildlife Management Area	Cedar Canyon WMA	2.5 miles S and 4.5 W of Gering
Scotts Bluff	NPS	National Monument	Scotts Bluff National Monument	5 miles SW of Scotts Bluff
Scotts Bluff	TNC	Project Area	Kiowa WMA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Seward	FWS	Waterfowl Production Area	Tamora Basin WPA	
Seward	FWS	Waterfowl Production Area	Freeman Lakes WPA	
Seward	NGPC	State Recreation Area	Blue River SRA	
Seward	NGPC	Wildlife Management Area	Straight Water WMA	
Seward	NGPC	Wildlife Management Area	Oak Glen WMA	
Seward	NGPC	Wildlife Management Area	Bur Oak WMA	
Seward	NGPC	Wildlife Management Area	Twin Lakes WMA	
Seward	NGPC	Wildlife Management Area	Blue Bluff WMA	3 miles S, 1 E, 1 N of Milford
Seward	NGPC	Wildlife Management Area	North Lake Basin WMA	
Sheridan	NGPC	State Recreation Area	Walgren Lake SRA	
Sheridan	NGPC	Wildlife Management Area	Smith Lake WMA	
Sheridan	NGPC	Wildlife Management Area	Metcalf WMA	
Sheridan	NPS	Identified in NPS Nationwide Rivers Inventory	Snake River	Niobrara River to source
Sherman	NGPC	State Recreation Area	Bowman Lake SRA	
Sherman	NGPC	State Recreation Area	Sherman Reservoir SRA	
Sherman	NGPC	Wildlife Management Area	Sherman Reservoir WMA	
Sioux	NGPC	State Park	Fort Robinson SP	
Sioux	NGPC	State Recreation Area	James Ranch SRA	
Sioux	NGPC	Wildlife Management Area	Peterson WMA	
Sioux	NGPC	Wildlife Management Area	Gilbert-Baker WMA	
Sioux	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Entire segment within Agate Fossil Beds National Monument
Sioux	NPS	National Monument	Agate Fossil Beds National Monument	20 miles north of Harrison
Sioux	TNC	Project Area	Cherry Ranch	Parts of T29 and 30-R56
Sioux	USFS	National Forest/Grassland	Oglala National Grassland	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Sioux	USFS	National Wilderness Area	Soldier Creek Wilderness	Nebraska NF
Stanton	NGPC	Wildlife Management Area	Red Fox WMA	
Stanton	NGPC	Wildlife Management Area	Wood Duck WMA	
Thayer	FWS	FmHA easement under the NWR	Gerdes, Don	Section 9, T2N, R2W
Thayer	NGPC	Wildlife Management Area	Prairie Marsh WMA	
Thayer	NGPC	Wildlife Management Area	Father Hupp WMA	
Thayer	NGPC	Wildlife Management Area	Meridian WMA	
Thayer	NGPC	Wildlife Management Area	Prairie Marsh West WMA	
Thayer	NGPC	Wildlife Management Area	Little Blue WMA	
Thayer	NGPC	Wildlife Management Area	Dry Sandy WMA	2 miles E, 0.75 N of Bruning
Thayer	NGPC	Wildlife Management Area	Little Blue East WMA	1.5 miles E of Hebron
Thayer	TNC	Project Area	Prairie Marsh WMA	
Thomas	NPS	Identified in NPS Nationwide Rivers Inventory	Dismal River	Middle Loup Rive to source
Thomas	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Loup River	Milburn Diversion Dam to source
Thomas	USFS	National Forest	Nebraska National Forest - Bessey District	
Thurston	BIA	Indian Reservation	Omaha Indian Reservation	
Thurston	BIA	Indian Reservation	Winnebago Indian Reservation	
Valley	FWS	FmHA easement under the NWR	Plate, Willis	Section 34, T17N, R13W
Valley	FWS	FmHA easement under the NWR	Wayne, Gregory	Section 33, T20N, R13W
Valley	FWS	FmHA easement under the NWR	Wayne, Gregory	Sections 3 and 4, T19N, R13W
Valley	NGPC	State Historical Park	Fort Hartsuff SHP	
Valley	NGPC	Wildlife Management Area	Davis Creek WMA	
Valley	NGPC	Wildlife Management Area	Scotia Canal WMA	
Washington	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Washington	FWS	National Wildlife Refuge	Boyer Chute NWR	
Washington	FWS	National Wildlife Refuge	DeSoto NWR	
Washington	NGPC	State Historical Park	Fort Atkinson SHP	
Washington	TNC	Project Area	Cuming City Cemetery	
Wayne	NGPC	Wildlife Management Area	Sioux Strip WMA	
Webster	NGPC	Wildlife Management Area	Indian Creek WMA	
Webster	NGPC	Wildlife Management Area	Narrows WMA	
Webster	NGPC	Wildlife Management Area	Elm Creek WMA	
Webster	TNC	Project Area	Willa Cather Memorial Prairie	
Webster	TNC	Project Area	Willa Cather Memorial Prairie	Part of T1-R11
Wheeler	NGPC	State Recreation Area	Pibel Lake SRA	
York	FWS	FmHA easement under the NWR	Gocke, Raymond	Section 33, T12N, R1W
York	FWS	FmHA easement under the NWR	Jack R. Anstine	Section 28, T11N, R2W
York	FWS	FmHA easement under the NWR	Gocke, Raymond	Section 28, T12N, R1W
York	FWS	FmHA easement under the NWR	Thiessen, Harvey	Section 9, T9N, R2W
York	FWS	Waterfowl Production Area	Sinninger WPA	
York	FWS	Waterfowl Production Area	County Line WPA	
York	FWS	Waterfowl Production Area	Heron WPA	
York	FWS	Waterfowl Production Area	Waco WPA	
York	NGPC	Wildlife Management Area	Renquist Basin WMA	
York	NGPC	Wildlife Management Area	Kirkpatrick Basin - S WMA	
York	NGPC	Wildlife Management Area	Kirkpatrick Basin - N WMA	
York	NGPC	Wildlife Management Area	Spikerush WMA	
York	NGPC	Wildlife Management Area	Hidden Marsh WMA	

APPENDIX A.2.a

EXAMPLE HABITAT FACT SHEET

UPPER MISSISSIPPI RIVER BASIN ASSOCIATION DEEP MARSH ANNUAL FACT SHEET

INLAND STRANDED OIL HABITAT FACT SHEET FOR RESPONSE:

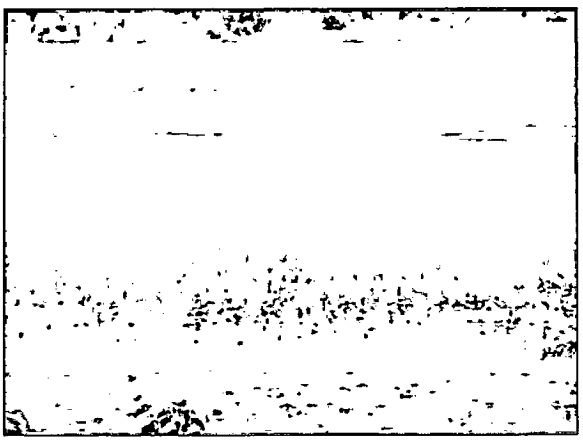
DEEP MARSH ANNUAL

Indicator Species



wild rice (*Zizania)*

I. Habitat Description



The deep marsh annuals habitat includes portions of lakes, ponds, marshes, or backwaters that are >10% vegetated with wild rice (*Zizania*). While this habitat is dominated by wild rice, it may have inclusions of submersed, non-rooted-floating aquatics, rooted-floating aquatics, or emergent vegetation. Deep marsh annuals are typically found in areas which are flooded semipermanently and have water depths between 0.25 and 2 meters with a silt or mucky bottom. During normal water conditions, there is little flow, though there can be wind-generated currents and stronger flows at inlets and outlets. During flood conditions, these habitats can be connected to rivers or streams, have strong currents, and the potential to carry large amounts of debris.

II. Sensitivity to Oil Spills

The deep marsh annuals habitat is highly sensitive to oil spills. This biologically diverse habitat provides a home to many plants and animal species, including amphibians, reptiles, fish, invertebrates as well as a wide variety of migratory waterfowl and plants. Many animal species use wetlands for reproductive and early life phases, during which they are most susceptible to the effects of oil. Significant loss of this habitat would greatly affect the populations of these animals and consequently, the local ecology. During normal water levels, oil would be less likely to penetrate water-saturated soils; during floods, oil could be deposited in areas that dry out after the flood, and penetrate the loose, organic-rich surface soils.

References/Additional Information:

General Classification Handbook for Floodplain Vegetation in Large River Systems (http://pubs.usgs.gov/tm/2005/tm2A1/)

Inland Oil Spills: Options for Minimizing Environmental Impacts for Freshwater Spill Response (http://www.michigan.gov/documents/deq/deq-wb-wws-FreshwaterResponse_NOAA102706_265069_7.pdf)

NatureServe (natureserve.org)

Natural Wetland Inventory (http://www.fws.gov/wetlands/)

State Natural Heritage Programs (see state website)

The U.S. National Vegetation Classification (http://usnvc.org/)

III. Sensitivity to Response Methods

The following text describes potential adverse impacts to this habitat resulting from various oil spill response methods and provides recommendations to reduce impact when these methods are implemented. This is not intended to preclude the use of any particular methods, but rather to aid responders in balancing the need to remove oil with the possible adverse effects of removal. More detail about the response methods themselves can be found in the Inland Response Tactics Manual.

Least Adverse Habitat Impacts

Exclusion or Deflection Booming

- Boom can be used to exclude or deflect the spill away from sensitive resources.
- Effectiveness is increased by positioning boom at appropriate angles for the current speed.

Sorbents/Sorbent Boom

- Water movement is needed to bring oil to the sorbent. Use on edge of vegetated area only or where water moves.
- Care is necessary during placement and recovery to minimize disturbance of vegetation. Work in boats to avoid driving oil into the sediment.
- Pom-pom type sorbents are best for heavy viscous oils that coat the strands; sorbent boom is best for light, low-viscosity oils that can penetrate into the sorbents.
- Absorbent boom must be changed frequently to prevent it from becoming a source of sheen.

Flooding

- Where there is the ability to control water levels such as locks and dams, this technique could be used to remove trapped oil; otherwise it is very difficult to herd oil trapped in vegetation towards recovery devices in open water. Contact the U.S. Army Corps of Engineers water control regarding lock and dam operation.
- Though this technique may work well, some oil may still be stranded and will need to be removed through other means.

Low-Pressure, Ambient Water Flushing

- Maintain low output pressures (less than 50 psi) to avoid disrupting the substrate and vegetation.
- Effectiveness increases with lighter oils because less residual oil is left in the environment.
- This tactic can be used with flooding to prevent re-deposition of oil.
- Use for spot removal of oil because of the limited area of effectiveness.

In-Situ Burning

- Presence of a water layer on marsh surface can protect roots.
- "Heavy ends" of petroleum product remain unburned and need to be recovered. The burn residue may sink after it cools, so quick removal is needed.
- Need to consider the amount of natural fuel present and the ability to constraint the fire to the oiled areas.
- Authorization of in-situ burning is subject to RRT approval, consultation and concurrence from the state and the Department of the Interior.

Debris/ Vegetation Removal

- Most appropriate for oils that form a persistent, thick, sticky coating on the vegetation, such as medium and heavy oils.
- Removal will release trapped oil and speed natural flushing rates.
- Debris may be associated with nests or living areas (e.g., beaver and muskrat lodges), therefore impacts on resident animal habitat need to be considered.
- If oil is trapped in floating vegetation, removal may be the only way to recover the oil in the absence of water currents.
- May be appropriate to prevent secondary oiling of wildlife.
- Damage by cleanup crews may be reduced by avoiding excessive cutting/removal, controlling access routes, or conducting operations from boats.

Some Adverse Habitat Impact

Natural Attenuation/Phytoremediation

- This technique may have some adverse effects due to the fact that wild rice is an attractive food source and leaving oil could harm birds and other wildlife that come to feed. If that is not an issue, this technique has few effects.
- Lesser impact for small to moderate spills and lighter oils; avoids damage often associated with cleanup activities.
- Some cleanup may be warranted where large numbers of animals are likely to become oiled during wetland use.
- Seeding or planting may be used to assist oil degradation.

Most Adverse Habitat Impact

Light Equipment Oil Removal

- Use equipment such as swamp buggies or light equipment on pontoons.
- Damage to vegetation and substrate may be reduced by controlling access routes, using pontoons or mats, or using a helicopter to bring in equipment.

Sediment Removal

- Vacuum/dredge sediments and dewater using geotube/settling tank. Treat the water and dispose of sediment.
- Excavate the sediment. Dewater the area before excavation.
- The hydrology may change and it may be difficult to restore the plant community that existed prior to the spill incident.
- Permits will be required for sediment removal and for water discharge.

APPENDIX A.3

ECONOMICALLY SENSITIVE AREAS

APPENDIX A.3.a

REGION 7

SURFACE WATER INTAKES

This information is restricted.

Please e-mail kroone.janice@epamail.epa.gov requesting information on how to receive this information.

APPENDIX A.3.b

WATER INTAKES

MISSISSIPPI AND MISSOURI RIVER

This information is restricted.

Please e-mail kroone.janice@epamail.epa.gov requesting information on how to receive this information.

APPENDIX A.4

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES

APPENDIX A.4 TO REGION 7 INTEGRATED CONTINGENCY PLAN

TABLE OF CONTENTS

TABLES

Table **Page**

TABLE A.4.1 FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – IOWA 1

TABLE A.4.2 FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS 9

TABLE A.4.3 FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – MISSOURI 16

TABLE A.4.4 FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA 26

Note: The prairie bush-clover and western prairie fringed orchid potentially occur in all Iowa counties. In addition, the Indiana bat is assumed to occur in all counties south of Interstate 80. The list below indicates only those counties in which these species have actually been collected.

TABLE A.4.1

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – IOWA

COUNTY	NAME	GROUP	STATUS
Adair	Indiana bat (Myotis sodalis)	Mammal	E
Adair	Mead's milkweed (Asclepias meadii)	Plant	T
Adair	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Adair	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Adams	Indiana bat (Myotis sodalis)	Mammal	E
Adams	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Adams	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Allamakee	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Allamakee	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Allamakee	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Allamakee	Northern monkshood (Aconitum novaboracense)	Plant	T
Appanoose	Indiana bat (Myotis sodalis)	Mammal	E
Appanoose	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Appanoose	Western prairie fringed orchid (Platanthaera praeclara)	Plant	T
Audubon	Indiana bat (Myotis sodalis)	Mammal	E
Audubon	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Audubon	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Benton	Indiana bat (Myotis sodalis)	Mammal	E
Benton	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Benton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Black Hawk	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Black Hawk	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Boone	Indiana bat (Myotis sodalis)	Mammal	E
Boone	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Boone	Topeka shiner (Notropis topeka)	Fish	E
Boone	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Bremer	Eastern massasauga (Sistrurus catenatus)	Snake	C
Bremer	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Bremer	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Buchanan	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Buchanan	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Buena Vista	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Buena Vista	Topeka shiner (Notropis Topeka)	Fish	E
Buena Vista	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Butler	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Butler	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Calhoun	Topeka shiner (Notropis topeka)	Fish	E
Calhoun	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Calhoun	Western prairie fringed orchid (Platanthera praeclara)	Plant	T

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TABLE A.4.1

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – IOWA

COUNTY	NAME	GROUP	STATUS
Carroll	Indiana bat (Myotis sodalis)	Mammal	E
Carroll	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Carroll	Topeka shiner (Notropis topeka)	Fish	E
Carroll	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cass	Indiana bat (Myotis sodalis)	Mammal	E
Cass	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Cass	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cedar	Indiana bat (Myotis sodalis)	Mammal	E
Cedar	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Cedar	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cerro Gordo	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C
Cerro Gordo	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Cerro Gordo	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cherokee	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Cherokee	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Chickasaw	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Chickasaw	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Clarke	Indiana bat (Myotis sodalis)	Mammal	E
Clarke	Mead's milkweed (Asclepias meadii)	Plant	T
Clarke	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Clarke	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Clay	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Clay	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Clayton	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Clayton	Iowa pleistocene snail (Discus macclintocki)	Snail	E
Clayton	Northern monkshood (Aconitum novaboracense)	Plant	T
Clayton	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Clayton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Clinton	Indiana bat (Myotis sodalis)	Mammal	E
Clinton	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Clinton	Iowa pleistocene snail (Discus macclintocki)	Snail	E
Clinton	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Clinton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Crawford	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Crawford	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dallas	Indiana bat (Myotis sodalis)	Mammal	E
Dallas	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Dallas	Topeka shiner (Notropis topeka)	Fish	E
Dallas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Davis	Indiana bat (Myotis sodalis)	Mammal	E
Davis	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Davis	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Decatur	Indiana bat (Myotis sodalis)	Mammal	E
Decatur	Mead's milkweed (Asclepias meadii)	Plant	T
Decatur	Eastern prairie fringed orchid (Platanthaera leucophaea)	Plant	T

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COUNTY	NAME	GROUP	STATUS
Decatur	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Decatur	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Delaware	Northern monkshood (Aconitum novaboracense)	Plant	T
Delaware	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Delaware	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Des Moines	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Des Moines	Indiana bat (Myotis sodalis)	Mammal	E
Des Moines	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Des Moines	Spectaclecase mussel (Cumberlandia monodonta)	Mussel	E
Des Moines	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dickenson	Dakota skipper (Hesperia dacotae)	Butterfly	C
Dickenson	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C
Dickenson	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Dickenson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dubuque	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Dubuque	Iowa pleistocene snail (Discus macclintocki)	Snail	E
Dubuque	Northern monkshood (Aconitum novaboracense)	Plant	T
Dubuque	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Dubuque	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Emmet	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C
Emmet	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Emmet	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Fayette	Iowa pleistocene snail (Discus macclintocki)	Snail	E
Fayette	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Fayette	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Floyd	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Floyd	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Franklin	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Franklin	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Fremont	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Fremont	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Fremont	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Greene	Indiana bat (Myotis sodalis)	Mammal	E
Greene	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Greene	Topeka shiner (Notropis topeka)	Fish	E
Greene	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Grundy	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Grundy	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Guthrie	Indiana bat (Myotis sodalis)	Mammal	E
Guthrie	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Guthrie	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hamilton	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Hamilton	Topeka shiner (Notropis topeka)	Fish	E
Hamilton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hancock	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C

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COUNTY	NAME	GROUP	STATUS
Hancock	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Hancock	Topeka shiner (Notropis topeka)	Fish	E
Hancock	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hardin	Northern monkshood (Aconitum novaboracense)	Plant	T
Hardin	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Hardin	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Harrison	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Harrison	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Harrison	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Henry	Indiana bat (Myotis sodalis)	Mammal	E
Henry	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Henry	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Howard	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C
Howard	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Howard	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Humboldt	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Humboldt	Topeka shiner (Notropis topeka)	Fish	E
Humboldt	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Ida	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Ida	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Iowa	Indiana bat (Myotis sodalis)	Mammal	E
Iowa	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Iowa	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jackson	Eastern prairie fringed orchid (Platanthaera leucophaea)	Plant	T
Jackson	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Jackson	Iowa pleistocene snail (Discus macclintocki)	Snail	E
Jackson	Northern monkshood (Aconitum novaboracense)	Plant	T
Jackson	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Jackson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jasper	Indiana bat (Myotis sodalis)	Mammal	E
Jasper	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Jasper	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jefferson	Indiana bat (Myotis sodalis)	Mammal	E
Jefferson	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Jefferson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Johnson	Eastern prairie fringed orchid (Platanthaera leucophaea)	Plant	T
Johnson	Eastern massasauga rattlesnake (Sistrurus catenatus catenatus)	Snake	C
Johnson	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Johnson	Indiana bat (Myotis sodalis)	Mammal	E
Johnson	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Johnson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jones	Eastern prairie fringed orchid (Platanthaera leucophaea)	Plant	T
Jones	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Jones	Indiana bat (Myotis sodalis)	Mammal	E
Jones	Prairie bush clover (Lespedeza leptostachya)	Plant	T

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COUNTY	NAME	GROUP	STATUS
Jones	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Keokuk	Indiana bat (Myotis sodalis)	Mammal	E
Keokuk	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Keokuk	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Kossuth	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C
Kossuth	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Kossuth	Topeka shiner (Notropis topeka)	Fish	E
Kossuth	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lee	Indiana bat (Myotis sodalis)	Mammal	E
Lee	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Lee	Sheepnose mussel (Plethobasus cyphyus)	Mussel	E
Lee	Spectaclecase mussel (Cumberlandia monodonta)	Mussel	E
Lee	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Linn	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Linn	Indiana bat (Myotis sodalis)	Mammal	E
Linn	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Linn	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Louisa	Eastern massasauga rattlesnake (Sistrurus catenatus catenatus)	Snake	C
Louisa	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Louisa	Indiana bat (Myotis sodalis)	Mammal	E
Louisa	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Louisa	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lucas	Indiana bat (Myotis sodalis)	Mammal	E
Lucas	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Lucas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lyon	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Lyon	Topeka shiner (Notropis topeka)	Fish	E
Lyon	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Madison	Indiana bat (Myotis sodalis)	Mammal	E
Madison	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Madison	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Mahaska	Indiana bat (Myotis sodalis)	Mammal	E
Mahaska	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Mahaska	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Marion	Indiana bat (Myotis sodalis)	Mammal	E
Marion	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Marion	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Marshall	Indiana bat (Myotis sodalis)	Mammal	E
Marshall	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Marshall	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Mills	Eastern massasauga rattlesnake (Sistrurus catenatus catenatus)	Snake	C
Mills	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Mills	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Mills	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Mitchell	Prairie bush clover (Lespedeza leptostachya)	Plant	T

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COUNTY	NAME	GROUP	STATUS
Mitchell	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Monona	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Monona	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Monona	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Monroe	Indiana bat (Myotis sodalis)	Mammal	E
Monroe	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Monroe	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Montgomery	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Montgomery	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Muscatine	Eastern massasauga rattlesnake (Sistrurus catenatus catenatus)	Snake	C
Muscatine	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Muscatine	Indiana bat (Myotis sodalis)	Mammal	E
Muscatine	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Muscatine	Sheepnose mussel (Plethobasus cyphyus)	Mussel	E
Muscatine	Spectaclecase mussel (Cumberlandia monodonta)	Mussel	E
Muscatine	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
O'Brien	Prairie bush clover (Lespedeza leptostachya)	Plant	T
O'Brien	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Osceola	Poweshiek skipperling (Oarisma Poweshiek)	Butterfly	C
Osceola	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Osceola	Topeka shiner (Notropis topeka)	Fish	E
Osceola	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Page	Indiana bat (Myotis sodalis)	Mammal	E
Page	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Page	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Palto Alto	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Palto Alto	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Plymouth	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Plymouth	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Pocahontas	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Pocahontas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Polk	Indiana bat (Myotis sodalis)	Mammal	E
Polk	Least tern (Sterna antillarum)	Bird	E
Polk	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Polk	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Pottawattamie	Eastern massasauga rattlesnake (Sistrurus catenatus catenatus)	Snake	C
Pottawattamie	Least tern (Sterna antillarum)	Bird	E
Pottawattamie	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Pottawattamie	Piping plover (Charadrius melodus)	Bird	E
Pottawattamie	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Pottawattamie	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Poweshiek	Indiana bat (Myotis sodalis)	Mammal	E
Poweshiek	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Poweshiek	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Ringgold	Indiana bat (Myotis sodalis)	Mammal	E

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COUNTY	NAME	GROUP	STATUS
Ringgold	Mead's milkweed (Asclepias meadii)	Plant	T
Ringgold	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Ringgold	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Sac	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Sac	Topeka shiner (Notropis topeka)	Fish	E
Sac	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Scott	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Scott	Indiana bat (Myotis sodalis)	Mammal	E
Scott	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Scott	Spectaclecase mussel (Cumberlandia monodonta)	Mussel	E
Scott	Sheepnose mussel (Plethobasus cyphyus)	Mussel	E
Scott	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Shelby	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Shelby	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Sioux	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Sioux	Topeka shiner (Notropis Topeka)	Fish	E
Sioux	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Story	Indiana bat (Myotis sodalis)	Mammal	E
Story	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Story	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Tama	Indiana bat (Myotis sodalis)	Mammal	E
Tama	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Tama	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Taylor	Indiana bat (Myotis sodalis)	Mammal	E
Taylor	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Taylor	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Union	Indiana bat (Myotis sodalis)	Mammal	E
Union	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Union	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Van Buren	Indiana bat (Myotis sodalis)	Mammal	E
Van Buren	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Van Buren	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Wapello	Indiana bat (Myotis sodalis)	Mammal	E
Wapello	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Wapello	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Warren	Indiana bat (Myotis sodalis)	Mammal	E
Warren	Mead's milkweed (Asclepias meadii)	Plant	T
Warren	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Warren	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Washington	Indiana bat (Myotis sodalis)	Mammal	E
Washington	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Washington	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Wayne	Indiana bat (Myotis sodalis)	Mammal	E
Wayne	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Wayne	Western prairie fringed orchid (Platanthera praeclara)	Plant	T

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TABLE A.4.1

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – IOWA

COUNTY	NAME	GROUP	STATUS
Webster	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Webster	Topeka shiner (Notropis topeka)	Fish	E
Webster	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Winnebago	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Winnebago	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Winneshiek	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Winneshiek	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Woodbury	Least tern (Sterna antillarum)	Bird	E
Woodbury	Piping plover (Charadrius melodus)	Bird	E
Woodbury	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Woodbury	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Woodbury	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Worth	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Worth	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Wright	Topeka shiner (Notropis topeka)	Fish	E
Wright	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Wright	Western prairie fringed orchid (Platanthera praeclara)	Plant	T

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TABLE A.4.2

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Allen	Mead's milkweed (Asclepias meadii)	Plant	T
Allen	Neosho madtom (Noturus placidus)	Fish	T
Allen	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Allen	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Allen	Sprague's pipit (Anthus spragueii)	Bird	C
Anderson	Mead's milkweed (Asclepias meadii)	Plant	T
Atchison	Pallid sturgeon (Scaphirhynchus)	Fish	T
Acthison	Sprague's pipit (Anthus spragueii)	Bird	C
Barber	Arkansas darter (Etheostoma cragini)	Fish	C
Barber	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Barber	Whooping crane (Grus americana)	Bird	E
Barber	Sprague's pipit (Anthus spragueii)	Bird	C
Barton	Arkansas darter (Etheostoma cragini)	Fish	C
Barton	Interior least Tern (Sterna antillarum athalassos)	Bird	E
Barton	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Barton	Piping plover (Charadrius melodus)	Bird	T
Barton	Whooping crane (Grus americana)	Bird	E
Barton	Sprague's pipit (Anthus spragueii)	Bird	C
Bourbon	Mead's milkweed (Asclepias meadii)	Plant	T
Bourbon	Sprague's pipit (Anthus spragueii)	Bird	C
Brown	Topeka shiner (Notropis topeka)	Fish	E
Brown	Sprague's pipit (Anthus spragueii)	Bird	C
Chase	Neosho madtom (Noturus placidus)	Fish	T
Chase	Sprague's pipit (Anthus spragueii)	Bird	C
Chase	Topeka shiner (Notropis topeka)	Fish	E
Chatauqua	American burying beetle (Nicrophorus americanus)	Insect	E
Chataqua	Sprague's pipit (Anthus spragueii)	Bird	C
Cherokee	Arkansas darter (Etheostoma cragini)	Fish	C
Cherokee	Neosho madtom (Noturus placidus)	Fish	T
Cherokee	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Cherokee	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Cherokee	Sprague's pipit (Anthus spragueii)	Bird	C
Chyenne	Sprague's pipit (Anthus spragueii)	Bird	C
Clark	Arkansas darter (Etheostoma cragini)	Fish	C
Clark	Arkansas River shiner (Notropis girardi)	Fish	T
Clark	Interior least tern (Sterna antillarum)	Bird	E
Clark	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Clark	Piping plover (Charadrius melodus)	Bird	T
Clark	Sprague's pipit (Anthus spragueii)	Bird	C
Clay	Sprague's pipit (Anthus spragueii)	Bird	C
Cloud	Sprague's pipit (Anthus spragueii)	Bird	C
Cloud	Whooping crane (Grus americana)	Bird	E
Coffey	Neosho madtom (Noturus placidus)	Fish	T
Coffey	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Coffey	Rabbitsfoot (Quadrula cylindrica)	Mussel	C

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Coffey	Sprague's pipit (Anthus spragueii)	Bird	C
Comanche	Arkansas darter (Etheostoma cragini)	Fish	C
Comanche	Arkansas River shiner (Notropis girardi)	Fish	T
Comanche	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Comanche	Sprague's pipit (Anthus spragueii)	Bird	C
Comanche	Whooping crane (Grus americana)	Bird	E
Cowley	Arkansas darter (Etheostoma cragini)	Fish	C
Cowley	Interior least tern (Sterna antillarum)	Bird	E
Cowley	Sprague's pipit (Anthus spragueii)	Bird	C
Crawford	Gray bat (Myotis grisescens)	Mammal	E
Crawford	Mead's milkweed (Asclepias meadii)	Plant	T
Crawford	Sprague's pipit (Anthus spragueii)	Bird	C
Decatur	Whooping crane (Grus americana)	Bird	E
Decatur	Sprague's pipit (Anthus spragueii)	Bird	C
Dickinsin	Sprague's pipit (Anthus spragueii)	Bird	C
Dickinson	Topeka shiner (Notropis topeka)	Fish	E
Doniphan	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Doniphan	Sprague's pipit (Anthus spragueii)	Bird	C
Douglas	Mead's milkweed (Asclepias meadii)	Plant	T
Douglas	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Douglas	Sprague's pipit (Anthus spragueii)	Bird	C
Douglas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Edwards	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Edwards	Sprague's pipit (Anthus spragueii)	Bird	C
Edwards	Whooping crane (Grus americana)	Bird	E
Elk	American burying beetle (Nicrophorus americanus)	Insect	E
Elk	Sprague's pipit (Anthus spragueii)	Bird	C
Ellis	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Ellis	Sprague's pipit (Anthus spragueii)	Bird	C
Ellis	Whooping crane (Grus americana)	Bird	E
Ellsworth	Sprague's pipit (Anthus spragueii)	Bird	C
Ellsworth	Whooping crane (Grus americana)	Bird	E
Finney	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Finney	Sprague's pipit (Anthus spragueii)	Bird	C
Finney	Whooping crane (Grus americana)	Bird	E
Ford	Arkansas River shiner (Notropis girardi)	Fish	T
Ford	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Ford	Sprague's pipit (Anthus spragueii)	Bird	C
Ford	Whooping crane (Grus americana)	Bird	E
Franklin	Mead's milkweed (Asclepias meadii)	Plant	T
Franklin	Sprague's pipit (Anthus spragueii)	Bird	C
Geary	Topeka shiner (Notropis topeka)	Fish	E
Geary	Sprague's pipit (Anthus spragueii)	Bird	C
Gove	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Gove	Sprague's pipit (Anthus spragueii)	Bird	C

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Gove	Whooping crane (Grus americana)	Bird	E
Graham	Sprague's pipit (Anthus spragueii)	Bird	C
Graham	Whooping crane (Grus americana)	Bird	E
Grant	Arkansas River shiner (Notropis girardi)	Fish	T
Grant	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Grant	Sprague's pipit (Anthus spragueii)	Bird	C
Gray	Arkansas River shiner (Notropis girardi)	Fish	T
Gray	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Gray	Sprague's pipit (Anthus spragueii)	Bird	C
Gray	Whooping crane (Grus americana)	Bird	E
Greeley	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Greeley	Sprague's pipit (Anthus spragueii)	Bird	C
Greenwood	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Greenwood	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Greenwood	Topeka shiner (Notropis topeka)	Fish	E
Hamilton	Arkansas River shiner (Notropis girardi)	Fish	T
Hamilton	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Hamilton	Sprague's pipit (Anthus spragueii)	Bird	C
Harper	Arkansas darter (Etheostoma cragini)	Fish	C
Harper	Sprague's pipit (Anthus spragueii)	Bird	C
Harper	Whooping crane (Grus americana)	Bird	E
Harvey	Sprague's pipit (Anthus spragueii)	Bird	C
Harvey	Whooping crane (Grus americana)	Bird	E
Haskell	Arkansas River shiner (Notropis girardi)	Fish	T
Haskell	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Haskell	Sprague's pipit (Anthus spragueii)	Bird	C
Haskell	Whooping crane (Grus americana)	Bird	E
Hodgeman	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Hodgeman	Sprague's pipit (Anthus spragueii)	Bird	C
Hodgeman	Whooping crane (Grus americana)	Bird	E
Jackson	Sprague's pipit (Anthus spragueii)	Bird	C
Jefferson	Mead's milkweed (Asclepias meadii)	Plant	T
Jefferson	Sprague's pipit (Anthus spragueii)	Bird	C
Jefferson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jewell	Sprague's pipit (Anthus spragueii)	Bird	C
Jewell	Whooping crane (Grus americana)	Bird	E
Johnson	Mead's milkweed (Asclepias meadii)	Plant	T
Johnson	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Kearny	Arkansas River shiner (Notropis girardi)	Fish	T
Kearny	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Kearney	Sprague's pipit (Anthus spragueii)	Bird	C
Kingman	Arkansas darter (Etheostoma cragini)	Fish	C
Kingman	Sprague's pipit (Anthus spragueii)	Bird	C
Kingman	Whooping crane (Grus americana)	Bird	E
Kiowa	Arkansas darter (Etheostoma cragini)	Fish	C

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Kiowa	Arkansas River shiner (Notropis girardi)	Fish	T
Kiowa	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Kiowa	Sprague's pipit (Anthus spragueii)	Bird	C
Kiowa	Whooping crane (Grus americana)	Bird	E
Labette	American burying beetle (Nicrophorus americanus)	Insect	E
Labette	Neosho madtom (Noturus placidus)	Fish	T
Labette	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Labette	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Labette	Sprague's pipit (Anthus spragueii)	Bird	C
Lane	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Lane	Sprague's pipit (Anthus spragueii)	Bird	C
Lane	Whooping crane (Grus americana)	Bird	E
Leavenworth	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Leavenworth	Sprague's pipit (Anthus spragueii)	Bird	C
Leavenworth	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lincoln	Sprague's pipit (Anthus spragueii)	Bird	C
Lincoln	Whooping crane (Grus americana)	Bird	E
Linn	Mead's milkweed (Asclepias meadii)	Plant	T
Linn	Spectaclecase mussel (Cumberlandia monodonta)	Mussel	E
Linn	Sprague's pipit (Anthus spragueii)	Bird	C
Logan	Black-footed ferret (Mustela nigripes)	Mammel	E
Logan	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Logan	Sprague's pipit (Anthus spragueii)	Bird	C
Lyon	Neosho madtom (Noturus placidus)	Fish	T
Lyon	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Lyon	Topeka shiner (Notropis topeka)	Fish	E
Lyon	Sprague's pipit (Anthus spragueii)	Bird	C
Logan	Neosho madtom (Noturus placidus)	Fish	T
Marion	Sprague's pipit (Anthus spragueii)	Bird	C
Marion	Topeka shiner (Notropis topeka)	Fish	E
Marshall	Sprague's pipit (Anthus spragueii)	Bird	C
Marshall	Topeka shiner (Notropis topeka)	Fish	E
McPherson	Sprague's pipit (Anthus spragueii)	Bird	C
McPherson	Whooping crane (Grus americana)	Bird	E
Meade	Arkansas darter (Etheostoma cragini)	Fish	C
Meade	Arkansas River shiner (Notropis girardi)	Fish	T
Meade	Interior least tern (Sterna antillarum)	Bird	E
Meade	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Meade	Sprague's pipit (Anthus spragueii)	Bird	C
Meade	Whooping crane (Grus americana)	Bird	E
Miami	Mead's milkweed (Asclepias meadii)	Plant	T
Miami	Sprague's pipit (Anthus spragueii)	Bird	C
Mitchell	Sprague's pipit (Anthus spragueii)	Bird	C
Mitchell	Whooping crane (Grus americana)	Bird	E
Montgomery	American burying beetle (Nicrophorus americanus)	Insect	E

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Montgomery	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Montgomery	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Montgomery	Sprague's pipit (Anthus spragueii)	Bird	C
Morris	Neosho madtom (Noturus placidus)	Fish	T
Morris	Sprague's pipit (Anthus spragueii)	Bird	C
Morris	Topeka shiner (Notropis topeka)	Fish	E
Morton	Arkansas River shiner (Notropis girardi)	Fish	T
Morton	Interior least tern (Sterna antillarum)	Bird	E
Morton	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Morton	Sprague's pipit (Anthus spragueii)	Bird	C
Nemaha	Sprague's pipit (Anthus spragueii)	Bird	C
Neosho	Mead's milkweed (Asclepias meadii)	Plant	T
Neosho	Neosho madtom (Noturus placidus)	Fish	T
Neosho	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Neosho	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Neosho	Sprague's pipit (Anthus spragueii)	Bird	C
Ness	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Ness	Sprague's pipit (Anthus spragueii)	Bird	C
Ness	Whooping crane (Grus americana)	Bird	E
Norton	Sprague's pipit (Anthus spragueii)	Bird	C
Norton	Whooping crane (Grus americana)	Bird	E
Osage	Sprague's pipit (Anthus spragueii)	Bird	C
Osage	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Osborne	Sprague's pipit (Anthus spragueii)	Bird	C
Osborne	Whooping crane (Grus americana)	Bird	E
Ottawa	Sprague's pipit (Anthus spragueii)	Bird	C
Ottawa	Whooping crane (Grus americana)	Bird	E
Pawnee	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Pawnee	Sprague's pipit (Anthus spragueii)	Bird	C
Pawnee	Whooping crane (Grus americana)	Bird	E
Phillips	Interior least tern (Sterna antillarum)	Bird	E
Phillips	Sprague's pipit (Anthus spragueii)	Bird	C
Phillips	Whooping crane (Grus americana)	Bird	E
Pottawatomie	Interior least tern (Sterna antillarum)	Bird	E
Pottawatomie	Piping plover (Charadrius melodus)	Bird	T
Pottawatomie	Sprague's pipit (Anthus spragueii)	Bird	C
Pottawatomie	Topeka shiner (Notropis topeka)	Fish	E
Pratt	Arkansas darter (Etheostoma cragini)	Fish	C
Pratt	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Pratt	Sprague's pipit (Anthus spragueii)	Bird	C
Pratt	Whooping crane (Grus americana)	Bird	E
Rawlins	Sprague's pipit (Anthus spragueii)	Bird	C
Rawlins	Whooping crane (Grus americana)	Bird	E
Reno	Arkansas darter (Etheostoma cragini)	Fish	C
Reno	Interior least tern (Sterna antillarum)	Bird	E

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Reno	Sprague's pipit (Anthus spragueii)	Bird	C
Reno	Whooping crane (Grus americana)	Bird	E
Republic	Sprague's pipit (Anthus spragueii)	Bird	C
Republic	Whooping crane (Grus americana)	Bird	E
Rice	Arkansas darter (Etheostoma cragini)	Fish	C
Rice	Interior least tern (Sterna antillarum)	Bird	E
Rice	Sprague's pipit (Anthus spragueii)	Bird	C
Rice	Whooping crane (Grus americana)	Bird	E
Riley	Interior least tern (Sterna antillarum)	Bird	E
Riley	Piping plover (Charadrius melodus)	Bird	T
Riley	Sprague's pipit (Anthus spragueii)	Bird	C
Riley	Topeka shiner (Notropis topeka)	Fish	E
Rooks	Sprague's pipit (Anthus spragueii)	Bird	C
Rooks	Whooping crane (Grus americana)	Bird	E
Rush	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Rush	Sprague's pipit (Anthus spragueii)	Bird	C
Rush	Whooping crane (Grus americana)	Bird	E
Russell	Sprague's pipit (Anthus spragueii)	Bird	C
Russell	Whooping crane (Grus americana)	Bird	E
Saline	Sprague's pipit (Anthus spragueii)	Bird	C
Saline	Whooping crane (Grus americana)	Bird	E
Scott	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Scott	Sprague's pipit (Anthus spragueii)	Bird	C
Scott	Whooping crane (Grus americana)	Bird	E
Sedgwick	Interior least tern (Sterna antillarum)	Bird	E
Sedgwick	Sprague's pipit (Anthus spragueii)	Bird	C
Sedgwick	Whooping crane (Grus americana)	Bird	E
Seward	Arkansas darter (Etheostoma cragini)	Fish	C
Seward	Arkansas River shiner (Notropis girardi)	Fish	T
Seward	Interior least tern (Sterna antillarum)	Bird	E
Seward	Sprague's pipit (Anthus spragueii)	Bird	C
Seward	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Seward	Whooping crane (Grus americana)	Bird	E
Shawnee	Interior least tern (Sterna antillarum)	Bird	E
Shawnee	Sprague's pipit (Anthus spragueii)	Bird	C
Shawnee	Topeka shiner (Notropis topeka)	Fish	E
Sheridan	Sprague's pipit (Anthus spragueii)	Bird	C
Sheridan	Whooping crane (Grus americana)	Bird	E
Sherman	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Sherman	Sprague's pipit (Anthus spragueii)	Bird	C
Smith	Sprague's pipit (Anthus spragueii)	Bird	C
Smith	Whooping crane (Grus americana)	Bird	E
Stafford	Arkansas darter (Etheostoma cragini)	Fish	C
Stafford	Interior least tern (Sterna antillarum)	Bird	E
Stafford	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C

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COUNTY	NAME	GROUP	STATUS
Stafford	Sprague's pipit (Anthus spragueii)	Bird	C
Stafford	Whooping crane (Grus americana)	Bird	E
Stanton	Arkansas River shiner (Notropis girardi)	Fish	T
Stanton	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Stanton	Sprague's pipit (Anthus spragueii)	Bird	C
Stevens	Interior least tern (Sterna antillarum)	Bird	E
Stevens	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Sumner	Arkansas darter (Etheostoma cragini)	Fish	C
Sumner	Interior least tern (Sterna antillarum)	Bird	E
Sumner	Sprague's pipit (Anthus spragueii)	Bird	C
Sumner	Whooping crane (Grus americana)	Bird	E
Trego	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Trego	Sprague's pipit (Anthus spragueii)	Bird	C
Trego	Whooping crane (Grus americana)	Bird	E
Wabaunsee	Interior least tern (Sterna antillarum)	Bird	E
Wabaunsee	Piping plover (Charadrius melodus)	Bird	T
Wabaunsee	Sprague's pipit (Anthus spragueii)	Bird	C
Wabaunsee	Topeka shiner (Notropis topeka)	Fish	E
Wallace	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Wallace	Sprague's pipit (Anthus spragueii)	Bird	C
Wallace	Topeka shiner (Notropis topeka)	Fish	E
Washington	Sprague's pipit (Anthus spragueii)	Bird	C
Wichita	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Wichita	Sprague's pipit (Anthus spragueii)	Bird	C
Wilson	American burying beetle (Nicrophorus americanus)	Insect	E
Wilson	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Wilson	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Wilson	Sprague's pipit (Anthus spragueii)	Bird	C
Woodson	Neosho madtom (Noturus placidus)	Fish	T
Woodson	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Woodson	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Woodson	Sprague's pipit (Anthus spragueii)	Bird	C
Wyandotte	Pallid sturgeon (Notropis girardi)	Fish	E
Wyandotte	Sprague's pipit (Anthus spragueii)	Bird	C

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TABLE A.4.3

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – MISSOURI

COUNTY	NAME	GROUP	STATUS
Adair	Indiana bat (Myotis sodalis)	Mammal	E
Adair	Mead's milkweed (Asclepias meadii)	Plant	T
Andrew	Indiana bat (Myotis sodalis)	Mammal	E
Andrew	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Atchison	Indiana bat (Myotis sodalis)	Mammal	E
Atchison	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Atchison	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Audrain	Indiana bat (Myotis sodalis)	Mammal	E
Barry	Arkansas darter (Etheostoma cragini)	Fish	C
Barry	Gray bat (Myotis grisescens)	Mammal	E
Barry	Indiana bat (Myotis sodalis)	Mammal	E
Barry	Neosho mucket (Lampsillis rafinesqueana)	Fish	C
Barry	Ozark big-eared bat (Corynorhinus townsendii ingens)	Mammal	E
Barry	Ozark cavefish (Amblyopsis rosae)	Fish	T
Barry	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Barton	Arkansas darter (Etheostoma cragini)	Fish	C
Barton	Mead's milkweed (Asclepias meadii)	Plant	T
Barton	Neosho mucket (Lampsillis rafinesqueana)	Fish	C
Benton	Gray bat (Myotis grisescens)	Mammal	E
Benton	Mead's milkweed (Asclepias meadii)	Plant	T
Benton	Niangua darter (Etheostoma nianguae)	Fish	T
Benton	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Bollinger	Curtis' pearlymussel (Epioblasma florentina curtisi)	Mussel	E
Bollinger	Small whorled pagonia (Isotria medeoloides)	Plant	T
Bollinger	Snuffbox (Epioblasma triquetra)	Plant	P
Boone	Gray bat (Myotis grisescens)	Mammal	E
Boone	Indiana bat (Myotis sodalis)	Mammal	E
Boone	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Boone	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Boone	Topeka shiner (Notropis topeka)	Fish	E
Boone	Virginia sneezeweed (Helenium virginicum)	Plant	T
Buchanan	Indiana bat (Myotis sodalis)	Mammal	E
Buchanan	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Butler	Curtis' pearlymussel (Epioblasma florentina curtisi)	Mussel	E
Butler	Pink mucket (Lampsilis abrupta)	Mussel	E
Butler	Pondberry (Lindera melissifolium)	Plant	E
Butler	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Caldwell	Indiana bat (Myotis sodalis)	Mammal	E
Caldwell	Topeka shiner (Notropis topeka)	Fish	E
Callaway	Gray bat (Myotis grisescens)	Mammal	E
Callaway	Indiana bat (Myotis sodalis)	Mammal	E
Callaway	Pallid sturgeon (Scaphirrhynchus albus)	Fish	E
Callaway	Running buffalo clover (Trifolium stoloniferum)	Plant	E

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COUNTY	NAME	GROUP	STATUS
Callaway	Topeka shiner (Notropis topeka)	Fish	E
Camden	Gray bat (Myotis grisescens)	Mammal	E
Camden	Indiana bat (Myotis sodalis)	Mammal	E
Camden	Niangua darter (Etheostoma nianguae)	Fish	T
Cape Girardeau	Decurrent false aster (Boltonia decurrens)	Plant	T
Cape Girardeau	Interior least tern (Sterna antillarum athalassos)	Bird	E
Cape Girardeau	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Carroll	Indiana bat (Myotis sodalis)	Mammal	E
Carroll	Pallid sturgeon (Scaphirrhynchus albus)	Fish	E
Carter	Gray bat (Myotis grisescens)	Mammal	E
Carter	Indiana bat (Myotis sodalis)	Mammal	E
Carter	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Carter	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Carter	Eastern prairie fringed orchid (Platanthera leucophaea)	Plant	T
Cass	Mead's milkweed (Asclepias meadii)	Plant	T
Cedar	Geocarpon (Geocarpon minimum)	Plant	T
Cedar	Gray bat (Myotis grisescens)	Mammal	E
Cedar	Mead's milkweed (Asclepias meadii)	Plant	T
Cedar	Niangua darter (Etheostoma nianguae)	Fish	T
Cedar	Pink mucket (Lampsilis abrupta)	Mussel	E
Cedar	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Cedar	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Chariton	Indiana bat (Myotis sodalis)	Mammal	E
Chariton	Interior least tern (Sterna antillarum athalassos)	Bird	E
Chariton	Pallid sturgeon (Scaphirrhynchus albus)	Fish	E
Christian	Gray bat (Myotis grisescens)	Mammal	E
Christian	Indiana bat (Myotis sodalis)	Mammal	E
Christian	Missouri bladder-pod (Lesquerella filiformis)	Plant	E
Christian	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Christian	Virginia sneezeweed (Helenium virginicum)	Plant	T
Clark	Fat pocketbook (Potamilus capax)	Mussel	E
Clark	Indiana bat (Myotis sodalis)	Mammal	E
Clark	Topeka shiner (Notropis topeka)	Fish	E
Clay	Indiana bat (Myotis sodalis)	Mammal	E
Clay	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Clinton	Indiana bat (Myotis sodalis)	Mammal	E
Cole	Gray bat (Myotis grisescens)	Mammal	E
Cole	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Cole	Pink mucket (Lampsilis abrupta)	Mussel	E
Cole	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Cole	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Cole	Topeka shiner (Notropis topeka)	Fish	E
Cooper	Indiana bat (Myotis sodalis)	Mammal	E
Cooper	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Cooper	Running buffalo clover (Trifolium stoloniferum)	Plant	E

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COUNTY	NAME	GROUP	STATUS
Cooper	Topeka shiner (Notropis topeka)	Fish	E
Crawford	Gray bat (Myotis grisescens)	Mammal	E
Crawford	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Crawford	Indiana bat (Myotis sodalis)	Mammal	E
Crawford	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Crawford	Scaleshell (Leptodea leptodon)	Mussel	E
Crawford	Sheepnose (Plethobasus cyphyus)	Mussel	E
Crawford	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Dade	Arkansas darter (Etheostoma cragini)	Fish	C
Dade	Geocarpon (Geocarpon minimum)	Plant	T
Dade	Gray bat (Myotis grisescens)	Mammal	E
Dade	Mead's milkweed (Asclepias meadii)	Plant	T
Dade	Missouri bladder-pod (Physaria filiformis)	Plant	E
Dade	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Dade	Virginia sneezeweed (Helenium virginicum)	Plant	T
Dallas	Gray bat (Myotis grisescens)	Mammal	E
Dallas	Niangua darter (Etheostoma nianguae)	Fish	T
Daviess	Indiana bat (Myotis sodalis)	Mammal	E
Daviess	Topeka shiner (Notropis topeka)	Fish	E
DeKalb	Indiana bat (Myotis sodalis)	Mammal	E
DeKalb	Topeka shiner (Notropis topeka)	Fish	E
Dent	Gray bat (Myotis grisescens)	Mammal	E
Dent	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Dent	Indiana bat (Myotis sodalis)	Mammal	E
Dent	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Dent	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Dent	Virginia sneezeweed (Helenium virginicum)	Plant	T
Douglass	Gray bat (Myotis grisescens)	Mammal	E
Douglass	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	E
Dunklin	Decurrent false aster (Boltonia decurrens)	Plant	T
Dunklin	Fat pocketbook (Potamilus capax)	Mussel	E
Dunklin	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Franklin	Decurrent false aster (Boltonia decurrens)	Plant	T
Franklin	Gray bat (Myotis grisescens)	Mammal	E
Franklin	Indiana bat (Myotis sodalis)	Mammal	E
Franklin	Pallid sturgeon (Scapphirhynchus albus)	Fish	E
Franklin	Pink mucket (Lampsillis abrupta)	Mussel	E
Franklin	Scaleshell (Leptodea leptodon)	Mussel	E
Franklin	Sheepnose (Plethobasus cyphyus)	Mussel	E
Franklin	Snuffbox (Epioblasma triquetra)	Plant	P
Franklin	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Franklin	Winged mapleleaf (Quadrula fragosa)	Mussel	E
Gasconade	Gray bat (Myotis grisescens)	Mammal	E
Gasconade	Indiana bat (Myotis sodalis)	Mammal	E
Gasconade	Pallid sturgeon (Scaphirhynchus albus)	Fish	E

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COUNTY	NAME	GROUP	STATUS
Gasconade	Pink mucket (Lampsilis abrupta)	Mussel	E
Gasconade	Scaleshell (Leptodea leptodon)	Mussel	E
Gasconade	Snuffbox (Epioblasma triquetra)	Plant	P
Gasconade	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Gentry	Indiana bat (Myotis sodalis)	Mammal	E
Greene	Geocarpon (Geocarpon minimum)	Plant	T
Greene	Gray bat (Myotis grisescens)	Mammal	E
Greene	Missouri bladder-pod (Physaria filiformis)	Plant	T
Greene	Niangua darter (Etheostoma nianguae)	Fish	T
Greene	Ozark cavefish (Amblyopsis rosae)	Fish	T
Greene	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Grundy	Eastern prairie fringed orchid (Platanthaera leucophaea)	Plant	T
Grundy	Indiana bat (Myotis sodalis)	Mammal	E
Grundy	Topeka shiner (Notropis topeka)	Fish	E
Harrison	Indiana bat (Myotis sodalis)	Mammal	E
Harrison	Mead's milkweed (Asclepias meadii)	Plant	T
Harrison	Topeka shiner (Notropis topeka)	Fish	E
Harrison	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Henry	Gray bat (Myotis grisescens)	Mammal	E
Henry	Geocarpon (Geocarpon minimum)	Plant	T
Henry	Indiana bat (Myotis sodalis)	Mammal	E
Henry	Mead's milkweed (Asclepias meadii)	Plant	T
Hickory	Gray bat (Myotis grisescens)	Mammal	E
Hickory	Niangua darter (Etheostoma nianguae)	Fish	T
Holt	Indiana bat (Myotis sodalis)	Mammal	E
Holt	Pallid sturgeon (Scaphirrhynchus albus)	Fish	E
Holt	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Howard	Gray bat (Myotis grisescens)	Mammal	E
Howard	Indiana bat (Myotis sodalis)	Mammal	E
Howard	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Howard	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Howell	Decurrent false aster (Boltonia decurrens)	Plant	T
Howell	Gray bat (Myotis grisescens)	Mammal	E
Howell	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Howell	Virginia sneezeweed (Helenium virginicum)	Plant	T
Iron	Gray bat (Myotis grisescens)	Mammal	E
Iron	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Iron	Indiana bat (Myotis sodalis)	Mammal	E
Iron	Mead's milkweed (Asclepias meadii)	Plant	T
Jackson	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Jackson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jasper	Arkansas darter (Etheostoma cragini)	Fish	C
Jasper	Geocarpon (Geocarpon minimum)	Plant	T
Jasper	Gray bat (Myotis grisescens)	Mammal	E
Jasper	Neosho madtom (Noturus placidus)	Fish	T

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COUNTY	NAME	GROUP	STATUS
Jasper	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Jasper	Ozark cavefish (Amblyopsis rosae)	Fish	T
Jasper	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Jasper	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Jasper	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jefferson	Gray bat (Myotis grisescens)	Mammal	E
Jefferson	Indiana bat (Myotis sodalis)	Mammal	E
Jefferson	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Jefferson	Pink mucket (Lampsilis abrupta)	Mussel	E
Jefferson	Scaleshell (Leptodea leptodon)	Mussel	E
Jefferson	Sheepnose (Plethobasus cyphyus)	Mussel	E
Jefferson	Snuffbox (Epioblasma triquetra)	Plant	P
Jefferson	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Johnson	Mead's milkweed (Asclepias meadii)	Plant	T
Johnson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Knox	Indiana bat (Myotis sodalis)	Mammal	E
Laclede	Gray bat (Myotis grisescens)	Mammal	E
Laclede	Indiana bat (Myotis sodalis)	Mammal	E
Laclede	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Laclede	Scaleshell (Leptodea leptodon)	Mussel	E
Laclede	Sheepnose (Plethobasus cyphyus)	Mussel	E
Laclede	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Lafayette	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Lawrence	Arkansas darter (Etheostoma cragini)	Fish	C
Lawrence	Geocarpon (Geocarpon minimum)	Plant	T
Lawrence	Gray bat (Myotis grisescens)	Mammal	E
Lawrence	Missouri bladder-pod (Physaria filiformis)	Plant	E
Lawrence	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Lawrence	Ozark cavefish (Amblyopsis rosae)	Fish	T
Lawrence	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lewis	Indiana bat (Myotis sodalis)	Mammal	E
Lewis	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Lewis	Sheepnose (Plethobasus cyphyus)	Mussel	E
Lincoln	Decurrent false aster (Boltonia decurrens)	Plant	T
Lincoln	Indiana bat (Myotis sodalis)	Mammal	E
Lincoln	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Linn	Indiana bat (Myotis sodalis)	Mammal	E
Livingston	Indiana bat (Myotis sodalis)	Mammal	E
Livingston	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Macon	Indiana bat (Myotis sodalis)	Mammal	E
Madison	Gray bat (Myotis grisescens)	Mammal	E
Madison	Indiana bat (Myotis sodalis)	Mammal	E
Madison	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Madison	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Maries	Gray bat (Myotis grisescens)	Mammal	E

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COUNTY	NAME	GROUP	STATUS
Maries	Niangua darter (Etheostoma nianguae)	Fish	T
Maries	Pink mucket (Lampsilis abrupta)	Mussel	E
Maries	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Maries	Scaleshell (Leptodea leptodon)	Mussel	E
Maries	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Marion	Fat pocketbook (Potamilus capax)	Mussel	E
Marion	Higgins eye pearly mussel (Lampsilis higginsii)	Mussel	E
Marion	Indiana bat (Myotis sodalis)	Mammal	E
Marion	Sheepnose (Plethobasus cyphyus)	Mussel	E
Marion	Spectaclecase (Cumberlandia monodonta)	Mussel	E
McDonald	Cave crayfish (Cambarus aculabrum)	Fish	E
McDonald	Gray bat (Myotis grisescens)	Mammal	E
McDonald	Indiana bat (Myotis sodalis)	Mammal	E
McDonald	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Mercer	Indiana bat (Myotis sodalis)	Mammal	E
Mercer	Topeka shiner (Notropis topeka)	Fish	E
Miller	Gray bat (Myotis grisescens)	Mammal	E
Millerr	Indiana bat (Myotis sodalis)	Mammal	E
Miller	Niangua darter (Etheostoma nianguae)	Fish	T
Miller	Pink mucket (Lampsilis abrupta)	Mussel	E
Miller	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Mississippi	Decurrent false aster (Boltonia decurrens)	Plant	T
Mississippi	Fat pocketbook (Potamilus capax)	Mussel	E
Mississippi	Indiana bat (Myotis sodalis)	Mammal	E
Mississippi	Interior least tern (Sterna antillarum athalassos)	Bird	E
Mississippi	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Moniteau	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Moniteau	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Moniteau	Topeka shiner (Notropis topeka)	Fish	E
Monroe	Indiana bat (Myotis sodalis)	Mammal	E
Montgomery	Indiana bat (Myotis sodalis)	Mammal	E
Montgomery	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Montgomery	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Morgan	Gray bat (Myotis grisescens)	Mammal	E
Morgan	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Morgan	Topeka shiner (Notropis topeka)	Fish	E
New Madrid	Interior least tern (Sterna antillarum athalassos)	Bird	E
New Madrid	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Newton	Arkansas darter (Etheostoma cragini)	Fish	C
Newton	Gray bat (Myotis grisescens)	Mammal	E
Newton	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Newton	Ozark cavefish (Amblyopsis rosae)	Fish	T
Newton	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Nodaway	Eastern Massasauga (Sistrurus catenatus catenatus)	Reptile	C
Nodaway	Indiana bat (Myotis sodalis)	Mammal	E

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COUNTY	NAME	GROUP	STATUS
Oregon	Gray bat (Myotis grisescens)	Mammal	E
Oregon	Indiana bat (Myotis sodalis)	Mammal	E
Oregon	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Osage	Gray bat (Myotis grisescens)	Mammal	E
Osage	Niangua darter (Etheostoma nianguae)	Fish	T
Osage	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Osage	Pink mucket (Lampsilis abrupta)	Mussel	E
Osage	Scaleshell (Leptodea leptodon)	Mussel	E
Osage	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Ozark	Gray bat (Myotis grisescens)	Mammal	E
Ozark	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Ozark	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Pemiscot	Interior least tern (Sterna antillarum athalassos)	Bird	E
Pemiscot	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Perry	Grotto sculpin (Cottus sp.)	Fish	C
Perry	Interior least tern (Sterna antillarum athalassos)	Bird	E
Perry	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Pettis	Mead's milkweed (Asclepias meadii)	Plant	T
Pettis	Topeka shiner (Notropis topeka)	Fish	E
Phelps	Gray bat (Myotis grisescens)	Mammal	E
Phelps	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Phelps	Indiana bat (Myotis sodalis)	Mammal	E
Phelps	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Phelps	Snuffbox (Epioblasma triquetra)	Plant	P
Phelps	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Pike	Decurrent false aster (Boltonia decurrens)	Plant	T
Pike	Fat pocketbook (Potamilus capax)	Mussel	E
Pike	Gray bat (Myotis grisescens)	Mammal	E
Pike	Indiana bat (Myotis sodalis)	Mammal	E
Pike	Sheepnose (Plethobasus cyphyus)	Mussel	E
Platte	Indiana bat (Myotis sodalis)	Mammal	E
Platte	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Polk	Geocarpon (Geocarpon minimum)	Plant	T
Polk	Mead's milkweed (Asclepias meadii)	Plant	T
Pulaski	Gray bat (Myotis grisescens)	Mammal	E
Pulaski	Indiana bat (Myotis sodalis)	Mammal	E
Pulaski	Scaleshell (Leptodea leptodon)	Mussel	E
Pulaski	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Putnam	Indiana bat (Myotis sodalis)	Mammal	E
Putnam	Topeka shiner (Notropis topeka)	Fish	E
Ralls	Eastern prairie fringed orchid (Platanthera leucophaea)	Plant	T
Ralls	Fat pocketbook (Potamilus capax)	Mussel	E
Ralls	Gray bat (Myotis grisescens)	Mammal	E
Ralls	Indiana bat (Myotis sodalis)	Mammal	E
Ralls	Sheepnose mussel (Plethobasus cyphysus)	Mussel	E

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TABLE A.4.3

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – MISSOURI

COUNTY	NAME	GROUP	STATUS
Ralls	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Randolph	Indiana bat (Myotis sodalis)	Mammal	E
Randolph	Topeka shiner (Notropis topeka)	Fish	E
Ray	Indiana bat (Myotis sodalis)	Mammal	E
Ray	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Ray	Topeka shiner (Notropis topeka)	Fish	E
Reynolds	Gray bat (Myotis grisescens)	Mammal	E
Reynolds	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Reynolds	Indiana bat (Myotis sodalis)	Mammal	E
Reynolds	Mead's milkweed (Asclepias meadii)	Plant	T
Ripley	Curtis pearlymussel (Epioblasma florentina curtisii)	Mussel	E
Ripley	Gray bat (Myotis grisescens)	Mammal	E
Ripley	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Ripley	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Ripley	Pink mucket (Lampsilis abrupta)	Mussel	E
Ripley	Pondberry (Lindera melissifolium)	Plant	E
Ripley	Snuffbox (Epioblasma triquetra)	Plant	P
Saline	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Schuyler	Indiana bat (Myotis sodalis)	Mammal	E
Schuyler	Topeka shiner (Notropis topeka)	Fish	E
Scotland	Indiana bat (Myotis sodalis)	Mammal	E
Scotland	Mead's milkweed (Asclepias meadii)	Plant	T
Scott	Interior Least tern (Sterna antillarum)	Bird	E
Scott	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Shannon	Gray bat (Myotis grisescens)	Mammal	E
Shannon	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Shannon	Indiana bat (Myotis sodalis)	Mammal	E
Shannon	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Shannon	Virginia sneezeweed (Helenium virginicum)	Plant	T
Shelby	Indiana bat (Myotis sodalis)	Mammal	E
St. Charles	Decurrent false aster (Boltonia decurrens)	Plant	T
St. Charles	Indiana bat (Myotis sodalis)	Mammal	E
St. Charles	Interior Least tern (Sterna antillarum)	Bird	E
St. Charles	Pallid sturgeon (Scaphirynchus albus)	Fish	E
St. Charles	Running buffalo clover (Trifolium stolonifereum)	Plant	E
St. Clair	Geocarpon (Geocarpon minimum)	Plant	T
St. Clair	Gray bat (Myotis grisescens)	Mammal	E
St. Clair	Mead's milkweed (Asclepias meadii)	Plant	T
St. Clair	Niangua darter (Etheostoma nianguae)	Fish	T
St. Clair	Pink mucket (Lampsilis abrupta)	Mussel	E
St. Clair	Spectaclecase (Cumberlandia monodonta)	Mussel	E
St. Francois	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
St. Francois	Indiana bat (Myotis sodalis)	Mammal	E
St. Genevieve	Indiana bat (Myotis sodalis)	Mammal	E
St. Genevieve	Pallid sturgeon (Scaphirhynchus albus)	Fish	E

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COUNTY	NAME	GROUP	STATUS
St. Louis	Decurrent false aster (Boltonia decurrens)	Plant	T
St. Louis	Gray bat (Myotis grisescens)	Mammal	E
St. Louis	Indiana bat (Myotis sodalis)	Mammal	E
St. Louis	Mead's milkweed (Asclepias meadii)	Plant	T
St. Louis	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
St. Louis	Pink mucket (Lampsilis abrupta)	Mussel	E
St. Louis	Running buffalo clover (Trifolium stoloniferum)	Plant	E
St. Louis	Scaleshell (Leptodea leptodon)	Mussel	E
St. Louis	Sheepnose (Plethobasus cyphysus)	Mussel	E
St. Louis	Snuffbox (Epioblasma triquetra)	Plant	P
St. Louis	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Stone	Gray bat (Myotis grisescens)	Mammal	E
Stone	Indiana bat (Myotis sodalis)	Mammal	E
Stone	Ozark big-eared bat (Corynorhinus townsendii ingens)	Mammal	E
Stone	Ozark cavefish (Amblyopsis rosae)	Fish	T
Sullivan	Indiana bat (Myotis sodalis)	Mammal	E
Sullivan	Mead's milkweed (Asclepias meadii)	Plant	T
Taney	Gray bat (Myotis grisescens)	Mammal	E
Taney	Indiana bat (Myotis sodalis)	Mammal	E
Taney	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Taney	Tumbling Creek cave snail (Antrobia culveri)	Mussel	E
Texas	Gray bat (Myotis grisescens)	Mammal	E
Texas	Indiana bat (Myotis sodalis)	Mammal	E
Texas	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Mammal	C
Texas	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Texas	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Texas	Virginia sneezeweed (Helenium virginicum)	Plant	T
Vernon	Mead's milkweed (Asclepias meadii)	Plant	T
Vernon	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Vernon	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Warren	Indiana bat (Myotis sodalis)	Mammal	E
Warren	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Washington	Gray bat (Myotis grisescens)	Mammal	E
Washington	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Washington	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Washington	Indiana bat (Myotis sodalis)	Mammal	E
Wayne	Curtis pearlymussel (Epioblasma florentina curtisii)	Mussel	E
Wayne	Gray bat (Myotis grisescens)	Mammal	E
Wayne	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Wayne	Indiana bat (Myotis sodalis)	Mammal	E
Wayne	Pink mucket (Lampsilis abrupta)	Mussel	E
Wayne	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Wayne	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Wayne	Snuffbox (Epioblasma triquetra)	Plant	P
Webster	Niangua darter (Etheostoma nianguae)	Fish	T

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COUNTY	NAME	GROUP	STATUS
Webster	Virginia sneezeweed (Helenium virginicum)	Plant	T
Worth	Indiana bat (Myotis sodalis)	Mammal	E
Wright	Gray bat (Myotis grisescens)	Mammal	E
Wright	Indiana bat (Myotis sodalis)	Mammal	E
Wright	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Mammal	E
Wright	Scaleshell (Leptodea leptodon)	Mussel	E
Wright	Virginia sneezeweed (Helenium virginicum)	Plant	T

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TABLE A.4.4

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA

COUNTY	NAME	GROUP	STATUS
Adams	Black-footed ferret (Mustela nigripes)	Mammal	E
Adams	Whooping crane (Grus americana)	Bird	FE
Antelope	American burying beetle (Nicrophorus americanus)	Insect	FE
Antelope	Black-footed ferret (Mustela nigripes)	Mammal	E
Antelope	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Antelope	Whooping crane (Grus americana)	Bird	E
Arthur	Black-footed ferret (Mustela nigripes)	Mammal	E
Arthur	Blowout penstemon (Penstemon haydenii)	Plant	E
Arthur	Whooping crane (Grus americana)	Bird	E
Banner	Black-footed ferret (Mustela nigripes)	Mammal	E
Blaine	American burying beetle (Nicrophorus americanus)	Insect	E
Blaine	Black-footed ferret (Mustela nigripes)	Mammal	E
Blaine	Blowout penstemon (Penstemon haydenii)	Plant	E
Blaine	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Blaine	Whooping crane (Grus americana)	Bird	E
Boone	American burying beetle (Nicrophorus americanus)	Insect	E
Boone	Black-footed ferret (Mustela nigripes)	Mammal	E
Boone	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Boone	Whooping crane (Grus americana)	Bird	E
Box Butte	Black-footed ferret (Mustela nigripes)	Mammal	E
Box Butte	Blowout penstemon (Penstemon haydenii)	Plant	E
Boyd	American burying beetle (Nicrophorus americanus)	Insect	E
Boyd	Black-footed ferret (Mustela nigripes)	Mammal	E
Boyd	Interior least tern (Sterna antillarum)	Bird	E
Boyd	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Boyd	Piping plover (Charadrius melodus)	Bird	T
Boyd	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Boyd	Whooping crane (Grus americana)	Bird	E
Brown	American burying beetle (Nicrophorus americanus)	Insect	E
Brown	Black-footed ferret (Mustela nigripes)	Mammal	E
Brown	Blowout penstemon (Penstemon haydenii)	Plant	E
Brown	Interior least tern (Sterna antillarum)	Bird	E
Brown	Piping plover (Charadrius melodus)	Bird	T
Brown	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Brown	Whooping crane (Grus americana)	Bird	E
Buffalo	Black-footed ferret (Mustela nigripes)	Mammal	E
Buffalo	Interior least tern (Sterna antillarum)	Bird	E
Buffalo	Piping plover (Charadrius melodus)	Bird	T
Buffalo	Western prairie fringed orchid (Platanthera praeclara)	Plant	ST
Buffalo	Whooping crane (Grus americana)	Bird	E
Burt	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Burt	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Butler	Black-footed ferret (Mustela nigripes)	Mammal	E
Butler	Interior least tern (Sterna antillarum)	Bird	E
Butler	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Butler	Piping plover (Charadrius melodus)	Bird	T

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COUNTY	NAME	GROUP	STATUS
Butler	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Butler	Whooping crane (Grus americana)	Bird	E
Cass	Interior least tern (Sterna antillarum)	Bird	E
Cass	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Cass	Piping plover (Charadrius melodus)	Bird	T
Cass	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cedar	Interior least tern (Sterna antillarum)	Bird	E
Cedar	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Cedar	Piping plover (Charadrius melodus)	Bird	T
Cedar	Scaleshell (Leptodea leptodon)	Mussel	E
Cedar	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Chase	Black-footed ferret (Mustela nigripes)	Mammal	E
Chase	Whooping crane (Grus americana)	Bird	E
Cherry	American burying beetle (Nicrophorus americanus)	Insect	E
Cherry	Black-footed ferret (Mustela nigripes)	Mammal	E
Cherry	Blowout penstemon (Penstemon haydenii)	Plant	E
Cherry	Topeka shiner (Notropis topeka)	Fish	E
Cherry	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cherry	Whooping crane (Grus americana)	Bird	E
Cheyenne	Black-footed ferret (Mustela nigripes)	Mammal	E
Cheyenne	Whooping crane (Grus americana)	Bird	E
Clay	Black-footed ferret (Mustela nigripes)	Mammal	E
Clay	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Clay	Whooping crane (Grus americana)	Bird	E
Colfax	Black-footed ferret (Mustela nigripes)	Mammal	E
Colfax	Interior least tern (Sterna antillarum)	Bird	E
Colfax	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Colfax	Piping plover (Charadrius melodus)	Bird	T
Colfax	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cuming	Interior least tern (Sterna antillarum)	Bird	E
Cuming	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cuming	Piping plover (Charadrius melodus)	Bird	T
Custer	American burying beetle (Nicrophorus americanus)	Insect	E
Custer	Blowout penstemon (Penstemon haydenii)	Plant	E
Custer	Black-footed ferret (Mustela nigripes)	Mammal	E
Custer	Interior least tern (Sterna antillarum athalassos)	Bird	E
Custer	Piping plover (Charadrius melodus)	Bird	E
Custer	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Custer	Whooping crane (Grus americana)	Bird	E
Dakota	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Dakota	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dawes	Black-footed ferret (Mustela nigripes)	Mammal	E
Dawes	Whooping crane (Grus americana)	Bird	E
Dawson	American burying beetle (Nicrophorus americanus)	Insect	E
Dawson	Black-footed ferret (Mustela nigripes)	Mammal	E
Dawson	Interior least tern (Sterna antillarum athalassos)	Bird	E

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COUNTY	NAME	GROUP	STATUS
Dawson	Piping plover (Charadrius melodus)	Bird	E
Dawson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dawson	Whooping crane (Grus americana)	Bird	E
Deuel	Black-footed ferret (Mustela nigripes)	Mammal	E
Dixon	Interior least tern (Sterna antillarum)	Bird	E
Dixon	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Dixon	Piping plover (Charadrius melodus)	Bird	T
Dodge	Interior least tern (Sterna antillarum)	Bird	E
Dodge	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Dodge	Piping plover (Charadrius melodus)	Bird	T
Dodge	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Douglas	Interior least tern (Sterna antillarum)	Bird	E
Douglas	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Douglas	Piping plover (Charadrius melodus)	Bird	T
Douglas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dundy	Black-footed ferret (Mustela nigripes)	Mammal	E
Fillmore	Black-footed ferret (Mustela nigripes)	Mammal	E
Fillmore	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Fillmore	Whooping crane (Grus americana)	Bird	E
Franklin	Black-footed ferret (Mustela nigripes)	Mammal	E
Franklin	Whooping crane (Grus americana)	Bird	E
Frontier	American burying beetle (Nicrophorus americanus)	Insect	E
Frontier	Black-footed ferret (Mustela nigripes)	Mammal	E
Frontier	Whooping crane (Grus americana)	Bird	E
Furnas	Black-footed ferret (Mustela nigripes)	Mammal	E
Furnas	Whooping crane (Grus americana)	Bird	E
Gage	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Garden	Black-footed ferret (Mustela nigripes)	Mammal	E
Garden	Blowout penstemon (Penstemon haydenii)	Plant	E
Garden	Whooping crane (Grus americana)	Bird	E
Garfield	American burying beetle (Nicrophorus americanus)	Insect	E
Garfield	Black-footed ferret (Mustela nigripes)	Mammal	E
Garfield	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Garfield	Whooping crane (Grus americana)	Bird	E
Gosper	American burying beetle (Nicrophorus americanus)	Insect	E
Gosper	Black-footed ferret (Mustela nigripes)	Mammal	E
Gosper	Interior least tern (Sterna antillarum)	Bird	E
Gosper	Piping plover (Charadrius melodus)	Bird	T
Gosper	Whooping crane (Grus americana)	Bird	E
Grant	American burying beetle (Nicrophorus americanus)	Insect	E
Grant	Black-footed ferret (Mustela nigripes)	Mammal	E
Grant	Blowout penstemon (Penstemon haydenii)	Plant	E
Grant	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Grant	Whooping crane (Grus americana)	Bird	E
Greeley	American burying beetle (Nicrophorus americanus)	Insect	E
Greeley	Black-footed ferret (Mustela nigripes)	Mammal	E

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COUNTY	NAME	GROUP	STATUS
Greeley	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Greeley	Whooping crane (Grus americana)	Bird	E
Hall	Black-footed ferret (Mustela nigripes)	Mammal	E
Hall	Interior least tern (Sterna antillarum)	Bird	E
Hall	Piping plover (Charadrius melodus)	Bird	T
Hall	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hall	Whooping crane (Grus americana)	Bird	E
Hamilton	Black-footed ferret (Mustela nigripes)	Mammal	E
Hamilton	Interior least tern (Sterna antillarum)	Bird	E
Hamilton	Piping plover (Charadrius melodus)	Bird	T
Hamilton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hamilton	Whooping crane (Grus americana)	Bird	E
Harlan	Black-footed ferret (Mustela nigripes)	Mammal	E
Harlan	Whooping crane (Grus americana)	Bird	E
Hayes	American burying beetle (Nicrophorus americanus)	Insect	E
Hayes	Black-footed ferret (Mustela nigripes)	Mammal	E
Hayes	Whooping crane (Grus americana)	Bird	E
Hitchcock	Black-footed ferret (Mustela nigripes)	Mammal	E
Hitchcock	Whooping crane (Grus americana)	Bird	E
Holt	American burying beetle (Nicrophorus americanus)	Insect	E
Holt	Black-footed ferret (Mustela nigripes)	Mammal	E
Holt	Interior least tern (Sterna antillarum)	Bird	E
Holt	Piping plover (Charadrius melodus)	Bird	T
Holt	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Holt	Whooping crane (Grus americana)	Bird	E
Hooker	American burying beetle (Nicrophorus americanus)	Insect	E
Hooker	Black-footed ferret (Mustela nigripes)	Mammal	E
Hooker	Blowout penstemon (Penstemon haydenii)	Plant	E
Hooker	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hooker	Whooping crane (Grus americana)	Bird	E
Howard	Black-footed ferret (Mustela nigripes)	Mammal	E
Howard	Interior least tern (Sterna antillarum)	Bird	E
Howard	Piping plover (Charadrius melodus)	Bird	T
Howard	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Howard	Whooping crane (Grus americana)	Bird	E
Jefferson	Black-footed ferret (Mustela nigripes)	Mammal	E
Jefferson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jefferson	Whooping crane (Grus americana)	Bird	E
Johnson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Johnson	Whooping crane (Grus americana)	Bird	E
Kearney	Black-footed ferret (Mustela nigripes)	Mammal	E
Kearney	Interior least tern (Sterna antillarum)	Bird	E
Kearney	Piping plover (Charadrius melodus)	Bird	T
Kearney	Whooping crane (Grus americana)	Bird	E
Keith	Black-footed ferret (Mustela nigripes)	Mammal	E
Keith	Blowout penstemon (Penstemon haydenii)	Plant	E

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COUNTY	NAME	GROUP	STATUS
Keith	Interior least tern (Sterna antillarum)	Bird	E
Keith	Piping plover (Charadrius melodus)	Bird	T
Keith	Whooping crane (Grus americana)	Bird	E
Keya Paha	American burying beetle (Nicrophorus americanus)	Insect	E
Keya Paha	Black-footed ferret (Mustela nigripes)	Mammal	E
Keya Paha	Blowout penstemon (Penstemon haydenii)	Plant	E
Keya Paha	Interior least tern (Sterna antillarum)	Bird	E
Keya Paha	Piping plover (Charadrius melodus)	Bird	T
Keya Paha	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Keya Paha	Whooping crane (Grus americana)	Bird	E
Kimball	Black-footed ferret (Mustela nigripes)	Mammal	E
Kimball	Colorado butterfly plant (Gaura neomexicana coloradensis)	Plant	T
Knox	American burying beetle (Nicrophorus americanus)	Insect	E
Knox	Black-footed ferret (Mustela nigripes)	Mammal	E
Knox	Interior least tern (Sterna antillarum)	Bird	E
Knox	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Knox	Piping plover (Charadrius melodus)	Bird	T
Knox	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Knox	Whooping crane (Grus americana)	Bird	E
Lancaster	Salt Creek tiger beetle (Cicindela nevadica lincoiniana)	Insect	E
Lancaster	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lincoln	American burying beetle (Nicrophorus americanus)	Insect	E
Lincoln	Black-footed ferret (Mustela nigripes)	Mammal	E
Lincoln	Blowout penstemon (Penstemon haydenii)	Plant	E
Lincoln	Interior least tern (Sterna antillarum)	Bird	E
Lincoln	Piping plover (Charadrius melodus)	Bird	T
Lincoln	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lincoln	Whooping crane (Grus americana)	Bird	E
Logan	Black-footed ferret (Mustela nigripes)	Mammal	E
Logan	Blowout penstemon (Penstemon haydenii)	Plant	E
Logan	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Logan	Whooping crane (Grus americana)	Bird	E
Loup	American burying beetle (Nicrophorus americanus)	Insect	E
Loup	Black-footed ferret (Mustela nigripes)	Mammal	E
Loup	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Loup	Whooping crane (Grus americana)	Bird	E
Madison	Black-footed ferret (Mustela nigripes)	Mammal	E
Madison	Interior least tern (Sterna antillarum)	Bird	E
Madison	Piping plover (Charadrius melodus)	Bird	T
Madison	Topeka shiner (Notropis topeka)	Fish	E
Madison	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Madison	Whooping crane (Grus americana)	Bird	E
McPherson	Black-footed ferret (Mustela nigripes)	Mammal	E
McPherson	Blowout penstemon (Penstemon haydenii)	Plant	E
McPherson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
McPherson	Whooping crane (Grus americana)	Bird	E

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TABLE A.4.4

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA

COUNTY	NAME	GROUP	STATUS
Merrick	Black-footed ferret (Mustela nigripes)	Mammal	E
Merrick	Interior least tern (Sterna antillarum)	Bird	E
Merrick	Piping plover (Charadrius melodus)	Bird	T
Merrick	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Merrick	Whooping crane (Grus americana)	Bird	E
Morrill	Black-footed ferret (Mustela nigripes)	Mammal	E
Morrill	Blowout penstemon (Penstemon haydenii)	Plant	E
Morrill	Whooping crane (Grus americana)	Bird	E
Nance	Black-footed ferret (Mustela nigripes)	Mammal	E
Nance	Interior least tern (Sterna antillarum)	Bird	E
Nance	Piping plover (Charadrius melodus)	Bird	T
Nance	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Nance	Whooping crane (Grus americana)	Bird	E
Nemaha	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Nemaha	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Nuckolls	Black-footed ferret (Mustela nigripes)	Mammal	E
Nuckolls	Whooping crane (Grus americana)	Bird	E
Otoe	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Otoe	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Pawnee	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Perkins	Black-footed ferret (Mustela nigripes)	Mammal	E
Perkins	Whooping crane (Grus americana)	Bird	E
Phelps	Black-footed ferret (Mustela nigripes)	Mammal	E
Phelps	Interior least tern (Sterna antillarum)	Bird	E
Phelps	Piping plover (Charadrius melodus)	Bird	T
Phelps	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Phelps	Whooping crane (Grus americana)	Bird	E
Pierce	Black-footed ferret (Mustela nigripes)	Mammal	E
Pierce	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Platte	Black-footed ferret (Mustela nigripes)	Mammal	E
Platte	Interior least tern (Sterna antillarum)	Bird	E
Platte	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Platte	Piping plover (Charadrius melodus)	Bird	T
Platte	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Platte	Whooping crane (Grus americana)	Bird	E
Polk	Black-footed ferret (Mustela nigripes)	Mammal	E
Polk	Interior least tern (Sterna antillarum)	Bird	E
Polk	Piping plover (Charadrius melodus)	Bird	T
Polk	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Polk	Whooping crane (Grus americana)	Bird	E
Red Willow	Black-footed ferret (Mustela nigripes)	Mammal	E
Red Willow	Piping plover (Charadrius melodus)	Bird	T
Red Willow	Whooping crane (Grus americana)	Bird	E
Richardson	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Richardson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Rock	American burying beetle (Nicrophorus americanus)	Insect	E

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TABLE A.4.4

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA

COUNTY	NAME	GROUP	STATUS
Rock	Black-footed ferret (Mustela nigripes)	Mammal	E
Rock	Blowout penstemon (Penstemon haydenii)	Plant	E
Rock	Interior least tern (Sterna antillarum)	Bird	E
Rock	Piping plover (Charadrius melodus)	Bird	T
Rock	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Rock	Whooping crane (Grus americana)	Bird	E
Saline	Black-footed ferret (Mustela nigripes)	Mammal	E
Saline	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Saline	Whooping crane (Grus americana)	Bird	E
Sarpy	Interior least tern (Sterna antillarum)	Bird	E
Sarpy	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Sarpy	Piping plover (Charadrius melodus)	Bird	T
Sarpy	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Saunders	Interior least tern (Sterna antillarum)	Bird	E
Saunders	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Saunders	Piping plover (Charadrius melodus)	Bird	T
Saunders	Salt Creek tiger beetle (Cicindela nevadica lincoiniana)	Insect	C
Saunders	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Scotts Bluff	Black-footed ferret (Mustela nigripes)	Mammal	E
Scotts Bluff	Whooping crane (Grus americana)	Bird	E
Seward	Black-footed ferret (Mustela nigripes)	Mammal	E
Seward	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Seward	Whooping crane (Grus americana)	Bird	E
Sheridan	Black-footed ferret (Mustela nigripes)	Mammal	E
Sheridan	Blowout penstemon (Penstemon haydenii)	Plant	E
Sheridan	Whooping crane (Grus americana)	Bird	E
Sherman	Black-footed ferret (Mustela nigripes)	Mammal	E
Sherman	Interior least tern (Sterna antillarum)	Bird	E
Sherman	Piping plover (Charadrius melodus)	Bird	T
Sherman	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Sherman	Whooping crane (Grus americana)	Bird	E
Sioux	Black-footed ferret (Mustela nigripes)	Mammal	E
Sioux	Ute ladies'-tresses orchid (Spiranthes diluvialis)	Plant	T
Sioux	Whooping crane (Grus americana)	Bird	E
Stanton	Interior least tern (Sterna antillarum)	Bird	E
Stanton	Piping plover (Charadrius melodus)	Bird	T
Stanton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Thayer	Black-footed ferret (Mustela nigripes)	Mammal	E
Thayer	Whooping crane (Grus americana)	Bird	E
Thomas	American burying beetle (Nicrophorus americanus)	Insect	E
Thomas	Black-footed ferret (Mustela nigripes)	Mammal	E
Thomas	Blowout penstemon (Penstemon haydenii)	Plant	E
Thomas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Thomas	Whooping crane (Grus americana)	Bird	E
Thurston	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Thurston	Western prairie fringed orchid (Platanthera praeclara)	Plant	T

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TABLE A.4.4

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA

COUNTY	NAME	GROUP	STATUS
Valley	American burying beetle (Nicrophorus americanus)	Insect	E
Valley	Black-footed ferret (Mustela nigripes)	Mammal	E
Valley	Interior least tern (Sterna antillarum)	Bird	E
Valley	Piping plover (Charadrius melodus)	Bird	T
Valley	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Valley	Whooping crane (Grus americana)	Bird	E
Washington	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Washington	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Wayne	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Webster	Black-footed ferret (Mustela nigripes)	Mammal	E
Webster	Whooping crane (Grus americana)	Bird	E
Wheeler	American burying beetle (Nicrophorus americanus)	Insect	E
Wheeler	Black-footed ferret (Mustela nigripes)	Mammal	E
Wheeler	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Wheeler	Whooping crane (Grus americana)	Bird	E
York	Black-footed ferret (Mustela nigripes)	Mammal	E
York	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
York	Whooping crane (Grus americana)	Bird	E

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APPENDIX A.5

METROPOLITAN STATISTICAL AREAS

METROPOLITAN STATISTICAL AREAS

APPENDIX A.5 TO REGION 7 INTEGRATED CONTINGENCY PLAN

TABLES

Table **Page**

TABLE A.5.1 METROPOLITAN AREAS WITH POPULATION GREATER THAN 50,000 1

FIGURES

Figure **Page**

FIGURE A.5.1 POPULATION CHANGE - IOWA 2

FIGURE A.5.2 POPULATION CHANGE - KANSAS 3

FIGURE A.5.3 POPULATION CHANGE - MISSOURI 4

FIGURE A.5.4 POPULATION CHANGE - NEBRASKA 5

APPENDIX A.6

EPA WETLAND REGULATORY AUTHORITY

EPA Wetland Regulatory Authority

Regulatory Requirements

Section 404 of the Clean Water Act (CWA) establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation (e.g. certain farming and forestry activities).

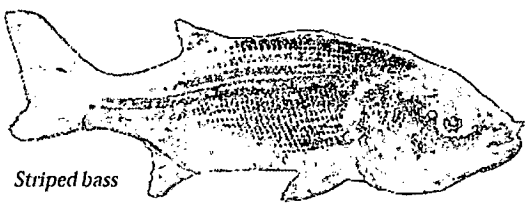


Wetlands subject to Clean Water Act Section 404 are defined as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

The basic premise of the program is that no discharge of dredged or fill material may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment or (2) the nation's waters would be significantly degraded. In other words, when you apply for a permit, you must show that you have, to the extent practicable:

- Taken steps to avoid wetland impacts;
- Minimized potential impacts on wetlands; and
- Provided compensation for any remaining unavoidable impacts.

Proposed activities are regulated through a permit review process. An *individual permit* is required for potentially significant impacts. Individual permits are reviewed by the U.S. Army Corps of Engineers, which evaluates applications under a public interest review, as well as the environmental criteria set forth in the CWA Section 404(b)(1) Guidelines. However, for most discharges that will have only minimal adverse effects, a *general permit* may be suitable. General permits are issued on a nationwide, regional, or State basis for particular categories of activities. The general permit process eliminates individual review and allows certain activities to proceed with little or no delay, provided that the general or specific conditions for the general permit are met. For example, minor road activities, utility line backfill, and bedding are activities that can be considered for a general permit. States also have a role in Section 404 decisions, through State program general permits, water quality certification, or program assumption.



Striped bass

Agency Roles and Responsibilities

The roles and responsibilities of the Federal resource agencies differ in scope.

U.S. Army Corps of Engineers:

- Administers day-to-day program, including individual and general permit decisions;
- Conducts or verifies jurisdictional determinations;
- Develops policy and guidance; and
- Enforces Section 404 provisions.

U.S. Environmental Protection Agency:

- Develops and interprets policy, guidance and environmental criteria used in evaluating permit applications;
- Determines scope of geographic jurisdiction and applicability of exemptions;
- Approves and oversees State and Tribal assumption;
- Reviews and comments on individual permit applications;
- Has authority to prohibit, deny, or restrict the use of any defined area as a disposal site (Section 404(c));
- Can elevate specific cases (Section 404(q));
- Enforces Section 404 provisions.

U.S. Fish and Wildlife Service and National Marine Fisheries Service:

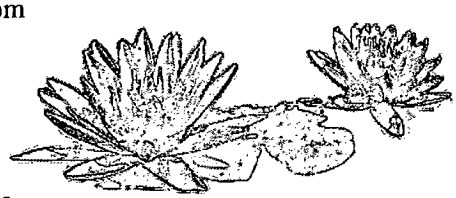
- Evaluates impacts on fish and wildlife of all new Federal projects and Federally permitted projects, including projects subject to the requirements of Section 404 (pursuant to the Fish and Wildlife Coordination Act); and
- Elevates specific cases or policy issues pursuant to Section 404(q).

Manual for Identifying Wetlands

The U.S. EPA and U.S. Army Corps of Engineers use the 1987 *Corps of Engineers Wetlands Delineation Manual* to identify wetlands for the CWA Section 404 permit program. The 1987 manual organizes the environmental characteristics of a potential wetland into three categories: soils, vegetation, and hydrology. The manual contains criteria for each category. Using this approach, an area that meets all three criteria is considered a wetland.

Wetlands on Agricultural Lands

Farmers who own or manage wetlands are directly affected by two important Federal programs—Section 404 of the CWA and the Swampbuster provision of the Food Security Act. The Swampbuster provision withholds certain Federal farm program benefits from farmers who convert or modify wetlands. The U.S. EPA, U.S. Army Corps of Engineers, U.S. Department of Agriculture, and U.S. Fish and Wildlife Service have established procedures to ensure consistency between the programs. Many normal farming practices are exempt from Section 404.



Water lilies

EPA843-F-04-001
Office of Water

Wetland Resources

On the Internet

EPA's Wetlands Website ..... www.epa.gov/owow/wetlands/regs/

Section 404 of the Clean Water Act ..... www.epa.gov/owow/wetlands/laws/

Wetland Delineation Manual ..... www.wes.army.mil/el/wetlands/wlpubs.html

U.S. Army Corps of Engineers Regulatory Program..... www.usace.army.mil/inet/functions/cw/cecwo/reg/

U.S. Army Corps of Engineers' Waterways Experiment Station Environmental Laboratory ..... www.wes.army.mil/el/wetlands/wetlands.html

Environmental Law Institute ..... www.eli.org

In Print

America's Wetlands: Our Vital Link Between Land and Water. For a copy, order from EPA's publications web site at http://yosemite.epa.gov/water/owrccatalog.nsf or call the EPA Wetlands Helpline at 1-800-832-7828.

Wetlands Deskbook, 2nd Edition, Margaret N. Strand. Available from the Environmental Law Institute. Call 1-800-433-5120; fax your request to (202) 939-3868; or e-mail to orders@eli.org.

Our National Wetland Heritage: A Protection Guide, 2nd Edition, Jon A. Kusler, Ph.D., Executive Director, Association of State Wetland Managers. Available from the Environmental Law Institute. Call 1-800-433-5120; fax your request to (202) 939-3868; or e-mail to orders@eli.org.

APPENDIX A.7

THREATENED AND ENDANGERED SPECIES AND SENSITIVE AREAS GEOSPATIAL INFORMATION GUIDE

THREATENED AND ENDANGERED SPECIES AND SENSITIVE AREAS GEOSPATIAL INFORMATION GUIDE

APPENDIX A.7 TO REGION 7 INTEGRATED CONTINGENCY PLAN

TABLE OF CONTENTS

Section		Page
1.0	PURPOSE	1
2.0	SPECIAL CONSIDERATIONS	1
3.0	GIS AND MAPPING DATA SOURCES	1
4.0	U.S. EPA REGION 7 SENSITIVITY ATLAS	3
5.0	GLOSSARY OF TERMS	4

TABLES

Table		Page
TABLE A.7.1	IOWA SENSITIVE INFORMATION	5
TABLE A.7.2	KANSAS SENSITIVE INFORMATION	14
TABLE A.7.3	MISSOURI SENSITIVE INFORMATION	30
TABLE A.7.4	NEBRASKA SENSITIVE INFORMATION	41

1.0 PURPOSE

The purpose of this document is to provide both the Federal On-Scene Coordinate (OSC) in the U.S. Environmental Protection Agency (EPA) Region 7 and owners/operators of facilities conducting facility response planning the necessary information to locate and analyze geo information pertaining to the Federal Oil Pollution Prevention regulation (Title 40 *Code of Federal Regulations* [40 CFR] Part 112) and supporting guidance documentation. The information outlined below are primarily for use with geographic information systems (GIS) or mapping systems and are designed to help locate critical features in relation to a facility. The information may include, but is not limited to, critical habitat, threatened and endangered species (for example, terrestrial or aquatic species), public use areas, cultural and historic areas, managed and protected areas, resources extraction areas, and water supplies.

2.0 SPECIAL CONSIDERATIONS

The information outlined below are not a product of the EPA and therefore the EPA does not guarantee the accuracy, completeness, or timeliness of the information shown, and shall not be liable for any injury or loss resulting from the reliance upon the information. The information contained within is intended to provide guidance only, please refer to the Oil Pollution Prevention regulation found at 40 CFR Part 112 for additional information (can be found at http://www.gpo.gov).

Also, please note many of the resources listed below require GIS software to fully view or manipulate the information contained within.

3.0 GIS AND MAPPING DATA SOURCES

There are numerous resources publicly available on-line to view and download GIS and mapping information for the various features of concern when reviewing Facility Response Planning (FRP) guidance. Below is a list of resources organized by federal, state, and local, along with links to websites where data can be viewed and/or downloaded for use in GIS. This information, coupled with additional information gleaned from various guidance documents, will provide assistance in determining if a facility falls under FRP regulation.

National GIS/Mapping Data Sources:

- U.S. Fish & Wildlife Service - http://www.fws.gov/gis/data/national/index.html
- U.S. Fish & Wildlife Server Migratory Bird Data Center - https://migbirdapps.fws.gov/
- USGS GAP Analysis Program - http://www.gap.uidaho.edu/species_viewer.html
- USGS Maps/GIS - http://water.usgs.gov/maps.html
- GeoCOMMUNITY GIS Data Depot - http://data.geocomm.com/
- GIS INVENTORY - http://gisinventory.net/

State GIS/Mapping Data Sources:

- Iowa
  - Natural Resources Geographic Information Systems Library - http://www.igsb.uiowa.edu/nrgislibx/
- Kansas
  - State of Kansas GIS Data Access and Support Center - http://www.kansasgis.org/
- Missouri
  - Missouri Spatial data Information Service - http://msdis.missouri.edu/
- Nebraska
  - NDNR Data Bank Spatial/GIS Databases - http://dnr.ne.gov/databank/spat.html
  - NDNR Nebraska Geospatial Data Center - http://dnr.ne.gov/databank/geospatial.html
  - University of Nebraska – Lincoln School of Natural Resources - http://snr.unl.edu/data/geographygis/NebrGISdata.asp

The tables below contain detailed information regarding threatened and endangered species and protected areas as identified by various federal, state, and local agencies. The tables are organized first by state, and then by data category and type, followed by date, uniform resource locator (URL) and comments associated with the data. The tables can be used as a guide to streamline the research of a given area based on the state and data type in question. There a numerous types of data represented though, a majority of the information contained requires GIS software for viewing.

4.0 U.S. EPA REGION 7 SENSITIVITY ATLAS

The U.S. EPA Region 7 Sensitivity Atlas (R7 Atlas) is designed to confront the problem of inadequate and unconsolidated information regarding infrastructure and sensitive areas during a response to significant man-made and natural disasters along major river corridors within EPA Region 7. The R7 Atlas consolidates various forms of information into a comprehensive and easy-to-use web-based mapping application in which ESRI ArcGIS Viewer for Flex technology is used to deliver mapping data coupled with GIS-like functionality. The R7 Atlas is comprised of mapping components and layers including: response strategies, drinking water and utility intakes, river access points (boat ramps), sensitive species information, critical habitat information, protected areas, wetlands, mile marker locations, Nation Pipeline Mapping System (NPMS) information, river navigation charts, Public Land Survey System (PLSS) data, and bulk oil and chemical storage facilities. Each component is organized and grouped in an intuitive layer structure and is attributed with pertinent response information. Various layers are clickable in the Flex viewer map, allowing for display of information such as emergency responder contact information and boom deployment strategies in customized data pop-ups. This information provides decision makers a common operational picture to help predict, prevent, or minimize the risk to human health and the environment. The R7 Atlas is designed and built using ESRI ArcGIS Viewer for Flex technology and is easily updated and enhanced, allowing for low cost and efficient maintenance.

The R7 Atlas employs multiple levels of security and leverages a user's e-mail for further securing the application and providing a way to quickly access without the use of traditional username/password credentials. To access the application, simply navigate to https://gis.tetratech.com/viewers/7/ and complete and submit the corresponding form. Your application will be processed, following which you will receive an e-mail (at the address provided) containing a secure link to the Map Portal housing the R7 Atlas. Click the thumbnail image for the R7 Sensitivity Atlas to open the R7 Atlas mapping application. In the event a user logs out of the application or clears their browser cache, they can simply navigate to the URL referenced above and verify their e-mail to receive a secure link to access the application.

For more information, please contact EPA Region 7 On-Scene Coordinator (OSC) Paul Doherty.

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Federal On-Scene Coordinator
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Phone: 913-551-7924
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5.0 GLOSSARY OF TERMS

- Raster: A term typically used in GIS which represents an image. A raster or raster graphic is a data structure representing a generally rectangular grid of pixels stored in an image file format (i.e. .jpg, .png, .tif). The raster images represented in the tables below are best viewed using GIS software.
- URL (Uniform Resource Locator): Constitutes the reference to a website, to navigate to this link copy and paste the URL into any web browser.
- Vector: A term typically used in GIS representing point, line, and polygon features. A vector graphic consists of geometrical primitives (based on mathematical expressions) consisting of X and Y coordinates, which combine to form an image (not related to a raster). The vector images represented in the tables below are best viewed using GIS software.

TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Animals & Plants (General)	Refuge Trail	U.S. Fish & Wildlife Service (USFWS)	Unknown	http://www.fws.gov/GIS/data/national/index.htm	National Wildlife Refuge System (NWRS) Trails, Vector
Animals & Plants (General)	Critical Habitat	USFWS	Unknown	http://criticalhabitat.fws.gov/crithab/	Vector
Animals & Plants (General)	Endangered, threatened, and special concern animals & plants	Iowa Department of Natural Resources (IDNR) Interactive Mapping	Unknown	https://programs.iowadnr.gov/naturalareasinventory/pages/Query.aspx	Digital Maps
Animals & Plants (General)	General Species Information	U.S. Geological Survey (USGS) Gap Analysis Program (GAP) Mapping	Unknown	http://www.gap.uidaho.edu/species_viewer.html	Vector
Animals & Plants (General)	Endangered, threatened, and special concern animals & plants	IDNR, The Iowa Legislature	Unknown	http://search.legis.state.ia.us/NXT/gateway.dll/ar/iac/5710___natural%20resource%20commission%20__5b571__5d/0770___chapter%2077%20endangered%20and%20threatened%20plant%20and__2e/_r_5710_0770_0020.xml?f=templates$fn=default.htm	List of animals and plants
Birds	Migratory Birds	Migratory Bird Data Center	Unknown	https://migbirdapps.fws.gov/	Database (DB)
Birds	Waterfowl	USFWS	Unknown	https://migbirdapps.fws.gov/	DB
Birds	Bird Conservation Areas	IDNR Geological Information System (GIS)	2009	http://www.igsb.uiowa.edu/nrgislibx/	Vector

TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Bird Point Count Database	USGS - Patuxent Wildlife Research Center	Unknown	http://www.pwrc.usgs.gov/point/	DB with Coordinate, Repository with bird count data
Birds	Bird database	North American Breeding Bird Survey	Unknown	http://www.pwrc.usgs.gov/bbs/	Repository to monitor the status and trends of North American birds
Birds	Ring Neck Duck (RNDU)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Ruddy Duck (RUDU)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Wood Duck (WODU)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Canada Goose (CAGO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Double-Crested Cormorant (DCCO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Eared Grebe (EAGR)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Western Grebe (WEGR)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Hooded Merganser (HOME)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Killdeer (KILL)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Piping Plover (PIPL)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Spotted Sandpiper (SPSA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Ring-Billed Gull (RBGU)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Black Tern (BLTE)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Belted Kingfisher (BEKI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster

TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Green Heron (GNBH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Great blue Heron (GTBH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Common Snipe (COSN)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Cattle Egret (CAEG)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Great Egret (GREG)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Olympic coast, National Marine Sanctuary	National Oceanic and Atmospheric Administration (NOAA)	2002	http://olympiccoast.noaa.gov/living/marine_wildlife/seabirds/birdlist.html	Birds' list
Birds	Broad-Winged Hawk (BWHA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Cooper's Hawk (COHA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Common Nighthawk (CONI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Red-Shouldered Hawk (RSHA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Red-tailed Hawk (RTHA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Barred Owl (BAOW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Burrowing Owl (BUOW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Barn Owl (COBO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Eastern Screech-Owl (EASO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Great Horned Owl (GHOW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster

TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Long-eared Owl (LEOW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	American Kestrel (MAKE)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Birds of Conservation Concern	USFWS	2008	http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf	PDF Document; BCR 11, 22, and 23, pages 27, 38 ,and 39 respectively.
Birds, Endangered Species	Least Bittern (LEBI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	American Bittern (AMBI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Upland Sandpiper (UPSA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Bald Eagle (BAEA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Swainson's Hawk (SWHA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Black Tern (BLTE)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Black-billed Cuckoo (BBCU)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Short-eared Owl (SEOW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Red-Headed Woodpecker (RHWO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Grasshopper Sparrow (GRSP)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Dickcissel (DICK)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Pied-Billed Grebe (PBGR)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster

TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds, Endangered Species	Willow Flycatcher (WIFL)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Marsh Wren (MAWR)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Brown Thrasher (BRTH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Blue-winged Warbler (BWWA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Cerulean Warbler (CERW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Henslow's Sparrow (HESP)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Bobolink (BOBO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Black-Crowned Night-Heron (BCNH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Whip-poor-will (WPWI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Northern Flicker (NOFL)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Acadian Flycatcher (ACFL)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Loggerhead Shrike (LOSH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Bell's Vireo (BEVI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Bewick's Wren (BEWR)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Wood Thrush (WOTH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Kentucky Warbler (KEWA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster

TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds, Endangered Species	Prothonotary Warbler (PROW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Field Sparrow (FISP)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Cultural Resources	Archaeological sites	IDNR GIS	2002	http://ags.gis.iastate.edu/IsitesPublicAccess/	Vector
Cultural Resources	Historical Sites	National Park Service		http://tps.cr.nps.gov/nhl/default.cfm	DB
Cultural Resources	Native American Lands	IDNR GIS	2003	http://www.igsb.uiowa.edu/nrgislibx/	Vector
Fish	Salmon	Iowa Rivers Information System (IRIS)	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Steelhead	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Trout Streams	IDNR GIS	2004	http://www.igsb.uiowa.edu/nrgislibx/	Vector - Line
Fish	Sturgeon	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Herring	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Temperate River Bass	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Smelt	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Lamprey	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Shad	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Fish Database	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Streams Database	USGS, National Water Information System	Unknown	http://waterdata.usgs.gov/ia/nwis/current/?type=flow	Alphanumeric
Fish	Fish Database	IDNR	Unknown	http://www.iowadnr.gov/Fishing/IowaFishSpecies.aspx	Info-Map
Fish	Cold water streams	IDNR GIS	2004	http://www.igsb.uiowa.edu/nrgislibx/	Vector – Polygon

TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Hazmat	Federal Response Program (FRP) Facilities	U.S. Environmental Protection Agency (EPA)	2011	FRP Database, Region 7 (v16r5)	Local DB, Vector
Land Management	Municipal Landfill	IDNR GIS	2010	http://www.igsb.uiowa.edu/nrgislibx/	Infrastructure Data Section, Vector
Management Areas	Protected state and local areas	USGS and National Biological Information Infrastructure (NBII)	2010	http://www.nbii.gov/portal/server.pt?open=512&objID=1850&mode=2&in_hi_userid=2&cached=true	Go to "Protected Areas Viewer" tab and choose "Download Data", Vector
Management Areas	Iowa Natural Areas Inventory (INAI Species)	IDNR GIS	2009	http://www.igsb.uiowa.edu/nrgislibx/	Biologic and Ecologic Natural Areas Inventory Data Section, Vector
Management Areas	Federal and State Protected Areas	USGS GAP	Unknown	http://dingo.gapanalysisprogram.com/padus/Map.aspx	Online Map
Management Areas	Protected Streams	IDNR GIS	2005	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector
Management Areas	Protected Water Areas	IDNR GIS	2006	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector
Management Areas	Cons rec lands public	IDNR GIS	2011	http://www.igsb.uiowa.edu/nrgislibx/	Administrative and Political Boundaries Section, Vector
Management Areas	Designated Wetlands Setback	IDNR GIS	2006	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Surface Water Data Section, Vector
Management Areas	Federal Reservoirs	IDNR GIS	2005	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Surface Water Data Section, Vector
Management Areas	National Wetlands Inventory (NWI)	USFWS	Unknown	http://www.fws.gov/wetlands/Data/Mapper.html	Wetlands online mapper and data download, geodatabase (GDB)
Management Areas	NWI polygons	IDNR GIS	2010	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Surface Water Data Section, Vector
Management Areas	Water Body	IDNR GIS	2007	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector

TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Natural Hazards	Flood Hazard Area	Federal Emergency Management Agency (FEMA)	Unknown	https://hazards.fema.gov/femaportal/wps/portal/NFHLWMSkmzdownload	Stay Dry v2.0.kmz
Recreation	Boat Ramps Parking	IDNR GIS	2006	http://www.igsb.uiowa.edu/nrgislibx/	Recreation Data Section, Vector
Recreation	Beach monitoring sites	IDNR GIS	2007	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector
Recreation	Water Access - Fishing and Boating (Canoe) Access Points	IDNR GIS	2009	http://www.igsb.uiowa.edu/nrgislibx/	Recreation Data Section, Vector
Recreation	State Parks	USGS GAP	Unknown	http://dingo.gapanalysisprogram.com/padus/Map.aspx	Vector
Recreation	Public Prairie	IDNR GIS	2004	http://www.igsb.uiowa.edu/nrgislibx/IaArcIms.asp?Ims_layer=223	Vector
Recreation	Canoe Routes	IDNR GIS	2008	http://www.igsb.uiowa.edu/nrgislibx/IaArcIms.asp?Ims_layer=141	Vector
Recreation	General Recreation Information	IDNR Interactive Mapping	Unknown	http://programs.iowadnr.gov/ims/website/recreation/viewer.htm	Digital Map
Reptiles/ Amphibians	Northern Water Snake (NESI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Reptiles/ Amphibians	Reptiles/ Amphibians Iowa Database	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Reptiles/ Amphibians	Reptiles/ Amphibians Iowa Database	HerpNet.net	Unknown	http://www.herpnet.net/Iowa-Herpetology/index.php?option=com_frontpage&Itemid=1	Database – Maps
Resource Extraction	Municipal Water Intake	IDNR GIS	1996	http://www.igsb.uiowa.edu/nrgislibx/	Vector
Resource Extraction	All public wells	IDNR GIS	2010	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector

TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Resource Extraction	Mineral Resources	USGS - Mineral Resources Data System (MRDS)	2005	http://tin.er.usgs.gov/mrds/	Vector
Resource Extraction	Mines and Mineral Plants	USGS	2003	http://tin.er.usgs.gov/mineplant/	Vector
Resource Extraction	SWAP Areas Surface Water	IDNR GIS	2006	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector
Resource Extraction	Water Use Surface Water Intakes	IDNR GIS	2010	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector
Resource Extraction	Public Water Supply Sources	USGS, National Hydrology Dataset (NHD)	2010	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Shellfish	Freshwater Mussels	Iowa DNR Interactive Mapping	Unknown	https://programs.iowadnr.gov/naturalareasinventory/pages/Query.aspx	Digital Map
Terrestrial Mammals	Otter (LUCA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Terrestrial Mammals	Beaver (CACA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Terrestrial Mammals	Mink (MUVI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Transportation	Railroad	IDNR GIS	2010	http://www.igsb.uiowa.edu/nrgislibx/	Infrastructure Data Section, Vector
Water Supply	Dam	USGS, National Hydrology Dataset (NHD)	2010	ftp://nhdftp.usgs.gov/DataSets/National//	Vector

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Animals & Plants - General	Critical Habitat	U.S. Fish & Wildlife Service (USFWS)	Unknown	http://criticalhabitat.fws.gov/crithab/	Vector	
Animals & Plants - General	Endangered and Threatened Species	Kansas Department of Wildlife, Parks, and Tourism (KDWPT)	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	
Animals & Plants - General	Natural Communities	Kansas Data Access & Support Center (DASC)	2008	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category
Animals & Plants - General	Rare Species	Kansas DASC	2008	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category
Animals & Plants - General	Refuge Trail	USFWS	Unknown	http://www.fws.gov/GIS/data/national/index.htm	Vector	National Wildlife Refuge System (NWRS) Trails
Birds	Migratory Birds	Migratory Bird Data Center	Unknown	https://migbirdapps.fws.gov/	Database	
Birds	American Black Duck	U.S. Geological Survey (USGS) Gap Analysis Program (GAP)	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	American Kestrel	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Baird's Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Bald Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Barn Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Barred Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Bird database	North American Breeding Bird Survey	Unknown	http://www.pwrc.usgs.gov/bbs/	Database - Maps	

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Bird Point Count Database	USGS - Patuxent Wildlife Research Center	Unknown	http://www.pwrc.usgs.gov/point/	Database with coord.	
Birds	Birds Information	Nature Serve	Unknown	http://www.natureserve.org/getData/birdMaps.jsp	Vector	
Birds	Birds of Conservation Concern	USFWS	2008	http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf	List	BCR 18, 19, and 22, pages 34, 35, and 38 respectively.
Birds	Black Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Bonaparte's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Broad-Winged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Part of State Migratory Bird
Birds	Buff-breasted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Burrowing Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Cackling Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Canada Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Clark's Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving
Birds	Common Loon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Migratory Bird
Birds	Common Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Common Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Cooper's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Eared Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Migratory Bird
Birds	Eastern Screech-Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Ferruginous Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Forster's Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Franklin's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Migratory Bird
Birds	Golden Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Great Horned Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Great White-fronted Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Herring Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Hooded Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Horned Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Part of State Migratory Bird
Birds	Least Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Long-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Merlin	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Migratory Bird
Birds	Mississippi Kite	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Goshawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Harrier	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Saw-whet Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Shoveler	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Osprey	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Migratory Bird

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Pectoral Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Peregrine Falcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Part of State Migratory Bird
Birds	Pied-Billed Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving
Birds	Prairie Falcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Red-breasted Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Migratory Bird
Birds	Red-shouldered Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Red-tailed Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Ring-Billed Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Ring-necked Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Migratory Bird
Birds	Ross's Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Rough-legged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Ruddy Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Sabine's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Semipalmated Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Sharp-shinned Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Short-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Snow Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Snowy Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Solitary Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Spotted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Stilt Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Swainson's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Turkey Vulture	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Upland Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Waterfowl Birds	USGS GAP	Unknown	https://migbirdapps.fws.gov/	Database	
Birds	Western Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Part of State Migratory Bird
Birds	Western Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Western Screech-owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	White-rumped Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Wilson's Phalarope	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Wilson's Snipe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Wood Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds, Endangered/ Threatened (E/T) Species	Endangered and Threatened Species	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	
Birds, E/T Species	Designated Critical Habitat	Kansas DASC	1997	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds, E/T Species	Black-capped Vireo	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Birds, E/T Species	Black-capped Vireo	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Birds, E/T Species	Eskimo Curlew	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Birds, E/T Species	Least Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds, E/T Species	Least Tern	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Birds, E/T Species	Piping Plover	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Birds, E/T Species	Piping Plover	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Birds, E/T Species	Snowy Plover	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Birds, E/T Species	Snowy Plover	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Birds, E/T Species	Whooping Crane	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Part of State Migratory Bird
Birds, E/T Species	Whooping Crane	USFWS	2011	http://criticalhabitat.fws.gov/crithab/	Vector	Endangered
Boundaries	Cities (Incorporated Places)	USGS - The National Map	2008	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Boundaries	County Boundaries	U.S. Census Bureau - TIGER	2011	http://www.census.gov/cgi-bin/geo/shapefiles2011/main	Vector	

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Cultural Resources	Archaeological sites	Kansas Historical Society	Unknown	http://www.kshs.org/p/archeological-site-and-survey-location-gis-coverage/15739	Guide	Guide to Access Private GIS Information
Cultural Resources	Historical Sites	National Park Service	Unknown	http://tps.cr.nps.gov/nhl/default.cfm	Database	
Cultural Resources	Native American Lands	Kansas DASC	2000	http://www.kansasgis.org/catalog/index.cfm	Vector	Administrative Boundaries Category
Emergency Services	Fire Stations	Kansas DASC	2009	http://www.kansasgis.org/catalog/index.cfm	Vector	Critical Infrastructure and Structures Category
Emergency Services	EMS Stations	Kansas DASC	2008	http://www.kansasgis.org/catalog/index.cfm	Vector	Critical Infrastructure and Structures Category
Emergency Services	Law Enforcement	Kansas DASC	2008	http://www.kansasgis.org/catalog/index.cfm	Vector	Critical Infrastructure and Structures Category
Energy	Oil & Gas Wells	University of Kansas (KU), Kansas Geological Survey (KGS)	2011	http://www.kgs.ku.edu/PRS/petroDB.html	Vector	
Energy	Pipelines	National Pipeline Mapping System (NPMS)	Unknown	https://www.npms.phmsa.dot.gov/PublicViewer/composite.jsf#		Interactive Maps; For Reference Purpose Only
Fish	2011 Fishing Atlas	KDWPT	2011	http://kdwpt.state.ks.us/news/KDWPT-Info/Locations/Hunting-Fishing-Maps-by-County/2011-Fishing-Atlas	Maps	2011 Fishing Atlas
Fish, E/T Species	Endangered and Threatened Species	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	
Fish, E/T Species	Arkansas River Shiner	USFWS	2005	http://criticalhabitat.fws.gov/crithab/	Vector	Endangered

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Fish, E/T Species	Arkansas Darter	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Arkansas Darter	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Arkansas River Shiner	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Fish, E/T Species	Arkansas River Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Designated Critical Habitat	Kansas DASC	1997	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category
Fish, E/T Species	Arkansas River Speckled Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Blackside Darter	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Chestnut Lamprey	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Flathead Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Hornyhead Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Neosho Madtom	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Pallid Sturgeon	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Plains Minnow	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Redspot Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Shoal Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Fish, E/T Species	Sicklefin Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Silver Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Silverband Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Sturgeon Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Topeka Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Western Silvery Minnow	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Arkansas River Speckled Chub	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Fish, E/T Species	Blackside Darter	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Chestnut Lamprey	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Flathead Chub	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Hornyhead Chub	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Neosho Madtom	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Pallid Sturgeon	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Fish, E/T Species	Plains Minnow	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Redspot Chub	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Shoal Chub	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Sicklefin Chub	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Fish, E/T Species	Silver Chub	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Fish, E/T Species	Silverband Shiner	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Sturgeon Chub	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Topeka Shiner	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Western Silvery Minnow	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Hazmat	Federal Response Program (FRP) Facilities	FRP Database, Region 7 (v16r5)	2011		Vector	Local Database
Land Management	Landfills	Kansas DASC	1994	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Land Management	Landuse (Kansas Land Cover Patterns, Level IV)	Kansas DASC	2005	http://www.kansasgis.org/catalog/index.cfm	Raster	Land Surface Geology Soils Category
Management Areas	Ecoregions	Kansas DASC	2003	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category
Management Areas	Federal and State Protected Areas	USGS GAP	Unknown	http://dingo.gapanalysisprogram.com/padus/Map.aspx	Interactive Map-Vector	
Management Areas	Groundwater Management Districts	Kansas DASC	2006	http://www.kansasgis.org/catalog/index.cfm	Vector	Administrative Boundaries Category
Management Areas	National Cadastral Data	USFWS	2011	http://www.fws.gov/GIS/data/CadastralDB/index.htm	Vector	
Management Areas	National Parks	National Park Service (IRMA Portal)	2011	https://irma.nps.gov/App/Reference/Profile/2181146	Vector	
Management Areas	National Wetlands Inventory (NWI)	USFWS	2011	http://www.fws.gov/wetlands/Data/DataDownload.html	GDB	Wetlands online mapper and data download
Management Areas	Protected Areas	Kansas DASC	2008	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category
Management Areas	Realtime Streamflow stations	USGS - National Water Information System	Daily	http://waterdata.usgs.gov/nwis/rt	Vector	
Management Areas	Reserves	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Management Areas	Riparian Inventory	Kansas DASC	2001	http://www.kansasgis.org/catalog/index.cfm	Vector	Land Surface Geology Soils Category
Management Areas	Terrestrial Ecoregions	World Wildlife Federation (WWF)	2006	http://www.worldwildlife.org/science/data/item6373.html	Vector	

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Management Areas	Water Body	U.S. Census Bureau - TIGER	2011	http://www.census.gov/cgi-bin/geo/shapefiles2011/layers.cgi	Vector	
Management Areas	Water Body High resolution	USGS - National Hydrography Dataset	2010	ftp://nhdftp.usgs.gov/DataSets/Staged/States/	Vector	
Management Areas	Wilderness Areas	Wilderness.net	2011	http://www.wilderness.net/index.cfm?fuse=NWPS&sec=geography	Vector	
Natural Hazards	Flood Hazard Areas (KMZ file)	Federal Emergency Management Agency (FEMA)	Unknown	https://hazards.fema.gov/femaportal/wps/portal/NFHLWMSkmzdownload	-	KMZ File; Stay Dry v2.0.kmz
Plants	Endangered and threatened Species	USFWS	2011	http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=KS&s8fid=112761032792&s8fid=112762573902	List - Interactive Maps	
Recreation	Canoe Access	KDWPT	Unknown	http://kdwpt.state.ks.us/news/Boating/KS-State-Boating-Access	Interactive Map	
Recreation	Playa Lakes	Kansas DASC	2004	http://www.kansasgis.org/catalog/index.cfm	Vector	Archive Category
Recreation	State Parks	USGS GAP	Unknown	http://www.gap.uidaho.edu/padusmap.html	Interactive Map - Vector	
Recreation	Walk-In Hunting Access	Kansas DASC	2011	http://www.kansasgis.org/catalog/index.cfm	Vector	Cultural and Recreational Category
Reptiles/ Amphibians, E/T Species	Endangered and Threatened Species	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	
Reptiles/ Amphibians, E/T Species	Broadhead Skink	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Cave Salamander	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Reptiles/ Amphibians, E/T Species	Common Map Turtle	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Eastern Narrowmouth Toad	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Eastern Newt	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Green Frog	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Green Toad	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Grotto Salamander	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Reptiles/ Amphibians, E/T Species	Longtail Salamander	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Many-ribbed Salamander	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Reptiles/ Amphibians, E/T Species	Spring Peeper	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Strecker's Chorus Frog	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Resource Extraction	Drinking Water	USGS - Drinking Water Watch	Unknown	http://165.201.142.59:8080/DWW/Maps/Map_Template.jsp	Database	

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Resource Extraction	Mineral Resources	USGS - Mineral Resources Data System (MRDS)	2005	http://tin.er.usgs.gov/mrds/	Vector	
Resource Extraction	Mines and Mineral Plants	USGS	2003	http://tin.er.usgs.gov/mineplant/	Vector	
Resource Extraction	Potable Water Facility	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Resource Extraction	Public Water Supply Systems (PWS)	Kansas DASC	2004	http://www.kansasgis.org/catalog/index.cfm	Vector	Utilities and Energy Resources Category
Resource Extraction	Registered Groundwater Wells	KU, KGS	2011	http://www.kgs.ku.edu/Magellan/WaterWell/index.html	List with Coordinates	
Shellfish, E/T Species	Butterfly Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Shellfish, E/T Species	Delta Hydrobe	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Shellfish, E/T Species	Elktoe Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Ellipse Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Flat Floater Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Flutedshell Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Shellfish, E/T Species	Mucket Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Neosho Mucket Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Ouchita Kidneyshell Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Shellfish, E/T Species	Rabbitsfoot Mussel	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Rock Pocketbook Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Shellfish, E/T Species	Sharp Hornsnail	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Shellfish, E/T Species	Slender Walker Snail	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Western Fanshell Mussell	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Endangered and Threatened Species	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	
Terrestrial Mammals	North American River Otter	USGS GAP	Unknown	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Terrestrial Mammals, E/T Species	Endangered and Threatened Species	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	

TABLE A.7.2

KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Terrestrial Mammals, E/T Species	Black-footed Ferret	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Terrestrial Mammals, E/T Species	Eastern Spotted Skunk	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Terrestrial Mammals, E/T Species	Gray Myotis	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Terrestrial Mammals, E/T Species	Mammals Information	Nature Serve	Unknown	http://www.natureserve.org/getData/mammalMaps.jsp	Vector	
Terrestrial Mammals, E/T Species	Threatened species	International Union for Conservation of Nature	2010	http://www.iucnredlist.org/technical-documents/spatial-data	Vector	International Area
Transportation	Railroads	Kansas DASC	2002	http://www.kansasgis.org/catalog/index.cfm	Vector	Transportation Category
Water Supply	Aquifers	National Atlas	2006	http://nationalatlas.gov/mld/aquifrp.html	Vector	
Water Supply	Dams	National Atlas	2006	http://nationalatlas.gov/atlasftp.html#dams00x	Vector	

TABLE A.7.3

MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Animals & Plants - General	Critical Habitat	U.S. Fish & Wildlife Service (USFWS)	Unknown	http://criticalhabitat.fws.gov/crithab/	Vector	
Animals & Plants - General	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Animals & Plants - General	Refuge Trail	USFWS	Unknown	http://www.fws.gov/GIS/data/national/index.htm	Vector	National Wildlife Refuge System (NWRS) Trails
Birds	Migratory Birds	Migratory Bird Data Center	Unknown	https://migbirdapps.fws.gov/	Database	
Birds	American Black Duck	U.S. Geological Survey (USGS) Gap Analysis Program (GAP)	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	American Kestrel	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Baird's Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Bald Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Barn Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Barred Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Bird database	North American Breeding Bird Survey	Unknown	http://www.pwrc.usgs.gov/bbs/	Database - Maps	
Birds	Bird Point Count Database	USGS - Patuxent Wildlife Research Center	Unknown	http://www.pwrc.usgs.gov/point/	Database with coord.	
Birds	Birds Information	Nature Serve	Unknown	http://www.natureserve.org/getData/birdMaps.jsp	Vector	
Birds	Birds of Conservation Concern	USFWS	2008	http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf	List	BCR 22, 24, and 26, pages 38, 40, and 42 respectively.

TABLE A.7.3

MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Black Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Migratory Bird
Birds	Black Vulture	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Bonaparte's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Broad-Winged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Buff-breasted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Cackling Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Canada Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Caspian Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Common Loon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Migratory Bird
Birds	Common Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Common Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Migratory Bird
Birds	Cooper's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Eared Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Part of State Migratory Bird
Birds	Eastern Screech-Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Forster's Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Migratory Bird
Birds	Franklin's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Migratory Bird
Birds	Golden Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Glaucous Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns
Birds	Great Horned Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor

TABLE A.7.3

MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Great White-fronted Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Herring Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Hooded Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Horned Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Part of State Migratory Bird
Birds	Least Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Long-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Merlin	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Migratory Bird
Birds	Mississippi Kite	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Goshawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Harrier	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Saw-whet Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Osprey	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Part of State Migratory Bird
Birds	Pectoral Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Peregrine Falcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Pied-Billed Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving
Birds	Red-breasted Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Migratory Bird
Birds	Red-shouldered Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor

TABLE A.7.3

MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Red-tailed Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Ring-Billed Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Ring-necked Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Ross's Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Rough-legged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Ruddy Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Semipalmated Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Sharp-shinned Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Short-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Snow Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Snowy Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Solitary Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Spotted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Stilt Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Swainson's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Turkey Vulture	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Upland Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Waterfowl Birds	USGS GAP	Unknown	https://migbirdapps.fws.gov/	Database	

TABLE A.7.3

MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Western Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	White-rumped Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Wilson's Phalarope	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Wilson's Snipe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Wood Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds, Endangered/ Threatened (E/T) Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Birds, E/T Species	Least Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird; Endangered
Birds, E/T Species	Piping Plover	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Threatened
Boundaries	Cities (Incorporated Places)	USGS - The National Map	2008	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Boundaries	County Boundaries	Missouri Spatial Data Information Service (MSDIS)	2011	http://www.msdis.missouri.edu/data/themelist.html#admin	Vector	
Cultural Resources	Archaeological sites	Missouri Department of Natural Resources (MDNR)	Unknown	http://www.dnr.mo.gov/shpo/mapgallery.htm	Interactive Map	Requires User ID and Password
Cultural Resources	Historical Sites	Missouri Spatial Data Information Service (MSDIS)	2009	http://www.msdis.missouri.edu/data/themelist.html#admin	Vector	

TABLE A.7.3

MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Cultural Resources	Native American Lands	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Emergency Services	Fire Stations	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Emergency Services	EMS Stations	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Emergency Services	Law Enforcement	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Energy	Oil & Gas Wells	USGS - Energy Resources Program	Unknown	http://certmapper.cr.usgs.gov/erp_datafinder_v1.1/explorer.jsp	Vector	
Energy	Oil and Gas Permits	USGS - Geological Survey Program	2011	http://dnr.mo.gov/geology/geosrv/ogc/index.html#permitted	XLS File with Coord	
Energy	Pipelines	National Pipeline Mapping System (NPMS)	Unknown	https://www.npms.phmsa.dot.gov/PublicViewer/composite.jsf#		Interactive Maps; For Reference Purpose Only
Fish	Trout Management Streams	Missouri Department of Conservation (MDC)	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Fish, E/T Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Fish, E/T Species	Critical Habitat	USFWS	2011	http://criticalhabitat.fws.gov/crithab/	Vector	
Fish, E/T Species	Nonindigenous Fish	USGS - Nonindigenous Aquatic Species (NAS)	2011	http://nas.er.usgs.gov/queries/StateSearch.aspx	Interactive Map	
Fish, E/T Species	Neosho Madtom	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map

TABLE A.7.3

MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Fish, E/T Species	Niangua Darter	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Ozark Cavefish	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Pallid Sturgeon	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Endangered; Go to Tools/Point Map
Fish, E/T Species	Topeka Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Endangered; Go to Tools/Point Map
Hazmat	Federal Response Program (FRP) Facilities	FRP Database, Region 7 (v16r5)	2011		Vector	Local Database
Land Management	Landfills	MSDIS	2011	http://www.msdis.missouri.edu/data/datalist.html#statemo	Vector	
Land Management	Landuse (Land Cover)	MSDIS	2005	http://www.msdis.missouri.edu/data/lulc/lulc05.html	Raster	
Management Areas	Ecoregions	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Management Areas	Conservation Areas	MDC	Unknown	http://mdc.mo.gov/discover-nature/places-go/google-earth	KMZ File	
Management Areas	Federal and State Protected Areas	USGS GAP	Unknown	http://dingo.gapanalysisprogram.com/padus/Map.aspx	Interactive Map-Vector	
Management Areas	Groundwater Watch	USGS - MO Active Water Level Network	2011	http://groundwaterwatch.usgs.gov/StateMaps/MO.html	KMZ File	
Management Areas	National Cadastral Data	USFWS	2011	http://www.fws.gov/GIS/data/CadastralDB/index.htm	Vector	
Management Areas	National Parks	National Park Service (IRMA Portal)	2011	https://irma.nps.gov/App/Reference/Profile/2181146	Vector	

TABLE A.7.3

MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Management Areas	National Wetlands Inventory (NWI)	USFWS	2011	http://www.fws.gov/wetlands/Data/DataDownload.html	GDB	Wetlands online mapper and data download
Management Areas	Realtime Streamflow stations	USGS - National Water Information System	Daily	http://waterdata.usgs.gov/nwis/rt	Vector	
Management Areas	Reserves	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Management Areas	Preserve Boundaries	MSDIS	2009	http://www.msdis.missouri.edu/data/themelist.html#admin	Vector	
Management Areas	Wild Areas	MSDIS	2011	http://www.msdis.missouri.edu/data/themelist.html#admin	Vector	
Management Areas	Terrestrial Ecoregions	World Wildlife Federation (WWF)	2006	http://www.worldwildlife.org/science/data/item6373.html	Vector	
Management Areas	Water Body	U.S. Census Bureau - TIGER	2011	http://www.census.gov/cgi-bin/geo/shapefiles2011/layers.cgi	Vector	
Management Areas	Water Body High resolution	USGS - National Hydrography Dataset	2010	ftp://nhdftp.usgs.gov/DataSets/Staged/States/	Vector	
Management Areas	Wilderness Areas	Wilderness.net	2011	http://www.wilderness.net/index.cfm?fuse=NWPS&sec=geography	Vector	
Natural Hazards	Flood Hazard Areas (KMZ file)	Federal Emergency Management Agency (FEMA)	Unknown	https://hazards.fema.gov/femaportal/wps/portal/NFHLWMSkmzdownload	KMZ File	Stay Dry v2.0.kmz
Plants, E/T Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Recreation	Boat Ramps	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	

TABLE A.7.3

MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Recreation	Camping	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Recreation	Docks and Plattforms	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Recreation	Fishing	MDC	Unknown	http://newmdcgis.mdc.mo.gov/Boat%20Ramps/	Interactive Map	
Recreation	Shooting Range	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Recreation	State Parks	USGS - Gap Analysis	Unknown	http://www.gap.uidaho.edu/padusmap.html	Interactive Map - Vector	
Recreation	State Parks and Historic Sites	MSDIS	2011	http://www.msdis.missouri.edu/data/datalist.html#statemo	Vector	
Recreation	Trails	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Recreation	Hunting Areas	MDC	Unknown	http://mdc4.mdc.mo.gov/applications/moatlas/AdvancedSearch.aspx	Database - Maps	Advance Search by Activities
Reptiles/ Amphibians	Northern Leopard Frog	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Reptiles/ Amphibians	Alligator Snapping turtle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Reptiles/ Amphibians, E/T Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Resource Extraction	Mineral Resources	USGS - Mineral Resources Data System (MRDS)	2005	http://tin.er.usgs.gov/mrds/	Vector	
Resource Extraction	Mines and Mineral Plants	USGS	2003	http://tin.er.usgs.gov/mineplant/	Vector	
Resource Extraction	Potable Water Facility	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	

TABLE A.7.3

MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Resource Extraction	Public Water Storage Tanks	Missouri Public Drinking Water Website - CARES	Unknown	http://drinkingwater.missouri.edu/	Vector	GIS Data; Password protected website
Resource Extraction	Public Water Systems	Missouri Public Drinking Water Website - CARES	Unknown	http://drinkingwater.missouri.edu/	Vector	GIS Data; Password protected website
Resource Extraction	Public Water Supply Intakes	Missouri Public Drinking Water Website - CARES	2007	http://drinkingwater.missouri.edu/	Vector	GIS Data; Password protected website
Resource Extraction	Public Water Treatment Plants	Missouri Public Drinking Water Website - CARES	2007	http://drinkingwater.missouri.edu/	Vector	GIS Data; Password protected website
Resource Extraction	Registered Groundwater Wells	MSDIS	2010	http://www.msdis.missouri.edu/data/datalist.html#statemo	Vector	
Shellfish, E/T Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Terrestrial Mammals	North American River Otter	USGS GAP	Unknown	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Terrestrial Mammals, E/T Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Terrestrial Mammals, E/T Species	Mammals Information	Nature Serve	Unknown	http://www.natureserve.org/getData/mammalMaps.jsp	Vector	
Terrestrial Mammals, E/T Species	Threatened species	International Union for Conservation of Nature	2010	http://www.iucnredlist.org/technical-documents/spatial-data	Vector	International Area
Transportation	Railroads	MSDIS	2006	http://www.msdis.missouri.edu/data/themelist.html#	Vector	
Water Supply	Aquifers	National Atlas	2006	http://nationalatlas.gov/mld/aquifrp.html	Vector	

TABLE A.7.3

MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Water Supply	Dams	MSDIS	2010	http://www.msdis.missouri.edu/data/datalist.html#mocdc	Vector	
Water Supply	Dams	National Atlas	2006	http://nationalatlas.gov/atlasftp.html#dams00x	Vector	

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Animals & Plants - General	Critical Habitat	U.S. Fish & Wildlife Service (USFWS)	Unknown	http://criticalhabitat.fws.gov/crithab/	Vector
Animals & Plants - General	Endangered and threatened Species	North American Native Fishes Association (NAFNA)	2011	http://outdoornebraska.ne.gov/wildlife/programs/nongame/pdf/E_T_Species_List.pdf	List
Animals & Plants - General	Native Vegetation	University of Nebraska-Lincoln (UNL), School of Natural Resources)	Unknown	http://snr.unl.edu/data/geographygis/NebrGISland.asp	Vector
Animals & Plants - General	Refuge Trail	USFWS	Unknown	http://www.fws.gov/GIS/data/national/index.htm	National Wildlife Refuge System (NWRS) Trails, Vector
Birds	Migratory Birds	Migratory Bird Data Center	Unknown	https://migbirdapps.fws.gov/	Database
Birds	American Kestrel	U.S. Geological Survey (USGS) Gap Analysis Program (GAP)	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Baird's Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory
Birds	Bald Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Barn Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Barred Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Bird database	North American Breeding Bird Survey	Unknown	http://www.pwrc.usgs.gov/bbs/	Database - Maps
Birds	Bird Point Count Database	USGS - Patuxent Wildlife Research Center	Unknown	http://www.pwrc.usgs.gov/point/	Database with coordinates

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Birds Information	Nature Serve	Unknown	http://www.natureserve.org/getData/birdMaps.jsp	Vector
Birds	Birds of Conservation Concern	USFWS	2008	http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf	BCR 11, 17, 18, 19, and 22, pages 27, 33, 34, 35, and 38 respectively.
Birds	Black Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird
Birds	Bonaparte's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird
Birds	Broad-Winged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor, and Part of State Migratory Bird
Birds	Buff-breasted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Part of State Migratory Bird
Birds	Burrowing Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Cackling Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl
Birds	California Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird
Birds	Canada Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl
Birds	Clark's Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving
Birds	Common Loon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving, and Migratory Bird
Birds	Common Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl
Birds	Common Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird
Birds	Cooper's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Eared Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving, and Part of State Migratory Bird
Birds	Eastern Screech-Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Ferruginous Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Forster's Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Franklin's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Migratory Bird
Birds	Golden Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Great Horned Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Great White-fronted Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Part of State Migratory Bird
Birds	Gyrfalcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Herring Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Migratory Bird
Birds	Hooded Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Part of State Migratory Bird
Birds	Horned Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving, and Migratory Bird
Birds	Least Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory Bird
Birds	Least Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird
Birds	Long-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Merlin	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor, and Migratory Bird
Birds	Northern Goshawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Northern Harrier	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Northern Saw-whet Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Osprey	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor, and Migratory Bird
Birds	Pacific Loon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving, and Part of State Migratory Bird
Birds	Pectoral Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory Bird
Birds	Peregrine Falcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor, and Part of State Migratory Bird

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Pied-Billed Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving
Birds	Prairie Falcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Red-breasted Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Migratory Bird
Birds	Red-tailed Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Ring-Billed Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Migratory Bird
Birds	Ring-necked Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Migratory Bird
Birds	Ross's Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Part of State Migratory Bird
Birds	Rough-legged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Ruddy Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Part of State Migratory Bird
Birds	Semipalmated Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory Bird
Birds	Sharp-shinned Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Short-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Snow Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Part of State Migratory Bird
Birds	Snowy Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Solitary Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory Bird
Birds	Spotted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading
Birds	Stilt Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Part of State Migratory Bird

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Swainson's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Trumpeter Swan	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl
Birds	Turkey Vulture	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Upland Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Part of State Migratory Bird
Birds	Waterfowl Birds	USFWS	Unknown	https://migbirdapps.fws.gov/	Database
Birds	Western Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving, and Part of State Migratory Bird
Birds	Western Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Part of State Migratory Bird
Birds	White-rumped Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory Bird
Birds	Wood Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl
Birds, Endangered/ Threatened (E/T) Species	Mountain Plover	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Endangered
Birds, E/T Species	Piping Plover	USFWS	2011	http://criticalhabitat.fws.gov/crithab/	Vector, Endangered
Birds, E/T Species	Whooping Crane	USFWS	2011	http://criticalhabitat.fws.gov/crithab/	Vector, Endangered
Boundaries	City Boundaries	Nebraska Department of Natural Resources (NDNR) Geographical Information System (GIS)	2010	http://www.dnr.ne.gov/databank/statewide.html	Vector
Boundaries	County Boundaries	NDNR GIS	2010	http://www.dnr.ne.gov/databank/statewide.html	Vector

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Cultural Resources	Archaeological sites	Nebraska State Historical Society (NSHS)	Unknown	http://www.nebraskahistory.org/histpres/nebraska/index.shtml	List
Cultural Resources	Historical Sites	NSHS	Unknown	http://www.nebraskahistory.org/histpres/nebraska/index.shtml	List
Cultural Resources	Historical Sites	National Park Service	Unknown	http://tps.cr.nps.gov/nhl/default.cfm	Database
Cultural Resources	Native American Lands	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Emergency Services	Fire Stations/EMS Station	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Emergency Services	Law Enforcement	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Energy	Oil & Gas Wells	Nebraska Oil and Gas Conservation Commission	2011	http://www.nogcc.ne.gov/NOGCCOnlineGIS/	Database - Maps
Energy	Pipelines	National Pipeline Mapping System (NPMS)	Unknown	https://www.npms.phmsa.dot.gov/PublicViewer/composite.jsf#	Interactive Maps; For Reference Purpose Only
Fish	Fish Guide	Nebraska Game and Parks Commission (NGP)	2011	http://outdoornebraska.ne.gov/Fishing/guides/fishguide/pdf/FishGuide.pdf	Guide; Threatened and Endangered Species Pag. 14
Fish, E/T Species	All Threatened and Endangered Species	UNL, School of Natural Resources	Unknown	http://watercenter.unl.edu/watermap/threatenedendangered.asp	Map
Fish, E/T Species	Blacknose Shiner	Nebraska Library Commission (NLC)	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 19
Fish, E/T Species	Blacknose Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Fish, E/T Species	Finescale Dace	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 21
Fish, E/T Species	Finescale Dace	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Lake Sturgeon	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 25
Fish, E/T Species	Lake Sturgeon	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Northern Redbelly Dace	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 23
Fish, E/T Species	Northern Redbelly Dace	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Pallid Sturgeon	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 27
Fish, E/T Species	Pallid Sturgeon	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Sturgeon Chub	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 29
Fish, E/T Species	Sturgeon Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Topeka Shiner	USFWS	2004	http://criticalhabitat.fws.gov/crithab/	
Fish, E/T Species	Topeka Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Topeka Shiner	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 31
Hazmat	Federal Response Program (FRP) Facilities	FRP Database, Region 7 (v16r5)	2011		Vector, Local Database
Land Management	Landuse Data	NDNR GIS	2005	http://dnr.ne.gov/databank/landuse.html	Raster

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Management Areas	Federal and State Protected Areas	USGS GAP	Unknown	http://dingo.gapanalysisprogram.com/padus/Map.aspx	Online Map -Vector
Management Areas	Terrestrial Ecosystems	WWF	2006	http://www.worldwildlife.org/science/data/item6373.html	Vector
Management Areas	Groundwater Regions	UNL, School of Natural Resources	Unknown	http://snr.unl.edu/data/geographygis/NebrGISwater.asp#ground	Vector
Management Areas	National Parks	National Park Service, IRMA Portal	2011	https://irma.nps.gov/App/Reference/Profile/2181146	Vector
Management Areas	Reserves	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Management Areas	Wilderness Areas	Wilderness.net	2011	http://www.wilderness.net/index.cfm?fuse=NWPS&sec=geography	Vector
Management Areas	National Cadastral Data	USFWS	2011	http://www.fws.gov/GIS/data/CadastralDB/index.htm	Vector
Management Areas	Realtime Streamflow stations	USGS - National Water Information System	Daily	http://waterdata.usgs.gov/nwis/rt	Vector
Management Areas	Federal Reservoirs	Central Nebraska Public Power and Irrigation District	Unknown	http://www.cnppid.com/Elevation_Flows2.htm	List - Graphs
Management Areas	National Wetlands Inventory (NWI)	USFWS	Unknown	http://www.fws.gov/wetlands/Data/DataDownload.html	GDB, Wetlands online mapper and data download
Management Areas	Water Body High resolution	USGS - National Hydrography Dataset	2010	ftp://nhdftp.usgs.gov/DataSets/Staged/States/	Vector
Management Areas	Water Body	U.S. Census Bureau - TIGER	2011	http://www.census.gov/cgi-bin/geo/shapefiles2011/layers.cgi	Vector

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Natural Hazards	Flood Hazard Areas (KMZ file)	Federal Emergency Management Agency (FEMA)	Unknown	https://hazards.fema.gov/femaportal/wps/portal/NFHLWMSkmzdownload	KMZ File; Stay Dry v2.0.kmz
Plants	Endangered and threatened Species	North American Native Fishes Association (NAFNA)	2011	http://outdoornebraska.ne.gov/wildlife/programs/nongame/pdf/E_T_Species_List.pdf	List; Plants information for Nebraska
Recreation	Boat Ramps	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	Campground	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	Canoe Access	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	Fishing	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	Parking	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	State Parks	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	Trails	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Vector
Reptiles/ Amphibians	Great Plains Skink	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Reptiles/ Amphibians	Northern Leopard Frog	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Reptiles/ Amphibians	Plains Gartersnake	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Reptiles/ Amphibians	Reptiles & Amphibians of Nebraska Database	UNL, School of Natural Resources	Unknown	http://snr.unl.edu/herpneb/	Database

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Resource Extraction	Mines	UNL, School of Natural Resources	Unknown	http://snr.unl.edu/data/geographygis/nebrgisgeology.asp	Vector
Resource Extraction	Mineral Resources	USGS - Mineral Resources Data System (MRDS)	2005	http://tin.er.usgs.gov/mrds/	Vector
Resource Extraction	Mines and Mineral Plants	USGS	2003	http://tin.er.usgs.gov/mineplant/	Vector
Resource Extraction	Potable Water Facility	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Resource Extraction	Registered Groundwater Wells	NDNR GIS	Unknown	http://dnrdata.dnr.ne.gov/OvernightBatch/DataTypeList.aspx	Vector
Terrestrial Mammals	Red Squirrel	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Terrestrial Mammals	Snowshoe Hare	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Terrestrial Mammals, E/T Species	General Species Information	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Terrestrial Mammals, E/T Species	Mammals Information	Nature Serve	Unknown	http://www.natureserve.org/getData/mammalMaps.jsp	Vector
Terrestrial Mammals, E/T Species	North American River Otter	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Threatened
Terrestrial Mammals, E/T Species	Swift Fox	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Endangered
Terrestrial Mammals, E/T Species	Threatened species	International Union for Conservation of Nature	2010	http://www.iucnredlist.org/technical-documents/spatial-data	International Area
Transportation	Railroads	NDNR GIS	2010	http://www.dnr.ne.gov/databank/statewide.html	Vector

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Water Supply	Aquifers	UNL School of Natural Resources	1979	http://snr.unl.edu/data/geographygis/NebrGISwater.asp	Vector
Water Supply	Dams	NDNR GIS	Unknown	http://dnrdata.dnr.ne.gov/Dams/index.aspx	Vector

APPENDIX G

MATERIAL SAFETY DATA SHEET(S)

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Keystone Commodities List: Legal Names & Codes

Page #	Commodity Legal Name & Manufacturer	OCC Codes / Synonyms
3	**Alberta Common Synthetic (ACS):** Husky Oil Operations Limited	ACS
4	**Albian Heavy Synthetic Crude:** Shell Canada Limited	AHS
5	**Albian Muskeg River Heavy (AMH):** Shell Canada Limited	AMH
6	**Albian Resid Blend:** Shell Canada Limited	ARB / Albian Residual Blend
7	**Albian Vacuum Gasoil Blend:** Shell Canada Limited	AVB / Albian Vacuum Bottoms
8	**Canadian Sour Crude**: Conoco Phillips Canada Res. Corp.	KCB / Keystone Conoco Blend
9	**Crude Oil Sour (Blended):** MEG Energy Corp	AWB / Access Western Blend
10	**Crude Oil Sweet (Canada):** Conoco Phillips Canada Limited	SW / Mixed Sweet
11	**Diluted Bitumen**: Nexen Canada Inc	PSH / Long Lake Synbit Blend
12	**Heavy Crude Oil/Diluent Mix**: Cenovus Energy Inc	CDB / Christina Lake Dilbit
13	**Heavy Crude Oil/Diluent Mix (Christina Lake/Foster Creek)**: EnCana Corporation	CL / Cold Lake
14	**Horizon Sweet Light Oil:** Canadian Natural Resources Ltd	CNS / CNRL Sweet Syn Blend / CNRL Sweet Synthetic Blend
15	**Mackay River Blend: Cdn** Petro-Canada	MKH / Mackay River Heavy
16	**Mackay River Blend: US** Petro-Canada	MKH / Mackay River Heavy
17	**Petroleum Crude Oil (Sour):** Gibson Energy ULC	BR / Bow River North / SO / Mixed Sour Blend
18	**Petroleum Crude Oil (Sweet):** Husky Oil Operations Limited	LLB / Lloydminister Blend
19	**Petroleum Heavy Crude Oil**: Canadian Natural Resources Ltd.	WH / Wabasca Heavy
20	**Premium Albian Synthetic Crude:** Shell Canada Limited	PAS
21	**Product Gas Oil:** Suncor Energy Inc	OSZ / Suncor - Z
22	**PSC**: Nexen Inc	PSC / Long Lake Light Synthetic
23	**Sour Produced Gas, Sour Produced Water, Sour Crude Oil**: Shell Canada Limited	PH / Peace Heavy
24	**Sales Oil**: Statoil	SCB / Statoil Cheecham Blend
25	**Seal Heavy Crude Oil:** Shell Canada Limited	SH / Seal Heavy
26	**Shell Synthetic Blend:** Shell Canada Limited	SSX / Shell Synthetic Light
27	**Suncor OSA**: Suncor Energy Inc	OSA / Suncor A
28	**Suncor OSB**: Suncor Energy Inc	BHB / Borealis Heavy Blend
29	**Suncor OSC**: Suncor Energy Inc	OSC / Suncor C

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30	**Suncor OSH**: Suncor Energy Inc	OSH
31	**Surmont Phase 1 Synbit Sales Oil (Canada):** Conoco Phillips Canada Limited	SHB / Surmont Heavy Blend
32	**Synthetic Crude Oil / Syncrude Sweet Blend / Syncrude Sweet Premium**: Syncrude Canada Ltd.	SYN / Syncrude
33	**Synthetic Crude Oil:** Husky Oil Operations Limited	HSB / Husky Synthetic Blend
34	**Western Canadian Select (WCS):** Husky Oil Operations Limited	WCS

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Husky Energy Material Safety Data Sheet

WHMIS	Personal Protection	TDG Road/Rail
		

Section I. Product Identification and Uses

Common/Trade name	**Alberta Common Synthetic (ACS)**		
Synonyms	Not available.	**CAS #**	8002-05-09
Chemical family	Petroleum Hydrocarbon.	**DSL**	On the DSL list.
Supplier	Husky Oil Operations Limited PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7 403-298-6111	**Manufacturer**	Husky Oil Operations Limited PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7 403-298-6111
Material uses	Synthetic Crude Oil - Keystone Pipeline System		

Section 2. First Aid Measures

Eye contact	Flush eyes for at least 15 minutes with clean water. Patch lightly, allowing drainage. Seek medical attention.
Skin contact	Remove contaminated clothing. Wash skin thoroughly with soap and water. Seek medical attention if irritation develops.
Inhalation	Protect rescuer. Move exposed person to fresh air. If breathing has stopped apply artificial respiration. Seek medical attention.
Ingestion	If swallowed, do not induce vomiting or give liquids. Seek immediate medical attention.

Section 3. Hazardous Ingredients

		Exposure Limits						
Name	**CAS #**	**TWA (ppm)**	**TWA (Mg/M3)**	**STEL (ppm)**	**STEL (Mg/M3)**	**CEIL (ppm)**	**CEIL (Mg/M3)**	**% by Weight**
Crude Oil (Hydrocarbons C5 and C6 Rich)	8002-05-09	100	n/av	n/av	n/av	n/av	n/av	100
Hydrogen Sulphide	7783-06-4	10	14	15	21	20	28	<0.5
Benzene	71-43-2	0.5		2.5				0.1-1
Toluene	108-88-3	20	75					1-5
Xylene	1330-20-7		100		150			1-30

Toxicity values of the hazardous ingredients

Crude oil (Hydrocarbons C5 and C6 Rich) LD50:4,300 mg/Kg (Rat). LC50: Not available.

Hydrogen Sulphide (H2S) LC50 Inhalation Mouse = 673 ppm 1 hour. LC50 Inhalation Rat = 444 ppm for 4 hours

Benzene. LD50 Oral rat= 930-5600 mg/Kg. LC50 Inhalation rat = 13,700 ppm for 4 hrs.

Xylene. LD50 Oral rat= 4300 mg/Kg. LC50 Inhalation rat= 6700 ppm for 4 hrs. LD50 Dermal rabbit >2000 mg/Kg.

Toluene. LD50 Oral rat= 5000 mg/Kg. LC50 Inhalation rat= 8000 ppm for n4 hrs. LD50 Dermal rabbit= 14000 mg/Kg.

Continued on Next Page

Section 4. Physical Data

Physical state and appearance	Liquid. Black/Brown.
Odor	Petroleum Odour
pH (1% soln/water)	Not applicable.
Odor threshold	O.13 ppm H2S
Evaporation rate	Not available.
Freezing point	Not available.
Boiling point	-11°C - >1100°C
Specific gravity	0.8 - 0.9 (Water = 1)
Volatility	100 (%vol)
Vapor density	Not available.
Vapor pressure	Not available.
Water/oil dist. coeff.	Not available.
Solubility	Not available.
Molecular Weight	Not applicable.
Melting Point	Not available.
Density	Not available.

Section 5. Fire and Explosion Data

Auto-ignition temperature	Not available.
Flash points	CLOSED CUP: -40°C (-40°F)
Flammable limits	Not available.
Extinguishing Media	Use DRY chemicals, CO2, or foam to extinguish fire. Water may not be an effective medium to extinguish fire. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.
Special fire fighting procedures	Use supplied air or self contained breathing apparatus (SCBA) for large fires or for fires in enclosed areas.
Flammability	Highly flammable liquid. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.
	Remark No additional remark.
Risks of explosion	This material is sensitive to static discharge. This product is not sensitive to mechanical impact.
	Remark No additional remark.

Section 6. Reactivity Data

Stability	The product is stable.
Hazardous decomp. products	Carbon monoxide, carbon dioxide and irritant fumes and gases including sulphur oxides, nitrogen oxides and aldehydes.
Reactivity	Incompatible material: Strong acids, strong oxidizers, chlorine. Hazardous polymerization: Will not occur.
	Remark No additional remark.

Continued on Next Page

Section 7. Toxicological Properties

Routes of entry	Ingestion. Inhalation. Eye contact. Skin contact.
TLV	TLV-TWA 100 PPM (525 mg/m3) for stoddard solvent from ACGIH. Hydrogen Sulfide: TWA: 10 ppm, 14 mg/m3 from ACGIH STEL: 2.5 ppm STEL from ACGIH Toluene TWA: 20 ppm from ACGIH Xylene (o, m, and p isomers) TWA: 100 ppm, STEL: 150 ppm from ACGIH Benzene TWA 0.5 ppm. STEL 2.5 ppm(SKIN) Consult local authorities for acceptable exposure limits.
Toxicity to animals	**Hydrocarbons C5 and C6 Rich** LD50: Not available. LC50: Not available. **Hydrogen Sulphide (H2S)** **LC50 Inhalation Mouse = 673 ppm 1 hour** **LC50 Inhalation Rat = 444 ppm for 4 hours**
	Remark No additional remark.
Chronic effects	This product may contain benzene. Benzene has been classified by the international agency for research on cancer as a group 1 product indicating sufficent evidence of carcinogenicity. Studies exist which report a link to crude oil and reproductive effects including fetal tumors and menstrual disorders. This product contains small quantities of xylene. High exposure to xylene has produced fetotoxic effects in animal studies. This product may contain toluene which is known to cause visual impairment, narcosis, anxiety, muscle fatigue, insomnia, parathesis, dermatitis, liver and kidney damage and to affect reproduction. This product contains small quantities of polycylic aromatic hydrocarbons. Prolonged contact with these compound has been associated with the induction of skin and lung tumours.
	Remark No additional remark.
Acute effects	Sensitizing Capabiltiy: No effects known. Irritancy: Skin, eye and upper respiratory tract irritant.
Ingestion	Pulmonary aspiration hazard if swallowed and vomitting occurs.
Skin	Prolonged skin contact can cause defatting of the skin resulting in dry cracked skin and dermatitis.
Eyes	Eye contact with product or product vapours may result in eye irritation.
Inhalation	May cause headache, dizziness, loss of appetite and loss of consiousness. Product vapours are irritating to the respiratory tract.
	Remark This product contains small quantities of hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.
Synergistic materials	Not available.

Section 8. Preventive Measures

Waste disposal	Dispose of in accordance with all federal, provincial and local regulations.
Storage	Keep away from all ignition sources. Maintain temperature below the flash point. Head spaces in storage containers may contain hydrocarbon vapours and toxic hydrogen sulphide gas.
Ventilation	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.
Spill and leak	Evacuate unecessary personnel. Eliminate all ignition sources. Be alert to the potential for the presence of hydrogen sulphide gas and don appropriate protective equipment. Stop leak if safe to do so. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution. Comply with federal, provincial, and local requirements for spill notification.

Continued on Next Page

Section 9. Classification/Regulatory Information

TDG road / rail

TDG CLASS 3: Flammable liquid with a flash point less than or equal to 60.5 C (140.9 F). Closed cup test method.



PIN: 1267 - PETROLEUM CRUDE OIL

Remark
No additional remark.

WHMIS

WHMIS CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
WHMIS CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
WHMIS CLASS D-2B: Material causing other toxic effects (TOXIC).



Remark
No additional remark.

Other

This product is on the Domestic Substances List (DSL). TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.
Refer to federal, provincial, and local legislation for further requirements.

Section 10. Protective Clothing

Eye

Non-vented chemical goggles to prevent eye irritation from the solvent vapours.

Skin

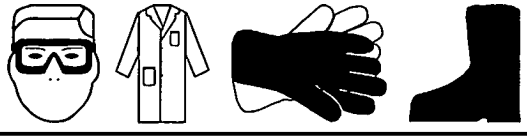
Impervious gloves and clothing should be worn as appropriate to protect against skin contact. Neoprene or nitrile material is suggested.

Respiratory

Respiratory protection may be required in poorly ventilated areas. Properly fitted air purifying masks equipped with organic vapour filters will provide protection at low concentrations. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed 10X the occupational exposure limit or when high concentrations of H2S may be present.

Other

As required by the situation according to your companies policies and procedures. Contact your supervisor for direction.



Section 11. Preparation Information

References

-Provisional Domestic Substances List, Canadian Ennvironmental Protection Act, Volume 1-Registry Number Index, April 1990; Environment Canada. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. CCOHS (Chem advi)
CCOHS(Cheminfo) Doccumentation of the Threshold Limit Values and Biological Exposure Indices (ACGIH)
Pocket Guide to Chemical Hazards (NIOSH)
Transportation of Dangerous Goods Shedule II List II

MSDS Status

Acronyms: TLV = Threshold Limit Value N/AP = Not applicable N/AV = Not Available COC = Cleveland Open Cup PMCC = Pensky Martens Closed Cup

Validated by Husky Corporate Hygiene on 12/2/2009.	**Verified by Husky Corporate Hygiene.**
Supersedes: not applicable	**Printed 12/2/2009.**

Continued on Next Page

Emergency Phone # 403-262-2111

While the company believes the data set forth herein are accurate as of the date hereof, the company makes no warranty with respect thereto and expressly disclaims all liability for reliance thereon. Such data are offered solely for your consideration, investigation and verification.

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2012-01-24
Supersedes: 2010-11-30



Class B2 Flammable Liquid



Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity



Class D2A Chronic Toxic Effects
Class D2B Skin Irritation

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**ALBIAN HEAVY SYNTHETIC CRUDE**
SYNONYMS:	AHS
	Crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**873-112**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS	
Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:

Flammable Liquid.
Irritating to skin.
A component in this product has been classified by IARC as carcinogenic to humans (Group 1).
May affect fetal development.
Prolonged exposure may cause serious health effects.
May be irritating to eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:

Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.

Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Hydrocracked Residues	64741-75-9	30 - 50	Yes
Petroleum - Crude Oil	8002-05-9	25 - 70	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 30	Yes
Natural Gas Condensates	68919-39-1	0 - 20	Yes
Natural Gas Condensates (C2 to C20)	64741-47-5	0 - 20	Yes
Residues (Petroleum), Vacuum	64741-56-6	0 - 15	Yes
Distillates (Petroleum), Hydrotreated Middle	64742-46-7	0 - 12.5	Yes
Naphtha (Petroleum), Hydrotreated Heavy	64742-48-9	0 - 12.5	Yes
Naphtha, heavy hydrocracked	64741-78-2	0 - 12	Yes
Clarified Oils (Petroleum), Catalytic Cracked	64741-62-4	2 - 10	Yes
Naphtha (petroleum), heavy straight-run	64741-41-9	0 - 6	Yes
Naphtha (petroleum), Light Straight-run	64741-46-4	0 - 6	Yes
Distillates (Petroleum), Straight-run Middle	64741-44-2	0 - 5	Yes
Benzene	71-43-2	0.1 - 1	Yes
Xylene (Mixed Isomers)	1330-20-7	0.1 - 0.5 % (wt)	Yes
Ethylbenzene	100-41-4	0.05 - 0.5	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

See Section 8 for Occupational Exposure Guidelines.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Do not give anything by mouth to an unconscious person.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis. If symptoms such as loss of gag reflex, convulsions or unconsciousness occur before vomiting, gastric lavage with a cuffed endotracheal tube should be considered.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Clear area of unprotected personnel. Vapours may travel along ground and flashback along vapour trail may occur. Do not use a direct stream of water as it may spread fire. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Xylene: 100 ppm (STEL: 150 ppm)
Gasoline: 300 ppm (STEL: 500 ppm)
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
Ethyl benzene: 100 ppm (STEL: 125 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves (viton, nitrile) should be worn at all times when handling this material. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	0 - 930 °C
Density:	930 - 940 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.93 - 0.94
pH:	Not available

Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	350 mm2/s @ pipeline reference temperature
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon solvents (benzene, ether, chloroform)

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials:	Avoid strong oxidizing agents.
Conditions of Reactivity:	Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Hydrocracked Residues	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Petroleum - Crude Oil	LD50 Oral Rat > 4300 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Natural Gas Condensates	LD50 Oral Rat > 3000 mg/kg
Natural Gas Condensates (C2 to C20)	LC50 Inhalation Rat > 5200 mg/m3 for 4hours LD50 Oral Rat = 14000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Residues (Petroleum), Vacuum	
Distillates (Petroleum), Hydrotreated Middle	LD50 Dermal Rat > 2000 mg/kg LD50 Oral Rat > 5000 mg/kg
Naphtha (Petroleum), Hydrotreated Heavy	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 3160 mg/kg
Naphtha, heavy hydrocracked	LC50 Inhalation Rat > 5240 mg/m3 for 4hours LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Clarified Oils (Petroleum), Catalytic Cracked	LD50 Oral Rat 4300 mg/kg
Naphtha (petroleum), heavy straight-run	LC50 Inhalation Rat > 5000 mg/m3 for 4hours
Naphtha (petroleum), Light Straight-run	
Distillates (Petroleum), Straight-run Middle	LC50 Inhalation Rat 1700 mg/m3 for 4hours
Benzene	LD50 Oral Rat 690 - 3400 mg/kg

	LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Irritancy: Based on the ingredients, this product is expected to be irritating to skin.

Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Long term intensive exposure to oil mist may cause benign lung fibrosis. Repeated and/or prolonged exposure to cat-cracked clarified oils may cause liver damage.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect. Oral or dermal exposure of pregnant rats to cat-cracked clarified oils produced embryotoxicity and fetal abnormalities at maternally toxic doses.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. Results of Modified Ames tests indicate that this product may have significant carcinogenic properties. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. A component of this product has produced mutagenic effects. This product contains benzene. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes. IARC has listed Ethylbenzene among those materials for which there is limited evidence for carcinogenicity in animals and inadequate evidence in humans. As a result, Ethylbenzene is classified by IARC as a possible human carcinogen (i.e. IARC 2b)

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. In the event of a release, the light fraction will vaporize and cause exposure via breathing and body contact. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Additional Information	Marine Pollutant
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I Marine Pollutant

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:	Class B2 Flammable Liquid Class D2A Embryo/Fetotoxicity Class D2A Carcinogenicity Class D2A Chronic Toxic Effects Class D2B Skin Irritation
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Flammable Liquid. Irritating to skin. A component in this product has been classified by IARC as carcinogenic to humans (Group 1). May affect fetal development. Prolonged exposure may cause serious health effects.
Handling Statement:	Eliminate all ignition sources. Avoid inhalation of vapours.

Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water.
If overcome by vapours remove to fresh air.
Do not induce vomiting.
Obtain medical attention.

Revisions: This MSDS has been reviewed and updated.

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2011-02-16
Supersedes: None



Class B2 Flammable Liquid



Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity



Class D2A Mutagenicity
Class D2B Skin Irritation

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**ALBIAN MUSKEG RIVER HEAVY (AMH)**
SYNONYMS:	AMH Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**9700-140**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:

Flammable Liquid.
Irritating to skin.
A component in this product has been classified by IARC as carcinogenic to humans (Group 1).
May affect fetal development.
This product contains a component that has produced mutagenic effects.
May be irritating to eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:

Eliminate all ignition sources.
Avoid inhalation of vapours.

Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Residues (Petroleum), Vacuum	64741-56-6	35 - 50	Yes
Distillates (petroleum), petroleum residues vacuum	68955-27-1	10 - 30	Yes
Natural Gas Condensates (C2 to C20)	64741-47-5	0 - 30	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 30	Yes
Distillates (Petroleum), Straight-run Middle	64741-44-2	7 - 15	Yes
Naphtha (petroleum), heavy straight-run	64741-41-9	0 - 5	Yes
Naphtha, heavy hydrocracked	64741-78-2	0 - 5	Yes
Toluene	108-88-3	0 - 3	Yes
n-Hexane	110-54-3	< 1	Yes
Benzene	71-43-2	0.1 - 1	Yes
Xylene (Mixed Isomers)	1330-20-7	0.1 - 0.5 % (wt)	Yes
Ethylbenzene	100-41-4	0.05 - 0.5	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

See Section 8 for Occupational Exposure Guidelines.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Do not give anything by mouth to an unconscious person.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis.

5. FIRE FIGHTING MEASURES

Extinguishing Media:	Dry Chemical Carbon Dioxide Foam Water Fog
Firefighting Instructions:	Flammable. Clear area of unprotected personnel. Vapours may travel along ground and flashback along vapour trail may occur. Do not use a direct stream of water as it may spread fire. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.
Hazardous Combustion Products:	A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling:	Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.
Storage:	Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.

Xylene: 100 ppm (STEL: 150 ppm)
Gasoline: 300 ppm (STEL: 500 ppm)
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
Ethyl benzene: 100 ppm (STEL: 125 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves (viton, nitrile) should be worn at all times when handling this material. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	35 - 930 °C
Density:	910 - 930 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.91 - 0.93
pH:	Not available
Flash Point:	PMCC 26 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	350 mm2/s @ pipeline reference temperature
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available

Water Solubility: Insoluble

10. STABILITY AND REACTIVITY

Chemically Stable: Yes
Hazardous Polymerization: No
Sensitive to Mechanical Impact: No
Sensitive to Static Discharge: Yes
Hazardous Decomposition Products: When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials: Avoid strong oxidizing agents.
Conditions of Reactivity: Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Residues (Petroleum), Vacuum	
Distillates (petroleum), petroleum residues vacuum	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Natural Gas Condensates (C2 to C20)	LC50 Inhalation Rat > 5200 mg/m3 for 4hours LD50 Oral Rat = 14000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Distillates (Petroleum), Straight-run Middle	LC50 Inhalation Rat 1700 mg/m3 for 4hours
Naphtha (petroleum), heavy straight-run	LC50 Inhalation Rat > 5000 mg/m3 for 4hours
Naphtha, heavy hydrocracked	LC50 Inhalation Rat > 5240 mg/m3 for 4hours LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Toluene	LD50 Oral Rat 5580 mg/kg LC50 Inhalation Rat 26700 ppm for 1 hour LD50 Dermal Rabbit 12400 mg/kg
n-Hexane	LD50 Oral Rat > 8 mL/kg LD50 Dermal Rat > 4 mL/kg LC50 Inhalation Rat = 54090 - 57000 ppm for 4 hours
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Irritancy: Based on the ingredients, this product is expected to be irritating to skin.

Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. A component of this product has produced mutagenic effects. This product contains benzene. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes. IARC has listed Ethylbenzene among those materials for which there is limited evidence for carcinogenicity in animals and inadequate evidence in humans. As a result, Ethylbenzene is classified by IARC as a possible human carcinogen (i.e. IARC 2b)

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. In the event of a release, the light fraction will vaporize and cause exposure via breathing and body contact. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG II
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG II

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:	Class B2 Flammable Liquid Class D2A Embryo/Fetotoxicity Class D2A Carcinogenicity Class D2A Mutagenicity Class D2B Skin Irritation
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Flammable Liquid. Irritating to skin. A component in this product has been classified by IARC as carcinogenic to humans (Group 1). May affect fetal development. This product contains a component that has produced mutagenic effects.
Handling Statement:	Eliminate all ignition sources. Avoid inhalation of vapours. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention.
Revisions:	This is a new MSDS.

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-11-30
Supersedes: 2010-02-19



Class B2 Flammable Liquid



Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity



Class D2B Skin Irritation

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**ALBIAN RESID BLEND**
SYNONYMS:	ARB Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**873-332**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Residues (Petroleum), Vacuum	64741-56-6	35 - 45	Yes
Distillates (Petroleum), Hydrotreated Middle	64742-46-7	0 - 59	Yes
Naphtha (Petroleum), Hydrotreated Heavy	64742-48-9	0 - 33	Yes
Gas Oils (Petroleum), Hydrotreated Vacuum	64742-59-2	0 - 26	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 19	Yes
Natural Gas Condensates	68919-39-1	0 - 10	Yes
n-Hexane	110-54-3	1 - 2	Yes
Toluene	108-88-3	< 1	Yes
Benzene	71-43-2	0.1 - 1	Yes
Xylene (Mixed Isomers)	1330-20-7	0.1 - 0.5 % (wt)	Yes

Ethylbenzene	100-41-4	0.05 - 0.2	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:
Flammable Liquid.
Contains xylene, which may affect fetal development.
May cause cancer.
Irritating to skin.
Exposure to vapours may cause irritation of the eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:
Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately.

Inhalation: Remove victim from further exposure and restore breathing, if required: Obtain medical attention.

Notes to Physician: Treatment of exposure should be directed at the control of symptoms and the clinical condition.

5. FIRE FIGHTING MEASURES

Extinguishing Media:
Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Clear area of unprotected personnel. Vapours may travel along ground and flashback along vapour trail may occur. Do not use a direct stream

of water as it may spread fire. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Xylene: 100 ppm (STEL: 150 ppm)
Gasoline: 300 ppm (STEL: 500 ppm)
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
n-Hexane (skin): 50 ppm

Ethyl benzene: 100 ppm (STEL: 125 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation:	Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection:	Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.
Skin Protection:	Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. Impervious clothing (apron, coveralls) should also be worn in confined workspaces or where the risk of skin exposure is much higher. Use protective clothing and gloves manufactured from nitrile.
Respiratory Protection:	Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	0 - 930 °C
Density:	930 - 940 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.93 - 0.94
pH:	Not available
Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	350 mm2/s @ pipeline reference temperature
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble

10. STABILITY AND REACTIVITY

Chemically Stable: Yes

Hazardous Polymerization: No
Sensitive to Mechanical Impact: No
Sensitive to Static Discharge: Yes
Hazardous Decomposition Products: When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials: Avoid strong oxidizing agents.
Conditions of Reactivity: Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Residues (Petroleum), Vacuum	
Distillates (Petroleum), Hydrotreated Middle	LD50 Dermal Rat > 2000 mg/kg LD50 Oral Rat > 5000 mg/kg
Naphtha (Petroleum), Hydrotreated Heavy	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 3160 mg/kg
Gas Oils (Petroleum), Hydrotreated Vacuum	
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Natural Gas Condensates	LD50 Oral Rat > 3000 mg/kg
n-Hexane	LD50 Oral Rat > 8 mL/kg LD50 Dermal Rat > 4 mL/kg LC50 Inhalation Rat = 54090 - 57000 ppm for 4 hours
Toluene	LD50 Oral Rat 5580 mg/kg LC50 Inhalation Rat 26700 ppm for 1 hour LD50 Dermal Rabbit 12400 mg/kg
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Irritancy: Based on the ingredients, this product is expected to be irritating to skin.
Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Long term intensive exposure to oil mist may cause benign lung fibrosis. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Peripheral neurotoxicity has been reported in connection with over exposure to n-hexane. Prolonged exposure over a period of weeks or months to levels well above the TLV may cause neurotoxic disease, with symptoms including weakness and lack of sensation in hands and feet.
Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have

not shown this effect.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. This product contains benzene. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes.

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:
Class B2 Flammable Liquid
Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity

Class D2B Skin Irritation

DSL/NDSL Status: This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.

Other Regulatory Status: No Canadian federal standards. Provincial criteria are likely and should be requested when notifying provincial authorities. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement : Flammable Liquid.
Contains xylene, which may affect fetal development.
May cause cancer.
Irritating to skin.

Handling Statement: Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water.
If overcome by vapours remove to fresh air.
Do not induce vomiting.
Obtain medical attention.

Revisions: This MSDS has been reviewed and updated. Changes have been made to: Section 2 Section 8 Section 9 Section 11 Section 12 Section 14

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-11-30
Supersedes: 2010-02-15



Class B2 Flammable Liquid



Class D2B Skin Irritation



Class D2A Carcinogenicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: **ALBIAN VACUUM GASOIL BLEND**
SYNONYMS: AVB
Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE: Base product for Petroleum Refining.
PRODUCT CODE: **873-331**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Distillates (petroleum), petroleum residues vacuum	68955-27-1	80 - 90	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	10 - 20	Yes

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Hydrocarbon Odour
Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Hazards:

Flammable Liquid.
Irritating to skin.
May cause cancer.

Exposure to vapours may cause irritation of the eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling: Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: Treatment of exposure should be directed at the control of symptoms and the clinical condition.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Do not use a direct stream of water as it may spread fire. Clear area of unprotected personnel. Vapours may travel along ground and flashback along vapour trail may occur. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain

spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3
Gasoline: 300 ppm (STEL: 500 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges

in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	-25 - 600 °C
Density:	940 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.94
pH:	Not available
Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Auto-ignition Temperature:	Not available
Viscosity:	350 mm2/s @ 6 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials:	Avoid strong oxidizing agents.
Conditions of Reactivity:	Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Distillates (petroleum), petroleum residues vacuum	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg

Routes of Exposure:	Exposure will most likely occur through skin contact or inhalation.
Irritancy:	Based on the ingredients, this product is expected to be irritating to skin.
Chronic Effects:	Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Prolonged exposure to high vapour concentration can

	cause headache, dizziness, nausea, blurred vision and central nervous system depression. Long term intensive exposure to oil mist may cause benign lung fibrosis.
Pre-existing Conditions:	Pre-existing skin disorders may be aggravated by exposure to components of this product.
Carcinogenicity and Mutagenicity:	Carcinogenic hazard. According to the International Agency for Research on Cancer (IARC) this product is considered to be possibly carcinogenic to humans. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. A component of this product has produced mutagenic effects.

12. ECOLOGICAL INFORMATION

Environmental Effects:	The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.
Biodegradability:	Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:	Class B2 Flammable Liquid Class D2B Skin Irritation Class D2A Carcinogenicity
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as

required under the Canadian Environmental Protection Act.

Other Regulatory Status: The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement : Flammable Liquid.
Irritating to skin.
May cause cancer.

Handling Statement: Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water.
If overcome by vapours remove to fresh air.
Do not induce vomiting.
Obtain medical attention.

Revisions: This MSDS has been reviewed and updated. Changes have been made to: Section 11 Section 15

Material Safety Data Sheet

bp

1. Product and company identification

Product name

Canadian Heavy Oil

This material can contain hydrogen sulfide (H_2S), a very toxic and extremely flammable gas.

Note: Released levels of hydrogen sulfide (H2S) are dependent on a variety of factors and cannot be fully predicted based on dissolved H2S levels.

Crude oil is a naturally occurring complex mixture of hydrocarbons whose exact composition and physical properties can vary widely depending upon its source.

MSDS #

0000003736

Code

0000003736

Product use

Refinery feedstock
For specific application advice see appropriate Technical Data Sheet or consult our company representative.

Synonyms

Crude oil; Petroleum distillate; PETROLEUM OIL, Canadian Heavy Oil, Dilbit, Dilsynbit

Supplier

BP Canada Energy Trading Company
240 - 4th Avenue S.W.
P.O. Box 200
Calgary, Alberta
T2P 2H8
Canada

EMERGENCY HEALTH INFORMATION:

1 (800) 447-8735
Outside the US: + 1 703 527 3887(CHEMTREC)

EMERGENCY SPILL INFORMATION:

1 (613) 996-6666 CANUTEC (Canada)

OTHER PRODUCT INFORMATION

1 (866) 4 BP - MSDS
(866-427-6737 Toll Free - North America)
email: bpcares@bp.com

2. Hazards identification

Physical state

Viscous liquid.

Color

Brown.

Emergency overview

DANGER !

FLAMMABLE LIQUID AND VAPOR.
HARMFUL IF ABSORBED THROUGH SKIN.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS.
CAUSES EYE AND SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.
HARMFUL OR FATAL IF SWALLOWED.
CAN ENTER LUNGS AND CAUSE DAMAGE.
CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.
CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.
CONTAINS MATERIAL WHICH MAY CAUSE HERITABLE GENETIC EFFECTS.
ASPIRATION HAZARD.
BIRTH HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS

Flammable liquid. Harmful in contact with skin and if swallowed. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Aspiration hazard if swallowed. Can enter lungs and cause damage. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. If ingested, do not induce vomiting. Do not get in eyes. Avoid contact with skin and clothing. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure. Contains material which may cause heritable genetic effects. Contains material which can cause birth defects. Use only with adequate ventilation. Keep container tightly closed and sealed until ready

for use. Wash thoroughly after handling.

Routes of entry Dermal contact. Eye contact. Inhalation. Ingestion.

Potential health effects

Eyes Causes eye irritation.

Skin Causes skin irritation. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. See toxicological information (Section 11) .

Inhalation Vapors may cause drowsiness and dizziness. Can cause central nervous system (CNS) depression. May cause respiratory tract irritation.

Ingestion Harmful if swallowed. Aspiration hazard if swallowed. Can enter lungs and cause damage.

See toxicological information (Section 11)

3. Composition/information on ingredients

Contains 20-30% Diluent. (typical value)

Ingredient name	CAS #	%
Crude Oil: complex hydrocarbon mixture comprising mainly of aliphatic, naphthenic and aromatic hydrocarbons.	8002-05-9	60 - 80
Natural gas condensates (petroleum)	64741-47-5	0 - 30
Naphtha (petroleum), light straight-run.	64741-46-4	0 - 20
Naphtha (petroleum), heavy straight-run.	64741-41-9	0 - 20
Naphtha (petroleum), hydrotreated light	64742-49-0	0 - 20
naphtha (petroleum), hydrotreated heavy	64742-48-9	0 - 20
Distillates (petroleum), hydrotreated middle	64742-46-7	0 - 10
Pentane	109-66-0	0 - 10
Butane	106-97-8	0 - 5
Hexane, other isomers	None assigned.	0 - 5
n-hexane	110-54-3	0 - 5
Heptane	142-82-5	0 - 5
methylcyclohexane	108-87-2	0 - 5
Benzene	71-43-2	0 - 1
Toluene	108-88-3	0 - 1
xylene	1330-20-7	0 - 1
ethylbenzene	100-41-4	0 - 1
methylbutane	78-78-4	0 - 1
Cyclohexane	110-82-7	0 - 1
Octane	111-65-9	0 - 1
Polycyclic aromatic hydrocarbons (PAHs)	mixture	0 - 0.1
Hydrogen Sulfide	7783-06-4	0 - 0.1

4. First aid measures

Eye contact In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin contact Immediately wash exposed skin with soap and water. Remove contaminated clothing and shoes. Clean shoes thoroughly before reuse. Wash contaminated clothing before reuse. Get medical attention.

Inhalation If inhaled, remove to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.

5. Fire-fighting measures

Flammability of the product Flammable liquid.

Flash point Closed cup: -50 to 100°C (-58 to 212°F) [Pensky-Martens.]

Explosion limits Lower: 0.6%
Upper: 8%

Fire/explosion hazards In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Runoff to sewer may create fire or explosion hazard.

Unusual fire/explosion hazards	Explosive in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

Extinguishing media

Suitable	Use dry chemical, CO_2, water spray (fog) or foam.
Not suitable	Do not use water jet.
Fire-fighting procedures	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
Hazardous combustion products	Combustion products may include the following: carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide) sulfur oxides (SO_2, SO_3 etc.) Hydrogen Sulfide (H2S)
Protective clothing (fire)	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6. Accidental release measures

Personal precautions	No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).
Environmental precautions	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

Methods for cleaning up

Large spill	Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.
Small spill	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

7. Handling and storage

Handling	Put on appropriate personal protective equipment (see Section 8). Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.
Storage	Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Other information	Do not enter storage tanks without breathing apparatus unless the tank has been well ventilated and the tank atmosphere has been shown to contain hydrocarbon vapor concentrations of less than 1% of the lower flammability limit and an oxygen concentration of at least 20% volume. Light hydrocarbon vapors can build up in the headspace of tanks. These can cause flammability/explosion hazards even at temperatures below the normal flash point (note: flash point must not be regarded as a reliable indicator of the potential flammability of vapor in tank headspaces). Tank headspaces should always be regarded as potentially flammable and care should be taken to avoid static electrical discharge and all ignition sources during filling, ullaging and sampling from storage tanks. This material can contain hydrogen sulphide (H_2S), an extremely toxic and flammable gas. Vapors containing hydrogen sulfide may accumulate during storage or transport and may also be vented during filling of tanks. Hydrogen sulfide has a typical "bad egg" smell but at high concentrations the sense of smell is rapidly lost, therefore do not rely on sense of smell for detecting hydrogen sulfide. Use specially designed measuring instruments for determining its concentration.

8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name	Occupational exposure limits
Crude oil	**CA Alberta Provincial (Canada).** OEL: 5 mg/m³ 8 hour(s). Form: Oil mist, mineral STEL: 10 mg/m³ 15 minute(s). Form: Oil mist, mineral
Natural gas condensates (petroleum)	**Alberta OH&S (Canada).** OEL: 5 mg/m³ STEL: 10 mg/m³ 15 minute(s). **British Columbia OH&S (Canada).** EL: 5 mg/m³ STEL: 10 mg/m³ 15 minute(s).
Naphtha (petroleum), light straight-run.	**ACGIH TLV (United States).** STEL: 1480 mg/m³ 15 minute(s). Form: Gasoline (Recommended) STEL: 500 ppm 15 minute(s). Form: Gasoline (Recommended) TWA: 890 mg/m³ 8 hour(s). Form: Gasoline (Recommended) TWA: 300 ppm 8 hour(s). Form: Gasoline (Recommended) TWA: 100 ppm 8 hour(s). Form: Stoddard Solvent (Recommended) TWA: 525 mg/m³ 8 hour(s). Form: Stoddard Solvent (Recommended) **OSHA PEL (United States).** TWA: 2900 mg/m³ 8 hour(s). Form: Stoddard Solvent (Recommended)
naphtha (petroleum), hydrotreated heavy	**ACGIH TLV (United States).** TWA: 300 ppm
Distillates (petroleum), hydrotreated middle	**ACGIH (United States).** TWA: 5 mg/m³ 8 hour(s). Form: Oil mist, mineral **OSHA (United States).** TWA: 5 mg/m³ 8 hour(s). Form: Oil mist, mineral
Pentane	**ACGIH TLV (Canada).** TWA: 600 ppm 8 hour(s). **CA British Columbia Provincial (Canada).** TWA: 600 ppm 8 hour(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** TWA: 600 ppm 8 hour(s). Issued/Revised: 9/1998 STEL: 2210 mg/m³ 15 minute(s). Issued/Revised: 7/2010 TWA: 1770 mg/m³ 8 hour(s). Issued/Revised: 7/2010 STEL: 750 ppm 15 minute(s). Issued/Revised: 7/2010 **CA Quebec Provincial (Canada).** TWAEV: 350 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 120 ppm 8 hour(s). Issued/Revised: 1/2000 **CA Alberta Provincial (Canada).** 8 hrs OEL: 600 ppm 8 hour(s). Issued/Revised: 4/2004 8 hrs OEL: 1770 mg/m³ 8 hour(s). Issued/Revised: 4/2004
Hydrogen Sulfide	**Alberta OH&S (Canada).** CEIL: 15 ppm OEL: 10 ppm 8 hour(s). **British Columbia OH&S (Canada).** CEIL: 10 ppm **CA Alberta Provincial (Canada).** C: 21 mg/m³ 15 minute(s). Issued/Revised: 7/2009 C: 15 ppm 15 minute(s). Issued/Revised: 7/2009 8 hrs OEL: 10 ppm 8 hour(s). Issued/Revised: 4/2004

8 hrs OEL: 14 mg/m³ 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
C: 10 ppm 15 minute(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 10 ppm 8 hour(s). Issued/Revised: 1/1990
STEL: 15 ppm 15 minute(s). Issued/Revised: 1/1990
CA Quebec Provincial (Canada).
TWAEV: 10 ppm 8 hour(s). Issued/Revised: 1/2000
TWAEV: 14 mg/m³ 8 hour(s). Issued/Revised: 1/2000
STEV: 15 ppm 15 minute(s). Issued/Revised: 1/2000
STEV: 21 mg/m³ 15 minute(s). Issued/Revised: 1/2000

Hexane, other isomers

ACGIH TLV (United States).
TWA: 500 ppm 8 hour(s).
STEL: 1000 ppm 15 minute(s).

n-hexane

CA Alberta Provincial (Canada). Absorbed through skin.
8 hrs OEL: 176 mg/m³ 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 50 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada). Absorbed through skin.
TWA: 20 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada). Absorbed through skin.
TWA: 50 ppm 8 hour(s). Issued/Revised: 9/1998
CA Quebec Provincial (Canada). Absorbed through skin.
TWAEV: 176 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 50 ppm 8 hour(s). Issued/Revised: 1/2000

Heptane

CA Alberta Provincial (Canada).
15 min OEL: 2050 mg/m³ 15 minute(s). Issued/Revised: 7/2009
15 min OEL: 500 ppm 15 minute(s). Issued/Revised: 7/2009
8 hrs OEL: 1640 mg/m³ 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 400 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
STEL: 500 ppm 15 minute(s). Issued/Revised: 8/2004
TWA: 400 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
STEL: 2050 mg/m³ 15 minute(s). Issued/Revised: 9/1994
STEL: 500 ppm 15 minute(s). Issued/Revised: 9/1994
TWA: 1640 mg/m³ 8 hour(s). Issued/Revised: 9/1994
TWA: 400 ppm 8 hour(s). Issued/Revised: 9/1994
CA Quebec Provincial (Canada).
STEV: 2050 mg/m³ 15 minute(s). Issued/Revised: 1/2000
STEV: 500 ppm 15 minute(s). Issued/Revised: 1/2000
TWAEV: 1640 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 400 ppm 8 hour(s). Issued/Revised: 1/2000

methylcyclohexane

CA Alberta Provincial (Canada).
8 hrs OEL: 1610 mg/m³ 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 400 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
TWA: 400 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 1610 mg/m³ 8 hour(s). Issued/Revised: 9/1994
TWA: 400 ppm 8 hour(s). Issued/Revised: 9/1994
CA Quebec Provincial (Canada).
TWAEV: 1610 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 400 ppm 8 hour(s). Issued/Revised: 1/2000

Butane

CA Alberta Provincial (Canada).
8 hrs OEL: 1000 ppm 8 hour(s). Issued/Revised: 7/2009
CA British Columbia Provincial (Canada).
STEL: 750 ppm 15 minute(s). Issued/Revised: 7/2005
TWA: 600 ppm 8 hour(s). Issued/Revised: 7/2005
CA Quebec Provincial (Canada).
TWAEV: 1900 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 800 ppm 8 hour(s). Issued/Revised: 1/2000
CA Ontario Provincial (Canada).
TWA: 800 ppm 8 hour(s). Issued/Revised: 7/2010

Benzene

CA Alberta Provincial (Canada). Absorbed through skin.
15 min OEL: 8 mg/m³ 15 minute(s). Issued/Revised: 7/2009
15 min OEL: 2.5 ppm 15 minute(s). Issued/Revised: 7/2009
8 hrs OEL: 1.6 mg/m³ 8 hour(s). Issued/Revised: 7/2009
8 hrs OEL: 0.5 ppm 8 hour(s). Issued/Revised: 7/2009
CA British Columbia Provincial (Canada). Absorbed through skin.
STEL: 2.5 ppm 15 minute(s). Issued/Revised: 8/2004
TWA: 0.5 ppm 8 hour(s). Issued/Revised: 8/2004

CA Ontario Provincial (Canada). Absorbed through skin.
STEL: 2.5 ppm 15 minute(s). Issued/Revised: 7/2010
TWA: 0.5 ppm 8 hour(s). Issued/Revised: 7/2010
CA Quebec Provincial (Canada).
STEV: 15.5 mg/m³ 15 minute(s). Issued/Revised: 1/2000
STEV: 5 ppm 15 minute(s). Issued/Revised: 1/2000
TWAEV: 3 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 1 ppm 8 hour(s). Issued/Revised: 1/2000

·.ıene

CA Alberta Provincial (Canada). Absorbed through skin.
8 hrs OEL: 188 mg/m³ 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 50 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
TWA: 20 ppm 8 hour(s). Issued/Revised: 5/2007
CA Ontario Provincial (Canada).
TWA: 20 ppm 8 hour(s). Issued/Revised: 11/2006
CA Quebec Provincial (Canada). Absorbed through skin.
TWAEV: 188 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 50 ppm 8 hour(s). Issued/Revised: 1/2000

xylene

CA Alberta Provincial (Canada).
15 min OEL: 651 mg/m³ 15 minute(s). Issued/Revised: 7/2009
15 min OEL: 150 ppm 15 minute(s). Issued/Revised: 7/2009
8 hrs OEL: 434 mg/m³ 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 100 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
STEL: 150 ppm 15 minute(s). Issued/Revised: 8/2004
TWA: 100 ppm 8 hour(s). Issued/Revised: 8/2004
CA Quebec Provincial (Canada).
STEV: 651 mg/m³ 15 minute(s). Issued/Revised: 1/2000
STEV: 150 ppm 15 minute(s). Issued/Revised: 1/2000
TWAEV: 434 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 100 ppm 8 hour(s). Issued/Revised: 1/2000
CA Ontario Provincial (Canada).
STEL: 651 mg/m³ 15 minute(s). Issued/Revised: 5/1996
STEL: 150 ppm 15 minute(s). Issued/Revised: 5/1996
TWA: 434 mg/m³ 8 hour(s). Issued/Revised: 5/1996
TWA: 100 ppm 8 hour(s). Issued/Revised: 5/1996

·lbenzene

CA Alberta Provincial (Canada).
8 hrs OEL: 100 ppm 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 434 mg/m³ 8 hour(s). Issued/Revised: 4/2004
15 min OEL: 543 mg/m³ 15 minute(s). Issued/Revised: 7/2009
15 min OEL: 125 ppm 15 minute(s). Issued/Revised: 7/2009
CA British Columbia Provincial (Canada).
TWA: 100 ppm 8 hour(s). Issued/Revised: 8/2004
STEL: 125 ppm 15 minute(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 100 ppm 8 hour(s). Issued/Revised: 1/2002
STEL: 125 ppm 15 minute(s). Issued/Revised: 1/2002
CA Quebec Provincial (Canada).
TWAEV: 100 ppm 8 hour(s). Issued/Revised: 1/2000
TWAEV: 434 mg/m³ 8 hour(s)..Issued/Revised: 1/2000
STEV: 125 ppm 15 minute(s). Issued/Revised: 1/2000
STEV: 543 mg/m³ 15 minute(s). Issued/Revised: 1/2000

2-methylbutane

CA British Columbia Provincial (Canada).
TWA: 600 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 600 ppm 8 hour(s). Issued/Revised: 9/1998
STEL: 2210 mg/m³ 15 minute(s). Issued/Revised: 7/2010
TWA: 1770 mg/m³ 8 hour(s). Issued/Revised: 7/2010
STEL: 750 ppm 15 minute(s). Issued/Revised: 7/2010
CA Alberta Provincial (Canada).
8 hrs OEL: 600 ppm 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 1770 mg/m³ 8 hour(s). Issued/Revised: 4/2004

Cyclohexane

Alberta OH&S (Canada).
TWA: 300 ppm 8 hour(s).
British Columbia OH&S (Canada).
TWA: 100 ppm 8 hour(s).
CA Alberta Provincial (Canada).
8 hrs OEL: 344 mg/m³ 8 hour(s). Issued/Revised: 7/2009
8 hrs OEL: 100 ppm 8 hour(s). Issued/Revised: 7/2009
CA British Columbia Provincial (Canada).

TWA: 100 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 100 ppm 8 hour(s). Issued/Revised: 1/2002
CA Quebec Provincial (Canada).
TWAEV: 1030 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 300 ppm 8 hour(s). Issued/Revised: 1/2000

Octane

CA Alberta Provincial (Canada). Skin sensitizer.
8 hrs OEL: 1400 mg/m³ 8 hour(s). Issued/Revised: 7/2009
8 hrs OEL: 300 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
TWA: 300 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 300 ppm 8 hour(s). Issued/Revised: 3/1999
CA Quebec Provincial (Canada).
STEV: 1750 mg/m³ 15 minute(s). Issued/Revised: 1/2000
STEV: 375 ppm 15 minute(s). Issued/Revised: 1/2000
TWAEV: 1400 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 300 ppm 8 hour(s). Issued/Revised: 1/2000

Polycyclic aromatic hydrocarbons (PAHs)

ACGIH TLV (United States).
TWA: 0.2 mg/m³ 8 hour(s). Form: Benzene-soluble
OSHA PEL (United States).
TWA: 0.2 mg/m³ 8 hour(s). Form: Benzene-soluble

While specific OELs for certain components may be shown in this section, other components may be present in any mist, vapor or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

Control Measures

Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Personal protection

Eyes

Avoid contact with eyes. Safety glasses with side shields or chemical goggles.

Skin and body

Do not get on skin or clothing. Wear clothing and footwear that cannot be penetrated by chemicals or oil.

Respiratory

Use adequate ventilation. Do not breathe vapor or mist. If ventilation is inadequate, use a NIOSH-certified respirator with an organic vapor cartridge and P95 particulate filter. If operating conditions cause high vapor concentrations or the TLV is exceeded, use NIOSH-certified, supplied-air respirator.

Hands

Wear chemical resistant gloves.

The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Consult your supervisor or Standard Operating Procedure (S.O.P) for special handling instructions.

9. Physical and chemical properties

Physical state

Viscous liquid.

Color

Brown.

Odor

Pungent.

Odor threshold

Not available.

Flash point

Closed cup: -50 to 100°C (-58 to 212°F) [Pensky-Martens.]

Explosion limits

Lower: 0.6%
Upper: 8%

Specific gravity	Not available.
Density	750 to 1000 kg/m^3 (0.75 to 1 g/cm^3) at 15°C
pH	Not available.
Viscosity	Kinematic: <7 mm^2/s (<7 cSt) at 40°C
Boiling point / Range	-10 to 800°C (14 to 1472°F)
ing point / Range	Not available.
Vapor pressure	39.894 to 698.138 kPa (300 to 5250 mm Hg)
Vapor density	Not available.
Evaporation rate	Not available.
Solubility	insoluble in water.
LogK_{ow}	>3

10. Stability and reactivity

Stability and reactivity	The product is stable.
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	Not available.
Incompatibility with various substances	Reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	Under normal conditions of storage and use, hazardous decomposition products should not be produced. Decomposition products may include the following materials: carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide) sulfur oxides (SO_2, SO_3 etc.) Hydrogen Sulfide (H2S)
Hazardous polymerization	Under normal conditions of storage and use, hazardous polymerization will not occur.

Toxicological information

Classification

Product/ingredient name	IARC	NTP	OSHA
Ethylbenzene	2B	-	-
xylene	3	-	-
Toluene	3	-	-
Benzene	1	Proven.	+
Polycyclic aromatic hydrocarbons (PAHs)	-	Possible	-

IARC :
1 - Carcinogenic to human.
2B - Possible carcinogen to human.
3 - Not classifiable as a human carcinogen.

NTP :
Proven - Known to be human carcinogens.
Possible - Reasonably anticipated to be human carcinogens.

OSHA :
+ Potential occupational carcinogen

Other information

Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material.

From skin-painting studies in laboratory animals, it has been concluded that most, if not all, petroleum crudes, regardless of source, possess carcinogenic activity to some degree. This means that workers who practice poor personal hygiene and who are repeatedly exposed by direct skin contact to crude oil over many years may potentially be at risk of developing skin cancer. However, intermittent or occasional skin contact with petroleum crude oils is not expected to have serious health effects as long as good personal hygiene measures such as those outlined in this material safety data sheet are followed. Crude oil has not been identified as a carcinogen by NTP, IARC or OSHA.

Exposure to sunlight may increase the degree of skin irritation.
Crude oil administered orally or dermally to pregnant rats during gestation produced increased numbers of resorptions and decreases in fetal weight at maternally toxic doses. Repeated exposures to some crude oils in rats have produced effects on the blood, liver and thymus.

Hydrogen sulfide (H2S) gas may accumulate in storage tanks of bulk transport compartments containing this material. Contact with eyes causes painful conjunctivitis, sensitivity to light, tearing and clouding of vision. Inhalation of low concentrations causes a runny nose with a loss of sense of smell, labored breathing and shortness of breath. Direct contact with skin causes pain and redness. Other symptoms of exposure include profuse salivation, nausea, vomiting, diarrhea, giddiness, headache, dizziness, confusion, rapid breathing, rapid heart rate, sweating, weakness, sudden collapse, unconsciousness and death due to respiratory paralysis.

Cardiac neurological effects have also been reported. Prolonged breathing (greater than one hour) of concentrations of H2S around 50 ppm can produce eye and respiratory tract irritation. Levels of 250 to 600 ppm will result in fluid in the lungs, and concentrations around 1,000 ppm will cause unconsciousness and death in a short period of time. Since the sense of smell rapidly becomes insensitive to this toxic, colorless gas, odor cannot be relied upon as an indicator of concentrations of the gas. Always exercise caution when working around closed containers.

Benzene: Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Benzene: Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC), the National Toxicology Program, and OSHA consider benzene to be a human carcinogen. Chronic exposures to high levels of benzene have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.
Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to higher dosage levels resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level. Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material.

Toluene: Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material. Deliberate inhalation of high concentrations of toluene has been linked to damage of the brain, liver and kidney. Inhalation of very high concentrations of toluene, such as in cases of solvent abuse, has resulted in sudden death which may be a result of cardiac arrhythmia or central nervous system depression. Mental and/or growth retardation has been reported in children of women who deliberately inhale toluene during pregnancy (usually at thousands of ppm). Fetal developmental toxicity was observed when pregnant rats were exposed to toluene at levels of 1500 ppm. Maternal toxicity was also observed at this concentration. Prolonged, high level exposure to toluene in laboratory animals has resulted in hearing loss. Exposure studies in rats have resulted in adverse effects on the kidney, liver and central nervous system. Studies in occupationally exposed individuals indicate that toluene exposure has been associated with impaired color vision and decreased performance in some neurobehavioral tests. There are occupational studies which report an association between inhalation exposure to toluene and adverse effects on reproduction including spontaneous abortion. The methodology of these studies and the reliability of the results have been questioned. In a two-generation study in rats, inhalation of toluene at levels up to 2000 ppm did not produce adverse effects on fertility or reproductive performance.

Xylenes: Xylene has been reported to cause central nervous system effects at concentrations above the recommended exposure limit. Xylene vapor becomes irritating at relatively high levels. In one study, eye irritation was reported at exposures of 460 ppm and in one person at 230 ppm after 15 minutes. In another study, no one reported eyes, nose and throat irritation at mixed xylene exposures up to 230 ppm for 30 minutes. Dermal LD50 is expected to be greater than 10g/kg in rabbits, based on test results from similar materials.

Mixed xylenes caused slight hearing loss in rats exposed to 800 ppm in the air for 14 hours/day for six weeks. There is no information available for lower concentrations; however, similar chemicals that have caused these hearing effects at similar concentrations have not caused effects at lower concentrations.

Pregnant animals exposed to xylene or its isomers have been reported to cause development toxicity in rodents when exposed by inhalation. The developmental effects observed consisted of delayed development and minor skeletal variations, but no malformations. Because of the high exposure levels used in these studies, we do not believe that these results imply an increased risk of reproductive toxicity to workers exposed to xylene levels at or below the exposure limits.

Xylene and its isomers are not genotoxic.

Technical grade xylene has been tested in a National Toxicology Program carcinogenicity study in rats and mice dosed orally for two years. There was no evidence of carcinogenicity.
NTP also exposed male and female rats and mice by inhalation to 0, 75, 250, or 750 ppm ethylbenzene for 2 years. There was a statistically significant increase in the number of kidney tumors in male and female rats at 750 ppm. There were also increased incidences of lung tumors in male mice and liver tumors in female mice that were statistically significant at 750 ppm. Except for the male rat kidney tumors, the incidence of the tumors were within the range observed for non-exposed animals from other studies conducted by NTP. The significance of these findings to humans is unknown. Ethylbenzene produced mixed results in in vitro genotoxicity studies, which were not confirmed when tested in vivo. The International Agency for Research on Cancer (IARC) has evaluated ethylbenzene and found it to be possibly carcinogenic to humans (Group 2B).

This product contains n-hexane. Overexposure to n-hexane may cause progressive and potentially irreversible damage to the peripheral nervous system, particularly in the arms and legs. Animal studies have also shown that n-hexane overexposure may cause testicular injury. However, animal studies conducted with commercial hexane, containing 53% n-hexane, showed neither peripheral nervous system damage nor testicular injury at inhalation exposures up to 9000 ppm.

This material may contain significant quantities of polycyclic aromatic hydrocarbons (PCAs), some of which have been shown by experimental studies to induce skin cancer.

Potential chronic health effects

Carcinogenicity	Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.
Mutagenicity	Contains material which may cause heritable genetic effects.
Teratogenicity	Contains material which can cause birth defects.
rtility effects	No known significant effects or critical hazards.
Reproductive effects	No known significant effects or critical hazards.
Medical conditions aggravated by over-exposure	Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

12. Ecological information

Ecotoxicity

No testing has been performed by the manufacturer.

Persistence/degradability	Inherently biodegradable
Mobility	Spillages may penetrate the soil causing ground water contamination. This material may accumulate in sediments.
Bioaccumulative potential	This product is not expected to bioaccumulate through food chains in the environment.
Other ecological information	Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

13. Disposal considerations

Waste information

The generation of waste should be avoided or minimized wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor

from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

NOTE: The generator of waste has the responsibility for proper waste identification (based on characteristic(s) or listing), transportation and disposal

14. Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Class	Packing group	Additional information
DOT Classification	UN 1267	PETROLEUM CRUDE OIL	3	I	-
TDG Classification	UN 1267	PETROLEUM CRUDE OIL	3	I	-
IMDG Classification	UN 1267	PETROLEUM CRUDE OIL. Marine pollutant	3	I	**Emergency schedules (EmS)** F-E, S-E
IATA/ICAO Classification	UN 1267	PETROLEUM CRUDE OIL	3	I	-

15. Regulatory information

WHMIS (Canada) Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Other regulations

Canada inventory	All components are listed or exempted.
United States inventory (TSCA 8b)	All components are listed or exempted.
REACH Status	For the REACH status of this product please consult your company contact, as identified in Section 1.
Australia inventory (AICS)	Not determined.
China inventory (IECSC)	Not determined.
Japan inventory (ENCS)	Not determined.
Korea inventory (KECI)	Not determined.
Philippines inventory (PICCS)	At least one component is not listed.

16. Other information

Label requirements DANGER !

FLAMMABLE LIQUID AND VAPOR.
HARMFUL IF ABSORBED THROUGH SKIN.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS.
CAUSES EYE AND SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.
HARMFUL OR FATAL IF SWALLOWED.
CAN ENTER LUNGS AND CAUSE DAMAGE.
CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.
CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

CONTAINS MATERIAL WHICH MAY CAUSE HERITABLE GENETIC EFFECTS.
ASPIRATION HAZARD.
BIRTH HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS

History

Date of issue 12/14/2011.

of previous issue No previous validation.

Prepared by Product Stewardship

Indicates information that has changed from previously issued version.

Notice to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from BP Group.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken. You can contact the BP Group to ensure that this document is the most current available. Alteration of this document is strictly prohibited.

Safety Data Sheet

Section 1: Identification of the substance or mixture and of the supplier

Product Name:	**Crude Oil, Sour**
SDS Number:	733721
Synonyms/Other Means of Identification:	Crude Oils, Desalted, Sour Field Crude, Sour Petroleum Crude, Sour Petroleum Oil, Sour Rock Oil, Sour Sour Crude
MARPOL Annex I Category:	Crude Oils
Intended Use:	Refinery Feed
Supplier:	Phillips 66 Company 600 N. Dairy Ashford Houston, Texas 77079-1175
Emergency Health and Safety Number:	Chemtrec: 800-424-9300 (24 Hours)
SDS Information:	Phone: 800-762-0942 Email: SDS@P66.com URL: www.Phillips66.com

Section 2: Hazard(s) Identification

DANGER

Highly flammable liquid and vapor. (H225)*
Causes serious eye irritation. (H319)*
May contain or release poisonous hydrogen sulfide gas
May be fatal if swallowed and enters airways. (H304)*
May cause drowsiness or dizziness. (H336)*
May cause damage to organs through prolonged or repeated exposure. (H373)*
May cause cancer. (H350)*
Toxic to aquatic life with long lasting effects. (H411)*

NFPA



Precautionary Statement(s):
Obtain special instructions before use. (P201)*
Do not handle until all safety precautions have been read and understood. (P202)*
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (P210)*
Keep away from any possible contact with water, because of violent reaction and possible flash fire. (P223)*
Ground/bond container and receiving equipment. (P240)*
Use with explosion-proof equipment. (P241)*
Use only non-sparking tools. (P242)*
Take precautionary measures against static discharge. (P243)*
Avoid breathing dust/fume/gas/mist/vapours/spray. (P261)*
Wash thoroughly after handling. (P264)*
Use only outdoors or in a well-ventilated area. (P271)*
Wear protective gloves / protective clothing / eye protection / face protection. (P280)*
IF ON SKIN (or hair):
Remove/Take off immediately all contaminated clothing. (P361)*
Rinse skin with water/shower. (P353)*
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. (P305+P351+P338*)
If eye irritation persists:
Get medical advice/attention. (P313)*
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P301+P310)*
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P304+P340)*
Call a POISON CENTER or doctor/physician if you feel unwell. (P312)*
In case of fire: Use dry chemical, carbon dioxide, or foam for extinction.(P370+P378)*
Store in a well-ventilated place. Keep cool.(P403+P235)*
Dispose of contents/container to approved disposal facility. (P501)*

** (Applicable GHS hazard code.)*

Section 3: Composition / Information on Ingredients

Component	CASRN	Concentration[1]
Crude Oil (Petroleum)	8002-05-9	100
Naphthalene	91-20-3	0-0.9
Benzene	71-43-2	<1
Hydrogen Sulfide	7783-06-4	<1

Total Sulfur: > 0.5 wt%

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.
Crude oil, natural gas and natural gas condensate can contain minor amounts of sulfur, nitrogen and oxygen containing organic compounds as well as trace amounts of heavy metals like mercury, arsenic, nickel, and vanadium. Composition can vary depending on the source of crude.

Section 4: First Aid Measures

Eye Contact: For direct contact, remove contact lenses if present and easy to do. Immediately hold eyelids apart and flush the affected eye(s) with clean water for at least 20 minutes. Seek immediate medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Notes to Physician: At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. For adults the dose is 10 mL of a 3% $NaNO_2$ solution (0.5 gm $NaNO_2$ in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

Medical Conditions Aggravated by Exposure: Conditions which may be aggravated by exposure include skin disorders, eye disorders, liver disorders and immune system disorders. Exposure to high concentrations of this material may increase the sensitivity of the heart to certain drugs. Persons with pre-existing heart disorders may be more susceptible to this effect (see Section 4 - Note to Physicians).

Other Comments: Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

Section 5: Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 2 **Flammability:** 3 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: Extremely flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire. Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: Long-duration fires involving crude or residual fuel oil stored in tanks may result in a boilover. The contents of the tank may be expelled beyond the containment dikes or ditches. All personnel should be kept back a safe distance when a boilover is anticipated (reference NFPA 11 or API 2021).

For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Hydrogen sulfide and oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal Precautions: Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. May contain or release poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H2S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Nonsparking tools should be used. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. May contain or release dangerous levels of hydrogen sulfide. Do not breathe vapors or mists. Wear protective gloves/clothing and eye/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Extremely Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

Mercury and other heavy metals may be present in trace quantities in crude oil, raw natural gas, and condensates. Production and processing of these materials can lead to "drop-out" of elemental mercury in enclosed vessels and pipe work, typically at the low point of any process equipment because of its density. Mercury may also occur in other process system deposits such as sludges, sands, scales, waxes, and filter media. Personnel engaged in work with equipment where mercury deposits might occur (confined space entry, sampling, opening drain valves, draining process lines, etc), may be exposed to a mercury hazard (see sections 3 and 8).

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H2S, and flammability prior to entry. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	Other
Crude Oil (Petroleum)	---	---	TWA:100 mg/m³ - 8 hr (Phillips 66 Guidelines)
Naphthalene	STEL: 15 ppm TWA: 10 ppm 2 ppm TWA; skin; A3 - confirmed animal carcinogen with unknown relevance to humans; TLV basis: upper respiratory tract irritation Skin	TWA: 10 ppm : 50 mg/m³	TWA: 0.2 mg/m³ (as total of 17 PNAs measured by NIOSH Method 5506) (Phillips 66 Guidelines)
Benzene	STEL: 2.5 ppm TWA: 0.5 ppm Skin	Ceiling: 25 ppm STEL: 5 ppm TWA: 10 ppm TWA: 1 ppm	---
Hydrogen Sulfide	STEL: 5 ppm TWA: 1 ppm	Ceiling: 20 ppm	TWA: 5 ppm 8hr TWA: 2.5 ppm 12hr STEL: 15 ppm (Phillips 66 Guidelines)

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection (such as splash goggles) that meets or exceeds ANSI Z.87.1 is recommended when there is potential liquid contact to the eye. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure to hydrogen sulfide (H2S) above exposure limits, a NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used. Under conditions where hydrogen sulfide (H2S) is NOT detected, a NIOSH certified air purifying respirator equipped with organic vapor cartridges/canisters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Workplace monitoring plans should consider the possibility that heavy metals such as mercury may concentrate in processing vessels and equipment presenting the possibility of exposure during various sampling and maintenance operations. Implement appropriate respiratory protection and the use of other protective equipment as dictated by monitoring results (See Sections 2 and 7).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readil, available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Amber to Black
Physical Form:	Liquid
Odor:	Petroleum; Rotten egg / sulfurous
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	0.6-10 psia (Reid VP) @ 100°F / 37.8°C
Vapor Density (air=1):	>1
Initial Boiling Point/Range:	-128 to 1000 °F / -89 to 538 °C
Melting/Freezing Point:	No data
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity (water=1):	0.7-1.03 @ 60°F (15.6°C)
Bulk Density:	5.83-8.58 lbs/gal
Evaporation Rate (nBuAc=1):	No data
Flash Point:	< 20 °F / < -7 °C
Test Method:	(estimate)
Lower Explosive Limits (vol % in air):	1.1
Upper Explosive Limits (vol % in air):	6.0
Auto-ignition Temperature:	590 °F / 310 °C

Section 10: Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Expected to have a low degree of toxicity by inhalation	May contain or release poisonous hydrogen sulfide gas - see Other Comments.	> 5 mg/L (vapor)
Skin Absorption	Unlikely to be harmful		> 2 g/kg
Ingestion (Swallowing)	Unlikely to be harmful		> 5 g/kg

Aspiration Hazard: May be fatal if swallowed and enters airways.

Skin Corrosion/Irritation: Causes mild skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes serious eye irritation.

Signs and Symptoms: Effects of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness and dizziness.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure. Laboratory animal studies of crude oil by the dermal and inhalation exposure routes have demonstrated toxicity to the liver, blood, spleen and thymus

Carcinogenicity: May cause cancer. Chronic application of crude oil to mouse skin resulted in an increased incidence of skin tumors. IARC concluded in its Crude Oil Monograph that there is limited evidence of carcinogenicity in animals, and that crude oil is not classifiable as to its carcinogenicity in humans (Group 3). It has not been listed as a carcinogen by NTP or OSHA.

Germ Cell Mutagenicity: Inadequate information available.

Reproductive Toxicity: Inadequate information available. Dermal exposure to crude oil during pregnancy resulted in limited evidence of developmental toxicity in laboratory animals. Decreased fetal weight and increased resorptions were noted at maternally toxic doses. No significant effects on pup growth or other developmental landmarks were observed postnatally.

Other Comments: This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

This material may contain varying concentrations of polycyclic aromatic hydrocarbons (PAHs) which have been known to produce a phototoxic reaction when contaminated skin is exposed to sunlight. The effect is similar in appearance to an exaggerated sunburn, and is temporary in duration if exposure is discontinued. Continued exposure to sunlight can result in more serious skin problems including pigmentation (discoloration), skin eruptions (pimples), and possible skin cancers.

Information on Toxicological Effects of Components

n-Hexane

Target Organs: Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone.

Reproductive Toxicity: Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Xylenes

Target Organs: Rats exposed to xylenes at 800, 1000 or 1200 ppm 14 hours daily for 6 weeks demonstrated high frequency hearing loss. Another study in rats exposed to 1800 ppm 8 hours daily for 5 days demonstrated middle frequency hearing loss.

Reproductive Toxicity: Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions, but no evidence of teratogenicity.

Ethyl Benzene

Carcinogenicity: Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC.

Target Organs: In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

Naphthalene

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

Target Organs: Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

Germ Cell Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

Section 12: Ecological Information

Toxicity: Experimental studies of acute aquatic toxicity show values for crude oil in the range of 2 to over 100 mg/L. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions. Crude oil should be regarded as harmful to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment. Classification: H411; Chronic Cat 2.

Persistence and Degradability: Most crude oils are not regarded as readily biodegradable. Most of the non-volatile constituents are inherently biodegradable; some of the highest molecular weight components are persistent in water.

Persistence per IOPC Fund definition: Persistent

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material range from less than 2 to greater than 6, and therefore would be regarded as having the potential to bioaccumulate.

Mobility in Soil: Crude oil spreads as a film on the surface of water, facilitating loss of its lighter components by volatilization. In air, the volatile hydrocarbons undergo photodegradation by reaction with hydroxyl radicals with half-lives varying from 0.5 days for n-dodecane to 6.5 days for benzene. The lower molecular weight aromatic hydrocarbons and some polar compounds have low but significant water solubility. Some higher molecular weight compounds are removed by emulsification and these also slowly biodegrade; others adsorb to sediment and sink. A further removal process from water involving the heavier fraction is agglomeration to form tars, some of which sink.

Other Adverse Effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)

- D001 - Ignitability characteristic
- D018 - Toxicity characteristic (Benzene)

Section 14: Transport Information

U.S. Department of Transportation (DOT)

Shipping Description:	UN1267, Petroleum crude oil, 3, I *or* II
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Non-Bulk Package Labeling:	Flammable liquid
Bulk Package/Placard Marking:	Flammable / 1267
Packaging - References:	49 CFR 173.150; 173.201; 173.243 ***[PG I]*** *-or-* 49 CFR 173.150; 173.202; 173.242 ***[PG II]*** ***(Exceptions; Non-bulk; Bulk)***
Hazardous Substance:	See Section 15 for RQ`s
Emergency Response Guide:	128
Note:	***Packing group is dependent on boiling point (BP) of the material:*** **I if BP <=35° C (95° F); II if BP > 35° C (95° F)** ***The following alternate shipping description order may be used until January 1, 2013:*** **Proper Shipping name, Hazard Class or Division, (Subsidiary Hazard if any), UN or NA number, Packing Group** ***Other shipping description elements may be required for DOT compliance.***

International Maritime Dangerous Goods (IMDG)

Shipping Description:	UN1267, Petroleum crude oil, 3, I *or* II, (FP° C cc), *[where FP is the material's flash point in degrees Celsius closed cup]*
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Labels:	Flammable liquid
Placards/Marking (Bulk):	Flammable / 1267
Packaging - Non-Bulk:	P001
EMS:	F-E, S-E
Note:	***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25. If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.***

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #:	UN1267
Proper Shipping Name:	Petroleum crude oil
Hazard Class/Division:	3
Subsidiary risk:	None
Packing Group:	I *or* II
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Labels:	Flammable liquid
ERG Code:	3H
Note:	***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24.***

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	*Forbidden - [PG I]* Y341 - *[PG II]*	351 - *[PG I]* 353 - *[PG II]*	361 - *[PG I]* 364 - *[PG II]*
Max. Net Qty. Per Package:	*Forbidden - [PG I]* 1L - *[PG II]*	1L - *[PG I]* 5 L - *[PG II]*	30 L - *[PG I]* 60 L - *[PG II]*

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:

Component	TPQ	EPCRA RQ
Hydrogen Sulfide	500 lb	100 lb

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health:	Yes
Chronic Health:	Yes
Fire Hazard:	Yes
Pressure Hazard:	No

Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration[1]	de minimis
n-Hexane	<5	1.0%
Xylenes	0-3	1.0%
Ethyl Benzene	<2	0.1%
Naphthalene	0-0.9	0.1%
Benzene	<1	0.1%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:
Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the warning requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Ethyl Benzene	Cancer
Naphthalene	Cancer
Various Polycyclic Aromatic Hydrocarbons	Skin Cancer
Toluene	Developmental Toxicant Female Reproductive Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant

International Hazard Classification

GHS Classification
H224 -- Flammable liquids -- Category 1
H304 -- Aspiration Hazard -- Category 1
H319 -- Eye damage/irritation -- Category 2
H336 -- Specific target organ toxicity (single exposure) -- Category 3
H350 -- Carcinogenicity -- Category 1B
H373 -- Specific target organ toxicity (repeated exposure) -- Category 2
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class:
B2 - Flammable Liquids
D2A
D2B

National Chemical Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA
All components are either on the DSL, or are exempt from DSL listing requirements

U.S. Export Control Classification Number: 1C981

Section 16: Other Information

Date of Issue: 11-May-2012
Status: FINAL
Previous Issue Date: 15-Jun-2011

Revised Sections or Basis for Revision: Responsible party (Section 1)
SDS Number: 733721

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Safety Data Sheet

Section 1: Identification of the substance or mixture and of the supplier

Product Name: **Crude Oil, Sweet**
SDS Number: 724160

Synonyms/Other Means of Identification:
Crude Oils, Desalted, Sweet
Field Crude
Petroleum Crude
Petroleum Oil
Rock Oil
Separator Crude
Sweet Crude

MARPOL Annex I Category: Crude Oils
Intended Use: Refinery Feed

Supplier:
Phillips 66 Company
600 N. Dairy Ashford
Houston, Texas 77079-1175

Emergency Health and Safety Number: Chemtrec: 800-424-9300 (24 Hours)

SDS Information:
Phone: 800-762-0942
Email: SDS@P66.com
URL: www.Phillips66.com

Section 2: Hazard(s) Identification

DANGER

Extremely flammable liquid and vapor. (H224)*
Causes serious eye irritation. (H319)*
May contain or release poisonous hydrogen sulfide gas
May be fatal if swallowed and enters airways. (H304)*
May cause drowsiness or dizziness. (H336)*
May cause damage to organs through prolonged or repeated exposure. (H373)*
May cause cancer. (H350)*
Toxic to aquatic life with long lasting effects. (H411)*



Precautionary Statement(s):
Obtain special instructions before use. (P201)*
Do not handle until all safety precautions have been read and understood. (P202)*
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (P210)*
Keep container tightly closed. (P233)*
Ground/bond container and receiving equipment. (P240)*
P241: Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools. (P242)*
Take precautionary measures against static discharge. (P243)*
Avoid breathing dust/fume/gas/mist/vapours/spray. (P261)*
Wash thoroughly after handling. (P264)*
Use only outdoors or in a well-ventilated area. (P271)*
Wear protective gloves / protective clothing / eye protection / face protection. (P280)*
IF ON SKIN (or hair):
Remove/Take off immediately all contaminated clothing. (P361)*
Rinse skin with water/shower. (P353)*
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. (P305+P351+P338*)
If eye irritation persists:
Get medical advice/attention. (P313)*
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P301+P310)*
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P304+P340)*
Call a POISON CENTER or doctor/physician if you feel unwell. (P312)*
In case of fire: Use dry chemical, carbon dioxide, or foam for extinction.(P370+P378)*
Store in a well-ventilated place. Keep cool.(P403+P235)*
Dispose of contents/container to approved disposal facility. (P501)*

** (Applicable GHS hazard code.)*

Section 3: Composition / Information on Ingredients

Component	CASRN	Concentration[1]
Crude Oil (Petroleum)	8002-05-9	100
Naphthalene	91-20-3	0-0.9
Benzene	71-43-2	<1
Hydrogen Sulfide	7783-06-4	<0.2

Total Sulfur: < 0.5 wt%

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Crude oil, natural gas and natural gas condensate can contain minor amounts of sulfur, nitrogen and oxygen containing organic compounds as well as trace amounts of heavy metals like mercury, arsenic, nickel, and vanadium. Composition can vary depending on the source of crude.

Section 4: First Aid Measures

Eye Contact: For direct contact, remove contact lenses if present and easy to do. Immediately hold eyelids apart and flush the affected eye(s) with clean water for at least 20 minutes. Seek immediate medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Notes to Physician: At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. For adults the dose is 10 mL of a 3% $NaNO_2$ solution (0.5 gm $NaNO_2$ in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

Medical Conditions Aggravated by Exposure: Conditions which may be aggravated by exposure include skin disorders, eye disorders, liver disorders and immune system disorders. Exposure to high concentrations of this material may increase the sensitivity of the heart to certain drugs. Persons with pre-existing heart disorders may be more susceptible to this effect (see Section 4 - Note to Physicians).

Other Comments: Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

Section 5: Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 1 **Flammability:** 3 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: Extremely flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire. Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: Long-duration fires involving crude or residual fuel oil stored in tanks may result in a boilover. The contents of the tank may be expelled beyond the containment dikes or ditches. All personnel should be kept back a safe distance when a boilover is anticipated (reference NFPA 11 or API 2021).

For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Hydrogen sulfide and oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal Precautions: Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. May contain or release poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H2S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Nonsparking tools should be used. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. May contain or release dangerous levels of hydrogen sulfide. Do not breathe vapors or mists. Wear protective gloves/clothing and eye/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Extremely Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

Mercury and other heavy metals may be present in trace quantities in crude oil, raw natural gas, and condensates. Production and processing of these materials can lead to "drop-out" of elemental mercury in enclosed vessels and pipe work, typically at the low point of any process equipment because of its density. Mercury may also occur in other process system deposits such as sludges, sands, scales, waxes, and filter media. Personnel engaged in work with equipment where mercury deposits might occur (confined space entry, sampling, opening drain valves, draining process lines, etc), may be exposed to a mercury hazard (see sections 3 and 8).

Conditions for safe storage: This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H2S, and flammability prior to entry. Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	Other
Crude Oil (Petroleum)	---	---	TWA:100 mg/m³ - 8 hr (Phillips 66 Guidelines)
Naphthalene	STEL: 15 ppm TWA: 10 ppm 2 ppm TWA; skin; A3 - confirmed animal carcinogen with unknown relevance to humans; TLV basis: upper respiratory tract irritation Skin	TWA: 10 ppm : 50 mg/m³	TWA: 0.2 mg/m³ (as total of 17 PNAs measured by NIOSH Method 5506) (Phillips 66 Guidelines)
Benzene	STEL: 2.5 ppm TWA: 0.5 ppm Skin	Ceiling: 25 ppm STEL: 5 ppm TWA: 10 ppm TWA: 1 ppm	---
Hydrogen Sulfide	STEL: 5 ppm TWA: 1 ppm	Ceiling: 20 ppm	TWA: 5 ppm 8hr TWA: 2.5 ppm 12hr STEL: 15 ppm (Phillips 66 Guidelines)

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection (such as splash goggles) that meets or exceeds ANSI Z.87.1 is recommended when there is potential liquid contact to the eye. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure to hydrogen sulfide (H2S) above exposure limits, a NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used. Under conditions where hydrogen sulfide (H2S) is NOT detected, a NIOSH certified air purifying respirator equipped with organic vapor cartridges/canisters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Workplace monitoring plans should consider the possibility that heavy metals such as mercury may concentrate in processing vessels and equipment presenting the possibility of exposure during various sampling and maintenance operations. Implement appropriate respiratory protection and the use of other protective equipment as dictated by monitoring results (See Sections 2 and 7).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readil available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Amber to Black
Physical Form:	Liquid
Odor:	Petroleum. Rotten egg / sulfurous
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	0.6-10 psia (Reid VP) @ 100°F / 37.8°C
Vapor Density (air=1):	>1
Initial Boiling Point/Range:	-128 to 1000 °F / -89 to 538 °C
Melting/Freezing Point:	No data
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity (water=1):	0.7-1.03 @ 60°F (15.6°C)
Bulk Density:	5.83-8.58 lbs/gal
Evaporation Rate (nBuAc=1):	No data
Flash Point:	< 20 °F / < -7 °C
Test Method:	(estimate)
Lower Explosive Limits (vol % in air):	1.1
Upper Explosive Limits (vol % in air):	6.0
Auto-ignition Temperature:	590 °F / 310 °C

Section 10: Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Expected to have a low degree of toxicity by inhalation	May contain or release poisonous hydrogen sulfide gas - see Other Comments.	> 5 mg/L (vapor)
Skin Absorption	Unlikely to be harmful		> 2 g/kg
Ingestion (Swallowing)	Unlikely to be harmful		> 5 g/kg

Aspiration Hazard: May be fatal if swallowed and enters airways.

Skin Corrosion/Irritation: Causes mild skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes serious eye irritation.

Signs and Symptoms: Effects of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness and dizziness.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure. Laboratory animal studies of crude oil by the dermal and inhalation exposure routes have demonstrated toxicity to the liver, blood, spleen and thymus

Carcinogenicity: May cause cancer. Chronic application of crude oil to mouse skin resulted in an increased incidence of skin tumors. IARC concluded in its Crude Oil Monograph that there is limited evidence of carcinogenicity in animals, and that crude oil is not classifiable as to its carcinogenicity in humans (Group 3). It has not been listed as a carcinogen by NTP or OSHA.

Germ Cell Mutagenicity: Inadequate information available.

Reproductive Toxicity: Inadequate information available. Dermal exposure to crude oil during pregnancy resulted in limited evidence of developmental toxicity in laboratory animals. Decreased fetal weight and increased resorptions were noted at maternally toxic doses. No significant effects on pup growth or other developmental landmarks were observed postnatally.

Other Comments: This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

This material may contain varying concentrations of polycyclic aromatic hydrocarbons (PAHs) which have been known to produce a phototoxic reaction when contaminated skin is exposed to sunlight. The effect is similar in appearance to an exaggerated sunburn, and is temporary in duration if exposure is discontinued. Continued exposure to sunlight can result in more serious skin problems including pigmentation (discoloration), skin eruptions (pimples), and possible skin cancers.

Information on Toxicological Effects of Components

n-Hexane

Target Organs: Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone.

Reproductive Toxicity: Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Xylenes

Target Organs: Rats exposed to xylenes at 800, 1000 or 1200 ppm 14 hours daily for 6 weeks demonstrated high frequency hearing loss. Another study in rats exposed to 1800 ppm 8 hours daily for 5 days demonstrated middle frequency hearing loss.

Reproductive Toxicity: Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions, but no evidence of teratogenicity.

Ethyl Benzene

Carcinogenicity: Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC.

Target Organs: In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

Naphthalene

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

Target Organs: Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

Germ Cell Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

Section 12: Ecological Information

Toxicity: Experimental studies of acute aquatic toxicity show values for crude oil in the range of 2 to over 100 mg/L. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions. Crude oil should be regarded as harmful to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment. Classification: H411; Chronic Cat 2.

Persistence and Degradability: Most crude oils are not regarded as readily biodegradable. Most of the non-volatile constituents are inherently biodegradable; some of the highest molecular weight components are persistent in water.

Persistence per IOPC Fund definition: Persistent

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material range from less than 2 to greater than 6, and therefore would be regarded as having the potential to bioaccumulate.

Mobility in Soil: Crude oil spreads as a film on the surface of water, facilitating loss of its lighter components by volatilization. In air, the volatile hydrocarbons undergo photodegradation by reaction with hydroxyl radicals with half-lives varying from 0.5 days for n-dodecane to 6.5 days for benzene. The lower molecular weight aromatic hydrocarbons and some polar compounds have low but significant water solubility. Some higher molecular weight compounds are removed by emulsification and these also slowly biodegrade; others adsorb to sediment and sink. A further removal process from water involving the heavier fraction is agglomeration to form tars, some of which sink.

Other Adverse Effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)

- D001 - Ignitability characteristic
- D018 - Toxicity characteristic (Benzene)

Section 14: Transport Information

U.S. Department of Transportation (DOT)

Shipping Description:	UN1267, Petroleum crude oil, 3, I *or* II
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Non-Bulk Package Labeling:	Flammable liquid
Bulk Package/Placard Marking:	Flammable / 1267
Packaging - References:	49 CFR 173.150; 173.201; 173.243 ***[PG I]*** *-or-* 49 CFR 173.150; 173.202; 173.242 ***[PG II]*** ***(Exceptions; Non-bulk; Bulk)***
Hazardous Substance:	See Section 15 for RQ`s
Emergency Response Guide:	128
Note:	***Packing group is dependent on boiling point (BP) of the material:*** **I if BP <=35° C (95° F); II if BP > 35° C (95° F)** ***The following alternate shipping description order may be used until January 1, 2013:*** **Proper Shipping name, Hazard Class or Division, (Subsidiary Hazard if any), UN or NA number, Packing Group** ***Other shipping description elements may be required for DOT compliance.***

International Maritime Dangerous Goods (IMDG)

Shipping Description:	UN1267, Petroleum crude oil, 3, I *or* II, (FP° C cc), *[where FP is the material's flash point in degrees Celsius closed cup]*
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Labels:	Flammable liquid
Placards/Marking (Bulk):	Flammable / 1267
Packaging - Non-Bulk:	P001
EMS:	F-E, S-E
Note:	***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25. If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.***

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #:	UN1267
Proper Shipping Name:	Petroleum crude oil
Hazard Class/Division:	3
Subsidiary risk:	None
Packing Group:	I *or* II
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Labels:	Flammable liquid
ERG Code:	3H
Note:	***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24.***

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	*Forbidden - [PG I]* Y341 - *[PG II]*	351 - *[PG I]* 353 - *[PG II]*	361 - *[PG I]* 364 - *[PG II]*
Max. Net Qty. Per Package:	*Forbidden - [PG I]* 1L - *[PG II]*	1L - *[PG I]* 5 L - *[PG II]*	30 L - *[PG I]* 60 L - *[PG II]*

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:

Component	TPQ	EPCRA RQ
Hydrogen Sulfide	500 lb	100 lb

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health:	Yes
Chronic Health:	Yes
Fire Hazard:	Yes
Pressure Hazard:	No

Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration[1]	de minimis
n-Hexane	0-5	1.0%
Xylenes	0-3	1.0%
Ethyl Benzene	<2	0.1%
Naphthalene	0-0.9	0.1%
Benzene	<1	0.1%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:
Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the warning requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Ethyl Benzene	Cancer
Naphthalene	Cancer
Various Polycyclic Aromatic Hydrocarbons	Skin Cancer
Toluene	Developmental Toxicant Female Reproductive Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant

International Hazard Classification

GHS Classification
H224 -- Flammable liquids -- Category 1
H304 -- Aspiration Hazard -- Category 1
H319 -- Eye damage/irritation -- Category 2
H336 -- Specific target organ toxicity (single exposure) -- Category 3
H350 -- Carcinogenicity -- Category 1B
H373 -- Specific target organ toxicity (repeated exposure) -- Category 2
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class:
B2 - Flammable Liquids
D2A
D2B

National Chemical Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA
All components are either on the DSL, or are exempt from DSL listing requirements

U.S. Export Control Classification Number: 1C981

Section 16: Other Information

Date of Issue: 11-May-2012
Status: FINAL
Previous Issue Date: 06-Jul-2011

Revised Sections or Basis for Revision: Responsible party (Section 1)
SDS Number: 724160

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Dilbit
Synonyms:	Diluted Bitumen; AWB – Access Western Blend; Pipeline Sales Oil.
Product Use:	Base product for Petroleum Refining.
Manufacturer/Supplier:	MEG Energy Corp. Christina Lake Regional Project P.O Box 21008 Fort McMurray, AB T9H 5B2
Phone Number:	403-770-5596
Emergency Phone:	MEG Emergency Number: 1-800-575-1400 FOR EMERGENCIES INVOLVING DANGEROUS GOODS Call CANUTEC's 24-hr Number: 613-996-6666
Date of Preparation:	August 31, 2011

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. CANCER HAZARD – CAN CAUSE CANCER. IRRITATING TO EYES AND SKIN.

Colour: Light to dark brown.
Physical State: Liquid.
Odour: Hydrocarbon.

WHMIS	Personal Protection Equipment	TDG (Ground)
		

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H2S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Hydrogen sulphide

may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

Chronic Effects: See Section 11 for more information.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Reproductive system. Nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS No.	Wt. %
Petroleum	8002-05-9	60 - 100
Hexane	110-54-3	5 - 10
Benzene	71-43-2	1 - 5
Toluene	108-88-3	1 - 5
Xylenes	1330-20-7	0.5 - 1.5
Benzene, ethyl-	100-41-4	0.1 - 1
Hydrogen sulfide (H2S)	7783-06-4	< 0.1

Section 4: FIRST AID MEASURES

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Inhalation: Remove person to fresh air. If breathing has stopped apply artificial respiration. If signs/symptoms develop, get medical attention.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately. For inhalation of Hydrogen Sulphide, consider oxygen.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Means of Extinction
Suitable Extinguishing Media: Dry chemical, foam, water fog, carbon dioxide.

Unsuitable Extinguishing Media:	Do not use water except as a fog.
Products of Combustion:	Oxides of carbon. Oxides of sulphur. Aldehydes.
Protection of Firefighters:	Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces.

Explosion Data

Sensitivity to Mechanical Impact:	This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge:	This material is sensitive to static discharge at temperatures above the flash point.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Don full-face, positive pressure, self-contained breathing apparatus.
Environmental Precautions:	Keep out of drains, sewers, ditches, and waterways.
Methods for Containment:	Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.
Methods for Clean-Up:	Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.
Other Information:	Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking. Harmful concentrations of hydrogen sulfide (H2S) gas can accumulate in excavations and low-lying areas as well as the vapour space of storage and bulk transport compartments. See Section 8 for information on Personal Protective Equipment.

Storage:
Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Keep out of the reach of children. Head spaces in storage containers may contain toxic hydrogen sulphide gas. Structural materials and lighting and ventilation systems should be corrosion resistant.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Petroleum
(8002-05-9) **ACGIH:** Exposure by all routes should be carefully controlled to levels as low as possible (2009); For Mineral oil, excluding metal working fluids; Poorly and mildly refined
(8002-05-9) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA); 400 ppm (TWA) [Vacated]

Hexane
(110-54-3) **ACGIH:** 50 ppm (TWA); Skin, BEI (1996)
(110-54-3) **OSHA:** 500 ppm (TWA), 1800 mg/m³ (TWA); Skin. 50 ppm (TWA) [Vacated]

Benzene
(71-43-2) **ACGIH:** 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)
(71-43-2) **OSHA:** 1 ppm (TWA); 5 ppm (STEL);

Toluene
(108-88-3) **ACGIH:** 20 ppm (TWA); A4; BEI (2006)
(108-88-3) **OSHA:** 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.) 100 ppm (TWA); 150 ppm (STEL) [Vacated]

Xylenes
(1330-20-7) **ACGIH:** 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)
(1330-20-7) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA); 150 ppm (STEL) [Vacated]

Benzene, ethyl-
(100-41-4) **ACGIH:** 20 ppm (TWA); A3; BEI (2010)
(100-41-4) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA); 125 ppm (STEL) [Vacated]

Hydrogen sulfide (H2S)
(7783-06-4) **ACGIH:** 1 ppm (TWA); 5 ppm (STEL); (2009)
(7783-06-4) **OSHA:** 20 ppm (C); 50 ppm (Peak) (Maximum duration: 10 mins. once only if no other meas. exp. occurs.) 10 ppm (TWA); 15 ppm (STEL) [Vacated]

PEL: Permissible Exposure Limit
TLV: Threshold Limit Value
TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.

Personal Protective Equipment

Eye/Face Protection: Wear safety glasses. Ensure that eyewash stations are close to the workstation location.

Hand Protection:	Wear impervious gloves. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Viscous liquid.
Colour:	Light to dark brown.
Odour:	Hydrocarbon.
Odour Threshold:	0.00047 ppm, (H_2S)
Physical State:	Liquid.
pH:	Not available.
Viscosity:	60.7 cSt @ 40 °C
Melting Point:	Not available.
Boiling Point:	34.9 °C to 720 °C
Flash Point:	Not available.
Evaporation Rate:	Not available.
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	> 1 (Air = 1)
Specific Gravity:	0.9178 (Water = 1) @ 15 °C
Density:	917.0 kg/m^3 @ 15 °C
Solubility in Water:	Insoluble.
Coefficient of Water/Oil Distribution:	Not measurable. Product is more soluble in oil.
Auto-ignition Temperature:	Not available.
Percent Volatile, wt. %:	Non-volatile.
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability: Stable under normal storage conditions.

Conditions of Reactivity: Contact with incompatible materials. Sources of ignition. Exposure to heat.

Incompatible Materials: Strong oxidizers.

Hazardous Decomposition Products: Not available.

Possibility of Hazardous Reactions: None known.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Petroleum	8002-05-9	4300 mg/kg, (rat)	Not available.	Not available.
Hexane	110-54-3	25000 mg/kg, (rat)	Not available.	48000 ppm, (rat), 4H
Benzene	71-43-2	930 mg/kg, (rat)	>9400 µl/kg, (rabbit)	10000 ppm, (rat), 7H
Toluene	108-88-3	600 mg/kg, (rat)	14.1 mL/kg, (rabbit)	49000 mg/m³, 4H, (rat)
Xylenes	1330-20-7	>1700 mg/kg, (rat)	4300 mg/kg, (rabbit)	5000 ppm, (rat), 4H
Benzene, ethyl-	100-41-4	3500 mg/kg, (rat)	17800 µl/kg, (rabbit)	Not available.
Hydrogen sulfide (H2S)	7783-06-4	Not available.	Not available.	444 ppm, (rat),

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H2S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Hydrogen sulphide may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

Skin Sensitization: Not hazardous by OSHA/WHMIS criteria.

Respiratory Sensitization: Not hazardous by OSHA/WHMIS criteria.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Kidneys. Reproductive system. Nervous system.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. Repeated dermal application of crude oils in rats produced systemic toxicity in blood, liver, thymus and bone marrow. Chronic inhalation of n-Hexane may cause peripheral nerve disorders and central nervous system effects. Long term inhalation of Benzene, Toluene or Xylene vapours can result in bone marrow abnormalities with damage to blood forming tissues and may cause anemia and other blood cell abnormalities. Immunodepressive effects have also been reported. Repeated exposure of the eyes to high concentrations of Xylenes vapour may cause reversible eye damage. Hydrogen sulphide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation: damage to cardiovascular system.

Carcinogenicity: Hazardous by OSHA/WHMIS criteria. May cause cancer. Lifetime skin painting studies in animals with whole crude oils and crude oil fractions have produced tumours in animals following prolonged and repeated skin contact. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumour composed of cells of the type normally found in the bone marrow).

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Petroleum	A2	Group 3	Not listed.	Not listed.	Not listed.
Hexane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen	Listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Xylenes	A4	Group 3	Not listed.	Not listed.	Not listed.
Benzene, ethyl-	A3	Group 2B	Not listed.	OSHA Carcinogen	Listed.
Hydrogen sulfide (H2S)	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.

Mutagenicity: Hazardous by OSHA/WHMIS criteria. May cause heritable genetic damage.

Reproductive Effects: Possible risk of impaired fertility. Studies exist which report a link to crude oil and reproductive effects including menstrual disorders.

Developmental Effects

Teratogenicity: Not hazardous by OSHA/WHMIS criteria.

Embryotoxicity: Hazardous by OSHA/WHMIS criteria. Possible risk of harm to the unborn child. Repeated dermal application of crude oils to pregnant rats produced maternal toxicity and fetal developmental toxicity and fetal tumours. Benzene and Xylene have caused adverse fetal effects in laboratory animals. Exposure to Toluene may affect the developing fetus.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: 21 and 41 mg/l, 96 hr., Rainbow trout;
2.7 and 4.1 mg/l, 96 hr., Mysid;
122 and 528 ml/kg, 96 hr., Algae.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORTATION INFORMATION

CFR
Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, I
Class: 3
UN Number: 1267
Packing Group: I
Label Code:



TDG
Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, I
Class: 3
UN Number: 1267
Packing Group: I
Label Code:



Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:
Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2A - Chronic toxic effects.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:



United States
This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Petroleum	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Hexane	Not listed.	Not listed.	5000	313 & X	Not listed.	Not listed.
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Xylenes	Not listed.	Not listed.	100	313	U239	Not listed.
Benzene, ethyl-	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Hydrogen sulfide (H2S)	500	100	100	313s	U135	10000

State Regulations
Massachusetts
US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Hexane	110-54-3	Listed.
Benzene	71-43-2	E
Toluene	108-88-3	Listed.
Xylenes	1330-20-7	Listed.
Benzene, ethyl-	100-41-4	Listed.
Hydrogen sulfide (H2S)	7783-06-4	E

Note: E = Extraordinarily Hazardous Substance

New Jersey
US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Petroleum	8002-05-9	SHHS
Hexane	110-54-3	SHHS
Benzene	71-43-2	SHHS
Toluene	108-88-3	SHHS
Xylenes	1330-20-7	SHHS
Benzene, ethyl-	100-41-4	SHHS
Hydrogen sulfide (H2S)	7783-06-4	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania
US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Hexane	110-54-3	Listed.
Benzene	71-43-2	ES
Toluene	108-88-3	E
Xylenes	1330-20-7	E
Benzene, ethyl-	100-41-4	E
Hydrogen sulfide (H2S)	7783-06-4	E

Note: E = Environmental Hazard; S = Special Hazardous Substance

California
California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Component	Type of Toxicity
Benzene	developmental, male & cancer
Toluene	developmental & female
Benzene, ethyl-	cancer
Polycyclic Aromatic Hydrocarbons	cancer
Nickel	cancer

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Expiry Date: August 30, 2014

Version: 1.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: Diluted Bitumen

Synonyms: Dilbit, Synbit, PSH. A mixture of bitumen & petroleum naphtha.

Product Use: Feed to refinery, feed to Orcrude.

Manufacturer/Supplier: Nexen Canada Inc.
Synthetic Oil Division
Box 6010
Ft. McMurray, Alberta
T9H 3G2

Emergency Phone: 1 (780) 334-3911

Date of Preparation: June 17, 2011

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
EXTREMELY FLAMMABLE LIQUID AND VAPOR - VAPOR MAY CAUSE FLASH FIRE. IRRITATING TO EYES AND SKIN. CANCER HAZARD – CAN CAUSE CANCER.

Colour: Black.
Physical State: Liquid.
Odour: Hydrocarbon. May have rotten eggs odour.

WHMIS	Personal Protection Equipment	TDG (Ground)
		

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May affect the central nervous system and cause headache, dizziness, confusion, loss of appetite and loss of consciousness. High vapor concentrations of p-Xylene are anesthetic and central nervous system depressants. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Very high concentrations may cause unconsciousness and death.

Chronic Effects: See Section 11 for more information.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Bone marrow. Liver. Kidneys. Nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS No.	Wt. %
Bitumen	8052-42-4	55 - 75
Naphtha	8030-30-6	0 - 25
Synthetic Crude Oil (SCO) *	(various)	0 - 45
Octane	111-65-9	3 - 7
Heptane	142-82-5	1 - 5
Sulfur	7704-34-9	1 - 5
Pentane	109-66-0	1 - 3
n-Hexane	110-54-3	1 - 3
Cyclohexane, methyl-	108-87-2	1 - 5
p-Xylene	106-42-3	0.1 - 1
Toluene	108-88-3	0.1 - 1
Benzene, ethyl-	100-41-4	0.1 - 1
Benzene	71-43-2	0.1 – 1
Hydrogen sulphide	7783-06-4	Trace

* **Note:** SCO is a commercial petroleum blend consisting of naphtha, diesel, and gasoil supplied by various oilsand Upgraders in Alberta.

Section 4: FIRST AID MEASURES

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Inhalation: Remove person to fresh air. If breathing has stopped apply artificial respiration. If signs/symptoms develop, get medical attention.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Means of Extinction
Suitable Extinguishing Media: Dry chemical, foam, water fog, carbon dioxide.
Unsuitable Extinguishing Media: Not available.

Products of Combustion: Oxides of carbon. Oxides of sulphur. Hydrogen sulphide.

Protection of Firefighters: Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA).

Explosion Data
Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge: This material is sensitive to static discharge at temperatures above the flash point.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Environmental Precautions: Keep out of drains, sewers, ditches, and waterways.

Methods for Containment: Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.

Methods for Clean-Up: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.

Other Information: Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking. See Section 8 for information on Personal Protective Equipment.

Storage:
Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Keep out of the reach of children.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Bitumen

(8052-42-4) **ACGIH:** 0.5 mg/m³ (TWA); A4; BEI; Inhalable fraction, as benzene-soluble

(8052-42-4) **OSHA:** Not established.

(8052-42-4) **Alberta OEL:** 5 mg/m³ (OEL)

Naphtha

(8030-30-6) **ACGIH:** 100 ppm (TWA);

(8030-30-6) **OSHA:** 100 ppm (TWA), 400 mg/m³ (TWA);

(8030-30-6) **Alberta OEL:** 400 ppm (OEL);

Octane

(111-65-9) **ACGIH:** 300 ppm (TWA); (1979)

(111-65-9) **OSHA:** 500 ppm (TWA), 2350 mg/m³ (TWA);

(111-65-9) **Alberta OEL:** 300 ppm (OEL);

Heptane

(142-82-5) **ACGIH:** 400 ppm (TWA); 500 ppm (STEL); (1979)

(142-82-5) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA);

(142-82-5) **Alberta OEL:** 400 ppm (OEL); 500 ppm (STEL);

Sulphur

(7704-34-9) **ACGIH:** 10 mg/m³ (TWA); Inhalable. 3 mg/m³ (Respirable.)

(7704-34-9) **OSHA:** 15 mg/m³ (Total dust) (TWA), 5 mg/m³ (Respirable fraction) (TWA); Respirable fraction. 15 mg/m³ (Total dust.)

(7704-34-9) **Alberta OEL:** 10 mg/m³ (OEL)

Pentane

(109-66-0) **ACGIH:** 600 ppm (TWA); (1989)

(109-66-0) **OSHA:** 1000 ppm (TWA), 2950 mg/m³ (TWA);

(109-66-0) **Alberta OEL:** 600 ppm (OEL);

n-Hexane

(110-54-3) **ACGIH:** 50 ppm (TWA); Skin, BEI (1996)

(110-54-3) **OSHA:** 500 ppm (TWA), 1800 mg/m³ (TWA); Skin.

(110-54-3) **Alberta OEL:** 50 ppm (OEL); Skin absorption

Hexane, isomers, other than n-Hexane

(various) **ACGIH:** 500 ppm (TWA); 1000 ppm (STEL); (1979)

(various) **OSHA:** 500 ppm (TWA); 1000 ppm (STEL); (vacated)

(various) **Alberta OEL:** 500 ppm (OEL); 1000 ppm (STEL)

Cyclohexane, methyl-

(108-87-2) **ACGIH:** 400 ppm (TWA); (1962)

(108-87-2) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA);

(108-87-2) **Alberta OEL:** 400 ppm (OEL)

p-Xylene

(106-42-3) **ACGIH:** 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)

(106-42-3) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA);

(106-42-3) **Alberta OEL:** 100 ppm (OEL); 150 ppm (STEL)

Toluene

(108-88-3) **ACGIH:** 20 ppm (TWA); A4; BEI (2006)

(108-88-3) **OSHA:** 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)

(108-88-3) **Alberta OEL:** 50 ppm (OEL)

Benzene, ethyl-

(100-41-4) **ACGIH:** 20 ppm (TWA); A3; BEI (2010)

(100-41-4) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA);

(100-41-4) **Alberta OEL:** 100 ppm (OEL); 125 ppm (STEL);

Benzene

(71-43-2) **ACGIH:** 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)

(71-43-2) **OSHA:** 1 ppm (TWA); 5 ppm (STEL);

(71-43-2) **Alberta OEL:** 0.5 ppm (OEL); 2.5 ppm (STEL); Skin absorption

PEL: Permissible Exposure Limit
TLV: Threshold Limit Value
TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls:	Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.
Personal Protective Equipment	
Eye/Face Protection:	Wear safety glasses.
Hand Protection:	Wear impervious gloves. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Viscous liquid.
Colour:	Black.
Odour:	Hydrocarbon. May have rotten eggs odour.
Odour Threshold:	Not available.
Physical State:	Liquid.
pH (as supplied):	Not available.
Viscosity:	Not available.

Melting Point:	Not available.
Boiling Point:	Not available.
Flash Point:	< -13 °C (PMCC)
Evaporation Rate:	Not available.
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	5 kPa (calculated)
Vapor Density:	3 (Air = 1)
Specific Gravity:	Not available.
Density:	Not available.
Solubility in Water:	Not available.
Coefficient of Water/Oil Distribution:	< 1
Auto-ignition Temperature:	537 °C
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability:	Stable under normal storage conditions.
Conditions of Reactivity:	Contact with incompatible materials. Sources of ignition. Exposure to heat.
Incompatible Materials:	Strong acids. Bases. Strong oxidizers. Alkali metals. Metals. Zinc. Oxides of nitrogen. Chlorine. Halogens. Nitrates. Phosphorus. Ammonia.
Hazardous Decomposition Products:	Not available.
Possibility of Hazardous Reactions:	Contact between heated Bitumen and water can cause a violent eruption.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Bitumen	8052-42-4	Not available.	Not available.	Not available.
Naphtha	8030-30-6	>5000 mg/kg, (rat)	>3000 mg/kg, (rabbit)	>10600 mg/m³, (rat)
Octane	111-65-9	Not available.	Not available.	118000 mg/m³, (rat)
Heptane	142-82-5	Not available.	Not available.	103000 mg/m³, (rat)
Sulfur	7704-34-9	>8437 mg/kg, (rat)	Not available.	Not available.
Pentane	109-66-0	400 mg/kg, (rat)	Not available.	364000 mg/m³, (rat)
n-Hexane	110-54-3	25000 mg/kg, (rat)	Not available.	48000 ppm, (rat)
Cyclohexane, methyl-	108-87-2	>3200 mg/kg, (rat)	>86700 mg/kg, (rabbit)	15227 ppm, (rabbit)

p-Xylene	106-42-3	5000 mg/kg, (rat)	Not available.	4550 ppm, (rat)
Toluene	108-88-3	600 mg/kg, (rat)	14.1 mL/kg, (rabbit)	49000 mg/m³, (rat)
Benzene, ethyl-	100-41-4	3500 mg/kg, (rat)	17800 µl/kg, (rabbit)	Not available.
Benzene	71-43-2	930 mg/kg, (rat)	>9400 µl/kg, (rabbit)	10000 ppm, (rat)

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May affect the central nervous system and cause headache, dizziness, confusion, loss of appetite and loss of consciousness. High vapor concentrations of p-Xylene are anesthetic and central nervous system depressants. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Very high concentrations may cause unconsciousness and death.

Skin Sensitization: Not hazardous by OSHA/WHMIS criteria.

Respiratory Sensitization: Not hazardous by OSHA/WHMIS criteria.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Blood. Bone marrow. Liver. Kidneys. Nervous system.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. This material contains n-Hexane which is known to cause damage to the peripheral nervous system (peripheral neuropathy). Long term inhalation of Benzene vapours can result in bone marrow abnormalities with damage to blood forming tissues and may cause anemia and other blood cell abnormalities.

Carcinogenicity: Hazardous by OSHA/WHMIS criteria. May cause cancer.

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Bitumen	A4	Group 2B	Not listed.	OSHA Carcinogen	Not listed.
Naphtha	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Octane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Heptane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Sulfur	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Pentane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
n-Hexane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Cyclohexane, methyl-	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
p-Xylene	A4	Not listed.	Not listed.	Not listed.	Not listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Benzene, ethyl-	A3	Group 2B	Not listed.	OSHA Carcinogen	Listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen	Not listed.

Mutagenicity: Hazardous by OSHA/WHMIS criteria. May cause heritable genetic damage.

Reproductive Effects: Not hazardous by OSHA/WHMIS criteria. This material contains n-Hexane which may impair fertility at doses which produce other toxic effects.

Developmental Effects Teratogenicity: Not hazardous by OSHA/WHMIS criteria. P-Xylene may cause teratogenic effects. Exposure to Toluene may affect the developing fetus. Benzene has caused adverse fetal effects in laboratory animals.

Embryotoxicity: Hazardous by OSHA/WHMIS criteria. Possible risk of harm to the unborn child.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Not available.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORTATION INFORMATION

CFR

Proper Shipping Name: TARS, LIQUID, (Diluted Bitumen), 3, UN 1999, II

Class: 3

UN Number: 1999

Packing Group: II

Label Code:



TDG

Proper Shipping Name: TARS, LIQUID, (Diluted Bitumen), 3, UN 1999, II

Class: 3

UN Number: 1999

Packing Group: II

Label Code:



Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:
Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2A - Chronic toxic effects.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:



United States
This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Bitumen	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Naphtha	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Octane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Heptane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Sulfur	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Pentane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
n-Hexane	Not listed.	Not listed.	5000	313 & X	Not listed.	Not listed.
Cyclohexane, methyl-	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
P-Xylene	Not listed.	Not listed.	100	313 & X	U239	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Benzene, ethyl-	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Bitumen	8052-42-4	Listed.
Naphtha	8030-30-6	Listed.
Octane	111-65-9	Listed.
Heptane	142-82-5	Listed.
Sulfur	7704-34-9	Listed.
Pentane	109-66-0	Listed.
n-Hexane	110-54-3	Listed.
Cyclohexane, methyl-	108-87-2	Listed.
P-Xylene	106-42-3	Listed.
Toluene	108-88-3	Listed.
Benzene, ethyl-	100-41-4	Listed.
Benzene	71-43-2	E

Note: E = Extraordinarily hazardous substance

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Bitumen	8052-42-4	Listed.
Naphtha	8030-30-6	SHHS
Octane	111-65-9	SHHS
Heptane	142-82-5	SHHS
Sulfur	7704-34-9	Listed.
Pentane	109-66-0	SHHS
n-Hexane	110-54-3	SHHS
Cyclohexane, methyl-	108-87-2	SHHS
P-Xylene	106-42-3	SHHS
Toluene	108-88-3	SHHS
Benzene, ethyl-	100-41-4	SHHS
Benzene	71-43-2	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Bitumen	8052-42-4	Listed.
Naphtha	8030-30-6	Listed.
Octane	111-65-9	Listed.
Heptane	142-82-5	Listed.
Sulfur	7704-34-9	Listed.
Pentane	109-66-0	Listed.
n-Hexane	110-54-3	Listed.
Cyclohexane, methyl-	108-87-2	Listed.
P-Xylene	106-42-3	E
Toluene	108-88-3	E
Benzene, ethyl-	100-41-4	E
Benzene	71-43-2	ES

Note: E = Environmental Hazard; S = Special Hazardous Substance

California
California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Component	Type of Toxicity
Bitumen	cancer
Toluene	developmental & female
Benzene, ethyl-	cancer
Benzene	developmental, male

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Expiry Date: June 16, 2014

Version: 1.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

SECTION 1 – MATERIAL IDENTIFICATION AND USE

Material Name:	HEAVY CRUDE OIL/DILUENT MIX
Synonyms:	Bow River (BR); Cold Lake Blend (CLB) from Foster Creek; Christina Lake Blend (CSB); Western Canadian Blend (WCB) or Wainwright; Western Canadian Select (WCS); Wabasca Heavy (WH) from Pelican Lake
Use:	Process stream, fuels and lubricants production
WHMIS Classification:	Class B, Div. 2, Class D, Div. 2, Sub-Div. A and B
NFPA:	**Fire:** 2 **Reactivity:** 0 **Health:** 3
TDG Shipping Name:	Petroleum Crude Oil
TDG Class:	3 **UN:** 1267
TDG Packing Group:	II (boiling point 35 deg. C or above, and flash point less than 23 deg. C)
Manufacturer/Supplier:	CENOVUS ENERGY INC. 421 - 7 Ave SW PO Box 766 Calgary, AB T2P 0M5
Emergency Telephone:	1-877-458-8080
Chemical Description:	A naturally occurring mixture of paraffins, naphthalenes, aromatic hydrocarbons and small amounts of sulphur and nitrogen compounds mixed with condensate

SECTION 2 – HAZARDOUS INGREDIENTS OF MATERIAL

Hazardous Ingredients	Approximate Concentrations (%)	C.A.S. Nos.	LD50/LC50 Specify Species & Route	Exposure Limits
Crude oil	50 – 90	8002-05-9	LD50, rat, skin, >2 g/kg	5 mg/m^3 (OEL,TLV)
Hydrocarbon Diluent	10 – 50	N.Av.	N.Av.	900 mg/m^3 (OEL)*
Benzene	0.03 - 0.3	71-43-2	LD50, rat, oral, 930 mg/kg LC50, rat, 4 hr, 13200 ppm	1 ppm (OEL), 0.5 ppm (TLV)
Hydrogen Sulphide[§]	<0.1	7783-06-04	LC50, rat, 4 hrs, 444 ppm	10 ppm (OEL,TLV)

OEL = Alberta Occupational Exposure Limit (8hrs); TLV = ACGIH Threshold Limit Value *OEL for gasoline
[§]Hydrogen Sulfide in liquid, vapour phase may contain higher concentrations

SECTION 3 – PHYSICAL DATA FOR MATERIAL

Physical State:	Liquid	**Vapour Pressure (kPa):**	2.5 – 36.5 @ 20°C
Specific Gravity:	0.91 – 0.94	**Odour Threshold (ppm):**	N.Av.
Vapour Density (air=1):	2.5 -5.0 (estimated)	**Evaporation Rate:**	N.Av.
Percent Volatiles, (v/v):	15 - 30 (estimated)	**Boiling Pt. (deg.C):**	35 – 180°C
pH: N.Av.		**Freezing Pt. (deg.C):**	<20

Coefficient of Water/Oil Distribution: <0.1
Odour & Appearance: Brown/black liquid, hydrocarbon odour
(N.Av. = not available N.App. = not applicable)

SECTION 4 – FIRE AND EXPLOSION

Flammability: Yes **Conditions:** Material will ignite at normal temperatures.
Means of Extinction: Foam, CO2, dry chemical. Explosive accumulations can build up in areas of poor ventilation.
Special Procedures: Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not ignited. Cut off fuel and allow flame to burn out.
Flash Point (deg.C) & Method: <-35 (PMCC)
Upper Explosive Limit (% by vol.): 8 (estimated) **Sensitivity to Impact:** No
Lower Explosive Limit (% by vol.): 0.8 (estimated) **Sensitivity to Static Discharge:** Yes, at normal temperatures
Auto-Ignition Temp. (deg.C): 250 (estimated) **TDG Flammability Classification:** 3
Hazardous Combustion Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 5 – REACTIVITY DATA

Chemical Stability: Stable **Conditions:** Heat
Incompatibility: Yes **Substances:** Oxidizing agents (e.g. chlorine)
Reactivity: Yes **Conditions:** Heat, strong sunlight
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 6 – TOXICOLOGICAL PROPERTIES OF PRODUCT

Routes of Entry:
Skin Absorption: Yes **Skin Contact**: Yes **Eye Contact**: Yes
Inhalation: **Acute**: Yes **Chronic**: Yes **Ingestion**: Yes
Effects of Acute Exposure: Vapour may cause irritation of eyes, nose and throat, dizziness and drowsiness. Contact with skin may cause irritation and possibly dermatitis. Contact of liquid with eyes may cause severe irritation/burns.
Effects of Chronic Exposure: Due to presence of benzene, long term exposure may increase the risk of anemia and leukemia. Repeated skin contact may increase the risk of skin cancer.
Sensitization to Product: No.
Exposure Limits of Product: 0.5 ppm (Alberta 8 hr OEL for benzene)
Irritancy: Yes
Synergistic Materials: None reported
Carcinogenicity: Yes **Reproductive Effects**: Possibly **Teratogenicity**: Possibly **Mutagenicity**: Possibly

SECTION 7 – PREVENTIVE MEASURES

Personal Protective Equipment: Use positive pressure self-contained breathing apparatus, supplied air breathing apparatus or cartridge air purifying respirator approved for organic vapours where concentrations may exceed exposure limits (note: cartridge respirator not suitable for hydrogen sulfide, oxygen deficiency or IDLH situations) – see also Storage below).
Gloves: Viton (nitrile adequate for short exposure to liquid)
Eye: Chemical splash goggles. **Footwear**: As per safety policy **Clothing**: As per fire protection policy
Engineering Controls: Use only in well ventilated areas. Mechanical ventilation required in confined areas. Equipment must be explosion proof.
Leaks & Spills: Stop leak if safe to do so. Use personal protective equipment. Use water spray to cool containers. Remove all ignition sources. Provide explosion-proof clearing ventilation, if possible. Prevent from entering confined spaces. Dyke and pump into containers for recycling or disposal. Notify appropriate regulatory authorities.
Waste Disposal: Contact appropriate regulatory authorities for disposal requirements.
Handling Procedures & Equipment: Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers. Avoid sparking conditions.
Storage Requirements: Store in a cool, dry, well ventilated area away from heat, strong sunlight, and ignition sources.
Special Shipping Provisions: N.App.

Caution: hydrogen sulphide may accumulate in headspaces of tanks and other equipment, even when concentrations in the liquid product are low. Overexposure to hydrogen sulphide may cause dizziness, headache, nausea and possibly knock-down and death. Factors increasing this risk include heating, agitation and contact of the liquid with acids or acid salts. Assess the exposure risk by gas monitoring. Wear air supplying breathing apparatus if necessary.

SECTION 8 – FIRST AID MEASURES

Skin: Flush skin with water, removing contaminated clothing. Get medical attention if irritation persists or large area of contact. Decontaminate clothing before re-use.

Eye: Immediately flush with large amounts of luke warm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.

Inhalation: Ensure own safety. Remove victim to fresh air. Give oxygen, artificial respiration, or CPR if needed. Seek medical attention immediately.

Ingestion: Give 2-3 glasses of milk or water to drink. DO NOT INDUCE VOMITING. Keep warm and at rest. Get immediate medical attention.

SECTION 9 – PREPARATION DATE OF MSDS

Prepared By: Cenovus Energy Inc. Health and Safety
Phone Number: 1-877-458-8080
Preparation Date: March 29, 2011 Expiry Date: March 29, 2014

SECTION 1 – MATERIAL IDENTIFICATION AND USE

Material Name: HEAVY CRUDE OIL/DILUENT MIX (CHRISTINA LAKE/FOSTER CREEK)
Use: Process stream, fuels and lubricants production
WHMIS Classification: Class B, Div. 2, Class D, Div. 2, Sub-Div. A and B
NFPA: Fire: 2 **Reactivity:** 0 **Health:** 3
TDG: **UN:** 1267 **Class:** 3
Packing Group: I (boiling point less than 35 deg. C)
II (boiling point 35 deg. C or above, and flash point less than 23 deg. C)
Manufacturer/Supplier: ENCANA CORPORATION
#1800, 855 - 2nd Street S.W., P.O. BOX 2850,
CALGARY, ALBERTA, T2P 2S5
Emergency Telephone: 403-645-3333
Chemical Family: Crude oil/condensate mix

SECTION 2 – HAZARDOUS INGREDIENTS OF MATERIAL

Hazardous Ingredients	Approximate Concentrations (%)	C.A.S. Nos.	LD50/LC50 Specify Species & Route	Exposure Limits
Crude oil	50 - 70	8002-05-9	LD50,rat, skin,>2 g/kg	5 mg/m3 (OEL,TLV)
Hydrocarbon Diluent	30 - 50	N.Av.	N.Av.	900 mg/m3 (OEL)*
Benzene	0.05 - 0.1	71-43-2	LD50,rat,oral,930 mg/kg LC50,rat,4 hr,13200 ppm	1 ppm (OEL), 0.5 ppm (TLV)
Hydrogen Sulphide	<20 ppm	7783-06-04	LC50, rat, 4 hrs, 444 ppm	10 ppm (OEL,TLV)

OEL = 8 hr. Alberta Occupational Exposure Limit; TLV = Threshold Limit Value (8 hrs) *OEL for gasoline

SECTION 3 – PHYSICAL DATA FOR MATERIAL

Physical State: Liquid
Specific Gravity: 0.92 – 0.94
Vapour Density (air=1): 2.5 -5.0
Percent Volatiles, by volume: 20 - 30 (estimated)
pH: N.Av.
Vapour Pressure (mmHg): approx. 300 @ 20C
Odour Threshold (ppm): N.Av.
Evaporation Rate: N.Av.
Boiling Pt. (deg.C): initial B.Pt. variable (16 – 30C)
Freezing Pt. (deg.C): <0
Coefficient of Water/Oil Distribution: <0.1
Odour & Appearance: Brown/black liquid, hydrocarbon odour
(N.Av. = not available N.App. = not applicable)

SECTION 4 – FIRE AND EXPLOSION

Flammability: Yes **Conditions:** Material will ignite at normal temperatures.
Means of Extinction: Foam, CO2, dry chemical. Explosive accumulations can build up in areas of poor ventilation.
Special Procedures: Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not ignited. Cut off fuel and allow flame to burn out.
Flash Point (deg.C) & Method: <-35 (PMCC)
Upper Explosive Limit (% by vol.): 8 (estimated) **Sensitivity to Impact:** No
Lower Explosive Limit (% by vol.): 0.8 (estimated) **Sensitivity to Static Discharge:** Yes, at elevated temperatures
Auto-Ignition Temp. (deg.C): 250 (estimated) **TDG Flammability Classification:** N.App.
Hazardous Combustion Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 5 – REACTIVITY DATA

Chemical Stability: Stable **Conditions:** Heat
Incompatibility: Yes **Substances:** Oxidizing agents (e.g. chlorine)
Reactivity: Yes **Conditions:** Heat, strong sunlight
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 6 – TOXICOLOGICAL PROPERTIES OF PRODUCT

Routes of Entry:
Skin Absorption: Yes **Skin Contact**: Yes **Eye Contact**: Yes
Inhalation: **Acute**: Yes **Chronic**: Yes **Ingestion**: Yes
Effects of Acute Exposure: Vapour may cause irritation of eyes, nose and throat, dizziness and drowsiness. Contact with skin may cause irritation and possibly dermatitis. Contact of liquid with eyes may cause severe irritation/burns.
Effects of Chronic Exposure: Due to presence of benzene, long term exposure may increase the risk of anaemia and leukemia. Repeated skin contact may increase the risk of skin cancer.
Sensitization to Product: No.
Exposure Limits of Product: 1 ppm (Alberta 8 hr OEL for benzene)
Irritancy: Yes
Synergistic Materials: None reported
Carcinogenicity: Yes **Reproductive Effects**: Possibly **Teratogenicity**: Possibly **Mutagenicity**: Possibly

SECTION 7 – PREVENTIVE MEASURES

Personal Protective Equipment: Use positive pressure self-contained breathing apparatus, supplied air breathing apparatus or cartridge air purifying respirator approved for organic vapours where concentrations may exceed exposure limits (note: cartridge respirator not suitable for oxygen deficiency or IDLH situations).
Gloves: Viton (nitrile adequate for short exposure to liquid)
Eye: Chemical splash goggles. **Footwear**: As per safety policy **Clothing**: As per fire protection policy
Engineering Controls: Use only in well ventilated areas. Mechanical ventilation required in confined areas. Equipment must be explosion proof.
Leaks & Spills: Stop leak if safe to do so. Use personal protective equipment. Use water spray to cool containers. Remove all ignition sources. Provide explosion-proof clearing ventilation, if possible. Prevent from entering confined spaces. Dyke and pump into containers for recycling or disposal. Notify appropriate regulatory authorities.
Waste Disposal: Contact appropriate regulatory authorities for disposal requirements.
Handling Procedures & Equipment: Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers. Avoid sparking conditions.
Storage Requirements: Store in a cool, dry, well ventilated area away from heat, strong sunlight, and ignition sources.
Special Shipping Provisions: N.App.

SECTION 8 – FIRST AID MEASURES

Skin: Flush skin with water, removing contaminated clothing. Get medical attention if irritation persists or large area of contact. Decontaminate clothing before re-use.

Eye: Immediately flush with large amounts of luke warm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.

Inhalation: Ensure own safety. Remove victim to fresh air. Give oxygen, artificial respiration, or CPR if needed. Seek medical attention immediately.

Ingestion: Give 2-3 glasses of milk or water to drink. DO NOT INDUCE VOMITING. Keep warm and at rest. Get immediate medical attention.

SECTION 9 – PREPARATION DATE OF MSDS

Prepared By: EnCana Environment, Health and Safety (EHS)
Phone Number: (403) 645-2000 Preparation Date: August 19, 2009 Expiry Date: August 19, 2012

MATERIAL SAFETY DATA SHEET

Canadian Natural

Manufacturer/Supplier: Canadian Natural Resources Ltd.
2500, 855 2nd Street S.W.
Calgary, Alberta, Canada
T2P 4J8

24 Hour Emergency Telephone Number:
1-780-828-3000

1. PRODUCT IDENTIFICATION

HORIZON SWEET LIGHT OIL

SYNONYMS: 1. Synthetic Crude Oil 2. Sweet Light Oil 3. Horizon Sweet Oil 4. Horizon Light Oil

WHIMIS	
Class B: Division 2 Flammable Liquid	Class D Division 2: Material Causing Other Toxic Effects
	

TDG	
FLAMMABLE LIQUID: 3 	SHIPPING NAME: Synthetic Crude Oil UN NUMBER: UN1267 Class 3, PG II or III

DESCRIPTION: Complex mixture of hydrocarbons derived from Upgrading processing of Extra Heavy Crude Oil.

PRODUCT USE: Refinery feedstock.

2. HAZARDOUS INGREDIENTS

The following components are defined in accordance with sub-paragraph 13(a)(I) to (iv) or paragraph 14(a) of the Hazardous Product Act:

NAME	%	CAS#
Hydrocarbons(aromatic and paraffinic)	100	8002-05-9
Benzene	0.05 (LV%)	71-43-2

LD50: not available
LC50: not available
All components of this material are either on the Domestic Substances List (DSL) or exempt.

3. TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:	Liquid
ODOUR AND APPEARANCE:	Aromatic or petroleum odour. Usually light brown or light green liquid
ODOUR THRESHOLD:	Not available
SPECIFIC GRAVITY:	0.838 (water = 1)
VAPOUR PRESSURE (RVP):	35 kPa(ab) @ 37.8 °C
VAPOUR DENSITY:	Not available
EVAPORATION RATE:	Variable
BOILING POINT/RANGE:	-18 °C to 538 °C
FREEZING / MELTING POINT:	Not available
pH IN WATER	Not available
SOLUBILITY IN WATER:	0%
MOLECULAR FORMULA:	Not applicable - mixture
MOLECULAR WEIGHT:	Not applicable - mixture

4. HEALTH HAZARD INFORMATION

RELEVANT ROUTES OF ENTRY:
Inhalation, skin contact, eye contact, ingestion

ACUTE AND CHRONIC EFFECTS OF EXPOSURE:
INHALATION:
Inhalation of vapours can lead to irritation upper respiratory system and depression of the central nervous system.

EYE CONTACT:
Contact with vapours and/or mists can lead to irritation.

SKIN CONTACT:
Can cause defatting of the skin as well as skin irritation.

INGESTION:
Ingestion may lead to irritation of mucous membranes as well as nausea and vomiting.

IRRITANCY OF PRODUCT:
See acute and chronic effects of exposure; inhalation, eye contact, ingestion and skin contact.

SENZITATION OF PRODUCT: Not available

CARCINOGENICITY: Benzene: IARC Group 1: Carcinogenic to humans

REPRODUCTIVE TOXICITY: Not available

TERATOGENICITY: Not available

MUTAGENICITY: Not available

NAME OF TOXICOLOGICALLY SYNERGISTIC PRODUCTS: Not available

OCCUPATIONAL EXPOSURE LIMITS (OELs) RECOMMENDED:

Alberta (Stoddard Solvent)	100 ppm

THRESHOLD LIMIT VALUES:

ACGIH (Stoddard Solvent)	100 ppm

Manufacturer/Supplier: Canadian Natural Resources Ltd.
2500, 855 2nd Street S.W.
Calgary, Alberta, Canada
T2P 4J8

24 Hour Emergency Telephone Number:
1-780-828-3000

5. FIRST AID MEASURES

INHALATION:
If inhalation causes adverse effects remove victim to fresh air and seek medical attention immediately.

EYE CONTACT:
Flush immediately with water for at least 15 min. Seek medical attention immediately.

SKIN CONTACT:
Flush with water and soap. Remove contaminated clothing and shoes. Seek medical attention if necessary.

INGESTION:
Do not induce vomiting, seek medical attention immediately.

6. PREVENTATIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

SKIN PROTECTION: Wear long sleeves, chemical resistant gloves, chemical safety goggles and CSA approved work boots.

RESPIRATORY PROTECTION: If OEL are likely to be exceeded wear NIOSH approved respiratory protection.

EYE PROTECTION: Wear CSA or ANSI approved eye protection where required.

ENGINEERING CONTROL:
Ensure adequate ventilation.

HANDLING, STORAGE:
Always use personal protective equipment as specified above. Avoid sources of ignition where LEL limits have been reached. Store only in approved containers.

LAND SPILL:
Ensure clean up and disposal in compliance with government requirements and ensure conformity to local disposal regulations. Follow proper notification requirements.

WATER SPILL:
Ensure clean up and disposal in compliance with government requirements and ensure conformity to local disposal regulations. Follow proper notification requirements.

WASTE DISPOSAL:
Dispose of as per local and federal regulations.

7. FIRE AND EXPLOSION HAZARD

CONDITIONS OF FLAMMABILITY	Temperature above flash point, open flame or sources of ignition
MEANS OF EXTINCTION	Foam, water and/or dry chemical
FLASH-POINT (Test Method):	Below -18 °C (Tag Closed Cup)
FLAMMABLE LIMITS (% Volume):	Not available
AUTO-IGNITION:	245 °C
HAZARDOUS COMBUSTION PRODUCTS	Carbon monoxide and dioxide, oxides of sulphur and acrid fumes
SENSITIVITY TO MECHANICAL IMPACT	Stable (do not expose to sparks - highly flammable)
SENSITIVITY TO STATIC DISCHARGE	Low. Highly flammable

8. REACTIVITY DATA

CONDITIONS UNDER WHICH PRODUCT IS CHEMICALLY UNSTABLE:
Chemical is stable under normal conditions. Hazardous polymerization is not known to occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:
Strong oxidizing agents, heat

CONDITIONS OF REACTIVITY:
Heat, sparks, flames, sources of ignition

9. PREPARATION

Prepared by:	CNRL Horizon Industrial Hygiene
Phone:	780-828-2555
Preparation Date:	June 2011
Expiration Date:	May 2014

CAUTION

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SUNCOR ENERGY | ÉNERGIE

SUNCOR MKH

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	* 2 (chronic health hazard)
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	Splash Goggles, Gloves, Apron, Dust and Vapor Respirator

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR MKH

Product type : Suncor Product
MSDS Number : OS0000000003
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
BITUMEN	128683-24-9	50 - 80 %
Naphtha (oil sand), hydrotreated	128683-33-0	4 - 15 %
FUEL, DIESEL NO.2	68476-34-6	4 - 15 %
SULPHUR	7704-34-9	<= 3.5 %
BENZENE	71-43-2	0.04 - 0.12 %
Xylene, All Isomers	1330-20-7	0.40 - 0.80 %
BUTANE	106-97-8	0 - 1.2 %
HYDROGEN SULPHIDE	7783-06-4	0 - 40 PPM
sec-Butyl Mercaptan	513-53-1	50 - 300 PPM
1-Propanethiol	107-03-9	30 - 120 PPM

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ETHANETHIOL	75-08-1	30 - 120 PPM
Isopropyl Mercaptan	75-33-2	20 - 80 PPM
Butyl Mercaptan	109-79-5	15 - 60 PPM
METHANETHIOL	74-93-1	5 - 30 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Highly flammable.Product may contain Hydrogen Sulfide.

Potential Health Effects

Eyes : May cause eye irritation.
Liquid may cause severe irritation, reddening and swelling.

Skin : Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
May cause irritation, drying and blistering.
Component of product may cause skin sensitization.

Inhalation : Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.
May cause respiratory tract irritation.
Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath.
In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis.
Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.

Ingestion : May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness.
Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.

Chronic Exposure : Chronic exposure causes drying effect on the skin and eczema.
May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory.

Primary Routes of Entry : Inhalation
Eye contact
Skin Absorption
Skin contact
Ingestion

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Target Organs	:	Respiratory system Central nervous system
Carcinogenic Effects	:	Contains benzene, a confirmed human carcinogen. IARC Group 1 - Known Human Carcinogen ACGIH A1 - Confirmed Human Carcinogen
Reproductive toxicity	:	Components in the product have demonstrated reproductive effects, teratogenicity and embryo toxicity in animal tests.

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Seek medical advice. Thoroughly clean shoes before reuse. Wash contaminated clothing before reuse.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	Estimated8 - 175 °C (46 - 347 °F)
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product. Increased risk of flammable or explosive concentrations if hydrogen sulfide builds up in unventilated spaces.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.

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Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, Polycyclic Aromatic Hydrocarbons

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials. Storage tank should be vented to atmosphere. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. A containment dike should be built around tank. Small quantities should be stored in an approved safety solvent container.

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Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn. Wear face-shield if splashing hazard is likely.
Hand protection	:	Wear suitable gloves. The following materials are acceptable: Nitrile rubber Neoprene
Skin and body protection	:	Wear long sleeve clothing or coveralls. Wear as appropriate: A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor cartridges is acceptable to 50 times the exposure limit. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

BITUMEN	128683-24-9		TWA	5 mg/m3
		Expressed as		Bitumen fume
		Remarks		OEL Established in agreement with Alberta Occupational Health and Safety, and Suncor Energy Inc., Oil Sands
FUEL, DIESEL NO.2	68476-34-6	CAD ON OEL	TWA	100 mg/m3
		Expressed as		as total hydrocarbons
		Form of exposure		Vapor and aerosol.
		ACGIH	TWA	100 mg/m3
		Expressed as		as total hydrocarbons
		Form of exposure		Vapor and aerosol.
SULPHUR	7704-34-9	CAD AB OEL	TWA	10 mg/m3

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BENZENE	71-43-2	CAD AB OEL	TWA	1 ppm	3.2 mg/m3
		CAD AB OEL	STEL	5 ppm	16 mg/m3
		CAD ON OEL	TWA	0.5 ppm	
		CAD ON OEL	STEL	2.5 ppm	
		ACGIH	TWA	0.5 ppm	
		ACGIH	STEL	2.5 ppm	
		NIOSH	REL	0.1 ppm	
		NIOSH	STEL	1 ppm	
		OSHA Z2	TWA	10 ppm	
		OSHA Z2	Ceiling	25 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OSHA	TWA	1 ppm	
		OSHA	STEL	5 ppm	
		OSHA	OSHA_ACT	0.5 ppm	
		OEL (QUE)	TWA	1 ppm	3 mg/m3
		OEL (QUE)	STEL	5 ppm	15.5 mg/m3
Xylene, All Isomers	1330-20-7	CAD AB OEL	TWA	100 ppm	434 mg/m3
		CAD AB OEL	STEL	150 ppm	651 mg/m3
		CAD ON OEL	TWA	100 ppm	435 mg/m3
		CAD ON OEL	STEL	150 ppm	650 mg/m3
		ACGIH	TWA	100 ppm	
		ACGIH	STEL	150 ppm	
		OSHA Z1	PEL	100 ppm	435 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
BUTANE	106-97-8	CAD AB OEL	TWA	800 ppm	1,900 mg/m3
		NIOSH	REL	800 ppm	1,900 mg/m3
		ACGIH	TWA	1,000 ppm	
		CAD ON OEL	TWA	800 ppm	1,900 mg/m3
		CAD ON OEL	TWA	1,000 ppm	
HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	
		CAD ON OEL	STEL	15 ppm	
		ACGIH	TWA	1 ppm	
		ACGIH	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OEL (QUE)	TWA	10 ppm	14 mg/m3
		OEL (QUE)	STEL	15 ppm	21 mg/m3
		CAD BC OEL	CEILING	10 ppm	
		CAD SK OEL	8 HR ACL	10 ppm	
		CAD SK OEL	15 MIN ACL	15 ppm	
1-Propanethiol	107-03-9	NIOSH	Ceil_Time	0.5 ppm	1.6 mg/m3
ETHANETHIOL	75-08-1	CAD AB OEL	TWA	0.5 ppm	1.3 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.3 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.3 mg/m3
		OSHA Z1	Ceiling	10 ppm	25 mg/m3
METHANETHIOL	74-93-1	CAD AB OEL	TWA	0.5 ppm	0.98 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1 mg/m3
		ACGIH	TWA	0.5 ppm	

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NIOSH	Ceil_Time	0.5 ppm	1 mg/m3
OSHA Z1	Ceiling	10 ppm	20 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.
Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	black
Odour	:	hydrocarbon-like
Physical state	:	liquid
Vapour pressure	:	Estimated 11.8 kPa Method: ASTM D 323A
Density	:	Estimated 0.92 - 0.94 g/cm3
Specific gravity	:	Estimated 0.92 - 0.94
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	POW: Estimated< 1
Viscosity, kinematic	:	Estimated 63.5 mm2/s at 40 °C (104 °F) Estimated 268.5 mm2/s at 15.5 °C (59.9 °F) Method: ASTM D 445

SECTION 10. STABILITY AND REACTIVITY.

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Incompatible with oxidizing agents.
Hazardous decomposition products	:	Carbon monoxide carbon dioxide polycyclic aromatic hydrocarbons hydrogen sulfide sulfur dioxide
Hazardous reactions	:	Hazardous polymerisation does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

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Acute oral toxicity	:	LD50 Rat Dose: 930 mg/kg Test substance: Benzene
Acute dermal toxicity	:	LD50 Rabbit Dose: > 8,240 mg/kg Test substance: Benzene
Acute inhalation toxicity	:	LC50 Rat Exposure time: 4 h Dose: 13700 ppm Test substance: Benzene LC50 Rat Exposure time: 4 h Dose: 444 ppm Test substance: Hydrogen sulphide
Further information	:	Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells and DNA damage in mammalian cells in vitro.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

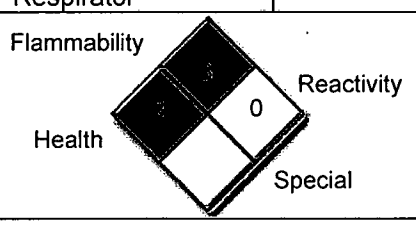
DOT	Proper shipping name	: **Flammable liquid, n.o.s.**
	UN-Number	: 1993
	Class	: 3
	Packing group	: II
TDG	Proper shipping name	: Flammable liquid, n.o.s.
	UN-Number	: 1993
	Class	: 3
	Packing group	: II
IATA	UN Number	: 1993
	Description of the goods	: Flammable liquid, n.o.s.
	Class	: 3
	Packaging group	: II
	ADR/RID-Labels	: 3

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	Packing instruction (cargo aircraft)	:	307
	Packing instruction (passenger aircraft)	:	305
	Packing instruction (passenger aircraft)	:	Y305
IMDG	Substance No.	:	UN 1993
	Description of the goods	:	Flammable liquid, n.o.s.
	Class	:	3
	Packaging group	:	II
	ADR/RID-Labels	:	3
	EmS Number	:	F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	* 2 (chronic health hazard)
Flammability	3
Physical Hazard	0
Personal Protective Equipment	Splash Goggles, Gloves, Apron, Dust and Vapor Respirator
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)



DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 10/17/2012

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SUNCOR ENERGY | ÉNERGIE TM/MC

References : This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Validation date of previous version : 12/07/2009

General contact information : B. Burrell: (519) 383-3657

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PETRO-CANADA

Material Safety Data Sheet

NFPA	HMIS (U.S.A.)	Rating	Protective Clothing	DOT (pictograms)
Health 2, Fire Hazard 2, Reactivity 0, Specific hazard	Health Hazard 2* Fire Hazard 3 Reactivity 0 Personal Protection H	0 Insignificant 1 Slight 2 Moderate 3 High 4 Extreme		

Section I. Chemical Product and Company Identification

Product Name	**MACKAY RIVER BLEND**	**Code**	90000125
		DSL	See Section 15
Synonym	MacKay River Bitumen/Synthetic Crude Oil Blend, Synbit Blend	**TSCA**	See Section 15
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Used as refinery feedstock.		

Section II. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Synthetic crude oil *	64742-59-2	45 - 55	Not available	Not available	Not available
2) Bitumen	8052-42-4	45 - 55	0.5 mg/m³	Not available	Not available
3) Sulphur	7704-34-9	2.7	Not available	Not available	Not available
4) * A complex combination of hydrocarbons extracted from oil sands. Contains small amounts of benzene, polynuclear aromatic hydrocarbons (PNAs), sulphur compounds and oxygenated compounds.					

Manufacturer Recommendation	If an aerosol or mist, Petro-Canada recommends an allowable exposure for 8 hours time weighted average (TWA) of 0.2 mg/m³ for Particulate polycyclic aromatic hydrocarbons (PPAH) (Coal tar pitch volatiles, as benzene soluble aerosol).
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section III. Hazards Identification.

Potential Health Effects	Can irritate eyes, skin and respiratory tract. Inhalation of vapours or mist may cause headache, coughing, nausea, vomiting, dizziness, fatigue, light-headedness, reduced coordination and unconciousness; central nervous system depressant; kidney and liver damage from long-term exposure. May be narcotic in high concentrations. Harmful if swallowed. This product contains a cancer causing agent. For more information, refer to Section 11.

Section IV. First Aid Measures

Eye Contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.
Skin Contact	Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.
Inhalation	Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.
Note to Physician	Not available

Section V. Fire-fighting Measures

Flammability	Flammable.	**Flammable Limits**	Not available
Flash Points	CLOSED CUP: <0°C (32°F).	**Auto-Ignition Temperature**	Not available

Continued on Next Page

Available in French

Fire Hazards in Presence of Various Substances	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back. Hydrogen sulphide may be released if product is overheated.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire. Vapours may form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. Liquid may accumulate static charge.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 128, flammable/combustible liquid (non-polar/water-immiscible). CAUTION: This product has a low flash point, use of water spray when fighting fire may be inefficient. SMALL FIRE: Use DRY chemicals, CO2, water spray or foam. LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. DO NOT extinguish a leaking gas flame unless leak can be stopped. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. Avoid flushing spilled material into sewers, streams or other bodies of water. Self-contained breathing apparatus (SCBA) will be required if approaching the fire from downwind, or to enter enclosed areas or buildings.		

Section VI. Accidental Release Measures

Material Release or Spill	NAERG96, GUIDE 128, flammable/combustible liquid (non-polar/water-immiscible). Evacuate in a downwind direction for at least 300 meters (1000 feet). ELIMINATE ALL IGNITION SOURCES. Ventilate closed spaces before entering. By forced ventilation, maintain concentration of vapour below the range of explosive mixture. Avoid contact, fully-encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire. Stop leak if without risk. Remove the leaking container to an open area and allow it to bleeds off into the atmosphere. Use vapour suppressing foam or water spray to reduce vapours; it may reduce vapour, but it may not prevent ignition in closed spaces; isolate area until vapour has dispersed. Contain spill. Absorb with inert absorbents such as dry clay, or diatomaceous earth, or recover using electrically grounded explosion-proof pumps. Avoid inhaling dust of diatomaceous earth for it may contain silica in very fine particle size, making this a potential respiratory hazard. Place used absorbent in closed metal containers for later disposal or burn absorbent in a suitable combustion chamber. DO NOT FLUSH TO SEWERS, STREAMS OR OTHER BODIES OF WATER. Check with applicable jurisdiction for specific disposal requirements of spilled material and empty containers. Notify the appropriate authorities immediately.

Section VII. Handling and Storage

Handling	Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk. DO NOT reuse empty containers without commercial cleaning or reconditioning. Ground/bond line and equipment during pumping or transfer to avoid accumulation of static charge. DO NOT ingest. Do not breathe vapours. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately. Avoid contact with skin and eyes. Practice good personal hygiene. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods.
Storage	Keep containers closed and store in a cool, well-ventilated place away from heat, spark, open flames and other sources of ignition. Store away from incompatible materials.

Section VIII. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - *The selection of personal protective equipment varies, depending upon conditions of use.*	
Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section IX. Physical and Chemical Properties

Physical State and Appearance	Viscous liquid.	**Viscosity**	90 cSt @ 40°C (104°F)
Colour	Black.	**Pour Point**	<-27°C (-16.6°F).
Odour	Pungent.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	Initial boiling point: 25°C (77°F)	**Penetration**	Not applicable.
Density	940 kg/m³ @ 15°C (59°F).	**Oil / Water Dist. Coeff.**	Not measurable. The product is more soluble in oil.
Vapour Density	Heavier than air.	**Ionicity (in water)**	Insoluble in water.
Vapour Pressure	Not available	**Dispersion Properties**	Nonvolatile and immobile.
Volatility	Not available	**Solubility**	Insoluble in water.

Section X. Stability and Reactivity

Corrosivity	Not available		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Can react with oxidizing agents and halogens.	**Decomposition Products**	Releases of COx, NOx, SOx, H2S, smoke and irritating vapours when heated to decomposition.

Section XI. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation and ingestion.
Acute Lethality	Synthetic crude oil: Acute oral toxicity (LD50): >5000 mg/kg (rat). Acute dermal toxicity (LD50): >3000 mg/kg (rabbit). Benzene: Acute oral toxicity (LD50): 4700 mg/kg (mouse). Acute dermal toxicity (LD50): 48 mg/kg (mouse). Acute inhalation toxicity (LC50): 13200 ppm/4h (rat).
Chronic or Other Toxic Effects	
Dermal Route:	Can cause irritation to the skin, no permanent damage.
Inhalation Route:	Inhalation can cause irritation of the upper respiratory tract. Inhalation of vapours can cause CNS depression with symptoms of nausea, headaches, vomiting, dizziness, fatigue, light-headedness, reduced coordination, unconciousness and possibly death.
Oral Route:	Aspiration into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure. Can cause CNS depression. (See Inhalation Route for symptoms).
Eye Irritation/Inflammation:	Can cause irritation to the eyes, no permanent damage.
Immunotoxicity:	Not available
Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	Positive results have been obtained for mutagenic effects. (Benzene)
Reproductive Toxicity:	This product is not expected to be a reproductive hazard, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	Fetotoxicity was observed in the presence of maternal toxicity. (Benzene)
Carcinogenicity (ACGIH):	ACGIH A1: confirmed human carcinogen. (Benzene, PNA's)
Carcinogenicity (IARC):	IARC Group 1: carcinogenic to Humans. (Benzene) IARC Group 2A: probably carcinogenic to Humans. (PNA's)
Carcinogenicity (NTP):	NTP Group 1: known to be a carcinogen. (Benzene) NTP Group 2B: sufficient evidence of carcinogenicity from studies in experimental animals. (PNA's)
Carcinogenicity (IRIS):	EPA/IRIS Class A: human carcinogen. (Benzene)
Carcinogenicity (OSHA):	OSHA Group X: carcinogen defined with no further categorization. (Benzene) PNA's are an OSHA suspected carcinogen.
Other Considerations	Synthetic crude oil is carcinogenic by RTEC criteria.

Continued on Next Page

Section XII. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section XIII. Disposal Considerations

Waste Disposal	Preferred waste management priorities are: (1) recycle or reprocess; (2) incineration with energy recovery; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations. Consult your local or regional authorities.

Section XIV. Transport Information

DOT Classification	PETROLEUM CRUDE OIL, 3, UN 1267, PG I	**Special Provisions for Transport**	See 49 CFR

Section XV. Regulatory Information

Other Regulations	CEPA: This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List). EPA: All components of this formulation are listed on the US EPA-TSCA Inventory. This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR. Please contact Product Safety for more information.		
DSD/DPD (EEC)	Not evaluated.	**WHMIS (Canada)**	B-2, D-2A, D-2B
ADR (Europe) (Pictograms)	NOT EVALUATED FOR EUROPEAN TRANSPORT NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.	**TDG (Canada) (Pictograms)**	

Section XVI. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS
Internet: www.petro-canada.ca

WCDO:
Western Canada, telephone: 403-296-7672; fax: 403-296-5147

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - TAR on 8/20/2002.

Data entry by Product Safety - TAR.

Continued on Next Page

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

GIBSON ENERGY LTD.
MATERIAL SAFETY DATA SHEET
PETROLEUM CRUDE OIL (SOUR)

1. PRODUCT INFORMATION

NAME: PETROLEUM CRUDE OUL (SOUR)

SYNONYMS: Crude, Petroleum Hydrocarbon

APPLICATIONS AND USE: Refinery feed stock

PRODUCT DESCRIPTION: A naturally occurring mixture of paraffins, naphthenes, aromatic hydrocarbons and small amounts of sulphur and nitrogen compounds. The composition and properties will vary significantly according to source of crude. Crude oil with a sulphur content greater than 0.5 weight percent is considered sour.

REGULATORY CLASSIFICATION:

WHMIS: Class B, Division 2, Flammable Liquid
Class D, Division 1, Subdivision A: Very Toxic Material
Class D, Division 2, Subdivision B: Toxic Material

TRANSPORTATION OF DANGEROUS GOODS INFORMATION: (CANADA)

Shipping Name:	Petroleum Crude Oil
Primary TDG:	3
Secondary TDG:	3
P.I.N.:	UN1267
Packing Group:	II
Guide Number:	128

EMERGENCY TELEPHONE NUMBERS:

Name of MFG/SUPPLIER:

Gibson Energy Ltd.
1700, 440 – 2nd Ave. SW
Calgary, Alberta T2P 5E9

24 Hour Exchange: (780) 888-8222
Health: (403) 206-4188

2. HAZARDOUS INGREDIENTS

The following components are defined in accordance with subparagraph 13(a), (I) to (iv) or paragraph 14(a) of the Hazardous Product Act.

Component	*%*	*CAS #*
Hydrocarbons (aromatic and paraffinic hydrocarbons)	100	8002-05-9
Toluene	100 ppm	108-88-3
Benzene	10 ppm	71-43-2
Xylene	100 ppm	1330-20-7
Hydrogen Sulphide(H_2S)	10 ppm	7783-06-4

3. TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:	Liquid @ 25° C
RELATIVE DENSITY:	0.8 - 1.1
DENSITY:	0.8 - 1.0 g/cc
EVAPORATION RATE:	Variable
BOILING POINT/RANGE:	10° C - 1100° C
SOLUBILITY IN WATER:	0%
VAPOUR PRESSURE:	10 - 80 kPa(a) @ 20° C
APPEARANCE/ODOUR:	Aromatic or sulphide (rotten egg) odour. Usually black or green liquid.
ODOUR THRESHOLD:	Not available
EVAPORATION RATE:	Variable:
FREEZING/MELTING PT.:	Not available
VISCOSITY:	Not applicable
pH:	Not available
VOLATILE BY VOL.:	100%
CO-EFFICIENT OF WATER/ OIL DISTRIBUTION:	Not Available
PERCENT VOLATILE:	100%
MOLECULAR FORMULA:	Not Applicable - mixture
MOLECULAR WEIGHT:	Not Applicable - mixture

4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION: May cause headache, dizziness, loss of appetite, weakness, loss of coordination, and unconsciousness. Crude oil vapours are irritating to the upper respiratory tract.

EYE CONTACT: Crude oil vapours are moderately irritating to the eyes.

SKIN CONTACT: Prolonged skin contact may result in defatting of the skin resulting in dry cracked skin and dermatitis.

INGESTION: Minimal toxicity. Small amounts of this liquid ingested into the lungs from swallowing or vomiting may cause severe health effects (e.g. bronchopneumonia or pulmonary edema).

CHRONIC EFFECTS: Benzene is a known human carcinogen and may cause damage to the bone marrow/blood making system and may result in leukemia.

TOXICITY DATA: product is not listed as a carcinogen by any agen but individual components have been associated with carcinogenicity, mutagenicity, reproductive and teratogenicity properties in animal experiments.

OCCUPATIONAL EXPOSURE LIMITS:

ACGIH Recommends:

For oil mists, 5 mg/m^3
For Hydrogen sulphide, 10 ppm (24 mg/m^3)
For Benzene, the ACGIH recommends a TLV of 10 ppm (30 mg/m^3) and describe it as a substance of suspect carcinogenic potential in man.

Manufacturer Recommends:

For total hydrocarbons, 100 ppm recommended.

5. FIRST AID MEASURES

INHALATION: Remove individual to fresh air immediately. If breathing stops, administer artificial resuscitation. Keep victim warm and at rest, seek medical attention.

EYE CONTACT: Flush eyes with large amounts of water for at least 15 minutes and seek medical attention.

SKIN CONTACT: Remove contaminated clothing as soon as possible. Wash exposed skin thoroughly with soap and water. If irritation develops, consult a physician.

INGESTION: DO NOT induce vomiting since it is important that no amount of the material should enter the lungs (aspiration). Get prompt medical attention. Never give anything by mouth to an unconscious person.

5. FIRST AID MEASURES (Cont.)

EMERGENCY PROCEDURES: Because hydrogen sulphide inhalation can be fatal, rescuers must wear positive pressure full face piece, self contained or supplied air NIOSH approve respirators before attempting the rescue.

6. PREVENTATIVE AND CORRECTIVE MEASURES

SPECIAL PROTECTION INFORMATION:

Use in a well ventilated area. Adequate ventilation should be provided in the workplace to maintain the hydrocarbon vapours and hydrogen sulphide below the applicable occupational exposure level.

Under normal conditions respiratory protection is not required. Respiratory protection may be required in poorly ventilated areas. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed 10x the occupational exposure limit or when high concentration of H_2S may be present.

Non-vented chemical goggles should be worn to prevent eye injury. Chemical resistant gloves, apron and/or clothing should be worn if direct contact with liquid is likely to occur. Neoprene or nitrile materials have been shown to provided effective protection against crude oil liquid.

SPILL CONTROL AND DISPOSAL:

Evacuate personnel. Eliminate all ignition sources. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution.

WASTE DISPOSAL METHOD:

Contaminated material should be placed in disposable containers and disposed in compliance with federal, provincial and local regulations.

7. FIRE AND EXPLOSION HAZARD

Flash-point (Test Method):	<40 deg C (PMCC)
Auto-ignition:	Not Available
Flammable Limits (% volume):	Not Available

GENERAL HAZARDS:

Static discharge: Highly flammable, vapours are heavier than air and may collect in low-lying areas. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.

FIREFIGHTING:

Fire extinguishing substances: foam, water spray and dry chemical. Water may be ineffective, but water should be used to keep fire-exposed containers cool. If leak or spill has not ignited, use water spray to disperse vapours. Use full protective equipment and self-contained breathing apparatus (SCBA) for fires in enclosed areas.

EXPLOSION/SENSITIVITY DATA:

Stable under normal conditions of temperature and pressure.

8. REACTIVITY DATA:

This material is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Oxidizing material.

HAZARDOUS DECOMPOSITION

May release hydrogen sulphide gas when agitated. See health hazard information. Overheating or incomplete combustion may result in carbon dioxide, carbon monoxide, acrid fumes or decomposition and oxides of sulphur.

Avoid heat, open flame or sources of ignition.

Maintain temperature below the flash-point and keep away from all ignition sources. Head spaces in storage tanks may contain toxic hydrocarbon vapours and hydrogen sulphide gas.

9. NOTES

This product contains benzene. Repeated or prolonged breathing of benzene vapours has been associated with the development of chromosomal damage in experimental animals and various blood disorders in humans ranging from aplastic anemia to leukemia.

This product may also contain polycyclic aromatic hydrocarbons, which have been associated with skin and lung cancers.

ACUTE EFFECTS:

Vary with concentration of hydrogen sulphide release, from mild eye, nose and throat irritation at approximately 100 ppm, to sudden unconsciousness or death at 500 ppm.

INHALATION:

H_2S release may occur in the vapour space of storage tanks. Abnormal behavior or sudden paralysis of breathing and unconsciousness can occur.

10. PREPARATION INFORMATION

Prepared by: GIBSON ENERGY LTD.
1700, 440 – 2nd Avenue SW
CALGARY, AB T2P 5E9

Issued by: HEALTH, SAFETY & ENVIRONMENT DEPT.

Telephone: (403) 206-4000

Date Prepared: August 1, 2008

CAUTION:

The information contained herein is provided free of charge and is offered to the user in good faith as accurate. Certain of the information has been obtained from sources outside of the supplier and while the supplier believes such information to be correct, it cannot guarantee its accuracy or completeness.

The information contained herein relates only to the product or material set forth in Section 1 and may not be applicable or complete if such product or material is used in combination with any other product or material or in any process. The information may not be applicable or complete for all individual deliveries or if the product or material is used for a purpose or under conditions which are abnormal or not reasonably foreseeable. For greater certainty, uses other than those described in Section 1 must be reviewed with the supplier.

It is the user's obligation to consider, investigate and verify the information, to use the product safely and to comply with all applicable laws and regulations.

The supplier makes no warranties, guarantees or conditions express or implied in respect of the information contained herein.

Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Petroleum Crude Oil (Sour)
Synonyms:	Petroleum (CAS No. 8002-05-9)
Product Use:	Chemical feedstock.
Supplier:	Husky Oil Operations Ltd. PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7
Phone Number:	403-298-6111
Emergency Phone:	877-262-2111
Date of Preparation:	December 15, 2010

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
EXTREMELY FLAMMABLE LIQUID AND VAPOR - VAPOR MAY CAUSE FLASH FIRE. MAY BE FATAL IF INHALED. IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE.

Colour:	Black/Brown
Physical State:	Liquid.
Odour:	Petroleum. Rotten eggs.

WHMIS	Personal Protection Equipment	TDG (Ground)
		

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact, skin contact, inhalation, and ingestion.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Above 50 ppm Hydrogen sulphide, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: Very toxic by inhalation. Irritating to respiratory system. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May

cause headache, dizziness, confusion, loss of appetite and loss of consciousness. This product contains hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.

Chronic Effects: See Section 11 for more information.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin, eyes, gastrointestinal tract, and respiratory system. Central nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS No.	Wt. %
Hydrocarbons, C>=5, C5-6-rich	68476-50-6	60 - 100
Benzene, dimethyl-	1330-20-7	10 - 30
Benzene, methyl-	108-88-3	1 - 5
Hydrogen sulfide (H2S)	7783-06-4	1 - 2
Benzene	71-43-2	0.1 - 1

Section 4: FIRST AID MEASURES

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.

Inhalation: Remove person to fresh air. If breathing has stopped apply artificial respiration. Get medical attention immediately.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Means of Extinction

Suitable Extinguishing Media:	Dry chemical, foam, or carbon dioxide.
Unsuitable Extinguishing Media:	Water may not be an effective medium to extinguish fire.
Products of Combustion:	Oxides of carbon. Oxides of nitrogen. Aldehydes. Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.
Protection of Firefighters:	Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces.

Explosion Data

Sensitivity to Mechanical Impact:	This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge:	This material is sensitive to static discharge at temperatures above the flash point.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Don full-face, positive pressure, self-contained breathing apparatus. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Environmental Precautions:	Keep out of drains, sewers, ditches, and waterways.
Methods for Containment:	Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.
Methods for Clean-Up:	Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.
Other Information:	Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

Section 7: HANDLING AND STORAGE

Handling:
Do not breathe vapour/gas. Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking. See Section 8 for information on Personal Protective Equipment.

Storage:
Head spaces in storage containers may contain toxic hydrogen sulphide gas. Limit quantity of material in storage. Restrict access to storage area. Post appropriate warning signs. Keep storage area separate from populated work areas. Consider leak detection and alarm systems, as required. Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Structural materials and lighting and ventilation systems should be corrosion resistant. Keep out of the reach of children.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Ingredient		TWA	STEL	Ceiling	Notes
Petroleum	ACGIH	5 mg/m³ *	10 mg/m³ *	Not available.	* Oil mist, mineral.
Petroleum	OSHA	5 mg/m³ *	Not available.	Not available.	* Oil mist, mineral.
Hydrocarbons, C>=5, C5-6-rich	ACGIH	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Hydrocarbons, C>=5, C5-6-rich	OSHA	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Benzene, dimethyl-	ACGIH	100 ppm	150 ppm	Not available.	Not available.
Benzene, dimethyl-	OSHA	100 ppm (435 mg/m³)	Not available.	Not available.	Not available.
Benzene, methyl-	ACGIH	20 ppm	Not available.	Not available.	Not available.
Benzene, methyl-	OSHA	200 ppm	Not available.	300 ppm	PEAK = 500 ppm (for a 10 minute interval during an 8 hour shift)
Hydrogen sulfide (H2S)	ACGIH	1 ppm	5 ppm	Not available.	Not available.
Hydrogen sulfide (H2S)	OSHA	Not available.	Not available.	20 ppm	50 ppm (10 mins. once only if no other meas. exp. occurs.)
Benzene	ACGIH	0.5 ppm	2.5 ppm	Not available.	Skin.
Benzene	OSHA	1 ppm	5 ppm	Not available.	Not available.
Polycyclic Aromatic Hydrocarbons	ACGIH	0.2 mg/m³ *	Not available.	Not available.	* For benzene-soluble fraction.
Polycyclic Aromatic Hydrocarbons	OSHA	0.2 mg/m³ *	Not available.	Not available.	* For benzene-soluble fraction.

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.

Personal Protective Equipment

Eye/Face Protection: Wear chemical goggles.

Hand Protection: Wear impervious gloves. Neoprene or nitrile gloves are recommended. Consult manufacturer specifications for further information.

Skin and Body Protection: Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.

Respiratory Protection: If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators. Where hydrogen sulfide is present or possibly present in confined spaces at hazardous levels a NIOSH-approved supplied air respirator or self-contained breathing apparatus

(SCBA) is necessary.

General Hygiene Considerations: Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Opaque.
Colour:	Black/Brown
Odour:	Petroleum. Rotten eggs.
Odour Threshold:	0.00047 ppm, (Hydrogen sulphide)
Physical State:	Liquid.
pH:	Not available.
Viscosity:	Not available.
Melting Point:	Not available.
Boiling Point:	10 to > 1100 °C
Flash Point:	-40 °C (PMCC)
Evaporation Rate:	(Water = 1)
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Specific Gravity:	0.7 to 1.1 (Water = 1)
Density:	Not available.
Solubility in Water:	Slightly soluble.
Coefficient of Water/Oil Distribution:	Not available.
Auto-ignition Temperature:	Not available.
Percent Volatile, wt. %:	100
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability:	Stable under normal storage conditions.
Conditions of Reactivity:	Contact with incompatible materials. Sources of ignition.
Incompatible Materials:	Strong acids. Strong oxidizers. Chlorine.
Hazardous Decomposition Products:	Oxides of carbon. Oxides of nitrogen. Aldehydes. Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.
Possibility of Hazardous Reactions:	None known.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Ingredient	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Petroleum	8002-05-9	4300 mg/kg, (rat)	Not available.	Not available.
Hydrocarbons, C>=5, C5-6-rich	68476-50-6	Not available.	Not available.	Not available.
Benzene, dimethyl-	1330-20-7	>1700 mg/kg, (rat)	4300 mg/kg, (rabbit)	5000 ppm, (rat)
Benzene, methyl-	108-88-3	600 mg/kg, (rat)	14.1 mL/kg, (rabbit)	49000 mg/m^3, (rat)
Hydrogen sulfide (H2S)	7783-06-4	Not available.	Not available.	444 ppm, (rat)
Benzene	71-43-2	930 mg/kg, (rat)	>9400 µl/kg, (rabbit)	10000 ppm, (rat)
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not available.	Not available.	Not available.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Above 50 ppm Hydrogen sulphide, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: Very toxic by inhalation. Irritating to respiratory system. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. This product contains hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm. Memory loss, paralysis of facial muscles, and nerve tissue damage may occur after severe exposures near 500 ppm.

Skin Sensitization: Not hazardous by OSHA/WHMIS criteria.

Respiratory Sensitization: Not hazardous by OSHA/WHMIS criteria.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Respiratory system. Skin. Blood. Kidney. Liver. Central nervous system. Cardiovascular system. Peripheral nervous system.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. High vapour concentrations, generally greater than 10% by volume, may sensitize the heart and lead to lethal cardiac arrhythmias. Repeated or prolonged exposure to H2S at 50 ppm or greater include respiratory illnesses such as bronchitis and pulmonary edema. Epidemiological studies indicate that long term inhalation of benzene vapours can result in leukemia. Exposure to toluene is

known to cause visual impairment, narcosis, anxiety, muscle fatigue, insomnia, parathesis, dermatitis, anemia, cause damage to the liver, kidneys, as well as the central and peripheral nervous systems. Xylene can damage bone marrow thus causing anemia, and can also damage the liver and kidneys, as well as the central and peripheral nervous systems. This product contains small quantities of polycyclic aromatic hydrocarbons. Prolonged contact with these compounds has been associated with the induction of skin and lung tumours.

Carcinogenicity: Hazardous by OSHA/WHMIS criteria. May cause cancer. Benzene has been classified by the International Agency for Research on Cancer as carcinogenic to humans (IARC Group 1).

Component Carcinogenicity

Ingredient	ACGIH	IARC	OSHA	NTP	Prop 65
Petroleum	Not listed.	Group 3	Not listed.	Not listed.	Not listed.
Hydrocarbons, C>=5, C5-6-rich	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Benzene, dimethyl-	A4	Group 3	Listed.	Not listed.	Not listed.
Benzene, methyl-	A4	Group 3	Listed.	Not listed.	Not listed.
Hydrogen sulfide (H2S)	Not listed.	Not listed.	Listed.	Not listed.	Not listed.
Benzene	A1	Group 1	Listed.	List 1	Not listed.
Polycyclic Aromatic Hydrocarbons	A2	Group 2A	Listed.	List 2	Listed.

Mutagenicity: Hazardous by OSHA/WHMIS criteria. May cause heritable genetic damage.

Reproductive Effects: Not hazardous by OSHA/WHMIS criteria.

Developmental Effects

Teratogenicity: Not hazardous by OSHA/WHMIS criteria.

Embryotoxicity: Hazardous by OSHA/WHMIS criteria. Possible risk of harm to the unborn child. Exposure to xylene has produced fetotoxic effects in animal studies.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Not available.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORTATION INFORMATION

CFR

Proper Shipping Name:	PETROLEUM CRUDE OIL, 3, UN 1267, I
Class:	3
UN Number:	1267
Packing Group:	I
Label Code:	

TDG

Proper Shipping Name:	PETROLEUM CRUDE OIL, 3, UN 1267, I
Class:	3
UN Number:	1267
Packing Group:	I
Label Code:	

Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:
Class B2 - Flammable Liquids.
Class D1A - Very Toxic Material.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2A - Chronic toxic effects.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:



United States
This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

State Regulations
Massachusetts
US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Ingredient	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Hydrocarbons, C>=5, C5-6-rich	68476-50-6	Not listed.
Benzene, dimethyl-	1330-20-7	Not listed.
Benzene, methyl-	108-88-3	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Not listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

New Jersey
US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Ingredient	CAS No.	RTK List
Petroleum	8002-05-9	Not listed.
Hydrocarbons, C>=5, C5-6-rich	68476-50-6	Not listed.
Benzene, dimethyl-	1330-20-7	Listed.
Benzene, methyl-	108-88-3	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

Pennsylvania
US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Ingredient	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Hydrocarbons, C>=5, C5-6-rich	68476-50-6	Not listed.
Benzene, dimethyl-	1330-20-7	Listed.
Benzene, methyl-	108-88-3	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

California
California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Ingredient	Type of Toxicity
Benzene, methyl-	female
Benzene, methyl-	developmental
Benzene	developmental, male
Benzene	cancer
Polycyclic Aromatic Hydrocarbons	cancer

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Expiry Date: December 14, 2013

Version: 1.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

Material Safety Data Sheet

1. Product and company identification

Product name Petroleum Crude Oil - Sweet

This material can contain hydrogen sulfide (H_2S), a very toxic and extremely flammable gas.

The amount of dissolved H2S can vary considerably with the crude oil source.

MSDS # 0000001688

Historic MSDS #: 03885

Code 0000001688

Product use Industrial

Manufacturer BP Canada Energy Company
240 - 4 Avenue S.W.
P.O. Box 200, Station M
Calgary, Alberta T2P 2H8
CANADA

Supplier BP Canada Energy Company
240 - 4 Avenue S.W.
P.O. Box 200, Station M
Calgary, Alberta T2P 2H8
CANADA

EMERGENCY HEALTH INFORMATION: 1 (800) 447-8735

Outside the US: +1 703-527-3887 (CHEMTREC)

EMERGENCY SPILL INFORMATION: 1 (613) 996-6666 CANUTEC (Canada)

OTHER PRODUCT INFORMATION 1 (866) 4 BP - MSDS
(866-427-6737 Toll Free - North America)
email: bpcares@bp.com

2. Hazards identification

Physical state Liquid.

Color Brown. to Black.

Emergency overview DANGER !

EXTREMELY FLAMMABLE LIQUID AND VAPOR.
FLAMMABLE.
VAPOR MAY CAUSE FLASH FIRE.
MAY BE FATAL IF INHALED.
HARMFUL IF ABSORBED THROUGH SKIN.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS.
CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
HARMFUL OR FATAL IF SWALLOWED.
CAN ENTER LUNGS AND CAUSE DAMAGE.
CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.
ASPIRATION HAZARD.

Extremely flammable liquid. Very toxic by inhalation. Harmful in contact with skin. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Aspiration hazard if swallowed. Can enter lungs and cause damage. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. If ingested, do not induce vomiting. Do not get in eyes or on skin or clothing. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Routes of entry Dermal contact. Eye contact. Inhalation. Ingestion.

Potential health effects

Eyes	Causes eye irritation.
Skin	Harmful if absorbed through the skin. Causes skin irritation. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis.
Inhalation	May be fatal if inhaled. Vapors may cause drowsiness and dizziness. Can cause central nervous system (CNS) depression. Causes respiratory tract irritation.
Ingestion	Aspiration hazard if swallowed. Can enter lungs and cause damage. Ingestion may cause gastrointestinal irritation and diarrhea.

See toxicological information (Section 11)

3. Composition/information on ingredients

Ingredient name	CAS #	%
Crude Oil: complex hydrocarbon mixture comprising mainly of aliphatic, naphthenic and aromatic hydrocarbons.	8002-05-9	98 - 100
Contains:		
Benzene	71-43-2	0 - 2
Hydrogen Sulfide	7783-06-4	< 0.1
Polycyclic aromatic hydrocarbons (PAHs)	mixture	< 0.1

4. First aid measures

Eye contact	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.
Skin contact	Immediately wash exposed skin with soap and water. Remove contaminated clothing and shoes. Clean shoes thoroughly before reuse. Wash contaminated clothing before reuse. Get medical attention.
Inhalation	If inhaled, remove to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion	Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.

5. Fire-fighting measures

Flammability of the product	Extremely flammable liquid.
Flash point	Open cup: <4°C (<39.2°F) [Cleveland.]
Explosion limits	Lower: 1.1% Upper: 5.9%
Fire/explosion hazards	In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.
Unusual fire/explosion hazards	Explosive in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

Extinguishing media

Suitable	Use dry chemical, CO_2, water spray (fog) or foam.
Not suitable	Do not use water jet.
Fire-fighting procedures	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
Hazardous combustion products	Combustion products may include the following: carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide) sulfur oxides (SO_2, SO_3 etc.) nitrogen oxides (NO, NO_2 etc.) Hydrogen Sulfide (H2S)

Protective clothing (fire)

Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6. Accidental release measures

Personal precautions

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Large spill

Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Small spill

Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

7. Handling and storage

Handling

Put on appropriate personal protective equipment (see Section 8). Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Storage

Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Other information

Do not enter storage tanks without breathing apparatus unless the tank has been well ventilated and the tank atmosphere has been shown to contain hydrocarbon vapor concentrations of less than 1% of the lower flammability limit and an oxygen concentration of at least 20% volume.

Light hydrocarbon vapors can build up in the headspace of tanks. These can cause flammability/explosion hazards even at temperatures below the normal flash point (note: flash point must not be regarded as a reliable indicator of the potential flammability of vapor in tank headspaces). Tank headspaces should always be regarded as potentially flammable and care should be taken to avoid static electrical discharge and all ignition sources during filling, ullaging and sampling from storage tanks. When the product is pumped (e.g. during filling, discharge or ullaging) and when sampling, there is a risk of static discharge. Ensure equipment used is properly earthed or bonded to the tank structure.

This material can contain hydrogen sulfide (H_2S), a very toxic and extremely flammable gas. Vapors containing hydrogen sulfide may accumulate during storage or transport and may also be vented during filling of tanks. Hydrogen sulfide has a typical "bad egg" smell but at high concentrations the sense of smell is rapidly lost, therefore do not rely on sense of smell for detecting hydrogen sulfide. Use specially designed measuring instruments for determining its concentration.

8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name	Occupational exposure limits
Crude Oil: complex hydrocarbon mixture consisting mainly of aliphatic, naphthenic and aromatic hydrocarbons.	**Alberta OH&S (Canada).** OEL: 5 mg/m³ 8 hour(s). Form: OIL MIST, MINERAL STEL: 10 mg/m³ 15 minute(s). Form: OIL MIST, MINERAL
Contains: Benzene	**Alberta OH&S (Canada).** STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s). **British Columbia OH&S (Canada).** STEL: 2.5 ppm 15 minute(s). TWA: 0.5 ppm 8 hour(s). **CA Alberta Provincial (Canada). Absorbed through skin.** 15 min OEL: 16 mg/m³ 15 minute(s). 15 min OEL: 5 ppm 15 minute(s). 8 hrs OEL: 3.2 mg/m³ 8 hour(s). 8 hrs OEL: 1 ppm 8 hour(s). **CA British Columbia Provincial (Canada). Absorbed through skin.** STEL: 2.5 ppm 15 minute(s). TWA: 0.5 ppm 8 hour(s). **CA Ontario Provincial (Canada).** STEV: 2.5 ppm 15 minute(s). TWAEV: 0.5 ppm 8 hour(s). **CA Quebec Provincial (Canada).** STEV: 15.5 mg/m³ 15 minute(s). STEV: 5 ppm 15 minute(s). TWAEV: 3 mg/m³ 8 hour(s). TWAEV: 1 ppm 8 hour(s).
Hydrogen Sulfide	**Alberta OH&S (Canada).** CEIL: 15 ppm OEL: 10 ppm 8 hour(s). **British Columbia OH&S (Canada).** CEIL: 10 ppm **CA Alberta Provincial (Canada).** 15 min OEL: 21 mg/m³ 15 minute(s). 15 min OEL: 15 ppm 15 minute(s). 8 hrs OEL: 14 mg/m³ 8 hour(s). 8 hrs OEL: 10 ppm 8 hour(s). **CA British Columbia Provincial (Canada).** STEL: 10 ppm 15 minute(s). **CA Ontario Provincial (Canada).** STEV: 21 mg/m³ 15 minute(s). STEV: 15 ppm 15 minute(s). TWAEV: 14 mg/m³ 8 hour(s). TWAEV: 10 ppm 8 hour(s). **CA Quebec Provincial (Canada).** STEV: 21 mg/m³ 15 minute(s). STEV: 15 ppm 15 minute(s). TWAEV: 14 mg/m³ 8 hour(s). TWAEV: 10 ppm 8 hour(s).
Other applicable Exposure limit values: pitch, coal tar, high-temp.	**CA British Columbia Provincial (Canada).** TWA: 0.2 mg/m³, (as benzene-soluble aerosol) 8 hour(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** TWAEV: 0.2 mg/m³, (as total benzene-soluble compounds) 8 hour(s). Issued/Revised: 2/2005 **CA Quebec Provincial (Canada).** TWAEV: 0.2 mg/m³ 8 hour(s). Issued/Revised: 1/2000 **CA Alberta Provincial (Canada).** 8 hrs OEL: 0.2 mg/m³ 8 hour(s). Issued/Revised: 4/2004 **Alberta OH&S (Canada).** TWA: 0.2 mg/m³ 8 hour(s). Form: Benzene soluble **British Columbia OH&S (Canada).** TWA: 0.2 mg/m³ 8 hour(s). Form: Benzene soluble Aerosol.

While specific OELs for certain components may be shown in this section, other components may be present in any mist, vapor or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

Control Measures Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Personal protection

Eyes Avoid contact with eyes. Safety glasses with side shields or chemical goggles.

Skin and body Do not get on skin or clothing. Wear clothing and footwear that cannot be penetrated by chemicals or oil.

Respiratory Use adequate ventilation. Do not breathe vapor or mist. Approved air-supplied breathing apparatus must be worn where there is a risk of inhaling hydrogen sulfide gas. Personal gas monitors may also provide early warning of hydrogen sulfide. Air supplied respiratory protection should be worn whenever it is required for the worker's face to be within 3 feet of an open hatch.

Hands Recommended: Gloves made from Viton or comparable material resistant to hydrocarbons. Nitrile gloves. Butyl rubber gloves.

The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Consult your supervisor or Standard Operating Procedure (S.O.P) for special handling instructions.

9. Physical and chemical properties

Physical state Liquid.

Color Brown. to Black.

Odor Petroleum Hydrocarbon, Rotten eggs.

Odor threshold Not available.

Flash point Open cup: <4°C (<39.2°F) [Cleveland.]

Explosion limits Lower: 1.1%
Upper: 5.9%

Specific gravity 0.74 to 1.03

pH Not available.

Viscosity SUS: 31 to 9000 SUS at 20°C

Boiling point / Range -17.8 to 537.8°C (-0.04 to 1000°F)

Melting point / Range -60 to -20°C (-76 to -4°F)

Vapor pressure >0.359 kPa (>2.7 mm Hg)

Vapor density >1 [Air = 1]

Evaporation rate Not available.

Solubility insoluble in water.

$LogK_{ow}$ Not available.

10. Stability and reactivity

Stability and reactivity	The product is stable.
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
ditions to avoid	Keep away from heat, sparks and flame. Avoid all possible sources of ignition (spark or flame).
Incompatibility with various substances	Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis. hydrogen fluoride
Hazardous decomposition products	Decomposition products may include the following materials: carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide), sulfur oxides (SO_2, SO_3 etc.) Vapor may contain hydrogen sulfide (H2S) gas which can be harmful or fatal if inhaled.
Hazardous polymerization	Under normal conditions of storage and use, hazardous polymerization will not occur.

11. Toxicological information

Classification

Product/ingredient name	IARC	NTP	OSHA
Crude oil	3	-	-
Benzene	1	Proven.	+
Polycyclic aromatic hydrocarbons (PAHs)	-	Possible	-

IARC :
1 - Carcinogenic to human.
3 - Not classifiable as a human carcinogen.

NTP :
Proven - Known to be human carcinogens.
Possible - Reasonably anticipated to be human carcinogens.

OSHA :
+ Potential occupational carcinogen

er information

To the best of our knowledge, the toxicological properties of this product have not been thoroughly investigated.

Crude oil is a naturally occurring complex mixture of hydrocarbons whose exact composition and physical properties can vary widely depending upon its source.

From skin-painting studies in laboratory animals, it has been concluded that most, if not all, petroleum crudes, regardless of source, possess carcinogenic activity to some degree. This means that workers who practice poor personal hygiene and who are repeatedly exposed by direct skin contact to crude oil over many years may potentially be at risk of developing skin cancer. However, intermittent or occasional skin contact with petroleum crude oils is not expected to have serious health effects as long as good personal hygiene measures such as those outlined in this material safety data sheet are followed. Crude oil has not been identified as a carcinogen by NTP, IARC or OSHA.

Exposure to sunlight may increase the degree of skin irritation.
Crude oil administered orally or dermally to pregnant rats during gestation produced increased numbers of resorptions and decreases in fetal weight at maternally toxic doses. Repeated exposures to some crude oils in rats have produced effects on the blood, liver and thymus.

Benzene: Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Benzene: Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC), the National Toxicology Program, and OSHA consider benzene to be a human carcinogen. Chronic exposures to high levels of benzene have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.
Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene

at levels up to 300 ppm did not produce birth defects in animal studies, however, exposure to higher dosage levels resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level. Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material.

Hydrogen sulfide (H2S) gas may accumulate in storage tanks of bulk transport compartments containing this material. Contact with eyes causes painful conjunctivitis, sensitivity to light, tearing and clouding of vision. Inhalation of low concentrations causes a runny nose with a loss of sense of smell, labored breathing and shortness of breath. Direct contact with skin causes pain and redness. Other symptoms of exposure include profuse salivation, nausea, vomiting, diarrhea, giddiness, headache, dizziness, confusion, rapid breathing, rapid heart rate, sweating, weakness, sudden collapse, unconsciousness and death due to respiratory paralysis.

Cardiac neurological effects have also been reported. Prolonged breathing (greater than one hour) of concentrations of H2S around 50 ppm can produce eye and respiratory tract irritation. Levels of 250 to 600 ppm will result in fluid in the lungs, and concentrations around 1,000 ppm will cause unconsciousness and death in a short period of time. Since the sense of smell rapidly becomes insensitive to this toxic, colorless gas, odor cannot be relied upon as an indicator of concentrations of the gas. Always exercise caution when working around closed containers.

Potential chronic health effects

Carcinogenicity	Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.
Mutagenicity	No known significant effects or critical hazards.
Teratogenicity	No known significant effects or critical hazards.
Fertility effects	No known significant effects or critical hazards.
Reproductive effects	No known significant effects or critical hazards.
Medical conditions aggravated by over-exposure	None known.

12. Ecological information

Ecotoxicity

No testing has been performed by the manufacturer.

13. Disposal considerations

Waste information

The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

NOTE: The generator of waste has the responsibility for proper waste identification (based on characteristic(s) or listing), transportation and disposal

14. Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Class	Packing group	Additional information
DOT Classification	UN1267	PETROLEUM CRUDE OIL (Hydrogen Sulfide)	3	II	**Reportable quantity 10 lbs. (4.54 kg)**
TDG ssification	UN1267	PETROLEUM CRUDE OIL (Hydrogen Sulfide)	3	II	-
IMDG Classification	UN1267	PETROLEUM CRUDE OIL (Hydrogen Sulfide)	3	II	-
IATA/ICAO Classification	UN1267	PETROLEUM CRUDE OIL (Crude oil)	3	II	-

15. Regulatory information

WHMIS (Canada)

Class B-2: Flammable liquid
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Other regulations

Canada inventory	All components are listed or exempted.
United States inventory (TSCA 8b)	All components are listed or exempted.
REACH Status	For the REACH status of this product please consult your company contact, as identified in Section 1.
Australia inventory (AICS)	All components are listed or exempted.
China inventory (IECSC)	Not determined.
Japan inventory (ENCS)	Not determined.
Korea inventory (KECI)	Not determined.
Philippines inventory (PICCS)	Not determined.

16. Other information

Label requirements

DANGER !

EXTREMELY FLAMMABLE LIQUID AND VAPOR.
FLAMMABLE.
VAPOR MAY CAUSE FLASH FIRE.
MAY BE FATAL IF INHALED.
HARMFUL IF ABSORBED THROUGH SKIN.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS.
CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
HARMFUL OR FATAL IF SWALLOWED.
CAN ENTER LUNGS AND CAUSE DAMAGE.
CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.
ASPIRATION HAZARD.

History

Date of issue 02/07/2012.

Date of previous issue 02/02/2009.

Prepared by Product Stewardship

ndicates information that has changed from previously issued version.

ce to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from BP Group.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken. You can contact the BP Group to ensure that this document is the most current available. Alteration of this document is strictly prohibited.

MATERIAL SAFETY DATA SHEET

Canadian Natural
Supplier: Canadian Natural Resources Ltd.
2500, 855 2nd Street S.W.
Calgary, Alberta, Canada T2P 4J8

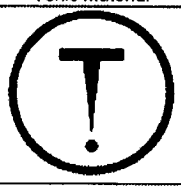
24 Hour Emergency Telephone Number:
1-888-878-3700

1. PRODUCT IDENTIFICATION

PETROLEUM HEAVY CRUDE OIL

SYNONYMS:
1. Crude Oil Tank Bottom Sludge
2. Crude Oil
3. Sour Crude
4. Sweet Crude
5. Mineral Oil
6. Rock Oil
7. Coal Oil
8. Heavy Crude Oil

WHIMIS

Class B, Division 2: Flammable Liquid	Class D, Division 1, Subdivision A: Very Toxic Effects	Class D, Division 2, Subdivision B: Toxic Material
		

TDG

PRIMARY TDG: 3.1
SECONDARY TDG: 3.2



SHIPPING NAME: Petroleum Crude Oil
CLASS: Flammable Liquids
P.I.N.: UN1267
PACKING GROUP: II or III

DESCRIPTION: A naturally occurring mixture of paraffins, naphthenes, aromatic hydrocarbons and small amounts of sulphur and nitrogen compounds. The composition and properties will vary significantly according to source of crude. Crude oil with a sulphur content greater than 0.5 weight percent is considered sour.

APPLICATION: Used as a refinery feedstock.

2. HAZARDOUS INGREDIENTS

The following components are defined in accordance with sub-paragraph 13(a)(I) to (iv) or paragraph 14(a) of the Hazardous Product Act:

NAME	%	CAS#
Hydrocarbons (aromatic and paraffinic hydrocarbons)	100	8002-05-9
Toluene	100 ppm	108-88-3
Benzene	10 ppm	71-43-2
Xylene	100 ppm	1330-20-7
Hydrogen sulphide (H2S)	10 ppm	7783-06-4

3. TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:	Liquid
SPECIFIC GRAVITY:	0.7 to 1.1
DENSITY:	0.8 to 1.0
APPEARANCE/ODOUR:	Aromatic or sulphide (rotten egg) odour.
ODOUR THRESHOLD:	Not available
VAPOUR PRESSURE:	10-80 kPa @ 20°C
VAPOUR DENSITY:	Not available
EVAPORATION RATE:	Variable
BOILING POINT/RANGE:	10°C – 1100°C
FREEZING/MELTING POINT:	Not available
VISCOSITY:	Not applicable
pH:	Not available
SOLUBILITY IN WATER:	0%
COEFF. OF WATER / OIL DIST.:	Not available
PERCENT VOLATILE:	100%
MOLECULAR FORMULA:	Not applicable - mixture
MOLECULAR WEIGHT:	Not applicable – mixture

4. HEALTH HAZARD INFORMATION

Nature of Hazard

INHALATION:
May cause headache, dizziness, loss of appetite, weakness, loss of coordination, and unconsciousness. Crude oil vapours are irritating to the upper respiratory tract.

EYE CONTACT:
Crude oil vapours are moderately irritating to the eyes.

SKIN CONTACT:
Prolonged skin contact may result in defatting of the skin resulting in dry cracked skin and dermatitis.

INGESTION:
Minimal toxicity. Small amounts of this liquid ingested into the lungs from swallowing or vomiting may cause severe health effects (e.g. bronchopneumonia or pulmonary edema).

CHRONIC EFFECTS:
Benzene is a known human carcinogen and may cause damage to the bone marrow/blood making system and may result in leukemia.

TOXICITY DATA:
Product is not listed as a carcinogen by any agent, but individual components have been associated with carcinogenicity, mutagenicity, reproductive and teratogenicity properties in animal experiments.

OCCUPATIONAL EXPOSURE LIMITS (OELs) RECOMMENDED:

ACGIH:	For oil mists	5mg/m³
	For Hydrogen sulphide	10 ppm (14mg/m³)
	For Benzene	a TLV of 10 ppm (30 mg/m3), and it is described as a substance of suspect carcinogenic potential in man.
Manufacturer:	For total hydrocarbons	100 ppm

5. FIRST AID MEASURES

INHALATION:
Remove individual to fresh air immediately. If breathing stops, administer artificial resuscitation. Keep victim warm and at rest. Seek medical attention.

...OVER

EYE CONTACT:
Immediately flush eyes with plenty of water for at least 15 minutes and seek medical attention.

SKIN CONTACT:
Remove contaminated clothing as soon as possible. Wash exposed skin thoroughly with soap and water. If irritation develops, consult a physician.

INGESTION:
If this material is swallowed DO NOT induce vomiting. If vomiting begins, lower victim's head in an effort to prevent vomitus from entering lungs. Seek medical attention. Never give anything by mouth to an unconscious person.

EMERGENCY PROCEDURES:
Because Hydrogen sulphide inhalation can be fatal, rescuers must wear positive pressure full face piece, self-contained or supplied air NIOSH approved respirators before attempting the rescue.

6. PREVENTATIVE AND CORRECTIVE MEASURES

SPECIAL PROTECTION INFORMATION:
Use in a well ventilated area. Adequate ventilation should be provide in the workplace to maintain the hydrocarbon vapours and hydrogen sulphide below the applicable occupational exposure level. Under normal conditions respiratory protection is not required. Respiratory protection may be required in poorly ventilated areas. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed the 10x the occupational exposure limit or when high concentration of H_2S may be present. Non-vented chemical goggles should be worn to prevent eye injury. Chemical resistant gloves, apron and/or clothing should be worn if direct contact with liquid is likely to occur. Neoprene or nitrile materials have been shown to provide effective protection against crude oil liquid.

SPILL CONTROL AND DISPOSAL:
Evacuate personnel. Eliminate all ignition sources. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution.

WASTE DISPOSAL METHOD:
Contaminated material should be placed in disposable containers and disposed in compliance with federal, provincial and local regulations.

7. FIRE AND EXPLOSION HAZARD

FLASH-POINT (Test Method):	-18C°
AUTO-IGNITION:	Not available
FLAMMABLE LIMITS (% Volume):	Not available

GENERAL HAZARDS:
Static discharge: Highly flammable, vapours are heavier than air and may collect in low-lying areas. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.

FIRE FIGHTING:
Fire extinguishing substances: foam, water spray and dry chemical. Water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse vapours. Use full protective equipment and self-contained breathing apparatus (SCBA) for fires in enclosed areas.

EXPLOSION/SENSITIVITY DATA:
Stable under normal conditions of temperatures and pressure..

8. REACTIVITY DATA

STABILITY:
This material is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:
Oxidizing material

HAZARDOUS DECOMPOSITION:
May release hydrogen sulphide gas when agitated. See health hazard information. Overheating or incomplete combustion may result in carbon dioxide, carbon monoxide, acrid fumes of decomposition and oxides of sulphur. Avoid head, open flame or sources of ignition. Maintain temperature below the flash-point and keep away from all ignition sources. Head spaces in storage tanks may contain toxic hydrocarbon vapours and hydrogen sulphide gas.

9. NOTES

This product contains benzene. Repeated or prolonged breathing of benzene vapours has been associated with the development of chromosomal damage in experimental animals and various blood disorders in humans ranging from aplastic anemia to leukemia. This product may also contain polycyclic aromatic hydrocarbons, which have been associated with skin and lung cancers.

ACCUTE EFFECTS:
Very with concentration of hydrogen sulphide released, from mild eye, nose and throat irritation at approximately 100 ppm, to sudden unconsciousness or death at 500 ppm.

INHALATION:
H_2S release may occur in the vapour space of storage tanks. Abnormal behavior or sudden paralysis of breathing and unconsciousness can occur.

10. PREPARATION

Prepared by:	CNRL HEALTH AND SAFETY
Date:	January 1, 2011
Expires:	March 31, 2013

CAUTION

The information contained herein is provided free of charge and is offered to the user in good faith as accurate. Certain of the information has been obtained from sources outside of the supplier and while the supplier believes such information to be correct, it cannot guarantee its accuracy or completeness.

The information contained herein relates only to the product or material set forth in Section 1 and may not be applicable or complete if such product material is used in combination with any other product or material or in any process. The information may not be applicable or complete for all individuals or if the products or material is used for a purpose or under conditions which are abnormal or not reasonable foreseeable. For greater certainty, uses other that those described in Section 1 must be reviewed with the supplier.

It is the user's obligation to consider, investigate and verify the information, to use the product safety and to comply with all applicable laws and regulations. The supplier makes no warranties, guarantees or conditions express or implied in respect of the information contained herein.

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-11-30
Supersedes: 2010-02-26



Class B2 Flammable Liquid



Class D2B Skin Irritation



Class D2A Embryo/Fetotoxicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**PREMIUM ALBIAN SYNTHETIC CRUDE**
SYNONYMS:	PAS Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**873-111**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Distillates (Petroleum), Hydrotreated Middle	64742-46-7	45 - 50	Yes
Naphtha (Petroleum), Hydrotreated Heavy	64742-48-9	45 - 50	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 6	Yes
n-Hexane	110-54-3	< 1	Yes
Toluene	108-88-3	< 1	Yes
Butane (n-Butane)	106-97-8	0.1 - 1	Yes
Xylene (Mixed Isomers)	1330-20-7	0.5 - 1	Yes
Benzene	71-43-2	< 0.1	Yes
Ethylbenzene	100-41-4	< 0.1	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Liquid Brown Colour Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:

Flammable Liquid.
Irritating to skin.
Contains xylene, which may affect fetal development.
Exposure to vapours may cause irritation of the eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:

Eliminate all ignition sources.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
Avoid inhalation of vapours.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis.

5. FIRE FIGHTING MEASURES

Extinguishing Media:

Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Clear area of unprotected personnel. Do not use a direct stream of water as it may spread fire. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container

rupture. Vapours may travel along ground and flashback along vapour trail may occur. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Xylene: 100 ppm (STEL: 150 ppm)
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3
Gasoline: 300 ppm (STEL: 500 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where

general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Brown Colour
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	-42 - 500 °C
Density:	845 - 860 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.845 - 0.86
pH:	Not available
Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	4 mm2/s @ 30 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials:	Avoid strong oxidizing agents.

Conditions of Reactivity: Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Distillates (Petroleum), Hydrotreated Middle	LD50 Dermal Rat > 2000 mg/kg LD50 Oral Rat > 5000 mg/kg
Naphtha (Petroleum), Hydrotreated Heavy	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 3160 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
n-Hexane	LD50 Oral Rat > 8 mL/kg LD50 Dermal Rat > 4 mL/kg LC50 Inhalation Rat = 54090 - 57000 ppm for 4 hours
Toluene	LD50 Oral Rat 5580 mg/kg LC50 Inhalation Rat 26700 ppm for 1 hour LD50 Dermal Rabbit 12400 mg/kg
Butane (n-Butane)	LC50 Inhalation Mouse = 680000 mg/m3 for 2 hours LC50 Inhalation Rat = 658000 mg/m3 for 4hours
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Irritancy: Based on the ingredients, this product is expected to be irritating to skin.

Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Long term intensive exposure to oil mist may cause benign lung fibrosis.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Middle distillates have caused skin cancers in laboratory animals when applied repeatedly and left in place between applications. This effect is believed to be caused by the continuous irritation of the skin. Good personal hygiene should be maintained to avoid this risk. Based on an Ames mutagenicity assay, this product would not be predicted to produce tumours via skin contact.

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class: Class B2 Flammable Liquid
Class D2B Skin Irritation
Class D2A Embryo/Fetotoxicity

DSL/NDSL Status: This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.

Other Regulatory Status: No Canadian federal standards. Provincial criteria are likely and should be requested when notifying provincial authorities. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement : Flammable Liquid.
Irritating to skin.
Contains xylene, which may affect fetal development.

Handling Statement: Eliminate all ignition sources.

Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
Avoid inhalation of vapours.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water.
If overcome by vapours remove to fresh air.
Do not induce vomiting.
Obtain medical attention.

Revisions: This MSDS has been reviewed and updated. Changes have been made to: Section 2 Section 4 Section 8 Section 11

SUNCOR ENERGY

Material Safety Data Sheet

PRODUCT GAS OIL

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B3 - Combustible Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	2
Flammability	2	Flashpoint below 200 F	Flammability	2
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	PRODUCT GAS OIL
Product type	:	Suncor Product
MSDS Number	:	V00000000448
CAS-No.	:	128683-29-4
Synonyms	:	Hydrotreated Gas Oil, Treated Gas Oil
Intended Use	:	Process Stream Component of synthetic crude
Manufacturer	:	Suncor Energy Inc., Oil Sands P.O. Box 4001 Fort McMurray, Alberta Canada T9H 3E3
Telephone	:	(780) 790-7001 (24-hr)

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Gas oils (oil sand), hydrotreated	128683-29-4	99 - 100 %
HYDROGEN SULPHIDE	7783-06-4	< 30 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Flammable.Avoid breathing vapors, mist or gas.

Potential Health Effects

Eyes : May cause eye irritation.

Skin	:	May cause skin irritation. Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
Inhalation	:	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. High concentration of vapours may induce unconsciousness. May cause respiratory tract irritation.
Ingestion	:	May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness. Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.
Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact
Target Organs	:	Respiratory system Central nervous system

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water. For large exposures use a deluge shower.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	55 - 93 °C (131 - 199 °F)

		Method: ASTM D 93
Autoignition temperature	:	255 °C (491 °F) Method: ASTM E659
Lower explosion limit	:	0.32 %(V) Method: ASTM E681
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Vapors can accumulate and travel to distant ignition sources and flash back.
Explosibility in Presence of	:	Explosive reaction may occur on heating or burning.
Products of Combustion	:	Hydrogen sulphide, carbon monoxide, Carbon dioxide (CO2), nitrogen oxides, sulfur dioxide, Polycyclic Aromatic Hydrocarbons

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.
Further information	:	Do not extinguish with water unless flow can be stopped The use of water may spread fire. Do NOT use water jet. Do not cut, drill or weld empty containers.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition.

Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits.
When transferring from one container to another apply earthing measures and use conductive hose material.

Storage

Advice on mixed storage : Store in a cool, well ventilated area away from incompatible materials.
Storage tank should be vented to atmosphere.
To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.
A containment dike should be built around tank.
Small quantities should be stored in an approved safety solvent container.
Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures : Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.

Eye protection : Chemical resistant goggles must be worn.
Wear face-shield if splashing hazard is likely.

Hand protection : Wear suitable gloves.
The following materials are acceptable:
Neoprene
Nitrile rubber

Skin and body protection : Wear as appropriate:
Long sleeved clothing
A neoprene or nitrile rain suit may be needed in certain situations.
(e.g., vessel cleaning).

Respiratory protection : When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm.
Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit.
Use an air-supplied or self-contained breathing apparatus in confined spaces or in emergency or high-exposure situations.

Hygiene measures : Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	14 mg/m3
		CAD ON OEL	STEL	15 ppm	21 mg/m3
		ACGIH	TWA	10 ppm	
		ACGIH	STEL	15 ppm	
		ACGIH NIC	TWA	1 ppm	
		ACGIH NIC	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.

Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	brown
Odour	:	hydrocarbon-like
Physical state	:	liquid
Boiling point/range	:	110 - 620 °C (230 - 1,148 °F) Method: ASTM D-2887
Vapour pressure	:	< 0.1 kPa Method: ASTM D 323A
Density	:	0.91 - 0.92 g/cm3
Specific gravity	:	0.91 - 0.92
Water solubility	:	insoluble
Partition coefficient (n-octanol/water)	:	POW: < 1

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Strong oxidizing agents Peroxides Strong acids
Hazardous decomposition products	:	Carbon monoxide carbon dioxide polycyclic aromatic hydrocarbons hydrogen sulfide

sulfur dioxide
nitrogen oxides (NOx)

Hazardous reactions : Hazardous polymerization does not occur.
Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity : LD50 rat
Dose: > 5,000 mg/kg

Acute dermal toxicity : LD50 rabbit
Dose: > 2,000 mg/kg

Skin irritation : rabbit
Result: Moderate skin irritation

Sensitization : Remarks: Did not cause sensitization on laboratory animals.

Further information : Information given is based on data obtained from similar substances.
Prolonged skin contact caused cancerous skin tumors in animals.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal : Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	: PETROLEUM DISTILLATES, N.O.S.
	UN-No.	: 1268
	Class	: 3
	Packing group	: II
TDG	Proper shipping name	: PETROLEUM DISTILLATES, N.O.S.
	UN-No.	: 1268
	Class	: 3
	Packing group	: II
IATA	UN Number	: 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: II

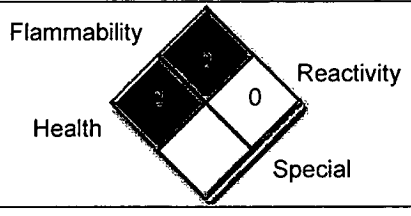
	ADR/RID-Labels	: 3
	Packing instruction (cargo aircraft)	: 307
	Packing instruction (passenger aircraft)	: 305
	Packing instruction (passenger aircraft)	: Y305
IMDG	Substance No.	: UN 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: II
	ADR/RID-Labels	: 3
	EmS Number	: F-E

Further information for transport

Special provisions for transport : not regulated

SECTION 15: REGULATORY INFORMATION

HMIS Hazard Class

Health	2
Flammability	2
Physical Hazard	0
Personal Protective Equipment	
NFPA Hazard Rating	

WHMIS Classification : B3 - Combustible Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)



TSCA Status : Listed on TSCA
HYDROGEN SULPHIDE 7783-06-4

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16: OTHER INFORMATION

Date Validated : 02/14/2007

References :
Core laboratory and Maxxam laboratory analysis, 1999.
Chemex Labs Alberta Inc., Analysis Results for Product Gas Oil, 1989.
Maxxam Analytics Inc. Laboratory Analysis 2006
The Petroleum HPV Testing Group, Test Plan Gas Oils Category, November 3, 2003
Kidde Fenwal Combustion Research Center Laboratory Analysis 2006
Kidde Fenwal Combustion Research Centre Laboratory Analysis 2007

General contact information : B. Burrell: (519) 383-3657

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Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: PSC

Synonyms: Hydrocarbon Product; Sales Oil; Premium Synthetic Crude.

Product Use: Gas Plant/Refinery Feed.

Manufacturer/Supplier: Nexen Inc.
Synthetic Oil
Box 6010
Fort McMurray, Alberta
Canada T9H 4V9

Emergency Phone: 1 (780) 334-3911

Date of Preparation: August 18, 2011

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
EXTREMELY FLAMMABLE LIQUID AND VAPOR - VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. CANCER HAZARD – CAN CAUSE CANCER. IRRITATING TO EYES, UPPER RESPIRATORY TRACT AND SKIN.

Colour: Light yellow.
Physical State: Liquid.
Odour: Petroleum.

WHMIS	Personal Protection Equipment	TDG (Ground)
		

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness.

Chronic Effects: See Section 11 for more information.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Blood. Bone marrow. Liver. Kidneys. Reproductive system. Nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS No.	Wt. %
Petroleum	8002-05-9	100
Decane	124-18-5	3 - 7
Nonane	111-84-2	3 - 7
Octane	111-65-9	1 - 5
Heptane	142-82-5	1 - 5
Hexane	110-54-3	1 - 5
Cyclohexane, methyl-	108-87-2	1 - 5
m,p-Xylene	179601-23-1	0.1 - 1
O-Xylene	95-47-6	0.1 - 1
Benzene, 1,2,4-trimethyl-	95-63-6	0.1 - 1
Toluene	108-88-3	0.1 - 1
Cyclohexane	110-82-7	0.1 - 1
Benzene, ethyl-	100-41-4	0.1 - 1
Benzene	71-43-2	0.1 - 1

Section 4: FIRST AID MEASURES

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Inhalation: Remove person to fresh air. If breathing has stopped apply artificial respiration. If signs/symptoms develop, get medical attention.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Means of Extinction
Suitable Extinguishing Media: Dry chemical, water spray, foam, carbon dioxide.
Unsuitable Extinguishing Media: Not available.

Products of Combustion: Oxides of carbon. Aldehydes.

Protection of Firefighters: Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA).

Explosion Data
Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge: This material is sensitive to static discharge at temperatures above the flash point.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Environmental Precautions: Keep out of drains, sewers, ditches, and waterways.

Methods for Containment: Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.

Methods for Clean-Up: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.

Other Information: Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking.
Storage:
Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Keep out of the reach of children. Structural materials and lighting and ventilation systems should be corrosion resistant.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Petroleum
(8002-05-9) **ACGIH:** A2; Exposure by all routes should be carefully controlled to levels as low as possible (2009); For Mineral oil, excluding metal working fluids; Poorly and mildly refined
(8002-05-9) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA); 400 ppm (TWA) [Vacated]
(8002-05-9) **Alberta OEL:** 5 mg/m³ (OEL); 10 mg/m³ (STEL); For Oil mist, mineral

Decane

(124-18-5) **ACGIH:** No TLV established.

(124-18-5) **OSHA:** No PEL established.

(124-18-5) **Alberta OEL:** No OEL established.

Nonane

(111-84-2) **ACGIH:** 200 ppm (TWA); (1992)

(111-84-2) **OSHA:** 200 ppm (TWA) [Vacated]

(111-84-2) **Alberta OEL:** 200 ppm (OEL); 1050 mg/m³ (OEL)

Octane

(111-65-9) **ACGIH:** 300 ppm (TWA); (1979)

(111-65-9) **OSHA:** 500 ppm (TWA), 2350 mg/m³ (TWA); 300 ppm (TWA); 375 ppm (STEL) [Vacated]

(111-65-9) **Alberta OEL:** 300 ppm (OEL); 1400 mg/m³ (STEL)

Heptane

(142-82-5) **ACGIH:** 400 ppm (TWA); 500 ppm (STEL); (1979)

(142-82-5) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA); 400 ppm (TWA); 500 ppm (STEL) [Vacated]

(142-82-5) **Alberta OEL:** 400 ppm (OEL); 1640 mg/m³ (OEL); 500 ppm (STEL); 2050 mg/m³ (STEL)

Hexane

(110-54-3) **ACGIH:** 50 ppm (TWA); Skin, BEI (1996)

(110-54-3) **OSHA:** 500 ppm (TWA), 1800 mg/m³ (TWA); Skin. 50 ppm (TWA) [Vacated]

(110-54-3) **Alberta OEL:** 50 ppm (OEL); 176 mg/m³ (OEL); Substance may be readily absorbed through intact skin

Cyclohexane, methyl-

(108-87-2) **ACGIH:** 400 ppm (TWA); (1962)

(108-87-2) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA); 400 ppm (TWA) [Vacated]

(110-82-7) **Alberta OEL:** 100 ppm (OEL); 344 mg/m³ (OEL)

m,p-Xylene

(179601-23-1) **ACGIH:** No TLV established.

(179601-23-1) **OSHA:** No PEL established.

(179601-23-1) **Alberta OEL:** 100 ppm (OEL); 434 mg/m³ (OEL); 150 ppm (STEL); 651 mg/m³ (STEL)

o-Xylene

(95-47-6) **ACGIH:** 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)

(95-47-6) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA); 150 ppm (STEL) [Vacated]

(95-47-6) **Alberta OEL:** 100 ppm (OEL); 434 mg/m³ (OEL); 150 ppm (STEL); 651 mg/m³ (STEL)

Benzene, 1,2,4-trimethyl-

(95-63-6) **ACGIH:** 25 ppm (TWA); (1970)

(95-63-6) **OSHA:** 25 ppm (TWA) [Vacated]

(95-63-6) **Alberta OEL:** No OEL established.

Toluene

(108-88-3) **ACGIH:** 20 ppm (TWA); A4; BEI (2006)

(108-88-3) **OSHA:** 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)
100 ppm (TWA); 150 ppm (STEL) [Vacated]
(108-88-3) **Alberta OEL:** 50 ppm (OEL); 188 mg/m³ (OEL); Substance may be readily absorbed through intact skin

Cyclohexane

(110-82-7) **ACGIH:** 100 ppm (TWA); (1964)

(110-82-7) **OSHA:** 300 ppm (TWA), 1050 mg/m³ (TWA);

(110-82-7) **Alberta OEL:** 100 ppm (OEL); 344 mg/m³ (OEL)

Benzene, ethyl-

(100-41-4) **ACGIH:** 20 ppm (TWA); A3; BEI (2010)
(100-41-4) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA);
125 ppm (STEL) [Vacated]
(100-41-4) **Alberta OEL:** 100 ppm (OEL); 434 mg/m³ (OEL); 125 ppm (STEL); 543 mg/m³ (STEL)

Benzene

(71-43-2) **ACGIH:** 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)

(71-43-2) **OSHA:** 1 ppm (TWA); 5 ppm (STEL);
(71-43-2) **Alberta OEL:** 0.5 ppm (OEL); 1.6 mg/m³ (OEL); 2.5 ppm (STEL); 8 mg/m³ (STEL); Substance may be readily absorbed through intact skin

Polycyclic Aromatic Hydrocarbons

(130498-29-2) **ACGIH:** A2; BEI; Exposure by all routes should be carefully controlled to levels as low as possible (1990); For Benz[a]anthracene

(130498-29-2) **OSHA:** 0.2 mg/m³ (TWA); For benzene-soluble fraction.

(130498-29-2) **Alberta OEL:** 0.2 mg/m³ (OEL)

PEL: Permissible Exposure Limit
TLV: Threshold Limit Value
TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls:	Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.
Personal Protective Equipment	
Eye/Face Protection:	Wear safety glasses. Ensure that eyewash stations are close to the workstation location.
Hand Protection:	Wear impervious gloves. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations

are low or if airborne concentrations exceed the limits of the air-purifying respirators.

General Hygiene Considerations: Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Light yellow.
Colour:	Light yellow.
Odour:	Petroleum.
Odour Threshold:	Not available.
Physical State:	Liquid.
pH:	Not available.
Viscosity:	4.0352 cSt @ 20 °C
Melting Point:	Not available.
Boiling Point:	35.4 to 561.9 °C (1 atm)
Flash Point:	< -13 °C
Evaporation Rate:	> 1(Water = 1)
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	30.3 kPa gauge (37.8 °C) (RVP)
Vapor Density:	3 (Air = 1) 1 atm
Specific Gravity:	0.848 (Water = 1) @ 15°C (1 atm)
Density:	Not available.
Solubility in Water:	Not available.
Coefficient of Water/Oil Distribution:	< 1
Auto-ignition Temperature:	537 °C
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.
API Gravity:	39 API @ 15 °C

Section 10: STABILITY AND REACTIVITY

Stability: Stable under normal storage conditions.

Conditions of Reactivity: Contact with incompatible materials. Sources of ignition. Exposure to heat.

Incompatible Materials: Strong oxidizers.

Hazardous Decomposition Products: Not available.

Possibility of Hazardous Reactions: None known.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Petroleum	8002-05-9	4300 mg/kg, (rat)	Not available.	Not available.
Decane	124-18-5	Not available.	Not available.	>1369 ppm, (rat), 8H
Nonane	111-84-2	Not available.	Not available.	3200 ppm, (rat), 4H
Octane	111-65-9	Not available.	Not available.	118000 mg/m³, (rat), 4H
Heptane	142-82-5	Not available.	Not available.	103000 mg/m³, (rat), 4H
Hexane	110-54-3	25000 mg/kg, (rat)	Not available.	48000 ppm, (rat), 4H
Cyclohexane, methyl-	108-87-2	>3200 mg/kg, (rat)	>86700 mg/kg, (rabbit)	15227 ppm, (rabbit), 1H
m,p-Xylene	179601-23-1	5000 mg/kg, (rat)	Not available.	4550 ppm, (rat), 4H
O-Xylene	95-47-6	5000 mg/kg, (rat)	Not available.	6125 ppm, (rat), 12H
Benzene, 1,2,4-trimethyl-	95-63-6	5000 mg/kg, (rat)	Not available.	18000 mg/m³, (rat), 4H
Toluene	108-88-3	600 mg/kg, (rat)	14.1 mL/kg, (rabbit)	49000 mg/m³, (rat), 4H
Cyclohexane	110-82-7	813 mg/kg, (mouse)	180000 mg/kg, (rabbit)	Not available.
Benzene, ethyl-	100-41-4	3500 mg/kg, (rat)	17800 µl/kg, (rabbit)	Not available.
Benzene	71-43-2	930 mg/kg, (rat)	>9400 µl/kg, (rabbit)	10000 ppm, (rat), 7H
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not available.	Not available.	Not available.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness.

Skin Sensitization: Not hazardous by OSHA/WHMIS criteria.

Respiratory Sensitization: Not hazardous by OSHA/WHMIS criteria.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Blood. Bone marrow. Liver. Kidneys. Reproductive system. Nervous system.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. Repeated dermal application of crude oils in rats produced systemic toxicity in blood, liver, thymus and bone marrow. Chronic inhalation of n-Hexane may cause

peripheral nerve disorders and central nervous system effects. Exposure to Xylene, Toluene or Ethylbenzene may cause liver and kidney damage. Long term inhalation of Benzene vapours can result in bone marrow abnormalities with damage to blood forming tissues and may cause anemia and other blood cell abnormalities, including leukemia.

Carcinogenicity: Hazardous by OSHA/WHMIS criteria. May cause cancer. Lifetime skin painting studies in animals with whole crude oils and crude oil fractions have produced tumours in animals following prolonged and repeated skin contact. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma.

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Petroleum	A2	Group 3	Not listed.	OSHA Carcinogen	Not listed.
Decane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Nonane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Octane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Heptane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Hexane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Cyclohexane, methyl-	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
m,p-Xylene	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
O-Xylene	A4	Not listed.	Not listed.	Not listed.	Not listed.
Benzene, 1,2,4-trimethyl-	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Cyclohexane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Benzene, ethyl-	A3	Group 2B	Not listed.	OSHA Carcinogen	Listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen	Listed.
Polycyclic Aromatic Hydrocarbons	A2	Group 2A	List 2	OSHA Carcinogen	Listed.

Mutagenicity: Hazardous by OSHA/WHMIS criteria. May cause heritable genetic damage.

Reproductive Effects: Studies exist which report a link to crude oil and reproductive effects including menstrual disorders.

Developmental Effects

Teratogenicity: Exposure to Toluene may affect the developing fetus. P-Xylene may cause teratogenic effects. Benzene has caused adverse fetal effects in laboratory animals.

Embryotoxicity: Hazardous by OSHA/WHMIS criteria. Possible risk of harm to the unborn child. Repeated dermal application of crude oils to pregnant rats produced maternal toxicity and fetal developmental toxicity and fetal tumors. Benzene has caused adverse fetal effects in laboratory animals.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: 21 and 41 mg/l, 96 hr., Rainbow trout;
2.7 and 4.1 mg/l, 96 hr., Mysid;
122 and 528 ml/kg, 96 hr., Algae.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORTATION INFORMATION

CFR

Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, II

Class: 3

UN Number: 1267

Packing Group: II

Label Code:



TDG

Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, II

Class: 3

UN Number: 1267

Packing Group: II

Label Code:



Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:
Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2A - Chronic toxic effects.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:



United States
This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Petroleum	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Decane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Nonane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Octane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Heptane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Hexane	Not listed.	Not listed.	5000	313 & x	Not listed.	Not listed.
Cyclohexane, methyl-	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
m,p-Xylene	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
O-Xylene	Not listed.	Not listed.	1000	313 & X	U239	Not listed.
Benzene, 1,2,4-trimethyl-	Not listed.	Not listed.	Not listed.	313	Not listed.	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Cyclohexane	Not listed.	Not listed.	1000	313	U056	Not listed.
Benzene, ethyl-	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Polycyclic Aromatic Hydrocarbons	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Decane	124-18-5	Not listed.
Nonane	111-84-2	Listed.
Octane	111-65-9	Listed.
Heptane	142-82-5	Listed.
Hexane	110-54-3	Listed.
Cyclohexane, methyl-	108-87-2	Listed.
m,p-Xylene	179601-23-1	Not listed.
O-Xylene	95-47-6	Listed.
Benzene, 1,2,4-trimethyl-	95-63-6	Listed.
Toluene	108-88-3	Listed.
Cyclohexane	110-82-7	Listed.
Benzene, ethyl-	100-41-4	Listed.
Benzene	71-43-2	E
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

Note: E = Extraordinarily Hazardous Substance

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Petroleum	8002-05-9	SHHS
Decane	124-18-5	Listed.
Nonane	111-84-2	SHHS
Octane	111-65-9	SHHS
Heptane	142-82-5	SHHS
Hexane	110-54-3	SHHS
Cyclohexane, methyl-	108-87-2	SHHS
m,p-Xylene	179601-23-1	Not listed.
O-Xylene	95-47-6	SHHS
Benzene, 1,2,4-trimethyl-	95-63-6	Listed.
Toluene	108-88-3	SHHS
Cyclohexane	110-82-7	SHHS
Benzene, ethyl-	100-41-4	SHHS
Benzene	71-43-2	SHHS
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Decane	124-18-5	Listed.
Nonane	111-84-2	Listed.
Octane	111-65-9	Listed.
Heptane	142-82-5	Listed.
Hexane	110-54-3	Listed.
Cyclohexane, methyl-	108-87-2	Listed.

m,p-Xylene	179601-23-1	Not listed.
O-Xylene	95-47-6	E
Benzene, 1,2,4-trimethyl-	95-63-6	E
Toluene	108-88-3	E
Cyclohexane	110-82-7	E
Benzene, ethyl-	100-41-4	E
Benzene	71-43-2	ES
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

Note: E = Environmental Hazard; S = Special Hazardous Substance

California
California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Component	Type of Toxicity
Toluene	developmental & female
Benzene, ethyl-	cancer
Benzene	developmental, male & cancer
Polycyclic Aromatic Hydrocarbons	cancer

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Expiry Date: August 17, 2014

Version: 1.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

STATOIL
LEISMER SE2-079-10-W4M
Material Safety Data Sheet

SECTION 1 – PRODUCT IDENTIFICATION & USE

Product Identifier: Sales Oil

Product Use: Refinery Feed

Manufacturer/Supplier: Statoil
Leismer SE2-079-10-W4M
Conklin, Alberta
T0A 2C0
Emergency Telephone Number: 1-403-268-7461

Chemical Name & Synonym: Crude Oil, Hydrocarbon Liquids, Treater Oil

Chemical Name & Formula: C5-C30+ Hydrocarbons

WHMIS Class: Class B, Division 2, Flammable Liquid

TDG Description: Class 3, UN 1267, Packing Group 3

SECTION 2 COMPOSITION

Ingredients	% W/W	CAS Number	UN Number	Exposure Limits(ppm)
Butane	0.15-0.40	106-97-8	1011	800
Pentane	3.50-4.00	109-66-0	1265	600
Hexanes	2.50-3.00	110-54-3	1208	*
Heptanes	2.00-2.50	142-82-5	1206	400
Octanes	2.25-2.75	111-65-9	1262	300
Benzene	0.20-0.40	71-43-2	1114	1(skin)
Toluene	0.75-1.25	108-88-3	1294	100(skin)
Xylenes	0.75-1.00	106-42-3	1307	100
1,2,4 TMBenzene	0.15-0.25	95-63-6	2325	25
MethylCyclopentane	0.50-0.75	96-37-7	2298	n. av.
Cyclohexane	0.75-1.00	110-82-7	1145	300
Methyl Cyclohexane	1.25-1.75	108-87-2	2296	400
Ethylbenzene	0.05-0.15	100-41-4	1175	100

*Note: nHexane 8 hour OEL = 50 ppm Isomers = 500 ppm

SECTION 3 – PHYSICAL DATA

Physical State: Liquid	Odour and Appearance: Viscous liquid Black	Odour Threshold: n. av.
Vapour Pressure: 12 kPa calc.	Vapour Density: (Air = 1) >3.0	Evaporation Rate: <1
Boiling Point: 35 ->716 °C	Pour Point: -45 C	Critical Temperature n. av.
Specific Gravity: (Water = 1) 0.914	Solubility in Water: Not Soluble	Coeff. of Water/Oil Dist.: <1

SECTION 4 – REACTIVITY, FIRE AND EXPLOSIVE DATA

Flash Point:
<-35 °C (est)

Auto Ignition:
537 est

LEL/UEL%:
n. ap.

Hazardous Combustion Products:
CO2, NOx, CO, SO_2

Sensitivity to Mechanical Impact:
Not Sensitive

Sensitivity to Static Electricity:
Static Spark may cause Ignition

Flammability:
Flammable

Fire Fighting Procedures – Means of Extinguishing:
DRY CHEMICAL, WATER FOG, FOAM, SHUT FUEL SUPPLY OFF

Special Fire Fighting Procedures: n. ap.

Chemical Stability: Stable Mixture

Hazardous Polymerisation:
Will not occur

Sensitivity to Mechanical Impact: Not sensitive

Incompatibility:
Strong Oxidizing Agents

Reactivity: Chlorine Dioxide

SECTION 5 – TOXICOGICAL PROPERTIES

Routes of Entry:

Inhalation: X

Eye Contact: X

Skin Contact: X.

Ingestion: n. ap.

Effects of Acute Exposure:

Inhalation – Primary route of exposure. High vapour concentrations are irritating to the eyes, nose, throat and lungs. May cause headaches, and dizziness. May be anesthetic and may cause other central nervous system effects.

Skin/Eye Contact – May cause eye and/or skin irritation

Ingestion – n. ap.

Effects of Chronic Exposure:

	Specific Species & Route	
Ingredients	LD50 OF INGREDIENT	LC50 OF INGREDIENT
Butane	n. av.	6583 ppm - rats
Pentane	446 ppm IVN mouse	n. av.
Hexanes	28710 mg/kg oral rat	n. av.
Heptanes	n. av.	n. av.
Octanes	n. av.	n. av.
Nonanes	218 mg/kg (IVN mouse)	3200 ppm (4 hr INH rat)
Benzene	930 mg/kg oral rat	13,228 ppm rat
Toluene	7.53 g/kg (oral rat)	n. av.
Xylenes	7.71 mL/kg (oral rat)	n. av.
1,2,4 Trimethylbenzene	n. av.	n. av.
Methyl Cyclopentane	n. av.	n. av.
Cyclohexane	n. av.	n. av.
Methyl Cyclohexane	3.8 mL/kg (oral rat)	41500 mg/m^3 (2 hr INH mouse)
Ethylbenzene	3500 mg/kg (oral rat)	n .av.
Benzene	930 mg/kg oral rat	13,228 ppm rat

Exposure Limits:
(8 hours) Occupational Exposure Limit
See list

Carcinogenicity:
Contains small amount of Benzene, a known carcinogen

Reproductive Effects:
n. av.

Synergistic Materials:
n. av.

Sensitizing Capabilities:
n. av.

SECTION 6 – PREVENTATIVE MEASURES

Engineering Controls: USE EXPLOSION-PROOF VENTILATION TO CONTROL VAPOUR CONCENTRATION, FOR PERSONNEL ENTRY INTO CONFINED SPACE, ENTRY PROCEDURE MUST INCLUDE VENTILATION AND TESTING OF ATMOSPHERE. MAKE UP AIR MUST BE SUPPLIED TO BALANCE AIR EXHAUSTED.

Personal Protective Equipment:

Respiratory Protection: SCBA should be worn in areas of insufficient oxygen or when H_2S levels exceed 15 ppm.

Body Protection: Flame retardant clothing should be worn,

Eye Protection: Safety glasses with side shields

Leak and Spill Handling: ELIMINATE SOURCE OF IGNITION. PREVENT ADDITIONAL DISCHARGE OF MATERIAL. EVACUATE PERSONNEL NOT EQUIPPED WITH PROTECTIVE CLOTHING AND NIOSH APPROVED RESPIRATORY EQUIPMENT. CONTAIN SPILL WITH NONCOMBUSTABLE ABSORBENTS.

Environmental Effects and Hazards: CONSULT AN EXPERT AND ENSURE DISPOSAL IS IN COMPLIANCE WITH GOVERNMENT REQUIREMENTS.

Handling Procedure and Equipment: KEEP CONTAINERS CLOSED. STORE IN COOL, WELL VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERIALS. DO NOT PRESSURIZE, HEAT, OR WELD EMPTY CONTAINERS. KEEP AWAY FROM OPEN FLAMES AND USE PROPER GROUNDING PROCEDURES.

Storage Requirements: STORE IN COOL, WELL VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERIALS.

Special Shipping Information:

Per Transportation of Dangerous Goods Legislation.

SECTION 7 - FIRST AID MEASURES

Inhalation: IN EMERGENCY SITUATIONS USE PROPER RESPIRATORY PROTECTION AND IMMEDIATELY REMOVE THE VICTIM FROM EXPOSURE. ADMINISTER ARTIFICIAL RESPIRATION IF BREATHING HAS STOPPED. KEEP AT REST AND CALL FOR MEDICAL ATTENTION:

Skin Contact: FLUSH AREA WITH LARGE AMOUNTS OF WATER AND USE SOAP IF AVAILABLE. REMOVE SEVERELY CONTAMINATED CLOTHING AND LAUNDER BEFORE REUSE.

Eye Contact: FLUSH EYES WITH LARGE AMOUNTS OF WATER UNTIL IRRITATION SUBSIDES. CALL FOR MEDICAL ATTENTION IF IRRITATION PERSISTS.

SECTION 8 – PREPARATION INFORMATION

Prepared by: Maxxam Analytics Inc.

Reference: GPSA SI Engineering Data Book

Date Prepared 2010-11-09

This MSDS information was developed for employees, customers and agents of Statoil Canada Ltd. to provide safety information of the described product or material. The information may not be valid or complete if the product or material is used in combination with other products or materials, or in any process. This information is intended for reasonable normal usage and recommended practices, or does underscore the hazard inherent in the nature of the product or material. Although every effort is made to insure accuracy and completeness of the contained information, it is understood that Statoil Canada Ltd. makes no warranty as to the accuracy or completeness of information and assumes no liability or any damage or loss suffered as result of any inaccuracy or incompleteness therein. This information is considered to accurate as of the date of preparation. Updated information will be forwarded to employees, customers or agents, however the reader is invited to contact Statoil Canada Ltd. at the address shown to insure the most up to date information or obtain information related to an unusual or other use.

n. ap. = not applicable
n. av. = not available
calc. = calculated
est. = estimated

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-07-29
Supersedes: 2007-07-09


Class B2 Flammable Liquid


Class D2B Skin Irritation


Class D2A Embryo/Fetotoxicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**SEAL HEAVY CRUDE OIL**
SYNONYMS:	Crude oil is a naturally occurring mixture of paraffins, naphthenes, aromatic hydrocarbons, small amounts of sulphur and nitrogen compounds.
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**9500-145**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS	
Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Petroleum - Crude Oil	8002-05-9	100	Yes
Xylene (Mixed Isomers)	1330-20-7	0.1 - 1.0	Yes
Hydrogen Sulfide (H2S)	7783-06-4	< 10 ppm	Yes

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Mild Hydrocarbon Odour

Routes of Exposure: Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.

Hazards:

Flammable Liquid.
Irritating to skin.
Contains xylene, which may affect fetal development.

Handling:	Eliminate all ignition sources. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames. Avoid prolonged exposure to vapours. Wear suitable gloves and eye protection.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes:	Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.
Skin:	Wipe excess from skin. Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.
Ingestion:	Do not induce vomiting; get medical help immediately. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Do not give anything by mouth to an unconscious person.
Inhalation:	Remove victim from further exposure and restore breathing, if required. Obtain medical attention.
Notes to Physician:	The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis.

5. FIRE FIGHTING MEASURES

Extinguishing Media:	Dry Chemical Carbon Dioxide Foam Water Fog
Firefighting Instructions:	Flammable. Avoid inhalation of smoke. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Vapours may travel along ground and flashback along vapour trail may occur. Product will float and can be reignited on surface of water. Do not use a direct stream of water as it may spread fire. Containers exposed to intense heat may rupture. Use water to cool fire exposed containers. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure.
Hazardous Combustion Products:	A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon dioxide, carbon monoxide and unidentified organic compounds may be formed upon combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". Isolate hazard area and restrict access. Wear appropriate breathing apparatus (if applicable) and protective clothing. Eliminate all ignition sources. Handling equipment must be grounded. Avoid direct contact with material. Stop leak only if safe to do so. Dike and contain land spills; contain spills

to water by booming. Work upwind of spill if it is safe to do so. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. Use water fog to knock down vapours; contain runoff. Notify appropriate environmental agency(ies). After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Avoid excessive heat, sparks, open flames and all other sources of ignition. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Vapours may accumulate and travel to distant ignition sources and flashback. Vapours are heavier than air and will settle and collect in low areas and pits, displacing breathing air. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Do not pressurize drum containers to empty them. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Launder contaminated clothing prior to reuse. Use good personal hygiene.

Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Keep container tightly closed.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):

The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Hydrogen Sulfide: 1 ppm (STEL: 5 ppm)
Xylene: 100 ppm (STEL: 150 ppm)

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere. Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes. Provide an eyewash station in the area.

Skin Protection: Impervious gloves (viton, nitrile) should be worn at all times when handling this material. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Safety showers should be available for emergency use.

Respiratory Protection: If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Use a NIOSH-approved chemical cartridge respirator with organic vapour

cartridges or use a NIOSH-approved supplied-air respirator. For high airborne concentrations, use a NIOSH-approved supplied-air respirator, either self-contained or airline breathing apparatus, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Mild Hydrocarbon Odour
Boiling Point:	> 25 - 600 °C
Density:	932 kg/m3 @ 15 °C
Vapour Density (Air = 1):	Not available
Vapour Pressure (absolute):	Not available
pH:	Not available
Flash Point:	Not available
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	251 mm2/s @ 15 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon solvents (benzene, ether, chloroform)

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	Thermal decomposition products are highly dependent on combustion conditions.
Incompatible Materials:	Avoid strong oxidizing agents.
Conditions of Reactivity:	Avoid excessive heat, open flames and all ignition sources.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Petroleum - Crude Oil	LD50 Oral Rat > 4300 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Hydrogen Sulfide (H2S)	LC50 Inhalation Mouse = 673 ppm for 1 hour LC50 Inhalation Rat = 444 ppm for 4 hours

Routes of Exposure: Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.

Irritancy:	Based on the ingredients, this product is expected to be irritating to skin.
Feto/Teratogenicity:	High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.
Pre-existing Conditions:	Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.
Carcinogenicity and Mutagenicity:	The International Agency for Research on Cancer (IARC) indicates that there is little evidence for the carcinogenicity in humans of crude oil. Various components of crude oil have been tested independently and have been shown to cause serious long-term effects.

12. ECOLOGICAL INFORMATION

Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Block off drains and ditches. May cause physical fouling of aquatic and avian organisms.

Biodegradability: Not available.
Bioaccumulation: Not available.
Partition Coefficient (log K_{OW}): Not available

Ingredient:	Toxicological Data
Petroleum - Crude Oil	
Xylene (Mixed Isomers)	LL50 Rainbow Trout (96hr) 1 - 10 mg/L. EL50 Daphnia Magna (48hr) 1 - 10 mg/L.
Hydrogen Sulfide (H2S)	LL50 Rainbow Trout (96hr) < 1 mg/L. EL50 Daphnia Magna (48hr) < 1 mg/L. EL50 - growth rate Algae (72hr) < 1 mg/L.

Definition(s): LL and EL are the lethal loading concentration and effective loading concentration respectively. The concentration represents the amount of substance added to the system to obtain a toxic concentration. They replace the traditional LC and EC for low solubility substances.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1267
Proper Shipping Name	PETROLEUM CRUDE OIL
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG II
Additional Information	Classification as PG II determined in accordance with TDGR 2.19 (2) (b).
Shipping Description	PETROLEUM CRUDE OIL Class 3 UN1267 PG II

Classification as PG II determined in accordance with TDGR 2.19 (2) (b).

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:	Class B2 Flammable Liquid Class D2B Skin Irritation Class D2A Embryo/Fetotoxicity
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Flammable Liquid. Irritating to skin. Contains xylene, which may affect fetal development.
Handling Statement:	Eliminate all ignition sources. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames. Avoid prolonged exposure to vapours. Wear suitable gloves and eye protection.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention.
Revisions:	This MSDS has been reviewed and updated. Changes have been made to: Section 1 Section 3 Section 4 Section 5 Section 6 Section 7 Section 8 Section 10 Section 11 Section 15

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-11-30
Supersedes: 2010-03-31



Class B2 Flammable Liquid



Class D2B Skin Irritation



Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**SHELL SYNTHETIC BLEND**
SYNONYMS:	SSX Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**9200-100**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Hydrocracked Residues	64741-75-9	0 - 100	Yes
Gas Oils (Petroleum), Heavy Atmospheric	68783-08-4	0 - 100	Yes
Distillates (Petroleum), Hydrotreated Middle	64742-46-7	0 - 30	Yes
Naphtha (Petroleum), Hydrotreated Heavy	64742-48-9	0 - 30	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 10	Yes
Xylene (Mixed Isomers)	1330-20-7	1 - 2	Yes
Benzene	71-43-2	< 1.6	Yes
n-Hexane	110-54-3	< 1	Yes
Toluene	108-88-3	< 1	Yes
Naphtha (petroleum), heavy straight-	64741-41-9	0 - 5	Yes

run			
Naphtha, heavy hydrocracked	64741-78-2	0 - 5	Yes
Ethylbenzene	100-41-4	< 0.1	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:

Flammable Liquid.
Irritating to skin.
May cause cancer.
Contains xylene, which may affect fetal development.
Exposure to vapours may cause irritation of the eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:

Eliminate all ignition sources.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
Avoid inhalation of vapours.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: Treatment of exposure should be directed at the control of symptoms and the clinical condition.

5. FIRE FIGHTING MEASURES

Extinguishing Media:

Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Clear area of unprotected personnel. Do not use a direct stream of water as it may spread fire. Vapours may travel along ground and flashback along vapour trail may occur. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Xylene: 100 ppm (STEL: 150 ppm)
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total

exposure.
Gasoline: 300 ppm (STEL: 500 ppm)
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	-15 - 590 °C
Density:	860 - 900 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.86 - 0.9
pH:	Not available
Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	16 mm2/s @ 30 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable: Yes
Hazardous Polymerization: No
Sensitive to Mechanical Impact: No
Sensitive to Static Discharge: Yes
Hazardous Decomposition Products: When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials: Avoid strong oxidizing agents.
Conditions of Reactivity: Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Hydrocracked Residues	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Gas Oils (Petroleum), Heavy Atmospheric	
Distillates (Petroleum), Hydrotreated Middle	LD50 Dermal Rat > 2000 mg/kg LD50 Oral Rat > 5000 mg/kg
Naphtha (Petroleum), Hydrotreated Heavy	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 3160 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
n-Hexane	LD50 Oral Rat > 8 mL/kg LD50 Dermal Rat > 4 mL/kg LC50 Inhalation Rat = 54090 - 57000 ppm for 4 hours
Toluene	LD50 Oral Rat 5580 mg/kg LC50 Inhalation Rat 26700 ppm for 1 hour LD50 Dermal Rabbit 12400 mg/kg
Naphtha (petroleum), heavy straight-run	LC50 Inhalation Rat > 5000 mg/m3 for 4hours
Naphtha, heavy hydrocracked	LC50 Inhalation Rat > 5240 mg/m3 for 4hours LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Irritancy: Based on the ingredients, this product is expected to be irritating to skin.
Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Long term intensive exposure to oil mist may cause benign lung

fibrosis. Myelodysplastic syndrome (MDS) has been observed in people exposed to very high levels (50 to 300 ppm) of benzene over a long period of time in the workplace. The relevance of these results to lower levels of exposure is not known.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. This product contains benzene. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes.

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products*

***Regulations* (CPR) and the MSDS contains all the information required by the CPR.**

WHMIS Class:	Class B2 Flammable Liquid Class D2B Skin Irritation Class D2A Embryo/Fetotoxicity Class D2A Carcinogenicity
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Flammable Liquid. Irritating to skin. May cause cancer. Contains xylene, which may affect fetal development.
Handling Statement:	Eliminate all ignition sources. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames. Avoid inhalation of vapours.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention.
Revisions:	This MSDS has been reviewed and updated. Changes have been made to: Section 2 Section 8 Section 11 Section 15

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2011-08-25
Supersedes: 2008-09-03



Class D1A Very Acutely Toxic Material



Class B2 Flammable Liquid
Class B1 Flammable Gas



Class D2A Carcinogenicity
Class D2A Embryo/Fetotoxicity
Class D2B Chronic Toxic Effects

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: **SOUR PRODUCED GAS, SOUR PRODUCED WATER, SOUR CRUDE OIL**
PRODUCT USE: Gas plant intermediate
PRODUCT CODE: **9050-122**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. HAZARDS IDENTIFICATION

Physical Description: Liquid and gas phases Rotten egg odour
Routes of Exposure: Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.

Hazards:

Exposure to hydrogen sulphide can result in irritation to eyes and respiratory tract.
Hydrogen sulphide acts as a cellular poison and overexposure may result in loss of consciousness and possible death.
Compressed Gas.
Flammable Liquid.
Flammable Gas.
Contains Hydrogen Sulfide.
Single high level exposures may lead to immediate and serious health effects.
Contains Benzene.
May cause cancer.
Contains xylene, which may affect fetal development.
Prolonged exposure may cause serious health effects.
Exposure to this product can produce damage to the:
Nervous system.

May be irritating to eyes.
Ingestion may result in vomiting. Avoid aspiration of vomitus into lungs as small quantities may result in aspiration pneumonitis.
May be absorbed by skin contact. Overexposure to hydrogen sulphide can result in irritation of the skin.
Inhaled H2S may cause central nervous system depression resulting in headache, dizziness, nausea, unconsciousness, and death. Supplied air respiratory protection must be worn if the airborne H2S concentration is greater than 20 ppm. Hydrogen sulphide, at 150 ppm or greater, may deaden sense of smell. Hydrogen sulphide (H2S) may arise from excessive heating, agitation or from contact with acids or acid salts. Excessive exposure to benzene may cause leukemia in man.

Handling: Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
Minimize skin contact.

For further information on health effects, see Section 11.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Methane	74-82-8	1 - 76	Yes
Hydrocarbons, C6 - C30	69430-33-7	1 - 75	Yes
Ethane	74-84-0	1 - 12	Yes
Propane	74-98-6	1 - 5	Yes
Xylene (Mixed Isomers)	1330-20-7	1 - 5	Yes
Butane (n-Butane)	106-97-8	1 - 5	Yes
Benzene	71-43-2	0.1 - 1	Yes
Hydrogen Sulfide (H2S)	7783-06-4	< 50 ppm	Yes

See Section 8 for Occupational Exposure Guidelines.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. Obtain medical attention as soon as possible after first aid has been initiated and completed.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: DO NOT INDUCE VOMITING! OBTAIN MEDICAL ATTENTION IMMEDIATELY.
Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.

Inhalation: Remove victim from further exposure and restore breathing, if required. Take proper precautions to ensure your own safety before attempting rescue. Obtain medical attention immediately.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the

lungs producing chemical pneumonitis. If symptoms such as loss of gag reflex, convulsions or unconsciousness occur before vomiting, gastric lavage with a cuffed endotracheal tube should be considered. At high concentrations, hydrocarbon gases may cause cardiac sensitization and arrhythmia. This effect may be enhanced by stress and hypoxia. Administration of oxygen is recommended.

5. FIRE FIGHTING MEASURES

Extinguishing Media:	Carbon Dioxide Dry Chemical Foam Water Fog
Firefighting Instructions:	Flammable. Extremely toxic. Evacuate hazard area. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Allow gas to burn if flow cannot be shut off safely. Fight fire from maximum distance. Avoid breathing vapours. Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Collects in lower, poorly ventilated areas. Vapours may travel along ground and flashback along vapour trail may occur. Use water fog to disperse vapours. Containers exposed to intense heat may rupture. Use water to cool fire exposed containers. Exposure to these gases can cause severe lung damage and may cause death. Avoid inhalation of smoke.
Hazardous Combustion Products:	Carbon dioxide, carbon monoxide and unidentified organic compounds may be formed upon combustion. Oxides of sulphur on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". Be alert for the presence of hydrogen sulphide gas. Eliminate all ignition sources. Isolate hazard area and restrict access. Wear appropriate breathing apparatus (if applicable) and protective clothing. Avoid direct contact with material. Handling equipment must be grounded. Stop leak only if safe to do so. Dike and contain land spills; contain spills to water by booming. Use water fog to knock down vapours; contain runoff. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. Notify appropriate environmental agency(ies). After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Use buddy system; avoid working alone. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Vapours may accumulate and travel to distant ignition sources and flashback. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Hydrogen sulphide may readily cause pipes and valves to corrode or become brittle. Do not pressurize drum containers to empty them. Provide adequate ventilation. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Launder contaminated clothing prior to reuse.

Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Protect against physical damage to containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):

The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Xylene: 100 ppm (STEL: 150 ppm)
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.
Hydrogen Sulfide: 1 ppm (STEL: 5 ppm)
n-Hexane (skin): 50 ppm
Toluene: 20 ppm
Aliphatic Hydrocarbon Gases Alkane (C1 - C4): 1000 ppm

Mechanical Ventilation:	Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. Make up air should always be supplied to balance air exhausted (either generally or locally). For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection:	Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes. Provide an eyewash station in the area.
Skin Protection:	Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. Impervious clothing (apron, coveralls) should also be worn in confined workspaces or where the risk of skin exposure is much higher. Safety showers should be available for emergency use.
Respiratory Protection:	If exposure has the potential to exceed occupational exposure limits, use an appropriate NIOSH-approved respirator. Supplied air respiratory protection must be worn if the airborne H2S concentration is greater than 10 ppm. Avoid working alone; use the buddy system.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid and gas phases
Odour:	Rotten egg odour
Odour Threshold:	Not available
Freezing/Pour Point:	Not available
Boiling Point:	Not available

Density:	799 - 837 kg/m3 @ 15 °C
Vapour Density (Air = 1):	Not available
Vapour Pressure (absolute):	Not available
pH:	Not available
Flash Point:	Not available
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	Not available
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Negligible
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	When heated to decomposition may emit toxic and corrosive fumes of sulfur oxides.
Incompatible Materials:	Avoid contact with strong oxidizing agents and acids. Avoid Metal oxides Metals.
Conditions of Reactivity:	Avoid excessive heat, open flames and all ignition sources. May explode if ignited in an enclosed area.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Methane	
Hydrocarbons, C6 - C30	
Ethane	
Propane	LD50 Dermal Rat = 658 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Butane (n-Butane)	LC50 Inhalation Mouse = 680000 mg/m3 for 2 hours LC50 Inhalation Rat = 658000 mg/m3 for 4hours
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Hydrogen Sulfide (H2S)	LC50 Inhalation Mouse = 673 ppm for 1 hour LC50 Inhalation Rat = 444 ppm for 4 hours

Routes of Exposure: Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.

Formulation: No data is specifically available for this product and therefore this toxicological information is based on data available for the ingredients. This product contains n-hexane.

Acute Toxicity: Exposure to hydrogen sulphide can result in irritation to eyes and respiratory tract. Hydrogen sulphide acts as a cellular poison and overexposure may result in loss of consciousness and possible death.

Chronic Effects: Prolonged and repeated contact with skin can cause defatting and drying of the skin resulting in skin irritation and dermatitis. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Prolonged and repeated exposure may cause serious injury to blood forming organs, resulting in anemia and similar conditions. Prolonged exposure over a period of weeks or months to levels well above the TLV may cause neurotoxic disease, with symptoms including weakness and lack of sensation in hands and feet. Peripheral neurotoxicity has been reported in connection with over exposure to n-hexane. Peripheral nerve damage may be evidenced by muscular weakness and loss of sensation in the arms and legs.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.

Pre-existing Conditions: Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.

Carcinogenicity and Mutagenicity: This product contains benzene. Carcinogenic hazard. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes.

12. ECOLOGICAL INFORMATION

Notify authorities if any exposure to the general public or environment occurs or is likely to occur. Provincial regulations require and federal regulations may require that environmental and/or other agencies be notified of a spill incident. Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Spill area must be cleaned and restored to original condition or to the satisfaction of authorities.

Biodegradability: Not available.
Rapid volatilization.

Bioaccumulation: Not available.

Partition Coefficient (log K_{OW}): Not available

Aquatic Toxicity: Product is expected to be toxic to aquatic organisms.

Ingredient:	Toxicological Data
Methane	LL50 Rainbow Trout (96hr) > 100 mg/L. EL50 Daphnia Magna (48hr) > 100 mg/L. EL50 - growth rate Algae (72hr) > 100 mg/L.
Hydrocarbons, C6 - C30	
Ethane	LL50 Rainbow Trout (96hr) > 100 mg/L. EL50 Daphnia Magna (48hr) > 100 mg/L. EL50 - growth rate Algae (72hr) > 100 mg/L.

Propane	EL50 Daphnia Magna (48hr) > 100 mg/L. LL50 Rainbow Trout (96hr) > 100 mg/L. EL50 - growth rate Algae (72hr) > 100 mg/L.
Xylene (Mixed Isomers)	LL50 Rainbow Trout (96hr) 1 - 10 mg/L. EL50 Daphnia Magna (48hr) 1 - 10 mg/L.
Butane (n-Butane)	LC50 Inhalation Rainbow Trout (96hr) 10 - 100 mg/L. EL50 - growth rate Daphnia Magna (48hr) 10 - 100 mg/L.
Benzene	LL50 Rainbow Trout (96hr) 1 - 10 mg/L. EL50 Daphnia Magna (48hr) 10 - 100 mg/L. EL50 - growth rate Algae (72hr) 10 - 100 mg/L.
Hydrogen Sulfide (H2S)	LL50 Rainbow Trout (96hr) < 1 mg/L. EL50 Daphnia Magna (48hr) < 1 mg/L. EL50 - growth rate Algae (72hr) < 1 mg/L.

Definition(s): LL and EL are the lethal loading concentration and effective loading concentration respectively. The concentration represents the amount of substance added to the system to obtain a toxic concentration. They replace the traditional LC and EC for low solubility substances.
WAF is the water accommodated fraction. A slightly soluble hydrocarbon is stirred into water and the insoluble portions are removed. The remaining solution is the water accommodated fraction.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:
THE TDG classification for this product is not available.

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:
Class D1A Very Acutely Toxic Material
Class B2 Flammable Liquid
Class B1 Flammable Gas
Class D2A Carcinogenicity
Class D2A Embryo/Fetotoxicity
Class D2B Chronic Toxic Effects

DSL/NDSL Status: This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.

Other Regulatory Status: Provincial criteria are likely and should be requested when notifying provincial authorities. The regulatory information is not intended to be

comprehensive. Other regulations may apply to this material.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Compressed Gas. Flammable Liquid. Flammable Gas. Contains Hydrogen Sulfide. Single high level exposures may lead to immediate and serious health effects. Contains Benzene. May cause cancer. Contains xylene, which may affect fetal development. Prolonged exposure may cause serious health effects. Exposure to this product can produce damage to the: Nervous system.
Handling Statement:	Eliminate all ignition sources. Avoid inhalation of vapours. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames. Minimize skin contact.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention IMMEDIATELY.
Revisions:	This MSDS has been reviewed and updated.

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SUNCOR OSA

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	* 2 (chronic health hazard)
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSA

Product type : Suncor Product
MSDS Number : V00000000948
Synonyms : Sweet Crude Oil, Blended Synthetic Oil, Petroleum Crude

Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc., Oil Sands
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3
Telephone : (780)790-7001

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Gas oils (oil sand), hydrotreated	128683-29-4	60 - 70 %
FUEL, DIESEL NO.2	68476-34-6	10 - 25 %
Naphtha (oil sand), hydrotreated	128683-33-0	10 - 25 %
BUTANE	106-97-8	0 - 3 %

SECTION 3: HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Highly flammable.Avoid breathing vapors, mist or gas.Vapor

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accumulation could flash and/or explode if in contact with open flame.Exposure to fire can generate highly toxic fumes.

Potential Health Effects

Eyes	:	May cause eye irritation.
Skin	:	May cause skin irritation. Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
Inhalation	:	May cause respiratory tract irritation. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. High concentration of vapours may induce unconsciousness.
Ingestion	:	Ingestion may cause irritation to mucous membranes. Aspiration hazard if swallowed - can enter lungs and cause damage.
Chronic Exposure	:	May damage the peripheral nervous system. Symptoms include tingling sensations in fingers and toes and muscle weakness.
Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system
Carcinogenic Effects	:	ACGIH A3 - Confirmed Animal Carcinogen

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Seek medical advice. Wash clothing before reuse. Thoroughly clean shoes before reuse.

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Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	< -35 °C (< -31 °F) Method: ASTM D 93
Autoignition temperature	:	247 °C (477 °F) Method: ASTM E659
Lower explosion limit	:	0.41 %(V) Method: ASTM E681
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Vapors can accumulate and travel to distant ignition sources and flash back. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product.
Explosibility in Presence of	:	Explosive reaction may occur on heating or burning.
Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, nitrogen oxides

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical, Water fog.
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition.

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Ensure adequate ventilation.
Turn off source, if possible.
Soak up with inert absorbent material.
Keep in suitable, closed containers for disposal.

SECTION 7: HANDLING AND STORAGE

Handling Precautions

Handling : Keep away from open flames, hot surfaces and sources of ignition.
Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits.
When transferring from one container to another apply earthing measures and use conductive hose material.

Storage

Advice on mixed storage : Store in a cool, well ventilated area away from incompatible materials.
Storage tank should be vented to atmosphere.
To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.
A containment dike should be built around tank.
Small quantities should be stored in an approved safety solvent container.
Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures : Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.

Eye protection : Chemical resistant goggles must be worn.

Hand protection : Wear gloves as a standard industrial handling procedure.
The following materials are acceptable:
Neoprene
Nitrile rubber

Skin and body protection : Wear long sleeve clothing or coveralls.
Wear as appropriate:
A neoprene or nitrile rain suit may be needed in certain situations.
(e.g., vessel cleaning).

Respiratory protection : When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

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Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit.
Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm.
Use an air-supplied or self-contained breathing apparatus in confined spaces or in emergency or high-exposure situations.

Hygiene measures : Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

FUEL, DIESEL NO.2	68476-34-6	CAD ON OEL	TWA	100 mg/m3	
		Expressed as		as total hydrocarbons	
		Form of exposure		Vapor and aerosol.	
		ACGIH	TWA	100 mg/m3	
		Expressed as		as total hydrocarbons	
		Form of exposure		Vapor and aerosol.	
BUTANE	106-97-8	CAD AB OEL	TWA	800 ppm	1,900 mg/m3
		NIOSH	REL	800 ppm	1,900 mg/m3
		ACGIH	TWA	1,000 ppm	
		CAD ON OEL	TWA	800 ppm	1,900 mg/m3
		CAD ON OEL	TWA	1,000 ppm	

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.
Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	: amber
Odour	: Petroleum Spirits
Physical state	: liquid
Boiling point/boiling range	: 30 - 550 °C (86 - 1,022 °F) Method: ASTM D6352
Evaporation rate	: 1.1 compared to Butyl Acetate
Density	: 0.86 - 0.87 g/cm3
Specific gravity	: 0.86 - 0.87
Water solubility	: insoluble
Partition coefficient: n-octanol/water	: POW: < 1
Viscosity, kinematic	: 4.4 mm2/s at 30 °C (86 °F)

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3.5 mm2/s at 40 °C (104 °F)

2.9 mm2/s at 50 °C (122 °F)
Method: ASTM D 445

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	static charge will ignite rising vapor
Materials to avoid	:	Incompatible with oxidizing agents.
Hazardous decomposition products	:	Carbon monoxide carbon dioxide Hydrocarbons
Hazardous reactions	:	Hazardous polymerisation does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Further information	:	There is no data available for this product.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

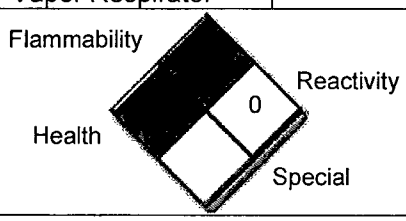
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	UN-Number	: 1267
	Class	: 3
	Packing group	: I
TDG	Proper shipping name	: PETROLEUM CRUDE OIL
	UN-Number	: 1267
	Class	: 3
	Packing group	: I
IATA	UN Number	: 1267
	Description of the goods	: PETROLEUM CRUDE OIL
	Class	: 3

TM/MC Marque de commerce de Suncor Énergie Inc. – Trademark

	Packaging group	: I
	ADR/RID-Labels	: 3
	Packing instruction (cargo aircraft)	: 303
	Packing instruction (passenger aircraft)	: 302
IMDG	Substance No.	: UN 1267
	Description of the goods	: PETROLEUM CRUDE OIL
	Class	: 3
	Packaging group	: I
	ADR/RID-Labels	: 3
	EmS Number	: F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	* 2 (chronic health hazard)
Flammability	3
Physical Hazard	0
Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)



DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 05/31/2012

References : This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the

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CPR.

Validation date of previous version	:	06/16/2009
General contact information	:	B. Burrell: (519) 383-3657

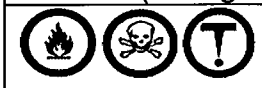
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SUNCOR ENERGY

Material Safety Data Sheet

SUNCOR OSB

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D1A - Materials causing immediate and serious toxic effects, Very Toxic Material D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	2
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSB
Product type : Suncor Product
MSDS Number : V00000003973
Synonyms : Sour Bitumen Blend
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
BITUMEN	128683-24-9	40 - 60 %
Light Vacuum Gas Oil	64741-58-8	25 - 40 %
Naphtha (oil sand)	128683-32-9	10 - 20 %
Naphtha (oil sand), hydrotreated	128683-33-0	10 - 20 %
HYDROGEN SULPHIDE	7783-06-4	0 - 40 PPM
sec-Butyl Mercaptan	513-53-1	50 - 300 PPM
1-Propanethiol	107-03-9	30 - 120 PPM
ETHANETHIOL	75-08-1	30 - 120 PPM
Isopropyl Mercaptan	75-33-2	20 - 80 PPM
Butyl Mercaptan	109-79-5	15 - 60 PPM

METHANETHIOL	74-93-1	5 - 30 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Highly flammable.Product may contain Hydrogen Sulfide.

Potential Health Effects

Eyes : May cause eye irritation.
Liquid may cause severe irritation, reddening and swelling.

Skin : Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
May cause irritation, drying and blistering.

Inhalation : Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.
May cause respiratory tract irritation.
Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath.
In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis.
Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.

Ingestion : May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness.
Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.

Chronic Exposure : Chronic exposure causes drying effect on the skin and eczema.
May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory.
May cause kidney damage and enlargement of the liver.

Primary Routes of Entry : Inhalation
Eye contact
Skin Absorption
Skin contact
Ingestion

Target Organs : Respiratory system
Central nervous system

Carcinogenic Effects	:	There is no data available for this product.

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water. For large exposures use a deluge shower.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	Estimated8 - 175 °C (46 - 347 °F)
Lower explosion limit	:	Note: no data available
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product. Increased risk of flammable or explosive concentrations if hydrogen sulfide builds up in unventilated spaces.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.
Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, Polycyclic Aromatic Hydrocarbons

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials. Storage tank should be vented to atmosphere. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. A containment dike should be built around tank. Small quantities should be stored in an approved safety solvent container. Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn. Wear face-shield if splashing hazard is likely.

Hand protection	:	Wear suitable gloves. The following materials are acceptable: Nitrile rubber Neoprene
Skin and body protection	:	Wear as appropriate: Long sleeved clothing A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	14 mg/m3
		CAD ON OEL	STEL	15 ppm	21 mg/m3
		ACGIH	TWA	10 ppm	
		ACGIH	STEL	15 ppm	
		ACGIH NIC	TWA	1 ppm	
		ACGIH NIC	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
1-Propanethiol	107-03-9	NIOSH	Ceil_Time	0.5 ppm	1.6 mg/m3
ETHANETHIOL	75-08-1	CAD AB OEL	TWA	0.5 ppm	1.3 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.3 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.3 mg/m3
		OSHA Z1	Ceiling	10 ppm	25 mg/m3
METHANETHIOL	74-93-1	CAD AB OEL	TWA	0.5 ppm	0.98 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1 mg/m3
		OSHA Z1	Ceiling	10 ppm	20 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.

Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	black
Odour	:	hydrocarbon-like
Physical state	:	liquid
Vapour pressure	:	11.8 kPa Method: ASTM D 323A
Density	:	0.92 - 0.94 g/cm3
Specific gravity	:	0.92 - 0.94
Water solubility	:	insoluble
Partition coefficient (n-octanol/water)	:	POW: < 1
Viscosity, kinematic	:	63.5 mm2/s at 40 °C (104 °F) 268.5 mm2/s at 15.5 °C (59.9 °F) Method: ASTM D 445

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Incompatible with oxidizing agents.
Hazardous decomposition products	:	Carbon monoxide carbon dioxide polycyclic aromatic hydrocarbons hydrogen sulfide sulfur dioxide
Hazardous reactions	:	Hazardous polymerization does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Skin irritation	:	rabbit Result: Mild skin irritation Method: OECD Test Guideline 404 Exposure time: 4 h Test substance: Bitumen
Eye irritation	:	rabbit Result: slight irritation Method: OECD Test Guideline 405

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : no data available

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal : Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

DOT

Proper shipping name	: Flammable liquid, n.o.s.
UN-No.	: 1993
Class	: 3
Packing group	: II

TDG

Proper shipping name	: Flammable liquid, n.o.s.
UN-No.	: 1993
Class	: 3
Packing group	: II

IATA

UN Number	: 1993
Description of the goods	: Flammable liquid, n.o.s.
Class	: 3
Packaging group	: II
ADR/RID-Labels	: 3
Packing instruction (cargo aircraft)	: 307
Packing instruction (passenger aircraft)	: 305
Packing instruction (passenger aircraft)	: Y305

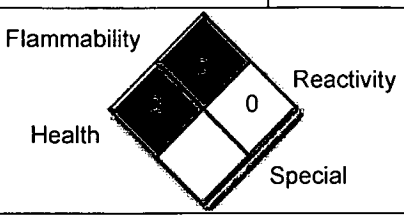
IMDG

Substance No.	: UN 1993
Description of the goods	: Flammable liquid, n.o.s.
Class	: 3
Packaging group	: II
ADR/RID-Labels	: 3
EmS Number	: F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	2
Flammability	3
Physical Hazard	0

Personal Protective Equipment	
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D1A - Materials causing immediate and serious toxic effects, Very Toxic Material, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)



TSCA Status : Listed on TSCA

Light Vacuum Gas Oil	64741-58-8
HYDROGEN SULPHIDE	7783-06-4
sec-Butyl Mercaptan	513-53-1
1-Propanethiol	107-03-9
ETHANETHIOL	75-08-1
Isopropyl Mercaptan	75-33-2
Butyl Mercaptan	109-79-5
METHANETHIOL	74-93-1

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 02/13/2007

References : Maxxam Analytics Inc. analysis, 2002
Hazelton Wisconsin, Primary Dermal Irritation/Corrosion Study of Bitumen in Rabbits (OECD Guidelines), January 22, 1991
Hazelton Wisconsin, Primary Eye Irritation/Corrosion Study of Bitumen in Rabbits (OECD Guidelines), January 22, 1991

General contact information : B. Burrell: (519) 383-3657

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SUNCOR ENERGY

SUNCOR OSC

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	2
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSC
Product type : Suncor Product
MSDS Number : V00000005743
Synonyms : Sweet Crude Oil, Synthetic Crude Oil, Petroleum Crude
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Gas oils (oil sand), hydrotreated	128683-29-4	0 - 100 %
Naphtha (oil sand), hydrotreated	128683-33-0	0 - 100 %
DISTILLATES (PETROLEUM), HYDROTREATED MIDDLE	64742-46-7	0 - 100 %
BUTANE	106-97-8	0 - 3 %

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Highly flammable.Avoid breathing vapors, mist or gas.Vapor accumulation could flash and/or explode if in contact with open flame.Exposure to fire can generate highly toxic fumes.

Potential Health Effects

Eyes	:	May cause eye irritation.
Skin	:	May cause skin irritation. Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
Inhalation	:	May cause respiratory tract irritation. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. High concentration of vapours may induce unconsciousness.
Ingestion	:	Ingestion may cause irritation to mucous membranes. Aspiration hazard if swallowed - can enter lungs and cause damage.
Chronic Exposure	:	May damage the peripheral nervous system. Symptoms include tingling sensations in fingers and toes and muscle weakness.
Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system
Carcinogenic Effects	:	No data is available on the product itself.

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water. For large exposures use a deluge shower.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk

of aspiration.
Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	Estimated< -35 °C (< -31 °F)
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Vapors can accumulate and travel to distant ignition sources and flash back. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product.
Explosibility in Presence of	:	Explosive reaction may occur on heating or burning.
Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, nitrogen oxides

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical, Water fog.
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing

measures and use conductive hose material.

Storage

Advice on mixed storage : Store in a cool, well ventilated area away from incompatible materials.
Storage tank should be vented to atmosphere.
To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.
A containment dike should be built around tank.
Small quantities should be stored in an approved safety solvent container.
Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures : Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.

Eye protection : Chemical resistant goggles must be worn.

Hand protection : Wear suitable gloves.
The following materials are acceptable:
Neoprene
Nitrile rubber

Skin and body protection : Wear as appropriate:
Long sleeved clothing
A neoprene or nitrile rain suit may be needed in certain situations.
(e.g., vessel cleaning).

Respiratory protection : When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit.
Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm.
Use an air-supplied or self-contained breathing apparatus in confined spaces or in emergency or high-exposure situations.

Hygiene measures : Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

BUTANE	106-97-8	CAD AB OEL	TWA	800 ppm	1,900 mg/m3
		NIOSH	REL	800 ppm	1,900 mg/m3
		ACGIH	TWA	1,000 ppm	
		CAD ON OEL	TWA	800 ppm	1,900 mg/m3

CAD ON OEL TWA 1,000 ppm

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.

Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	amber
Odour	:	Petroleum Spirits
Physical state	:	liquid
Boiling point/range	:	Estimated 30 - 550 °C (86 - 1,022 °F)
Vapour pressure	:	Note: no data available
Density	:	Estimated 0.71 - 0.91 g/cm3
Specific gravity	:	Estimated 0.71 - 0.91
Water solubility	:	insoluble
Partition coefficient (n-octanol/water)	:	POW: < 1

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	static charge will ignite rising vapor
Materials to avoid	:	Incompatible with oxidizing agents.
Hazardous decomposition products	:	Carbon monoxide carbon dioxide Hydrocarbons
Hazardous reactions	:	Hazardous polymerization does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Further information	:	No data is available on the product itself.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

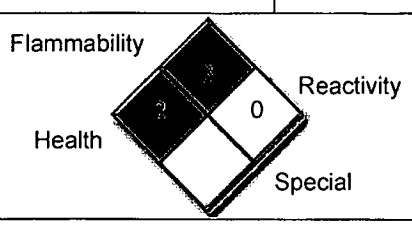
Advice on disposal : Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	: PETROLEUM CRUDE OIL
	UN-No.	: 1267
	Class	: 3
	Packing group	: I
TDG	Proper shipping name	: PETROLEUM CRUDE OIL
	UN-No.	: 1267
	Class	: 3
	Packing group	: I
IATA	UN Number	: 1267
	Description of the goods	: PETROLEUM CRUDE OIL
	Class	: 3
	Packaging group	: I
	ADR/RID-Labels	: 3
	Packing instruction (cargo aircraft)	: 303
	Packing instruction (passenger aircraft)	: 302
IMDG	Substance No.	: UN 1267
	Description of the goods	: PETROLEUM CRUDE OIL
	Class	: 3
	Packaging group	: I
	ADR/RID-Labels	: 3
	EmS Number	: F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	2
Flammability	3
Physical Hazard	0
Personal Protective Equipment	
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)



TSCA Status : Listed on TSCA

DISTILLATES (PETROLEUM), HYDROTREATED MIDDLE	64742-46-7
BUTANE	106-97-8

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 02/14/2007

References : Information derived from component Material Safety Data Sheets

General contact information : B. Burrell: (519) 383-3657

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SUNCOR ENERGY

Material Safety Data Sheet

SUNCOR OSH

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	2
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSH
Product type : Suncor Product
MSDS Number : V00000003972
Synonyms : Sour Crude Blend, Sour Crude Oil
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc., Oil Sands
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3
Telephone : (780) 790-7001 (24-hr)

EMERGENCY CONTACT INFORMATION

(780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
GAS OILS (PETROLEUM), HEAVY VACUUM	64741-57-7	75 - 85 %
Naphtha (oil sand), hydrotreated	128683-33-0	8 - 15 %
Light Vacuum Gas Oil	64741-58-8	0 - 15 %
HYDROGEN SULPHIDE	7783-06-4	0 - 20 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Flammable.May liberate highly toxic and flammable hydrogen sulfide gas.Avoid breathing vapors, mist or gas.

Potential Health Effects

Eyes	:	May cause eye irritation. Liquid may cause severe irritation, reddening and swelling.
Skin	:	May cause irritation, drying and blistering. Can be absorbed through the skin in toxic amounts resulting in vomiting, diarrhea, and respiratory disorders.
Inhalation	:	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. High concentration of vapours may induce unconsciousness. May cause respiratory tract irritation. Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath. In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis. Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.
Ingestion	:	May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness. Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.
Chronic Exposure	:	May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory. May cause kidney damage and enlargement of the liver. Chronic exposure causes drying effect on the skin and eczema.
Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system
Carcinogenic Effects	:	There is no data available for this product.

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Seek medical advice.

Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5: FIRE-FIGHTING MEASURES

Flash point	:	<-35 °C (-31 °F) Method: ASTM D 93
Autoignition temperature	:	267 °C (513 °F) Method: ASTM E659
Lower explosion limit	:	0.35 %(V) Method: ASTM E681
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product. Increased risk of flammable or explosive concentrations if hydrogen sulfide builds up in unventilated spaces.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.
Products of Combustion	:	sulfur dioxide, nitrogen oxides, Hydrogen sulphide, carbon monoxide, other toxic gases

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.
Further information	:	Do not extinguish with water unless flow can be stopped The use of water may spread fire. Do NOT use water jet. Do not cut, drill or weld empty containers.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials. Storage tank should be vented to atmosphere. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. A containment dike should be built around tank. Small quantities should be stored in an approved safety solvent container. Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn. Wear face-shield if splashing hazard is likely.

Hand protection	:	Wear suitable gloves. The following materials are acceptable: Nitrile rubber Neoprene polyvinyl alcohol
Skin and body protection	:	Wear as appropriate: Long sleeved clothing A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	14 mg/m3
		CAD ON OEL	STEL	15 ppm	21 mg/m3
		ACGIH	TWA	10 ppm	
		ACGIH	STEL	15 ppm	
		ACGIH NIC	TWA	1 ppm	
		ACGIH NIC	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.
Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	brown
Physical state	:	liquid
Boiling point/range	:	35 - 600 °C (95 - 1,112 °F) Method: ASTM D6352

Vapour pressure	:	18.4 kPa Method: ASTM D 323A
Density	:	0.9 - 0.94 g/cm3
Specific gravity	:	0.9 - 0.94
Water solubility	:	insoluble
Partition coefficient (n-octanol/water)	:	POW: < 1
Viscosity, kinematic	:	35.4 mm2/s at 30 °C (86 °F)
		22.5 mm2/s at 40 °C (104 °F)
		14.6 mm2/s at 50 °C (122 °F)

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Strong oxidizing agents
Hazardous decomposition products	:	Carbon monoxide carbon dioxide sulfur dioxide
Hazardous reactions	:	Hazardous polymerization does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Further information	:	There is no data available for this product.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

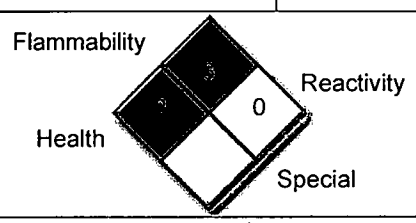
SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	:	PETROLEUM DISTILLATES, N.O.S.
	UN-No.	:	1268
	Class	:	3

	Packing group	: II
TDG	Proper shipping name	: PETROLEUM DISTILLATES, N.O.S.
	UN-No.	: 1268
	Class	: 3
	Packing group	: II
IATA	UN Number	: 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: II
	ADR/RID-Labels	: 3
	Packing instruction (cargo aircraft)	: 307
	Packing instruction (passenger aircraft)	: 305
	Packing instruction (passenger aircraft)	: Y305
IMDG	Substance No.	: UN 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: II
	ADR/RID-Labels	: 3
	EmS Number	: F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	2
Flammability	3
Physical Hazard	0
Personal Protective Equipment	
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)



TSCA Status	: Listed on TSCA	
	GAS OILS (PETROLEUM), HEAVY VACUUM	64741-57-7
	Light Vacuum Gas Oil	64741-58-8
	HYDROGEN SULPHIDE	7783-06-4

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 02/20/2007

References : The Petroleum HPV Testing Group, Test Plan Heavy Fuel Oils Category, June 17, 2004
Suncor lab data, August 1998 (R. Blackmore).
Core Lab data (Sept 16, 1999).
Maxxam data (May 18, 1999).
Maxxam Analytics Inc. Laboratory Analysis 2006
Kidde Fenwal Combustion Research Center Laboratory Analysis 2006
Kidde Fenwal Combustion Research Centre Laboratory Analysis 2007

General contact information : B. Burrell: (519) 383-3657

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SUNCOR ENERGY | ÉNERGIE TM/MC

SUNCOR OSY

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	* 2 (chronic health hazard)
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSY

Product type : Suncor Product
MSDS Number : OS0000000013
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
BITUMEN	128683-24-9	10 - 65 %
DISTILLATES (PETROLEUM), HEAVY THERMAL CRACKED	64741-81-7	5 - 55 %
Naphtha (oil sand)	128683-32-9	15 - 35 %
SULPHUR	7704-34-9	1 - 5 %
Xylene, All Isomers	1330-20-7	0.1 - 1 %
TOLUENE	108-88-3	0.1 - 1 %
BENZENE	71-43-2	0.1 - 0.5 %
sec-Butyl Mercaptan	513-53-1	150 - 450 PPM
ETHANETHIOL	75-08-1	90 - 180 PPM
1-Propanethiol	107-03-9	90 - 180 PPM

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Isopropyl Mercaptan	75-33-2	60 - 120 PPM
HYDROGEN SULPHIDE	7783-06-4	<= 100 PPM
n-Butyl Mercaptan	109-79-5	45 - 90 PPM
METHANETHIOL	74-93-1	15 - 45 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Extremely flammable.Product may contain Hydrogen Sulfide.

Potential Health Effects

Eyes : Causes eye irritation.

Skin : Causes skin irritation.
Sulfur may cause skin allergy.

Inhalation : Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.
May cause respiratory tract irritation.
Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath.
In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis.
Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.

Ingestion : May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness.
Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.

Chronic Exposure : May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory.
Chronic exposure causes drying effect on the skin and eczema.

Primary Routes of Entry : Inhalation
Eye contact
Skin contact
Ingestion

Target Organs : Respiratory system
Central nervous system
Blood
Skin

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Carcinogenic Effects	:	IARC Group 2A - Probable human carcinogen Contains benzene. IARC Group 1 - Known Human Carcinogen ACGIH A1 - Confirmed Human Carcinogen

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Seek medical advice. Wash contaminated clothing before reuse. Thoroughly clean shoes before reuse.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	<-35 °C (-31 °F) Method: ASTM D 93
Autoignition temperature	:	253 °C (487 °F) Method: ASTM E659
Lower explosion limit	:	0.39 %(V) Method: ASTM E681
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product. Increased risk of flammable or explosive concentrations if hydrogen sulfide builds up in unventilated spaces.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.

TM/MC Marque de commerce de Suncor Énergie Inc. – Trademark

Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, nitrogen oxides, other toxic gases

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.
Further information	:	Do not extinguish with water unless flow can be stopped The use of water may spread fire. Do NOT use water jet. Do not cut, drill or weld empty containers.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials.

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Storage tank should be vented to atmosphere.
To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.
A containment dike should be built around tank.
Small quantities should be stored in an approved safety solvent container.
Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn. Wear face-shield if splashing hazard is likely.
Hand protection	:	Wear gloves as a standard industrial handling procedure. The following materials are acceptable: Nitrile rubber Neoprene polyvinyl alcohol
Skin and body protection	:	Wear long sleeve clothing or coveralls. Wear as appropriate: A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

BITUMEN	128683-24-9		5 mg/m3
		Expressed as	Bitumen fume
		Remarks	OEL Established in agreement with Alberta Occupational Health and Safety, and Suncor Energy

TM/MC Marque de commerce de Suncor Énergie Inc. – Trademark

Inc., Oil Sands

SULPHUR	7704-34-9	CAD AB OEL	TWA	10 mg/m3	
Xylene, All Isomers	1330-20-7	CAD AB OEL	TWA	100 ppm	434 mg/m3
		CAD AB OEL	STEL	150 ppm	651 mg/m3
		CAD ON OEL	TWA	100 ppm	435 mg/m3
		CAD ON OEL	STEL	150 ppm	650 mg/m3
		ACGIH	TWA	100 ppm	
		ACGIH	STEL	150 ppm	
		OSHA Z1	PEL	100 ppm	435 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
TOLUENE	108-88-3	CAD AB OEL	TWA	50 ppm	188 mg/m3
		ACGIH	TWA	20 ppm	
		NIOSH	REL	100 ppm	375 mg/m3
		NIOSH	STEL	150 ppm	560 mg/m3
		OSHA Z2	TWA	200 ppm	
		OSHA Z2	Ceiling	300 ppm	
		OSHA Z2	MAX. CONC	500 ppm	
		OEL (QUE)	TWA	50 ppm	188 mg/m3
		CAD BC OEL	TWA	20 ppm	
		CAD ON OEL	TWA	20 ppm	
BENZENE	71-43-2	CAD AB OEL	TWA	1 ppm	3.2 mg/m3
		CAD AB OEL	STEL	5 ppm	16 mg/m3
		CAD ON OEL	TWA	0.5 ppm	
		CAD ON OEL	STEL	2.5 ppm	
		ACGIH	TWA	0.5 ppm	
		ACGIH	STEL	2.5 ppm	
		NIOSH	REL	0.1 ppm	
		NIOSH	STEL	1 ppm	
		OSHA Z2	TWA	10 ppm	
		OSHA Z2	Ceiling	25 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OSHA	TWA	1 ppm	
		OSHA	STEL	5 ppm	
		OSHA	OSHA_ACT	0.5 ppm	
		OEL (QUE)	TWA	1 ppm	3 mg/m3
		OEL (QUE)	STEL	5 ppm	15.5 mg/m3
ETHANETHIOL	75-08-1	CAD AB OEL	TWA	0.5 ppm	1.3 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.3 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.3 mg/m3
		OSHA Z1	Ceiling	10 ppm	25 mg/m3
1-Propanethiol	107-03-9	NIOSH	Ceil_Time	0.5 ppm	1.6 mg/m3
HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	
		CAD ON OEL	STEL	15 ppm	
		ACGIH	TWA	1 ppm	
		ACGIH	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	

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		OEL (QUE)	TWA	10 ppm	14 mg/m3
		OEL (QUE)	STEL	15 ppm	21 mg/m3
		CAD BC OEL		10 ppm	
		CAD SK OEL		10 ppm	
		CAD SK OEL		15 ppm	
n-Butyl Mercaptan	109-79-5	CAD AB OEL	TWA	0.5 ppm	1.8 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.8 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.8 mg/m3
		OSHA Z1	PEL	10 ppm	35 mg/m3
METHANETHIOL	74-93-1	CAD AB OEL	TWA	0.5 ppm	0.98 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1 mg/m3
		OSHA Z1	Ceiling	10 ppm	20 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.
Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	: brown
Odour	: Petroleum-like odor
Physical state	: liquid
Boiling point/boiling range	: -12 - 711 °C (10 - 1,312 °F) Method: ASTM D 5307
Vapour pressure	: 7.9 kPa Method: ASTM D 323A
Density	: 0.89 - 0.94 g/cm3
Specific gravity	: 0.89 - 0.94
Water solubility	: insoluble
Partition coefficient: n-octanol/water	: POW: < 1
Viscosity, kinematic	: 62 mm2/s at 30 °C (86 °F) 40 mm2/s at 40 °C (104 °F) 26 mm2/s at 50 °C (122 °F) Method: ASTM D 445

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SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Strong oxidizing agents
Hazardous decomposition products	:	Carbon monoxide carbon dioxide sulfur dioxide Hydrogen sulphide polycyclic aromatic hydrocarbons
Hazardous reactions	:	Hazardous polymerisation does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity	:	LD50 Rat Dose: 5,000 mg/kg Test substance: Petroleum distillates
Acute dermal toxicity	:	LD50 Rabbit Dose: > 2,000 mg/kg Test substance: Petroleum distillates
Acute inhalation toxicity	:	LC50 Rat Exposure time: 4 h Dose: 444 ppm Test substance: Hydrogen sulphide LC 50 Exposure time: 4 h Dose: 13700 ppm Test substance: Benzene

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

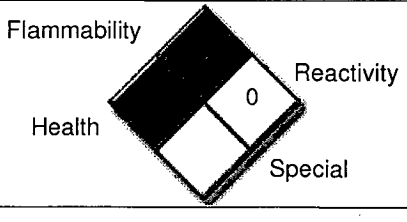
DOT Proper shipping name : **PETROLEUM DISTILLATES, N.O.S.**

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	UN-Number	: 1268
	Class	: 3
	Packing group	: I
TDG	Proper shipping name	: PETROLEUM DISTILLATES, N.O.S.
	UN-Number	: 1268
	Class	: 3
	Packing group	: I
IATA	UN Number	: 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: I
	ADR/RID-Labels	: 3
	Packing instruction (cargo aircraft)	: 303
	Packing instruction (passenger aircraft)	: 302
IMDG	Substance No.	: UN 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: I
	ADR/RID-Labels	: 3
	EmS Number	: F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	* 2 (chronic health hazard)
Flammability	3
Physical Hazard	0
Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

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DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 01/08/2013

References : This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Validation date of previous version : 04/16/2009

General contact information : B. Burrell: (519) 383-3657

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ConocoPhillips

Surmont Phase 1 Synbit Sales Oil (Canada)

Material Safety Data Sheet

1. Product and Company Identification

Product Name:	Surmont Phase 1 Synbit Sales Oil (Canada)
MSDS Number:	778998
Synonyms:	Sales Oil
Intended Use:	Feedstock
Manufacturer/Supplier:	ConocoPhillips Canada Limited or its Affiliates PO Box 130, 401 9th Ave. SW Calgary, Alberta T2P 2H7 Canada
Emergency Health and Safety Number:	Chemtrec: 800-424-9300 (24 Hours)
Customer Service:	403-233-4000
Technical Information:	403-233-4000
MSDS Information:	Internet: http://w3.conocophillips.com/NetMSDS/

2. Hazards Identification

Emergency Overview

WARNING!

Flammable Liquid and Vapor
Possible Cancer Hazard (Component)
Target Organ Hazard (Component)

NFPA



Appearance: Dark brown
Physical Form: Liquid
Odor: Petroleum

Potential Health Effects

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Contact may cause mild skin irritation including redness and a burning sensation. Prolonged or repeated contact can defat the skin, causing drying and cracking of the skin, and possibly dermatitis (inflammation). No harmful effects from skin absorption have been reported.

Inhalation (Breathing): Low to moderate degree of toxicity by inhalation.

Ingestion (Swallowing): No harmful effects reported from ingestion.

Signs and Symptoms: Effects of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Other Comments: This material may contain varying concentrations of polycyclic aromatic hydrocarbons (PAHs) which have been known to produce a phototoxic reaction when contaminated skin is exposed to sunlight. The effect is similar in appearance to an exaggerated sunburn, and is temporary in duration if exposure is discontinued. Continued exposure to sunlight can result in more serious skin problems including pigmentation (discoloration), skin eruptions (pimples), and possible skin cancers.

Pre-Existing Medical Conditions: Conditions which may be aggravated by exposure include skin disorders, respiratory (asthma-like) disorders and nervous system disorders.

See Section 11 for additional Toxicity Information.

3. Composition / Information on Ingredients

Component	CASRN	Concentration*
Crude Oil (Petroleum)	8002-05-9	100
Benzene	71-43-2	<2
Ethyl Benzene	100-41-4	<1
Naphthalene	91-20-3	<1

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Notes to Physician: Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

5. Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 1 **Flammability:** 3 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: Flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

6. Accidental Release Measures

Personal Precautions: Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Notify persons and shipping down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802). If spill occurs on water notify appropriate authorities and advise shipping of any hazard.

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents).

7. Handling and Storage

Precautions for safe handling: Do not eat, drink, or smoke when using this product. Wash thoroughly after handling. Do not breathe vapors or mists. Use good personal hygiene practices and wear appropriate personal protective equipment. Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Use only non-sparking tools.

Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharge. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-704 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

Conditions for safe storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

8. Exposure Controls / Personal Protection

Component	US-ACGIH	OSHA	Other
Crude Oil (Petroleum)	---	---	TWA:100 mg/m^3 - 8 hr. ConocoPhillips (ConocoPhillips Guidelines)
Benzene	STEL: 2.5 ppm Skin TWA: 0.5 ppm	Ceiling: 25 ppm STEL: 5 ppm TWA: 1 ppm TWA: 10 ppm	---
Ethyl Benzene	STEL: 125 ppm TWA: 100 ppm	TWA: 435 mg/m^3 TWA: 100 ppm	---
Naphthalene	STEL: 15 ppm Skin TWA: 10 ppm	TWA: 10 ppm TWA: 50 mg/m^3	TWA: 0.2 mg/m^3 (as total of 17 PNA's measured by NIOSH Method 5506) (ConocoPhillips Guidelines)

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with organic vapor cartridges/canisters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

9. Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Dark brown
Physical Form:	Liquid
Odor:	Petroleum
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	25.6 kPa @ 104°F / 40°C
Vapor Density (air=1):	>1
Boiling Point/Range:	13155
Melting/Freezing Point:	-33°F / -36°C
Solubility in Water:	Insoluble
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity:	0.913 @ 60°F (15.6°C)
Viscosity:	180.66 mPa°s @ 15°C; 43.21 mPa°s @ 40°C
Percent Volatile:	Varies
Evaporation Rate (nBuAc=1):	No data
Molecular Weight:	277.2 g/mole
Flash Point:	<43°F / <6°C
Test Method:	Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
LEL (vol % in air):	0.6
UEL (vol % in air):	15.0
Autoignition Temperature:	>752°F / >400°C

10. Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

11. Toxicological Information

Chronic Toxicity:

Crude Oil (Petroleum)

Carcinogenicity: Chronic application of crude oil to mouse skin resulted in an increased incidence of skin tumors. IARC concluded in its Crude Oil Monograph that there is limited evidence of carcinogenicity in animals, and that crude oil is not classifiable as to its carcinogenicity in humans (Group 3). It has not been listed as a carcinogen by NTP or OSHA.

Reproductive Toxicity: Dermal exposure to crude oil during pregnancy resulted in limited evidence of developmental toxicity in laboratory animals. Decreased fetal weight and increased resorptions were noted at maternally toxic doses. No significant effects on pup growth or other developmental landmarks were observed postnatally.

Xylenes

Target Organs: Rats exposed to 800, 1000 or 1200 ppm 14 hours daily for 6 weeks demonstrated high frequency hearing loss. Another study in rats exposed to 1800 ppm 8 hours daily for 5 days demonstrated middle frequency hearing loss.

Reproductive Toxicity: Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions, but no evidence of teratogenicity.

Toluene

Carcinogenicity: Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC.

Target Organs: Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.

Reproductive Toxicity: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

Target Organs: Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells, and DNA damage in mammalian cells in vitro.

Ethyl Benzene

Carcinogenicity: Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. Ethyl benzene has not been listed as a carcinogen by NTP, or OSHA.

Naphthalene

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

Acute Toxicity:

Component	Oral LD50	Dermal LD50	Inhalation LC50
Crude Oil (Petroleum)	> 5 g/kg	> 2 g/kg	> 5 mg/L

Component	Oral LD50	Dermal LD50	Inhalation LC50
Xylenes	4300 mg/kg	>3.16 ml/kg	5000 ppm/4 hr
Toluene	5.6 g/kg	12.4 g/kg	28.1 mg/L
Benzene	3.3 g/kg	> 9.4 g/kg	45 mg/L
Ethyl Benzene	3500 mg/kg, 4.7 g/kg (Rat)	17,800 mg/kg, 77.4 g/kg (Rabbit)	4000 ppm/4 hr.; 13367 ppm (Rat)
Naphthalene	> 2 g/kg	>2.5 g/kg	> 1 mg/L

12. Ecological Information

Ecotoxicity: Experimental studies of acute aquatic toxicity show values for crude oil in the range of 10 to over 100 mg/l. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions. Should be regarded as harmful to aquatic organisms - may cause long term adverse effects in the aquatic environment.

Mobility: Crude oil spreads as a film on the surface of water, facilitating loss of its lighter components by volatilization. In air, the volatile hydrocarbons are photodegraded by reaction with hydroxyl radicals with half-lives varying from 0.5 days for n-dodecane to 6.5 days for benzene. The lower molecular weight aromatic hydrocarbons and some polar compounds have low but significant water solubility. Some higher molecular weight compounds are removed by emulsification and these also slowly biodegrade; others adsorb to sediment and sink. A further removal process from water involving the heavier fraction is agglomeration to form tars, some of which sink.

Persistence and degradability: Most crude oils are not regarded as readily biodegradable. Most of the non-volatile constituents are inherently biodegradable; some of the highest molecular weight components are persistent in water.

Bioaccumulation Potential: Log Kow values measured for the hydrocarbon components of this material range from 2 to over 6, and therefore regarded as having the potential to bioaccumulate.

13. Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)
- D001 - Ignitability characteristic
- D018 - Toxicity characteristic (Benzene)

14. Transportation Information

Canadian (TDG)

Shipping Description:	UN1267, Petroleum crude oil, 3, II
Small Means of Containment	
Package Marking:	Petroleum crude oil, UN1267
Package Labeling:	Flammable liquid
Large Means of Containment	
Package Placard/Marking:	Flammable liquids / 1267
ERAP Index:	None
Emergency Response Guide:	128

U.S. Department of Transportation (DOT)

Shipping Description:	Petroleum crude oil, 3, UN1267, II
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Non-Bulk Package Labeling:	Flammable liquid
Bulk Package/Placard Marking:	Flammable / 1267
Packaging - References:	49 CFR 173.150; 173.202; 173.242 ***(Exceptions; Non-bulk; Bulk)***
Hazardous Substance:	See Section 15 for RQ`s

14. Transportation Information

Emergency Response Guide: 128
Note: ***Shipping description may be modified by placing the UN or NA number as the first element. This order becomes mandatory on January 1, 2013.***

International Maritime Dangerous Goods (IMDG)

Shipping Description: UN1267, Petroleum crude oil, 3, II, (FP° C cc), *[where FP is the material's flash point in degrees Celsius closed cup]*
Non-Bulk Package Marking: Petroleum crude oil, UN1267
Labels: Flammable liquid
Placards/Marking (Bulk): Flammable / 1267
Packaging - Non-Bulk: P001
EMS: F-E, S-E

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #: UN1267
Proper Shipping Name: Petroleum crude oil
Hazard Class/Division: 3
Packing Group: II
Non-Bulk Package Marking: Petroleum crude oil, UN1267
Labels: Flammable liquid
ERG Code: 3L

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	Y305	305	307
Max. Net Qty. Per Package:	1 L	5 L	60 L

15. Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health: No
Chronic Health: Yes
Fire Hazard: Yes
Pressure Hazard: No
Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration*	de minimis
Xylenes	<6	1.0%
Toluene	<3	1.0%
Benzene	<2	0.1%
Ethyl Benzene	<1	0.1%
Naphthalene	<1	0.1%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:
Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Toluene	Developmental Toxicant

Component	Type of Toxicity
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant
Ethyl Benzene	Cancer
Naphthalene	Cancer

Canadian Regulations:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class
B2 - Flammable Liquids
D2A
D2B

National Chemical Inventories:
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.
All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: 1C981

16. Other Information

Date of Issue:	09-Feb-2009
Status:	Final
Revised Sections or Basis for Revision:	New MSDS
MSDS Number:	778998

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; IARC = International Agency for Research on Cancer; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Syncrude
Securing Canada's Energy Future

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

PRODUCT: **Synthetic Crude Oil** **SAN 0930**
Syncrude Sweet Blend; Syncrude Sweet Premium

MANUFACTURER:

Syncrude Canada Ltd.
P.O. Bag 4009
Fort McMurray, AB
Canada T9H 3L1
Emergency Telephone No. (780) 790-5094

SYNONYMS: Synthetic Crude Oil; SSB; SSP
Syncrude sample Tag # 200000

PRODUCT USE: Refinery feedstock for petroleum and petrochemical refining.

PREPARED BY: Industrial Hygiene
(780) 790-5249

DATE OF PREPARATION/REVISION: November 28, 2012

2. COMPOSITION, INFORMATION ON INGREDIENTS

CAS #: 8002-05-9

A low sulfur blend of treated naphtha, light gas oil, and heavy gas oil petroleum fractions derived from bitumen. It consists predominantly of paraffins, cyclic paraffins, and cyclic aromatic hydrocarbons having carbon numbers predominantly in the range of C3 to C50, boiling between -20 and 550 °C. It may also contain small amounts of benzene and oxygenated compounds.

Hazardous Ingredients	Composition	CAS #
Benzene	0.2 Wt.%	CAS # 71-43-2

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

A yellow, translucent, slightly viscous liquid with a hydrocarbon odour. Extremely flammable. Crude oil can cause eye, skin, gastrointestinal, and respiratory tract irritation. May cause serious health effects if inhaled or swallowed. Aspirated crude oil is a threat to life.

ROUTE OF ENTRY: Skin contact, skin absorption, eye contact, inhalation, and ingestion.

EFFECTS OF ACUTE EXPOSURE:

EYES: May cause irritation.

SKIN: May cause irritation. May cause moderate inflammatory redness, fluid build-up, and slight burning on exposed skin. May damage the liver and kidneys.

INGESTION: May cause irritation and inflammation of the gastrointestinal tract. May cause vomiting, bloating, weight loss, mild mental depression, decreased plasma glucose level, nausea, diarrhea, and abdominal pain. May cause liver and kidney damage. May cause excitement of the central nervous system, as expressed by jerking eye movements, muscle tremors, and short sudden seizures. May affect blood clotting and cellular respiration. May affect reproduction, and cause developmental effects.

Ingestion of crude oil may result in aspiration into the lungs. Symptoms of aspiration may include coughing, choking, shortness of breath, increased respiration, chemical pneumonitis, and pulmonary edema. Liver and kidney damage can occur following aspiration.

INHALATION: Inhalation of crude oil may cause respiratory tract irritation. May cause central nervous system depression, chemical pneumonitis, respiratory arrest, euphoria, and cardiac dysrythmia. May damage the liver, kidneys, and lungs.

EFFECTS OF CHRONIC EXPOSURE:

EYES: Effects not reported.

SKIN: May cause irritation characterized by inflammation, dryness, pigmentation, and/or lesions of the hair follicles. May aggravate existing skin conditions. May affect the blood, liver, and kidneys. May cause changes to the skin.

INGESTION: Effects not reported.

INHALATION: May cause irritation.

4. FIRST AID MEASURES

INHALATION: Move victim to uncontaminated area. If breathing has stopped, trained personnel should begin artificial respiration, or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Apply oxygen if available. Obtain medical attention.

EYES: Immediately flush eyes with water for at least 15 minutes. If irritation persists, seek medical attention.

SKIN: Remove contaminated clothing. Wash affected area with soap and water. If irritation persists, seek medical attention.

INGESTION: DO NOT INDUCE VOMITING BECAUSE OF DANGER OF ASPIRATING LIQUID INTO LUNGS. If spontaneous vomiting occurs, monitor for breathing difficulty. Get immediate medical attention.

GENERAL: In all cases seek medical attention.

5. FIRE FIGHTING MEASURES

FLASH POINT (Tag Closed Cup):	below -20 °C
FLAMMABLE LIMITS IN AIR:	Not available
AUTO-IGNITION TEMPERATURE:	245 °C

FIRE & EXPLOSION HAZARDS:
Flammable near any source of ignition with vapour concentration within explosion limits.

EXTINGUISHING MEDIA:
Class B fire extinguishers: Carbon Dioxide, dry powder, foam, and polymer foam. Water fog can be used by trained fire prevention personnel.

FIRE FIGHTING PROCEDURES:
Evacuate all personnel from danger area. Exposed firefighters must wear full bunker gear, including a NIOSH approved positive pressure self-contained breathing apparatus with full-face mask. Shut off sources of fuel and ignition. Stop flow of material, and contain spill. Cover with extinguishing media. Use water spray to cool fire-exposed containers, and as a protective screen. To avoid spreading fire, do not point solid water stream directly into burning material.

6. ACCIDENTAL RELEASE MEASURES

LEAK AND SPILL PROCEDURE:
Shut off all sources of ignition and evacuate area. Ventilate area of spill. Dike large spill with non-flammable material. Absorb on inert material and place in closed container for recycling or disposal. Personal Protective Equipment must be worn by clean-up crew.

7. HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:
Avoid prolonged or repeated exposure to vapours. Avoid skin contact. Wash thoroughly after handling. Contact lens may absorb vapours and cause eye irritation.

STORAGE REQUIREMENTS:
Keep away from direct sunlight, heat, flame, or sources of spark. Do not store near oxidizing material. Provide adequate ventilation. Keep containers tightly closed and grounded.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

ENGINEERING CONTROLS:
Ventilate confined space before entry. Provide local exhaust where appropriate to minimize fugitive vapours or mists. Provide adequate general ventilation to dilute vapour concentrations within buildings.

PERSONAL PROTECTIVE EQUIPMENT:

Gloves:	Nitrile or neoprene
Respirator:	NIOSH approved air purifying respirator with organic vapour cartridges and P100 (HEPA) particulate filters at low concentrations (< 1000 ppm).
Eyes:	Safety glasses, monogoggles, or faceshield as determined by task and area owner requirements.
Body:	Wear appropriate protective clothing consistent with area owner and trade specific body protection requirements. Coveralls, apron, rain suit, or disposable coveralls as required.
Footwear:	Standard work boots or rubber boots as determined by task.

EXPOSURE LIMITS:

AB 8-hour OEL total hydrocarbon = 300 ppm
AB 8-hour OEL oil mist = 5 mg/m^3
AB 8-hour OEL benzene = 0.5 ppm

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Yellow translucent, slightly viscous
ODOUR: Hydrocarbon odour
PHYSICAL STATE: Liquid
pH: Not applicable
VAPOUR PRESSURE: 3 - 6 psi (Reid Method)
VAPOUR DENSITY (Air = 1): 2.7
FREEZING POINT: -45 °C
BOILING RANGE: -20 to 560 °C
SPECIFIC GRAVITY: 0.85 to 0.87 at 20 °C
EVAPORATION RATE (n-Butyl Acetate = 1): 0.28
COEFFICIENT OF WATER/OIL DISTRIBUTION: Water insoluble, Oil soluble
ODOUR THRESHOLD: Not available

10. STABILITY AND REACTIVITY

STABILITY: Stable

CONDITIONS TO AVOID: Avoid exposure to sources of ignition

MATERIALS TO AVOID: Strong oxidizing materials. This material might soften or dissolve some plastics.

HAZARDOUS COMBUSTION PRODUCTS: Carbon dioxide, carbon monoxide, uncombusted hydrocarbons, soot.

11. TOXICOLOGICAL INFORMATION

LD50: >2 g/kg (dermal) - species not reported
>3.16 g/kg (dermal) - rabbits
>5 g/kg (oral) - mice, rats

LC50: 4 g/m3 (6 hr) - mice

ACUTE:
An acute oral, dermal, ocular and inhalation toxicity study was performed using synthetic crude oil from the Alberta oil sands. No animals (rats and mice) died following a single oral dose of 5 g/kg. No animals (rabbits) died following a single dermal dose of 3.16 g/kg. The rabbits did experience moderate skin irritation (Draize score of 3/8), desquamation, ocular discharge and decreased food consumption. Rabbits experienced slight eye irritation (Draize score of 4/110) with conjunctival redness. Five of 10 mice and no rats died following a 6-hour exposure to 4.0 g/m3. Additional effects following inhalation included extreme hair loss in mice, possible liver and kidney involvement, increased liver weight in mice and female rats and decreased lung weight in female rats. (Reference 1)

CHRONIC:
Observed skin effects among petroleum field workers and crude oil transport workers include dryness, pigmentation, hyperkeratosis, pigmented plane warts, eczematous reaction and follicular lesions.

Two crude oils were dermally applied to rats at doses of 30, 125 and 500 mg/kg (5 day/wk) for 13 weeks. At the 500 mg/kg dose level, observed effects included a reduced weight gain, depressed red blood cell counts, hemoglobin, hematocrit and platelet counts, increased relative and absolute liver weights, decreased absolute and relative thymus weight, changes in the relative kidney, spleen and adrenal weights and atrophy of the thymus. Hyperplasia and an associated dermal inflammatory cell infiltration at the site of application and hypertrophy and hyperplasia of the follicular epithelium in the thyroid gland were observed at all dose levels. (Reference 2)

SENSITIZATION TO PRODUCT:
An acute dermal toxicity study was performed to assess the effect of ultraviolet light on petroleum oil toxicity. Mice were painted with 50 L of oil 5 days per week for 2 weeks. The petroleum oil was found to be non-toxic to the skin of mice, however, the mice that were painted with the oil and then exposed to ultraviolet light for 2 hours experienced some skin damage (distinct erythema). (Reference 3)

CARCINOGENICITY:
Crude oil was applied to the skin of mice (3 times/wk, 6 months followed by 2 times/wk for life) for up to 13 months. Hyperkeratosis was observed at the site of treatment. Many cases of keratotic changes and epithelioma on the exposed skin of workers exposed to crude oil. (Reference 4)

An evaluation of the dermal carcinogenic potential of synthetic crude oil from the Athabasca oil sands was conducted. Mice were dermally applied crude oil three times per week (75 mL/wk) for life. Out of fifty animals 13 developed tumors with a mean latency of 113 weeks. This was significantly different from the controls. The authors concluded that synthetic crude oil from the Athabasca oil sands is a moderately active dermal carcinogen, however, results are consistent with conventional crude oil. (Reference 1)

REPRODUCTIVE TOXICITY:
A single dose (5 mL/kg bw) of crude oil to pregnant rats on gestation days 11, 15 or 17 resulted in induction in both placental and fetal hepatic enzyme systems. (Reference 4)

Oral administration to pregnant rats as a single dose (5 mL/kg bw on gestation days 3, 6, 11, 15 or 17), as a single variable dose (2-10 mL/kg bw on gestation day 6), or as daily doses (1 or 2 mL/kg bw on gestation days 6-17) resulted in significantly increased number of resorptions and decreased fetal weight and length. Daily doses of crude oil also caused a significant reductive in maternal body weight. (Reference 4)

TERATOGENICITY:
Crude oil was dermally applied to pregnant rats on days 0-19 of gestation. Parturition was delayed in the dams at 500 mg/kg. Fetal body weight was decreased at 500 mg/kg and the 4-day viability index was decreased at all dose levels (30, 125 and 500 mg/kg). Also observed were increased in utero death and reduced ossification. (Reference 5)

MUTAGENICITY:
Several studies have reported on the mutagenicity of crude oil to Salmonella typhimurium. Crude oil did not induce mutagenicity either in the presence or absence of an exogenous metabolic system, however, some neutral/aromatic fractions were mutagenic. (Reference 4)

A weak positive result was reported for two crude oil samples in the Syrian hamster embryo cell-transformation assay. (Reference 6)

No significant differences were noted in the number of spontaneous streptomycin-resistant mutants in Chlamydomonas reinhardtii. (Reference 7)

The photomutagenicity of crude oil was assessed using a modification of the Salmonella histidine reversion test. Crude oil was non-mutagenic without the added light and was non-mutagenic in the presence of visible light. (Reference 8)

SYNERGISTIC EFFECTS:
May act as a synergist to pesticides. The combination of crude oil and ultraviolet radiation may potentiate the suppressive effect on Langerhans cell density and contact hypersensitivity. (Reference 9)

Ultraviolet light may increase the severity of the effects to the skin. (Reference 10)

12. ECOLOGICAL INFORMATION

Not available.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Recover for reuse and recycling. Comply with relevant regulations with regards to disposal, recycling, treatment, transportation and storage.
This material would be considered a hazardous waste in Alberta due to its low flashpoint.

14. TRANSPORT INFORMATION:

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

Hazard Class: 3 **Packing Group:** I

PRODUCT IDENTIFICATION NUMBER (PIN): UN1268

PROPER SHIPPING NAME: PETROLEUM DISTILLATES, N.O.S.

15. REGULATORY INFORMATION

WHMIS CLASS: B-2, D-2B

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

All compounds in this product are listed in the Canada Domestic Substances List (DSL) and the United States Toxic Substances Control Act (TSCA) Chemical Substance Inventory (1985).

16. OTHER INFORMATION

REFERENCES:

1. McKee, R., W. Stubblefield, S. Lewis, R. Scala, G. Simon and L. DePass. Evaluation of the Dermal Carcinogenic Potential of Tar Sands Bitumen-Derived Liquids. Fund. and Appl. Toxicol. 7:228-235. 1986.

2. Feuston, M. H., Mackerer, C. R., C. A. Schreiner and C. E. Hamilton. Systemic Toxicity of Dermally Applied Crude Oils in Rats. J. Toxicol. Environ. Health. 51:387-399. 1997.

3. Burnham, K. and M. Bey. Effects of Crude Oil and Ultraviolet Radiation on Immunity Within Mouse Skin. J. Toxicol. Environ. Health. 34(1):83-93. 1991.

4. World Health Organization. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. World Health Organization. Lyon. 1988.

5. Kerstetter, S. L. and K. R. Bodnar. Developmental Toxicity of Dermally Applied Crude Oils in Rats. Teratology. 45:500. 1992.

6. Frazier, M. E. and T. K. Andrews, Jr., Transformation of Syrian Hamster Embryo Cells by Synfuel Mixtures. J. Toxicol. Environ. Health. 11(4-6):591-606. 1983.

7. Vandermeulen, J. H. and R. W. Lee. Lack of Mutagenic Activity of Crude and Refined Oils in the Unicellular Alga Chlamydomonas Reinhardtii. Bull. Environ. Contam. Toxicol. 36:250-253.

8. Selby, C., J. Calkins and H. Enoch. Detection of Photomutagens in Natural and Synthetic Fuels. Mutation Research. 124(1):53-60. 1983.

9. Burnham, K. and M. Rahman. Effects of Petrochemicals and Ultraviolet Radiation on Epidermal IA. Expression in Vitro. J. Toxicol. Environ. Health. 35(3):175-185. 1992.

10. Gomer, C. J. and D. M. Smith. Acute Skin Phototoxicity in Hairless Mice Following Exposure to Crude Shale Oil or Natural Petroleum Oil. Toxicol. 18:75-85. 1980.

DISCLAIMER

The information and recommendations contained in this MSDS are believed to be accurate as at the date of its preparation. Syncrude Canada Ltd. makes no representations or warranties, express or implied, with respect to the accuracy or completeness of the information contained herein. Syncrude Canada Ltd. assumes no responsibility for incorrect handling or use of the product or the inherent hazards involved in the nature of the product itself.

Syncrude
Securing Canada's Energy Future

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

PRODUCT: **Syncrude Sweet Blend Crude Oil** **SAN 0930**

MANUFACTURER:

Syncrude Canada Ltd.
P.O. Bag 4009
Fort McMurray, AB
Canada T9H 3L1
Emergency Telephone No. (780) 790-5094

SYNONYMS: Synthetic Crude Oil; SSB
Syncrude sample Tag # 200000

PRODUCT USE: Refinery feedstock for petroleum and petrochemical refining.

PREPARED BY: Nathalie Bérubé
(780) 790-4544

DATE OF PREPARATION/REVISION: March 7, 2006

2. COMPOSITION, INFORMATION ON INGREDIENTS

CAS #: 8002-05-9

A low sulfur blend of treated naphtha, light gas oil, and heavy gas oil petroleum fractions derived from bitumen. It consists predominantly of paraffins, cyclic paraffins, and cyclic aromatic hydrocarbons having carbon numbers predominantly in the range of C3 to C50, boiling between -20 and 550 °C. It may also contain small amounts of benzene and oxygenated compounds.

Hazardous Ingredients	Composition	CAS #
Benzene	0.2 Wt.%	CAS # 71-43-2

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

A yellow, translucent, slightly viscous liquid with a hydrocarbon odour. Extremely flammable. Crude oil can cause eye, skin, gastrointestinal, and respiratory tract irritation. May cause serious health effects if inhaled or swallowed. Aspirated crude oil is a threat to life.

ROUTE OF ENTRY: Skin contact, skin absorption, eye contact, inhalation, and ingestion.

EFFECTS OF ACUTE EXPOSURE:

EYES: May cause irritation.

SKIN: May cause irritation. May cause moderate inflammatory redness, fluid build-up, and slight burning on exposed skin. May damage the liver and kidneys.

INGESTION: May cause irritation and inflammation of the gastrointestinal tract. May cause vomiting, bloating, weight loss, mild mental depression, decreased plasma glucose level, nausea, diarrhea, and abdominal pain. May cause liver and kidney damage. May cause excitement of the central nervous system, as expressed by jerking eye movements, muscle tremors, and short sudden seizures. May affect blood clotting and cellular respiration. May affect reproduction, and cause developmental effects.

Ingestion of crude oil may result in aspiration into the lungs. Symptoms of aspiration may include coughing, choking, shortness of breath, increased respiration, chemical pneumonitis, and pulmonary edema. Liver and kidney damage can occur following aspiration.

INHALATION: Inhalation of crude oil may cause respiratory tract irritation. May cause central nervous system depression, chemical pneumonitis, respiratory arrest, euphoria, and cardiac dysrythmia. May damage the liver, kidneys, and lungs.

EFFECTS OF CHRONIC EXPOSURE:

EYES: Effects not reported.

SKIN: May cause irritation characterized by inflammation, dryness, pigmentation, and/or lesions of the hair follicles. May aggravate existing skin conditions. May affect the blood, liver, and kidneys. May cause changes to the skin.

INGESTION: Effects not reported.

INHALATION: May cause irritation.

4. FIRST AID MEASURES

INHALATION: Move victim to uncontaminated area. If breathing has stopped, trained personnel should begin artificial respiration, or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Apply oxygen if available. Obtain medical attention.

EYES: Immediately flush eyes with water for at least 15 minutes. If irritation persists, seek medical attention.

SKIN: Remove contaminated clothing. Wash affected area with soap and water. If irritation persists, seek medical attention.

INGESTION: DO NOT INDUCE VOMITING BECAUSE OF DANGER OF ASPIRATING LIQUID INTO LUNGS. If spontaneous vomiting occurs, monitor for breathing difficulty. Get immediate medical attention.

GENERAL: In all cases seek medical attention.

5. FIRE FIGHTING MEASURES

FLASH POINT (Tag Closed Cup): below -20 °C
FLAMMABLE LIMITS IN AIR: Not available
AUTO-IGNITION TEMPERATURE: 245 °C

FIRE & EXPLOSION HAZARDS:
Flammable near any source of ignition with vapour concentration within explosion limits.

EXTINGUISHING MEDIA:
Class B fire extinguishers: Carbon Dioxide, dry powder, foam, and polymer foam. Water fog can be used by trained fire prevention personnel.

FIRE FIGHTING PROCEDURES:
Evacuate all personnel from danger area. Exposed firefighters must wear full bunker gear, including a NIOSH approved positive pressure self-contained breathing apparatus with full-face mask. Shut off sources of fuel and ignition. Stop flow of material, and contain spill. Cover with extinguishing media. Use water spray to cool fire-exposed containers, and as a protective screen. To avoid spreading fire, do not point solid water stream directly into burning material.

6. ACCIDENTAL RELEASE MEASURES

LEAK AND SPILL PROCEDURE:
Shut off all sources of ignition and evacuate area. Ventilate area of spill. Dike large spill with non-flammable material. Absorb on inert material and place in closed container for recycling or disposal. Personal Protective Equipment must be worn by clean-up crew.

7. HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:
Avoid prolonged or repeated exposure to vapours. Avoid skin contact. Wash thoroughly after handling. Contact lens may absorb vapours and cause eye irritation.

STORAGE REQUIREMENTS:
Keep away from direct sunlight, heat, flame, or sources of spark. Do not store near oxidizing material. Provide adequate ventilation. Keep containers tightly closed and grounded.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

ENGINEERING CONTROLS:
Ventilate confined space before entry. Provide local exhaust where appropriate to minimize fugitive vapours or mists. Provide adequate general ventilation to dilute vapour concentrations within buildings.

PERSONAL PROTECTIVE EQUIPMENT:

Gloves:	Acrylonitrile or neoprene
Respirator:	NIOSH approved air purifying organic vapour at low concentrations (< 1000 ppm)
Eye:	Monogoggles
Footwear:	Not required under normal conditions. Remove and change footwear if contaminated.
Clothing:	Coveralls/apron as required.

EXPOSURE LIMITS:
8-hour OEL= 300 ppm (total hydrocarbon)
8-hour OEL = 5 mg/m^3 (aerosol)
Benzene 8-hour OEL = 1 ppm
Benzene 15-minute OEL = 5 ppm

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Yellow translucent, slightly viscous
ODOUR: Hydrocarbon odour
PHYSICAL STATE: Liquid
pH: Not applicable
VAPOUR PRESSURE: 4-5 psi (Reid Method)
VAPOUR DENSITY (Air = 1): 2.7
FREEZING POINT: -45 °C
BOILING RANGE: -20 to 550 °C
SPECIFIC GRAVITY: 0.87 at 20 °C
EVAPORATION RATE (n-Butyl Acetate = 1): 0.28
COEFFICIENT OF WATER/OIL DISTRIBUTION: Water insoluble, Oil soluble
ODOUR THRESHOLD: Not available

10. STABILITY AND REACTIVITY

STABILITY: Stable

CONDITIONS TO AVOID: Avoid exposure to sources of ignition

MATERIALS TO AVOID: Strong oxidizing materials. This material might soften or dissolve some plastics.

HAZARDOUS COMBUSTION PRODUCTS: Carbon dioxide, carbon monoxide, uncombusted hydrocarbons, soot.

11. TOXICOLOGICAL INFORMATION

LD50: >2 g/kg (dermal) - species not reported
>3.16 g/kg (dermal) - rabbits
>5 g/kg (oral) - mice, rats

LC50: 4 g/m3 (6 hr) - mice

ACUTE:
An acute oral, dermal, ocular and inhalation toxicity study was performed using synthetic crude oil from the Alberta oil sands. No animals (rats and mice) died following a single oral dose of 5 g/kg. No animals (rabbits) died following a single dermal dose of 3.16 g/kg. The rabbits did experience moderate skin irritation (Draize score of 3/8), desquamation, ocular discharge and decreased food consumption. Rabbits experienced slight eye irritation (Draize score of 4/110) with conjunctival redness. Five of 10 mice and no rats died following a 6-hour exposure to 4.0 g/m3. Additional effects following inhalation included extreme hair loss in mice, possible liver and kidney involvement, increased liver weight in mice and female rats and decreased lung weight in female rats. (Reference 1)

CHRONIC:
Observed skin effects among petroleum field workers and crude oil transport workers include dryness, pigmentation, hyperkeratosis, pigmented plane warts, eczematous reaction and follicular lesions.

Two crude oils were dermally applied to rats at doses of 30, 125 and 500 mg/kg (5 day/wk) for 13 weeks. At the 500 mg/kg dose level, observed effects included a reduced weight gain, depressed red blood cell counts, hemoglobin, hematocrit and platelet counts, increased relative and absolute liver weights, decreased absolute and relative thymus weight, changes in the relative kidney, spleen and adrenal weights and atrophy of the thymus. Hyperplasia and an associated dermal inflammatory cell infiltration at the site of application and hypertrophy and hyperplasia of the follicular epithelium in the thyroid gland were observed at all dose levels. (Reference 2)

SENSITIZATION TO PRODUCT:
An acute dermal toxicity study was performed to assess the effect of ultraviolet light on petroleum oil toxicity. Mice were painted with 50 L of oil 5 days per week for 2 weeks. The petroleum oil was found to be non-toxic to the skin of mice, however, the mice that were painted with the oil and then exposed to ultraviolet light for 2 hours experienced some skin damage (distinct erythema). (Reference 3)

CARCINOGENICITY:
Crude oil was applied to the skin of mice (3 times/wk, 6 months followed by 2 times/wk for life) for up to 13 months. Hyperkeratosis was observed at the site of treatment. Many cases of keratotic changes and epithelioma on the exposed skin of workers exposed to crude oil. (Reference 4)

An evaluation of the dermal carcinogenic potential of synthetic crude oil from the Athabasca oil sands was conducted. Mice were dermally applied crude oil three times per week (75 mL/wk) for life. Out of fifty animals 13 developed tumors with a mean latency of 113 weeks. This was significantly different from the controls. The authors concluded that synthetic crude oil from the Athabasca oil sands is a moderately active dermal carcinogen, however, results are consistent with conventional crude oil. (Reference 1)

REPRODUCTIVE TOXICITY:
A single dose (5 mL/kg bw) of crude oil to pregnant rats on gestation days 11, 15 or 17 resulted in induction in both placental and fetal hepatic enzyme systems. (Reference 4)

Oral administration to pregnant rats as a single dose (5 mL/kg bw on gestation days 3, 6, 11, 15 or 17), as a single variable dose (2-10 mL/kg bw on gestation day 6), or as daily doses (1 or 2 mL/kg bw on gestation days 6-17) resulted in significantly increased number of resorptions and decreased fetal weight and length. Daily doses of crude oil also caused a significant reductive in maternal body weight. (Reference 4)

TERATOGENICITY:
Crude oil was dermally applied to pregnant rats on days 0-19 of gestation. Parturition was delayed in the dams at 500 mg/kg. Fetal body weight was decreased at 500 mg/kg and the 4-day viability index was decreased at all dose levels (30, 125 and 500 mg/kg). Also observed were increased in utero death and reduced ossification. (Reference 5)

MUTAGENICITY:
Several studies have reported on the mutagenicity of crude oil to Salmonella typhimurium. Crude oil did not induce mutagenicity either in the presence or absence of an exogenous metabolic system, however, some neutral/aromatic fractions were mutagenic. (Reference 4)

A weak positive result was reported for two crude oil samples in the Syrian hamster embryo cell-transformation assay. (Reference 6)

No significant differences were noted in the number of spontaneous streptomycin-resistant mutants in Chlamydomonas reinhardtii. (Reference 7)

The photomutagenicity of crude oil was assessed using a modification of the Salmonella histidine reversion test. Crude oil was non-mutagenic without the added light and was non-mutagenic in the presence of visible light. (Reference 8)

SYNERGISTIC EFFECTS:
May act as a synergist to pesticides. The combination of crude oil and ultraviolet radiation may potentiate the suppressive effect on Langerhans cell density and contact hypersensitivity. (Reference 9)

Ultraviolet light may increase the severity of the effects to the skin. (Reference 10)

12. ECOLOGICAL INFORMATION

Not available.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Recover for reuse and recycling on plant site. Small quantities off-site can be burned in a chemical incinerator equipped with afterburner and scrubber. Comply with relevant legislation.
This product is known to be a hazardous waste according to Canada and US RCRA regulations. Provincial jurisdictions use various hazardous waste control regulations and the Transportation of Dangerous Goods Act to define hazardous waste and appropriate packaging, reporting, storage, and transport. Contact federal, provincial/state, and local authorities in order to generate or ship a waste material associated with this product to ensure materials are handled appropriately and meet all criteria for disposal of hazardous waste.

14. TRANSPORT INFORMATION:

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

Hazard Class: 3 **Packing Group:** I

PRODUCT IDENTIFICATION NUMBER (PIN): UN1268

PROPER SHIPPING NAME: PETROLEUM DISTILLATES, N.O.S.

15. REGULATORY INFORMATION

WHMIS CLASS: B-2, D-2B

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

All compounds in this product are listed in the Canada Domestic Substances List (DSL) and the United States Toxic Substances Control Act (TSCA) Chemical Substance Inventory (1985).

16. OTHER INFORMATION

REFERENCES:

1. McKee, R., W. Stubblefield, S. Lewis, R. Scala, G. Simon and L. DePass. Evaluation of the Dermal Carcinogenic Potential of Tar Sands Bitumen-Derived Liquids. Fund. and Appl. Toxicol. 7:228-235. 1986.

2. Feuston, M. H., Mackerer, C. R., C. A. Schreiner and C. E. Hamilton. Systemic Toxicity of Dermally Applied Crude Oils in Rats. J. Toxicol. Environ. Health. 51:387-399. 1997.

3. Burnham, K. and M. Bey. Effects of Crude Oil and Ultraviolet Radiation on Immunity Within Mouse Skin. J. Toxicol. Environ. Health. 34(1):83-93. 1991.

4. World Health Organization. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. World Health Organization. Lyon. 1988.

5. Kerstetter, S. L. and K. R. Bodnar. Developmental Toxicity of Dermally Applied Crude Oils in Rats. Teratology. 45:500. 1992.

6. Frazier, M. E. and T. K. Andrews, Jr., Transformation of Syrian Hamster Embryo Cells by Synfuel Mixtures. J. Toxicol. Environ. Health. 11(4-6):591-606. 1983.

7. Vandermeulen, J. H. and R. W. Lee. Lack of Mutagenic Activity of Crude and Refined Oils in the Unicellular Alga Chlamydomonas Reinhardtii. Bull. Environ. Contam. Toxicol. 36:250-253.

8. Selby, C., J. Calkins and H. Enoch. Detection of Photomutagens in Natural and Synthetic Fuels. Mutation Research. 124(1):53-60. 1983.

9. Burnham, K. and M. Rahman. Effects of Petrochemicals and Ultraviolet Radiation on Epidermal IA. Expression in Vitro. J. Toxicol. Environ. Health. 35(3):175-185. 1992.

10. Gomer, C. J. and D. M. Smith. Acute Skin Phototoxicity in Hairless Mice Following Exposure to Crude Shale Oil or Natural Petroleum Oil. Toxicol. 18:75-85. 1980.

DISCLAIMER

The information and recommendations contained in this MSDS are believed to be accurate as at the date of its preparation. Syncrude Canada Ltd. makes no representations or warranties, express or implied, with respect to the accuracy or completeness of the information contained herein. Syncrude Canada Ltd. assumes no responsibility for incorrect handling or use of the product or the inherent hazards involved in the nature of the product itself.

Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Synthetic Crude Oil
Synonyms:	Not available.
Product Use:	Refinery feedstock.
Supplier:	Husky Oil Operations Ltd. PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7
Phone Number:	403-298-6111
Emergency Phone:	877-262-2111
Date of Preparation:	January 5, 2011

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
FLAMMABLE LIQUID AND VAPOR. IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE.

Colour: Straw coloured.
Physical State: Liquid.
Odour: Petroleum. Rotten eggs. May be odourless (due to high H2S concentrations present).

WHMIS	Personal Protection Equipment	TDG (Ground)
		

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact, skin contact, inhalation, and ingestion.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Above 50 ppm Hydrogen sulphide, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: Irritating to respiratory system. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. This product contains hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with

concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.

Chronic Effects: See Section 11 for more information.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin, eyes, gastrointestinal tract, and respiratory system. Central nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS No.	Wt. %
Gas oils (petroleum), hydrodesulfurized	64742-79-6	60 - 100
Naphtha (petroleum), hydrotreated heavy	64742-48-9	10 - 30
Naphtha (petroleum), hydrotreated light	64742-49-0	3 - 7
Butane	106-97-8	1 - 5
Hydrogen sulfide (H2S)	7783-06-4	0.001 - 0.01

Section 4: FIRST AID MEASURES

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.

Inhalation: Remove person to fresh air. If breathing has stopped apply artificial respiration. If signs/symptoms develop, get medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Means of Extinction
Suitable Extinguishing Media: Dry chemical, foam, or carbon dioxide.
Unsuitable Extinguishing Media: Water may not be an effective medium to extinguish fire.

Products of Combustion: Oxides of carbon. Oxides of nitrogen. Aldehydes. Hazardous

sulphur dioxide, and related oxides of sulphur may be generated upon combustion.

Protection of Firefighters: Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA).

Explosion Data
Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge: This material is sensitive to static discharge at temperatures above the flash point.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Environmental Precautions: Keep out of drains, sewers, ditches, and waterways.

Methods for Containment: Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.

Methods for Clean-Up: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.

Other Information: Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

Section 7: HANDLING AND STORAGE

Handling:
Do not breathe vapours. Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking. See Section 8 for information on Personal Protective Equipment.

Storage:
Head spaces in storage containers may contain toxic hydrogen sulphide gas. Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Structural materials and lighting and ventilation systems should be corrosion resistant. Keep out of the reach of children.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Ingredient		TWA	STEL	Ceiling	Notes
Gas oils (petroleum), hydrodesulfurized	ACGIH	5 mg/m³ *	10 mg/m³ *	Not available.	* Oil mist, mineral.

Gas oils (petroleum), hydrodesulfurized	OSHA	5 mg/m³ *	Not available.	Not available.	* Oil mist, mineral.
Naphtha (petroleum), hydrotreated heavy	ACGIH	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Naphtha (petroleum), hydrotreated heavy	OSHA	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Naphtha (petroleum), hydrotreated light	ACGIH	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Naphtha (petroleum), hydrotreated light	OSHA	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Butane	ACGIH	1000 ppm	Not available.	Not available.	Not available.
Butane	OSHA	800 ppm (1900 mg/m³) *	Not available.	Not available.	* Vacated.
Hydrogen sulfide (H2S)	ACGIH	1 ppm	5 ppm	Not available.	Not available.
Hydrogen sulfide (H2S)	OSHA	Not available.	Not available.	20 ppm	50 ppm (10 mins. once only if no other meas. exp. occurs.)
Benzene	ACGIH	0.5 ppm	2.5 ppm	Not available.	Skin.
Benzene	OSHA	1 ppm	5 ppm	Not available.	Not available.
Polycyclic Aromatic Hydrocarbons	ACGIH	0.2 mg/m³ *	Not available.	Not available.	* For benzene-soluble fraction.
Polycyclic Aromatic Hydrocarbons	OSHA	0.2 mg/m³ *	Not available.	Not available.	* For benzene-soluble fraction.
Benzene, dimethyl-	ACGIH	100 ppm	150 ppm	Not available.	Not available.
Benzene, dimethyl-	OSHA	100 ppm (435 mg/m³)	Not available.	Not available.	Not available.

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.

Personal Protective Equipment

Eye/Face Protection: Wear chemical goggles.

Hand Protection: Wear impervious gloves. Neoprene or nitrile gloves are recommended. Consult manufacturer specifications for further information.

Skin and Body Protection: Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.

Respiratory Protection: If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-

purifying respirators. Where hydrogen sulfide is present or possibly present in confined spaces at hazardous levels a NIOSH-approved supplied air respirator or self-contained breathing apparatus (SCBA) is necessary.

General Hygiene Considerations: Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear liquid.
Colour:	Straw coloured.
Odour:	Petroleum.
Odour Threshold:	0.00047 ppm, (Hydrogen sulphide)
Physical State:	Liquid.
pH:	Not available.
Viscosity:	Not available.
Melting Point:	Not available.
Boiling Point:	Not available.
Flash Point:	20 °C (PMCC)
Evaporation Rate:	(Ether, anhydrous = 1)
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	15 to 35 kPa (20 °C)
Vapor Density:	Not available.
Specific Gravity:	0.86 (Water = 1)
Density:	Not available.
Solubility in Water:	Insoluble in cold water.
Coefficient of Water/Oil Distribution:	Not available.
Auto-ignition Temperature:	Not available.
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability:	Stable under normal storage conditions.
Conditions of Reactivity:	Contact with incompatible materials. Sources of ignition.
Incompatible Materials:	Strong acids. Strong oxidizers. Chlorine.

Hazardous Decomposition Products: Oxides of carbon. Oxides of nitrogen. Aldehydes. Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.

Possibility of Hazardous Reactions: Explosion hazard in contact with strong nitric acid.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Ingredient	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Not available.	Not available.	Not available.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Not available.	Not available.	Not available.
Naphtha (petroleum), hydrotreated light	64742-49-0	Not available.	Not available.	Not available.
Butane	106-97-8	Not available.	Not available.	658000 mg/m³, (rat)
Hydrogen sulfide (H2S)	7783-06-4	Not available.	Not available.	444 ppm, (rat)
Benzene	71-43-2	930 mg/kg, (rat)	>9400 µl/kg, (rabbit)	10000 ppm, (rat)
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not available.	Not available.	Not available.
Benzene, dimethyl-	1330-20-7	>1700 mg/kg, (rat)	4300 mg/kg, (rabbit)	5000 ppm, (rat)

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Above 50 ppm Hydrogen sulphide, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: Irritating to respiratory system. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. This product contains hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm. Memory loss, paralysis of facial muscles, and nerve tissue damage may occur after severe exposures near 500 ppm.

Skin Sensitization: Not hazardous by OSHA/WHMIS criteria.

Respiratory Sensitization: Not hazardous by OSHA/WHMIS criteria.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Respiratory system. Skin. Liver. Kidney. Blood. Central nervous system. Cardiovascular system.

Chronic Effects: Not hazardous by OSHA/WHMIS criteria. Prolonged or repeated contact may dry skin and cause irritation. Similar products have shown the potential to produce skin tumors in laboratory animals as indicated following direct skin application over the lifetime of the test animal.High vapour concentrations, generally greater than 10% by volume, may sensitize the heart and lead to lethal cardiac arrhythmias. Repeated or prolonged exposure to H2S at 50 ppm or greater include respiratory illnesses such as bronchitis and pulmonary edema. This product may contain small quantities of benzene. Epidemiological studies indicate that long term inhalation of benzene vapours can result in leukemia. This product contains small quantities of xylene. Xylene can damage bone marrow thus causing anemia, and can also damage the liver and kidneys, as well as the central and peripheral nervous systems. This product contains small quantities of polycylic aromatic hydrocarbons. This product contains small quantities of polycyclic aromatic hydrocarbons. Prolonged contact with these compounds has been associated with the induction of skin and lung tumours.

Carcinogenicity: Hazardous by OSHA/WHMIS criteria. May cause cancer. Benzene has been classified by the International Agency for Research on Cancer as carcinogenic to humans (IARC Group 1).

Component Carcinogenicity

Ingredient	ACGIH	IARC	OSHA	NTP	Prop 65
Gas oils (petroleum), hydrodesulfurized	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Naphtha (petroleum), hydrotreated heavy	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Naphtha (petroleum), hydrotreated light	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Butane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Hydrogen sulfide (H2S)	Not listed.	Not listed.	Listed.	Not listed.	Not listed.
Benzene	A1	Group 1	Listed.	List 1	Listed.
Polycyclic Aromatic Hydrocarbons	A2	Group 2A	Listed.	List 2	Listed.
Benzene, dimethyl-	A4	Group 3	Listed.	Not listed.	Not listed.

Mutagenicity: Not hazardous by OSHA/WHMIS criteria.

Reproductive Effects: Not hazardous by OSHA/WHMIS criteria.

Developmental Effects

Teratogenicity: Not hazardous by OSHA/WHMIS criteria.

Embryotoxicity: Not hazardous by OSHA/WHMIS criteria. Exposure to xylene has produced fetotoxic effects in animal studies.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Not available.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORTATION INFORMATION

CFR

Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, II

Class: 3

UN Number: 1267

Packing Group: II

Label Code:



TDG

Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, II

Class: 3

UN Number: 1267

Packing Group: II

Label Code:



Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:

Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:



United States

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Ingredient	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Not listed.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Not listed.
Naphtha (petroleum), hydrotreated light	64742-49-0	Not listed.
Butane	106-97-8	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Not listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.
Benzene, dimethyl-	1330-20-7	Not listed.

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Ingredient	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Not listed.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Not listed.
Naphtha (petroleum), hydrotreated light	64742-49-0	Not listed.
Butane	106-97-8	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.
Benzene, dimethyl-	1330-20-7	Listed.

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Ingredient	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Not listed.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Not listed.
Naphtha (petroleum), hydrotreated light	64742-49-0	Not listed.

Butane	106-97-8	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.
Benzene, dimethyl-	1330-20-7	Listed.

California

California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Ingredient	Type of Toxicity
Benzene	developmental, male
Benzene	cancer
Polycyclic Aromatic Hydrocarbons	cancer

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Expiry Date: January 4, 2014

Version: 1.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

Husky Energy Material Safety Data Sheet

WHMIS	Personal Protection	TDG Road/Rail
		

Section I. Product Identification and Uses

Common/Trade name	**Western Canadian Select (WCS)**		
Synonyms	Not available.	**CAS #**	8002-05-09
Chemical family	Blend of Heavy Petroleum Crude, Medium Sweet Crude and Synthetic Crude.	**DSL**	On the DSL list.
Supplier	Husky Oil Operations Limited PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7 403-298-6111	**Manufacturer**	Husky Oil Operations Limited PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7 403-298-6111
Material uses	Chemical feedstock		

Section 2. First Aid Measures

Eye contact	Flush eyes for at least 15 minutes with clean water. Patch lightly, allowing drainage. Seek medical attention.
Skin contact	Remove contaminated clothing. Wash skin thoroughly with soap and water. Seek medical attention if irritation develops.
Inhalation	Protect rescuer. Move exposed person to fresh air. If breathing has stopped apply artificial respiration. Seek medical attention.
Ingestion	If swallowed, do not induce vomiting or give liquids. Seek immediate medical attention.

Section 3. Hazardous Ingredients

		Exposure Limits						
Name	**CAS #**	**TWA (ppm)**	**TWA (Mg/M3)**	**STEL (ppm)**	**STEL (Mg/M3)**	**CEIL (ppm)**	**CEIL (Mg/M3)**	**% by Weight**
Crude Oil (Hydrocarbons C5 and C6 Rich)	8002-05-09	100	n/av	n/av	n/av	n/av	n/av	100
Hydrogen Sulphide	7783-06-4	10	14	15	21	n/av	n/av	<0.5
Benzene	71-43-2	0.5	n/av	2.5	n/av			0.1-1
Toluene	108-88-3	20	n/av					1-5
Xylene	1330-20-7	100	n/av	150	n/av			1-30

Toxicity values of the hazardous ingredients

Crude oil (Hydrocarbons C5 and C6 Rich) LD50:4,300 mg/Kg (Rat). LC50: Not available.

Hydrogen Sulphide (H2S) LC50 Inhalation Mouse = 673 ppm 1 hour. LC50 Inhalation Rat = 444 ppm for 4 hours

Benzene. LD50 Oral rat= 930-5600 mg/Kg. LC50 Inhalation rat = 13,700 ppm for 4 hrs.

Xylene. LD50 Oral rat= 4300 mg/Kg. LC50 Inhalation rat= 6700 ppm for 4 hrs. LD50 Dermal rabbit >2000 mg/Kg.

Toluene. LD50 Oral rat= 5000 mg/Kg. LC50 Inhalation rat= 8000 ppm for n4 hrs. LD50 Dermal rabbit= 14000 mg/Kg.

Continued on Next Page

Section 4. Physical Data

Physical state and appearance	Liquid. Black/Brown.
Odor	Petroleum Odour
pH (1% soln/water)	Not applicable.
Odor threshold	O.13 ppm H2S
Evaporation rate	Not available.
Freezing point	Not available.
Boiling point	10°C - 1000°C
Specific gravity	0.92 -0.94 (Water = 1)
Volatility	100 (%vol)
Vapor density	Not available.
Vapor pressure	Not available.
Water/oil dist. coeff.	Not available.
Solubility	Not available.
Molecular Weight	Not applicable.
Melting Point	Not available.
Density	Not available.

Section 5. Fire and Explosion Data

Auto-ignition temperature	Not available.
Flash points	CLOSED CUP: -40°C (-40°F)
Flammable limits	Not available.
Extinguishing Media	Use DRY chemicals, CO2, or foam to extinguish fire. Water may not be an effective medium to extinguish fire. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.
Special fire fighting procedures	Use supplied air or self contained breathing apparatus (SCBA) for large fires or for fires in enclosed areas.
Flammability	Highly flammable liquid. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.
	Remark No additional remark.
Risks of explosion	This material is sensitive to static discharge. This product is not sensitive to mechanical impact.
	Remark No additional remark.

Section 6. Reactivity Data

Stability	The product is stable.
Hazardous decomp. products	Carbon monoxide, carbon dioxide and irritant fumes and gases including sulphur oxides, nitrogen oxides and aldehydes.
Reactivity	Incompatible material: Strong acids, strong oxidizers, chlorine. Hazardous polymerization: Will not occur.
	Remark No additional remark.

Continued on Next Page

Section 7. Toxicological Properties

Routes of entry	Ingestion. Inhalation. Eye contact. Skin contact.
TLV	TLV-TWA 100 PPM (525 mg/m3) for stoddard solvent from ACGIH. Hydrogen Sulfide: TWA: 10 ppm, STEL: 15 ppm, from ACGIH Benzene TWA:0.5 ppm, STEL: 2.5 ppm, from ACGIH, SKIN Toluene TWA: 20 ppm, from ACGIH Consult local authorities for acceptable exposure limits.
Toxicity to animals	**Hydrocarbons C5 and C6 Rich** LD50: Not available. LC50: Not available. **Hydrogen Sulphide (H2S)** **LC50 Inhalation Mouse = 673 ppm 1 hour** **LC50 Inhalation Rat = 444 ppm for 4 hours**
	Remark No additional remark.
Chronic effects	This product may contain benzene. Benzene has been classified by the international agency for research on cancer as a group 1 product indicating sufficent evidence of carcinogenicity. Studies exist which report a link to crude oil and reproductive effects including fetal tumors and menstrual disorders. This product contains small quantities of xylene. High exposure to xylene has produced fetotoxic effects in animal studies. This product contains small quantities of polycylic aromatic hydrocarbons. Prolonged contact with these compound has been associated with the induction of skin and lung tumours. This product may contain toluene which is known to cause visual impairment, narcosis, anxiety, muscle fatigue, insomnia, dermatitis, parathesis, liver and kidney damage and to affect reproduction.
	Remark No additional remark.
Acute effects	Sensitizing Capabiltiy: No effects known. Irritancy: Skin, eye and upper respiratory tract irritant.
Ingestion	Pulmonary aspiration hazard if swallowed and vomitting occurs.
Skin	Prolonged skin contact can cause defatting of the skin resulting in dry cracked skin and dermatitis.
Eyes	Eye contact with product or product vapours may result in eye irritation.
Inhalation	May cause headache, dizziness, loss of appetite and loss of consiousness. Product vapours are irritating to the respiratory tract.
	Remark This product contains small quantities of hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.
Synergistic materials	Not available.

Section 8. Preventive Measures

Waste disposal	Dispose of in accordance with all federal, provincial and local regulations.
Storage	Keep away from all ignition sources. Maintain temperature below the flash point. Head spaces in storage containers may contain hydrocarbon vapours and toxic hydrogen sulphide gas.
Ventilation	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.
Spill and leak	Evacuate unecessary personnel. Eliminate all ignition sources. Be alert to the potential for the presence of hydrogen sulphide gas and don appropriate protective equipment. Stop leak if safe to do so. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution. Comply with federal, provincial, and local requirements for spill notification.

Continued on Next Page

Section 9. Classification/Regulatory Information

TDG road / rail

TDG CLASS 3: Flammable liquid with a flash point less than or equal to 60.5 C (140.9 F). Closed cup test method.



PIN: 1267 - PETROLEUM CRUDE OIL

Remark
No additional remark.

WHMIS

WHMIS CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
WHMIS CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
WHMIS CLASS D-2B: Material causing other toxic effects (TOXIC).



Remark
No additional remark.

Other

This product is on the Domestic Substances List (DSL). TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.
Refer to federal, provincial, and local legislation for further requirements.

Section 10. Protective Clothing

Eye

Non-vented chemical goggles to prevent eye irritation from the solvent vapours.

Skin

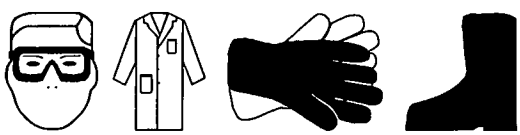
Impervious gloves and clothing should be worn as appropriate to protect against skin contact. Neoprene or nitrile material is suggested.

Respiratory

Respiratory protection may be required in poorly ventilated areas. Properly fitted air purifying masks equipped with organic vapour filters will provide protection at low concentrations. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed 10X the occupational exposure limit or when high concentrations of H2S may be present.

Other

As required by the situation according to your companies policies and procedures. Contact your supervisor for direction.



Section 11. Preparation Information

References

-Provisional Domestic Substances List, Canadian Ennvironmental Protection Act, Volume 1-Registry Number Index, April 1990; Environment Canada. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. CCOHS (Chem advi)
CCOHS(Cheminfo) Doccumentation of the Threshold Limit Values and Biological Exposure Indices (ACGIH)
Pocket Guide to Chemical Hazards (NIOSH)
Transportation of Dangerous Goods Shedule II List II

MSDS Status

Acronyms: TLV = Threshold Limit Value N/AP = Not applicable N/AV = Not Available COC = Cleveland Open Cup PMCC = Pensky Martens Closed Cup

Validated by Husky Corporate Hygiene on 3/19/2009.	**Verified by Husky Corporate Hygiene.**
Supersedes: 11/28/2005	**Printed 3/9/2009.**

Continued on Next Page

Emergency Phone # 403-262-2111

While the company believes the data set forth herein are accurate as of the date hereof, the company makes no warranty with respect thereto and expressly disclaims all liability for reliance thereon. Such data are offered solely for your consideration, investigation and verification.

Material Safety Data Sheet

According to the Controlled Product Regulations

1. MATERIAL AND COMPANY IDENTIFICATION

Material Name : **Western Heavy Blend**
Uses : Refinery Feedstock.

Manufacturer/Supplier : **Shell Trading Canada**
400 - 4th Avenue S.W.
Calgary-Alberta T2P 0J4
Canada
Telephone : (+1) 800-661-1600

Emergency Telephone Number
: Shell Canada: (+1) 800-661-7378
CANUTEC (24 hr): (+1) 613-996-6666

2. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture Description : Raw petroleum extracted in its natural state from the ground (excluding hydrocarbons from shale) and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.
Synonyms : Crude Oil, Sour (>0.5% S)

WHMIS Controlled Ingredients

Chemical Identity	CAS No.	Conc. W/W
Asphalt	8052-42-4	40.00- 60.00 %
Petroleum, Crude Oil	8002-05-9	5.00- 20.00 %
Hydrocracked petroleum residues	64741-75-9	5.00- 20.00 %
Natural Gas Condensate (C2-C8)	68919-39-1	0.00- 10.00 %
Naphtha (petroleum), hydrotreated light	64742-49-0	0.00- 10.00 %
Natural Gas Condensate	64741-47-5	0.00- 10.00 %
Residues (petroleum), vacuum	64741-56-6	0.00- 5.00 %
Distillates (petroleum), hydrotreated middle	64742-46-7	0.00- 5.00 %
Naphtha (petroleum), hydrotreated heavy	64742-48-9	0.00- 5.00 %
Naphtha (petroleum), heavy hydrocracked	64741-78-2	0.00- 5.00 %
Clarified oils (petroleum), catalytic cracked	64741-62-4	0.00- 5.00 %
Naphtha (petroleum), heavy straight-run	64741-41-9	0.00- 5.00 %
Naphtha (petroleum), light straight-run	64741-46-4	0.00- 5.00 %
Distillates (petroleum), straight-run, middle	64741-44-2	0.00- 5.00 %
CONTAINS:		
Isopentane	78-78-4	
Pentane	109-66-0	
n-Hexane	110-54-3	
Heptane	142-82-5	
Octane	111-65-9	
Nonane	111-84-2	

Decane	124-18-5
Methylcyclopentane	96-37-7
Methyl cyclohexane	108-87-2
Asphalt, fumes	8052-42-4
Benzene	71-43-2
Toluene	108-88-3
Trimethylbenzene, all isomers	25551-13-7

Refer to Chapter 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION



WHMIS Class/Description : Class B2 Flammable Liquid
Class D2B Other Toxic Effects - Narcotic effects.
Class D2A Other Toxic Effects - Carcinogen/Mutagen
Class D2A Other Toxic Effects - Reproductive Toxicity
Class D2B Other Toxic Effects - Irritant (Skin and Eye)
Class D2A Other Toxic Effects - Embryotoxic/Fetotoxic
Class D2A Other Toxic Effects - Developmental Toxicity

Routes of Exposure : Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.

Health Hazards : Moderately irritating to eyes. Harmful: may cause lung damage if swallowed. Possibility of organ or organ system damage from prolonged exposure; see Chapter 11 for details. Target organ(s): Bone Marrow Thymus. Liver. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome).

Signs and Symptoms : Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death.

Safety Hazards : Extremely flammable. May ignite on surfaces at temperatures above auto-ignition temperature. Flammable vapours may be present even at temperatures below the flash point. This material is a static accumulator. Even with proper grounding

and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.

Additional Information : This product is intended for use in closed systems only.

4. FIRST AID MEASURES

Inhalation : Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.

Skin Contact : Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye Contact : Flush eyes with water while holding eyelids open. Rest eyes for 30 minutes. If redness, burning, blurred vision, or swelling persist transport to the nearest medical facility for additional treatment.

Ingestion : If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Give nothing by mouth. Do not induce vomiting. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.

Advice to Physician : Treat symptomatically.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Flash point : -35 °C / -31 °F

Upper / lower Flammability or Explosion limits : Data not available

Auto ignition temperature : > 220 °C / 428 °F

Hazardous Combustion Products and Specific Hazards : Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Oxides of nitrogen. Oxides of sulphur. Unidentified organic and inorganic compounds. Flammable vapours may be present even at temperatures below the flash point. The vapour is heavier than air, spreads along the ground and distant ignition is possible.

Suitable Extinguishing Media : Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.

Unsuitable Extinguishing Media : Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to

be avoided as water destroys the foam.

Protective Equipment for Firefighters : Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).

Additional Advice : Keep adjacent containers cool by spraying with water. If possible remove containers from the danger zone. If the fire cannot be extinguished the only course of action is to evacuate immediately.

6. ACCIDENTAL RELEASE MEASURES

Protective Measures : May ignite on surfaces at temperatures above auto-ignition temperature. Do not breathe fumes, vapour. Do not operate electrical equipment. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.

Clean Up Methods : For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.

Additional Advice : Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet.

7. HANDLING AND STORAGE

General Precautions : Use the information in this data sheet as input to a risk assessment of local circumstances to help determine

appropriate controls for safe handling, storage and disposal of this material. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Prevent spillages. For comprehensive advice on handling, product transfer, storage and tank cleaning refer to the product supplier. Avoid contact with skin, eyes and clothing.

Handling : When using do not eat or drink. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Never siphon by mouth. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Avoid exposure. Use only non-sparking tools. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Bulk storage tanks should be diked (bunded). Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur. Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges. These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements. These activities may lead to static discharge e.g. spark formation. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/s until fill pipe submerged to twice its diameter, then <= 7 m/s). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.

Storage : Drum and small container storage: Keep containers closed when not in use. Drums should be stacked to a maximum of 3 high. Use properly labelled and closeable containers. Packaged product must be kept tightly closed and stored in a diked (bunded) well-ventilated area, away from, ignition sources and other sources of heat. Take suitable precautions when opening sealed containers, as pressure can build up during storage. Tank storage: Tanks must be specifically designed for use with this product. Bulk storage tanks should be diked (bunded). Locate tanks away from heat and other sources of ignition. Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions. Electrostatic charges will be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk. The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable. Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Product Transfer : Wait 2 minutes after tank filling (for tanks such as those on

road tanker vehicles) before opening hatches or manholes.
Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes.
Avoid splash filling. Keep containers closed when not in use.
Do not use compressed air for filling, discharging or handling.
Contamination resulting from product transfer may give rise to light hydrocarbon vapour in the headspace of tanks that have previously contained gasoline. This vapour may explode if there is a source of ignition. Partly filled containers present a greater hazard than those that are full, therefore handling, transfer and sampling activities need special care.
Refer to guidance under Handling section.

Recommended Materials : For containers, or container linings use mild steel, stainless steel. Aluminium may also be used for applications where it does not present an unnecessary fire hazard. Examples of suitable materials are: high density polyethylene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyvinyl fluoride (PVDF), and fluoroelastomers (FKM), e.g. Viton, which have been specifically tested for compatibility with this product. For container linings, or coatings, use Epoxy (amine-cured), or Epoxy Novolac, or Phenolic Epoxy. For seals and gaskets use: fluoroelastomers (FKM), e.g. Viton A, B, or F, or Neoprene (CR), or nitrile (NBR, HNBR), or graphite, or expanded PTFE (e.g. Gore-Tex).

Unsuitable Materials : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyisobutylene. However, some may be suitable for glove materials.

Container Advice : Do not cut, drill, grind, weld or perform similar operations on or near containers. Containers, even those that have been emptied, can contain explosive vapours.

Additional Information : Ensure that all local regulations regarding handling and storage facilities are followed.
See additional references that provide safe handling practices for liquids that are determined to be static accumulators: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity). CENELEC CLC/TR 50404 (Electrostatics – Code of practice for the avoidance of hazards due to static electricity).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

Occupational Exposure Limits

Material Safety Data Sheet

Material	Source	Type	ppm	mg/m3	Notation
Benzene	ACGIH	TWA	0.5 ppm		
	ACGIH	STEL	2.5 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
	SHELL IS	TWA	0.5 ppm	1.6 mg/m3	
	SHELL IS	STEL	2.5 ppm	8 mg/m3	
Hydrogen Sulphide	ACGIH	TWA	1 ppm		
	ACGIH	STEL	5 ppm		
Ethylbenzene	ACGIH	TWA	20 ppm		
n-hexane	ACGIH	TWA	50 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
Toluene	ACGIH	TWA	20 ppm		
Isopentane	ACGIH	TWA	600 ppm		
Pentane	ACGIH	TWA	600 ppm		
Heptane	ACGIH	TWA	400 ppm		
	ACGIH	STEL	500 ppm		
	ACGIH	TWA	400 ppm		
	ACGIH	STEL	500 ppm		
Octane	ACGIH	TWA	300 ppm		
Xylene	ACGIH	TWA	100 ppm		
	ACGIH	STEL	150 ppm		
Cyclohexane	ACGIH	TWA	100 ppm		
Methyl cyclohexane	ACGIH	TWA	400 ppm		

Material Safety Data Sheet

Asphalt, fumes	ACGIH	TWA(Inhalable fraction.)		0.5 mg/m3	as benzene solubles
Trimethylbenzene, all isomers	ACGIH	TWA	25 ppm		

Consult local authorities for acceptable exposure limits within their jurisdiction.

Additional Information : SHELL IS is the Shell Internal Standard.

Biological Exposure Index (BEI) - See reference for full details

Material	Determinant	Sampling Time	BEI	Reference
Benzene	S-Phenylmercapturic acid in Creatinine in urine	Sampling time: End of shift.	25 µg/g	ACGIH BEL (2011)
	t,t-Muconic acid in Creatinine in urine	Sampling time: End of shift.	500 µg/g	ACGIH BEL (2011)
Ethylbenzene	Sum of mandelic acid and phenylglyoxylic acid in Creatinine in urine	Sampling time: End of shift at end of work week.	0.7 g/g	ACGIH BEL (2011)
	Ethyl benzene in End-exhaled air	Sampling time: Not critical.		ACGIH BEL (2011)
n-hexane	2,5-Hexanedion, without hydrolysis in Urine	Sampling time: End of shift at end of work week.	0.4 mg/l	ACGIH BEL (2011)
Toluene	toluene in Urine	Sampling time: End of shift.	0.03 mg/l	ACGIH BEL (2011)
	toluene in Blood	Sampling time: Prior to last shift of work week.	0.02 mg/l	ACGIH BEL (2011)

	o-Cresol, with hydrolysis in Creatinine in urine	Sampling time: End of shift.	0.3 mg/g	ACGIH BEL (2011)
Xylene	Methylhippuric acids in Creatinine in urine	Sampling time: End of shift.	1.5 g/g	ACGIH BEL (02 2012)

Exposure Controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Local exhaust ventilation is recommended. Eye washes and showers for emergency use.

Personal Protective Equipment : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory Protection : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. All respiratory protection equipment and use must be in accordance with local regulations. If air-filtering respirators are suitable for conditions of use: Select a filter suitable for combined particulate/organic gases and vapours [boiling point >65 °C (149 °F)] meeting EN14387. Select a filter suitable for acid gases and vapours meeting EN14387.

Hand Protection : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: Longer term protection: Nitrile rubber. Incidental contact/Splash protection: PVC. Natural rubber. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where

		suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognise that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time may be acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material.
Eye Protection	:	Chemical splash goggles (chemical monogoggles).
Protective Clothing	:	Chemical resistant gloves/gauntlets, boots, and apron (where risk of splashing).
Monitoring Methods	:	Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Environmental Exposure Controls	:	Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. Information on accidental release measures are to be found in section 6.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Yellow to brown. Viscous liquid.
Odour	:	Strong hydrocarbon.
Odour threshold	:	Data not available
pH	:	Not applicable
Initial Boiling Point and Boiling Range	:	34.1 °C / 93.4 °F
Freezing Point	:	< -65 °C / -85 °F
Pour point		-30 °C / -22 °F
Vapour pressure	:	Typical 54 kPa
Specific gravity	:	Data not available
Density	:	Typical 928 kg/m3 at 15 °C / 59 °F
Water solubility	:	Insoluble.
n-octanol/water partition coefficient (log Pow)	:	Data not available
Kinematic viscosity	:	101 mm2/s at 30 °C / 86 °F
Vapour density (air=1)	:	Data not available
Electrical conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semi-conductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid.
Evaporation rate (nBuAc=1)	:	Data not available

10. STABILITY AND REACTIVITY

Stability	:	No hazardous reaction is expected when handled and stored according to provisions.
Conditions to Avoid	:	Avoid heat, sparks, open flames and other ignition sources.
Materials to Avoid	:	Strong oxidising agents.
Hazardous Decomposition Products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.
Hazardous Polymerisation	:	No, hazardous, exothermic polymerization cannot occur.
Sensitivity to Mechanical Impact	:	Data not available
Sensitivity to Static Discharge	:	Yes

11. TOXICOLOGICAL INFORMATION

Basis for Assessment	:	Information given is based on product data, a knowledge of the components and the toxicology of similar products.
Routes of Exposure	:	Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.
Acute Oral Toxicity	:	Low toxicity: LD50 >2000 mg/kg , Rat.
Acute Dermal Toxicity	:	Low toxicity: LD50 >2000 mg/kg , Rabbit.
Acute Inhalation Toxicity	:	Low toxicity by inhalation. LC50 >5 mg/l (Petroleum, Crude Oil) High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.
Skin Irritation	:	Irritating to skin. Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis.
Eye Irritation	:	Expected to be irritating to eyes.
Respiratory Irritation	:	Based on human experience, breathing of vapours or mists may cause a temporary burning sensation to nose, throat and lungs.
Sensitisation	:	Not expected to be a sensitiser.
Repeated Dose Toxicity	:	May cause damage to organs or organ systems through prolonged or repeated exposure. Bone Marrow Thymus. Liver.
Repeated Dose Toxicity	:	Kidney: caused kidney effects in male rats which are not considered relevant to humans Blood-forming organs: repeated exposure affects the bone marrow. (Benzene)
Mutagenicity	:	May cause heritable genetic damage. (Benzene) Mutagenicity

studies on gasoline and gasoline blending streams have shown predominantly negative results.

Carcinogenicity : Known human carcinogen. (Benzene) May cause leukaemia (AML - acute myelogenous leukemia). (Benzene) Inhalation exposure to mice causes liver tumours, which are not considered relevant to humans.

Material	:	**Carcinogenicity Classification**
Asphalt	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Asphalt	:	IARC: Occupational exposures to hard bitumens and their emissions during mastic asphalt work are 'possibly carcinogenic to humans' (IARC Group 2B)., Occupational exposures to straight-run bitumens and their fume condensates during road paving are 'possibly carcinogenic to humans' (IARC Group 2B).
Asphalt	:	GHS / CLP: No carcinogenicity classification
Petroleum, Crude Oil	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Petroleum, Crude Oil	:	GHS / CLP: No carcinogenicity classification
Hydrocracked petroleum residues	:	GHS / CLP: No carcinogenicity classification
Natural Gas Condensate (C2-C8)	:	GHS / CLP: No carcinogenicity classification
Naphtha (petroleum), hydrotreated light	:	ACGIH Group A3: Confirmed animal carcinogen with unknown relevance to humans.
Naphtha (petroleum), hydrotreated light	:	IARC 2B: Possibly carcinogenic to humans.
Naphtha (petroleum), hydrotreated light	:	GHS / CLP: No carcinogenicity classification
Natural Gas Condensate	:	GHS / CLP: No carcinogenicity classification
Residues (petroleum), vacuum	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Residues (petroleum), vacuum	:	IARC 2B: Occupational exposures to hard bitumens and their emissions during mastic asphalt work are 'possibly carcinogenic to humans' (IARC Group 2B)., Occupational exposures to straight-run bitumens and their fume condensates during road paving are 'possibly carcinogenic to humans' (IARC Group 2B).
Residues (petroleum), vacuum	:	GHS / CLP: No carcinogenicity classification
Distillates (petroleum), hydrotreated middle	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Distillates (petroleum), hydrotreated middle	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Distillates (petroleum), hydrotreated middle	:	GHS / CLP: No carcinogenicity classification
Naphtha (petroleum), hydrotreated heavy	:	GHS / CLP: No carcinogenicity classification
Naphtha (petroleum), heavy hydrocracked	:	GHS / CLP: No carcinogenicity classification
Clarified oils (petroleum),	:	IARC 2B: Possibly carcinogenic to humans.

catalytic cracked		
Clarified oils (petroleum), catalytic cracked	:	GHS / CLP: No carcinogenicity classification
Naphtha (petroleum), heavy straight-run	:	GHS / CLP: No carcinogenicity classification
Naphtha (petroleum), light straight-run	:	GHS / CLP: No carcinogenicity classification
Distillates (petroleum), straight-run, middle	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Distillates (petroleum), straight-run, middle	:	GHS / CLP: No carcinogenicity classification
Isopentane	:	GHS / CLP: No carcinogenicity classification
Pentane	:	GHS / CLP: No carcinogenicity classification
n-Hexane	:	GHS / CLP: No carcinogenicity classification
Heptane	:	GHS / CLP: No carcinogenicity classification
Octane	:	GHS / CLP: No carcinogenicity classification
Nonane	:	GHS / CLP: No carcinogenicity classification
Decane	:	GHS / CLP: No carcinogenicity classification
Methylcyclopentane	:	GHS / CLP: No carcinogenicity classification
Methyl cyclohexane	:	GHS / CLP: No carcinogenicity classification
Toluene	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Toluene	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Toluene	:	GHS / CLP: No carcinogenicity classification
Benzene	:	ACGIH Group A1: Confirmed human carcinogen.
Benzene	:	NTP: Known To Be Human Carcinogen.
Benzene	:	IARC 1: Carcinogenic to humans.
Benzene	:	OSHA: Cancer hazard.
Benzene	:	GHS / CLP: No carcinogenicity classification
n-hexane	:	GHS / CLP: No carcinogenicity classification
Asphalt, fumes	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Asphalt, fumes	:	IARC 2B: Occupational exposures to hard bitumens and their emissions during mastic asphalt work are 'possibly carcinogenic to humans' (IARC Group 2B)., Occupational exposures to straight-run bitumens and their fume condensates during road paving are 'possibly carcinogenic to humans' (IARC Group 2B).
Asphalt, fumes	:	GHS / CLP: No carcinogenicity classification
Trimethylbenzene, all isomers	:	GHS / CLP: No carcinogenicity classification

Reproductive and Developmental Toxicity : May impair fertility at doses which produce other toxic effects. (n-hexane)

Additional Information : May cause MDS (Myelodysplastic Syndrome).
Exposure to very high concentrations of similar materials has been associated with irregular heart rhythms and cardiac arrest.

12. ECOLOGICAL INFORMATION

Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Acute Toxicity : Expected to be toxic:LL/EL/IL50 > 1 <= 10 mg/l(to aquatic organisms)LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract.

Fish : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Aquatic crustacea : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Algae/aquatic plants : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Microorganisms : Expected to be harmful: LL/EL/IL50 >10 <= 100 mg/l

Chronic Toxicity

Fish : NOEC/NOEL expected to be > 1.0 - <= 10 mg/l

Aquatic crustacea : NOEC/NOEL expected to be > 1.0 - <= 10 mg/l

Mobility : If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater. Contains volatile constituents. Partly evaporates from water or soil surfaces, but a significant proportion will remain after one day. Floats on water and forms a slick.

Persistence/degradability : Major constituents are inherently biodegradable, but contains components that may persist in the environment.

Bioaccumulation : Contains constituents with the potential to bioaccumulate.

Other Adverse Effects : Films formed on water may affect oxygen transfer and damage organisms.

13. DISPOSAL CONSIDERATIONS

Material Disposal : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination. Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Container Disposal : Send to drum recoverer or metal reclaimer. Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard if heated above the flash point. Do not puncture, cut or weld uncleaned drums. Do not pollute the soil, water or environment with the waste container. Comply with any local recovery or

waste disposal regulations.

Local Legislation : Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be in compliance.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification

UN/NA Number	UN 1267
Proper shipping name	PETROLEUM CRUDE OIL
Class Division	3
Packing group	II
Shipping Description	PETROLEUM CRUDE OIL, Class 3, UN 1267, PG II
Additional Information	MARPOL Annex 1 rules apply for bulk shipments by sea.

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class/Description : Class B2 Flammable Liquid
Class D2B Other Toxic Effects - Narcotic effects.
Class D2A Other Toxic Effects - Carcinogen/Mutagen
Class D2A Other Toxic Effects - Reproductive Toxicity
Class D2B Other Toxic Effects - Irritant (Skin and Eye)
Class D2A Other Toxic Effects - Embryotoxic/Fetotoxic
Class D2A Other Toxic Effects - Developmental Toxicity

Inventory Status

EINECS	:	All components listed or polymer exempt.
DSL	:	All components listed.
TSCA	:	All components listed.

16. OTHER INFORMATION

SDS Version Number : 1.1

SDS Effective Date : 11-08-2012

SDS Revisions : A vertical bar (|) in the left margin indicates an amendment from the previous version.

Material Safety Data Sheet

SDS Regulation	:	The content and format of this (M)SDS is in accordance with the Controlled Product Regulations.
SDS Prepared By	:	Shell Product Stewardship; 1-800-661-1600
SDS Distribution	:	The information in this document should be made available to all who may handle the product.
Disclaimer	:	The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.

APPENDIX H

BASICS OF OIL SPILL RESPONSE

H.1 Dikes, Berms and Dams

H.2 Deflection Boom

H.3 Containment Boom

H.4 Diversion Boom

H.5 Shoreline Recovery

H.6 Ice Operations

Figure H.1 Culvert Blocking

Figure H.2 Deflective Booming Technique(Single Boom Method)

Figure H.3 Deflective Booming Technique(Trolley Method)

Figure H.4 Deflective Booming Technique(Cascade Method)

Figure H.5 Containment Booming (Catenary Method)

Figure H.6 Open Chevron Boom Technique

Figure H.7 Closed Chevron Boom Technique

Figure H.8 Ice Slotting Technique

Figure H.9 Deflective Board Recovery Strategy

Figure H.10 Close up view of Deflective Board

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H.1 DIKES, BERMS AND DAMS

Dikes, berms, and dams are land-based tactics, with the objective of containing spilled oil and limiting spreading of oil slicks, thus minimizing impacts to the environment. Dikes, berms and dams are embankment structures built-up from the existing terrain, placed to contain and accumulate oil for recovery. These barriers can serve to:

- Contain and stabilize a contaminated area.
- Contain or divert oil on water or oil that has potential to migrate.
- Create cells for recovery.
- Use natural depressions to act as containment areas for recovery.

The tactic may be deployed in association with a recovery tactic, such as Shoreline Recovery or On-land Recovery. Dikes, berms, and dams are most effective when placed before oil arrives. Dikes, berms, and dams can also be used to exclude oil from a sensitive area, which is covered in the Beach Berms and Exclusion Dams tactic. The tactic can also be used in conjunction with an excavation tactic to enhance containment volumes (see Pits, Trenches, and Slots).

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Plan a deployment configuration that best supports the operating environment and available resources.
3. Mobilize to the location and deploy response resources.
4. Construct the containment structure and ensure it does not leak.
5. Consider the need to remove any water-bottom that may collect beneath the oil inside the structure.
6. Monitor the containment structure on an appropriate basis.
7. If oil collects in the structure, utilize an appropriate recovery system for removal.

Tactic Description

This tactic involves building an embankment perpendicular to the flow of the oil slick or around a contaminated area. Dike, berm, and dam structures can be constructed with a wide variety of materials including: soil, gravel, snow, sand bags, oil boom, timbers and logs. Selection of the construction material depends on the operating environment, location, available materials, and whether the structure is to be temporary or permanent. The containment area should be lined with an impermeable membrane, such as plastic sheeting, to keep oil and oily water from leaking or migrating into the soil. The structure may include a method to regulate flow, such as a weir or spill way. Dikes, berms, and dams can be built by manual labor or with earth-moving equipment depending on the location and available resources.

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Deployment Configurations

Berms

A containment berm can be constructed of available materials such as earth, gravel, or snow. Use earth-moving equipment or manual labor to construct the berm. Form the materials into a horseshoe shape ahead of the flow of oil. Use plastic sheeting to line the walls of a soil berm to prevent oil penetration. Sandbags filled with sand or other heavy material also make excellent containment barriers.

Dams

An underflow dam can be used when there is too much water flow to allow for a complete blockage of a drainage channel. The dam is built of earth, gravel, or other barriers such as sandbags or plywood sheets. Wherever possible, line the upstream side of the dam with plastic sheeting to prevent erosion and penetration of oil into the dam material.

Underflow dams use inclined culverts or pipes to move water downstream while leaving the spill contained behind the dam. The capacity of the pipe(s) should exceed the stream flow rate. It may be necessary to use pumps to remove water behind a dike. Valves or culvert plugs can also be used to control flow rate.

Pipes must be placed on the upstream side of the dam, with the elevated end on the downstream side. Make sure that the upstream end of the pipe is submerged and below the oil/water interface. The height of the elevated downstream end of the pipe will determine the water level behind the dam.

Existing Roads

Roadways that are built up above the terrain can be used as dikes. However, road construction usually allows for natural drainage through culverts or bridges. These drainage structures must be controlled to turn the road into a barrier.

Culvert Blocking

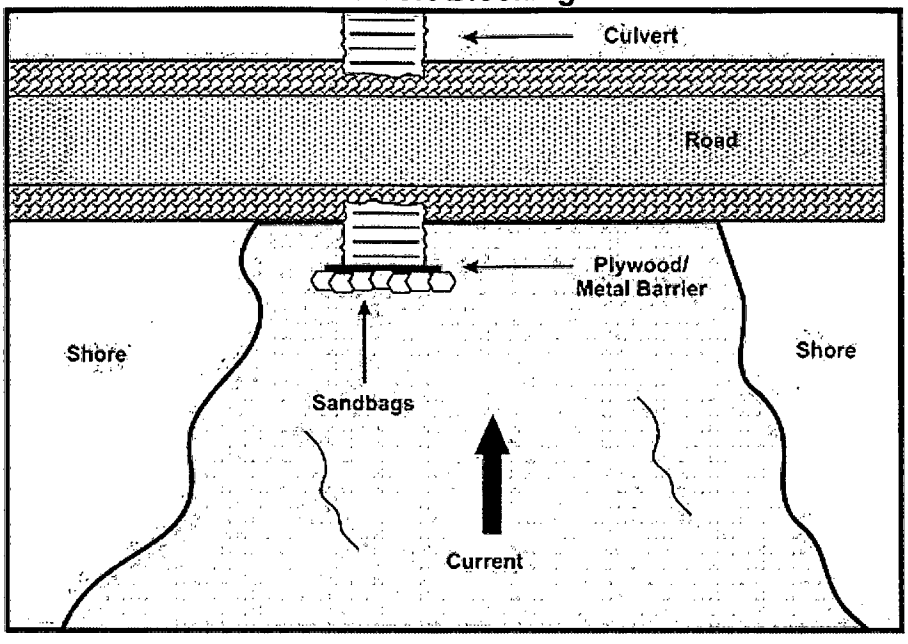
A culvert can be blocked using sheet metal, plywood barriers, or inflatable culvert plugs. Use a full block only when the culvert will be blocked for the entire cleanup operation, if the oil floating on the water will not contaminate additional soil or tundra, and if blocking the water flow will not threaten the road. Otherwise, an adjustable weir or culvert plug should be used.

Plywood and/or sandbags can also be used as culvert blocks, but are more labor-intensive and pose a higher potential for injury. A wood block may require a headwall with kickers oriented to support the boards or plywood. Place the blocking materials over the upstream end of the culvert. Plastic sheeting over the outside of the block will prevent oil penetration.

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FIGURE H.1

Culvert Blocking



Earth Moving Equipment

A bulldozer, road grader, or front-end loader drives around the spill with its blade angled towards the spill, pushing earth or snow into a berm. Once the perimeter has been covered with an initial berm, shore-up areas as necessary.

Snow

Because of the absorbent quality of snow, it makes an excellent berm for both containment and recovery. A snow berm can be strengthened by spraying it with a fine water mist that forms an ice layer on top of the snow. A snow berm is built around the areas of heaviest oiling to contain oil or diesel spilled to tundra and/or ice in winter.

Mesh Fence

Plastic mesh fencing may be used to quickly construct an underflow dam system. The mesh fencing is placed across the drainage and held in place with stakes. Absorbent boom, oil boom, plywood, or even dry dead grass can be placed on the upstream side of the fencing. Running water will find its way under the barrier fence, but oil floating on top of the water will be trapped. The advantages of this system are that it is lightweight and mobile.

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H.2 DEFLECTION BOOM

Objective & Strategy

The objective is to direct spilled oil away from a location to be protected or simply to change the course of the slick. "Deflection" is used to describe the tactic where oil is redirected away from an area but not recovered.

Tactic Description

The boom is placed at an optimum angle to the oil trajectory, using the movement of the current to carry oil along the boom and then releasing it into the current again with a new trajectory. The angle is chosen to prevent oil from entraining beneath the boom skirt. Boom may be held in place by anchors, vessels, or a boom control device.

Deflection Boom may be used to temporarily avoid impacts to a sensitive area, but there is no recovery associated with the tactic, thus no oil is removed from the environment.

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Identify, prioritize, and select sensitive areas to be protected from impact.
3. Select a deployment configuration that best supports the operating environment and available resources.
4. Mobilize to the location and deploy the tactic.
5. Place boom using secured anchor systems, mooring points, vessels, boom control devices, etc.
6. Monitor and adjust the boom on an appropriate basis.

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Boom Angle

Select the appropriate boom angle to keep oil from entraining under the boom. Where currents exceed 3 knots the boom must be almost parallel to the current to prevent entrainment. In currents exceeding 3 knots, a cascade of boom arrays may be used; the first boom array will slow the velocity of the slick allowing subsequent arrays to deflect the oil.

Anchor Systems

Boom is secured in place using standard anchoring systems. Anchor sizes vary depending on the boom type and the operating equipment.

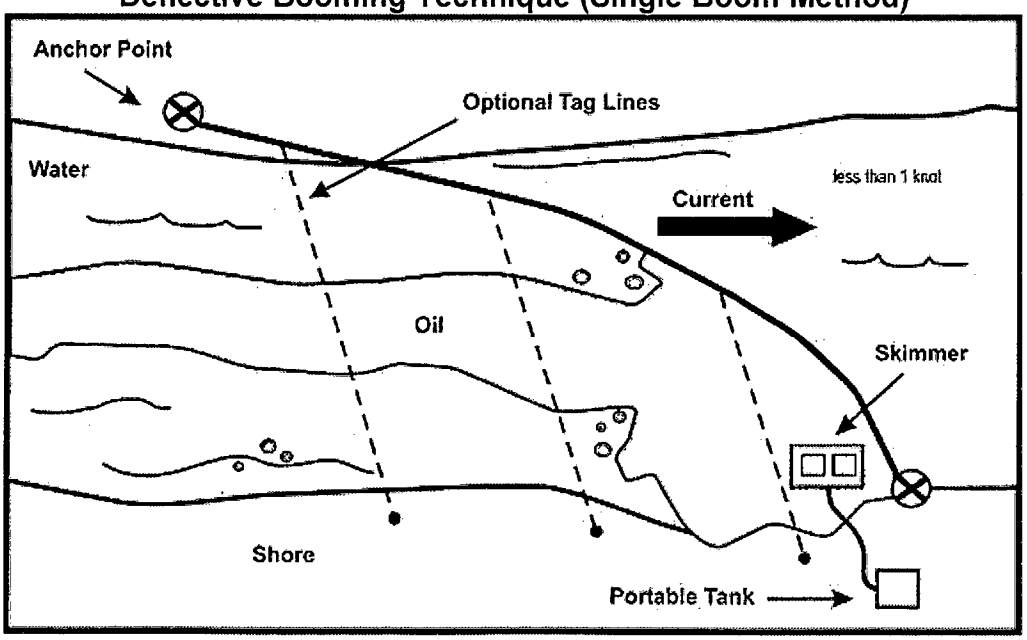
Deployment Configurations

Single Boom

Boom is deployed from a site at an optimum angle to the current and anchored to deflect the oil away from a location. Figures H.2 and H.3 illustrate two single boom deflection techniques.

FIGURE H.2

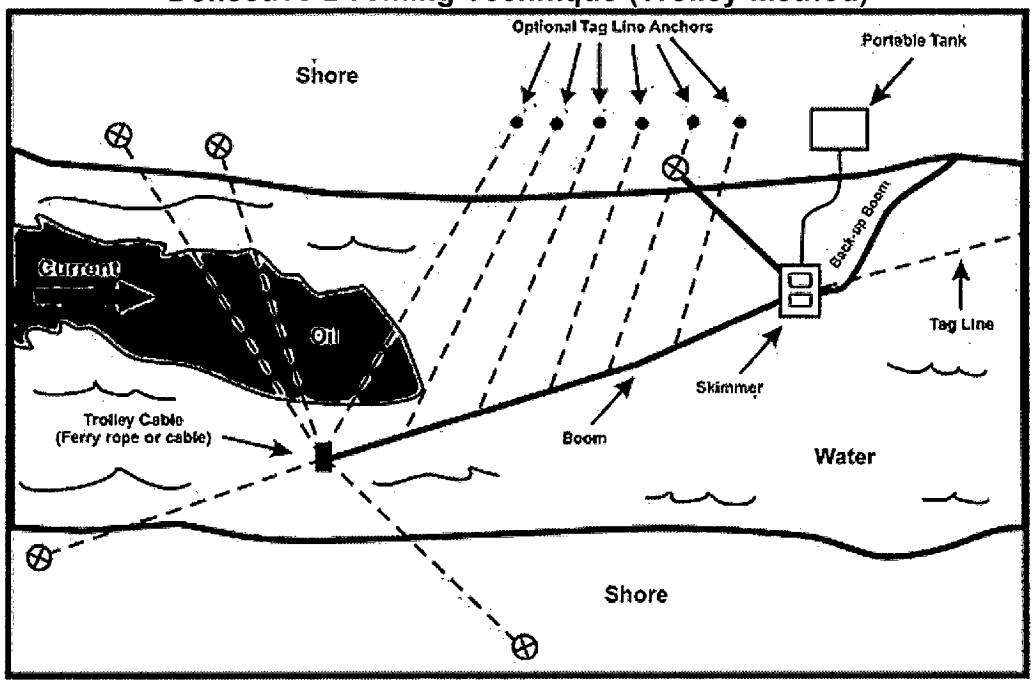
Deflective Booming Technique (Single Boom Method)



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FIGURE H.3

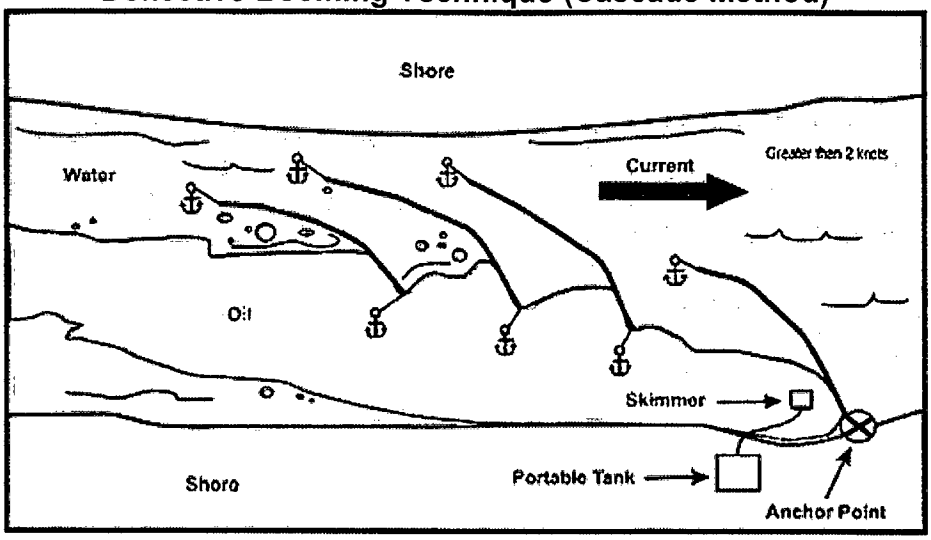
Deflective Booming Technique (Trolley Method)



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FIGURE H.4

Deflective Booming Technique (Cascade Method)



Cascade

Several booms are deployed in a cascade configuration when a single boom cannot be used because of fast current or because it is necessary to leave openings in the boom for vessel traffic, etc. This configuration can be used in strong currents where it may be impossible to effectively deploy one continuous section of boom. Shorter sections of boom used in a cascade deployment are easier to handle in faster water, thereby increasing efficiency. Additional equipment may be required to set and maintain this system as compared to the single boom configuration.

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H.3 CONTAINMENT BOOM

Objective & Strategy

Containment booming is a fixed-boom tactic. The objective is to corral spilled oil on the water, usually near the source, thus minimizing spreading and impacts to the environment. It is usually deployed with Shoreline Recovery.

This tactic can be deployed for oil spill migrating downstream or downhill to water or through water.

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Select a deployment configuration that best supports the operating environment and available resources.
3. Mobilize to the location and deploy the tactic.
4. Place boom, using secure anchor system or mooring points.
5. Monitor the boom on an appropriate basis.
6. If oil collects in the boom, utilize an appropriate recovery tactic to remove it.

Tactic Description

Containment boom systems are comprised of the appropriate oil boom for containment and concentration, and anchoring systems to hold the boom in place.

Containment boom systems are not recommended for the fast water environment because of the high probability of fixed-boom failure and the difficulty of anchoring in this environment.

Containment boom systems are not recommended for the broken ice environment, because of the high probability of fixed-boom failure and loss due to ice encounters.

Anchoring systems are often deployed first and then the boom is set from one anchor to the adjacent anchor. Boom can be placed from shoreline to shoreline.

A second layer of containment boom, outside the primary boom, has two advantages:

1. It breaks the sea chop and reduces its impact on the primary boom,
2. It may capture oil that has escaped if the primary boom fails.

Figure H.5 illustrates a simple containment booming technique.

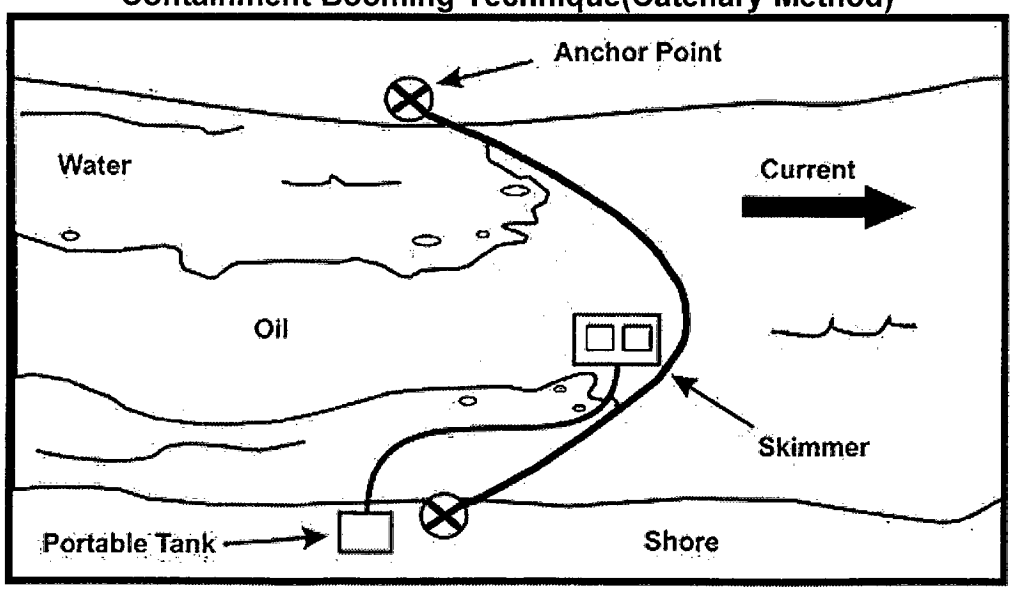
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Deployment Considerations

- It is often advisable to "line" the containment boom with sorbent materials (passive recovery) to recover the sheen and reduce decontamination costs.
- If the oil slick is moving, due to wind or current, consider containment at the source and ahead of the leading edge.
- If spill is moving in excess of 1 knot, consider the Diversion Boom Tactic.
- Anchor systems must be selected based on the maximum stress that might be expected to occur on the boom array, considering stronger currents and winds than when the anchor is set.
- Site conditions will influence deployment configuration options.
- Combinations of Containment Boom and Diversion Boom tactics are often used together to optimize success.

FIGURE H.5

Containment Booming Technique(Catenary Method)



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H.4 DIVERSION BOOM

Objective & Strategy

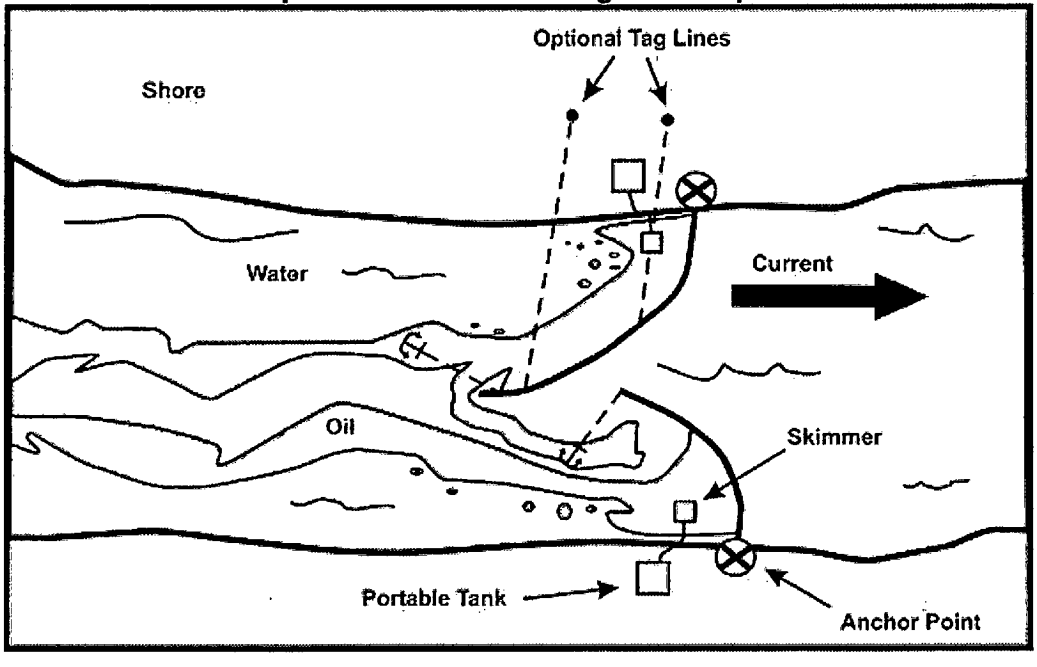
The objective is to redirect the spilled oil from one location or direction of travel to a specific site for recovery. For the purposes of maintaining consistent and clear terms, diversion is always associated with oil recovery, in contrast with the term deflection, which is used to describe the tactic where oil is redirected away from an area but not recovered.

Tactic Description

The Diversion Boom tactic is for water-born spills where there is some current, usually from 0.5 to 3.0 knots. The boom is placed at an optimum angle to the oil trajectory, using the movement of the current to carry oil along the boom to a recovery location. The angle is chosen to prevent oil from entraining beneath the boom skirt. Oil can be diverted to a shoreline or away from a shoreline or shoal waters. This tactic is always associated with a Shoreline Recovery. Figures H.6 and H.7 illustrate two diversionary booming techniques. These techniques are the Open Checvron and the Closed Chevron technique respectively.

FIGURE H.6

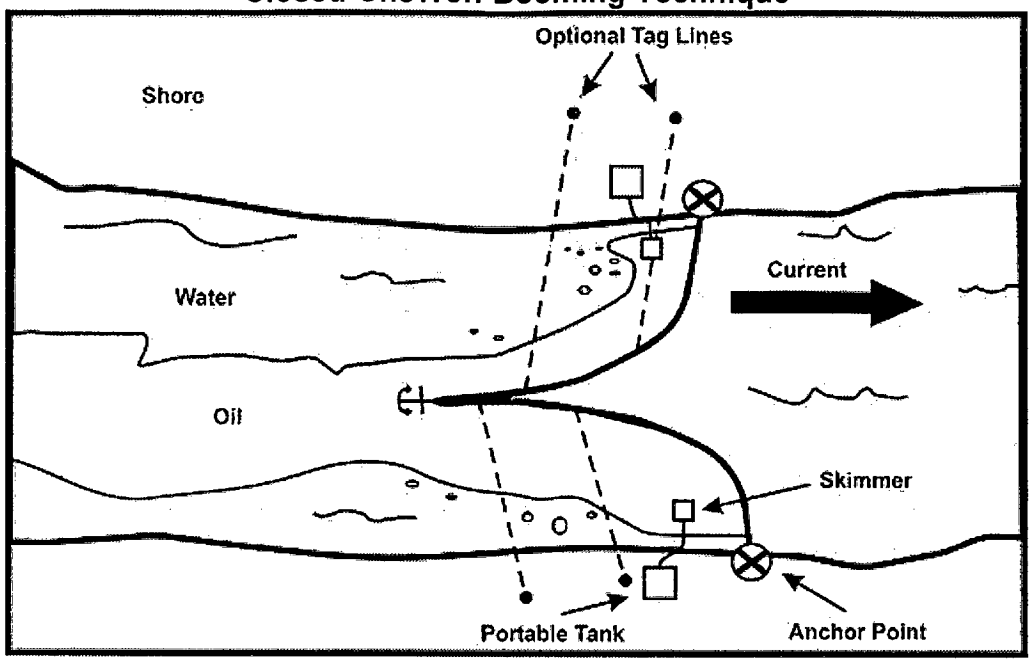
Open Chevron Booming Technique



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FIGURE H.7

Closed Chevron Booming Technique



Anchor Systems

Boom is secured in place using standard anchoring systems. Anchor sizes vary depending on the boom type and the operating environment.

Boom Angle

Select the appropriate boom angle to keep oil from entraining under the boom. Note that the angle relative to the current decreases rapidly as the current increases. Where currents exceed 3 knots the boom must be almost parallel to the current to prevent entrainment. In currents exceeding 3 knots, a cascade of boom arrays may be used; the first boom array will slow the velocity of the slick allowing subsequent arrays to deflect the oil.

Single Boom

A basic diversion technique is to divert oil from a current to a recovery site along a shoreline. The recovery site is chosen where there is minimal current and a suitable recovery system can be deployed. The boom is then anchored at the site and deployed at an optimum angle to the current and secured/anchored to divert the oil to the shoreline for recovery.

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H.5 SHORELINE RECOVERY

Objective & Strategy

The objective is to remove spilled oil that has been diverted to a designated recovery site accessible from the shore.

Shoreline Recovery is usually deployed as part of another tactic, such as Diversion Boom strategy. When deployed in conjunction with another tactic, fewer personnel may be required.

The general strategy is to:

1. Identify the primary recovery site.
2. Assess site conditions and access routes.
3. Determine the appropriate recovery and storage systems based on oil type, access, and deployment restrictions.
4. Mobilize and deploy equipment to recover and temporarily store the oil from the recovery site.
5. Take precautions to minimize contamination of the shoreline at the collection site.
6. Man and monitor the system as appropriate.
7. Store and transfer recovered oil and oily water according to an approved waste management plan.

Tactic Description

Shoreline recovery systems can be deployed from land access routes (beaches, all-terrain vehicles), or water access. Access to the recovery site and the oil type will influence/dictate the options of equipment to be used.

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Skimming Systems

Shoreline recovery requires at least one portable skimming system to remove spilled oil. The typical portable skimming system includes:

- Skimmer with pump and power pack
- Hose (suction and discharge with fittings)
- Oil transfer and decanting pump(s)
- Repair kit (tools and extra parts)

There are many models of skimmers to choose from, but they all fall into three types:

- **Weir skimmers** draw liquid from the surface by creating a sump in the water into which oil and water pour. The captured liquid is pumped from the sump to storage. Weir skimmers can recover oil at high rates, but they can alsó recover more water than oil, especially when the oil is in thin layers on the surface of the water. This creates the need to separate the water from the oil and decant it back into the environment. Otherwise, the recovered water takes available storage volume. Weir skimmers are best employed where oil has been concentrated into thick pools or where there are very large volumes of oil and recovered liquid storage capacity.
- **Oleophilic skimmers** pick up oil that adheres to a collection surface, leaving most of the water behind. The oil is then scraped from the collection surface and pumped to a storage device. Oleophilic skimmers do not recover oil as fast as weir skimmers, but they have the advantage of recovering very little water. Oleophilic skimmers may be used where oil is very thin on the surface. Oleophilic skimmers are a good choice where liquid storage capacity is limited.
- **Suction skimmers** use a vacuum to lift oil from the surface of the water. These skimmers require a vacuum pump or air conveyor system. Like weir skimmers, suction skimmers may also collect large amounts of water if not properly operated. Most suction skimmers are truck mounted and work best at sites with road access.

Primary Oil Storage Devices

Primary oil storage devices for shoreline recovery can be portable tanks, bladders, or truck-mounted tanks on the shoreline. If access is not restricted, larger systems can be used and deployed by heavy lifting equipment. If the site is accessible by road, vacuum trucks may be used for oil recovery, storage, and transport.

Recovery Location

Selection of a shoreline recovery location is critical to the success of this tactic. A recovery site should be in calm water with minimal currents. The site must have enough level ground to set up and operate a power pack and portable tanks. Sites with road access are preferred, but if not available, the site must have some other suitable access. Shelter, food and water for the response crew must also be considered in selecting a site.

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H.6 ICE OPERATIONS

Objective & Strategy

Much like that of diversion booming, the objective is to redirect the spilled oil from one location or direction of travel to a specific site for recovery. With a layer of ice preventing the use of booming equipment, other response strategies must be employed.

Tactic Description

Ice Slotting

Ice slotting (Figure H.8) may be used in cases where the ice is thick enough to support the response equipment and personnel. Consideration for the weakening and cracking of the ice must be taken when conducting ice slotting operations.

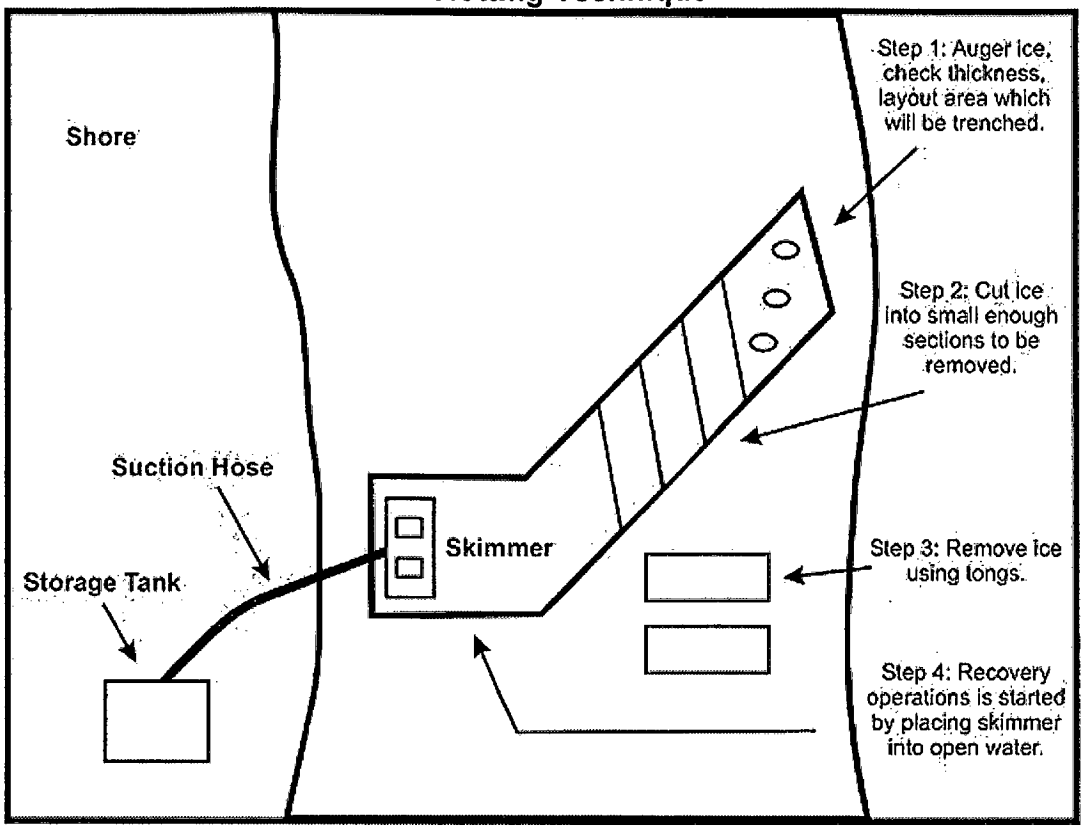
Slotting Angle

The slot should be angled at approximately 30 degrees to the river's edge. The slotting needs to be wide enough to place a skimming system into the water to recover the oil. The lead end of the slot should have a slight curve which parallels the river current to allow the current to push the oil towards the recovery area.

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FIGURE H.8

Ice Slotting Technique



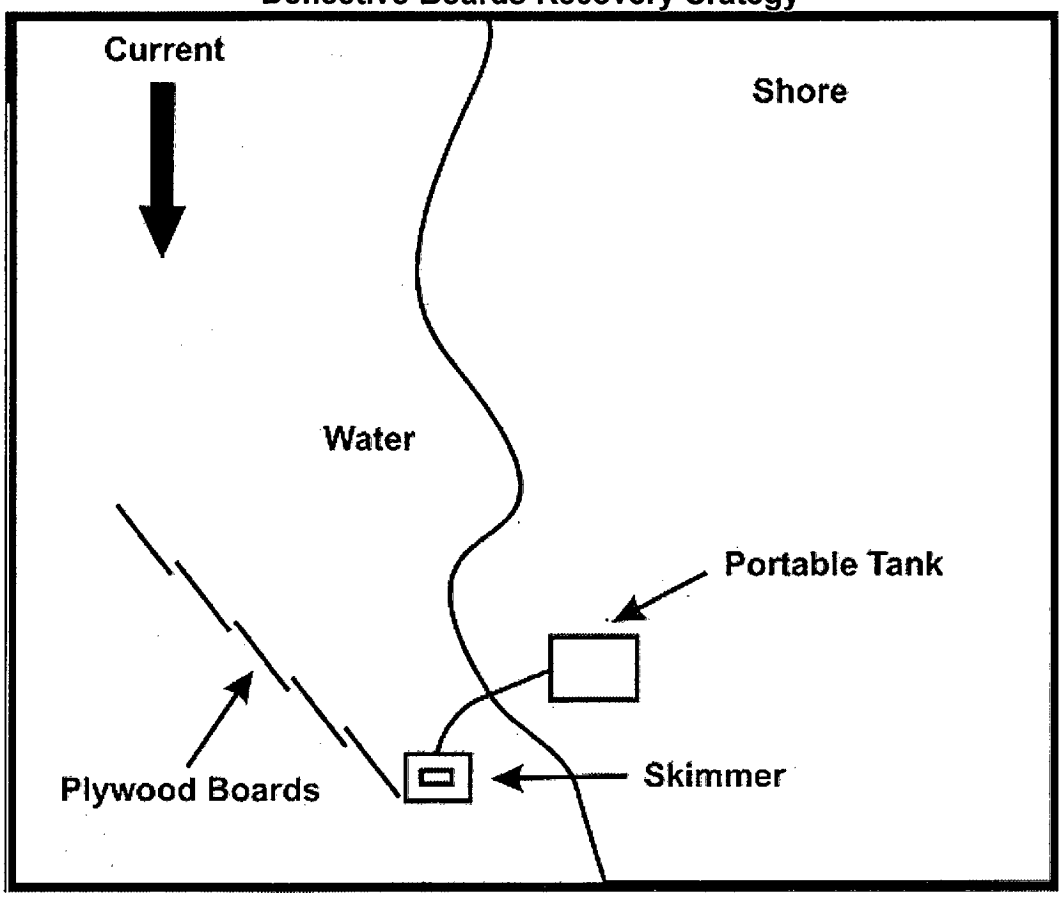
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Deflection Boards

In place of using booming equipment it may be possible to use flat boards, such as plywood, to divert the oil under the ice into a recovery area, which has been cut out. To use this form of diversion, the depth of the water under the ice and the speed of the current ice must be considered. The angle in which the boards are placed is derived much like that of deflection booming. In any current above 3 knots, a series of cascading boards should be considered. Also, the depth of the water must be considered. The stronger the current the deeper the boards must be placed to prevent entrainment. If the water is not deep enough to place the boards to prevent entrainment, ice slotting methods may be required. Figure H.9 illustrates the overall method of using deflective boards. Figure H.10 illustrates a close up of the deflective board response method.

FIGURE H.9

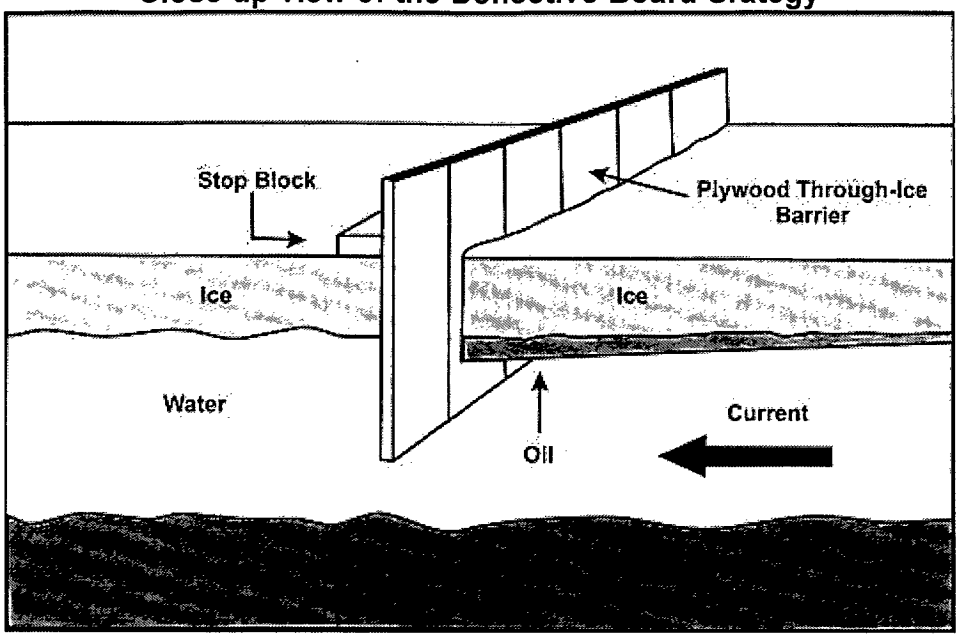
Deflective Boards Recovery Srategy



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FIGURE H.10

Close up view of the Deflective Board Srategy



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APPENDIX I

MEDIA RELATIONS

I.1 Introduction

I.2 Dealing with Agencies, the Media and the Public

I.3 The Public Wants to Know

I.4 Target Audiences

I.5 Media Statements

I.6 Holding Statements

I.7 Media Advisories

I.8 Press Releases

I.9 New Confrences

I.10 Media Center

I.11 Post Incident Public Affairs

Figure I.1 Media Holding Statement

Figure I.2 Procedures and Considerations

Figure I.3 Layout for Press Conference

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I.1 INTRODUCTION

Goals:

- Provide a coordinated communications response to ensure appropriate information is disseminated in an accurate and timely manner
- Communicate concisely the nature of the emergency, the steps being taken to address it and the effectiveness of those measures
- Control the communications environment as much as possible in an effort to protect the reputation of the Company

I.2 DEALING WITH AGENCIES, THE MEDIA AND THE PUBLIC

Only official Company spokespersons are authorized to release incident information. Receptionists and others may receive calls or be required to take messages. They should take the following information from each caller and pass the details to the Public Information Officer as soon as possible:

- Name
- Media outlet-publication, TV/radio station and market they are serving
- Time of call
- Nature of request
- Phone and fax number(s)
- E-mail address

Deadline

The Company's goal is to prioritize and return media calls as soon as possible knowing that a reporter working on a breaking news story will attempt to fill the information void. The Company will want to be the ones to fill that void. It may not be possible to return all phone calls. Reporters might also be directed to other sources such as our website or instructed to call back at a specific time.

Objectives During Emergencies

- Provide as much relevant information as possible about how the Company is responding to the incident to build and maintain stakeholder and media trust.
- Present an accurate, compassionate and up-to-date account of the crisis.
- Balance the resolution of the technical emergency while managing human issues.

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- Maintain an accurate record of what is happening and actions being taken to respond to the crisis.
- Present a positive and accurate perception of the Company.
- Identify factual and interpretative errors and develop a strategy to respond.
- Bring positive developments to the forefront quickly.
- Prepare spokespersons to deliver the message.
- Communicate the policies, attitudes and actions of the Company to convey that the organization has a plan in place to deal with the crisis.
- Maintain credibility in the communication process by ensuring consistency in the message and the information being disseminated.

I.3 THE PUBLIC WANTS TO KNOW

- Does the Company care?
- Does the Company have a plan in place?
- Is Company's priority to keep people and the environment safe?
- Is the Company doing everything possible to address the situation?

It is the job of the Public Information Officer or Company spokesperson to convey to the audiences and to assist Executive Management to convey that the answer to all these questions is a resounding **"Absolutely."**

I.4 TARGET AUDIENCES

Each emergency is unique and requires careful judgment to determine which audiences to target and which audiences have priority. Given the media's pervasive and instant capability to relay information and impact public opinion, it is clearly the key audience for Company's communications strategy and actions.

The following list indicates the audiences who should be considered when developing the key messages that will be communicated by the media.

Internal

- Employees and Employees' families
- Affiliated Companies/Businesses

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External (Local, Regional, National, and International)

- Media
- Environmental Community
- Impacted Communities/General Public
- Contractors
- Site Investigators
- Industry Associations
- Elected Officials
- Vendors
- Shareholders
- Securities Exchanges
- Analysts
- Neighboring Businesses
- Regulators
- Governmental Entities
- General Public
- Bankers

When responding, always prepare for the worst possible scenario. It is important to recognize that no two incidents will be the same. The Company must remain flexible and adapt a response to meet the unique characteristics of the current situation.

I.5 MEDIA STATEMENTS

Three types of media statements for communicating information can be generated:

1. Holding Statement
2. Media Advisory
3. Press Release

I.6 HOLDING STATEMENTS

A holding statement should be prepared **immediately** to reduce media frustration and quickly establish a channel of communication. Immediate action will help to fill the information void with accurate details. The holding statement is the response to any inquiries made to the Company prior to a press release being issued. The holding statement should contain the following:

- Nature of incident;
- Time and date of incident;

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- Location of incident;
- Impact of the incident (e.g., any people involved? Injuries? Damage?); and
- Report fatalities only if cleared by the Public Information Officer and Legal and only after the family has been notified.
- It is OK to say "no information is available" on any given topic if the information is not yet known
- Status of emergency crews – en route or on the scene
- "The Company's trained emergency response teams are supporting rescue units. The Company's teams are trained to deal with incidents of this nature."
- "It is just too early to tell what caused this incident. There will be a thorough investigation."
- When to expect an update

Not Release

- Fatalities unless cleared by the Public Information Officer and Legal Officer
- Names of injured or deceased
- Nature of injuries
- Any Company communication or Company record
- Any opinion as to the cause of the incident
- Hazardous Materials involved

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Holding Statement Template

DATE:(YY/MM/DD) _____ TIME: _____ ☐ AM

☐ PM

MY NAME IS: _____ MY JOB TITLE IS: _____

_____

This is the information I can give you so far:

At *(time)* _____ ☐ AM ☐ PM, on _____

(date), a(n) (fire, explosion, gas release, spill – specify) occurred at (Company's name) _____'s _____ location, located _____ _____ kilometers *(east/west/north/south)* _____ of *(nearest town or city)* _____.

Presently, *(number of personnel)* _____ Company employees or Contract personnel, are (O.K., not injured, are being treated for injuries, etc. – specify).

_____

_____.

Note: The names and condition of the injured can only be released after they have been released by the proper authorities.

The *(plant / pipeline / office, etc. – specify)* _____

_____

_____ has been shut down and isolated.

Company staff have activated the Emergency Response Plan and are directing emergency response procedures to protect the Public, our employees and the environment.

The cause of the (fire, explosion, gas release, spill, etc. – specify) _____is not yet known and no estimate of damage is available. Further information will be released as it becomes available.

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I.7 MEDIA ADVISORIES

A media advisory should be issued immediately after the holding statement has been finalized. Essentially, the holding statement is the media advisory; the only difference is that the media advisory is issued externally. The Public Information Officer has overall responsibility for ensuring this advisory is issued externally.

I.8 PRESS RELEASES

Press releases should be prepared for distribution by the Public Information Officer as soon possible, preferably within an hour of the incident. Subsequent news releases should be issued as new information becomes available.

They should include the following details:

- Time, date and location of the release;
- Spokesperson name and contact number;
- Summary of holding statement information;
- Current status of the incident;
- Status of the investigation;
- Concern for public health and safety, safety of responders and environmental impact;
- Involvement of authorities and outside responders;
- Time of next update or news conference, if warranted; and
- Refer to media specific web site, if available.

Consider using other tools for the media when appropriate:

- Fact Sheets;
- Backgrounders; and
- Visuals (e.g., maps, etc.).

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I.9 NEWS CONFERENCES

A number of factors will determine the need for a news conference, including:

- The level of media interest the story has generated;
- The need to make technical experts available to journalists to explain complex details such as nature of a substance released, environmental impact, public health threats, etc.;
- A significant change in the status of the situation; or
- The investigation is complete and the results are ready for release.

Strategy

- If possible, hold press conferences at a location removed from Company property.
- Give media some type of guideline for the timing (i.e., there will NOT be a briefing before a given time).
- Determine who will open the news conference and what the ground rules will be (e.g., time limits, etc.).
- Determine who will make statements and whether there will be a question period.
- It is appropriate to outline the ground rules for those attending the press conference before the conference formally begins.
- Prepare opening statement and review potential questions with key spokesperson. Any new information released during the press conference should be cleared with the Public Information Officer.

Note: Media should never be left unattended on Company property. If necessary, arrange for media escorts. Also, arrange for any Security personnel or law enforcement as deemed necessary.

News Conference Checklist

- ■ Check with Public Information Officer (and spokesperson) to select the best time for the conference. (Arrange for Technical Advisor to be present.) Keep in mind demands of the news cycle. Late morning and early afternoon are typically best for electronic media. Late afternoon will better serve the print media and might facilitate a "live shot" by electronic media.
- ■ Stage the conference at a local hotel or hall. Keep in mind accommodations for cameras, reporters, technical staff, parking for live or satellite trucks and cable run for television crews.
- ■ Distribute media advisory of time and location, including directions and parking information.

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- Compile list of media who have indicated they will attend. If possible, determine if there is a particular area of interest.
- Invite outside officials, as appropriate.
- Compile background information that may serve as a resource for reporters.

I.10 MEDIA CENTER

The need to establish a media center will be determined by the Public Information Officer. The level of media interest in the story will be a key factor in determining if a media center is needed.

If a media center is established appropriate news organizations will be notified by way of fax and e-mail distribution. Access to the media center should be confined only to credentialed "working press." Arrange for Security personnel or law enforcement as deemed necessary.

Media Center Checklist

- Work Tables and Chairs;
- External telephone lines (might not be possible if center is located in the field);
- Radio;
- Television/VCR;
- Podium with microphone and audio distribution (mult box);
- Extension cords;
- Blank audio and videotapes;
- Copier/Fax machine;
- Laptop computer and printer;
- If the center is in the field, you might need a generator to provide power;
- Car battery adapter for PC;
- Cell phone car adapter; and
- Power generator (if remote location).

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Supplies Checklist

- The Company letterhead
- Pens and pencils
- Background material
- Past press releases
- Fact sheets
- Maps
- Refreshments

I.11 POST INCIDENT PUBLIC AFFAIRS

Once the incident is concluded, the Public Information Officer should prepare one final press release, possibly in the form of a chronology, to describe the incident and the subsequent response. The media may also be looking for any follow-up information as to the cause of the incident, people involved, long term effects on the company, costs associated with the incident, etc. These requests will have to be considered on a case-by-case basis. All releases should be reviewed by the Legal Officer and approved by the Incident Commander (or a higher authority) prior to being released.

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FIGURE I.1

MEDIA HOLDING STATEMENT

The following statement is an example of how to address reporters when you need more time to gather facts before speaking to them.

Open:

Hi_____. I'm _____, and I am the spokesperson for _____ _____.

I am in the process of gathering more facts for you regarding _____ _____.

I know you want accurate information, so I will need_____(how much time) to get these facts confirmed.

Basic Facts: (If confirmed)

I can tell you...Who: **(Background -- optional at this point)**

When:

Where:

What:

Priority:
"A preliminary investigation into the _____has already begun. That is all the information I have for you at this time.

Holding Statement:

We could meet back here (or via phone) at _____ o'clock.

Meantime, let me get your business card, cell phone, etc...

Questions & Offers: (Optional)

What is your deadline?

I can give you our web address for more information on our Company.

I can provide our public affairs contact and number (or provide your business card):

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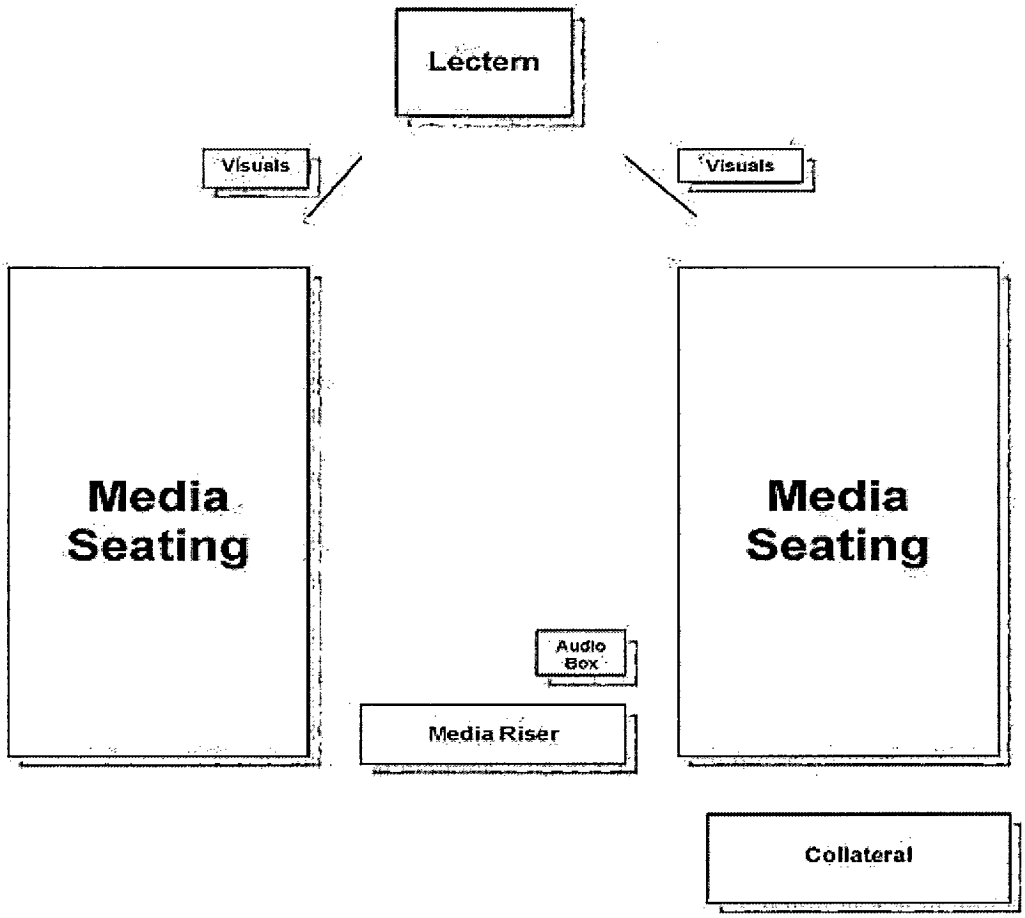
FIGURE I.2

PROCEDURES AND CONSIDERATIONS	
Identify Your Audience • Employees • Clients • Local Media • National / International Media • Special Interest Groups • Stakeholders • Agencies / Public Officials • Industry Associations • Suppliers • Competitors	**Identify Key Message(s)** • People / Safety • Environment • Property • Potential Impacts of Incident • Basis for Company's Position / Action(s) • Business Continuity
Prepare Official Company Statement • Facility / Personnel Fact Sheet(s) • Issues Applicable to Identified Audience • No Speculation of Any Kind • Confidentiality Issues • Express Care and Concern • Do Not Accept Liability or Offer Compensation • Include Photos / Video • Must be Reviewed and Approved by Incident Commander and Legal Officer	**Identify Communications Methods** • Media Advisory • Toll-free Telephone • Web-Site • Press Release • Telephone Interviews • Personal Interviews • Press Briefings (Alone or Jointly?) • Holding Statement
Determine Support Requirements • Personnel • Equipment • Physical Space • Photos, Videos, Charts, Graphs, Maps	**Determine Frequency of Communications** • Times per Shift • Daily • Corporate IC's Discretion • Maintain Awareness of Audience Deadlines / Schedules • Obtain Corporate IC's Approval
Identify Spokesperson(s) if Applicable • Ensure Understanding of Incident • Ensure Familiarity With Expected Audience • Ensure Understanding of Confidentiality / Privacy Issues • Brief on Anticipated Questions and Answers • Ensure Equal Treatment of All Audience Members • Establish Conference Duration • Do Not Underestimate the Impact of Television Reports • Coordinate Responses if Joint Conference • Be Positive • Be Supportive of Agencies, Investigators, and Responders	**Monitor Audience Reaction to and Perception of Message** • Hostile Press • Special Interest Groups • Public Outrage or Increased Demands • Attempts to Place Blame • Distribution of Disinformation
Revise/Update Message • Answer Earlier Questions • Provide Additional Facts • Address Previous and New Concerns • Adjust Position as suitable or Necessary but Do Not Appear to "Flip-Flop" or Waiver • Maintain Awareness of Audience Deadlines / Schedules • Must be Reviewed and Approved by Incident Commander and Legal Officer	

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FIGURE I.3

LAYOUT FOR PRESS CONFERENCE



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REGULATORY CROSS REFERENCE

DOT/PHMSA 49 CFR Part 194 Cross Reference
Onshore Pipeline Regulation, 1999 SOR/99-294
Annex A to Can/CSA-Z-731-03
Texas Discharge Prevention and Response Plans, 31 TAC Section 19.13
South Dakota Legislature - South Dakota Codified Laws 34A-12-9, 34A-18-2, 34A-18-9

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DOT/PHMSA 49 CFR PART 194		
§ 194.105	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	... determine the worst case discharge ... provide methodology, including calculations, used to arrive at the volume.	App B
(b)	The worst case discharge is the largest volume, in barrels, of the following:	-----
(b)(1)	... maximum release time in hours, plus the maximum shutdown response time in hours, multiplied by the maximum flow rate expressed in barrels per hour, plus the largest line drainage volume after shutdown of the line section(s) ...; or	App B
(b)(2)	The largest foreseeable discharge for the line section(s) within a response zone, expressed in barrels, based on the maximum historic discharge, if one exists, adjusted for any subsequent corrective or preventative action taken; or	App B
(b)(3)	If the response zone contains one or more breakout tanks, the capacity of the single largest tank or battery of tanks within a single secondary containment system, adjusted for the capacity or size of the secondary containment system, expressed in barrels.	App B
(b)(4)	Operators may claim prevention credits for breakout tank secondary containment and other specific spill prevention measures as follows:...	App B
§ 194.107	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each response plan must plan for resources for responding, to the maximum extent practicable, to a worst case discharge, and to a substantial threat of such a discharge.	App A
(b)	An operator must certify in the plan ... reviewed NCP and each applicable ACP...	Foreword
(b)(1)	As a minimum to be consistent with the NCP as a facility response plan must:	-----
(b)(1)(i)	Demonstrate an operator's clear understanding of the function of the Federal response structure...	§ 4.0
(b)(1)(ii)	Establish provisions to ensure the protection of safety at the response site; and	§ 4.0 (Command), § 5.0
(b)(1)(iii)	Identify the procedures to obtain any required Federal and State permissions for using alternative response strategies such as in-situ burning and dispersants...	§ 6.7, App. E
(b)(2)	As a minimum, to be consistent with the applicable ACP the plan must:	-----
(b)(2)(i)	Address the removal of a worst case discharge and the mitigation or prevention of a substantial threat of a worst case discharge;	§ 3, App B
(b)(2)(ii)	Identify environmentally and economically sensitive areas;	§ 6.0
(b)(2)(iii)	Describe the responsibilities of the operator and of Federal, State and local agencies in removing a discharge and in mitigating or preventing a substantial threat of a discharge; and	§4.0
(b)(2)(iv)	Establish the procedures for obtaining an expedited decision on use of dispersants or other chemicals.	§ 6.8
(c)	Each response plan must include:	-----
(c)(1)	A core plan consisting of ...	-----
(c)(1)(i)	An information summary as required in § 194.113,	Fig 1.1
(c)(1)(ii)	Immediate notification procedures,	§ 2.0
(c)(1)(iii)	Spill detection and mitigation procedures,	§ 3.0
(c)(1)(iv)	The name, address, and telephone number of the oil spill response organization, if appropriate,	Fig 2.5, App A
(c)(1)(v)	Response activities and response resources,	§ 3.0, App A

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DOT/PHMSA 49 CFR PART 194		
§ 194.107	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(c)(1)(vi)	Names and telephone numbers of Federal, State, and local agencies which the operator expects to have pollution control responsibilities or support,	Fig 2.5
(c)(1)(vii)	Training procedures,	App D
(c)(1)(viii)	Equipment testing,	App D.2
(c)(1)(ix)	Drill program - an operator will satisfy the requirement for a drill program by following the National Preparedness for Response Exercise Program (PREP) guidelines. An operator choosing not to follow PREP guidelines must have a drill program that is equivalent to PREP. The operator must describe the drill program in the response plan and PHMSA will determine if the program is equivalent to PREP.	App D.2
(c)(1)(x)	Plan review and update procedures;	§ 1.4
(c)(2)	An appendix for each response zone that includes the information required in paragraph (c)(1)(i)-(ix) of this section and the worst case discharge calculations that are specific to that response zone. An operator submitting a response plan for a single response zone does not need to have a core plan and a response zone appendix. The operator of a single response zone onshore pipeline shall have a single summary in the plan that contains the required information in § 194.113.7; and.	Annexes
(c)(3)	A description of the operator's response management system including the functional areas of finance, logistics, operations, planning, and command. The plan must demonstrate that the operator's response management system uses common terminology and has a manageable span of control, a clearly defined chain of command, and sufficient trained personnel to fill each position.	§ 4.0
§ 194.111	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each operator shall maintain relevant portions of its response plan at the operator's headquarters and at other locations from which response activities may be conducted, for example, in field offices, supervisor's vehicles, or spill response trailers.	Foreword Distribution List
(b)	Each operator shall provide a copy of its response plan to each qualified individual	Foreword Distribution List
§ 194.113	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	The information summary for the core plan, required by § 194.107, must include:	-----
(a)(1)	The name and address of the operator.	Fig 1.1
(a)(2)	For each response zone which contains one or more line sections that meet the criteria for determining significant and substantial harm as described in § 194.103, a listing and description of the response zones, including county(s) and state(s).	Fig 1.1, Response Zone Annexes
(b)	The information summary for the response zone appendix, required in § 194.107, must include:	-----
(b)(1)	The information summary for the core plan.	Fig 1.1
(b)(2)	The names or titles and 24-hour telephone numbers of the qualified individual(s) and at least one alternate qualified individual(s);	Fig 1.1, Fig 2.2
(b)(3)	The description of the response zone, including county(s) and state(s), for those zones in which a worst case discharge could cause substantial harm to the environment.	Fig 1.1, Response Zone Annexes
(b)(4)	A list of line sections for each pipeline contained in the response zone, identified by milepost or survey station number, or other operator designation.	Fig 1.1
(b)(5)	The basis for the operator's determination of significant and substantial harm.	Foreword
(b)(6)	The type of oil and volume of the worst case discharge.	App B

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DOT/PHMSA 49 CFR PART 194		
§ 194.115	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each operator shall identify and ensure, by contract or other approved means, the resources necessary to remove, to the maximum extent practicable, a worst case discharge and to mitigate or prevent a substantial threat of a worst case discharge.	App A
(b)	An operator shall identify in the response plan the response resources which are available to respond within the time specified, after discovery of a worst case discharge, or to mitigate the substantial threat of such a discharge.	App A
§ 194.117	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each operator shall conduct training to ensure that:	-----
(a)(1)	All personnel know --	-----
(a)(1)(i)	Their responsibilities under the response plan	
(a)(1)(ii)	The name and address of, and the procedure for contacting, the operator on a 24-hour basis	§ 4.0
(a)(1)(iii)	The name of, and procedures for contacting, the qualified individual on a 24-hour basis	§ 2.0, Fig 2.2
(a)(2)	Reporting personnel know --	-----
(a)(2)(i)	The content of the information summary of the response plan.	Fig 1.1
(a)(2)(ii)	The toll-free telephone number of the National Response Center	Fig 2.5
(a)(2)(iii)	The notification process	§ 2.0, Fig 2.5
(a)(3)	Personnel engaged in response activities know --	-----
(a)(3)(I)	The characteristics and hazards of the oil discharged	Fig 3.2, App G
(a)(3)(ii)	The conditions that are likely to worsen emergencies, including the consequences of facility malfunctions or failures, and the appropriate corrective actions.	§ 3.0
(a)(3)(iii)	The steps necessary to control any accidental discharge of oil and to minimize the potential for fire, explosion, toxicity, or environmental damage	§ 3.0
(a)(3)(iv)	The proper firefighting procedures and use of equipment, fire suits, and breathing apparatus	§ 3.0
(b)	Each operator shall maintain a training record for each individual that has been trained as required by this section. Theses records must be maintained in the following manner as long as the individual is assigned duties under the response plan	App D.1
(b)(1)	Records for operator personnel must be maintained at the operator's headquarters	App D.1
(b)(2)	Records for personnel engaged in response, other than operator personnel, shall be maintained as determined by the operator.	App D.1
(b)(3)	Nothing in this section relieves an operator from the responsibility to ensure that all response personnel are trained to meet the OSHA standards for emergency response operations in 29 CFR 1910.120 ...	App D.1
§ 194.119	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each owner shall submit two copies...	Distribution
(b)	...PHMSA will notify the operator of any alleged deficiencies...	-----
(c)	The operator...may petition PHMSA for reconsideration within 30 days...	-----
(d)	...PHMSA will approve the Response Plan...	-----
(e)	...The operator may submit a certification to PHMSA...that the operator has obtained, through contract or other approved means, the necessary private personnel and equipment to record, to the maximum extent practicable, to a worst case discharge...	Foreword (Operator's Statement)
(f)	...PHMSA may require an operator to provide a copy of the response plan to the OSC...	-----

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DOT/PHMSA 49 CFR PART 194		
§ 194.121	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each operator shall update its response plan to address new or different operating conditions or information. In addition, each operator shall review its response plan in full at least every 5 years from the date of the last submission or the last approval as follows:	§ 1.4
(a)(1)	For substantial harm plans, an operator shall resubmit every 5 years from the last approval date.	§ 1.4
(a)(2)	For significant and substantial harm plans, an operator shall resubmit every 5 years form the last approval date.	§ 1.4
(b)	If a new or different operating condition or information would substantially affect the implementation of a response plan, the operator must immediately modify its response plan to address such a change...	§ 1.4
(b)(1)	An extension of the existing pipeline or construction of a new pipeline in a response zone not covered by the previously approved plan;	§ 1.4
(b)(2)	Relocation or replacement of the pipeline in a way that substantially affects the information included in the response plan, such as a change to the worst case discharge volume;	§ 1.4
(b)(3)	The type of oil transported, if the type affects the required response resources, such as a change from crude oil to gasoline;	§ 1.4
(b)(4)	The name of the spill removal organization;	§ 1.4
(b)(5)	Emergency response procedures;	§ 1.4
(b)(6)	The qualified individual;	§ 1.4
(b)(7)	A change in the NCP or an ACP that has significant impact on the equipment appropriate for response activities; and	§ 1.4
(b)(8)	Any other information relating to circumstances that may affect full implementation of the plan.	§ 1.4
(c)	If PHMSA determines that a change to a response plan does not meet the requirements of this part, PHMSA will notify the operator of any alleged deficiencies, and provide operator...opportunity to correct deficiencies.	-----
(d)	An operator who disagrees with a determination that proposed revisions to a plan are deficient may petition PHMSA for reconsideration, within 30 days from the date of receipt of PHMSA's notice...	-----

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SOR/99-294		
S 32-34	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
-----	Directions for Use of Manual;	§ 1.0
-----	Emergency Preparedness and Response Policy;	§ 3.0
-----	Description of Initial Responses to Incident Calls;	§ 3.1
-----	Management of Threat Information;	§ 3.1
-----	Definitions and Levels of Emergencies;	§ 3.1
-----	Corporate and Operational Chains of Command;	§ 4.0
-----	Internal and External Contact Lists;	Fig. 2.2, 2.5
-----	External Communication Information (e.g. media outlets);	App. I
-----	Description of General and Site Specific Emergency Response Procedures;	§ 3.0
-----	Roles and Responsibilities (e.g. checklist of duties);	§ 4.0
-----	Site-Specific Emergency Information (e.g. control points);	Fig. 6.2
-----	Lists of Persons in Emergency Planning Zones (or on separate file);	Fig. 2.2
-----	Environmental or Other Areas Requiring Special Consideration or Protection;	§ 6.0
-----	Detailed Product Information (e.g. MSDS);	App. G
-----	Description and Location of Response Equipment;	App. A
-----	Internal and External Reporting Requirements;	§ 2.0
-----	Area Maps;	Fig. 1.2
-----	Training Requirements;	App. D
-----	Role of Government Departments;	§ 4.6
-----	Manual Updating Procedure and Schedule;	§ 1.4
-----	Forms and Records; and	App. F
-----	Manual Distribution List.	Foreword

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ANNEX A TO CAN/CSA-Z731-03		
SAMPLE TABLE OF CONTENTS FOR AN EMERGENCY PREPAREDNESS MANUAL		
REFERENCE		LOCATION IN PLAN
1	Administration	-----
1.1	Emergency Preparedness Policy	Sec. 1.1
1.2	Purpose of This Manual	Sec. 1.2
1.3	Distribution of This Manual	Foreword, Sec. 1.3
1.4	Definitions	Glossary of Terms/Acronyms
2	Organization of Emergency Areas	Annexes
3	Roles ad Responsibilities	Sec. 4.0
4	Communications	App. A.6
5	Emergency Response	-----
5.1	Emergencies Caused by Human Activity	Fig. 3.1
5.2	Natural Disasters	Fig. 3.1
6	Emergency Resources	-----
6.1	Contact List	Fig 2.2, 2.5
6.2	Personnel/Equipment	App. A
7	Training	-----
7.1	Employees	App. D.1
7.2	Contractors	App. D.1
7.3	Training Drills	App. D.2
8	Checklists	App. F
8.1	Role Checklists	App. F
8.2	Equipment Checklists	App. F

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TEXAS DISCHARGE PREVENTION AND RESPONSE PLANS *31 TAC Section 19.13*		
19.13	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(c)	Required elements of discharge prevention and response plans for all facility classifications.	-----
(1)	The owner and operator of the facility;	Fig 1.1
(2)	The person or persons in charge of this facility...	Fig 1.1
(3)	The name and address (both physical and mailing) of the facility;	Fig 1.1
(4)	A description of the facility, including:	-----
(A)	The location of the facility by latitude and longitude;	Fig 1.1
(B)	The facility's primary activity;	Fig 1.1
(C)	The types of oil handled, whether material safety data sheets (MSDS) have been prepared for them, and the location where the MSDS are maintained;	App. G
(D)	The storage capacity of each tank used for storing oil;	N/A
(E)	The diameter of all lines through which oil is transferred;	Fig 1.1
(F)	The average daily throughput of oil at the facility; and	Fig 1.1
(G)	The dimensions and capacity in barrels of the largest oil-handling vessel which docks at the facility	N/A
(5)	For a facility which normally does not have personnel on-site...	N/A
(6)	A general description of measures taken by the facility to prevent unauthorized discharges of oil;	3.0
(7)	A plan to conduct an annual oil spill drill that entails notifying the GLO and National Response Center and keeping a log...	App D
(8)	If oil is transferred at the facility, emergency transfer procedures to be implemented if an actual or threatened unauthorized discharge of oil occurs at the facility;	App H
(9)	Strategic plans to contain and clean up unauthorized discharges of oil from the facility;	3.0
(10)	A statement that all facility personnel who might be involved in an oil spill response have been informed that detergents or other surfactants are prohibited from being used on an oil spill in the water, and that dispersants can only be used with the approval of the Regional Response Team...	6.7
(11)	A description of any secondary containment or diversionary structures or equipment at the facility to prevent discharged oil from reaching coastal waters...	App C
(e)	Additional requirements for facilities classified as large	-----
(1)	Maps showing vehicular access to the facility, pipelines to and from the facility, and nearby residential or other populous areas;	Fig. 6.2

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TEXAS DISCHARGE PREVENTION AND RESPONSE PLANS *31 TAC Section 19.13 (Cont'd)*		
19.13	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(2)	A site plan of the facility showing:	-----
(A)	The location of all structures in which oil is stored;	Fig. 6.2
(B)	The location of all areas where oil is transferred at the facility; and	Fig 1.1, Fig. 6.2
(C)	Drainage and diversion systems at the facility...	N/A
(3)	A plan to conduct an annual oil spill drill that includes the following elements:	-----
(A)	Notifying the GLO and National Response Center;	2.0
(B)	Notifying any third parties, such as discharge cleanup organizations	2.0
(C)	If the facility has spill response equipment stored on-site, deployment of a representative portion of the equipment which would be used to respond	App D
(D)	A log documenting when the annual drill was conducted and the facility personnel who participated in it;	App F
(4)	A detailed description of the facility's discharge prevention and response capability, including:	-----
(A)	Leak detection and safety systems to prevent accidental discharges	App C
(B)	Schedules, methods, and procedures for testing, maintaining, and inspecting storage tanks, pipelines, and other equipment used for handling oil;	App C
(C)	Schedules, methods, and procedures for conducting accidental discharge response drills;	App D
(D)	Whether the facility's oil spill response capability will primarily be based on contracts or agreements with third parties or on the facility's own personnel and equipment;	App A
(E)	Planned response actions, the chain of command, lines of communication, and procedures for notifying the GLO, emergency response and public safety entities;	3.0, 4.0
(F)	Oil spill response equipment and supplies located at the facility;	App A
(G)	If the facility owns and maintains oil spill response equipment, the schedules, methods, and procedures for maintaining the equipment;	App D
(H)	If the operator has entered into any oil spill response or cleanup contracts or basic ordering agreements with a discharge cleanup organization, copies of the contracts or agreements or a narrative description of their terms;	App A

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TEXAS DISCHARGE PREVENTION AND RESPONSE PLANS *31 TAC Section 19.13 (Cont'd)*		
19.13	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(I)	The worst case unauthorized discharge of oil reasonably likely to occur at the facility and the rationale used to determine the worst case unauthorized discharge;	App B
(J)	A description and map of environmentally sensitive areas that would be impacted by the worst case unauthorized discharge;	6.0
(K)	A description of response strategies that would be implemented to contain and clean up worst case unauthorized discharge;	6.0
(L)	Information on the facility's program for training facility personnel;	App D
(M)	Information on facility personnel who have been specifically designated to respond to an oil spill, including any training they have received and where the training records are maintained;	Fig 2.1, App D
(N)	Plans for transferring oil during an emergency; plans for recovering, storing, separating, transporting, and disposing of oily waste materials generated during an oil spill response; and	App B
(O)	Plans for providing emergency medical treatment, site safety, and security during an oil spill	3.0

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DAKOTA LEGISLATURE - SOUTH DAKOTA CODIFIED LAWS *34A-12-9, 34A-18-2, and 34A-18-9*		
	BRIEF DESCRIPTION	**LOCATION IN PLAN**
34A-12-9	Report of discharge--Rules for reporting. Any person who has caused a discharge of a regulated substance shall immediately report the discharge to the department. The department may promulgate rules pursuant to chapter 1-26 to provide for the procedures to be followed in reporting a discharge.	2.0, Fig. 2.3
34A-18-2	Oil spill response plan required. Each crude oil pipeline operator which is issued a permit from the South Dakota Public Utilities Commission under the Energy Conversion and Transmission Facilities Act shall prepare an oil spill response plan. An oi lspill response plan must plan for resources for responding, to the maximum extent practicable, to a worst case discharge, and to a substantial threat of such a discharge. Each response plan must include, but not be limited to:	-----
(1)	Immediate notification procedures;	2.0
(2)	Spill detection and mitigation procedures;	3.0, App. C
(3)	The name, address, and telephone number of the oil spill response organization, if appropriate;	2.0
(4)	Response activities and response resources;	App. A
(5)	Names and telephones of federal, state, and local agencies which the operator expects to have pollution control responsibilities or support;	2.0
(6)	Training procedures;	App. D
(7)	Equipment testing;	App. D.2
(8)	Drill types, schedules, and procedures; and	App. D
(9)	Plan review and update procedures.	1.4
	No oil spill response plan is effective until it is approved by the department.	-----
34A-18-9	Reports regarding spill. Each crude oil pipeline operator that experiences a spill shall file a written report with the department, within thirty days of discovery of the spill, if the spill: • Is of five gallons or more; or • Causes an explosion or fire; or • Causes the injury or death of any person.	2.0

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GLOSSARY OF TERMS AND ACRONYMS

Glossary

Acronyms

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GLOSSARY OF TERMS

This glossary contains definitions of terms that will be used frequently during the course of response operations.

Activate: The process of mobilizing personnel and/or equipment within the response organization to engage in response operations.

Activator: An individual in the response organization whose responsibilities include notifying other individuals or groups within the organization to mobilize personnel and/or equipment.

Adverse Weather: The weather conditions that will be considered when identifying response systems and equipment in a response plan for the applicable operating environment. Factors to consider include significant wave height, ice, temperature, weather - related visibility, and currents within the Captain of the Port (COTP) zone in which the systems or equipment are intended to function.

Agency Representative: Individual assigned to an incident from an agency who has been delegated full authority to make decisions on all matters affecting that agency's participation in response operations.

Area Committee: As defined by Sections 311(a)(18) and (j)(4) of CWA, as amended by OPA, means the entity appointed by the President consisting of members from Federal, State, and local agencies with responsibilities that include preparing an Area Contingency Plan for the area designated by the President. The Area Committee may include ex-officio (i.e., non-voting) members (e.g., industry and local interest groups).

Area Contingency Plan: As defined by Sections 311(a)(19) and (j)(4) of CWA, as amended by OPA, means the plan prepared by an Area Committee, that in conjunction with the NCP, shall aliress the removal of a discharge including a worst-case discharge and the mitigation or prevention of a substantial threat of such a discharge from a vessel, offshore facility, or onshore facility operating in or near an area designated by the President.

Average Most Probable Discharge: A discharge of the lesser of 50 barrels or 1% of the volume of the worst case discharge.

Barrel (bbl): Measure of space occupied by 42 U.S. gallons at 60 degrees Fahrenheit.

Bioremediation Agents: Means microbiological cultures, enzyme aliitives, or nutrient aliitives that are deliberately introduced into an oil discharge and that will significantly increase the rate of biodegradation to mitigate the effects of the discharge.

Boom: A piece of equipment or a strategy used to either contain free floating oil to a confined area or protect an uncontaminated area from intrusion by oil.

Booming Strategies: Strategic techniques which identify the location and quantity of boom required to protect certain areas. These techniques are generated by identifying a potential spill source and assuming certain conditions which would affect spill movement on water.

Bulk: Material that is stored or transported in a loose, unpackaged liquid, powder, or granular form capable of being conveyed by a pipe, bucket, chute, or belt system.

Chemical Agents: Means those elements, compounds, or mixtures that coagulate, disperse, dissolve, emulsify, foam, neutralize, precipitate, reduce, solubilize, oxidize, concentrate, congeal, entrap, fix, make the pollutant mass more rigid or viscous, or otherwise facilitate the mitigation of deleterious effects or the removal of the oil pollutant from the water. Chemical agents include biological aliitives, dispersants, sinking agents, miscellaneous oil spill control agents, and burning agents, but do not include solvents.

Clean-up Contractor: Persons contracted to undertake a response action to clean up a spill.

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Cleanup: For the purposes of this document, cleanup refers to the removal and/or treatment of oil, hazardous substances, and/or the waste or contaminated materials generated by the incident. Cleanup includes restoration of the site and its natural resources.

Coastal Waters: For the purpose of classifying the size of discharges, means the waters of the coastal zone except for the Great Lakes and specified ports and harbors on inland rivers.

Coastal Zone: As defined for the purpose of the NCP, means all United States waters subject to the tide, United States waters of the Great Lakes, specified ports and harbors on inland rivers, waters of the contiguous zone, other waters of the high seas subject to the NCP, and the land surface or land substrata, ground waters, and ambient air proximal to those waters. The term coastal zone delineates an area of federal responsibility for response action. Precise boundaries are determined by EPA/USCG agreements and identified in federal regional contingency plans.

Coast Guard District Response Ground (DRG): As provided for by CWA sections 311(a)(20) and (j)(3), means the entity established by the Secretary of the department in which the USCG is operating within each USCG district and shall consist of: the combined USCG personnel and equipment, including firefighting equipment, of each port within the district; aliitional prepositioned response equipment; and a district response advisory team.

Command: The act of controlling manpower and equipment resources by virtue of explicit or delegated authority.

Command Post: A site located at a safe distance form the spill site where response decisions are made, equipment and manpower deployed, and communications hanuled. The Incident Commander and the On-Scene Coordinators may direct the on-scene response from this location.

Communications Equipment: Equipment that will be utilized during response operations to maintain communication between the Company employees, contractors, Federal/State/Local agencies. (Radio/ telephone equipment and links)

Containment Boom: A flotation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to entrap and contain the product for recovery.

Contingency Plan: A document used by (1) federal, state, and local agencies to guide their planning and response procedures regarding spills of oil, hazardous substances, or other emergencies; (2) a document used by industry as a response plan to spills of oil, hazardous substances, or other emergencies occurring upon their vessels or at their facilities.

Contract or Other Approved Means: For OPA 90, a written contract with a response contractor; certification by the facility owner or operator that personnel and equipment are owned, operated, or under the direct control of the facility, and available within the stipulated times; active membership in a local or regional oil spill removal organization; and/or the facility?s own equipment.

Critical Areas to Monitor: Areas which if impacted by spilled oil may result in threats to public safety or health.

Cultural Resources: Current, historic, prehistoric and archaeological resources which include deposits, structures, ruins, sites, buildings, graves, artifacts, fossils, or other objects of antiquity which provide information pertaining to the historical or prehistorical culture of people in the state as well as to the natural history of the state.

Damage Assessment: The process of determining and measuring damages and injury to the human environment and natural resources, including cultural resources. Damages include differences between the conditions and use of natural resources and the human environment that would have occurred without the incident, and the conditions and use that ensued following the incident. Damage assessment includes planning for restoration and determining the costs of restoration.

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Decontamination: The removal of hazardous substances from personnel and their equipment necessary to prevent adverse health effects.

Discharge: Any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.

Dispersants: Means those chemical agents that emulsify, disperse, or solubilize oil into the water column or promote the surface spreading of oil slicks to facilitate dispersal of the oil into the water column.

Diversion Boom: A floatation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to deflect or divert the product towards a pick up point, or away from certain areas.

Drinking Water Supply: As defined by Section 101(7) of CERCLA, means any raw or finished water source that is or may be used by a public water system (as defined in the Safe Drinking Water Act) or as drinking water by one or more individuals.

EM: Emergency Management. Serves as the focal point for senior management support of an incident.

Economically Sensitive Areas: Those areas of explicit economic importance to the public that due to their proximity to potential spill sources may require special protection and include, but are not limited to: potable and industrial water intakes; locks and dams; and public and private marinas.

Emergency Management: The personnel identified to staff the organizational structure identified in a response plan to manage response plan implementation.

Emergency Service: Those activities provided by state and local government to prepare for and carry out any activity to prevent, minimize, respond to, or recover from an emergency.

Environmentally Sensitive Areas: Streams and water bodies, aquifer recharge zones, springs, wetlands, agricultural areas, bird rookeries, endangered or threatened species (flora and fauna) habitat, wilulife preserves or conservation areas, parks, beaches, dunes, or other areas protected or managed for its natural resource value.

Facility: Either an onshore facility or an offshore facility and includes, but is not limited to structures, equipment, and appurtenances thereto, used or capable of being used to transfer oil to or from a vessel or a public vessel. A facility includes federal, state, municipal, and private facilities.

Facility Operator: The person who owns, operates, or is responsible for the operation of the facility.

Federal Fund: The spill liability trust fund established under OPA.

Federal Regional ResponseTeam: The federal response organization (consisting of representatives from selected federal and state agencies) which acts as a regional body responsible for planning and preparedness before an oil spill occurs and providing advice to the FOSC in the event of a major or substantial spill.

Federal Response Plan (FRP): Means the agreement signed by 25 federal departments and agencies in April 1987 and developed under the authorities of the Earthquake Hazards Reduction Act of 1977 and the Disaster Relief Act of 1974, as amended by the Stafford Disaster Relief Act of 1988.

First Responders, First Response Agency: A public health or safety agency (e.g., fire service or police department) charged with responding to a spill during the emergency phase and alleviating immediate danger to human life, health, safety, or property.

Hanule: To transfer, transport, pump, treat, process, store, dispose of, drill for, or produce.

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Harmful Quantity Of Oil: The presence of oil from an unauthorized discharge in a quantity sufficient either to create a visible film or sheen upon or discoloration of the surface of the water or a shoreline, tidal flat, beach, or marsh, or to cause a sludge or emulsion to be deposited beneath the surface of the water or on a shoreline, tidal flat, beach, or marsh.

Hazardous Material: Any nonradioactive solid, liquid, or gaseous substance which, when uncontrolled, may be harmful to humans, animals, or the environment. Including but not limited to substances otherwise defined as hazardous wastes, dangerous wastes, extremely hazardous wastes, oil, or pollutants.

Hazardous Substance: Any substance designed as such by the Administrator of the EPA pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act; regulated pursuant to Section 311 of the Federal Water Pollution Control Act, or discharged by the SERC.

Hazardous Waste: Any solid waste identified or listed as a hazardous waste by the Administrator of the EPA pursuant to the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), 42 U.S.C., Section 6901,et seq as amended. The EPA Administrator has identified the characteristics of hazardous wastes and listed certain wastes as hazardous in Title 40 of the Code of Federal Regulations, Part 261, Subparts C and D respectively.

HAZMAT: Hazardous materials or hazardous substances, exposure to which may result in adverse effects on health or safety of employees.

HAZWOPER: Hazardous Waste Operations and Emergency Response Regulations published by OSHA to cover worker safety and health aspects of response operations.

Heat Stress: Dangerous physical condition caused by over exposure to extremely high temperatures.

Hypothermia: Dangerous physical condition caused by over exposure to freezing temperatures.

Incident: Any event that results in a spill or release of oil or hazardous materials. Action by emergency service personnel may be required to prevent or minimize loss of life or damage to property and/or natural resources.

Incident Briefing Meeting: Held to develop a comprehensive, accurate, and up-to-date understanding of the incident, nature of status of control operations, and nature and status of response operations; ensure the adequacy of control and response operations; begin to organize control and response operations; and prepare for interactions with outside world.

Incident Command Post (ICP): That location at which all primary command functions are executed.

Incident Command System (ICS): The combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, with responsibility for the management of assigned resources at an incident.

Incident Commander (IC): The one individual in charge at any given time of an incident. The Incident Commander will be responsible for establishing a unified command with all on-scene coordinators.

Indian Tribe: As defined in OPA section 1001, means any Indian tribe, band, nation, or other organized group or community, but not including any Alaska Native regional or village corporation, which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians and has governmental authority over lands belonging to or controlled by the Tribe.

Initial Cleanup: Remedial action at a site to eliminate acute hazards associated with a spill. An initial clean-up action is implemented at a site when a spill of material is an actual or potentially imminent threat to public health or the environment, or difficulty of cleanup increases significantly without timely remedial action. All sites must be evaluated to determine whether initial cleanup is total cleanup, however, this will not be possible in all cases due to site conditions (i.e., a site where overland transport or flooding may occur).

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Initial Notification: The process of notifying necessary the Company personnel and Federal/ State/Local agencies that a spill has occurred, including all pertinent available information surrounding the incident.

Initial Response Actions: The immediate actions that are to be taken by the spill observer after detection of a spill.

Inland Area: The area shoreward of the boundary lines defined in 46 CFR part 7, except that in the Gulf of Mexico, it means the area shoreward of the lines of demarcation (COLREG lines) as defined in §80.740 through 80.850 of this chapter. The inland area does not include the Great Lakes.

Inland Waters: State waters not considered coastal waters; lakes, rivers, ponds, streams, underground water, et. al.

Inland Zone: Means the environment inland of the coastal zone excluding the Great Lakes, and specified ports and harbors on inland rivers. The term inland zone delineates an area of federal responsibility for response action. Precise boundaries are determined by EPA/USCG agreements and identified in federal regional contingency plans.

Interim Storage Site: A site used to temporarily store recovered oil or oily waste until the recovered oil or oily waste is disposed of at a permanent disposal site. Interim storage sites include trucks, barges, and other vehicles, used to store waste until the transport begins.

Lead Agency: The government agency that assumes the lead for directing response activities.

Lead Federal Agency: The agency which coordinates the federal response to incident on navigable waters. The lead federal agencies are:

- **U.S. Coast Guard:** Oil and chemically hazardous materials incidents on navigable waters.
- **Environmental Protection Agency:** Oil and chemically hazardous materials incidents on inland waters.

Lead State Agency: The agency which coordinates state support to federal and/or local governments or assumes the lead in the absence of federal response.

Loading: Transfer from Facility to vehicle.

Local Emergency Planning Committee (LEPC): A group of local representatives appointed by the State Emergency Response Commission (SERC) to prepare a comprehensive emergency plan for the local emergency planning district, as required by the Emergency Planning and Community Right-to-know Act (EPCRA).

Local Response Team: Designated Facility individuals who will fulfill the roles determined in the oil spill response plan in the event of an oil or hazardous substance spill. They will supervise and control all response and clean-up operations.

Lower Explosive Limit: Air measurement utilized to determine the lowest concentration of vapors that support combustion. This measurement must be made prior to entry into a spill area or a confined space.

Marinas: Small harbors with docks, services, etc. for pleasure craft.

Medium Discharge: Means a discharge greater than 2,100 gallons (50 Bbls) and less than or equal to 36,000 gallons (85+ Bbls) or 10% of the capacity of the largest tank, whichever is less and not to exceed the WCD.

National Contingency Plan: The plan prepared under the Federal Water Pollution Control Act (33 United State Code §1321 et seq) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 United State Code § 9601 et seq), as revised from time to time.

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National Pollution Funds Center (NPFC): Means the entity established by the Secretary of Transportation whose function is the administration of the Oil Spill Liability Trust Fund (OSLTF). Among the NPFC's duties are: providing appropriate access to the OSLTF for federal agencies and states for removal actions and for federal trustees to initiate the assessment of natural resource damages; providing appropriate access to the OSLTF for claims; and coordinating cost recovery efforts.

National Response System (NRS): Is the mechanism for coordinating response actions by all levels of government in support of the OSC. The NRS is composed of the NRT, RRTs, OSC, Area Committees, and Special Teams and related support entities.

National Strike Force (NSF): Is a special team established by the USCG, including the three USCG Strike Teams, the Public Information Assist Team (PIAT), and the National Strike Force Coordination Center. The NSF is available to assist OSCs in their preparedness and response duties.

National Strike Force Coordination Center (NSFCC): Authorized as the National Response Unit by CWA section 311(a)(23) and (j)(2), means the entity established by the Secretary of the department in which the USCG is operating at Elizabeth City, North Carolina, with responsibilities that include administration of the USCG Strike Teams, maintenance of response equipment inventories and logistic networks, and conducting a national exercise program.

Natural Resource: Land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to or otherwise controlled by the state, federal government, private parties, or a municipality.

Navigable Waters: As defined by 40 CFR 110.1 means the waters of the United States, including the territorial seas. The term includes:

All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide;

Interstate waters, including interstate wetlands;

All other waters such as interstate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, and wetlands, the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

- that are or could be used by interstate or foreign travelers for recreational or other purposes;
- from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; and
- that are used or could be used for industrial purposes by industries in interstate commerce.

All impoundments of waters otherwise defined as navigable waters under this section;

Tributaries of waters identified in paragraphs (a) through (d) of this definition, including adjacent wetlands; and

Wetlands adjacent to waters identified in paragraphs (a) through (e) of this definition: Provided, that waste treatment systems (other than cooling ponds meeting the criteria of this paragraph) are not waters of the United States.

Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act jurisdiction remains with EPA.

Nearshore Area: For OPA 90, the area extending seaward 12 miles from the boundary lines defined in 46 CFR Part 7, except in the Gulf of Mexico. In the Gulf of Mexico, it means the area extending seaward 12 miles from the line of demarcation defined in §80.740 - 80.850 of title 33 of the CFR.

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Non-persistent or Group I Oil: A petroleum-based oil that, at the time of shipment, consists of hydrocarbon fractions:

1. At lease 50% of which by volume, distill at a temperature of 340 degrees C (645 degrees F);
2. At least 95% of which volume, distill at a temperature of 370 degrees C (700 degrees F).

Ocean: The open ocean, offshore area, and nearshore area as defined in this subpart.

Offshore area: The area up to 38 nautical miles seaward of the outer boundary of the nearshore area.

Oil or Oils: Naturally occurring liquid hydrocarbons at atmospheric temperature and pressure coming from the earth, including condensate and natural gasoline, and any fractionation thereof, including, but not limited to, crude oil, petroleum gasoline, fuel oil, diesel oil, oil sludge, oil refuse, and oil mixed with wastes other than dredged spoil. Oil does not include any substance listed in Table 302.4 of 40 CFR Part 302 adopted August 14, 1989, under Section 101(14) of the federal comprehensive environmental response, compensation, and liability act of 1980, as amended by P. L. 99-499.

Oil Spill Liability Trust Fund: Means the fund established under section 9509 of the Internal Revenue Code of 1986 (26 U.S.C. 9509).

Oily Waste: Product contaminated waste resulting from a spill or spill response operations.

On-Scene Coordinator (OSC): Means the federal official predesignated by the EPA or the USCG to coordinate and direct response under subpart D.

On-site: Means the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of a response action.

Open Ocean: means the area from 38 nautical miles seaward of the outer boundary of the nearshore area, to the seaward boundary of the exclusive economic zone.

Owner or Operator: Any person, individual, partnership, corporation, association, governmental unit, or public or private organization of any character.

Persistent Oil: A petroleum-based oil that does not meet the distillation criteria for a non-persistent oil. For the purposes of this Appendix, persistent oils are further classified based on specific gravity as follows:

1. Group II specific gravity less than .85
2. Group III specific gravity between .85 and less than .95
3. Group IV specific gravity .95 and including 1.0
4. Group V specific gravity greater than 1.0

Plan Holder: The plan holder is the industry transportation related facility for which a response plan is required by federal regulation to be submitted by a vessel or facility's owner or operator.

Post Emergency Response: The portion of a response performed after the immediate threat of a release has been stabilized or eliminated and cleanup of the sites has begun.

Post Emergency: The phase of response operations conducted after the immediate threat of the release has been stabilized, and cleanup operations have begun.

Primary Response Contractors or Contractors: An individual, company, or cooperative that has contracted directly with the plan holder to provide equipment and/or personnel for the containment or cleanup of spilled oil.

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Qualified Individual (QI): That person or entity who has authority to activate a spill cleanup contractors, act as liaison with the "On-Scene Coordinator" and obligate funds required to effectuate response activities.

Recreation Areas: Publicly accessible locations where social/sporting events take place.

Regional Response Team (RRT): The Federal response organization (consisting of representatives from selected Federal and State agencies) which acts as a regional body responsible for overall planning and preparedness for oil and hazardous materials releases and for providing advice to the OSC in the event of a major or substantial spill.

Remove or Removal: As defined by section 311(a)(8) of the CWA, refers to containment and removal of oil or hazardous substances from the water and shorelines or the taking of such other actions as may be necessary to minimize or mitigate damage to the public health or welfare (including, but not limited to, fish, shellfish, wildlife, public and private property, and shorelines and beaches) or to the environment. For the purpose of the NCP, the term also includes monitoring of action to remove discharge.

Response Activities: The containment and removal of oil from the water and shorelines, the temporary storage and disposal of recovered oil, or the taking of other actions as necessary to minimize or mitigate damage to public health or welfare, or the environment.

Response Contractors: Persons/companies contracted to undertake a response action to contain and/or clean up a spill.

Response Guidelines: Guidelines for initial response that are based on the type of product involved in the spill, these guidelines are utilized to determine clean-up methods and equipment.

Response Plan: A practical manual used by industry for responding to a spill. Its features include: (1) identifying the notifications sequence, responsibilities, response techniques, etc. in a easy to use format; (2) using decision trees, flowcharts, and checklists to insure the proper response for spills with varying characteristics; and (3) segregating information needed during the response from data required by regulatory agencies to prevent confusion during a spill incident.

Response Resources: All personnel and major items of equipment available, or potentially available, for assignment to incident tasks on which status is maintained.

Responsible Party: Any person, owner/operator, or facility that has control over an oil or hazardous substance immediately before entry of the oil or hazardous substance into the atmosphere or in or upon the water, surface, or subsurface land of the state.

Response Priorities: Mechanism used to maximize the effective use of manpower and equipment resources based upon their availability during an operational period.

Response Resources: All personnel and major items of equipment available, or potentially available, for assignment to incident tasks on which status is maintained.

Restoration: The actions involved in returning a site to its former condition.

Rivers and Canals: A body of water confined within the inland area that has a project depth of 12 feet or less, including the Intracoastal Waterway and other waterways artificially created for navigation.

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Securing the Source: Steps that must be taken to stop discharge of oil at the source of the spill.

Sinking Agents: Means those aliitives applied to oil discharges to sink floating pollutants below the water surface.

Site Characterization: An evaluation of a cleanup site to determine the appropriate safety and health procedures needed to protect employees from identified hazards.

Site Conditions: Details of the area surrounding the facility, including shoreline descriptions, typical weather conditions, socioeconomic breakdowns, etc.

Site Safety and Health Plan: A site specific plan developed at the time of an incident that addresses:

- Safety and health hazard analysis for each operation.
- Personal protective equipment to be used.
- Training requirements for site workers.
- Medical surveillance requirements.
- Air monitoring requirements.
- Site control measures.
- Decontamination procedures.
- Emergency response procedures.
- Confined space entry procedures.

Site Security and Control: Steps that must be taken to provide safeguards needed to protect personnel and property, as well as the general public, to ensure an efficient clean-up operation.

Skimmers: Mechanical devices used to skim the surface of the water and recover floating oil. Skimmers fall into four basic categories (suction heads, floating weirs, oleophilic surface units, and hydrodynamic devices) which vary in efficiency depending on the type of oil and size of spill.

Snare Boom: Oil will adhere to the material of which this boom is made of and thus collect it.

Sorbents: Materials ranging from natural products to synthetic polymeric foams placed in confined areas to soak up small quantities of oil. Sorbents are very effective in protecting walkways, boat decks, working areas, and previously uncontaminated or cleaned areas.

Spill: An unauthorized discharge of oil or hazardous substance into the waters of the state.

Spill Observer: The first Facility individual who discovers a spill. This individual must function as the first responder and person-in-charge until relieved by an authorized supervisor.

Spill of National Significance (SONS): Means a spill which due to its severity, size, location, actual or potential impact on the public health and welfare or the environment, or the necessary response effort, is so complex that it requires extraordinary coordination of federal, state, local, and responsible party resources to contain and cleanup the discharge.

Spill Management Team: The personnel identified to staff the organizational structure identified in a response plan to manage response plan implementation.

Spill Response: All actions taken in responding to spills of oil and hazardous materials, e.g.: receiving and making notifications; information gathering and technical advisory phone calls; preparation for and travel to and from spill sites; direction of clean-up activities; damage assessments; report writing, enforcement investigations and actions; cost recovery; and program development.

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Spill Response Personnel: Federal, state, local agency, and industry personnel responsible for participating in or otherwise involved in spill response. All spill response personnel will be pre-approved on a list maintained in each region.

Staging Areas: Designated areas near the spill site accessible for gathering and deploying equipment and/or personnel.

State Emergency Response Commission (SERC): A group of officials appointed by the Governor to implement the provisions of Title III of the Federal Superfund Amendments and Re-authorization Act of 1986 (SARA). The SERC approves the State Oil and Hazardous Substance Discharge Prevention and Contingency Plan and Local Emergency Response Plans.

Surface Collecting Agents: Means those chemical agents that form a surface film to control the layer thickness of oil.

Surface Washing Agent: Is any product that removes oil from solid surfaces, such as beaches and rocks, through a detergency mechanism and does not involve dispersing or solubilizing the oil into the water column.

Tanker: A self-propelled tank vessel constructed or adapted primarily to carry or hazardous material in bulk in the cargo spaces.

Tidal Current Tables: Tables which contain the predicted times and heights of the high and low waters for each day of the year for designated areas.

Trajectory Analysis: Estimates made concerning spill size, location, and movement through aerial surveillance or computer models.

Transfer: Any movement of oil to, from, or within a vessel by means of pumping, gravitation, or displacement.

Trustee: Means an official of a federal natural resources management agency designated in subpart G of the NCP or a designated state official or Indian tribe or, in the case of discharges covered by the OPA, a foreign government official, who may pursue claims for damages under section 1006 of the OPA.

Underwriter: An insurer, a surety company, a guarantor, or any other person, other than an owner or operator of a vessel or facility, that undertakes to pay all or part of the liability of an owner or operator.

Unified Command: The method by which local, state, and federal agencies and the responsible party will work with the Incident Commander to:

- Determine their roles and responsibilities for a given incident.
- Determine their overall objectives for management of an incident.
- Select a strategy to achieve agreed-upon objectives.
- Deploy resources to achieve agreed-upon objectives.

Unified or Coordinated Command Meeting: Held to obtain agreement on strategic objectives and response priorities; review tactical strategies; engage in joint planning, integrate response operations; maximize use of resources; and minimize resolve conflicts.

Volunteers: An individual who donates their services or time without receiving monetary compensation.

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Waste: Oil or contaminated soil, debris, and other substances removed from coastal waters and adjacent waters, shorelines, estuaries, tidal flats, beaches, or marshes in response to an unauthorized discharge. Waste means any solid, liquid, or other material intended to be disposed of or discarded and generated as a result of an unauthorized discharge of oil. Waste does not include substances intended to be recycled if they are in fact recycled within 90 days of their generation or if they are brought to a recycling facility within that time.

Waters of the United States: See **Navigable Waters** in this Glossary.

Wetlands: Those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include playa lakes, swamps, marshes, bogs, and similar areas such as sloughs, prairie potholes, wet meadows, prairie river overflows, mudflats, and natural ponds (40 CFR 112.2(y)).

Wildlife Rescue: Efforts made in conjunction with Federal and State agencies to retrieve, clean, and rehabilitate birds and wildlife affected by an oil spill.

Worst Case Discharge: The largest foreseeable discharge under adverse weather conditions. For facilities located above the high water line of coastal waters, a worst case discharge includes those weather conditions most likely to cause oil discharged from the facility to enter coastal waters.

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ACRONYMS

AMIO	Alien Migration Interdiction Operation
AQI	Alternate Qualified Individual
AM	Ante Meridiem
ACP	Area Contingency Plan
Avg.	Average
bbls	Barrels
bbl/hr	Barrel per Hour
Br	Branch
BLM	Bureau of Land Management
COTP	Captain of the Port
Ctr.	Center
CAS Number	Chemical Abstracts Service
CST	Civil Support Team
CG	Coast Guard
CFR	Code of Federal Regulations
Cont'd	Continued
CERT	Corporate Emergency Response Team
CMT	Crisis Management Team
DOA	Dead on Arrival
Dept.	Department
DOD	Department of Defense
DENR	Department of Environment and Natural Resources
DHS	Department of Homeland Security
DOI	Department of Interior
DNR	Department of Natural Resources
DOT	Department of Transportation
D.C.	District of Columbia
Div.	Division
DOCL	Documentation Unit Leader
EMS	Emergency Management System
EM	Emergency Manager
EMS	Emergency Medical Service
EOC	Emergency Operations Center
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESA	Endangered Species Act
EET	Environmental Emergency Team
EPA	Environmental Protection Agency
EDRC	Estimated Daily Recovery Capability
EPA	Environmental Protection Agency
ETA	Estimated Time of Arrival
etc.	Et Cetera
exempli gratia e.g.	For Example
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FOSC	Federal On-Scene Coordinator
Ft.	Feet
Ft./Sec.	Feet/Second
FIR	Field Investigation Report
FR	Fire Retardant
FWD	Forward
Freq.	Frequency
GRP	Group
Gru Sups.	Group Supervisors
HAZMAT	Hazardous Material
HAZWOPER	Hazardous Waste Operations and Emergency Response Standard

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HVAC	Heating, Ventilating, and Air Conditioning
HEPA OVV	High Efficiency Particle Air Device
HF ERW	High Frequency Electric-Resistance Weld
HLS	Homeland Security
Hrs.	Hours
ID NO.	Identification Number
IL	Illinois
IDNR	Illinois Department of Natural Resources
IAW	In Accordance With
IAP	Incident Action Plan
ICP	Incident Command Post
ICS	Incident Command System
IC	Incident Commander
IMH	Incident Management Handbook
IMS	Incident Management System
Info.	Information
IRT	Initial Response Team
KS	Kansas
KM	Kilometer
KP	Kilometer Point
LE	Law Enforcement
LDS	Leak Detection System
LO	Liaison Officer
LPG	Liquefied Petroleum Gas
LEPC	Local Emergency Planning Committee
LRT	Local Response Team
LSC	Logistics Section Chief
LF ERW	Low Frequency Electric-Resistance Weld
LEL	Lower Explosive Limit
MO	Missouri
MSDS	Material Safety Data Sheets
MEDEVAC'D	Medical Evacuation
NCP	National Contingency Plan
NE	Nebraska
NEECP (CA)	National Environmental Emergencies Contingency Plan
NFPA	National Fire Protection Association
NIMS	National Incident Management System
NOAA	National Oceanographic Atmospheric Administration
NCP (U.S.)	National Oil and Hazardous Substances Contingency Plan
NPFC	National Pollution Fund Center
NRC	National Response Center
NRS	National Response System
NSF	National Strike Force
NSFCC	National Strike Force Coordination Center
NRDAR	Natural Resource Damage Assessment and Restoration
NEB	National Energy Board
N	No
ND	North Dakota
NW	North West
N/A	Not Available
OSHA	Occupational Safety & Health Administration
OPA	Oil Pollution Act of 1990
OSRO	Oil Spill Removal Organization
OSRP	Oil Spill Response Plan
OSRV	Oil Spill Response Vessel
OSC	On-Scene Commander
OSC	On-Scene Coordinate
OSC	Operation Section Chief

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O&M	Operations and Maintenance
OP	Operational Period
Op.	Operations
OPS	Operations
O&M	Operations and Maintenance
OCC	Operations Coordination Center
OV	Organic Vapor
PPM	Parts Per Million
PFD	Personal Floatation Device
PPE	Personal Protection Equipment
PHMSA	Pipeline and Hazardous Materials Safety Administration
PSC	Planning Section Chief
POC	Point of Contact
PVC	Polyvinyl Chloride
P.M.	Post Meridiem
PREP	Preparedness for Response Exercise Program
Prot.	Protection
PWSD	Public Water Supply District
QI	Qualified Individual
REET	Regional Environmental Emergency Team
RPT	Regional Preparedness Team
RRT	Regional Response Team
Req.	Required
RCRA	Resource Conservation and Recovery Act
RESL	Resource Leader
RP	Responsible Party
RPIC	Responsible Party Incident Commander
Rev.	Revision
ROW	Right-of-Way
RWD	Rural Water District
SAR	Search and Rescue
SART	Search and Rescue Transporter
Sec.	Second
SI	Security Incident
SO	Security Officer
SCBA	Self Contained Breathing Apparatus
SSPs	Site Safety Plans
SITL	Situation Unit Leader
SD	South Dakota
Spec.	Special
SONS	Spill of National Significance
SPCC	Spill Prevention, Control, and Countermeasure
SORS	Spilled oil Recovery System
Sq. Ft.	Square Foot
STAM	Staging Area Manager
SERC	State Emergency Response Center
SERC	State Emergency Response Commission
SOSC	State On-Scene Coordinator
SOR	Statutory Orders and Regulations
SUPSALV	US Navy Supervisor Salvage & Diving
SCADA	Supervisory Control and Data Acquisition
TOC	Table of Contents
TSD	Temporary Storage and Disposal
TSC	Temporary Storage Capacity
id est, I.E.	That is
TBA	To be Assigned
TSB	Transportation Safety Board
UC	Unified Command

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UN Number	United Nations
US	United States
USCG	United States Coast Guard
Vsl.	Vessel
VOSS	Vessel of Opportunity Skimmer System
VP	Vice President
VOC	Volatile Organic Compound
Vol.	Volume
W	West
WCD	Worst Case Discharge
Y	Yes

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RESPONSE ZONE INFORMATION

Hardisty Pump Station/ Regina Pump Station

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	1-800-447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Alberta, Saskatchewan
Areas/Counties Traversed:	Eastern Alberta, Western Saskatchewan

INFORMATION SUMMARY

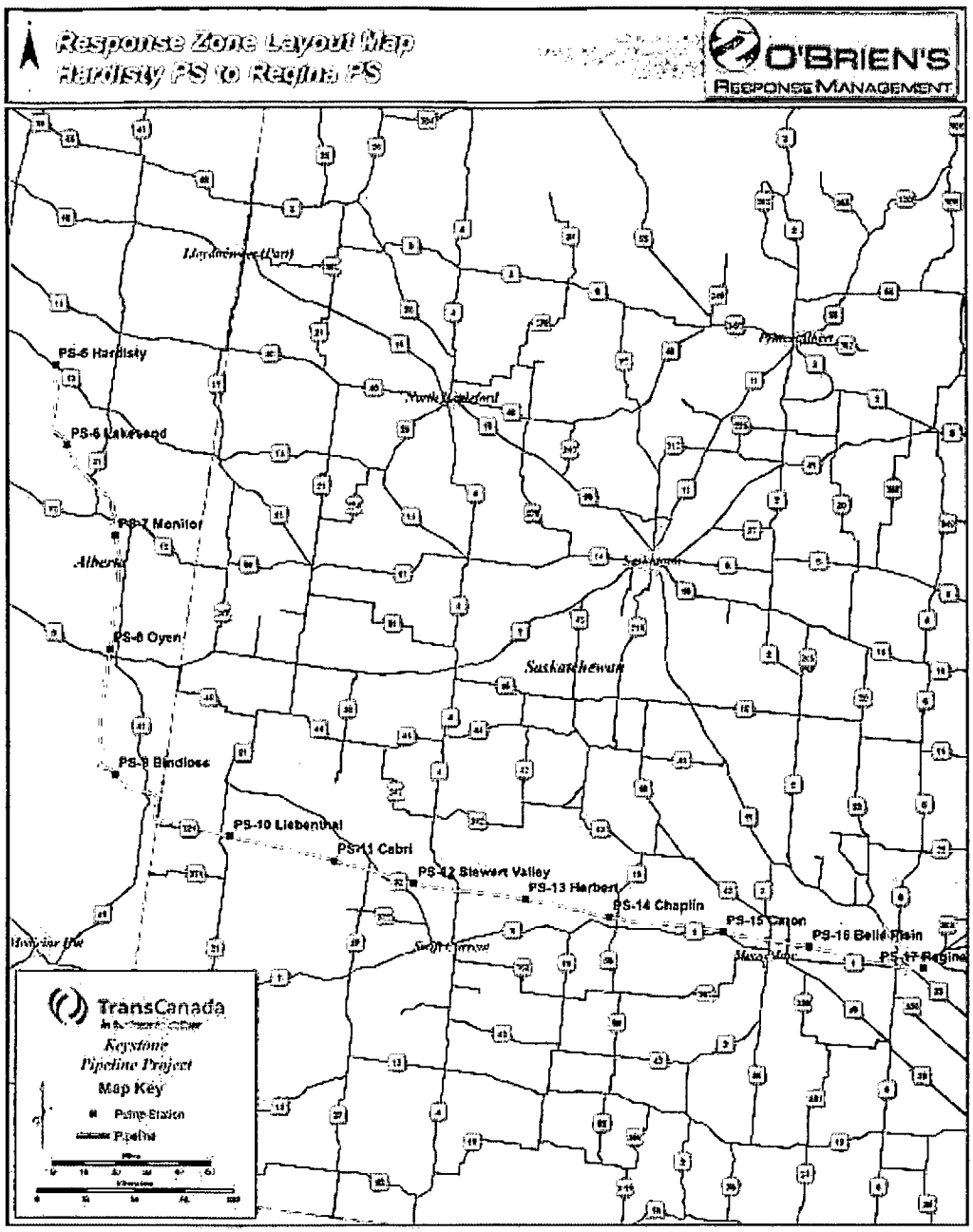
Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 39,723 Bbls

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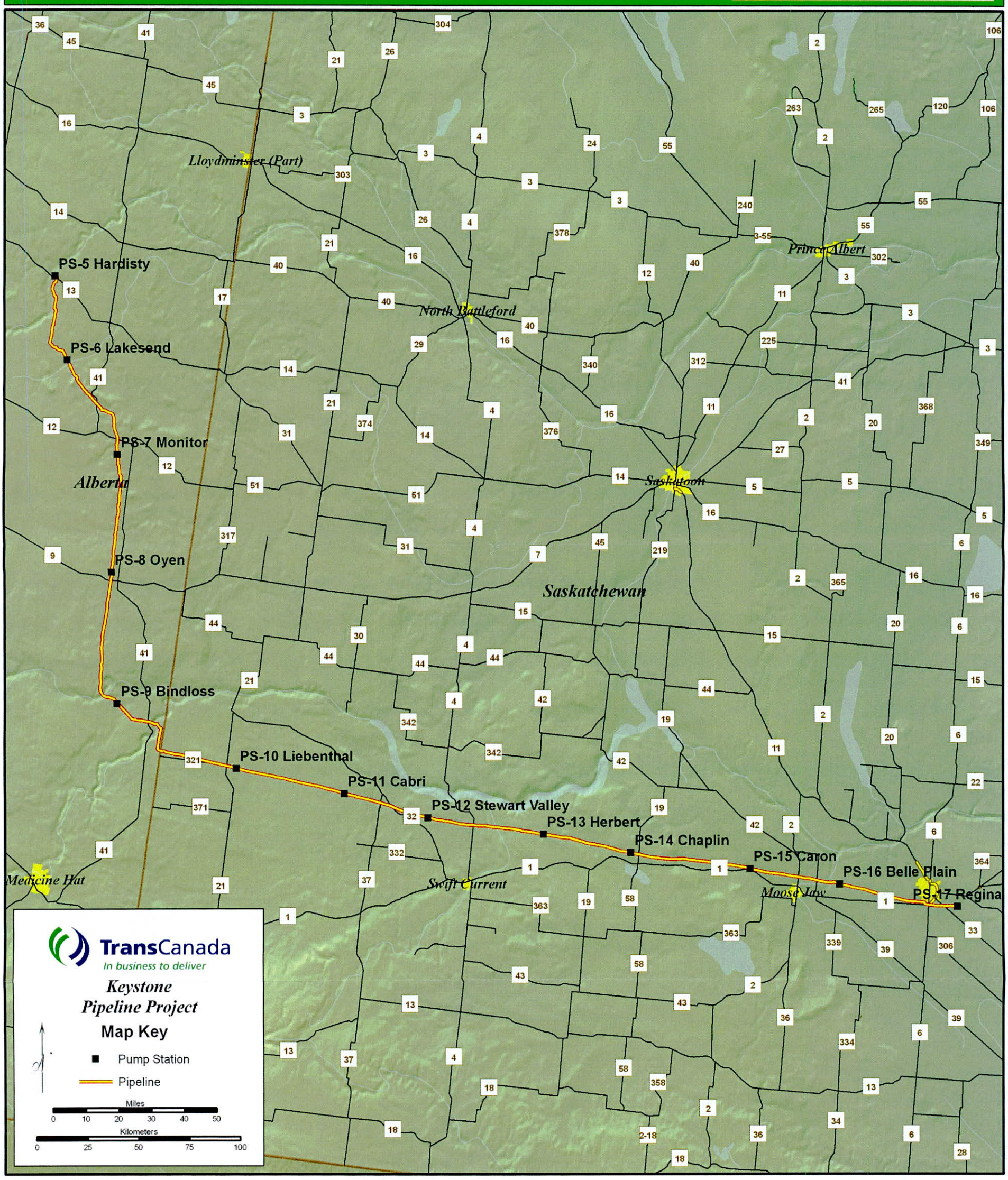


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Response Zone Layout Map
Hardisty PS to Regina PS

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
(281)320-9796

O'BRIEN'S RESPONSE MANAGEMENT



RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Director		Michael Liao	(204) 957-6832 (Office) (204) 260-9364 (Cell)
Qu'Appelle Area Manager	Incident Commander	Deanna Doig	(306) 347-4307 (Office) (306) 781-2964 (Home) (306) 533-4852 (Cell)
Hardisty Area Manger	Incident Commander	Bryan Templeton	(780) 888-2668 (Office) (780) 842-4023 (Home) (403) 928-1852 (Cell)
Incident Response Specialist	Incident Commander, Operations Section Chief, Environmental Unit Leader	Gary Trask	(204) 957-6837 (Office) (204) 736-4730 (Home) (204) 619-2416 (Cell)
Palliser Area Manager	Incident Commander, Planning Section Chief	Rob Ferguson	(403) 529-4318 (Office) (403) 548-6077 (Home) (204) 233-7109 (Cell)
RAR Manager	Incident Commander	Patrick Kelly	(204) 957-6813 (Office) (204) 330-5139 (Home) (204) 918-2984 (Cell)
Incident Response Specialist	Incident Commander	Ken Jones	(780) 962-7331 (Office) (587) 337-8713 (Cell)
Heartland Area Manager	Incident Commander	Stephen Bachorcik	(306) 773-7501 (Office) (306) 750-2103 (Cell)

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Area: Hardisty Pump Station / Regina Pump Station Qualified Individuals			
NAME	OFFICE	HOME	CELL
Deanna Doig	(306) 347-4307	(306) 781-2964	(306) 533-4852
Bryan Templeton	(780) 888-2668	(780) 842-4023	(403) 928-1852
Gary Trask	(204) 957-6837	(204) 736-4730	(204) 619-2416
Rob Ferguson	(403) 529-4318	(403) 548-6077	(204) 233-7109

Pipeline Specifications			
Location	Type of Oil	State	County
Cabri PS / Herbert PS	Crude Oil	Saskatchewan	Western Saskatchewan
Herbert PS / Caron PS	Crude Oil	Saskatchewan	Western Saskatchewan
Hardisty PS / Lakesend PS	Crude Oil	Alberta	Eastern Alberta
Lakesend PS / Monitor PS	Crude Oil	Alberta	Eastern Alberta
Monitor PS / Oyen PS	Crude Oil	Alberta	Eastern Alberta
Oyen PS / Bindloss PS	Crude Oil	Alberta	Eastern Alberta
Blindloss PS / Cabri PS	Crude Oil	Alberta	Eastern Alberta
Hardisty Interconnection Facility	Crude Oil	Alberta	Eastern Alberta
Caron PS / Regina PS	Crude Oil	Saskatchewan	Western Saskatchewan

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Company Owned Response Equipment		
NAME	LOCATION	DESCRIPTION
34' Equipment Response Trailer	HSE Integrated, Brooks Ab	See Inventory - Appendix A
20' Boom trailer	HSE Integrated, Brooks Ab	See Inventory - Appendix A
OSRV boat	HSE Integrated, Brooks Ab	See Inventory - Appendix A
Safety Boat - HSE	HSE Integrated, Brooks Ab	See Inventory - Appendix A
20' Equpment Trailer	TC, Hardisty, Ab	See Inventory - Appendix A
Work Boat	TC, Hardisty, Ab	See Inventory - Appendix A
Safety Boat - TC	TC, Hardisty, Ab	See Inventory - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES

Alberta

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Eastern Alberta		
Abbey Fire Department	Abbey, Alberta	(306) 689-2933
Acadia Valley Fire Department	Acadia Valley, Alberta	(403) 972-3808
Bindloss Fire Department	Bindloss, Alberta	(403) 379-2278
Bow Island Fire Department	Bow Island, Alberta	(403) 545-2424
Cereal Fire Department	Cereal, Alberta	(403) 326-2195
CFB Suffield Military Police Detachment	Ralston, Alberta	(403) 544-4303 /4506
Elkwater Fire Department	Elkwater, Alberta	(403) 893-2005
Empress Ambulance Services (Alberta Medivac)	Oyen, Alberta	(403) 664-2456
Empress Fire Department	Empress, Alberta	(403) 565-3746
Etzikom Fire Department	Bow Island, Alberta	(403) 545-2424
Hilda Fire Department	Hilda, Alberta	(403) 838-2510
Irvine Fire Department	Irvine, Alberta	(403) 529-8285
Jenner Fire Department	Jenner, Alberta	(403) 898-2204
Medicine Hat Police Service	Medicine Hat, Alberta	(403) 529-8400
Medicine Hat Disaster Services	Medicine Hat, Alberta	(403) 529-8450
Medicine Hat Fire Department	Medicine Hat, Alberta	(403) 529-8282
Oyen Fire Department	Oyen, Alberta	911
Oyen RCMP Detachment	Oyen, Alberta	(403) 664-3505 /3883
Palliser Regional EMS - Medicine Hat	Medicine Hat, Alberta	(403) 529-8800
Ralston Fire Department	Ralston, Alberta	(403) 544-4448

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Redcliff Disaster Services	Redcliff, Alberta	(403) 548-3618
Redcliff Fire Department	Redcliff, Alberta	(403) 548-3425
Schuler Fire Department	Schuler, Alberta	(403) 526-2888
Seven Persons Fire Department	Seven Persons, Alberta	(403) 832-3750
Special Areas No. 3 Fire Department (Youngstown)	Youngstown, Alberta	(403) 779-3733
Walsh Fire Department	Walsh, Alberta	(403) 937-3936

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EXTERNAL NOTIFICATION REFERENCES

Saskatchewan

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Western Saskatchewan		
Burstall Ambulance Services	Burstall, Saskatchewan	(306) 679-2271
Burstall EMO Services	Burstall, Saskatchewan	(306) 679-2000
Burstall Fire Department	Burstall, Saskatchewan	(306) 679-2108 /2215
Cabri Ambulance Services	Cabri, Saskatchewan	(306) 587-2547
Cabri Fire Department	Cabri, Saskatchewan	(306) 587-2500
Cabri RCMP Detachment	Cabri, Saskatchewan	(306) 587-6400
Caronport Fire Department	Caronport, Saskatchewan	(306) 756-3253
Central Butte Ambulance Services	Central Butte, Saskatchewan	(306) 694-2111 /4610
Chaplin Fire Department	Chaplin, Saskatchewan	(306) 395-2561 /2598
City of Regina - Emergency Planning	Regina, Saskatchewan	(306) 777-7886
Climax Fire Department	Climax, Saskatchewan	(306) 293-2131
Eastend Fire Department	Eastend, Saskatchewan	(306) 295-3634
Fox Valley Fire Department	Fox Valley, Saskatchewan	(306) 666-2151
Frontier Ambulance Services	Frontier, Saskatchewan	(306) 296-4554
Frontier Fire Department	Frontier, Saskatchewan	(306) 296-4554 /4778
Gull Lake Ambulance Services	Gull Lake, Saskatchewan	(306) 672-4704
Gull Lake EMO Services	Gull Lake, Saskatchewan	(306) 672-4704
Gull Lake Fire Department	Gull Lake, Saskatchewan	(306) 672-4273
Herbert Fire Department	Herbert, Saskatchewan	(306) 784-2400
Kipling Fire Department	Kipling, Saskatchewan	(306) 736-8461

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Leader Ambulance Services	Leader, Saskatchewan	(306) 628-3828
Leader EMO Services	Leader, Saskatchewan	(306) 628-3868
Leader Fire Department	Leader, Saskatchewan	(306) 628-3868
Leader RCMP Detachment	Leader, Saskatchewan	(306) 628-4600
Maple Creek Ambulance	Maple Creek, Saskatchewan	(306) 662-2611
Maple Creek EMO Services	Maple Creek, Saskatchewan	(306) 662-2244
Maple Creek RCMP Detachment	Maple Creek, Saskatchewan	(306) 662-5550
Moose Jaw Ambulance Services	Moose Jaw, Saskatchewan	(306) 694-2151
Moose Jaw EMO Services	Moose Jaw, Saskatchewan	(306) 693-9700
Moose Jaw Fire Department	Moose Jaw, Saskatchewan	(306) 692-2792
Moose Jaw RCMP Detachment	Moose Jaw, Saskatchewan	(306) 691-4670
Morse Fire Department	Morse, Saskatchewan	(306) 629-3282
Morse RCMP Detachment	Morse, Saskatchewan	(306) 629-4100
Pense Fire Department	Pense, Saskatchewan	(306) 345-2302
Piapot Fire Department	Piapot, Saskatchewan	(306) 558-2022 /2011
RCMP - Gull Lake Community Detachment	Swift Current, Saskatchewan	(306) 672-3140
Regina City Police Department	Regina, Saskatchewan	(306) 777-6500
Regina EMS - Ambulance	Regina, Saskatchewan	(306) 766-7007
Regina Fire Department	Regina, Saskatchewan	(306) 777-7829 /7830
Regina RCMP Detachment	Regina, Saskatchewan	(306) 780-5560
Richmound Ambulance Services	Leader, Saskatchewan	(306) 679-7182
RM of Moose Jaw EMO Services	Moose Jaw, Saskatchewan	(306) 692-3446
RM of Wheatland EMO Services	Mortlach, Saskatchewan	(306) 355-2233
Rural Municipality of Riverside No.168 Fire Depart	Pennant, Saskatchewan	(306) 626-3255
Sceptre Fire Department	Sceptre, Saskatchewan	(306) 623-4244

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Shaunavon Ambulance Services	Shaunavon, Saskatchewan	(306) 297-2644
Shaunavon EMO Services	Shaunavon, Saskatchewan	(306) 297-9381
Shaunavon Fire Department	Shaunavon, Saskatchewan	(306) 297-4131
Shaunavon RCMP Detachment	Shaunavon, Saskatchewan	(306) 297-5555
Stewart Valley Fire Department	Stewart Valley, Saskatchewan	(306) 778-2105 /2152
Swift Current Ambulance Services	Swift Current, Saskatchewan	(306) 773-2666
Swift Current Fire Department	Swift Current, Saskatchewan	(306) 778-2760
Swift Current RCMP Detachment	Swift Current, Saskatchewan	(306) 778-5550
Val Marie Ambulance Services	Val Marie, Saskatchewan	(306) 298-4911
Val Marie Fire Department	Val Marie, Saskatchewan	(306) 298-2012 /2022

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RESPONSE ZONE INFORMATION

Regina Pump Station / Haskett Pump Station

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	1-800-447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Saskatchewan, Manitoba
Areas/Counties Traversed:	Eastern Saskatchewan, Southwestern Manitoba

INFORMATION SUMMARY

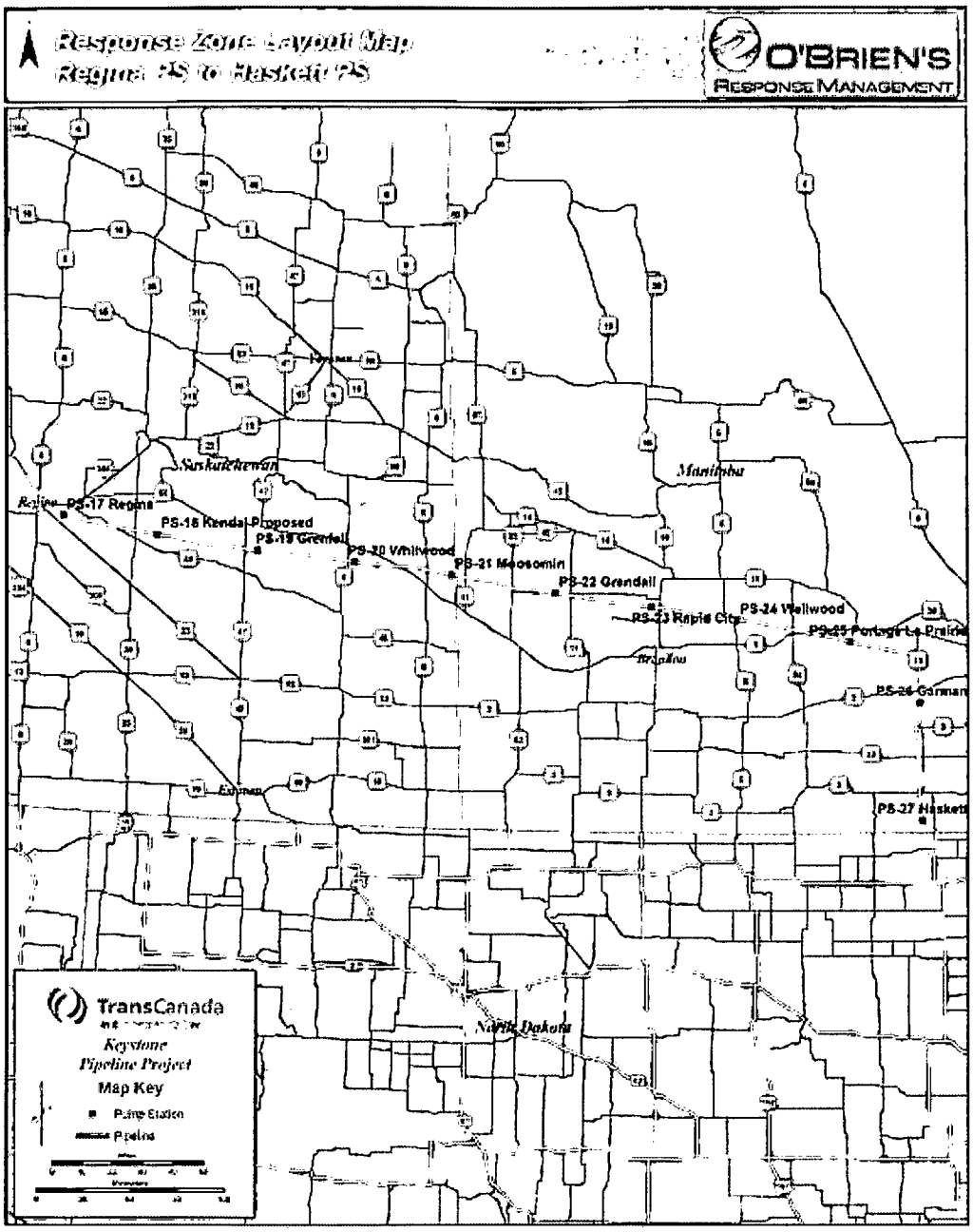
Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 47,782 Bbls

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Response Zone Layout Map
Regina PS to Haskett PS

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
(281)320-9796

O'BRIEN'S RESPONSE MANAGEMENT

Saskatchewan

Manitoba

North Dakota

Regina

Yorkton

Estevan

Brandon

PS-17 Regina

PS-18 Kendal Proposed

PS-19 Grenfell

PS-20 Whitwood

PS-21 Moosomin

PS-22 Grandall

PS-23 Rapid City

PS-24 Wellwood

PS-25 Portage La Prairie

PS-26 Carman

PS-27 Haskett

TransCanada
In business to deliver

Keystone Pipeline Project

Map Key

Pump Station

Pipeline

Miles
0 10 20 30 40 50

Kilometers
0 25 50 75 100

RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Director		Michael Liao	(204) 957-6832 (Office) (204) 260-9364 (Cell)
Agassiz Area Manger	Incident Commander, Operations Section Chief	Barry Adamson	(204) 957-6840 (Office) (204) 878-4473 (Home) (204) 471-7918 (Cell)
Qu'Appelle Area Manager	Incident Commander	Deanna Doig	(306) 347-4307 (Office) (306) 781-2964 (Home) (306) 533-4852 (Cell)
Incident Response Specialist	Incident Commander, Operations Section Chief, Environmental Unit Leader	Gary Trask	(204) 957-6837 (Office) (204) 736-4730 (Home) (204) 619-2416 (Cell)
RAR Manager	Incident Commander	Patrick Kelly	(204) 957-6813 (Office) (204) 330-5139 (Home) (204) 918-2984 (Cell)
Incident Response Specialist	Incident Commander	Ken Jones	(780) 962-7331 (Office) (587) 337-8713 (Cell)

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Area: Regina Pump Station / Haskett Pump Station Qualified Individuals			
NAME	OFFICE	HOME	CELL
Barry Adamson	(204) 957-6840	(204) 878-4473	(204) 471-7918
Deanna Doig	(306) 347-4307	(306) 781-2964	(306) 533-4852
Gary Trask	(204) 957-6837	(204) 736-4730	(204) 619-2416

Pipeline Specifications			
Location	Type of Oil	State	County
Regina PS / Kendal PS	Crude Oil	Saskatchewan	Eastern Saskatchewan
Kendal PS / Grenfell PS	Crude Oil	Saskatchewan	Eastern Saskatchewan
Grenfell PS / Moosomin PS	Crude Oil	Saskatchewan	Eastern Saskatchewan
Moosomin PS / Rapid City PS	Crude Oil	Manitoba	Southwestern Manitoba
Rapid PS / Portage La Prairie PS	Crude Oil	Manitoba	Southwestern Manitoba
Portage La Prairie PS / Carman PS	Crude Oil	Manitoba	Southwestern Manitoba
Carman PS / Haskett PS	Crude Oil	Manitoba	Southwestern Manitoba

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Company Owned Response Equipment		
NAME	**LOCATION**	**DESCRIPTION**
Safety Boat - TC	TC, Caron Sk	See Inventory - Appendix A
34' Equipment Response Trailer	Euroway Industries, Winnipeg, Mb	See Inventory - Appendix A
20' Boom trailer	Euroway Industries, Winnipeg, Mb	See Inventory - Appendix A
OSRV boat	Euroway Industries, Winnipeg, Mb	See Inventory - Appendix A
Safety Boat - Winnipeg	Euroway Industries, Winnipeg, Mb	See Inventory - Appendix A
20' Equpment Trailer	TC, Caron Sk	See Inventory - Appendix A
Work Boat	TC, Caron Sk	See Inventory - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES

Saskatchewan

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Eastern Saskatchewan		
Balgonie Fire Department	Balgonie, Saskatchewan	(306) 771-2206
Broadview Fire Department	Broadview, Saskatchewan	(306) 696-2533
Broadview RCMP Detachment	Broadview, Saskatchewan	(306) 696-5200
Carry The Kettle Fire Department	Sintaluta, Saskatchewan	(306) 727-2135
City of Regina - Emergency Planning	Regina, Saskatchewan	(306) 777-7886
Glenavon Fire Department	Glenavon, Saskatchewan	(306) 429-2220
Grenfell Ambulance Services	Grenfell, Saskatchewan	(306) 697-2707
Grenfell Fire Department	Grenfell, Saskatchewan	(306) 697-2217
Indian Head Fire Department	Indian Head, Saskatchewan	(306) 695-3887
Indian Head RCMP Detachment	Indian Head, Saskatchewan	(306) 695-5200
Kipling Ambulance Service	Kipling, Saskatchewan	(306) 736-2553
Kipling RCMP Detachment	Kipling, Saskatchewan	(306) 736-6400
Montmartre Fire Department	Montmartre, Saskatchewan	(306) 424-2040
Montmartre RCMP Detachment	Montmartre, Saskatchewan	(306) 424-6400
Moosomin Ambulance Services	Moosomin, Saskatchewan	(306) 435-2962
Moosomin Fire Department	Moosomin, Saskatchewan	(306) 435-2105
Moosomin RCMP Detachment	Moosomin, Saskatchewan	(306) 435-3361
Regina City Police Department	Regina, Saskatchewan	(306) 777-6500
Regina EMS - Ambulance	Regina, Saskatchewan	(306) 766-7007
Regina Fire Department	Regina, Saskatchewan	(306) 777-7829 /7830

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Regina RCMP Detachment	Regina, Saskatchewan	(306) 780-5560
Val Marie Fire Department	Val Marie, Saskatchewan	(306) 298-2012 /2022
White City Fire Department	White City, Saskatchewan	(306) 781-2303
Whitewood Fire Department	Whitewood, Saskatchewan	(306) 735-2331
Wolseley Fire Department	Wolseley, Saskatchewan	(306) 698-2288

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EXTERNAL NOTIFICATION REFERENCES

Manitoba

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Southwestern Manitoba		
Austin Fire Department	Austin, Manitoba	(204) 637-2169
Brandon Ambulance	Brandon, Manitoba	(204) 729-2400 /2406
Brandon Fire Department	Brandon, Manitoba	(204) 729-2400 /2406
Brandon RCMP Detachment	Brandon, Manitoba	(204) 726-7500 /7522
Carberry - Assiniboine EMS	Carberry, Manitoba	(204) 834-3548
Carberry Ambulance Services	Carberry, Manitoba	(204) 834-3548
Carberry Fire Department	Carberry, Manitoba	(204) 834-2212
Carberry RCMP Detachment	Carberry, Manitoba	(204) 834-2905
Cartier Ambulance	Elie, Manitoba	(204) 353-4161
Cartier Fire Department	Elie, Manitoba	(204) 353-2214 /2424
City of Brandon Emergency Management Services	Brandon, Manitoba	(204) 729-2239
Dominion City Fire Department	Dominion City, Manitoba	(204) 427-2628
Emerson Ambulance Department	Emerson, Manitoba	(204) 373-2002
Emerson Fire Department	Emerson, Manitoba	(204) 373-2335 /2414
Emerson RCMP	Emerson, Manitoba	(204) 373-2505
Falcon / Whiteshell Fire Department	Falcon Lake, Manitoba	(204) 349-8772
Gladstone RCMP Detachment	Gladstone, Manitoba	(204) 385-3035
Hadashville Ambulance Services	Hadashville, Manitoba	(204) 426-5328
Hamiota - Ambulance EMS	Hamiota, Manitoba	(204) 764-4207
Hamiota Fire Department	Hamiota, Manitoba	(204) 764-3050 /3055

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Hamiota RCMP Detachment	Hamiota, Manitoba	(204) 759-2704 /2732
Headingley Fire Department	Headingley, Manitoba	(204) 837-5766
Headingley RCMP Detachment	Headingley, Manitoba	(204) 888-0358
Headingley Traffic Services	Winnipeg, Manitoba	(204) 984-6911
Ile des Chenes Ambulance Services	St. Pierre-Jolys, Manitoba	(204) 433-3330
MacDonald Ambulance Services	Oak Bluff, Manitoba	(204) 837-3332
MacGregor Ambulance Services	MacGregor, Manitoba	(204) 685-2161
MacGregor Fire Department	MacGregor, Manitoba	(204) 685-2161
MacGregor RCMP	Portage la Prairie, Manitoba	(204) 857-4445
McAuley Fire Department	McAuley, Manitoba	(204) 722-2211
Miniota Fire Department	Miniota, Manitoba	(204) 567-3683 /3813
Minnedosa Ambulance Services	Minnedosa, Manitoba	(204) 867-5555
Minnedosa EMO Services	Minnedosa, Manitoba	(204) 867-5273
Minnedosa Fire Department	Minnedosa, Manitoba	(204) 867-2727
Minnedosa RCMP Detachment	Minnedosa, Manitoba	(204) 867-2916
Morris RCMP Detachment	Morris, Manitoba	(204) 746-2323
Neepawa Ambulance Services	Neepawa, Manitoba	(204) 476-7840
Neepawa Fire Department	Neepawa, Manitoba	(204) 476-7654
Neepawa RCMP Detachment	Neepawa, Manitoba	(204) 476-7340
North Eastman Health Association Inc	Pinawa, Manitoba	(204) 753-2015
Oak Bank RCMP Detachment	Oak Bank, Manitoba	(204) 444-3847
Oak River Fire Department	Oak River, Manitoba	(204) 566-2126
Portage la Prairie Ambulance Central Region Health	Portage la Prairie, Manitoba	(204) 857-5444
Portage la Prairie Fire Department	Portage la Prairie, Manitoba	(204) 239-5154
Portage la Prairie RCMP Detachment	Portage la Prairie, Manitoba	(204) 857-8767 /4445

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Rapid City EMO	Rapid City, Manitoba	(204) 826-2679
Rapid City Fire Department	Rapid City, Manitoba	(204) 826-2652 /2679
Richer Fire Department	Richer, Manitoba	(204) 422-5929
Ritchot Fire Department	Ile Des Chenes, Manitoba	(204) 981-6782
Rivers Ambulance Services	Rivers, Manitoba	(204) 328-6201
Rivers Fire Department	Rivers, Manitoba	(204) 328-7437 /7930
Rivers Police Services	Rivers, Manitoba	(204) 328-7430
RM of Reynolds Fire Department	Hadashville, Manitoba	(204) 426-2265 /2266
RM of Tache Fire Department	Lorette, Manitoba	(204) 878-9977
Sanford Fire Department	Sanford, Manitoba	(204) 736-2255
Shoal Lake RCMP Detachment	Shoal Lake, Manitoba	(204) 759-2390
Souris RCMP Detachment	Souris, Manitoba	(204) 483-2854
South Eastman Health/EMS	Ste. Anne, Manitoba	(204) 935-2730
St. Malo Fire Department	St. Malo, Manitoba	(204) 347-5246 /
St. Pierre-Jolys Ambulance Service	St. Pierre-Jolys, Manitoba	(204) 433-7701
St. Pierre-Jolys Fire Department	St. Pierre-Jolys, Manitoba	(204) 433-7117
St. Pierre-Jolys RCMP Detachment	St. Pierre-Jolys, Manitoba	(204) 433-7908
Ste. Anne Fire Department	Ste. Anne, Manitoba	(204) 422-9110
Ste. Anne Police Service	Ste. Anne, Manitoba	(204) 422-8209
Steinbach Ambulance Services	Steinbach, Manitoba	(204) 346-6411
Steinbach Fire Department	Steinbach, Manitoba	(204) 326-1109 /9877
Steinbach RCMP Detachment	Steinbach, Manitoba	(204) 326-1234 /4452
Virden & Wallace Fire Department	Virden, Manitoba	(204) 748-1304
Virden Ambulance Services	Virden, Manitoba	(204) 748-4332
Virden RCMP Detachment	Virden, Manitoba	(204) 748-2046

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Whitemouth Ambulance Services	Whitemouth, Manitoba	(204) 348-7700
Whitemouth Fire Department	Whitemouth, Manitoba	(204) 348-7911
Winnipeg Fire Paramedic Service	Winnipeg, Manitoba	(204) 986-6380
Winnipeg Police Service	Winnipeg, Manitoba	(204) 986-6222
Winnipeg RCMP Detachment	Winnipeg, Manitoba	(204) 983-5420

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RESPONSE ZONE INFORMATION

North Dakota, South Dakota, Nebraska

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	1-800-447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	North Dakota, South Dakota, Nebraska
Areas/Counties Traversed:	Barnes, Beadle, Butler, Cavalier, Cedar, Clark, Colfax, Day, Gage, Hanson, Hutchinson, Jefferson, Kingsbury, Marshall, McCook, Miner, Nelson, Pembina, Platte, Ransom, Saline, Sargent, Seward, Stanton, Steele, Walsh, Wayne, Yankton

INFORMATION SUMMARY

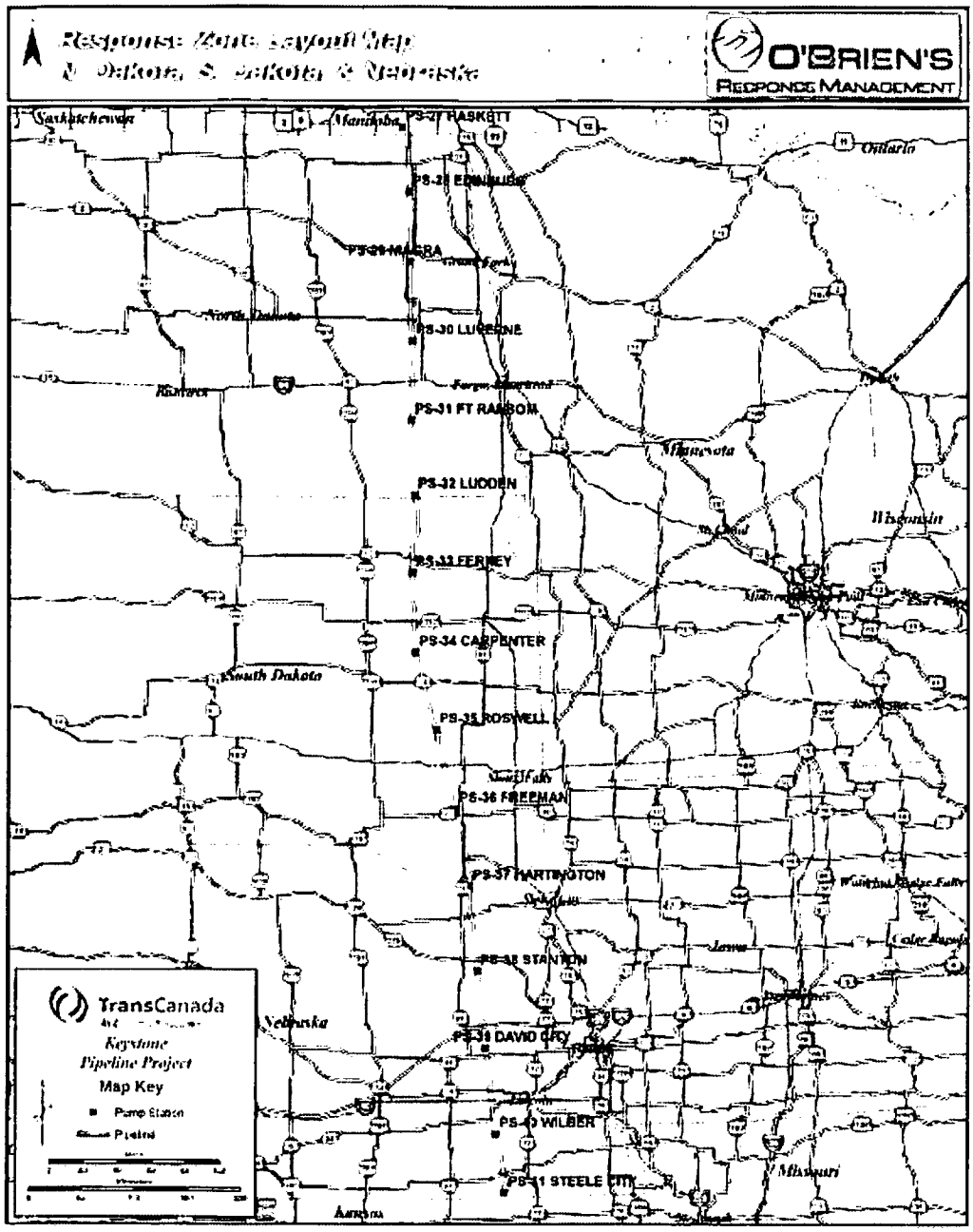
Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 33,058 Bbls

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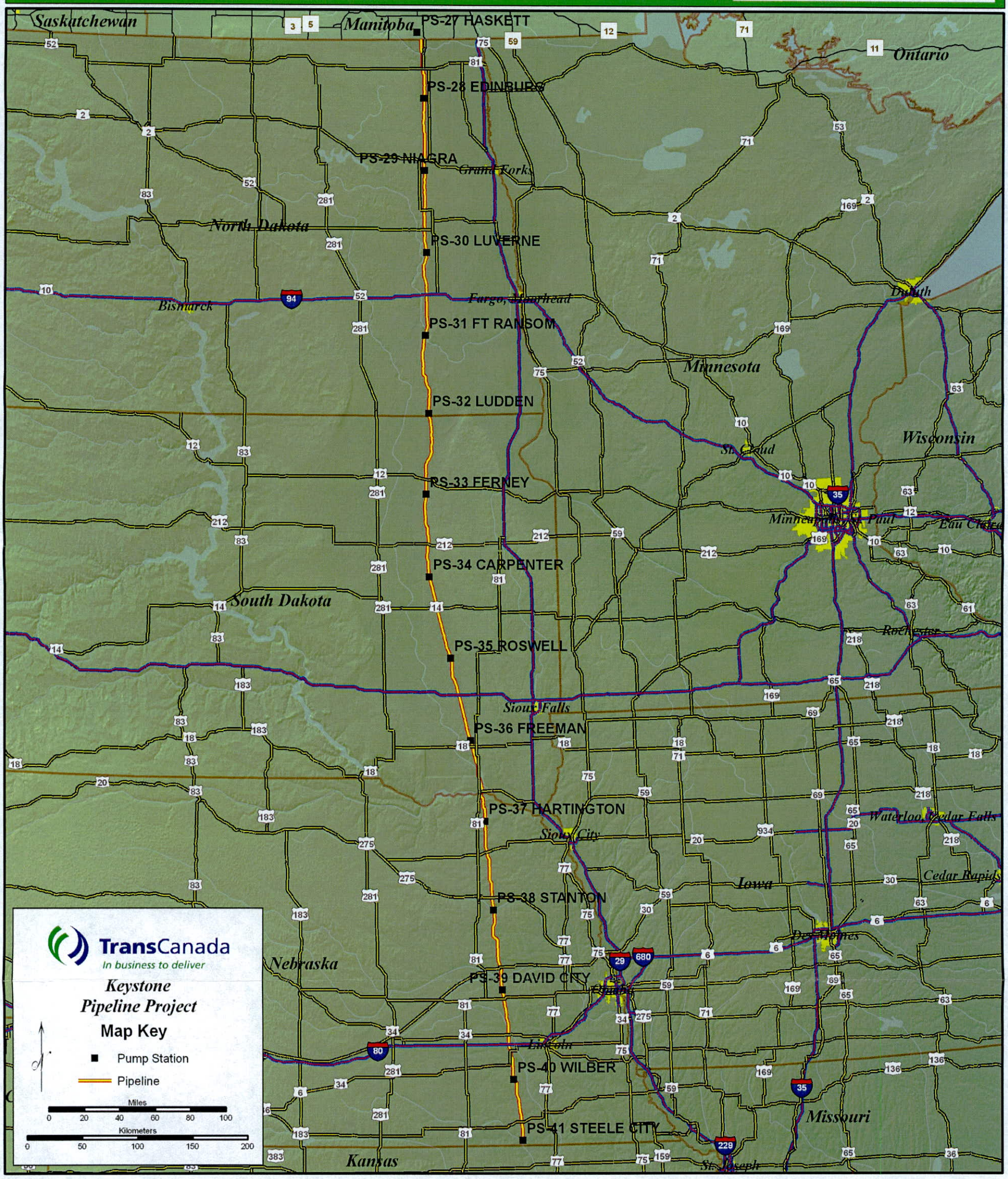


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Response Zone Layout Map
N. Dakota, S. Dakota, & Nebraska

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
(281)320-9796

O'BRIEN'S RESPONSE MANAGEMENT



RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
West River Area Manager	Incident Commander	Virgil Pfenning	(402) 492-7469 (Office) (402) 889-7383 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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Area: North Dakota, South Dakota, Nebraska Qualified Individuals			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Virgil Pfenning	(402) 492-7469		(402) 889-7383
Jon Wickersham	(402) 492-7406		(402) 672-6386

Pipeline Specifications			
Location	Type of Oil	State	County
Steele City / State Line	Crude Oil	Nebraska	Jefferson, Gage
Carpenter PS / Roswell PS	Crude Oil	South Dakota	Clark, Beadle, Kingsbury, Miner
Roswell PS / Freeman PS	Crude Oil	South Dakota	Miner, Hanson, McCook, Hutchinson
Freeman PS / Hartington PS	Crude Oil	Nebraska , South Dakota	Hutchinson, Yankton, Cedar
Hartington PS / Stanton PS	Crude Oil	Nebraska	Cedar, Wayne, Stanton
US-CAN Border / Edinburg PS	Crude Oil	North Dakota	Cavalier, Pembina, Walsh
Edinburg PS / Niagara PS	Crude Oil	North Dakota	Walsh, Nelson
Niagara PS / Luverne PS	Crude Oil	North Dakota	Nelson, Steele
Luverne PS / Fort Ransom PS	Crude Oil	North Dakota	Steele, Barnes, Ransom
Fort Ransom PS / Ludden PS	Crude Oil	North Dakota	Ransom, Sargent
Ludden PS / Ferney PS	Crude Oil	North Dakota , South Dakota	Sargent, Marshall, Day
Stanton PS / David City PS	Crude Oil	Nebraska	Stanton, Platte, Colfax, Butler
David City PS / Wilber PS	Crude Oil	Nebraska	Butler, Seward, Saline
Wilber PS/Steele City PS	Crude Oil	Nebraska	Saline, Jefferson
Ferney PS / Carpenter PS	Crude Oil	South Dakota	Day, Clark

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Company Owned Response Equipment		
NAME	**LOCATION**	**DESCRIPTION**
Valley City 20' Enclosed Trailer	Valley City, ND	See Inventory - Appendix A
Valley City 20' Work Boat	Valley City, ND	See Inventory - Appendix A
Valley City Zodiac Inflatable Boat	Valley City, ND	See Inventory - Appendix A
Yankton OSRV	Yankton, SD	See Inventory - Appendix A
Yankton 34' Response Trailer	Yankton, SD	See Inventory - Appendix A
Yankton 20' Work Boat	Yankton,SD	See Inventory - Appendix A
Yankton 20' Boom Trailer	Yankton, SD	See Inventory - Appendix A
Fairbury 20' Enclosed Trailer	Fairbury, NE	See Inventory - Appendix A
Fairbury 20' Work Boat	Fairbury, NE	See Inventory - Appendix A
Fairbury Zodiac Inflatable Boat	Fairbury, NE	See Inventory - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES

Nebraska

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Cedar		
Cedar County	Hartington, Nebraska	(402) 254-7411
Cedar County Sheriff & Emergency Mgmt.	Hartington, Nebraska	(402) 254-6884
City of Hartington	Hartington, Nebraska	(402) 254-6353
Local Public Safety Answering Point (PSAP)	Hartington, Nebraska	(402) 254-6451
Wayne		
City of Wayne	Wayne, Nebraska	(402) 375-1733
City of Wayne Electric Distribution Department	Wayne, Nebraska	(402) 375-2896
City of Wayne Fire Department	Wayne, Nebraska	(402) 375-1122
City of Wayne Police Department	Wayne, Nebraska	(402) 375-2626
City of Wayne Public Works Department	Wayne, Nebraska	(402) 375-1300
City of Wayne Water Department	Wayne, Nebraska	(402) 375-5250
Local Public Safety Answering Point	Wayne, Nebraska	(402) 375-2626
Wayne County (LEPC)	Wayne, Nebraska	(402) 833-5190
Stanton		
City of Stanton	Stanton, Nebraska	(402) 439-2119
Local Public Safety Answering Point	Stanton, Nebraska	(402) 439-2212
Stanton County LEPC	Stanton, Nebraska	(402) 439-2631
Stanton County Sheriff	Stanton, Nebraska	(402) 439-2212
Village of Pilger	Stanton, Nebraska	(402) 396-3563
Platte		
City of Columbus	Columbus, Nebraska	(402) 562-4224
Local Public Safety Answering Point	Columbus, Nebraska	(402) 564-3229

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Platte County LEPC	Columbus, Nebraska	(402) 564-1206
Platte County Sheriff	Columbus, Nebraska	(402) 564-3229
Colfax		
City of Schuyler Schools	Schuyler, Nebraska	(402) 352-3527
Colfax County	Schuyler, Nebraska	(402) 352-8502
Colfax County LEPC	Schuyler, Nebraska	(402) 352-8522
Colfax County Sheriff	Schuyler, Nebraska	(402) 352-8526
Local Public Safety Answering Point	Schuyler, Nebraska	(402) 352-8527
Village of Leigh	Leigh, Nebraska	(402) 487-3303
Village of Richland	Richland, Nebraska	(402) 564-0609
Butler		
Butler County First Responder / Sheriff	David City, Nebraska	(402) 367-7400
David City Electric & Light Department	David City, Nebraska	(402) 367-3197
David City Park & Auditorium Department	David City, Nebraska	(402) 367-3914
David City Police Department	David City, Nebraska	(402) 367-3133
David City Power Plant	David City, Nebraska	(402) 367-3138
David City Water & Sewer Department	David City, Nebraska	(402) 367-3132
Local Public Safety Answering Point	David City, Nebraska	(402) 367-7400
Butler County LEPC	David City, Nebraska	(402) 367-3125
Seward		
City of Milford	Milford, Nebraska	(402) 761-3247
City of Seward	Seward, Nebraska	(402) 643-2928
City of Seward Electric Department	Seward, Nebraska	(402) 643-3151
City of Seward Fire Department	Seward, Nebraska	(402) 643-6088
City of Seward Police Department	Seward, Nebraska	(402) 643-2759
City of Seward Sheriff	Seward, Nebraska	(402) 643-2359

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City of Seward Water Department	Seward, Nebraska	(402) 643-3433
Local Public Safety Answering Point	Seward, Nebraska	(402) 643-3002
Seward County	Seward, Nebraska	(402) 643-6262
Seward County LEPC	Seward, Nebraska	(402) 643-4722
Village of Bee	Bee, Nebraska	(402) 643-6247
Village of Goehner	Goehner, Nebraska	(402) 534-4311
Village of Staplehurst	Staplehurst, Nebraska	(402) 535-2507
Jefferson		
City of Fairbury	Fairbury, Nebraska	(402) 729-2476
Jefferson Co. Emergency Management Agency/Planning	Fairbury, Nebraska	(402) 729-3602
Local Public Safety Answering Point	Fairbury, Nebraska	(402) 729-3624
Village of Diller	Diller, Nebraska	(402) 793-5991
Village of Plymouth	Plymouth Village, Nebraska	(402) 656-3132
Saline		
City of Wilber	Wilber, Nebraska	(402) 821-2320
City of Wilber Fire Department	Wilber, Nebraska	(402) 821-2647
City of Wilber Police Department	Wilber, Nebraska	(402) 821-2201
Crete Public Safety Answering Point	Crete, Nebraska	(402) 826-4311
Local Public Safety Answering Point	Wilber, Nebraska	(402) 821-2111
Saline County	Wilber, Nebraska	(402) 826-2363
Saline County LEPC	Wilber, Nebraska	(402) 821-3010
Saline County Sheriff	Wilber, Nebraska	(402) 821-2111
Village of Dorchester	Dorchester, Nebraska	(402) 946-3201
Village of Swanton	Swanton, Nebraska	(402) 448-2285
Gage		
Gage County LEPC	Beatrice, Nebraska	(402) 223-1305

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Gage County Sheriff / First Responder	Beatrice, Nebraska	(402) 223-1382
Local Public Safety Answering Point	Beatrice, Nebraska	(402) 223-4080

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EXTERNAL NOTIFICATION REFERENCES

North Dakota

OTHER POTENTIAL REQUIRED NOTIFICATIONS		
DIAL 911 for all Police, Fire and Ambulance Services. *** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**		
AGENCY	**LOCATION**	**OFFICE / ALTERNATE**
Cavalier		
Cavalier County	Langdon, North Dakota	(701) 256-2229
Cavalier County Fire Department	Langdon, North Dakota	(701) 256-3911
Cavalier County Water Resource	Langdon, North Dakota	(701) 256-2220
Fremont Township	Walhalla, North Dakota	(701) 549-2748
Local Public Safety Answering Point	Langdon, North Dakota	(701) 256-2555
Pembina		
City of Cavalier	Cavalier, North Dakota	(701) 265-8800
City of Walhalla	Walhalla, North Dakota	(701) 549-3176
Drayton, North Dakota	Drayton, North Dakota	(701) 265-4231
Local Public Safety Answering Point	Cavalier, North Dakota	(701) 265-4122
Local Public Safety Answering Point	Cavalier, North Dakota	(701) 265-4122
Pembina County	Cavalier, North Dakota	(701) 265-4231
Pembina County LEPC	Cavalier, North Dakota	(701) 265-4849
Pembina County Water Resource Board	Cavalier, North Dakota	(701) 265-4511
Walsh		
City of Grafton	Grafton, North Dakota	(701) 352-1561
City of Lankin	Lankin, North Dakota	(701) 593-6322
City of Minto	Minto, North Dakota	(701) 248-3480
City of Park River	Park River, North Dakota	(701) 284-6426
Golden Township	Park River, North Dakota	(701) 284-6846
Local Public Safety Answering Point	Grafton, North Dakota	(701) 352-2041

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Norton Township	Fordville, North Dakota	(701) 593-6249
Town of Norton	Park River, North Dakota	(701) 331-0810
Vesta Township	Adams, North Dakota	(701) 944-2790
Walsh County LEPC	Grafton, North Dakota	(701) 352-2311
Nelson		
Adler Township, Nelson County	Petersburg, North Dakota	(701) 345-8287
Dodds Township, Nelson County	Lakota, North Dakota	(701) 247-2279
Local Public Safety Answering Point	Lakota, North Dakota	(701) 662-5323
Michigan City	Michigan, North Dakota	(701) 259-2553
Nelson County	Lakota, North Dakota	(701) 247-2463
Nelson County Fire Department	Lakota, North Dakota	(701) 247-2474
Nelson County First Responder	Lakota, North Dakota	(701) 247-2474
Petersburg Township, Nelson County	Petersburg, North Dakota	(701) 345-6134
Steele		
City of Finley	Finley, North Dakota	(701) 352-1651
Local Public Safety Answering Point	Finley, North Dakota	(701) 524-2742
Steele County	Finley, North Dakota	(701) 945-2572
Steele County LEPC	Finley, North Dakota	(701) 524-2742
Barnes		
Barnes County	Sanborn, North Dakota	(701) 646-6983
Barnes County Emergency Manager (LEPC)	Valley City, North Dakota	(701) 845-8510
Local Public Safety Answering Point	Valley City, North Dakota	(701) 845-3110
Township of Alta	Valley City, North Dakota	(701) 845-2744
Township of Baldwin	Hope, North Dakota	(701) 945-2436
Township of Cuba	Valley City, North Dakota	(701) 845-0533
Township of Grand Prairie	Valley City, North Dakota	(701) 845-2544

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Township of Noltimier	Valley City, North Dakota	(701) 845-3835
Township of Norma	Oriska, North Dakota	(701) 924-8629
Valley City	Valley City, North Dakota	(701) 845-1700 ext. 17
Ransom		
City of Lisbon	Lisbon, North Dakota	(701) 683-4472 Rvrsd Bldg Ctr
Local Public Safety Answering Point	Lisbon, North Dakota	(701) 683-5255
Ransom County LEPC	Lisbon, North Dakota	(701) 683-5823, x125
Sargent		
City of Forman	Forman, North Dakota	(701) 724-3673
Denver Township	Gwinner, North Dakota	(701) 753-7671
Jackson Township	Forman, North Dakota	(701) 724-3420
Local Public Safety Answering Point	North Dakota	(800) 472-2121
Sargent County First Responder	Forman, North Dakota	(701) 724-3302
Sargent County LEPC	Forman, North Dakota	(701) 724-6241, x113
Southwest Township	Forman, North Dakota	(701) 724-3452
Verner Township	Oakes, North Dakota	(701) 742-3711
Verner Township	Gwinner, North Dakota	(701) 753-7161

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EXTERNAL NOTIFICATION REFERENCES

South Dakota

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Marshall		
BDM Rural Water System, Inc.	Britton, South Dakota	(605) 448-5417
City of Britton, South Dakota	Britton, South Dakota	(605) 448-5721
Local Public Safety Answering Point	Britton, South Dakota	(605) 448-5181
Marshall County LEPC	Britton, South Dakota	(605) 448-2339
Marshall County South Dakota	Britton, South Dakota	(605) 448-2116
Day		
City of Webster, South Dakota	Webster, South Dakota	(605) 345-3241
Day County, South Dakota LEPC	Webster, South Dakota	(605) 345-3222
Local Public Safety Answering Point	Webster, South Dakota	(605) 345-3222
Clark		
City of Clark, South Dakota	Clark, South Dakota	(605) 532-3512
Clark County, South Dakota	Clark, South Dakota	(605) 532-5921
Clark County, South Dakota LEPC	Clark, South Dakota	(605) 532-3822
Local Public Safety Answering Point	South Dakota	(605) 532-3822
Beadle		
Beadle County, South Dakota	Huron, South Dakota	(605) 352-5010
Beadle County, South Dakota LEPC	Huron, South Dakota	(605) 353-8421
City of Huron, South Dakota	Huron, South Dakota	(605) 353-8500
Local Public Safety Answering Point	Huron, South Dakota	(605) 353-8424
Kingsbury		
City of De Smet, South Dakota	De Smet, South Dakota	(605) 854-3731
Kingsbury County Fire Department / First Responder	De Smet, South Dakota	(605) 854-3832

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Kingsbury County, South Dakota	De Smet, South Dakota	(605) 854-3832
Kingsbury County, South Dakota LEPC	De Smet, South Dakota	(605) 854-3711
Local Public Safety Answering Point	De Smet, South Dakota	(605) 353-8550 (after 3 am)
Miner		
Local Public Safety Answering Point	Howard, South Dakota	(605) 772-4501
Miner County Fire Department / First Responder	Howard, South Dakota	(605) 772-4671
Miner County, South Dakota LEPC	Howard, South Dakota	(605) 772-4533
Hanson		
Edgerton Township	Alexandria, South Dakota	(605) 239-4361
Hanson County Fire Department	Alexandria, South Dakota	(605) 239-4717
Hanson County, South Dakota	Alexandria, South Dakota	(605) 239-4717
Hanson County, South Dakota LEPC	Alexandria, South Dakota	(605) 239-4218
Local Public Safety Answering Point	South Dakota	(605) 239-4409
Spring Lake Township	Canova, South Dakota	(605) 523-2546
McCook		
Local Public Safety Answering Point	Mitchell, South Dakota	(605) 425-2761
McCook Co., SD County Emergency Management	Salem, South Dakota	(605) 425-2791
McCook County, South Dakota LEPC	Salem, South Dakota	(605) 425-2466
Hutchinson		
City of Olivet	Olivet, South Dakota	(605) 387-5596
Grandview Township	Freeman, South Dakota	(605) 925-4142
Hutchinson County, South Dakota	Menno, South Dakota	(605) 387-4217
Hutchinson County, South Dakota LEPC	Menno, South Dakota	(605) 770-7927
Local Public Safety Answering Point	Mitchell, South Dakota	(605) 995-8400
Molan Township	Menno, South Dakota	(605) 387-5250
Pleasant Township	Bridgewater, South Dakota	(605) 449-4669
Valley Township	Menno, South Dakota	(605) 387-5480

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Yankton		
City of Yankton Fire Department	Yankton, South Dakota	(605) 668-5210
City of Yankton, Department of Public Works	Yankton, South Dakota	(605) 668-5251
City of Yankton, South Dakota	Yankton, South Dakota	(605) 668-5210
Jamesville Township	Jamesville, South Dakota	(605) 387-5756
Mission Hill Township	Mission Hill, South Dakota	(605) 665-7592
Utica Township	Utica, South Dakota	(605) 665-1341
Yankton County Fire Department	Yankton, South Dakota	(605) 668-3567
Yankton County LEPC	Yankton, South Dakota	(605) 668-5289
Yankton County Local Public Safety Answering Point	Yankton, South Dakota	(605) 668-5210
Yankton County, South Dakota	Yankton, South Dakota	(605) 668-3567

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RESPONSE ZONE INFORMATION

Kansas, Missouri, Illinois

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	1-800-447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Kansas, Missouri, Illinois
Areas/Counties Traversed:	Audrain, Bond, Brown, Buchanan, Butler, Caldwell, Carroll, Chariton, Clay, Clinton, Cowley, Dickinson, Doniphan, Fayette, Lincoln, Madison, Marion, Marshall, Montgomery, Nemaha, Randolph, St. Charles, Washington

INFORMATION SUMMARY

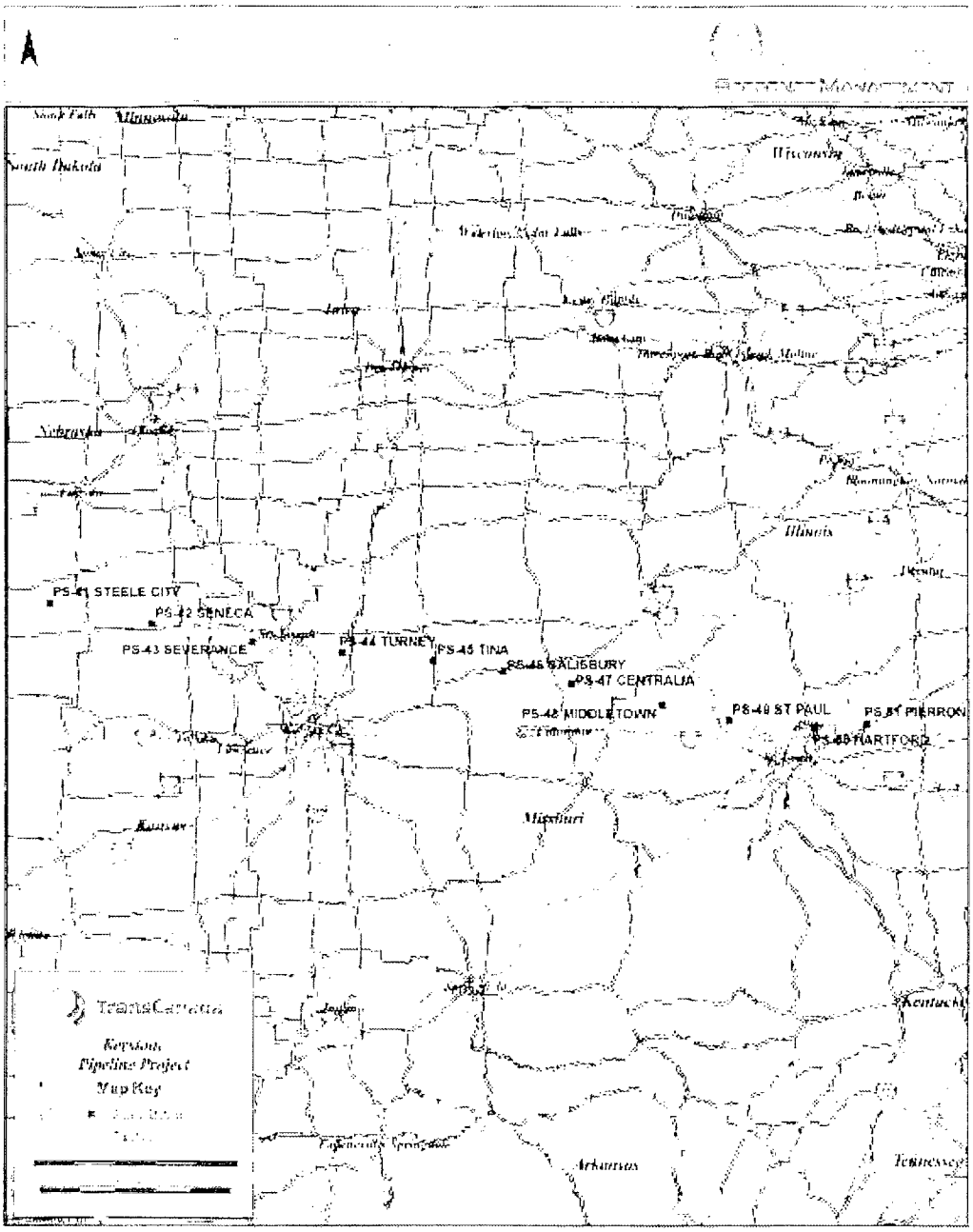
Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 28,787 Bbls

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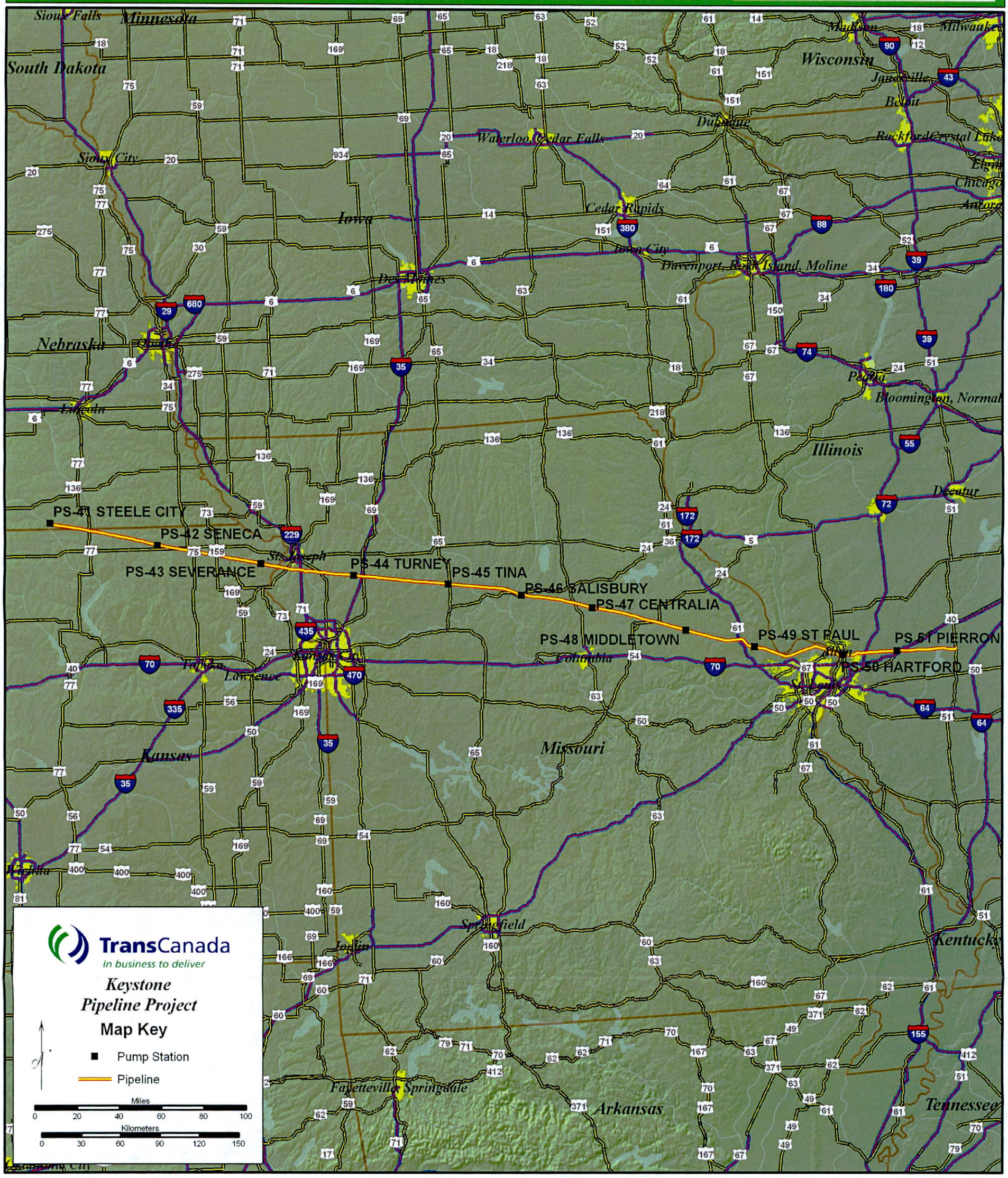


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Response Zone Layout Map
Kansas, Missouri, & Illinois

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
(281)320-9796

O'BRIEN'S RESPONSE MANAGEMENT



RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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Area: Kansas, Missouri, Illinois Qualified Individuals			
NAME	**OFFICE**	**HOME**	**CELL**
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Jon Wickersham	(402) 492-7406		(402) 672-6386

Pipeline Specifications			
Location	**Type of Oil**	**State**	**County**
State Line / Seneca PS	Crude Oil	Kansas	Marshall, Nemaha
Seneca PS / Severance PS	Crude Oil	Kansas	Nemaha, Brown, Doniphan
Severance PS / Turney PS	Crude Oil	Kansas , Missouri	Doniphan, Buchanan, Clinton
Turney PS / Tina PS	Crude Oil	Missouri	Clinton, Caldwell, Carroll
Tina PS / Salisbury PS	Crude Oil	Missouri	Carroll, Chariton
Salisbury PS / Centralia PS	Crude Oil	Missouri	Chariton, Randolph, Audrain
Centralia PS / Middletown PS	Crude Oil	Missouri	Audrain, Montgomery
Middletown PS / Saint Paul PS	Crude Oil	Missouri	Montgomery, Lincoln
Saint Paul PS / Hartford PS	Crude Oil	Illinois , Missouri	Lincoln, St. Charles, Madison
Hartford PS / Patoka Terminal	Crude Oil	Illinois	Madison, Bond, Fayette, Marion

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Company Owned Response Equipment		
NAME	LOCATION	DESCRIPTION
St. Joseph OSRV	St. Joseph, MO	See Inventory - Appendix A
St. Joseph 34' Response Trailer	St. Joseph, MO	See Inventory - Appendix A
St. Joseph 20' Work Boat	St. Joseph, MO	See Inventory - Appendix A
St. Joseph 20' Boom Trailer	St. Joseph, MO	See Inventory - Appendix A
Middletown 34' Response Trailer	Middletown P.S., MO	See Inventory - Appendix A
Middletown 20' Work Boat	Middletown P.S., MO	See Inventory - Appendix A
Hartford 20' Enclosed Trailer	Hartford, P.S., IL	See Inventory - Appendix A
Hartford 20' Work Boat	Hartford P.S., IL	See Inventory - Appendix A
Hartford Zodiac Inflatable Boat	Hartford P.S., IL	See Inventory - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES

Illinois

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Madison		
City of Edwardsville Fire Department	Edwardsville, Illinois	(618) 692-7541
City of Edwardsville, Illinois Public Works	Edwardsville, Illinois	(618) 692-7535
City of Highland Fire Department	Highland, Illinois	(618) 654-5901
City of Wood River Fire Department	Wood River, Illinois	(618) 251-3100
LPublicSafetyAnsweringPoint Wood River Dispatch (Wood River, Roxanna, Hartford)	Wood River, Illinois	(618) 692-4443
Madison Co. Ambulance (Fire Dept) First Respons	Edwardsville, Illinois	(618) 692-4433
Bond		
Bond Co. IL Emergency Svcs. and Disaster Agency	Greenville, Illinois	(618) 644-1442
Bond County First Responder (Fire Department)	Greenville, Illinois	(618) 664-2151
City of Greenville Public Works Department	Greenville, Illinois	(618) 664-1644
Local Public Safety Answering Point	Greenville, Illinois	(618) 664-2151
Village of Pocahontas	Pocahontas, Illinois	(618) 669-2431
Fayette		
City of Alton Fire Department	Alton, Illinois	(618) 463-3565
City of Vandalia Public Works Department	Vandalia, Illinois	(618) 283-1296
Fayette County Ambulance / First Responder	Vandalia, Illinois	(618) 283-2141
Local Public Safety Answering Point	Vandalia, Illinois	(618) 283-2141
Vandalia Public Safety Answering Point	Vandalia, Illinois	(618) 283-2131
Marion		
Local Public Safety Answering Point	Salem, Illinois	(618) 548-2141 ext 1 if after hrs
Marion Co. Ambulance (Fire Dept) / First Response	Salem, Illinois	(618) 548-2141

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Marion County Department of Environmental Quality	Salem, Illinois	(618) 692-0537

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EXTERNAL NOTIFICATION REFERENCES

Kansas

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Marshall		
Local Public Safety Answering Point	Kansas	(785) 562-3141
Marshall County Public Works Department	Marysville, Kansas	(785) 562-5349
Nemaha		
City of Oneida Sewerage Department	Oneida, Kansas	(785) 336-3038
Local Public Safety Answering Point	Seneca, Kansas	(785) 336-2311
Brown		
Brown County Fire Department	Hiawatha, Kansas	(785) 742-7125
Irving Township	Hiawatha, Kansas	(785) 544-6691
Local Public Safety Answering Point	Hiawatha, Kansas	(785) 742-7125
Mission Township	Hiawatha, Kansas	(785) 474-3564
Morrill Township	Morrill, Kansas	(785) 459-2277
Padonia Township	Hiawatha, Kansas	(785) 742-2777
Powhattan Township	Powhattan, Kansas	(785) 467-3520
Robinson Township	Robinson, Kansas	(785) 544-6831
Walnut Township	Walnut, Kansas	(785) 467-3250
Doniphan		
City of Denton	Denton, Kansas	(785) 359-6952
City of Denton Fire Department	Denton, Kansas	(785) 359-6641
City of Severance	Severance, Kansas	(785) 359-6589
City of Troy	Troy, Kansas	(785) 985-2101
Doniphan Co. Emergency Management / Zoning Dept.	Troy, Kansas	(785) 985-2229
Doniphan County Fire District No. 1	Wathena, Kansas	(785) 989-3265

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Doniphan County Fire District No. 2	Highland, Kansas	(785) 359-6699
Doniphan County Fire District No. 3	Denton, Kansas	(785) 359-6715
Doniphan County Fire District No. 4	Elwood, Kansas	(913) 365-8697
Doniphan County Fire District No. 5	Troy, Kansas	(785) 985-2145
Independence Township	Independence, Kansas	(785) 988-4425
Local Public Safety Answering Point	Troy, Kansas	(785) 985-3711
Union Township	Denton, Kansas	(785) 359-6533
Wayne Township	Troy, Kansas	(785) 985-2400
Wold River Township	Severance, Kansas	(785) 442-3775
Marion		
Local Public Safety Answering Point	Marion, Kansas	(620) 382-2144
Washington		
Local Public Safety Answering Point	Washington, Kansas	(785) 325-2293
Clay		
Local Public Safety Answering Point	Clay Center, Kansas	(785) 632-5601
Dickinson		
Local Public Safety Answering Point	Abilene, Kansas	(785) 263-4041
Butler		
Local Public Safety Answering Point	El Dorado, Kansas	(316) 322-4254
Cowley		
Local Public Safety Answering Point	Winfield, Kansas	(620) 221-5555

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EXTERNAL NOTIFICATION REFERENCES

Missouri

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Buchanan		
City of Gower Clerk	Gower, Missouri	(816) 424-6617
City of St Joseph Council	St Joseph, Missouri	(816) 271-4640
Colony Fire District	St. Joseph, Missouri	(816) 232-5307
Dearborn Fire District, Buchanan County	Dearborn, Missouri	(816) 992-8919
Easton Fire District, Buchanan County	Easton, Missouri	(816) 262-7057
Edgerton Fire District, Buchanan County	Edgerton, Missouri	(816) 790-3362
Local Public Safety Answering Point	St. Joseph, Missouri	(816) 271-4777
Maxwell Heights Fire District, Buchanan County	St. Joseph, Missouri	(816) 233-4160
Rushville Fire District, Buchanan County	Rushville, Missouri	(816) 688-7900
San Antonio Fire District, Buchanan County	San Antonio, Missouri	(816) 232-1664
South Buchanan Fire District, Buchanan County	Faucett, Missouri	(816) 253-9018
Sugar Lake Fire District, Buchanan County	Rushville, Missouri	(816) 579-5115
Village of Agency Clerk	Agency, Missouri	(816) 253-9176
Village of Dekalb Clerk	Amity, Missouri	(816) 685-3305
Village of Lewis & Clark Clerk	Lewis & Clark, Missouri	(816) 579-5737
Clinton		
City of Cameron	Cameron, Missouri	(816) 632-2177
City of Cameron Fire Department	Cameron, Missouri	(816) 632-2345
City of Cameron Police Department / First Responde	Cameron, Missouri	(816) 632-6521
City of Cameron Public Works Department	Cameron, Missouri	(816) 632-2177
City of Cameron Water and Electric Department	Cameron, Missouri	(816) 632-2177

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City of Lathrop	Lathrop, Missouri	(816) 740-4251
Clinton County PWSD No 1	Plattsburg, Missouri	(816) 370-2528
Clinton County PWSD No 4	Plattsburg, Missouri	(816) 580-7211
Lathrop Fire District	Lathrop, Missouri	(816) 740-3218
Local Public Safety Answering Point	Plattsburg, Missouri	(816) 539-2156
Osborne Fire District	Osborne, Missouri	(816) 675-2549
Plattsburg City Hall	Plattsburg, Missouri	(816) 539-2148
Plattsburg Fire District	Plattsburg, Missouri	(816) 539-3017
Stewartsville Fire District	Stewartsville, Missouri	(816) 669-3387
Village of Turney	Turney, Missouri	(816) 664-2009
Caldwell		
Caldwell County	Kingston, Missouri	(816) 586-2571
Cowgill No 1 Water District	Cowgill, Missouri	(660) 255-4421
Grant Township	Livonia, Missouri	(660) 354-2337
Local Public Safety Answering Point	Kingston, Missouri	(816) 586-2681
Rockford Township	Polo, Missouri	(660) 354-3631
Carroll		
Carroll County	Carrollton, Missouri	(660) 542-0615
Carroll County Fire Protection District No. 1	Carrollton, Missouri	(660) 542-2178
City of Carrollton	Carrollton, Missouri	(660) 542-1414
Hale Fire Protection District	Hale, Missouri	(660) 565-2212
Local Public Safety Answering Point	Carrollton, Missouri	(660) 542-3911
Norborne Fire Protection District	Norborne, Missouri	(660) 594-3505
North Central Fire Protection District	Bogard, Missouri	(660) 731-5371
Stet Fire Protection District	Norborne, Missouri	(660) 484-3179
Chariton		

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Chariton County, Missouri	Keytesville, Missouri	(660) 288-3200
City of Keytesville, Missouri	Keytesville, Missouri	(660) 288-3745
City of Salisbury, Missouri	Salisbury, Missouri	(660) 388-6197
Local Public Safety Answering Point	Keytesville, Missouri	(660) 288-3040
Randolph		
City of Huntsville, Missouri	Huntsville, Missouri	(660) 277-3110
City of Moberly, Missouri Public Works	Moberly, Missouri	(660) 269-8705
Local Public Safety Answering Point	Moberly, Missouri	(660) 263-0346
Randolph County County Government	Huntsville, Missouri	(660) 277-4714
Audrain		
Audrain County, Missouri	Mexico, Missouri	(573) 473-5822
City of Mexico, Missouri	Mexico, Missouri	(573) 581-2100
Local Public Safety Answering Point	Mexico, Missouri	(573) 473-5800
Montgomery		
City of Montgomery, Missouri	Montgomery City, Missouri	(573) 564-3160
Local Public Safety Answering Point	Montgomery City, Missouri	(573) 564-3378
Montgomery County	Montgomery City, Missouri	(573) 564-8084
Lincoln		
Lincoln County Fire Protection District	Troy, Missouri	(636) 528-8567
Lincoln County, Missouri	Troy, Missouri	(636) 528-6300
Local Public Safety Answering Point	Troy, Missouri	(636) 528-6100
St. Charles		
Central County Fire & Rescue	St. Peters, Missouri	(636) 970-9700
City of O'Fallon, Missouri	O'Fallon, Missouri	(636) 379-5500
City of St. Charles City/Municipal Government	St. Charles City, Missouri	(636) 949-3260
City of St. Charles Fire Department	St. Charles, Missouri	(636) 949-3250
City of St. Peters, Missouri	St. Peters, Missouri	(636) 477-9920

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Dardenne Prairie Township	O'Fallon, Missouri	(636) 300-0014
Local Public Safety Answering Point	Missouri	(636) 949-0809 Ext: 1
O'Fallon Fire Protection District	O'Fallon, Missouri	(636) 272-3493
O'Fallon Township	O'Fallon, Missouri	(636) 978-4144
St. Charles County First Responder	St. Charles, Missouri	(636) 949-1818
St. Charles County Government	St. Charles, Missouri	(636) 949-7455
Wentzville Fire Protection District	Wentzville, Missouri	(636) 327-6239
Wentzville Township	Wentzville, Missouri	(636) 332-5101

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RESPONSE ZONE INFORMATION

Cushing Extension

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	1-800-447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Kansas, Nebraska, Oklahoma
Areas/Counties Traversed:	Atoka, Bryan, Butler, Clay, Coal, Cowley, Dickinson, Hughes, Jefferson, Kay, Lincoln, Marion, Noble, Okfuskee, Payne, Seminole, Washington

INFORMATION SUMMARY

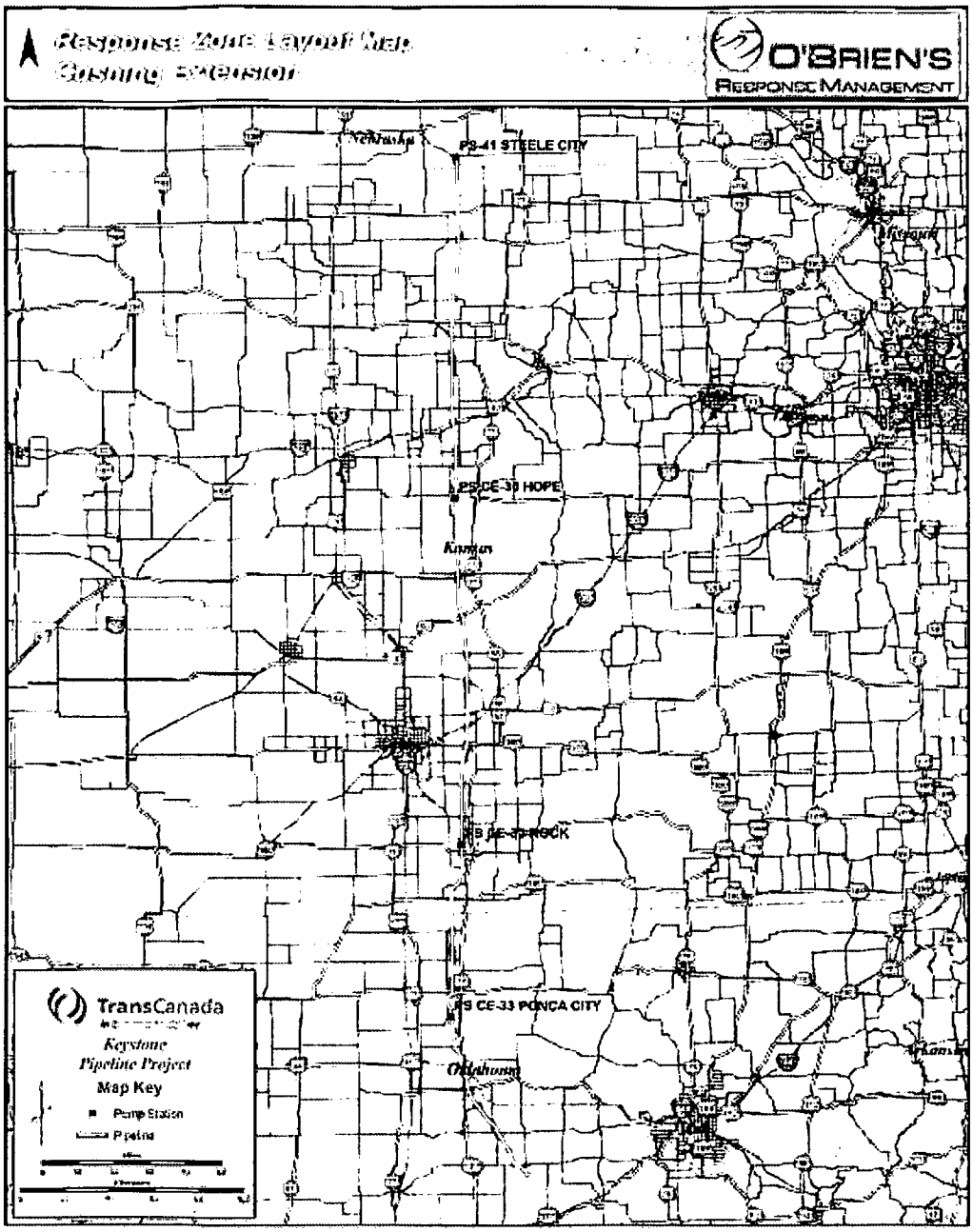
Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 105,000 Bbls

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Response Zone Layout Map
Cushing Extension

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
(281)320-9796

O'BRIEN'S RESPONSE MANAGEMENT

PS-41 STEELE CITY

PS CE-30 HOPE

PS CE-32 ROCK

PS CE-33 PONCA CITY

Nebraska

Kansas

Missouri

Oklahoma

Arkansas

Lawrence

Joplin

TransCanada
In business to deliver

Keystone Pipeline Project

Map Key

- Pump Station
- Pipeline

Miles
0 10 20 30 40 50

Kilometers
0 20 40 60 80 100

RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Red River Area Manager	Incident Commander, Operations Section Chief	Jeff Brown	(903) 939-0109 (Office) (254) 893-3082 (Home) (903) 714-5434 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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Area: Cushing Extension Area Qualified Individuals			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Jeff Brown	(903) 939-0109	(254) 893-3082	(903) 714-5434
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Jon Wickersham	(402) 492-7406		(402) 672-6386

Pipeline Specifications			
Location	Type of Oil	State	County
Station Steele City / Hope PS	Crude Oil	Kansas , Nebraska	Jefferson, Washington, Clay, Dickinson
Hope PS / Rock PS	Crude Oil	Kansas	Marion, Dickinson, Butler, Cowley
Rock PS / Ponca City PS	Crude Oil	Kansas , Oklahoma	Cowley, Kay
Ponca City PS / Cushing Extension	Crude Oil	Oklahoma	Kay, Noble, Payne

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Company Owned Response Equipment		
NAME	**LOCATION**	**DESCRIPTION**
Wichita 20' Enclosed Trailer	Wichita, KS	See Inventory - Appendix A
Wichita 20' Work Boat	Wichita, KS	See Inventory - Appendix A
Cushing 20' Enclosed Trailer	Cushing, OK	See Inventory - Appendix A
Cushing 20' Work Boat	Cushing, OK	See Inventory - Appendix A
Cushing 20" Boom Trailer	Cushing, OK	See Inventory - Appendix A
Cushing Zodiac Inflatable Boat	Cushing, OK	See Inventory - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL
BO-TK-01 KXL	Cushing Terminal	350000	Crude
BO-TK-02 KXL	Cushing Terminal	350000	Crude
BO-TK-03 KXL	Cushing Terminal	350000	Crude
BO-TK-04 BML	Cushing Terminal	350000	Crude
BO-TK-05 BML	Cushing Terminal	350000	Crude
BO-TK-06 CML	Cushing Terminal	250000	Crude
BO-TK-07 CML	Cushing Terminal	250000	Crude

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EXTERNAL NOTIFICATION REFERENCES

Kansas

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Marion		
City of Marion Fire Department	Marion, Kansas	(620) 382-3703
Lost Springs Fire Dept.	Lost Springs, Kansas	(785) 983-4410
Marion County EMS	Marion, Kansas	(620) 382-6271
Marion County Environmental Dept.	Marion, Kansas	(620) 382-2550
Marion County Sheriff	Marion, Kansas	(620) 382-2144
Washington		
City of Linn Fire Department	Linn, Kansas	(785) 348-5373
Hanover Fire Department	Washington, Kansas	(785) 325-2293
Hanover Hospital	Hanover, Kansas	(785) 337-2214
Washington County Sheriff	Washington, Kansas	(785) 325-2293
Washington Hospital	Washington, Kansas	(785) 325-2211
Clay		
Clay Center Fire Dept.	Clay Center, Kansas	(785) 632-5606
Clay County (First Responder)	Kansas	(785) 632-5601
Clay County Ambulance Service	Clay Center, Kansas	(785) 632-2166
Clay County Health Dept.	Clay Center, Kansas	(785) 632-3193
Clay County Sheriff	Clay Center, Kansas	(785) 632-5601
Milford Fire Dept.	Milford, Kansas	(785) 463-5490
Dickinson		
City of Abilene Fire Dept.	Abilene, Kansas	(785) 263-1121
City of Enterprise Fire Dept.	Enterprise, Kansas	(785) 263-8323
Dickinson County Emergency Management	Abilene, Kansas	(785) 263-3608

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Dickinson County EMS	Abilene, Kansas	(785) 263-0716
Dickinson County Environmental Services	Abilene, Kansas	(785) 263-4780
Dickinson County Sherriff	Abilene, Kansas	(785) 263-4081
Herrington Fire Dept.	Herrington, Kansas	(785) 258-3020
Butler		
Augusta Fire Dept.	Augusta, Kansas	(316) 775-4500
Butler County Emergency Communications	El Dorado, Kansas	(316) 322-4207
Butler County EMS	El Dorado, Kansas	(316) 321-9264
Butler County Fire District No. 3	Rose Hill, Kansas	(316) 776-0401
Butler County Sherriff	El Dorado, Kansas	(316) 322-4254
El Dorado Fire Department	El Dorado, Kansas	(316) 321-9100
Towanda Fire Department	Towanda, Kansas	(316) 536-2751
Cowley		
Arkansas City Fire Department	Arkansas City, Kansas	(620) 441-0238
Arkansas City Police Dept.	Arkansas City, Kansas	(620) 441-4444
Winfield Ambulance Service	Winfield, Kansas	(620) 221-2300
Winfield Fire Department	Winfield, Kansas	(620) 221-5563
Winfield Police Dept.	Winfield, Kansas	(620) 221-5555

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EXTERNAL NOTIFICATION REFERENCES

Nebraska

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Butler		
Butler County First Responder / Sheriff	David City, Nebraska	(402) 367-7400
Butler County LEPC	David City, Nebraska	(402) 367-3125
David City Electric & Light Department	David City, Nebraska	(402) 367-3197
David City Park & Auditorium Department	David City, Nebraska	(402) 367-3914
David City Police Department	David City, Nebraska	(402) 367-3133
David City Power Plant	David City, Nebraska	(402) 367-3138
Jefferson County Ambulance	Fairbury, Nebraska	(402) 729-3304
Jefferson County Emergency Management	Fairbury, Nebraska	(402) 729-3602
Local Public Safety Answering Point	David City, Nebraska	(402) 367-7400
Jefferson		
Fairbury Clinic	Fairbury, Nebraska	(402) 729-3351
Jefferson County Ambulance	Fairbury, Nebraska	(402) 729-3304
Jefferson County Emergency Management	Fairbury, Nebraska	(402) 729-3602

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EXTERNAL NOTIFICATION REFERENCES

Oklahoma

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Kay		
Kay County Emergency Management	Newkirk, Oklahoma	(580) 362-3825
Kay County Sheriff's Office	Newkirk, Oklahoma	(580) 362-2517
Local Public Safety Answering Point	Ponca City, Oklahoma	(580) 763-8011
Local Public Safety Answering Point	Ponca City, Oklahoma	(580) 763-8011
Newkirk Ambulance Service	Newkirk, Oklahoma	(580) 362-3131
Newkirk Fire Dept.	Newkirk, Oklahoma	(580) 362-3606
Ponca City Fire Dept.	Ponca City, Oklahoma	(580) 767-0368
Noble		
City of Perry Fire Dept.	Perry, Oklahoma	(580) 336-9755
Local Public Safety Answering Point	Perry, Oklahoma	(580) 336-3517
Marland Fire Dept.	Marland, Oklahoma	(580) 268-3468
Morrison Fire Dept.	Morrison, Oklahoma	(580) 724-3535
Noble County Sherriff	Perry, Oklahoma	(580) 336-2141
Payne		
City of Stillwater Fire Dept.	Stillwater, Oklahoma	(405) 742-8308
Cushing City Ambulance	Cushing, Oklahoma	(918) 225-1790
Cushing Fire Dept.	Cushing, Oklahoma	(918) 225-3361
Local Public Safety Answering Point	Stillwater, Oklahoma	(405) 372-4522
Payne County Sherriff	Stillwater, Oklahoma	(405) 372-4522
Lincoln		
Local Public Safety Answering Point	Chandler, Oklahoma	(405) 258-9933
Okfuskee		

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Local Public Safety Answering Point	Okemah, Oklahoma	(918) 623-1234
Hughes		
Local Public Safety Answering Point	Holdenville, Oklahoma	(405) 379-2203
Seminole		
Local Public Safety Answering Point	Seminole, Oklahoma	(405) 382-9340
Coal		
Local Public Safety Answering Point	Coalgate, Oklahoma	(580) 927-2121
Atoka		
Local Public Safety Answering Point	Atoka, Oklahoma	(580) 889-2221
Bryan		
Local Public Safety Answering Point	Durant, Oklahoma	(580) 924-3737

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RESPONSE ZONE INFORMATION

Gulf Coast

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	(800) 447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Oklahoma, Texas
Areas/Counties Traversed:	Angelina, Atoka, Bryan, Cherokee, Coal, Creek, Delta, Fannin, Franklin, Hardin, Hopkins, Hughes, Jefferson, Johnston, Lamar, Liberty, Lincoln, Nacogdoches, Okfuskee, Orange, Payne, Polk, Pontotoc, Rusk, Seminole, Smith, Upshur, Wood

INFORMATION SUMMARY

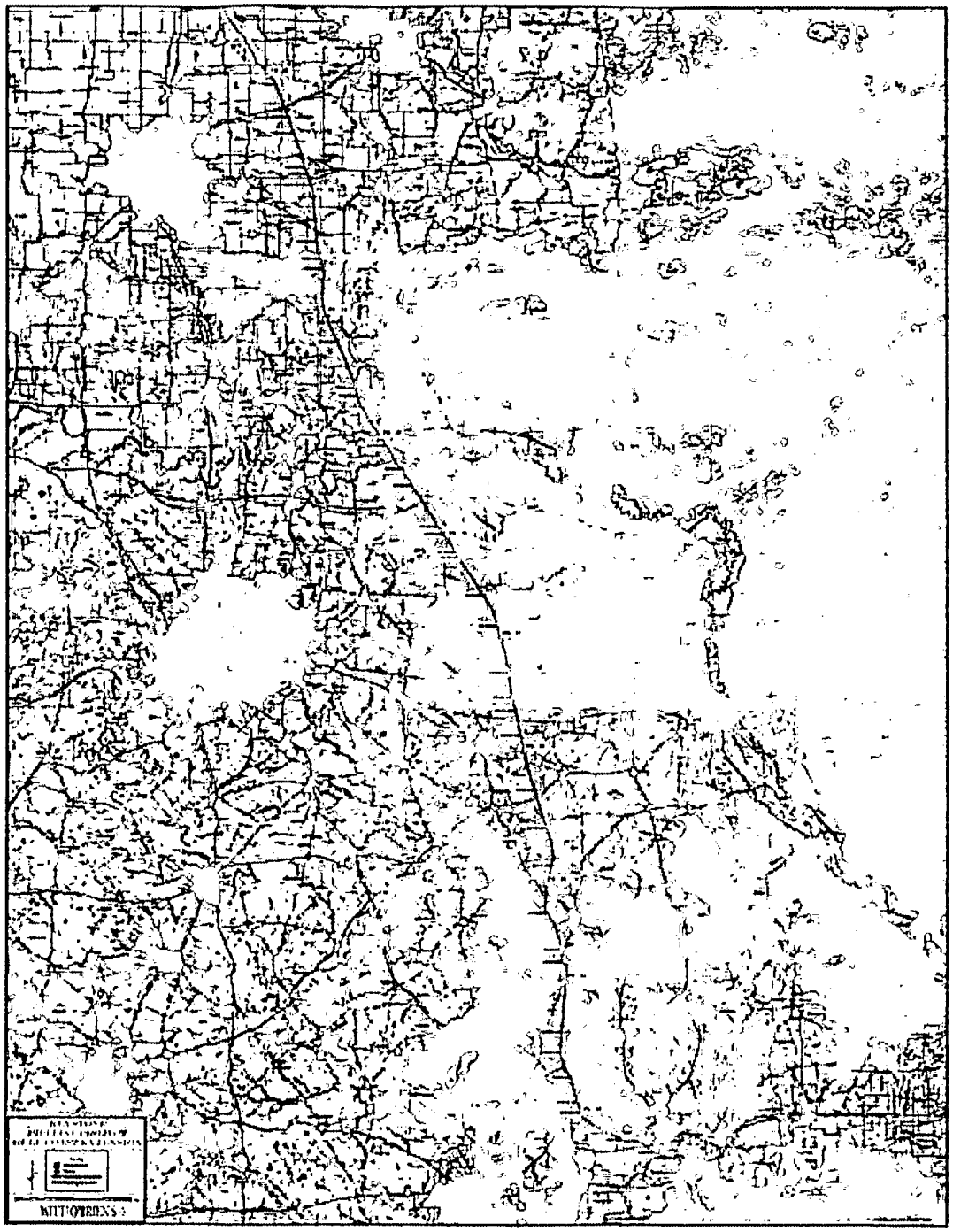
Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 34,539 Bbls

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RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Red River Area Manager	Incident Commander, Operations Section Chief	Jeff Brown	(903) 939-0109 (Office) (254) 893-3082 (Home) (903) 714-5434 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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Area: Gulf Coast Qualified Individuals			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Jeff Brown	(903) 939-0109	(254) 893-3082	(903) 714-5434
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Jon Wickersham	(402) 492-7406		(402) 672-6386

Pipeline Specifications			
Location	Type of Oil	State	County
Cushing South PS/ Cromwell PS	Crude Oil	Oklahoma	Payne, Lincoln, Creek, Okfuskee, Seminole
Cromwell PS/ Tupelo PS	Crude Oil	Oklahoma	Seminole, Hughes, Pontotoc, Coal
Tupelo PS/ Bryan PS	Crude Oil	Oklahoma	Coal, Atoka, Johnston, Bryan
Bryan PS/ Delta PS	Crude Oil	Oklahoma , Texas	Bryan, Fannin, Lamar, Delta
Delta PS/ Winnsboro PS	Crude Oil	Texas	Delta, Hopkins, Franklin
Winnsboro PS/ Lake Tyler PS	Crude Oil	Texas	Franklin, Upshur, Wood, Rusk, Smith
Lake Tyler PS/ Lufkin PS	Crude Oil	Texas	Smith, Nacogdoches, Cherokee
Lufkin PS/ Corrigan PS	Crude Oil	Texas	Cherokee, Angelina, Polk
Corrigan PS/ Liberty PS	Crude Oil	Texas	Polk, Hardin, Liberty
Liberty PS/end of pipleine	Crude Oil	Texas	Liberty, Jefferson, Orange

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Company Owned Response Equipment		
NAME	LOCATION	DESCRIPTION
Equipment Response Trailer	Bryan County, OK	See Equipment List - Appendix A
Tyler Equipment Response Trailer	Tyler, TX	See Equipment List - Appendix A
Liberty Equipment Response Trailer	Liberty, TX	See Equipment List - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES

Oklahoma

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Payne		
Cushing City Ambulance	Cushing, Oklahoma	(918) 225-1790
Cushing City Hall	Cushing, Oklahoma	(918) 225-2394
Cushing Police Department	Cushing, Oklahoma	(918) 225-1212
Cushing Regional Hospital	Cushing, Oklahoma	(918) 225-2915
Cushing Water Department	Cushing, Oklahoma	(918) 225-2394
Lifenet Medical Emergency Services	Stillwater, Oklahoma	(405) 707-0007
Pawnee Fire Department	Pawnee, Oklahoma	(918) 762-3166
Payne County Sheriff's Office	Stillwater, Oklahoma	(405) 372-4522
Perkins Police Department	Perkins, Oklahoma	(405) 547-2445
PerkinsCity Hall	Perkins, Oklahoma	(405) 547-2445
Ripley City Hall	Ripley, Oklahoma	(918) 372-4287
Stillwater Police Department	Stillwater, Oklahoma	(405) 372-4171
Yale CIty Hall	Yale, Oklahoma	(918) 387-2406
Yale Emergency Medical Services	Yale, Oklahoma	(918) 387-2447
Yale Police Department	Yale, Oklahoma	(918) 387-2403
Creek		
Creek County ER Ambulance	Creek County, Oklahoma	(918) 227-4111
Creek County Sheriff's Office	Sapulpa, Oklahoma	(918) 224-4964
Depew Police Department	Depew, Oklahoma	(918) 324-5060
Depew Water Department	Depew, Oklahoma	(918) 324-5251
Drumright City Hall	Drumright, Oklahoma	(918) 352-2631

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Drumright Fire Department	Drumright, Oklahoma	(918) 352-3131
Drumright Police Department	Drumright, Oklahoma	(918) 352-2251
Drumwright Regional Hospital	Drumwright, Oklahoma	(918) 382-2300
Oaklake Trails Naturist Park	Depew, Oklahoma	(918) 324-5999
Oilton Fire Department	Oilton, Oklahoma	(918) 862-3778
Oilton Police Department	Oilton, Oklahoma	(918) 862-3662
Lincoln		
Agra Fire Department	Agra, Oklahoma	(918) 375-2304
Agra Police Department	Agra, Oklahoma	(918) 375-2344
Chandler Fire Department	Chandler, Oklahoma	(405) 258-1202
Chandler Fire Dept. Station 1	Chandler, Oklahoma	(405) 258-1202
Chandler Police Department	Chandler, Oklahoma	(405) 258-1460
Chandler Water Department	Chandler, Oklahoma	(405) 258-3200
Davenport City Hall	Davenport, Oklahoma	(918) 377-2235
Davenport Ambulance	Davenport, Oklahoma	(918) 377-2300
Davenport Fire Department	Davenport, Oklahoma	(918) 377-2304
Davenport Police Department	Davenport, Oklahoma	(918) 377-2911
Lincoln Co RWD #1	Sparks, Oklahoma	(918) 866-2444
Lincoln Co RWD #2	Chandler, Oklahoma	(405) 258-0147
Lincoln County Sheriff's Office	Chandler, Oklahoma	(405) 258-1191
Prague Police Department	Prague, Oklahoma	(405) 567-2239
Prague Water Department	Prague, Oklahoma	(405) 567-2270
Stroud City Hall	Stroud, Oklahoma	(918) 968-2571
Stroud Fire Department	Stroud, Oklahoma	(918) 968-2733
Stroud Police Department	Stroud, Oklahoma	(918) 968-2733
Stroud Regional Medical Center	Stroud, Oklahoma	(918) 968-3571

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Stroud Utilities Authority	Stroud, Oklahoma	(918) 987-0221
Tatanka Ranch	Stroud, Oklahoma	(918) 368-2251
Okfuskee		
Bearden City Hall	Bearden, Oklahoma	(870) 687-2204
Boley Police Department	Boley, Oklahoma	(918) 667-3700
Creek Nation Community Hospital	Okemah, Oklahoma	(918) 623-1424
Creek Nation Community Hospital Ambulance	Okemah, Oklahoma	(918) 623-2015
Okemah Fire Department	Okemah, Oklahoma	(918) 623-1234
Okemah Police Department	Okemah, Oklahoma	(918) 623-1234
Okemah Utilities Authority	Okemah, Oklahoma	(918) 623-1050
Okfuskee Co RWD #1 (Boley)	Boley, Oklahoma	(918) 667-3477
Okfuskee County Sheriff's Office	Okemah, Oklahoma	(918) 623-1122
Paden Water Department	Paden, Oklahoma	(405) 932-4441
Hughes		
Calvin Water Department	Calvin, Oklahoma	(405) 645-2434
Holdenville City Hall	Holdenville, Oklahoma	(405) 379-3397
Holdenville Fire Department	Holdenville, Oklahoma	(405) 379-2413
Holdenville General Hospital	Holdenville, Oklahoma	(405) 379-4200
Holdenville Police Department	Holdenville, Oklahoma	(405) 379-6627
Holdenville Water Department	Holdenville, Oklahoma	(405) 379-3397
Hughes County Emergency Med	Holdenville, Oklahoma	(405) 379-7046
Hughes County Sheriff's Office	Holdenville, Oklahoma	(405) 379-2203
Moss School Water Department	Holdenville, Oklahoma	(405) 379-2273
Wetumka Water Department	Wetumka, Oklahoma	(405) 452-3253
Seminole		
Bowlegs Lima Water	Bowlegs, Oklahoma	(405) 382-1255

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Cromwell Police Department	Cromwell, Oklahoma	(405) 944-5525
Cromwell Volunteer Fire Department	Cromwell, Oklahoma	(405) 944-5432
Seminole City Hall	Seminole, Oklahoma	(405) 382-4330 Ext 210
Seminole Co RWD #7	Seminole, Oklahoma	(405) 243-5451
Seminole County Sheriff's Office	Wewoka, Oklahoma	(405) 257-5445
Seminole Fire Department	Seminole, Oklahoma	(405) 382-1314
Seminole Medical Center	Seminole, Oklahoma	(405) 303-4000
Seminole Police Department	Seminole, Oklahoma	(405) 382-3434
Seminole Water Department	Seminole, Oklahoma	(405) 382-4330
Wewoka Ambulance Service	Wewoka, Oklahoma	(405) 257-5421
Wewoka City Hall	Wewoka, Oklahoma	(405) 257-2413
Wewoka Fire Department	Wewoka, Oklahoma	(405) 257-5421
Wewoka Police Department	Wewoka, Oklahoma	(405) 257-3366 / (405) 257-3367
Wewoka Water Works	Wewoka, Oklahoma	(405) 257-5140
Pontotoc		
Allen Ambulance Service	Allen, Oklahoma	(405) 421-1130 / (405) 322-4466
Allen City Hall	Allen, Oklahoma	(580) 857-2461
Allen Fire Department	Allen, Oklahoma	(580) 857-2100
Allen Police Department	Allen, Oklahoma	(580) 857-2722
Allen PWA	Allen, Oklahoma	(580) 857-2461
Francis Water Department	Francis, Oklahoma	(580) 332-3967
Pontotoc County Sheriff's Office	Ada, Oklahoma	(580) 332-4169
Stonewall City Hall	Stonewall, Oklahoma	(580) 265-4511
Stonewall PWA	Stonewall, Oklahoma	(580) 265-4511
Valley View Regional Hospital	Ada, Oklahoma	(580) 421-6074
Coal		

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Coal County Emergency Services	Coalgate, Oklahoma	(580) 927-9008
Coal County Sheriff's Office	Coalgate, Oklahoma	(580) 927-2121
Coalgate City Hall	Coalgate, Oklahoma	(580) 927-3915
Coalgate Fire Department	Coalgate, Oklahoma	(580) 927-3913
Coalgate Police Department	Coalgate, Oklahoma	(580) 927-3913
Coalgate PWA	Coalgate, Oklahoma	(580) 927-3914
Lehigh Water Department	Lehigh, Oklahoma	(580) 927-9953
Mary Hurley Hospital	Coalgate, Oklahoma	(580) 927-2327
Tupelo Police Department	Tupelo, Oklahoma	(580) 845-2412
Johnston		
Bromide City Hall	Bromide, Oklahoma	(580) 638-2334
Bromide Water Department	Bromide, Oklahoma	(580) 638-2334
Johnston County Ambulance Service	Johnston County, Oklahoma	(580) 371-0569
Johnston County Sheriff's Of	Tishomingo, Oklahoma	(580) 371-2691
Johnston Memorial Hospital	Tishomingo, Oklahoma	(580) 371-2327
Tishomingo Fire Department	Tishomingo, Oklahoma	(580) 371-3051
Tishomingo Police Department	Tishomingo, Oklahoma	(580) 371-2319
Wapanucka City Hall	Wapanucka, Oklahoma	(580) 937-4272
Wapanucka Water Department	Wapanucka, Oklahoma	(580) 937-4272
Atoka		
Atoka City Hall	Atoka, Oklahoma	(580) 889-3341
Atoka County Ambulance Service	Atoka, Oklahoma	(580) 889-5228
Atoka County RWS & SWMD #4	Atoka, Oklahoma	(580) 889-5715
Atoka County Sheriff's Office	Atoka, Oklahoma	(580) 889-2221
Atoka Fire Department	Atoka, Oklahoma	(580) 889-2121
Atoka Memorial Hospital	Atoka, Oklahoma	(580) 889-3333

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Atoka Memorial Hospital	Atoka, Oklahoma	(580) 889-3333
Atoka Police Department	Atoka, Oklahoma	(580) 889-3250
Atoka PWS	Atoka, Oklahoma	(580) 889-2362
Howard McLeod Corr Center	Atoka, Oklahoma	(580) 889-6651
Mack Alford Corr Center	Stringtown, Oklahoma	(580) 346-7301
Rural Water District	Caddo, Oklahoma	(580) 889-3135
Stringtown Fire Department	Stringtown, Oklahoma	(580) 346-7035
Stringtown Police Department	Stringtown, Oklahoma	(580) 346-7200 / (580) 889-2424
Stringtown PWA	Stringtown, Oklahoma	(580) 346-7224
Tushka City Hall	Tushka, Oklahoma	(580) 889-3046
Bryan		
Bennington Police Department	Bennington, Oklahoma	(580) 847-2311
Bokchito City Hall	Bokchito, Oklahoma	(580) 295-3775
Bokchito Police Departmen	Bokchito, Oklahoma	(580) 295-3818
Bryan County RWD #7	Bennington, Oklahoma	(580) 295-2624
Bryan County Sheriff's Office	Durant, Oklahoma	(580) 924-3000
Caddo City Hall	Caddo, Oklahoma	(580) 367-2244
Caddo Fire Department	Caddo, Oklahoma	(580) 367-2244
Caddo Police Department	Caddo, Oklahoma	(580) 367-9806
Caddo Water Department	Caddo, Oklahoma	(580) 367-2244
Eastern Bryan County Ambulance Service	Bokchito, Oklahoma	(580) 295-3611
Kenefic City Hall	Kenefic, Oklahoma	(580) 367-2744
Kenefic Water Department	Kenefic, Oklahoma	(580) 367-2744
Medical Center of Southeastern Oklahoma	Durant, Oklahoma	(580) 924-3080

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EXTERNAL NOTIFICATION REFERENCES

Texas

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Orange		
Bridge City Fire Department	Bridge City, Texas	(409) 735-2419
Bridge City Police Department	Bridge City, Texas	(409) 735-5028
City Hall Bridge City	Bridge City, Texas	(409) 735-6801
City Hall Rose City	Rose, Texas	(409) 769-6809
Memorial Hermann Baptist Orange Hospital	Orange, Texas	(409) 883-9361
Orange City Hall	Orange, Texas	(409) 883-1016
Orange County Sheriff's Office	Orange, Texas	(409) 883-2612
Orange Fire Department	Orange, Texas	(409) 883-1050
Orange Police Department	Orange, Texas	(409) 883-1026
Pinehurst City Hall	Pinehurst, Texas	(409) 886-3873
Vidor City Hall	Vidor, Texas	(409) 769-5473
Vidor Police Department	Vidor, Texas	(409) 769-4561
West Orange City Hall	West Orange, Texas	(409) 883-3468
West Orange Fire Department	West Orange, Texas	(409) 883-3468
West Orange Police Department	West Orange, Texas	(409) 883-7574
Hardin		
Acadian Ambulance Service	Hardin County, Texas	(409) 385-4500
Hardin County Constable Precinct 5	Lumberton, Texas	(409) 658-1500
Hardin County Sheriff's Department	Kountze, Texas	(409) 246-5100 / (409) 246-3441
Local Public Safety Answering Point	Kountze, Texas	(409) 246-5100
Lumberton City Hall	Lumberton, Texas	(409) 755-3700

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Lumberton Police Department	Lumberton, Texas	(409) 755-2650
Lumberton Volunteer Fire Department	Lumberton, Texas	(409) 751-5862
Mayor Bevil City Hall	Bevil Oaks, Texas	(409) 753-1475
Sour Lake City Hall	Sour Lake, Texas	(409) 287-3573
Sour Lake Police Department	Sour Lake, Texas	(409) 287-3574
Sour Lake Volunteer Fire Department	Sour Lake, Texas	(409) 287-3062
Liberty		
Ames City Hall	Ames, Texas	(936) 336-5883
Cleveland Regional Medical Ctr	Cleveland, Texas	(281) 593-1811
Daisetta City Hall	Daisetta, Texas	(936) 536-6120
Daisetta Police Department	Daisetta, Texas	(936) 536-6120
Dayton Fire Department	Dayton, Texas	(936) 258-5323
Dayton Police Department	Dayton, Texas	(936) 258-7621
Doctors Diagnostic Hospital	Cleveland, Texas	(281) 622-2900
Hardin City Hall	Hardin, Texas	(936) 298-2117
Liberty City Hall	Liberty, Texas	(936) 336-3684
Liberty County Sheriff's Office	Liberty, Texas	(936) 336-4500
Liberty Fire Department	Liberty, Texas	(936) 336-3922
Liberty Police Department	Liberty, Texas	(936) 336-5666
Local Public Safety Answering Point	Liberty, Texas	(936) 336-4505
Jefferson		
Beaumont City Hall	Beaumont, Texas	(409) 980-8311 or 311
Beaumont Fire Department	Beaumont, Texas	(409) 880-3901
Beaumont Police Department	Beaumont, Texas	(409) 880-3801
Bevil Oaks City Hall	Bevil Oaks, Texas	(409) 781-4440
Christus Hospital	Beaumont, Texas	(409) 892-7171

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Groves City Hall	Groves, Texas	(409) 962-4471
Groves Fire Department	Groves, Texas	(409) 962-4471
Groves Police Department	Groves, Texas	(409) 962-0244
Jefferson County Sheriff's Office	Beaumont, Texas	(409) 835-8411
Local Public Safety Answering Point	Port Arthur, Texas	(409) 835-8411
Memorial Hermann Baptist Beaumont Hospital	Beaumont, Texas	(409) 212-5012
Nederland City Hall	Nederland, Texas	(409) 723-1503
Nederland Police Department	Nederland, Texas	(409) 723-1518
Port Arthur Fire Department	Port Arthur, Texas	(409) 983-3676
Port Arthur Mayor	Port Arthur, Texas	(409) 983-8105
Port Arthur Police Department	Port Arthur, Texas	(409) 983-8600
Port Neches Fire Department	Port Neches, Texas	(409) 722-5885
Port Neches Police Department	Port Neches, Texas	(409) 722-1424
Renaissance Hospital Groves	Groves, Texas	(409) 962-5733
The Medical Center Of Southeast Texas	Port Arthur, Texas	(409) 853-5900
Lamar		
Lamar County Sheriff's Office	Paris, Texas	(903) 737-2400
Local Public Safety Answering Point	Paris, Texas	(903) 784-7655
Paris City Hall	Paris, Texas	(903) 785-7511
Paris Fire Department	Paris, Texas	(903) 784-9225
Paris Police Department	Paris, Texas	(903) 784-6688
Paris Regional Medical Center	Paris, Texas	(903) 785-4521
Reno City Hall	Reno, Texas	(903) 785-0722
Delta		
City of Cooper Water Department	Cooper, Texas	(903) 395-4433
Cooper City Hall	Cooper, Texas	(903) 395-4433

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Cooper Volunteer Fire Depa	Cooper, Texas	(903) 395-2217
Delta County Ambulance District	Delta County, Texas	(970) 874-7001
Delta County Sheriff's Department	Cooper, Texas	(903) 395-2146
Local Public Safety Answering Point	Cooper, Texas	(903) 395-2146
Pecan Gap City Office	Pecan Gap, Texas	(903) 359-6565
Franklin		
Ambulance Service - Franklin County	Franklin County, Texas	(800) 522-4486
City of Mount Vernon Water Department	Mount Vernon, Texas	(903) 537-4643
East Texas Medical Center Mount Vernon	Mount Vernon, Texas	(903) 537-4552
Franklin County Sheriff's Office	Mount Vernon, Texas	(903) 537-4539
Local Public Safety Answering Point	Mt. Vernon, Texas	(903) 537-4539
Local Public Safety Answering Point	Mt. Vernon, Texas	(903) 537-4539
Local Public Safety Answering Point	Mt. Vernon, Texas	(903) 537-4539
Local Public Safety Answering Point	Mt. Vernon, Texas	(903) 537-4539
Mount Vernon Fire Department	Mount Vernon, Texas	(903) 537-4539
Mount Vernon Police Department	Mount Vernon, Texas	(903) 537-4681
Mt Vernon City Hall	Mt Vernon, Texas	(903) 537-2252
Hopkins		
Como City Hall	Como, Texas	(903) 488-3434
Como Police Department	Como, Texas	(903) 488-3434
Hopkins County Memorial Hospital	Sulphur Springs, Texas	(903) 885-7671
Hopkins County Sheriff's Office	Sulphur Springs, Texas	(903) 438-4040
Local Public Safety Answering Point	Sulhpur Springs, Texas	(903) 438-4040
Sulphur Springs Fire Department	Sulphur Springs, Texas	(903) 885-7547
Sulphur Springs Police Department	Sulphur Springs, Texas	(903) 885-7602
Wood		

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East Texas Medical Center Quitman	Quitman, Texas	(903) 763-4500
Hawkins Police Department	Hawkins, Texas	(903) 769-3628
Local Public Safety Answering Point	Quitman, Texas	(903) 763-5462
Mother Frances Hospital	Winnsboro, Texas	(903) 342-5227
Quitman City Hall	Quitman, Texas	(903) 537-2252
Quitman Fire Department	Quitman, Texas	(903) 763-2222
Quitman Police Department	Quitman, Texas	(903) 763-4410
Winnsboro City Hall	Winnsboro, Texas	(903) 342-3654
Winnsboro Police Department	Winnsboro, Texas	(903) 342-3620
Wood County Sheriff's Office	Quitman, Texas	(903) 763-5461
Upshur		
Big Sandy City Hall	Big Sandy, Texas	(903) 636-4343
Big Sandy Fire Department	Big Sandy, Texas	(903) 636-4343
Big Sandy Police Department	Big Sandy, Texas	(903) 636-4200
East Texas Medical Center - Gilmer	Gilmer, Texas	(903) 841-7100
Gilmer City Hall	Gilmer, Texas	(903) 843-2553
Gilmer Police Department	Gilmer, Texas	(903) 843-5547
Gladewater City Hall	Gladewater, Texas	(903) 845-2196
Gladewater Fire Department	Gladewater, Texas	(903) 845-2484
Gladewater Police Department	Gladewater, Texas	(903) 845-2166
Local Public Safety Answering Point	Gilmer, Texas	(903) 843-2541
Upshur County Sheriff's Office	Gilmer, Texas	(903) 843-2541
Smith		
Arp City Hall	Arp, Texas	(903) 859-6131
East Texas Medical Center	Tyler, Texas	(903) 597-0351
Mother Frances Hospital	Tyler, Texas	(903) 593-8441

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Overton Police Department	Overton, Texas	(903) 834-3145
Overton Police Department	Overton, Texas	(903) 834-3145
Smith County Sheriff's Office	Tyler, Texas	(903) 590-2600
Texas Spine And Joint Hospital	Tyler, Texas	(903) 525-3300
Troup Fire Department	Troup, Texas	(903) 842-3498
Troup Police Department	Troup, Texas	(903) 842-3211
Tyler City Hall	Tyler, Texas	(903) 531-1250
Tyler Fire Department	Tyler, Texas	(903) 535-0005
Tyler Police Department	Tyler, Texas	(903) 531-1000
Whitehouse City Manager	Whitehouse, Texas	(903) 839-4115
Whitehouse Fire Department	Whitehouse, Texas	(903) 839-2884
Whitehouse Police Department	Whitehouse, Texas	(903) 839-2828
Rusk		
Etmc Henderson	Henderson, Texas	(903) 657-7541
Henderson City Hall	Henderson, Texas	(903) 657-6551
Henderson Fire Department	Henderson, Texas	(903) 657-6551
Henderson Police Department	Henderson, Texas	(903) 657-3512
Local Public Safety Answering Point	Tyler, Texas	(903) 566-6600
New London City Hall	New London, Texas	(903) 895-4466
Reklaw City Hall	Reklaw, Texas	(936) 369-4368
Rusk County Sheriff's Office	Henderson, Texas	(903) 657-3581
Cherokee		
Alto City Hall	Alto, Texas	(936) 858-4711
Alto Fire Department	Alto, Texas	(936) 858-4444
Alto Police Department	Alto, Texas	(936) 858-2221
Cherokee County Sheriff's Office	Rusk, Texas	(903) 683-2271

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East Texas Medical Center Jacksonville	Jacksonville, Texas	(903) 541-5000
Local Public Safety Answering Point	Jacksonville, Texas	(903) 683-2271
Mother Frances Hospital Jacksonville	Jacksonville, Texas	(903) 541-4500
New Summerfield Fire Department	New Summerfield, Texas	(903) 726-3568
New Summerfield Police Department	New Summerfield, Texas	(903) 726-3726
Reklaw Fire Department	Reklaw, Texas	(936) 369-9917
Reklaw Police Department	Reklaw, Texas	(936) 369-4228
Rusk City Hall	Rusk, Texas	(903) 683-2213
Rusk Police Department	Rusk, Texas	(903) 683-2213
Nacogdoches		
Cushing City Hall	Cushing, Texas	(936) 326-4665
Local Public Safety Answering Point	Nacogdoches, Texas	(936) 559-2607
Memorial Hospital	Nacogdoches, Texas	(936) 564-4611
Nacogdoches City Hall	Nacogdoches, Texas	(936) 559-2516
Nacogdoches County Ambulance Service	Nacogdoches County, Texas	(936) 564-1212
Nacogdoches County Sheriff's Office	Nacogdoches, Texas	(936) 560-7790
Nacogdoches Fire Department	Nacogdoches, Texas	(936) 559-2541
Nacogdoches Medical Center	Nacogdoches, Texas	(936) 569-9481
Nacogdoches Police Department	Nacogdoches, Texas	(936) 559-2607
Angelina		
Angelina County Sheriff's Office	Lufkin, Texas	(936) 634-3331
Diboll City Hall	Diboll, Texas	(936) 829-4757
Diboll Fire Department	Diboll, Texas	(936) 829-2511
Diboll Police Department	Diboll, Texas	(936) 829-5586
Hudson Police Department	Lufkin, Texas	(936) 875-3028
Local Public Safety Answering Point	Lufkin, Texas	(936) 633-0356

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Lufkin City Mayor	Lufkin, Texas	(936) 633-0299
Lufkin Fire Department	Lufkin, Texas	(936) 633-0356
Lufkin Police Department	Lufkin, Texas	(936) 633-0300
Lufkin Public Safety Answering Point	Lufkin, Texas	(936) 829-5586
Memorial Health System Of East Texas- Lufkin	Lufkin, Texas	(936) 634-8111
Woodland Heights Medical Center	Lufkin, Texas	(936) 634-8311
Polk		
City Hall of Goodrich	Goodrich, Texas	(936) 365-2228
Corrigan City Office	Corrigan, Texas	(936) 398-5363
Corrigan Police Department	Corrigan, Texas	(936) 398-2551
Livingston City Hall	Livingston, Texas	(936) 327-4311
Livingston Fire Department	Livingston, Texas	(936) 327-4411
Livingston Police Department	Livingston, Texas	(936) 327-3117
Local Public Safety Answering Point	Livingston, Texas	(936) 327-6810
Memorial Medical Center Livingston	Livingston, Texas	(936) 327-4381
Polk County Sheriff's Department	Livingston, Texas	(936) 327-6810
Fannin		
Bonham Public Safety Answering Point	Bonham, Texas	(903) 583-2144
Fannin County Sheriff's Office	Bonham, Texas	(903) 583-2143
Honey Grove City Hall	Honey Grove, Texas	(903) 378-2323
Honey Grove Police Department	Honey Grove, Texas	(903) 378-2222
Honey Grove Volunteer Fire Department	Honey Grove, Texas	(903) 378-3435
Local Public Safety Answering Point	Bonham, Texas	(903) 583-2143
Red River Regional Hospital	Bonham, Texas	(903) 583-8585

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