
Oil Spills in Washington State: *A Historical Analysis*



April 1997 (rev. March 2007)
Publication No. 97-252

 Printed on Recycled Paper



Department of Ecology Spill Management Program

Oil Spills in Washington State: A Historical Analysis

April 1997, Publication #97-252

Tom Fitzsimmons, Director, *Department of Ecology*

Greg Sorlie, Program Manger, *Central Programs*

Dave Lundstrom and **Steve Hunter**, Section Supervisors, *Spill Management Program*

Prepared by: **Jon Neel, Curt Hart, Donna Lynch, Steve Chan** and **Jeanette Harris**
Central Programs — Spill Prevention and Policy Section

Cover Photo:

The tank vessel Mobil Oil grounded on Warrior Rock in the Columbia River on March 20, 1984. Rudder failure from improper maintenance was the cause of the accident. After losing 200,000 gallons of heavy oil, this photo shows how other vessels were used in an attempt to lighten and refloat the tanker.

Photo by Jon Neel

For additional copies of this document, contact:

Department of Ecology Distribution Center
PO Box 47600
Olympia, WA 98504-7600
Telephone: (360) 407-7472 (Voice) or (360) 407-6006 (TDD)

The Department of Ecology is an equal opportunity agency and does not discriminate on the basis of age, color, creed, disability, disabled veteran's status, marital status, national origin, race, religion, sex, sexual orientation, or Vietnam Era veteran's status. If you have special accommodation needs or require this document in an alternate format, please contact Ecology's Jon Neel at (360) 407-6905 (Voice) or (360) 407-6006 (TDD).

Table of Contents

Introduction	5
Chapter 1: Washington State Energy Policy and Oil Spill Initiatives	7
State Oil Spill Policy: A Historical Overview.....	8
Current Regulatory Framework.....	10
Current Oil Transportation Patterns and Related Spill Risks.....	11
Chapter 2: Oil Spill Data Sources	15
Chapter 3: Major Oil Spills in Washington	17
Distribution of Major Spills	17
Source of Major Spills.....	19
Types of Oil Spilled	21
Geographical Distribution	22
Chapter 4: Recent Trends in Oil Spills	25
Distribution of Recent Spills	25
Source of Recent Spills	26
Types of Oil Spilled	27
Geographical Distribution	28
Comparison with Coast Guard Data.....	31
Cause of Recent Spills.....	31
Chapter 5: Near Miss Incidents.....	35
Chapter 6: Lessons Learned From Recent Pipeline Spills	37
Conclusions	39
Data Collection and Analysis	39
Important Trends in Spills.....	39
Effectiveness of Existing Spill Prevention Measures	40
State Spill Policy	40
Appendices	43
Appendix 1 — Significant Vessel Casualties and Near Misses.....	44
Appendix 2 — Major Oil Spills and Related Legislative Action.....	46
Appendix 3 — Selected Spills in Washington State.....	48
Appendix 4 — Legend for Map: Spills Over 10,000 Gallons.....	50
Appendix 5 — Ecology’s Regional Offices.....	51

Introduction

Twenty-two years have elapsed since the Department of Ecology first proposed establishing a comprehensive oil spill prevention and response program in Washington State. The 1975 legislative proposal was prompted after the state suffered major oil spills. Another concern at that time was that the brand new Alyeska pipeline would dramatically increase oil tanker traffic in the Puget Sound. Although the Alaskan pipeline spurred major refining activity in Washington, the proposed environmental protection program never materialized due to lack of funding. Even though no one wanted spills to occur, the full public cost of oil spills was not placed completely on the shoulders of those responsible for transporting oil. The oil spills kept occurring.

It took a series of major oil spills in Washington and Alaska in the late 1980s and early 1990s before Washington's innovative spill prevention and response program was finally put into place by the Legislature. These major spills include:

- ◆ The 1985 *ARCO Anchorage* tanker spill in which 239,000 gallons of crude oil was released into marine waters at Port Angeles;
- ◆ The 1988 *Nestucca* barge spill which released 231,000 gallons of fuel oil into waters along the coast of Grays Harbor ;
- ◆ The disastrous 1989 *Exxon Valdez* spill in Alaska which unleashed 11 million gallons of crude oil into Prince William Sound;
- ◆ The 1991 Texaco refinery spill at Anacortes which released 130,000 gallons of crude oil, of which 40,000 gallons went into Fidalgo Bay; and
- ◆ The 1991 spill at the U.S. Oil refinery in Tacoma which involved 600,000 gallons of crude oil, most of which was stopped from entering state waters.

How these and other major oil spills accelerated state and federal oil spill prevention, preparedness and response legislation is outlined in **Appendix 2**. This outline shows how the major preventable spills between 1985 and 1992 resulted in innovative legislation which holds potential spillers accountable for preventing and cleaning up spills.

Washington's oil spill prevention and response program has been in place for six years. This report is an examination of the history of oil transportation and the resulting trends in oil spills. This analysis is the first step toward measuring the level of success that industry, government and the public are having on preventing oil spills. This report is also intended to help Washington determine how to best provide the "best achievable protection" from the effects of oil spills while assuring that federal and state programs complement each other.

This report provides partial answers to the following fundamental questions:

- ◆ What fundamental forces have shaped state policy regarding oil transportation and spills?
- ◆ Has Washington's additional attention to oil spill prevention and response paid off?
- ◆ Given Washington's recent increased refinery production, increased pipeline traffic and expanded Pacific Rim trade: How does our state's record of recent spills compare with national and international trends?
- ◆ Should the state make any adjustments in its program as a result of these trends?

Chapter 1: Washington State Energy Policy and Oil Spill Initiatives

Washington's unique physical geography coupled with its abundance and diversity of natural resources has been the driving force behind how the state has provided for its energy needs and how much importance the state has placed on preventing and responding to environmental threats, especially oil spills.

Located at the northwest corner of the continental United States, Washington's rugged mountain terrain and distance from traditional energy sources prompted the state to develop its own energy reservoirs. Since the 1930s, Washington has exploited its hydroelectric resources and these dams have, in many ways, become the region's energy backbone.

The Puget Sound is also the closest national port in the lower 48 states for vessels carrying crude oil out of Valdez, Alaska. For more than 25 years, tankers laden with Alaskan crude oil have brought their precious cargo into Washington. Even though the state produces none of its own oil, Washington has the fifth highest refining capacity of any state in the nation. The waters of Washington State are also one of North America's primary water-borne transportation avenues for Pacific Rim commerce. A visitor to one of Washington's busy ports will see many ships flying flags from Russia, China, Japan, Korea, Malaysia and a variety of other nations.

At the same time, Washington's waters and shorelines contain highly sensitive and valuable natural resources. State marine waters contain critical commercial resources including fishing, crabbing, shrimping and shellfish industries. Washington is also blessed with abundant and diverse fish and wildlife resources which are a driving force in state tourism and provide recreational opportunities for residents. The seabird colonies along Washington's outer coast are among the largest in the United States. In addition, 29 species of marine mammals — including whales, dolphins, seals, seal lions and sea otters — breed in or migrate through the state. The Olympic Coast is the least disturbed major section of coastline in the continental lower 48 states and, according to the Office of Marine Safety and U.S. Coast Guard, it is also the area in Washington that is at greatest risk of experiencing a major vessel oil spill.

Given the importance of preventing spills, this report explores the important connection between historical oil spill information and spill trends, and identifies general areas where non-regulatory approaches for spill prevention might be viable. Effective spill prevention can best be attained through the right mix of regulatory and voluntary compliance initiatives. As state regulatory programs have matured, Ecology has been shifting its focus to educational initiatives. The information on spill trends in this report is part of this effort.

Measuring the effectiveness of state spill prevention endeavors is very complex. Most experts agree that while human factors of one type or another underlie most incidents, spills occur from a wide variety of specific sources and causes. Specific technological or procedural changes must be developed and implemented to eliminate or minimize the occurrence of these incidents. If we are to continue making good progress in preventing spills, it is imperative that we gather better information on actual spills to understand these incidents. This report is also an effort to obtain and disseminate this information.

State Oil Spill Policy: A Historical Overview

Prior to the mid-1940s, most Washington communities discharged raw sewage into state water bodies, most industrial wastes went untreated and small oil spills were accepted as part of doing business. As a result of continued population growth, state harbors, rivers, lakes and streams quickly became polluted. In March 1945, the Legislature established the Pollution Control Commission. In order to give the commission real authority, lawmakers also passed legislation prohibiting the pollution of any waters of the state and established specific penalties for violations.

In 1955, the Legislature passed a new law which required that any "commercial or industrial operation of any type which results in the disposal of solid or liquid waste material into the waters of the state shall procure a permit" from the Pollution Control Commission. This state act preceded the federal Water Pollution Control Act by 10 years. In several instances, Washington State environmental laws have been models for federal pollution laws.

Growth of Washington Oil Industry

Prior to 1950, there were no refineries and very little crude oil was transported into Puget Sound. In 1953, the Trans-Mountain Pipeline Company and Mobil Oil announced their plan to construct an oil pipeline from British Columbia into Washington. A year later, the state received its first delivery of Canadian crude oil. Most of Washington's refineries were constructed in the 1950s, including:

- ◆ 1954 — Mobil Oil refinery, Ferndale (now owned by Tosco);
- ◆ 1955 — Shell Oil refinery, Anacortes;
- ◆ 1957 — US Oil refinery, Tacoma; and
- ◆ 1958 — Texaco refinery, Anacortes.

In 1958, a high tariff imposed by Canada on the Trans-Mountain Pipeline resulted in a 12-18 month embargo on oil imports from British Columbia. This and other events led to concerns about the long-term stability of the Canadian supplies. In order to improve the oil transportation system, the Olympic Pipe Line Company built its pipeline in 1966 and began delivering petroleum products from the refineries in the north part of the state to consumers in Seattle, Tacoma and Olympia in Washington, and to Portland and Eugene in Oregon.

Developments Related to Alaskan Oil

In 1968 and 1969, the Alaska North Slope oil fields were discovered at Prudhoe Bay. In anticipation of the movement of Alaskan oil into Washington and other pressing environmental concerns, the Legislature passed a series of environmental and spill-related laws.

In 1970, the Washington State Legislature established the Department of Ecology, followed quickly by the passage of the 1971 Washington Oil Pollution Act which:

- ◆ Established unlimited liability for oil spills;
- ◆ Provided for state cleanup capability; and
- ◆ Specifically clarified that the discharge of any oil into state waters was illegal.

That same year, Governor Dan Evans requested an oil risk analysis report concerning the transportation of oil into Puget Sound. Also in 1971, ARCO built its Cherry Point refinery near Ferndale. This move put state production of petroleum products well ahead of in-state consumption. It also greatly increased tanker traffic into Puget Sound.

Construction of the Trans Alaska Pipeline System (TAPS) began in 1973 after the U.S. Congress passed the Trans Alaska Pipeline Act. However, in October 1973 the Organizations of Petroleum Exporting Countries (OPEC) placed an embargo on oil exports to the United States. The resulting shortage placed additional national attention and reliance on Alaskan North Slope oil.

In Washington, one of the results of the embargo was that in 1975 the Northern Tier Pipeline Company proposed constructing a major oil pipeline originating in Cherry Point near Ferndale and terminating in Minnesota. In January 1976, Northern Tier changed its proposed point of origin from Cherry Point to Port Angeles.

Also in 1975, the Legislature passed the Washington Tanker Safety Act which prohibited tankers exceeding 125,000 dead weight tons from entering Puget Sound, and required tug escorts and pilots for certain other tankers. In 1978, the U.S. Supreme Court invalidated this “supertanker” ban in the case of *ARCO vs. Governor Ray*. The court found that federal law pre-empted Washington from banning large tankers, but affirmed the right of the state to establish tug escort and other requirements. U.S. Senator Warren Magnuson later re-established supertanker limits through federal legislation.

In the 1970s, the Department of Ecology completed a number of shoreline sensitivity studies focused on the San Juan Islands in anticipation of the influx of Alaskan oil. The studies were undertaken in order to establish a “baseline” so that any environmental changes precipitated by a major oil spill could be more readily quantified. In both 1972 and 1975, Ecology proposed creating a state spill prevention and response program but could not secure funding from the Legislature for the effort. It took a series of major spills in the late 1980s and early 1990s to provide the impetus to establish and fund a state comprehensive spill prevention, preparedness and response program (see **Appendix 2**).

In June 1976, a federal Coastal Zone Management law placed a partial prohibition on the expansion of existing oil terminals. However, this provision may be superseded by other federal laws. That same year, Washington also established the Energy Facility Site Evaluation Council (EFSEC) whose mission was to oversee the siting and permitting of energy facilities such as pipelines, refineries and nuclear power plants. The council held extensive hearings on the Northern Tier Pipeline proposal. The pipeline project was not approved.

Recent Developments

During the late 1970s, EFSEC certified the siting and construction of five Washington Public Power Supply System (WPPSS) nuclear power plants. Three developments — the subsequent demise of four of these five plants, the WPPSS bond default and the shut down of the federal “N” reactor at the Hanford Nuclear Reservation — assured the state’s continued reliance on hydropower and fossil fuel resources, including oil and coal for use in the Centralia power plant.

In 1990, the Trans Mountain Pipeline Company proposed constructing an oil terminal at Low Point east of Port Angeles on the Olympic Peninsula. The proposal included two single-point mooring buoys, a tank farm at Low Point, and a pipeline which would be located under Puget Sound and connect the Low Point facility with refineries located at Anacortes and Ferndale. The project would have eliminated most tanker traffic coming into Puget Sound beyond Port Angeles, but was eventually withdrawn as a result of public environmental concerns and lack of support from the oil industry.

Even with the state’s relative isolation from continental U.S. energy supplies, its oil markets are not immune to the market effects of Mideast oil supply volatility as seen during the 1973 OPEC embargo. On Dec. 11, 1996, the United Nations again allowed the sale of Iraqi oil on the international market as a result of humanitarian pressures. This action is expected to lower the consumer price of refined petroleum products throughout the United States.

Current Regulatory Framework

Ecology has been involved in preventing and responding to spills since the agency was formed in 1971. The agency’s spill response capability prior to 1989 consisted of a team of employee volunteers in each of the four regional offices whose main area of expertise lay in other program areas. There was little centralized management of spill activities. As a result of the drawbacks associated with this decentralized response system and the identification of additional funding, Ecology centralized the spill organization in 1990.

These changes and the legislation which passed from 1989 to 1992, resulted in the state spill program which continues to evolve to this day with centralized management systems and regional service delivery. Ecology is now responsible for:

- ◆ Preventing spills at oil handling facilities;
- ◆ Managing the state’s preparedness efforts;
- ◆ Responding to oil and hazardous material spills statewide; and
- ◆ Coordinating state natural resource damage assessment activities.

The U.S. Congress passed the Oil Pollution Act in 1990 (OPA 90). This statute created new national standards for oil spill prevention and response in the wake of the Exxon Valdez spill. Congress delegated responsibility for implementing most of OPA 90's provisions to the Coast Guard, Environmental Protection Agency, Department of Transportation's Office of Pipeline Safety, National Oceanic and Atmospheric Administration and the Minerals Management Service.

The Washington State Office of Marine Safety (OMS) was created in 1991 by the Legislature to provide further assurance that frequency of oil spills would be reduced. OMS is responsible for preventing vessel oil spills through vessel inspections, investigation of marine casualties, enforcement of state maritime standards and by approving vessel spill contingency plans.

State and Federal Relationships

Washington's role in the current state-federal framework for regulating the oil industry is complicated because each major federal regulatory agency views the role of the state differently. Some independent legal analysts believe that the U.S. Coast Guard attempts to promote uniformity by establishing "ceilings" for regulatory requirements, while the U.S. Environmental Protection Agency uses federal environmental laws to set "floors" which allow states to set more stringent requirements if they are necessary for regional considerations. Major oil pipelines are regulated by the U.S. Department of Transportation's Office of Pipeline Safety. This agency generally sets ceilings. However, unlike the EPA and Coast Guard, the Office of Pipeline Safety delegates some of their spill prevention authority to states that have established effective regulatory programs.

Some of these federal agency policy differences concerning state program consistency can be traced to concerns for interstate uniformity regarding transportation systems such as vessels, trucks and airlines. However, these interstate concerns may not be valid when states establish regional standards for fixed facilities and do not impede interstate commerce. Questions remain regarding EPA and the Coast Guard delegation of programs to states and why fixed interstate pipelines should not be subject to state spill prevention standards if interstate commerce is not impeded. These issues are particularly relevant when the current congressional view of states' rights' seems to be reducing federal regulatory programs in favor of state control. However, at this time federal law does not provide a mechanism for state delegation.

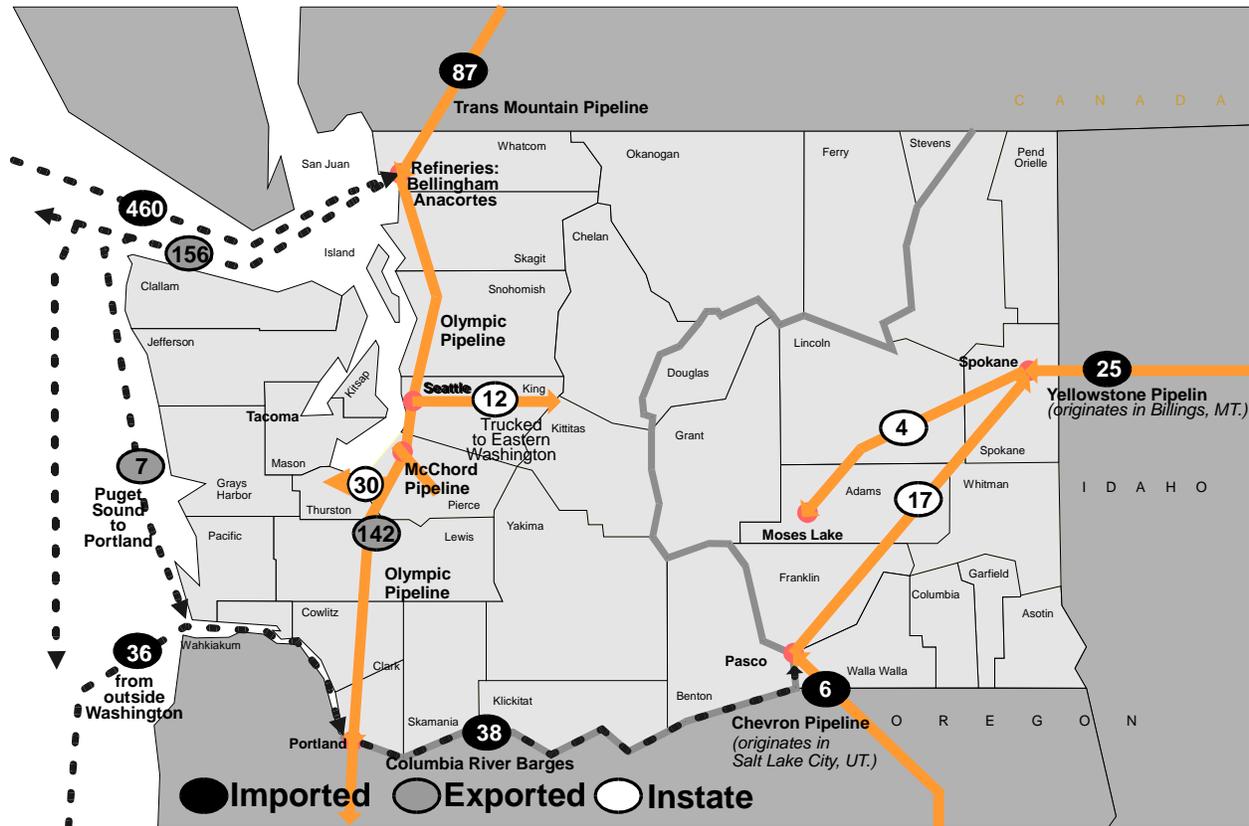
These differences in regulatory approach do not apply to spill preparedness and response. EPA and the Coast Guard have established strong and effective cooperative mechanisms with respect to state co-management of spill responses while minimizing duplication.

Current Oil Transportation Patterns and Related Spill Risks

As one of North America's major gateways to Pacific Rim trade, Puget Sound is one of the busiest waterways in the world with vessel traffic going to several busy ports in Washington State and to major facilities in Vancouver, British Columbia. More vessel tonnage moves through the Strait of Juan de Fuca than through the combined ports of Los Angeles and Long Beach, California.

Washington is also one of the nation's primary petroleum refining centers. Refined products are exported from Washington to other western states, such as Oregon and California, primarily through pipelines, barges and tankers. There are five major pipelines in Washington: Trans Mountain, Olympic, McChord, Chevron and Yellowstone. The primary transportation routes and quantities of oil transported are shown in **Figure 1**. The map shows the enormous quantities of crude oil and refined products which are transported through our coastal areas, Puget Sound and the Columbia River by tankers and barges.

Figure 1 — Oil Movement in Washington State (figures in thousands of barrels a day)



The vessels in-bound to Puget Sound are primarily moving crude oil to Washington's refineries. Large quantities of crude oil also come into our refineries through the Trans Mountain Pipeline. Refined petroleum products are moved to in-state consumers primarily by pipelines and trucks. These transportation corridors constitute the areas at greatest risk of major spills. Significant elements of major spill risk which are not indicated on the map include: cargo and passenger vessels in Pacific Rim trade; large facilities with piping and storage tanks; and rail/tanker truck traffic.

Production in the Alaskan North Slope oil fields has declined over the last few years as the proven reserves are drawn down. However, it is not clear at this time whether this trend will continue, as projected recently by the Oil and Gas Journal, or whether new finds and improved production techniques will stabilize production as believed by some industry analysts. The long-

term effect of changes in Alaskan oil production on Washington refineries remains to be seen. One of the current effects of the reduced North Slope oil supply is that oil importation from Canada through the Trans Mountain Pipeline has dramatically increased in recent years. The Office of Marine Safety data indicates that the number of individual tankers moving oil into Washington waters was:

- ◆ 907 in 1993;
- ◆ 908 in 1994;
- ◆ 723 in 1995; and
- ◆ 804 in 1996.

This data includes tank ships bound through Washington waters to Puget Sound ports, the Columbia River, Canadian ports and Grays Harbor.

Chapter 2: Oil Spill Data Sources

The spill related information in this report is divided into two sections for the purpose of presenting a clear analysis. **Chapter 3: Major Oil Spills in Washington** deals with well documented facility, pipeline, vessel and surface transportation spills greater than 10,000 gallons that have occurred since 1970. **Chapter 4: Recent Trends in Oil Spills** takes a closer look at all oil spills between 25 and 10,000 gallons that have occurred in the last four years — with the exception of surface transportation (railroad and truck) spills.

Ecology began consistently keeping records of oil spills only after the Legislature provided dedicated funding for the program in 1991. Prior to this time, readily accessible records are incomplete. Fortunately, the agency has institutional memory and information relating to larger spills, particularly those exceeding 10,000 gallons. In preparing this report, a range of sources were reviewed to fill in data gaps. With respect to recent spills (discussed in **Chapter 4**), the information should be accurate given the careful data collection efforts of Ecology's spill and damage assessment team for spills of over 25 gallons reaching surface waters. Spill information is stored in the agency's Environmental Report Tracking System (ERTS) database and a small "stand alone" database for major spills.

Information on specific spills in this report could contain inaccuracies. For example, there is often a tendency by those responsible for a spill to under report the amount of product spilled. No potential systematic errors in the data have been identified other than the possible under reporting of spill volume. Accurate information on the root cause of past spills was also difficult to obtain. Therefore, a smaller data set was used to evaluate spill causes.

Data for land transportation (truck and rail) spills has not been included in the analyses of recent spills because of a lack of complete information about this industry segment. However, land transportation spills do represent a serious threat. Staff from Ecology's regional office located in Yakima have reported that tanker truck accidents have resulted in multi-thousand gallon spills with some regularity over the years. These tanker truck spills pose a significant threat to public health and safety in addition to environmental damage. These inland fuel spills can contaminate drinking water, create dangerous fumes, pose a fire threat and result in fresh water fish kills.

Unless otherwise noted, the figures in this report do not include information on leaking underground storage tanks (LUST) or from spills of animal or vegetable oil.

Ecology intends to use the information contained in this report as environmental quality indicators to help measure the state's success in preventing spills. The information will also help the agency target its facility spill prevention efforts. The agency will continue tracking and reporting spill information and appreciates receiving additional information regarding spill history and trends from all sources.

Chapter 3: Major Oil Spills in Washington

This section evaluates information on major spills of 10,000 gallons or more which have occurred in Washington since 1970.

Distribution of Major Spills

The historical trends in the annual volume of oil spilled each year from major incidents are a key indicator of the state's success in preventing major spills. According to the *Oil Spill Intelligence Report*, the annual average volume of oil spilled worldwide from oil spills greater than 10,000 gallons during the five year period 1987-91 was 53 million gallons (excluding the 1991 Persian Gulf war related casualties). However, the annual average volume of oil spilled at major oil spills during the four year period 1992-95 was 75 million gallons worldwide — a 41 percent increase.

The “1995 International Oil Spill Statistics” compiled by the *Oil Spill Intelligence Report* concluded that despite the considerable efforts to reduce spills, a downward trend in the number of large spill incidents worldwide “is probably not occurring.”

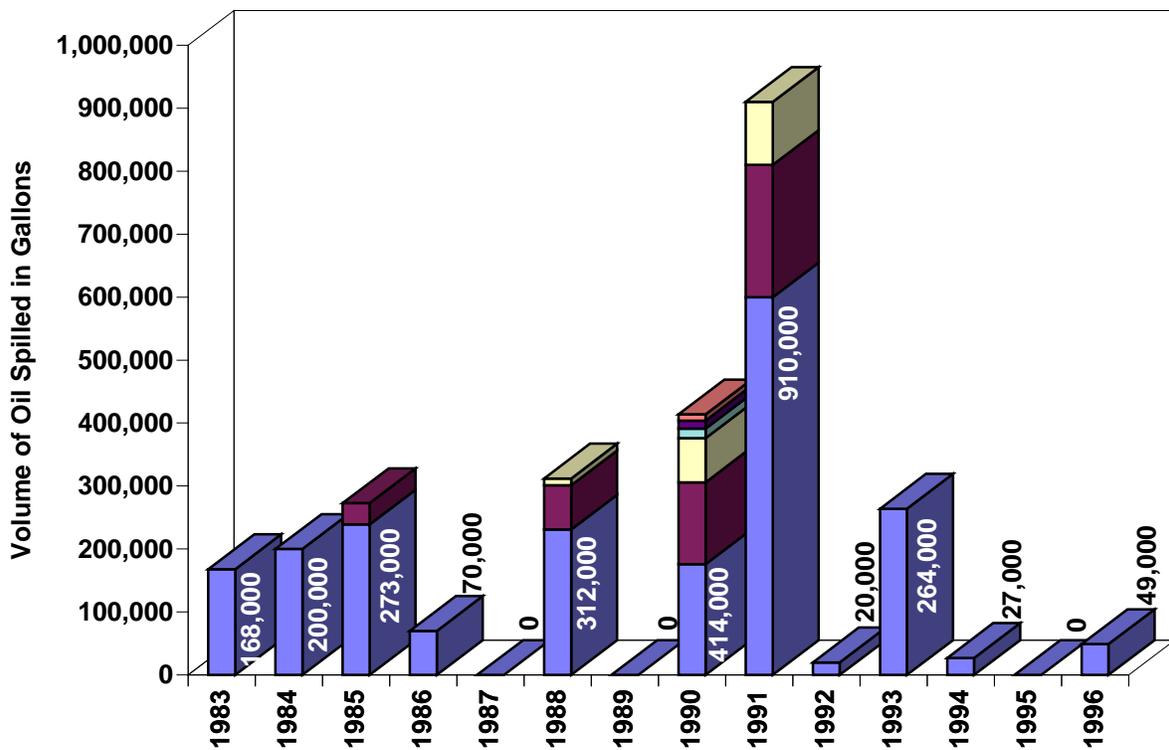
The data in **Figure 2** displays the annual amount of oil spilled in Washington State from spills larger than 10,000 gallons. As seen in this figure, the amount of oil spilled per year as a result of major incidents appears to be declining in Washington during the last five years. Although there is not enough data to evaluate the trends statistically, it does appear that the volume and incidence of major spills in Washington State may be declining more abruptly than that indicated by national and international trends.

The year Washington passed its major oil legislation (1991), we experienced 3 major spills over 10,000 gallons. During this apparently anomalous year, incidents resulted in the loss of 100,000 gallons from the Tenyo Maru; 600,000 gallons from US Oil and Refining; and 210,000 gallons from Texaco refining.

The annual average volume of oil spilled in Washington State from petroleum oil spills greater than 10,000 gallons during 1987-91 was 327,000 gallons. The volume of oil spilled during the five-year period from January 1992 through June 1996 was 72,000 gallons — a 78 percent reduction. Both Ecology and the state Office of Marine Safety's spill prevention and response efforts were fully funded and staffed by June 1992. However, one should be cautious when interpreting the significance of these trends in relation to the effectiveness of the state's program given:

- ◆ The highly variable nature of the data (especially spills during 1991);
- ◆ The fact that spill incidents have a higher probability of being reported in more recent years;
- ◆ The fact that spill volumes are more accurately reported now; and
- ◆ The regulatory programs of the Coast Guard and EPA under the federal Oil Pollution Act of 1990, while not visibly affecting national trends may have had a regional effect.

**Figure 2 — Major Oil Spills in Washington State Over 10,000 Gallons:
Volume of Spills Per Year in Gallons**



The cause and effect of such broad trends cannot easily be determined in a complex milieu such as spill prevention. Factors which weigh heavily in determining outcomes include human considerations such as legal liability, criminal liability and corporate philosophy. Non-human considerations include weather patterns, environment and sea conditions. Furthermore, a single catastrophic spill such as the *Exxon Valdez* can significantly skew the data.

However, with these limitations in mind, Ecology attributes this apparent decline in the volume of oil spilled in Washington from major incidents to a broad effort by industry, the public sector and public interest groups to prevent these incidents. In addition to the efforts by state agencies:

- ◆ The major oil refineries and marine terminals have enhanced corporate policies, developed more effective spill prevention and response plans, improved personnel training and dedicated more resources to equipment maintenance among other initiatives;
- ◆ Oil tanker and regional tank barge operators have invested heavily in clean-up equipment and personnel improvements — including procedures, training, crew rotation and spill response equipment;
- ◆ The domestic cargo vessel industry has placed a much higher priority on spill prevention than in the past;
- ◆ The Coast Guard has enhanced the vessel traffic system;
- ◆ In the Northwest, the Coast Guard and EPA have been very active in implementing the federal Oil Pollution Act of 1990; and
- ◆ The efforts by local government, tribes and environmental groups have been particularly important in keeping private and public sector stakeholders focused on effective prevention measures.

While this data relates to volume, it does appear to be consistent with trends identified in national spill statistics by American Petroleum Institute (API). API concluded that during the decade ending in 1994, the *frequency* of large spills declined by 57 percent.

Source of Major Spills

Figures 3 and 4 display the number of vessel, facility and transmission pipeline spills in the database. As previously mentioned, data on spills from surface transportation modes, such as rail and truck, has not been consistently collected and therefore was not included in the statistics.

**Figure 3 — Major Oil Spills Over 10,000 Gallons:
Number of Spills by Source**

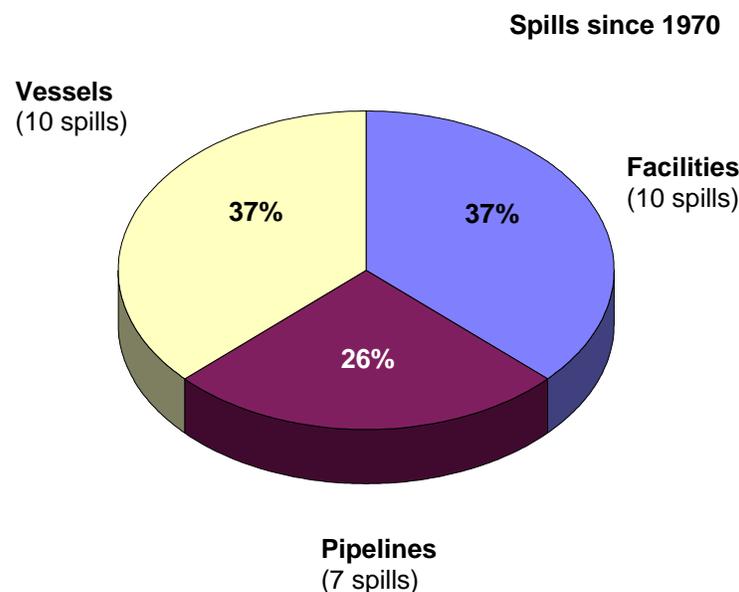
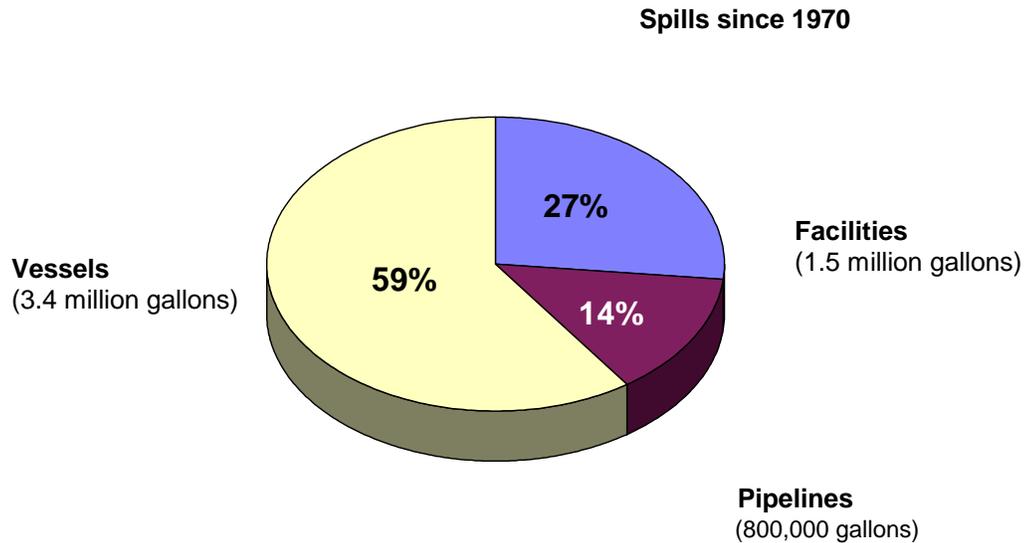


Figure 4 shows the volume of oil spilled from the marine industry (3.4 million gallons) is larger than that spilled by facilities and pipelines (2.3 million gallons). The two figures combined indicate that the size of major vessel spills exceeds that of facility and pipelines. This data is heavily influenced by several large volume marine accidents which have occurred on the coast and in the Strait of Juan de Fuca.

The data indicates that major pipeline spills are generally smaller than major vessel or major facility spills. However, as discussed later in this report, there has been a recent series of major pipeline spills.

The American Petroleum Institute has concluded that “large spills of 10,000 gallons or more accounted for nearly 90 percent of the total oil spilled during the last decade.” State data appears to support this conclusion.

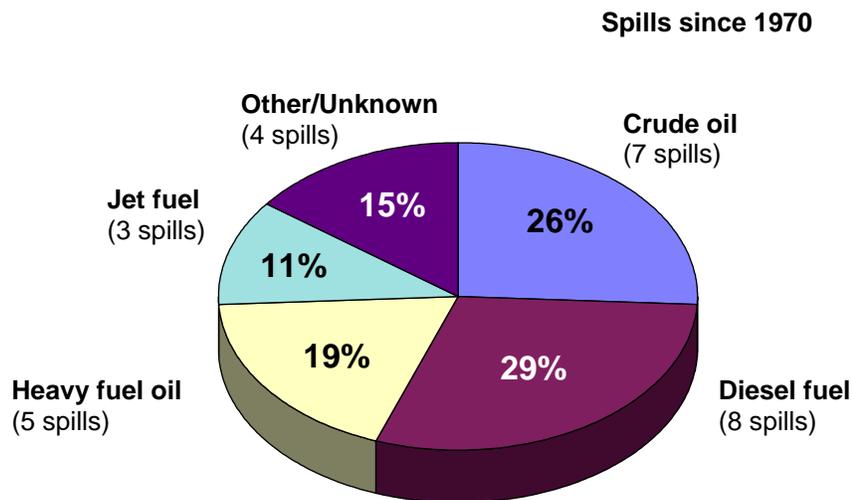
**Figure 4 — Major Oil Spills Over 10,000 Gallons:
Total Volume of Oil Spilled by Source**



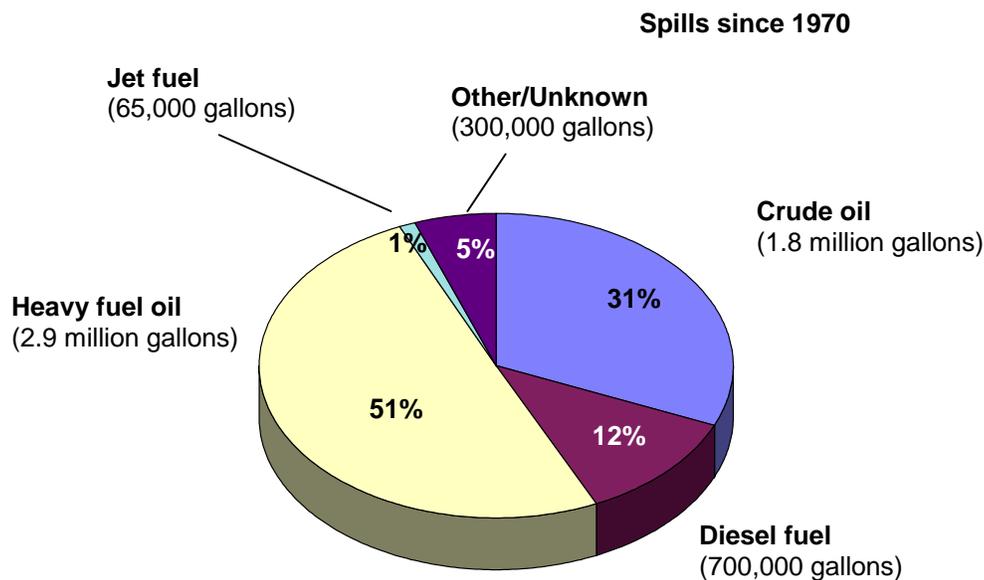
Types of Oil Spilled

Figures 5 and 6 display information on the number and volume of oil spilled by product type. The figures show that heavy fuel and crude oils, which are the most environmentally damaging types, are the largest amount of oil spilled in the state. These viscous “black” oils have a tendency to smother animals such as birds and mammals, often killing them. These oils are also highly persistent and create residues which are resistant to natural physical and biological degradation processes.

**Figure 5 — Major Oil Spills Over 10,000 Gallons:
Number of Spills by Type**



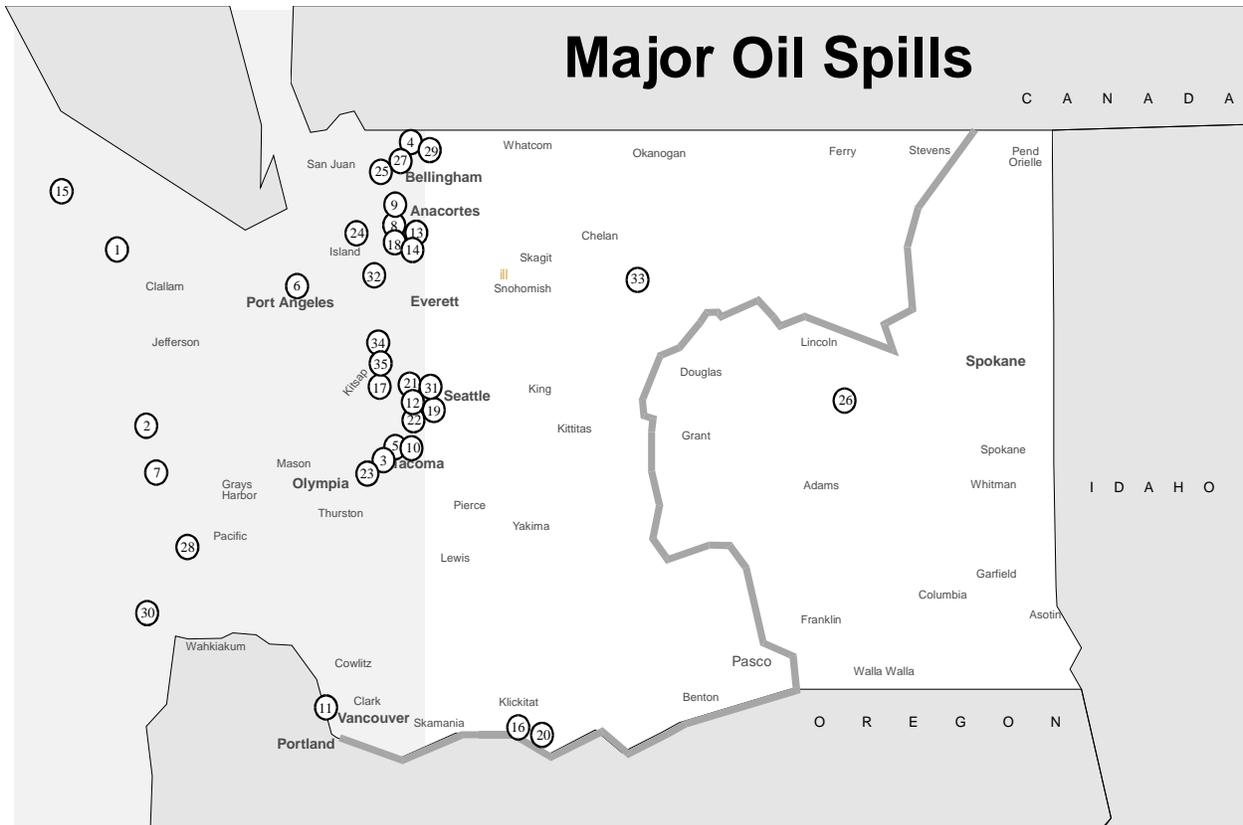
**Figure 6 — Major Oil Spills Over 10,000 Gallons:
Volume of Oil Spilled by Type**



Geographical Distribution

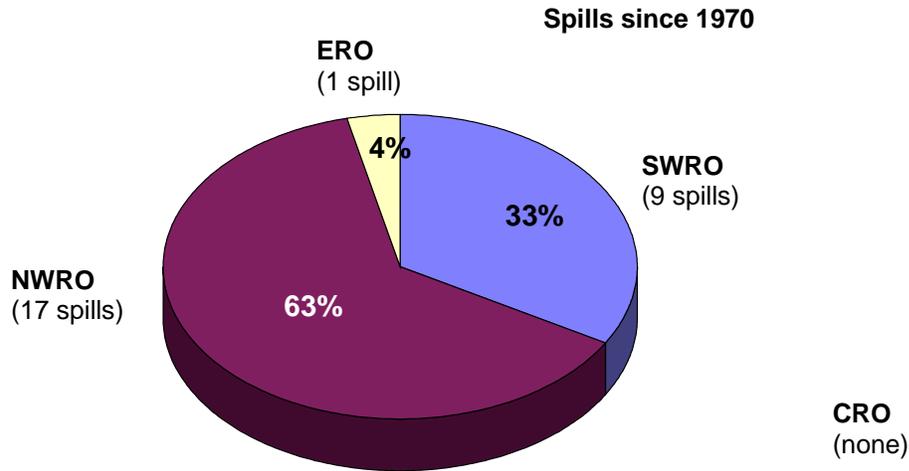
Figure 7 is a map of the state showing the locations of the major spills, and includes additional spills not analyzed in **Figures 2-10**. The additional spills are noted in **Appendix 4**. The map shows a clustering of large spills in Puget Sound and dispersed along the coast and Strait. **Appendix 4** provides a detailed list of these spills.

Figure 7: Location of Major Oil Spills Over 10,000 gallons

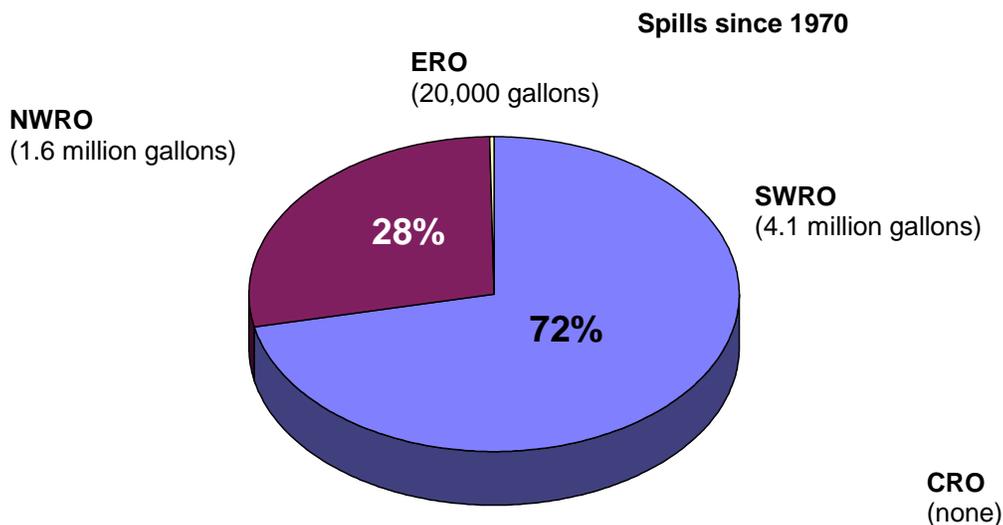


Figures 8 and 9 show the distribution of the number and volume of major oil spills in Ecology’s four regional offices. A map depicting the jurisdictional boundaries of each regional office is found in **Appendix 5**. More oil was lost from major spills in the agency’s southwest regional office than the three other regions combined. This is likely due to this region’s long marine shoreline which encompasses all of the state’s Pacific coast line, the Strait of Juan de Fuca and much of Puget Sound.

**Figure 8 — Major Oil Spills Over 10,000 Gallons:
Number of Spills by Regional Office**



**Figure 9 — Major Oil Spills Over 10,000 Gallons:
Volume of Spills by Regional Office**

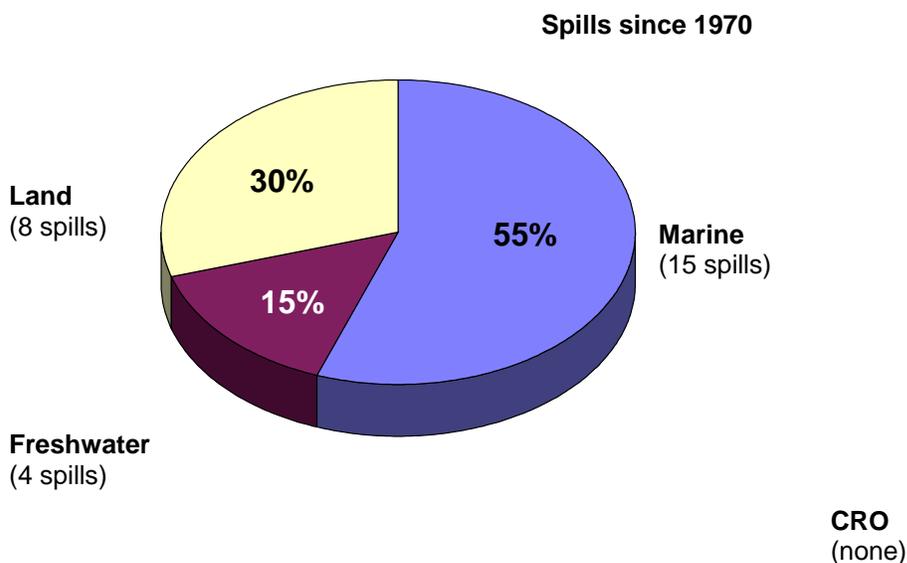


While the largest spills occurred in the SWRO, the northwest regional office (NWRO) actually received more spills greater than 10,000 gallons. This is due to the large population and activity levels centered in Seattle, Bremerton and, to a lesser extent, the northern refineries.

The data probably under represents the volume and number of spills in the Central (CRO) and Eastern (ERO) regions because surface transportation incidents were not included in the analysis. CRO has reported the greatest number of multi-thousand gallon petroleum product spills from tanker truck rollovers. Winter mountain pass conditions undoubtedly contribute to the number of truck accidents.

Figure 10 shows the distribution of spills by receiving environment. Slightly over half of the spills effected the marine environment. In 45 percent of the major spills, impacts were primarily limited to freshwater habits and the land. While land spills often have a lower degree of impact on the environment they can have serious consequences upon public health if they affect drinking water wells, and to public safety if gasoline fills buildings with explosive and/or toxic vapors.

**Figure 10 — Major Oil Spills Over 10,000 Gallons:
Number of Spills by Impacted Medium**



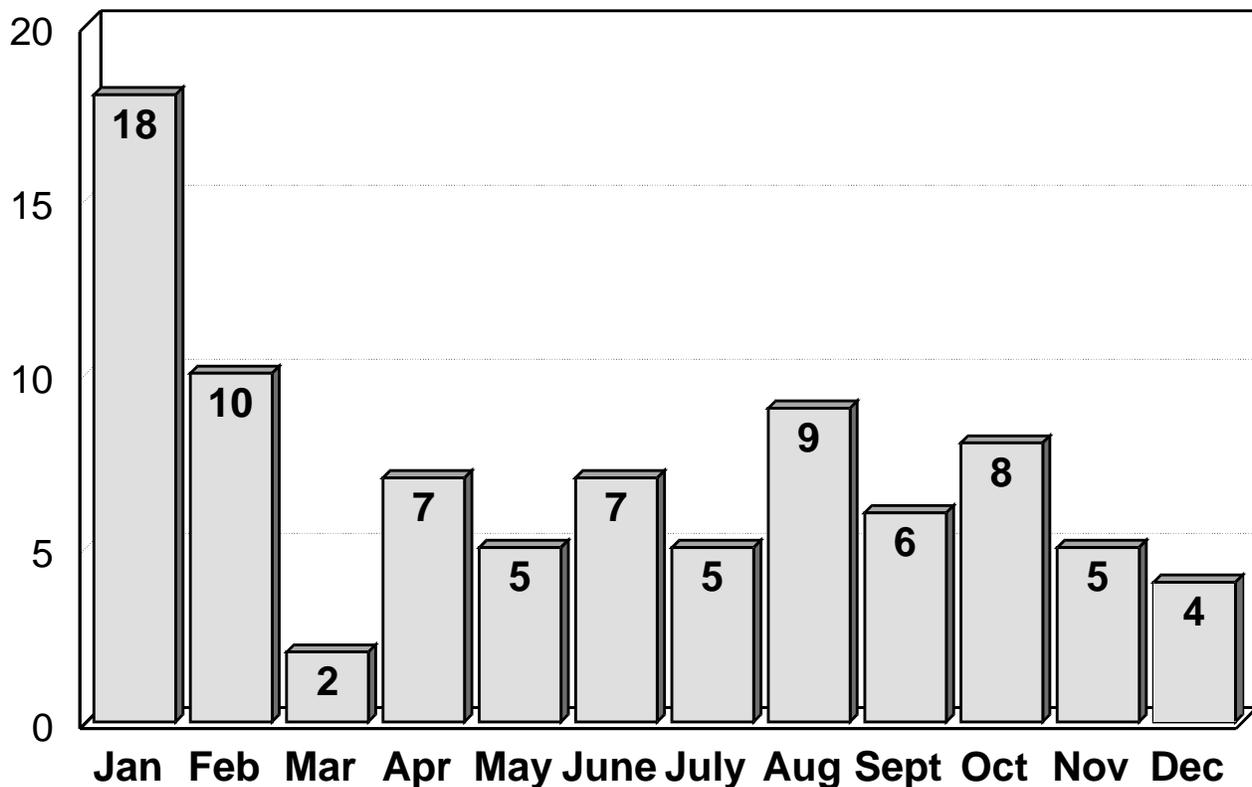
Chapter 4: Recent Trends in Oil Spills

This section evaluates information on spills between 25 and 10,000 gallons which have occurred between June 30, 1992, and July 1, 1996. The spills included in this data set include 86 vessel and facility spills and six pipeline spills where at least 25 gallons of oil reached water or at least 250 gallons was spilled on land. Truck and train transportation incidents are not included in this data.

Distribution of Recent Spills

Figure 11 compresses the most recent four years of facility and vessel spill data into a single 12 month bar chart. While we must be careful in not over interpreting the graph given the relatively few data points in each month, it does appear that spill frequency peaks during January. This phenomena has been observed by others and may be explained by probability of human error increasing during cold, dark climatic conditions and the holiday season.

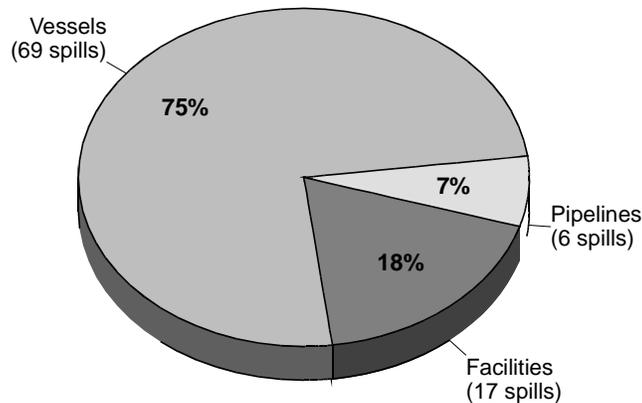
**Figure 11 — Distribution of Oil Spills Over Time:
Number of Vessel and Facility Spills by Month
(pipelines not included)**



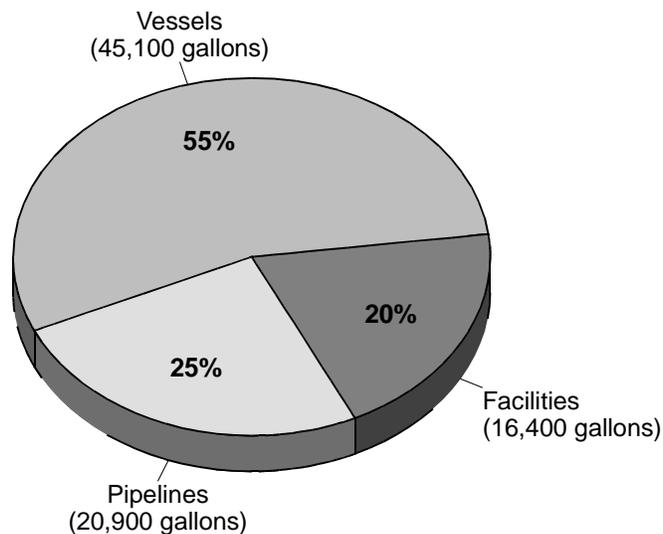
Source of Recent Spills

As shown in **Figures 12** and **13**, our information indicates that for these medium sized spills, the number of vessel incidents is significantly larger than the number of facility and pipeline incidents combined. The volume of oil spilled from the marine industry is also large compared with facilities and pipelines.

**Figure 12 — Recent Spills 25 to 10,000 Gallons:
Number of Oil Spills by Source**



**Figure 13 — Recent Spills 25 to 10,000 Gallons:
Volume of Oil Spilled by Source**

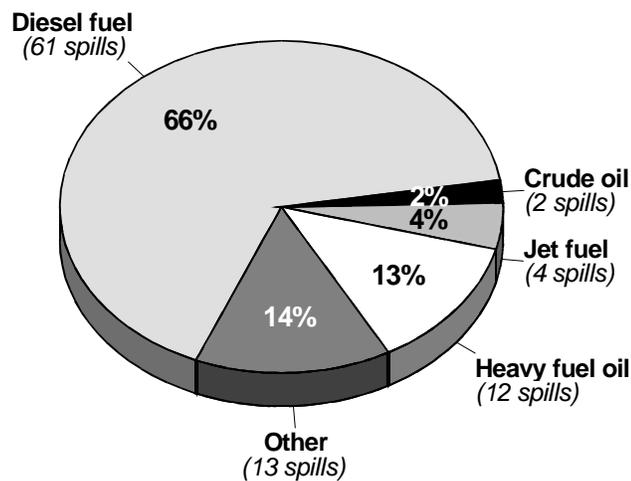


Overall, there are a relatively large number of medium sized vessel diesel fuel spills. However, another observation is that pipeline spills tend to be larger than vessel or facility spills (see **Figure 13**) for this data set. While pipelines account for only seven percent of the spill incidents, they resulted in 25 percent of the volume of spilled oil.

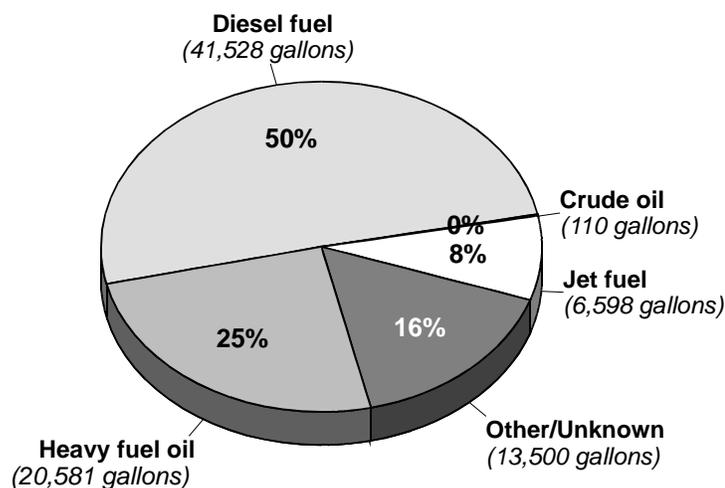
Types of Oil Spilled

Figures 14 and 15 describe the number and volume of oil spills by product type. In contrast to the major spills which were dominated by heavy fuels and crude oil, diesel spills dominate the number and volume of recent medium-sized spills. In this data set, crude oil spills are relatively infrequent while heavy fuel oil spills contributed to the total volume of spilled oil. In general the heavy fuel oil spills were larger than other incidents. This is due to the occurrence of relatively large vessel bunkering spills. Had rail and truck incidents also been included, they would have further increased the number and volume of diesel and gasoline spills.

**Figure 14 — Recent Spills 25 to 10,000 Gallons:
Number of Spills by Oil Type**



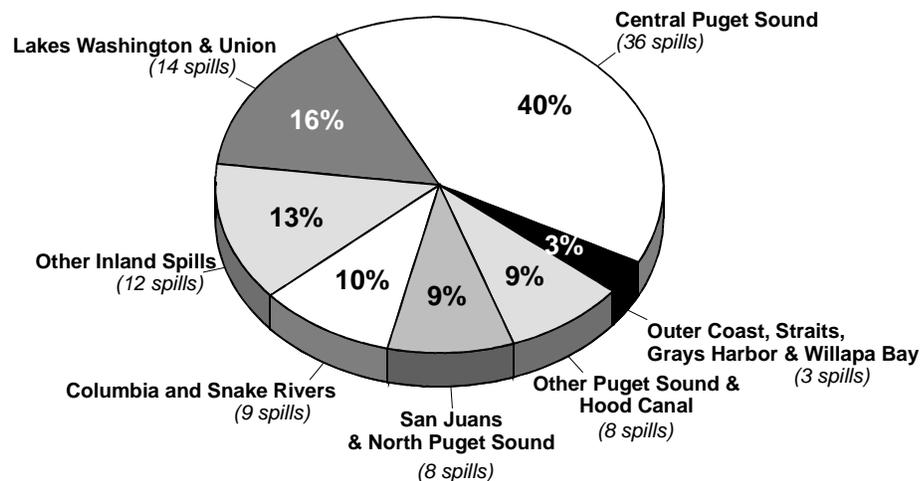
**Figure 15 — Recent Spills 25 to 10,000 Gallons:
Volume of Spills by Oil Type**



Geographical Distribution

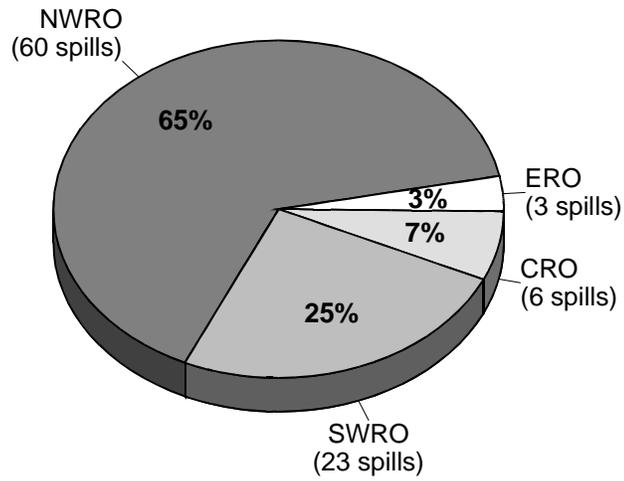
Figure 16 shows the distribution of spills among the Northwest Area Committee's Geographic Response Plans (GRP). More than half of the spills (50) occurred in the Central Puget Sound GRP and in Lakes Washington and Union. This area includes the state's largest population center, the Seattle/Tacoma metropolitan area. Other areas experiencing large numbers of spills included the San Juan Island/North Puget Sound area and the Columbia River.

**Figure 16— Recent Spills 25 to 10,000 Gallons:
Spill Distribution by GRP**

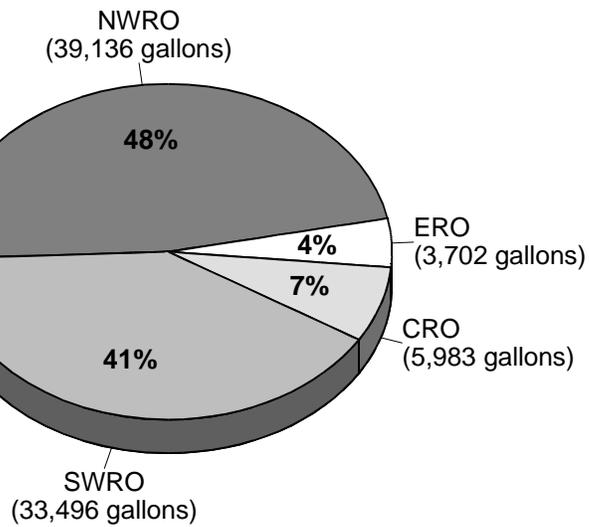


Figures 17 and 18 show the distribution of spills among Ecology's regional offices. The northwest regional office (NWRO) experienced more spills than any other region. However, the amount of oil spilled in the southwest region (SWRO) was approximately equal to that of the more populated northerly region. Interestingly, over both spill size distributions discussed in this report (spills greater than 10,000 gallons discussed in **Chapter 3** and the data in this chapter), spills in SWRO were larger than NWRO. This data again probably under represents the volume and number of spills in the central and eastern regions because surface transportation incidents (rail and truck) were not included in the analysis.

**Figure 17 — Recent Spills 25 to 10,000 Gallons:
Number of Spills by Ecology Region**

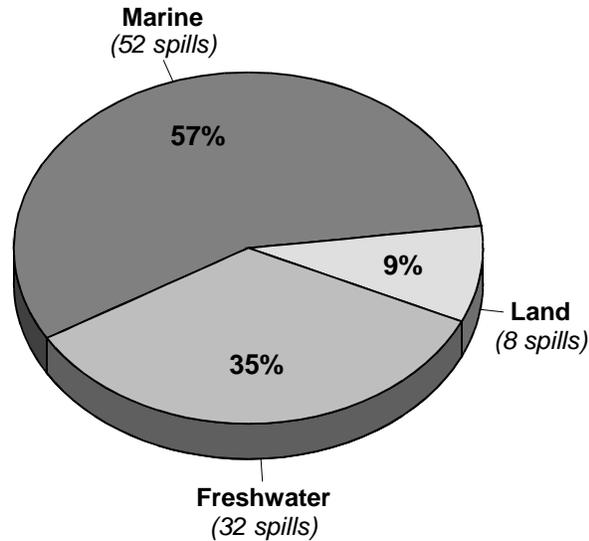


**Figure 18 — Recent Spills 25 to 10,000 Gallons:
Volume of Oil Spilled by Ecology Region**

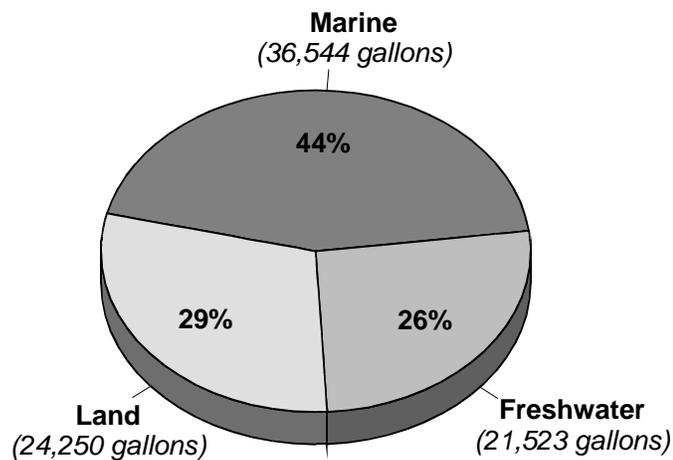


Figures 19 and 20 show that similar to the major spills discussed earlier in the report, recent medium-sized oil spills have had a significant impact on the marine waters compared with freshwater and land environments. However, primarily as a result of pipeline spills, land spills which represent only nine percent of the spills by number resulted in 29 percent of spills by volume.

**Figure 19 — Recent Spills 25 to 10,000 Gallons:
Number of Spills by Impacted Medium**



**Figure 20 — Recent Spills 25 to 10,000 Gallons:
Volume of Spills by Impacted Medium**



Comparison with Coast Guard Data

The U.S. Coast Guard maintains a national data base which can be used to evaluate both national and regional trends in oil spills. Spill data from 1991-1995 currently under review by the Coast Guard's District XIII staff in Seattle, seems to confirm the general trends shown in **Figure 13**. This data for the Puget Sound Marine Safety office indicates that 62 percent of the volume of oil spilled came from vessels, 34 percent came from facilities and four percent from another source.

National trends identified by the Coast Guard's "Marine Environmental Protection Performance Indicators" indicates that major and medium sized oil spills may be trending downward. This potential trend appears to be consistent with **Figure 2** of this report. Ecology will continue to work closely with our federal partners to track and report on trends as they emerge.

Cause of Recent Spills

The analysis and understanding of the causes of major spills is not as simple. There are a myriad of reasons for this, including:

- ◆ **Most major spills are difficult to analyze** given that they are often the result of a series of complex factors and conditions coming together at a particular moment in time. The factors may include both failures which are preventable, and conditions which are not within human control. Often a major incident would not have occurred if any one of the factors or conditions had been absent. Therefore, it is often difficult to boil an incident down to a single primary/root cause with identified contributing factors.
- ◆ **There is a lack of a consistent framework** for systematically analyzing and categorizing incidents. This is a problem both nationally and in Washington State.
- ◆ **There is lack of consistently collected reliable information** on spill causes. This is partially due to the scarcity of highly trained staff resources in the investigating agencies, the reluctance of industry to fully disclose information for liability reasons and the lack of agency funding to hire independent experts to conduct professional investigations.
- ◆ **There is also a reluctance on the part of many investigators** to directly place blame because of liability concerns, sympathy for an individual or organization who has already been affected by an incident, and concern that an employee who may have contributed to an incident may lose their livelihood. The result is that some investigations identify the cause of an incident as equipment failure or a natural event, even when an easily preventable human error (individual or organizational) occurred.

However, there is a consensus that most major spills are caused by some form of human error and are therefore preventable. In order to provide additional insight into the types of human error, this report further distinguishes between individual human factors and management/organizational factors. The terms used in this report are defined as follows:

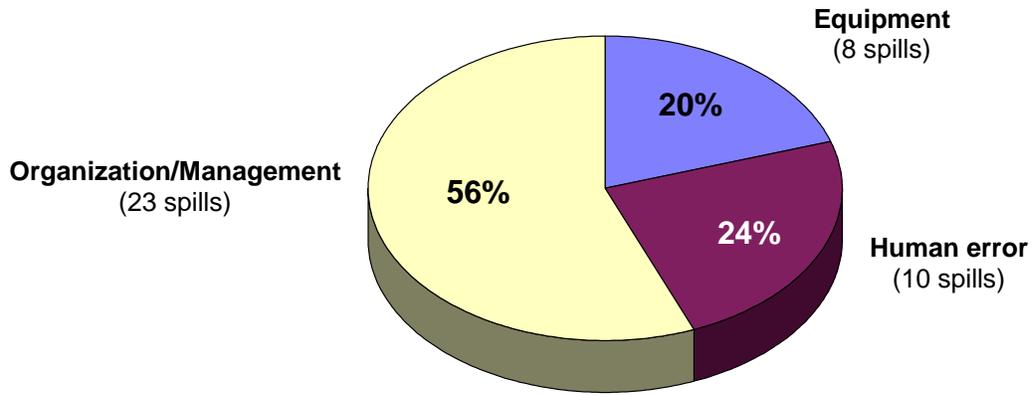
- ◆ **Management/Organization** — The failure of an organization to provide the necessary policies, procedures, equipment, personnel, supervision, training or time to safely design and operate a system which could potentially cause a spill. In order to prevent spills, an organization may be expected to go beyond currently accepted industry practices.
- ◆ **Human Factor** — The diminished ability (over which the organization has relatively little control) of an individual to safely complete a task. Examples include poor communication, drugs/alcohol, improper equipment use, inaccurate computation, inattention, procedural error, complacency, not following training procedures, fatigue, illness or sabotage/intentional.
- ◆ **Equipment** — A mechanical, structural or electrical failure not attributable to a human error-related design, material specification, manufacture/construction, installation, operation or maintenance deficiency. An example which would not qualify for this category as an “equipment failure” would be a failure from normal wear and tear as a result of lack of maintenance. This would be either a management/organization or human factor caused spill.
- ◆ **External** — Natural phenomenon such as earthquakes, floods, storms, tsunamis, fog, ice, lightning, tidal conditions, sea state and landslides which occur with a magnitude outside of reasonably anticipated design or operating limits. An example of an external cause could be any act caused by Mother Nature.

For the reasons stated earlier, Ecology’s data on spill cause is somewhat limited. Ecology is working to improve the systems for collecting, analyzing and maintaining spill cause data. Current initiatives include the development of an investigator training curriculum, hiring independent experts on major spills and the States/BC Oil Spill Task Force’s project to provide a consistent methodology for collecting and sharing spill data on the entire West Coast.

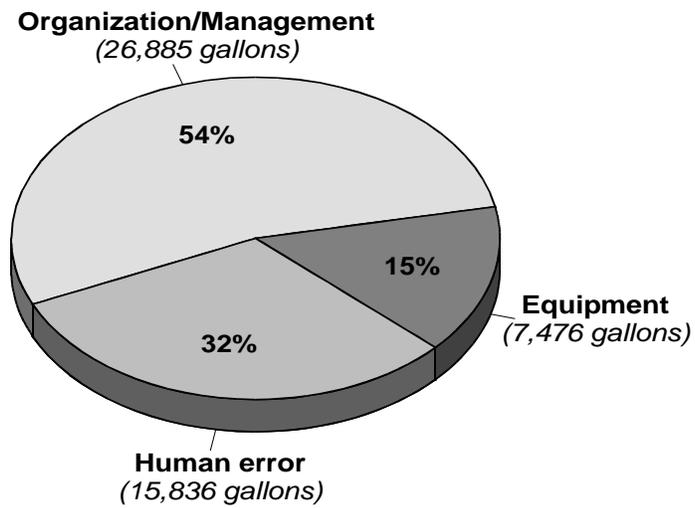
Figures 21 and 22 show the distribution of spill causes for 41 recent spills in Washington (Note: incident cause was not identified in 51 of the other spills analyzed in this section). Based on the limited information available to Ecology, it appears that "human error" at the levels of the organization and individual predominate. Of the four cause definitions, organizational failure is the primary cause of recent spills in terms of both number of incidents and total volume of oil spilled. Human factors are the second most predominant cause of these spills.

The conclusion that human error is the primary cause of most spills is supported by findings by the Washington State Office of Marine Safety, the California Lands Commission, the U.S. Coast Guard, the Alaska Department of Environmental Conservation and most industry analysts. The definitions used in this report are identical with those being developed by the States/British Columbia Task Force for the purpose of consistently collecting cause data in the future on the West Coast.

**Figure 21 — Recent Spills 25 to 10,000 Gallons:
Number of Spills by Cause**



**Figure 22 — Recent Spills 25 to 10,000 Gallons:
Volume of Oil Spilled by Cause**



Chapter 5: Near Miss Incidents

This report's **Appendix 1: Significant Vessel Casualties and Near Miss Incidents** is a list of important vessel-related incidents where there was either a major system failure or actual external damage to a vessel that occurred between 1984-96. Those incidents which did not result in the release of oil are considered to be close calls. When they are properly investigated, as much can be learned about spill prevention from these incidents as from actual spills. The state Office of Marine Safety (OMS) is currently working with other stakeholders to put a system in place which would collect information on more of these vessel incidents.

If these collisions, groundings, allisions (collision with a fixed object) and losses of power were plotted on the map outlining Washington's major oil spills (**Figure 7**), they would largely parallel the locations where major spills have actually occurred.

Given the difficulty in agreeing on what constitutes a "near miss," the lack of incentives for reporting these incidents and the liability concerns of facility owners, it would be difficult to establish a reporting system for major non-spill incidents at marine facilities and transmission pipelines. However, Ecology will continue to follow progress by OMS and the marine industry to determine if similar discussions should be initiated with the industry segments which Ecology regulates.

Chapter 6: Lessons Learned From Recent Pipeline Spills

Over the last few years pipeline spills have occurred nationally with a frequency and environmental consequence that have raised significant concerns from the National Transportation Safety Board and others. The potential for similar major oil spills exists in Washington State. For example, two past pipeline spills involved the release of 460,000 and 168,000 gallons. These incidents show how much oil can be spilled by pipelines before the leak is detected, the system is shut down and residual drain out is controlled.

In Washington State, the major oil transportation pipelines spill only a very small portion of the products they transport. However, because of the large amount of oil which can be spilled before a spill incident is identified and controlled, they have the potential to cause serious environmental damage. Spill events during 1996 have demonstrated the need for Ecology to review current spill prevention measures for the state's major oil transportation pipelines. During 1996, the following incidents occurred:

- ◆ **On March 23, 1996, an estimated 1,560 gallons of diesel fuel** spilled from the Olympic Pipe Line into a tributary to Spencer Creek in Cowlitz County. The spill was caused by damage to the pipeline as a result of ground slumping in unstable soil in the area surrounding the pipeline.
- ◆ **On June 16, 1996, at least 1,000 gallons of gasoline and diesel fuel spilled** from a small crack in the Olympic Pipe Line into an unnamed slough near Everett. The cause of the spill may have been due to construction damage during original installation in 1972.
- ◆ **On Dec. 6, 1996, approximately 49,000 gallons of unleaded gasoline spilled** at the GATX oil storage facility on Harbor Island in Seattle. The spill resulted from a pipeline coupling failure at the plant during a product transfer from the Olympic Pipe Line. The specific cause of the spill is still under investigation and has not been determined.

It is often difficult to determine the quantity of oil lost during pipeline spills. For instance, the two Olympic Pipe Line spills went undetected for a significant period of time while oil entered soils and state waters. Ecology will continue to review the cause of these and other similar events with industry to gain a better understanding of how these spills can be prevented. This review is particularly important at this time, given the proposal for a major cross-Cascades petroleum pipeline. The state has a responsibility to assure that any new or repaired pipeline sections are constructed and operated in an optimal manner to minimize the opportunity for spills.

As a result of recent pipeline spills, Ecology is evaluating the need for industry to put in place additional protection measures. However, at this time Ecology does not have resources to institute a transmission pipeline spill prevention effort.

Conclusions

We have reached a number of conclusions after reviewing the information presented in this report. These conclusions were not based on a statistical analysis but were developed by inference after evaluating the data. The conclusions presented below are arranged by category, not priority.

Data Collection and Analysis

- ◆ **Resources needed for data collection:** Readily accessible historical data on major spills prior to the mid-1980s is incomplete. Ecology will continue to improve the collection of this information in order to better analyze the cause of significant oil spills and help the agency target its prevention efforts. This needed improvement will require Ecology to continue current efforts to improve investigator training and commit additional resources to information management. There is also a need to improve truck and rail data in particular, given the gap in this report.

Important Trends in Spills

- ◆ **Human error causes most spills:** Ecology's spill cause data indicates that most recent spills (about 80 percent) were the result of some type of human factor and were, therefore, preventable. It also appears that organization/management is responsible for significantly more incidents than the failure of an individual. These conclusions are consistent with the findings of other researchers at the national level and have important implications for spill prevention.
- ◆ **Spills occur most frequently in January:** During the last four years, the annual incidence of significant oil spills was highest during January. While we need to better understand the reasons for this seasonal influx, one factor suggests the importance of addressing the human factors component in oil spills.
- ◆ **Spills over 10,000 gallons are source of most oil:** The overall quantity of oil spilled is dominated over time by large spills greater than 10,000 gallons. The state should continue to target prevention activities for potential major spill sources. However, this report did not evaluate non-point source oil inputs to the environment, which are seldom reported to environmental agencies and can add up to large volumes. Non-point sources include leaking motor vehicle crank cases, parking lot run-off, improper disposal of used motor oil and other similar sources.
- ◆ **"Black" oil is a serious threat:** Crude and heavy fuel oils have constituted about 82 percent of the total oil released from spills over 10,000 gallons. These forms of "black" oil are among the most persistent and environmentally damaging types of oil and are very difficult to clean up. Future spill prevention efforts should continue to address vessel

spills which were responsible for about 59 percent of the total volume of oil lost from major spills and many of the incidents involving black oil.

- ◆ **Biggest risk is associated with marine transportation corridors:** The outer coast, the Strait of Juan de Fuca and the vicinity surrounding the state's major refineries are the areas at greatest risk of major spills.
- ◆ **Transmission pipelines present significant risk:** During the last four years, the volume of oil released per spill from pipeline incidents was relatively large compared with routine vessel and facility spills. With the continued occurrence of these spills, industry and Ecology should place additional emphasis on prevention of spills from major transmission pipelines.

Effectiveness of Existing Spill Prevention Measures

- ◆ **Big spill incidents may be dropping:** While it is difficult to clearly attribute the long-term trend in spills over 10,000 gallons to any specific measure, it does appear that since 1983 the number and volume of major spills in Washington has gone down (see **Figure 2**). Furthermore, this apparent decline may be occurring more rapidly than national rates. If this is true, it has good implications for the effectiveness of the state/federal and industry spill prevention partnerships which have been developed in Washington since the passage of the state's spill prevention legislation in 1991. However, the state must guard against complacency and losing focus on spill prevention.
- ◆ **Land-based spills continue to pose risk:** Washington has information on 15 petroleum oil spills of over 100,000 gallons since 1964. These major spills have included tanker and barge accidents, refinery accidents and major transmission pipeline releases. While vessel spills may present the greatest risk for catastrophic spills, refinery and transmission pipeline operations have resulted in four of the last five spills over 10,000 gallons. These facilities should continue to be the primary focus of Ecology's spill prevention efforts.

State Spill Policy

- ◆ **Effect of spills on state legislation:** As indicated in **Appendix 2**, there is a strong connection between the incidence of oil spills and subsequent legislative expansion of state responsibilities for spill prevention and response. We can expect that the future occurrence of major spills will trigger additional public expectations for improved spill prevention measures.
- ◆ **Washington has a unique energy policy setting:** Washington State has not depended solely on federal rules for the protection of its natural resources, but has established its own stringent oil spill prevention and response program. The primary factors which have influenced state policy in this area (other than actual spill events) include: the high sensitivity and value of Washington's aquatic resources; the large volume of Pacific rim trade; and the state's reliance on external crude oil resources.

- ◆ **Petroleum products exported from Washington are subject to a tax credit:**
Washington State refines large volumes of petroleum products. A significant portion of the refined products are exported to Oregon and California. While our state is exposed to the spill risks associated with the importation, processing, storage and export of those products, Washington's spill prevention and response programs do not receive tax revenue from petroleum which is exported.

Appendices

Appendix 1 — Significant Vessel Casualties and Near Misses

Appendix 2 — Major Oil Spills and Related Legislative Action

Appendix 3 — Selected Spills in Washington State

Appendix 4 — Legend for Map: Spills Over 10,000 Gallons

Appendix 5 — Ecology's Regional Offices Map

Appendix 1 — Significant Vessel Casualties and Near Misses

- ◆ **August 12, 1996, Grounding** — A loaded grain ship, the *Ossolineum* grounded along the banks of the Columbia river. The vessel, which was outbound, was carrying 350,000 gallons of fuel in its tanks when it ran aground upstream from three wildlife refuges and estuaries. Luckily no oil was spilled.
- ◆ **July 11, 1996, Loss of Power** — The oil tanker *Kenai* lost power off Port Angeles. The tanker was headed toward Valdez when it stopped at Port Angeles to have its radar fixed and to refuel for the voyage. Fortunately, an escort tug was near by when the vessel lost power and was able to bring the vessel back to Port Angeles without incident.
- ◆ **July 6 1996, Shipboard Fire** — The cruise ship *Golden Princess* was headed to Vancouver, British Columbia, when a fire in the engine room caused the engines to shut down. The vessel also lost electrical power. A tug boat arrived on scene in three hours to tow the vessel to Vancouver for repairs. The vessel was carrying over 600,000 gallons of fuel when it lost power.
- ◆ **October 1994, Grounding** — The empty tanker *Keystone Canyon* broke all of her mooring lines in high winds while moored in Astoria, Oregon. The ship drifted across the Columbia River and struck the Astoria-Megler Highway Bridge. Fortunately, damage to the ship and the bridge was minimal. No oil was spilled although an empty tank was breached. A combination of weather conditions and lack of procedures lead to the grounding.
- ◆ **July 1994, Loss of power** — The 32,671 bulk carrier *Verbier* was outbound from Vancouver, British Columbia, when it lost power 2.5 miles from shore in the Strait of Juan de Fuca. After an unsuccessful attempt to be towed to port by a small tug, a second larger tug was dispatched. After several hours of towing, the tow line parted. The tug made-up again, and successfully towed the vessel to Port Angeles with the final assistance of tow other tugs. Lack of proper owner and operator oversight and support contributed to the accident.
- ◆ **July 1994, Collision** — The Chinese bulk freighter *Tian Tan Hai* collided with the fully laden tank barge *Cascades* approximately 30 miles west of the Columbia River entrance. The *Cascades* was being towed by the tug *Fairwind* and was carrying 2.4 million gallons of oil. Fortunately no oil was spilled because the collision did not rupture any cargo tanks on the barge or fuel tanks on the freighter. The barge was double-hulled. Lack of communication and adherence to regulations and policy contributed to this collision.
- ◆ **November 1993, Explosion** — The tanker *Sea River Philadelphia* suffered an explosion in her Inert Gas compartment while moored in Anacortes. Fortunately no one was injured and no oil was spilled. Inadequate maintenance procedures and possible inadequate design contributed to the explosion.

- ◆ **July 1993, Poor Vessel Condition** — The tanker *Altair* was boarded and briefly detained in Victoria, British Columbia, by the Canadian Coast Guard. The ship was in poor condition. Two months later, the *Altair* blew up and sank in the South China Sea.
- ◆ **June 1991, Grounding** — The laden tanker *ARCO Texas* ran aground at Ediz Hook in Port Angeles, Washington. No release of oil occurred.
- ◆ **September 1989, Loss of power** — The tanker *Exxon San Francisco* lost power while outbound in the Strait of Juan de Fuca. The vessel returned to Port Angeles without further problems.
- ◆ **April 1989, Loss of power** — The tanker *Exxon Philadelphia* lost power and was adrift off the mouth of the Strait of Juan de Fuca with a load of 23 million gallons of Alaska crude oil. Approximately five hours later, a tug reached the tanker and towed the ship to Port Angeles.
- ◆ **April 1988, Grounding** — The tanker *Matsukaze* grounded at Crescent Bay west of Port Angeles causing extensive damage to the vessel but no loss of product.

Appendix 2 — Major Oil Spills and Related Legislative Action

1964

- ◆ United Transportation Barge, Grays Harbor Co. (3/64) — 1,200,000 gallons diesel fuel

1969

- ◆ Extensive oil spill legislation was passed in 1969-1972

1971

- ◆ United Transportation Barge, Skagit Co. (4/71) — 230,000 gallons of diesel/gasoline

1972

- ◆ *General M.C. Meiggs* (U.S. Navy), Clallam Co. (1/72) — 2,300,000 gallons of fuel oil

1973

- ◆ Trans Mountain Pipeline, Whatcom Co. (1/73) — 460,000 gallons of crude oil

1983

- ◆ Olympic Pipe Line Co., Allen Pump Station (9/83) — 168,000 gallons of diesel fuel

1984

- ◆ *Tanker SS Mobil Oil*, Columbia River (3/84) — 200,000 gallons of fuel oil

1985

- ◆ Olympic Pipe Line, King Co. (11/85) — 34,000 gallons of jet fuel
- ◆ *ARCO Anchorage*, Port Angeles (12/85) — 239,000 gallons of crude oil

1986

- ◆ Concurrent Legislative Resolution 19 established an oil spill advisory committee
- ◆ Olympic Pipe Line, King Co. (5/86) — 70,000 gallons of oil

1988

- ◆ *Barge MCN#5* (Olympic Tug & Barge), Skagit Co. (1/88) — 70,000 gallons of heavy oil.
- ◆ *Nestucca Barge* (Sause Towing), Grays Harbor Co. (12/88) — 231,000 gallons of fuel oil.

1989

- ◆ HB 2242 — Established financial responsibility requirements for vessels.
- ◆ SB 6701 — Washington State Maritime Commission (WSMC) established.
- ◆ HB 1853 & 1854 — Natural Resource Damage Assessment methodology.
- ◆ *Exxon Valdez* grounding, AK (3/89) — 11,000,000 gallons of crude oil. This spill resulted in significant legislative changes in Washington, as well as other U.S. states and Canada.

1990

- ◆ HB 2494 — Broad spill preparedness & contingency planning legislation
- ◆ HB 6528 — Pilotage legislation
- ◆ OPA 90 — Passage of the Federal Oil Pollution Control Act of 1990
- ◆ Navy Supply Depot, Kitsap Co. (2/90) — 70,000 gallons of diesel fuel
- ◆ Texaco, Skagit Co. (3/90) — 130,000 gallons of diesel fuel
- ◆ Chevron Richmond Beach, King Co. (8/90) — 176,000 gallons of asphalt
- ◆ PNW Terminals, Pierce Co. (11/90) — 200,000 gallons of tallow

1991

- ◆ HB 1027 — Broad legislation with a spill prevention focus
- ◆ US Oil Tacoma, Tacoma (1/91) — 600,000 gallons of crude oil
- ◆ Texaco Refinery, Anacortes (2/91) — 210,000 gallons of crude oil
- ◆ *Tenyo Maru* (COSCO Shipping), Canadian waters at entrance to Strait of Juan de Fuca (7/91) — 100,000 gallons of diesel & heavy oil

1992

- ◆ HB 2389 — Amendments to 1991 legislation
- ◆ Chevron Pipeline, Lincoln Co. (11/92) — 20,000 gallons of jet fuel

1993

- ◆ HB 1144 — Established OMS vessel inspection program
- ◆ US Oil Refinery, Tacoma (10/93) — 264,000 gallons of crude oil
- ◆ *M/V Nosac Forest* (Barber International), Tacoma (4/93) — 6,260 gallons of fuel oil
- ◆ *M/V Central* (Azuero Shipping), Columbia River (6/93) — 3,000 gallons of fuel oil

1994

- ◆ ESHB 1107 — Marine Oversight Board Abolished
- ◆ HB 1407 — Washington State Maritime Commission privatized
- ◆ Crowley Barge 101, Rosario Strait (12/94) - 26,900 gallons diesel of fuel
- ◆ An Ping (Shanghi Hai Xing Shipping), Columbia River (1/94) - 2,771 gallons of fuel oil

1995

- ◆ ESHB 2080 — Merged OMS with Ecology, legislation was struck down by superior court action

1996

- ◆ Initiative 188 fails — Bans off-shore drilling; eliminates OMS merger; adjusts spill funding
- ◆ GATX, Harbor Island Seattle (12/96) — 49,000 gallons of unleaded gasoline

Appendix 3 — Selected Spills in Washington State (Arranged by date)

Incident Date	Incident Name	Total Quantity Spilled (Gallons)	Product Type
03/10/1964	V-UNITED TRANSPORTATION BARGE	1,200,000	DIESEL FUEL
04/26/1971	V-UNITED TRANSPORTATION BARGE # U	230,000	DIESEL FUEL
01/01/1972	V-GENERAL M.C. MEIGGS	2,300,000	HEAVY FUEL OIL
06/04/1972	V-WORLD BOND	21,000	CRUDE OIL
01/10/1973	P-TRANS-MOUNTAIN PIPELINE	460,000	CRUDE OIL
01/01/1978	V-BARGE	100,000	DIESEL FUEL
12/31/1980	F-WHATCOM CREEK PENTA SPILL	20,000	OTHER OIL
05/01/1981	V-ST. ANTHONY	2,000	CRUDE OIL
09/23/1983	P-OLYMPIC PIPELINE	168,000	DIESEL FUEL
03/20/1984	V-SS MOBIL OIL TANKER SPILL	200,000	HEAVY FUEL OIL
11/28/1985	P-OLYMPIC PIPELINE	34,000	JET FUEL
12/20/1985	F-CHEVRON BULK STORAGE TERMINAL	1,440	HEAVY FUEL OIL
12/21/1985	V-ARCO ANCHORAGE	239,000	CRUDE OIL
01/31/1988	V-MCN#5 BARGE	70,000	HEAVY FUEL OIL
12/23/1988	V-NESTUCCA BARGE	231,000	HEAVY FUEL OIL
02/25/1990	F-MANCHESTER NAVAL SUPPLY DEPOT	70,000	DIESEL FUEL
03/27/1990	F-TEXACO REFINERY	130,000	DIESEL FUEL
07/14/1990	F-PNW TERMINALS	30,000	OIL OTHER, TALLOW
08/10/1990	F-CHEVRON RICHMOND BEACH PARK	176,000	OTHER OIL
11/17/1990	F-PNW TERMINALS TALLOW SPILL	200,000	OIL OTHER, TALLOW
01/06/1991	F-US OIL AND REFINING COMPANY	600,000	CRUDE OIL
01/15/1991	P-TRANS MOUNTAIN	3,025	OTHER OIL
02/22/1991	F-TEXACO REFINERY	210,000	CRUDE OIL
02/28/1991	V-HANJIN CONTAINER	210	DIESEL FUEL
07/22/1991	V-TENYO MARU	100,000	HEAVY FUEL OIL AND DIESEL
12/11/1991	P-TRANS MOUNTAIN PIPELINE	3,528	CRUDE OIL
03/07/1992	P-TRANS MOUNTAIN PIPELINE	2,100	CRUDE OIL
06/30/1992	V-SUN ROSE	850	HEAVY FUEL OIL
07/04/1992	T-TWIN CITY FOODS	100	DIESEL FUEL
07/17/1992	V-SAMSON TUG	70	GASOLINE
08/22/1992	F-WASHINGTON WATER POWER	370	DIESEL FUEL
10/11/1992	V-ARCTIC ALASKA	30	DIESEL FUEL
11/03/1992	P-CHEVRON PIPELINE	20,000	JET FUEL
12/15/1992	V-ARCTIC ALASKA FISHERIES	500	DIESEL FUEL
01/07/1993	V-ARCTIC ALASKA FISHERIES	800	DIESEL FUEL
03/02/1993	V-F/V ROVER	495	DIESEL/LUBE OIL
04/15/1993	V-USS CAMDEN	5,400	HEAVY FUEL OIL
04/25/1993	F-PORT OF PORT TOWNSEND	900	DIESEL FUEL
04/25/1993	V-NOSAC FOREST	6,260	HEAVY FUEL OIL
05/04/1993	V-DUTCHIE C	60	DIESEL FUEL
06/01/1993	F-PENINSULA FUEL	35	DIESEL FUEL
06/03/1993	V-M/V CENTRAL	3,000	HEAVY FUEL OIL
08/03/1993	V-GREAT PACIFIC	100	DIESEL FUEL
08/05/1993	V-F/V EXCELLENCE	2,995	DIESEL FUEL
08/05/1993	V-ARCTIC ALASKA	50	DIESEL FUEL
08/08/1993	PACIFIC N. OIL	80	HEAVY FUEL OIL
08/13/1993	V-F/V RADIO	360	LUBE OIL
09/06/1993	V-STORMY SEA	30	DIESEL FUEL
10/14/1993	V-TIDEWATER SPILL	3,295	DIESEL FUEL
10/15/1993	V-F/V ANELA	50	DIESEL FUEL
10/18/1993	F-US OIL	264,000	CRUDE OIL
11/23/1993	V-WA D.O.C.	25	DIESEL FUEL
11/25/1993	F-U.S. NAVY	560	DIESEL FUEL
12/22/1993	V-USS NIMITZ	308	JET FUEL
01/07/1994	V-ISLAND TUG	40	DIESEL FUEL
01/10/1994	V-AN PING 6	2,771	HEAVY FUEL OIL
01/25/1994	F-FOSS MARITIME	300	DIESEL FUEL
01/30/1994	V-F/V TRIAL	40	DIESEL FUEL
02/01/1994	V-USS CAMDEN	30	DIESEL FUEL
02/15/1994	V-TUG DAUB	483	DIESEL FUEL
02/15/1994	F-NORTHWEST ENVIRO SERVICES	5,500	DIESEL FUEL

Incident Date	Incident Name	Total Quantity Spilled (Gallons)	Product Type
05/10/1994	V-GOLDEN DAWN	85	DIESEL FUEL
06/06/1994	V-USS SACRAMENTO	200	DIESEL FUEL
06/14/1994	V-MATTHEW	50	GASOLINE
06/29/1994	F-L.U. DRYDOCK	1,000	DIESEL FUEL
07/18/1994	V-JOE C	700	DIESEL FUEL
08/09/1994	V-USS ARCADIA	325	DIESEL FUEL
09/11/1994	V-OMAR	200	LUBE OIL
09/22/1994	V-J. MICHELLE	100	HYDRAULIC OIL
10/15/1994	V-TYSON SEAFOOD	25	DIESEL FUEL
10/15/1994	V-BRENEVA	500	DIESEL FUEL
10/27/1994	V-USS SACREMENTO	3,700	JET FUEL
11/05/1994	V-F/V SITKOF	100	DIESEL FUEL
11/13/1994	V-NOAA	80	DIESEL FUEL
12/17/1994	V- JUPITER	50	DIESEL FUEL
12/31/1994	V-CROWLEY BARGE 101	26,900	DIESEL FUEL
01/11/1995	F-BAINTER RANCH	300	DIESEL FUEL
01/20/1995	V-POLAR CUB	200	DIESEL FUEL
01/25/1995	V-U.S. NAVY	2,520	JET FUEL
01/25/1995	F-JOHNSON CONTROL	50	HYDRAULIC OIL
01/26/1995	V-TRIPOLI	30	DIESEL FUEL
01/27/1995	F-WEYERHAEUSER, LONGVIEW BUNKER SP	1,000	HEAVY FUEL OIL
01/30/1995	V-DAPHNE	400	DIESEL FUEL
02/10/1995	V-IMCO CONST.	37	DIESEL FUEL
02/17/1995	V-NX PRESSION	250	DIESEL FUEL
02/20/1995	TACOMA SCHOOL DISTRICT	50	HEAVY FUEL OIL
02/23/1995	V-CATHERINE	200	DIESEL FUEL
02/26/1995	V-USS-NIMITZ	100	DIESEL FUEL
04/22/1995	V-MARTINIQUE	55	DIESEL FUEL
05/24/1995	V-A. KOLLONTOY	100	DIESEL FUEL
06/02/1995	V-N. VICTOR	30	DIESEL FUEL
07/16/1995	V-BETTY JEAN	25	DIESEL FUEL
07/18/1995	V-RYBAKCAUTOKY	100	DIESEL FUEL
08/09/1995	V-GASTELLO	50	HEAVY FUEL OIL
08/13/1995	F-DISTINCTIVE PROPERTIES	30	DIESEL FUEL
08/19/1995	V-PELICAN	40	GASOLINE
09/14/1995	V-DAVID R. RAY	50	DIESEL FUEL
09/14/1995	V-SEA NEST	75	DIESEL FUEL
09/29/1995	V-DIANE	50	DIESEL FUEL
10/21/1995	F-SR 509 'D' STREET POND	50	HEAVY FUEL OIL
10/31/1995	F-TOSCO	85	CRUDE OIL
11/12/1995	V-OMAR	120	DIESEL FUEL
01/04/1996	V-MUSKRAT	30	HYDRAULIC OIL
01/05/1996	V-COMMODORE	241	DIESEL FUEL
01/06/1996	F-U.S. OIL	25	CRUDE OIL
01/14/1996	F-SNOQUALMIE PASS OIL TANK	200	HOME HEATING FUEL
02/06/1996	V-TANKER NEPTUNE	378	DIESEL FUEL
02/21/1996	V-REBEL	50	DIESEL FUEL
02/28/1996	V-BERNERT BARGE	308	DIESEL FUEL
03/23/1996	P-OLYMPIC PIPELINE	1,561	DIESEL FUEL
03/25/1996	V-NORTHERN LADY	450	DIESEL FUEL
04/16/1996	V-POLAR QUEEN	37	DIESEL FUEL
04/20/1996	T-WIND RIVER TRAIN DERAILMENT	65,000	DIESEL FUEL
04/21/1996	F-ROCK ISLAND SPILL	700	OTHER OIL
04/22/1996	V-ISSWAT	35	DIESEL FUEL
05/06/1996	F-WAPATO RANCH	4,000	HOME HEATING FUEL
05/15/1996	V-EXPEDITIONS 3	100	DIESEL FUEL
06/11/1996	V-U.S. NAVY	70	JET FUEL
06/17/1996	P-OLYMPIC PIPELINE	1,500	DIESEL FUEL
12/06/1996	F-GATX HARBOR ISLAND	49,000	GASOLINE, UNLEADED

This table lists all spills analyzed in this report. Also included are additional spills which included non-petroleum products or for which agency data is incomplete.

Appendix 4 — Legend for Map: Spills Over 10,000 Gallons (Ranked by spill size)

Incident Date	Incident Name	Total Quantity Spilled (Gallons)	Product Type	
1	01/01/1972	V-GENERAL M.C. MEIGGS	2,300,000	HEAVY FUEL OIL
2	03/10/1964	V-UNITED TRANSPORTATION BARGE*	1,200,000	DIESEL FUEL
3	01/06/1991	F-US OIL AND REFINING COMPANY	600,000	CRUDE OIL
4	01/10/1973	P-TRANS-MOUNTAIN PIPELINE	460,000	CRUDE OIL
5	10/18/1993	F-US OIL	264,000	CRUDE OIL
6	12/21/1985	V-ARCO ANCHORAGE	239,000	CRUDE OIL
7	12/23/1988	V-NESTUCCA BARGE	231,000	HEAVY FUEL OIL
8	04/26/1971	V-UNITED TRANSPORTATION BARGE # U	230,000	DIESEL FUEL
9	02/22/1991	F-TEXACO REFINERY	210,000	CRUDE OIL
10	01/17/1990	F-PNW TERMINALS TALLOW SPILL**	200,000	OIL OTHER, TALLOW
11	03/20/1984	V-SS MOBIL OIL TANKER SPILL	200,000	HEAVY FUEL OIL
12	08/10/1990	F-CHEVRON RICHMOND BEACH PARK	176,000	OTHER OIL
13	09/23/1983	P-OLYMPIC PIPELINE	168,000	DIESEL FUEL
14	03/27/1990	F-TEXACO REFINERY	130,000	DIESEL FUEL
15	07/22/1991	V-TENYO MARU	+100,000	HEAVY FUEL, OIL & DIESEL
16	01/01/1978	V-COLUMBIA RIVER BARGE***	100,000	DIESEL FUEL
17	02/25/1990	F-MANCHESTER NAVAL SUPPLY DEPOT	70,000	DIESEL FUEL
18	01/31/1988	V-MCN#5 BARGE	70,000	HEAVY FUEL OIL
19	05/08/1986	P-OLYMPIC PIPELINE	70,000	OTHER OIL
20	04/20/1996	T-WIND RIVER TRAIN DERAILMENT****	65,000	DIESEL FUEL
21	12/06/1996	F-GATX HARBOR ISLAND	49,000	GASOLINE, UNLEADED
22	11/28/1985	P-OLYMPIC PIPELINE	34,000	JET FUEL
23	07/14/1990	F-PNW TERMINALS**	30,000	OIL OTHER, TALLOW
24	12/31/1994	V-CROWLEY BARGE 101	26,900	DIESEL FUEL
25	06/04/1972	V-WORLD BOND	21,000	CRUDE OIL
26	11/03/1992	P-CHEVRON PIPELINE	20,000	JET FUEL
27	12/31/1980	F-WHATCOM CREEK PENTA SPILL	20,000	OTHER OIL
28	04/27/1980	V-WILLAPA BAY SPILL***	20,000	OTHER OIL
29	04/23/1974	P-TRANS MOUNTAIN PIPELINE	16,128	CRUDE OIL
30	06/24/1990	V-SULAK	15,000	DIESEL FUEL
31	02/07/1990	P-OLYMPIC PIPELINE	12,600	DIESEL FUEL
32	08/12/1988	F-NAS WHIDBEY ISLAND	11,000	JET FUEL
33	01/01/1991	T-MONITOR TANKER*****	10,000	GASOLINE
34	03/28/1990	F-U.S. NAVY SUPPLY CENTER	10,000	DIESEL FUEL

V = Vessel spill
P = Transmission pipeline spill
F = Facility spill

+ The Tenyo Maru contained over 400,000 gallons when it sank, at least 100,000 gallons was released during the initial incident.

The following spills were not included in the report analysis because:

- * the spill occurred prior to 1970.
- ** this was a non-petroleum spill.
- *** there is inadequate spill information.
- **** this was a land transport spill; considerably less than 65,000 gallons was actually released.
- ***** this was a land transport spill.

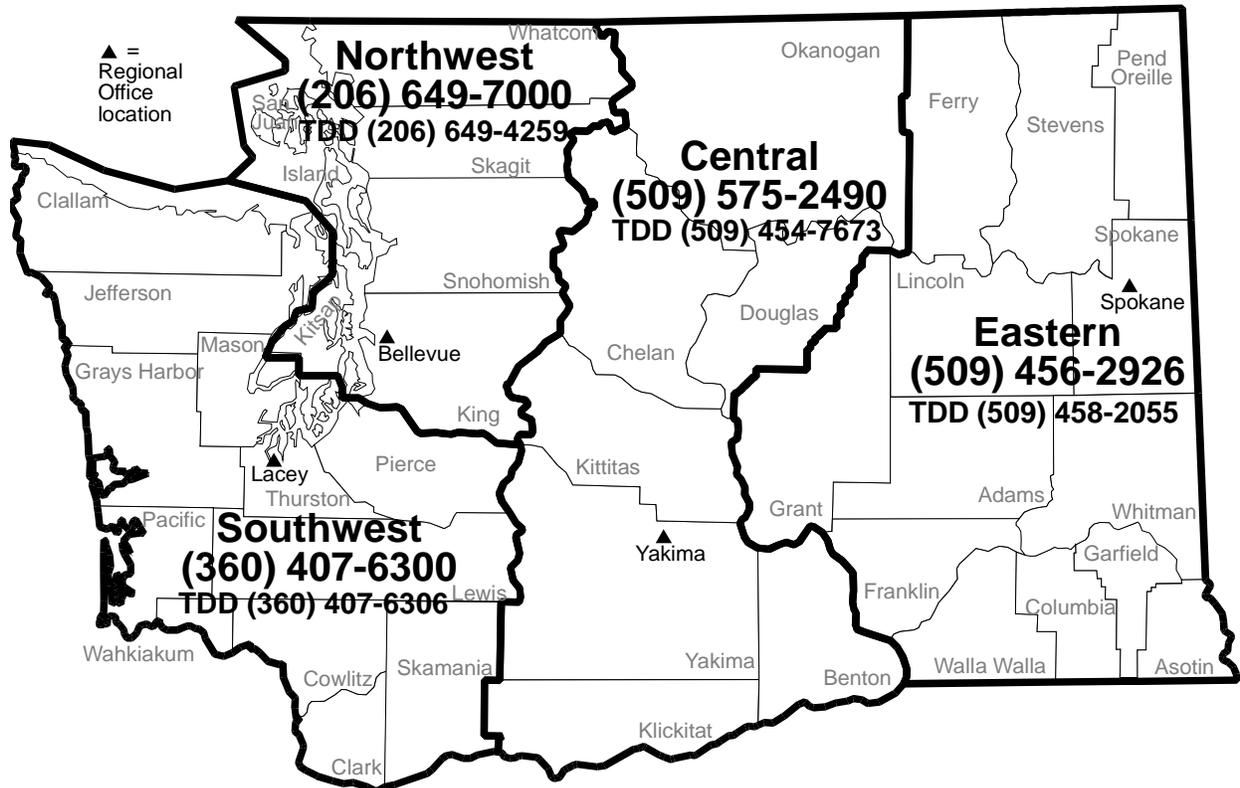
Other major spills will be added to this list as more information becomes available. Additional major spills have occurred at Kalama Chemicals, the City of Tacoma's power plant, US Oil in Tacoma, and on Whidby Island from an unknown source.

Appendix 5 — Ecology's Regional Offices



Washington Department of Ecology

Regional Office 24-Hour Oil and Hazardous Materials Spill Reporting Numbers



Need to Know:

- ◆ Reporting Party
- ◆ Contact Phone(s)
- ◆ Responsible Party
- ◆ Material Released
- ◆ Location
- ◆ Dead/Injured Fish or Wildlife
- ◆ Quantity
- ◆ Concentration
- ◆ Cleanup Status

Or call the state Emergency Management Division's 24-hour number at:

1-800-258-5990 or 1-800-OILS-911

For EPA and U.S. Coast Guard reporting, call the National Response Center at:

1-800-424-8802

Emergency numbers for other states and federal agencies:

Idaho: Communications Center (208) 327-7422

Oregon: Emergency Management (503) 378-6377

EPA Region X, Seattle: (206) 553-1263

British Columbia: Provincial Emergency Program (800) 663-3456