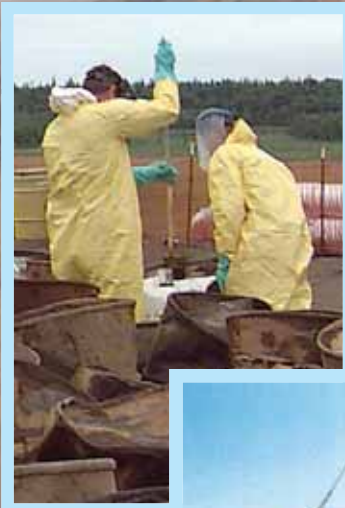
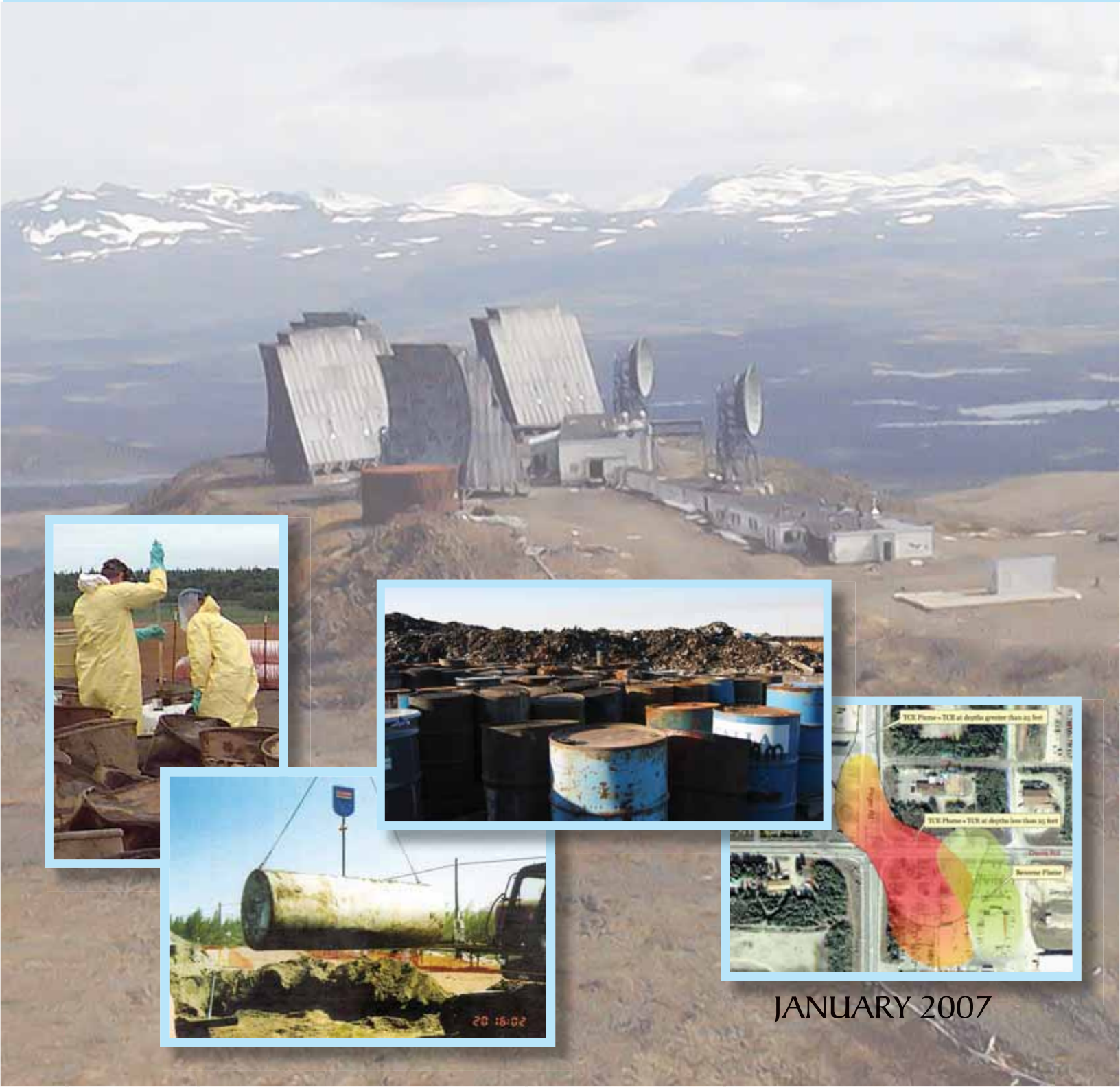




Alaska's Legacy of Oil and Hazardous Substance Pollution

Cleanup and Management of Alaska's Contaminated Sites

Fiscal Year 2006



JANUARY 2007

Cover photos:

1. The upper camp site of the former Big Mountain White Alice Station near Iliamna, before the Air Force began dismantling, in 2003. (US Air Force photo)

2. Sampling of drums before removal at the King Salmon Air Station. From 1984 to 1992, approximately 28,000 drums were removed from the bluff sites,. (DEC photo)

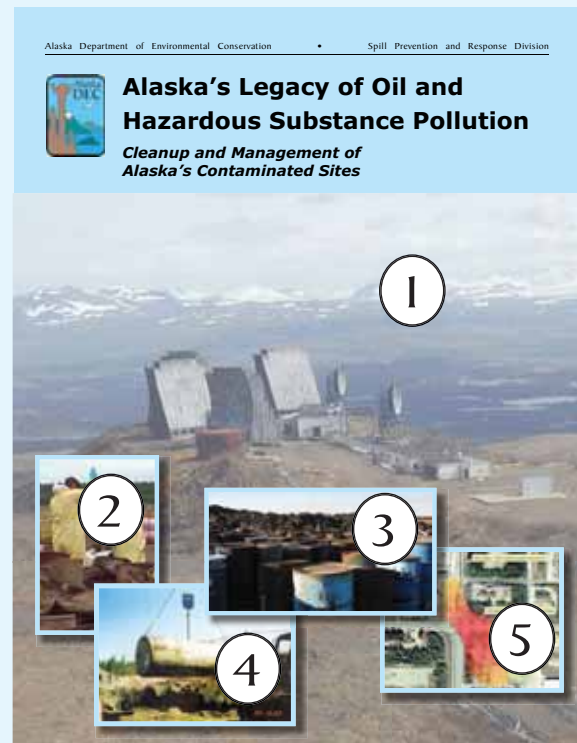
3. Barrels at the former Universal Recycling business in Fairbanks in 2003. The current owner, the Fairbanks North Star Borough, is cleaning up the land for redevelopment. Financial assistance has included a DEC Brownfield Assessment grant. (FNSB photo)

4. Removal of an underground fuel tank from a gas station. Removals were common in the late 1990s because of a federal deadline of December 1998 to install new leak prevention controls or close. (DEC photo)

5. Model of two plumes of groundwater contamination in Fairbanks. (DEC modeling)

Back cover photo:

Cleared of structures in 2003, the upper camp site of the former Big Mountain “White Alice” communications station (see page 3) has contamination remaining from hazardous and potentially hazardous substances used and stored to support base activities. The facility was operational from 1957 to 1979. DEC oversees the Air Force’s cleanup work, and the two agencies work with residents from six nearby communities through public meetings and newsletters as the cleanup progresses. (US Air Force photo)





Alaska's Legacy of Oil and Hazardous Substance Pollution

***Cleanup and Management of
Alaska's Contaminated Sites***

Alaska Department of Environmental Conservation,
Division of Spill Prevention and Response, Contaminated Sites Program

January 2007, Juneau Alaska • Sarah Palin, Governor • Larry Hartig, Commissioner

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The values and data listed in this report are preliminary and meant to show general trends.

Table of Contents

Executive Summary	iii
I. INTRODUCTION	1
II. HISTORY OF CONTAMINATED SITES IN ALASKA	3
The Military in Alaska	3
Civilian Federal Agencies	4
Developing Alaska's Infrastructure	5
Alaska's Oil Industry	6
Sites Owned by the State of Alaska	7
Sites Owned by Local Government	8
III. THE CONTAMINATED SITES PROGRAM	11
Beginning Efforts	11
Ranking of Sites by Risk	12
Regulations Development	13
IV. EXPOSURE TO CONTAMINANTS	15
Human Health	15
Health of the Environment	15
Kinds of Pollutants	17
V. CLEANUP AND MANAGEMENT	19
Site Intake	19
Preliminary Exposure Assessment	19
Prioritization	20
Cleanup Process	20
Site Closure and Long-Term Management	21
Reuse and Redevelopment	24
VI. PROGRESS	27
Progress at Military Sites	29
Progress at Civilian Federal Agency Sites	31
Progress at Private Sites	32

Progress at State Sites 33
Progress at Local Government Sites 34
The LUST Program 35

VII. CONCLUSION 37

VIII. BIBLIOGRAPHY 39

LIST OF FIGURES

Figure A-1 Alaska's Legacy of Contamination. vi
Figure A-2 Timeline of Cumulative Total of Reported Sites vii
Figure A-3 Number of Closed Sites Compared to Open Ones vii
Figure 1-1 Alaska's Contaminated Sites 1
Figure 4-1 People Exposed 16
Figure 4-2 Environment Exposed 16
Figure 4-3 Kinds of Pollutants. 17
Figure 5-1 Total Closed Sites - With and Without Closure Conditions 22
Figure 5-2 People Protected. 23
Figure 5-3 Environment Protected. 23
Figure 6-1 Open and Closed Contaminated Sites 27
Figure 6-2 Progress of All Contaminated Sites 28
Figure 6-3 Total Contaminated Sites by Responsible Party 28
Figure 6-4 Addressing Alaska's Contaminated Sites. 29
Figure 6-5 Contaminants at Department of Defense (DOD) Sites 30
Figure 6-6 Progress at DOD Sites 30
Figure 6-7 DOD Sites by Service 30
Figure 6-8 Civilian Federal Sites Contaminants 31
Figure 6-9 Civilian Federal Sites Progress 31
Figure 6-10 Civilian Federal Sites by Agency. 31
Figure 6-11 Private Sites Contaminants. 32
Figure 6-12 Private Sites Progress. 32
Figure 6-13 State Sites Contaminants 33
Figure 6-14 State Sites Progress 33
Figure 6-15 State Sites by Agency. 33
Figure 6-16 Local Government Contaminants 34
Figure 6-17 Local Government Sites Progress 34
Figure 6-18 Leaking Underground Storage Tank (LUST) Sites Progress. 35
Figure 6-19 LUST Sites by Responsible Party 35
Figure 6-20 Numbers of new LUST Sites Added Yearly to Database. 36

Executive Summary

As part of DEC's Division of Spill Prevention and Emergency Response (SPAR), the Contaminated Sites Program provides regulatory oversight to ensure that oil and hazardous substance contamination from historical or complex spills is cleaned up so that the public is protected from exposure and contaminated property can be put back into productive reuse.

Much of the existing contamination in Alaska is the result of inadvertent spills and careless chemical handling over the last century during the development accompanying a growing population. The large-scale military build-up beginning in World War II also contributed heavily to Alaska's contamination legacy. Unfortunately, spills that are not cleaned up when they first occur are often difficult and time-consuming to address. We often know very little about the source and volume of the spill. Contamination may have extended deep below the surface where it may have polluted groundwater and spread. The Contaminated Sites Program (CS Program) oversees cleanup of these "contaminated sites," many of which require long-term management to prevent exposure to humans and wildlife.

Since the early 1970s, a variety of federal and state regulations and other factors have effectively reduced the number of chemical leaks and spills. Prevention measures, better handling practices, a more enlightened environmental ethic, liability concerns, and seasoned state and federal response programs have combined to minimize the contribution to our contamination legacy. New spills do occur but are typically cleaned up before they become long-term problems (New spills are addressed by the Division's Prevention and Emergency Response Program).

The CS Program ensures the cleanup of Alaska's contaminated sites. It is a slow and expensive effort, but we've made significant progress in the past 16 years. As of the end of June 2006, 55% of Alaska's 6,287 sites known to be contaminated with oil or hazardous substances have been cleaned up to the point that they no longer pose a risk to human health and the environment. Another 30% are either in



Alaska's history of contamination parallels the history of the state in the 20th century. Military presence, growing industry and the urbanization during and after the Trans Alaska pipeline construction contributed significantly to the legacy of contamination. Photo above: Aerial view of the King Salmon Air Station in operation (U.S. Air Force photo).

Photo below: Leftover materials from construction of the pipeline are piled high in Fairbanks, ready to be hauled south for recycling (DEC photo).



the active cleanup stage or have undergone detailed assessment, leaving about 15% in the “preliminary evaluation” phase. These last sites have been documented and have received an initial evaluation that takes into account the types of contaminants, size of the contaminated area, and the presence of humans, fish and wildlife.

We have yet to identify all the legacy contamination in the state. History tells us, for example, that thousands of remote mines were developed in Alaska in the early to mid-20th century. Many of these mines are likely contaminated by tailings that contain high concentrations of heavy metals. Mine processing chemicals may also be present at many of the sites.

These sites contaminated long ago are considered “new” to us when discovered and added to our inventory each year. This is the positive effect of a well established program and an educated public. Once we learn of a contaminated site, we can take immediate measures to control risk, if necessary. We can then prioritize and manage the site over the long-term to ensure it is cleaned up properly and returned to a condition that allows for re-use.

Even though we continue to discover old sites, and new spills do occur, these numbers are a small percentage of the total sites and will continue to decrease over time. We estimate that 96% of all known contaminated sites in Alaska are from the days before environmental regulation, programs and waste control which now prevent many spills.

The CS Program’s growing use of site closure with conditions attached (“conditional closure”) as a management tool has enabled greater resolution of contamination issues at Alaska’s many sites. Spills and leaks are almost never intentional, and we can assume that everyone involved would prefer to see the land put back the way it was. Completely cleaning soil and water as if it had never happened, however, is almost impossible. Even achieving Alaska’s strictest cleanup standards may not be economically or physically feasible. Yet closure can be a critical hurdle for property transfer, financial lending and redevelopment.

Conditional closure provides a way to obtain a “closure” designation when the strictest cleanup standards have not been met but when conditions can be applied and maintained to ensure that human health and the environment are protected. Restrictions on land use or certain activities may be set upon closure, to remain in effect now and into the sometimes distant future. The conditions are designed to assure DEC and the public that the risk of possible exposure to remaining contamination is controlled. At right is a chart showing the progress the CS Program has made since 1990 in closing contaminated sites.

The CS Program’s top priority is “high risk” sites – those where humans, fish or wildlife are at risk of harm through exposure to chemicals. We are currently implementing a refined ranking system to allow us to be more specific about how people and the environment might be exposed. This system will provide even more confidence that we are addressing the high priority sites.

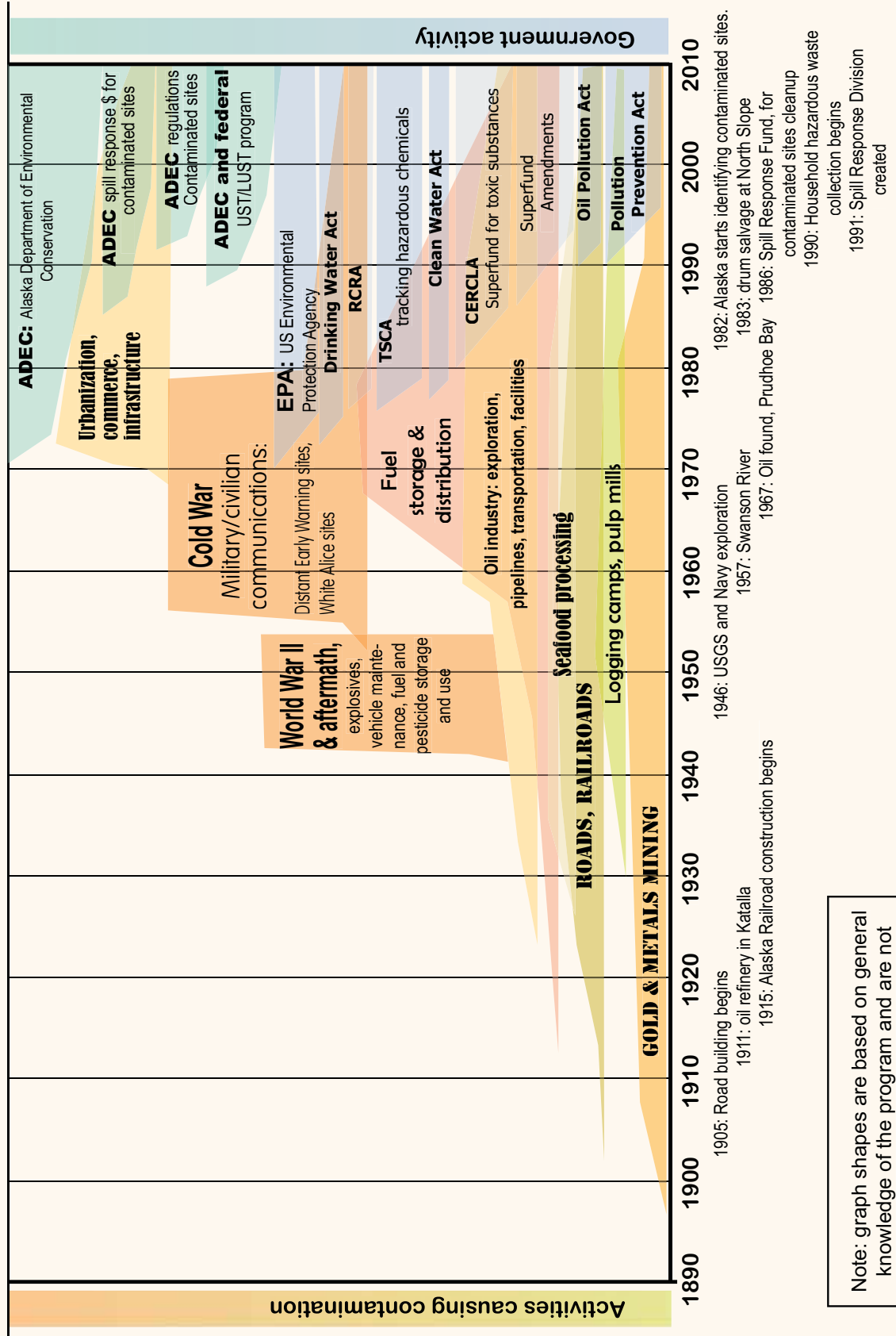
We also work on sites that may not currently present a high risk but must be cleaned up in order to facilitate a property transaction. Development, resale, and reuse of impacted properties can be hindered by ongoing cleanup efforts, the potential for exposure, and the stigma of being an “open” contaminated site.

Achieving Alaska's cleanup standards in the short-term may not be technically or economically feasible. A common example is pollution which has spread underneath buildings or roads. At the request of the responsible party, the CS Program will consider issuing a conditional closure. This designation is typically granted for sites where active cleanup is complete and measures can be taken to protect against exposure and at the same time allow the property to be put back into reuse. A conditional closure provides landowners, buyers, and lenders clarity about how residual contamination must be managed until the strictest cleanup standards have been met.

Another approach used by the CS Program to facilitate reuse of contaminated sites is a Prospective Purchaser Agreement. This is an agreement between the CS Program and a future landowner that clarifies liability for ongoing or future cleanup costs. We track conditional closures and Prospective Purchaser Agreements and may require periodic reporting or conduct inspections to verify that conditions or terms of the agreement remain in effect.

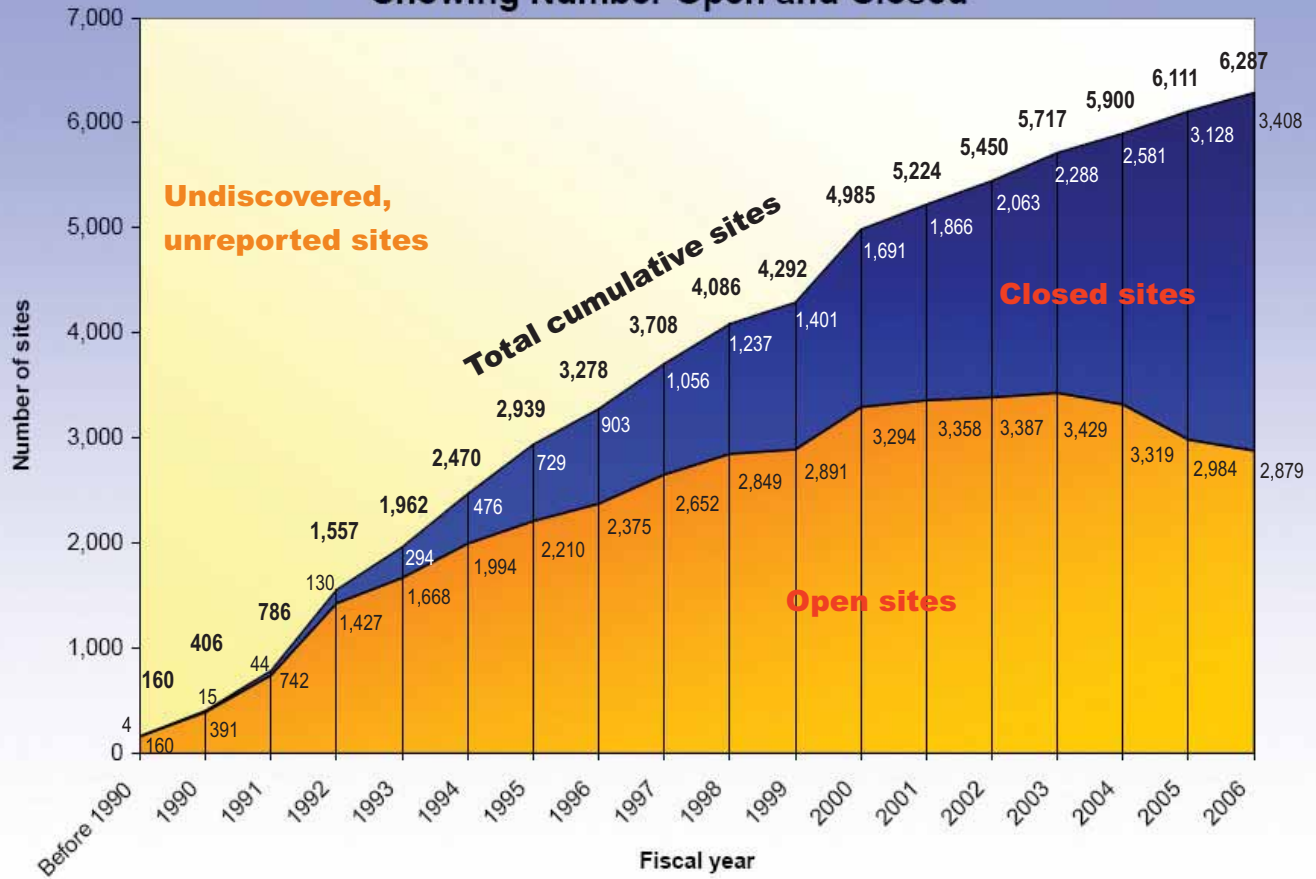
The CS Program is guided foremost by the charge to be protective of human health and the environment. In this regard, we will continue to contribute to the economic well-being of the state while ensuring our environment is safe for humans, fish and other wildlife.

FIGURE A-1 Alaska's Legacy of Contamination
 Its causes and the regulatory causes for its decline



Note: graph shapes are based on general knowledge of the program and are not derived from specific data.

FIGURE A-2 Timeline of Cumulative Total of Reported Sites Showing Number Open and Closed



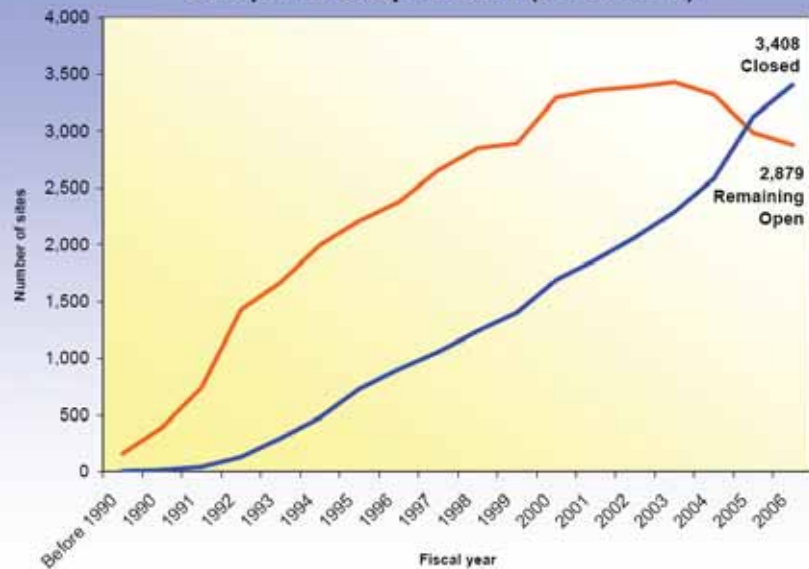
These charts give an historical look at the origins of contamination and our efforts to clean them.

At left, the chart shows the kinds of activity which created the contamination.

Above, the chart shows the cumulative numbers of sites discovered and listed in our database each year since we began using it in 1990. It also shows the numbers of open vs. closed sites each year.

At right, the chart uses the same data as the one above, but emphasizes that by the end of June 2005, we had more closed than open sites.

FIGURE A-3 Number of Closed Sites Compared to Open Ones (cumulative)



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I. INTRODUCTION

The mission of the Contaminated Sites Program (CS Program) is to protect public safety, public health and the environment by overseeing and conducting cleanups at contaminated sites in Alaska. The CS Program has regulatory authority over cleanup of all contaminated sites in Alaska. Many of these sites pose a high risk to human health or the environment due to a broad scope of different and multifaceted sources of contamination from industrial and military activities.

Federal agencies are responsible for cleanup of about half of these sites. Many of these cleanup efforts occur through agreements with the State. The CS Program coordinates cleanup of State-owned properties and other sites which have no responsible party. State-incurred costs are recovered from the responsible parties. The CS Program works with all parties to facilitate re-use or redevelopment of contaminated properties. We achieve this mission by working with those responsible for pollution to ensure that harmful substances are removed from the environment. In the event that removal is not feasible or would do more harm than good, the CS Program ensures that land use or groundwater use controls are in place to protect human health and the environment from exposure, thus allowing properties to be put back into use.

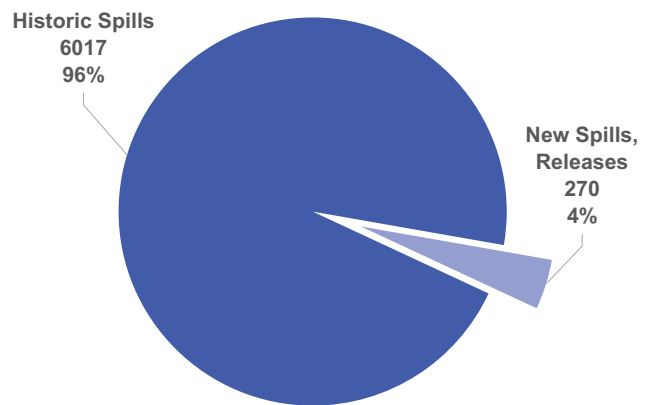
A “site” is defined in Alaska’s Pollution Control Regulations (18 AAC 75) as an area that is contaminated, including areas contaminated by the migration of a contaminant from a source area, regardless of property ownership. The CS Program oversees cleanup when pollutants exist in soil or water above a regulatory standard. The area of a contaminated site is based on a rational geographic boundary and may include multiple sources of contamination in close proximity. Those sources are typically associated with a specific operation or activity that resulted in pollutant releases to the environment. However, for large facilities, site boundaries may be drawn to encompass multiple related operations to allow for more efficient cleanup and management of contaminated areas.

* The values and data used in this report are as of the end of fiscal year 2006 (June 30, 2006) and based on responsible party, rather than landowner. Percentages are used to show general trends. Slight variations in some of the numbers behind the percentages are due to some inherent variances in the data. Percentages reflect accurate trends up to the limits of our database.



Oil and hazardous substances often have come to Alaska in barrels. Lack of proper storage and disposal over many years have contributed significantly to leaks and spills in the state’s environment.

FIGURE 1-1 Legacy of Contamination*
Total sites = 6,287

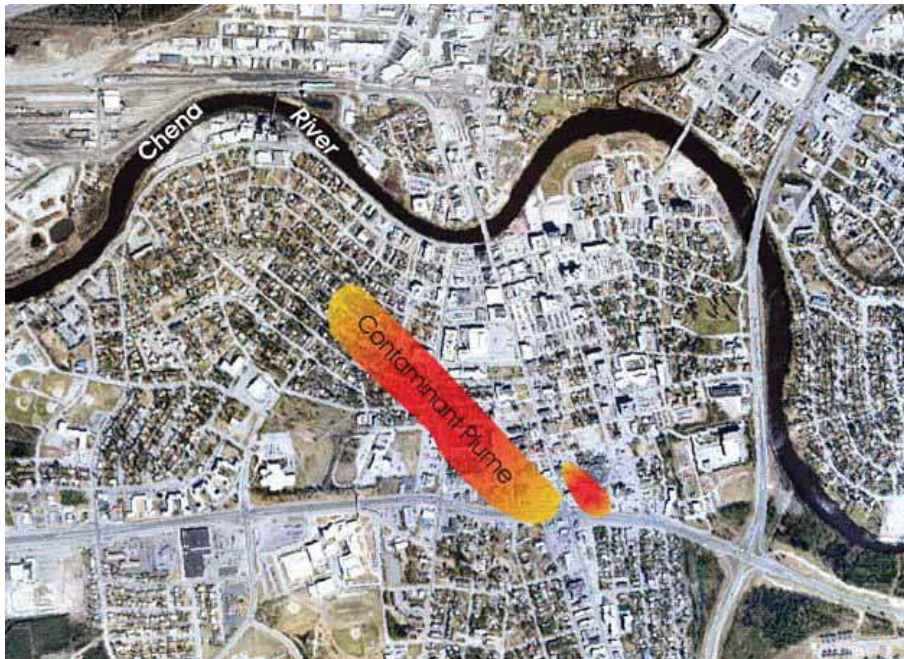


“New spills” are sites transferred to the Contaminated Sites Program from the division’s Prevention Emergency Response Program (PERP) over the last 11 years.

The vast majority of Alaska's contaminated sites are the result of historical petroleum and hazardous substances (non-petroleum) pollution resulting from handling and disposal practices that are no longer allowed. The existence of these sites is largely due to decades of military activities and the development of Alaska's infrastructure.

Much of the contamination occurred when disposal and storage practices for oil and hazardous chemicals were in development and before environmental laws were established. Stricter practices and more extensive environmental regulations now prevent much of the pollution previously caused by spills and leaks from facilities such as gas stations, junk yards, leaky barrels and fuel storage tanks, old dump sites, dry cleaners, and mines. When spills do occur, the vast majority are cleaned up under DEC's Prevention and Emergency Response Program (PERP). Only spills that require long-term cleanup efforts are transferred to the CS Program. For example, in Fiscal Year 2006, PERP received reports of 2,029 oil spills and hazardous substance spills. Of these, only 15 cases were transferred to the CS

Program for long-term cleanup and monitoring. Over the last ten years 270 sites were transferred from PERP to the CS Program for long term management.



A significant quantity of old spills remain, and more are discovered each year. The CS database listed 6,287 open and closed sites at the end of June 2006 (Figure 1-1). Since 1990, the CS Program has overseen cleanup and ensured that exposure is controlled at over 54% of these sites (see Progress section, page 28).

Aerial view of downtown Fairbanks, where multiple sources of contamination have over time contaminated groundwater. A diagram of the "plume" of contamination, similar to smoke in air, has been superimposed over the map. The city of Fairbanks has a public water system which does not draw water from the contaminated zone. The contaminants are primarily petroleum and perchloroethylene (PCE), and the compounds produced as it breaks down. PCE is used for dry-cleaning clothes and degreasing metal parts. *DEC rendering.*

Approximately 96% of known sites are the results of spills more than ten years old and many are much older, dating as far back as World War II.

Leaks from underground storage tanks and associated piping have caused just over 36% of Alaska's contaminated sites. Most of these tanks were at gas stations and many had been leaking for a number of years before the contamination was discovered. In 1988, the US Environmental Protection Agency (EPA) required all commercial underground storage tanks to be upgraded or closed by December 1998. During that 10-year upgrade process, about 1,900 leaking underground storage tank sites were discovered. Between July of 1998 and June 2006 an additional 418 sites were identified. As of the end of June 2006, cleanup was completed at 69% of the 2,291 leaking underground storage tank sites (see Progress section, page 35).

II. HISTORY OF CONTAMINATED SITES IN ALASKA

From early frontier days through the 1990's, contaminated soil and groundwater typically occurred wherever fuels, lubricants, and cleaning fluids for vehicles, machinery, and industrial processes were handled or discarded. Outdated practices and an “out of sight, out of mind” attitude marked disposal in the nation. This was especially true in Alaska, where expensive transportation meant that everything shipped to the state usually stayed in the state: the empty 55-gallon drum lying on the tundra became Alaska's tongue-in-cheek “state flower.”

Alaska's history of oil and hazardous substance contamination following Gold Rush days is mainly due to the development that inevitably accompanies a growing population in this age of industrialization, with its high dependence on petroleum fuels. As the urban centers grew, every sector of Alaska life involved activities that depended on the use of petroleum products or chemicals. Spills, leaks and intentional dumping were inevitable. Those releases became today's contaminated sites. The story of these sites parallels almost a century of Alaska's history.

The Military in Alaska

Alaska has played a critical role in national defense over the past sixty to seventy years. During World War II, the United States military constructed numerous airfields, coastal defense sites, naval bases, and other facilities in Alaska to stop the Japanese invasion and to ferry needed supplies to Russia. Some of these facilities were temporary; other bases remain to this day. Stations were established at Sitka, Kodiak, Unalaska, and Adak (see photo). Large army posts were built in Anchorage and Fairbanks. Air fields were built on Annette Island and at Yakutat, Galena, Gulkana, and Bettles.

In the late 1950s, a network of radar and communications facilities was constructed throughout Alaska to detect and respond to a possible strike by Soviet aircraft or missiles. Distant Early Warning (DEW) Line stations (see photo) served as the primary line of defense warning for an “over the pole” invasion of North America. Fifty-eight early warning stations were built between 1955 and 1957. DEW Line sites relayed signals to combat centers of the Alaskan air command through a military and civilian network known as the White Alice Communications System. The White Alice sites operated throughout Alaska from about 1956 until 1979.

The military used many types of petroleum products and chemicals at these facilities. Spills, leaks and intentional dumping frequently occurred. Facilities no longer needed for defense purposes were



From an Army installation at Adak, in the Aleutian Islands, U.S. forces mounted a successful offensive against the Japanese-held islands of Kiska and Attu. Adak's Naval Air Facility later played an important role in the Cold War as a submarine surveillance center. In 1994 the base was added to the National Priority List of contaminated sites.



These “White Alice” antennae on St. Lawrence Island are similar to others across Alaska. They served as part of a system of military/civilian communication system across Alaska from 1956 to 1979.

often abandoned, with many buildings, debris, and contaminants left behind. These contaminants included fuels, solvents, polychlorinated biphenyls (PCBs), herbicides to clear land, munitions, and dry-cleaning chemicals. A very small percentage of these sites contain chemical warfare materials such as mustard gas, or were used to test biological weapons.

Cleanup for all these sites is now under the umbrella of the U.S. Department of Defense (DOD). Each branch of the military is responsible for the sites it owns. Sites used before the mid-1980s but never actually owned by the military are considered “Formerly Used Defense Sites.” The Army Corps of Engineers sees to their cleanup.

DOD has recently begun a program to address areas where the military trained with munitions or had practice ranges that may contain unexploded ordnance or other types of explosive risks. Thirty-six percent of military sites have contamination from non-petroleum hazardous substances, the largest percentage when compared to the other groupings of responsible parties: private, local, state and civilian federal agencies (see the Progress section, page 30).

Military site cleanups often involve complex chemical compounds and facilities contaminated with many kinds of contaminants from numerous source areas. Because of this, military site cleanups tend to be multi-year efforts and cost millions of dollars. There are five military facilities listed on the National Priority List—also known as “Superfund” — created in 1980 by the federal Comprehensive Environmental Response Compensation and Liability Act (CERCLA). These cleanups are executed through federal facility agreements between the State of Alaska, DOD, and the Environmental Protection Agency (EPA). These agreements establish schedules and the process for conducting characterization, cleanup and site closure.



Civilian Federal Agencies

Civilian federal agencies such as the Bureau of Indian Affairs, Bureau of Land Management, Coast Guard, Fish and Wildlife Service, National Park

Service, Forest Service and the Federal Aviation Administration have provided essential public services throughout Alaska since Territorial days. These agencies have built and operated schools, airports, roads and hospitals. They have provided power generation, water and sewer systems, mail service and navigational facilities. They have also been land administrators for timber harvesting, fisheries, seal harvesting and mining. As environmental awareness increased, many agencies discovered impacts from petroleum and hazardous materials used in past operations. These include leaks to soil and groundwater

Samples are being taken of soil contaminated with polychlorinated biphenyls (PCBs) at an air strip owned by the Federal Aviation Administration (FAA) in Farewell. PCBs are chlorinated compounds which were used from about 1930 until 1979 in electrical transformers, switches and capacitors. Their use was banned in the United States in 1979 (ref. page 16). *Photo courtesy of the FAA.*

from fuel-tank farms, buildings with lead paint or asbestos, abandoned logging and mining camps, and other facilities with a host of contamination and physical hazards.

Developing Alaska's Infrastructure

Alaska's population in 1920 was about 55,000, by 2005 the population had increased twelve-fold, to about 660,000 persons.

Several major post-Gold Rush developments hastened population and economic growth in the state. First, the Alaska Railroad was built between 1915 and 1923, encouraging the growth of communities along its route. Anchorage, Alaska's largest city, began as a construction camp for the building of the railroad.

The next big influx of people came during World War II, when numerous naval stations, army bases and air stations were built, along with the Glenn and Alaska Highways. Many soldiers and construction workers stayed on after the war, and jobs became available for construction of the military and civilian network of communication sites around Alaska during the Cold War of the late 1950s and 1960s.

In the late 1950s, oil was discovered on the northern Kenai Peninsula and in Cook Inlet. Then North America's largest oil field was discovered at Prudhoe Bay in 1967. In the 1970s, the population of Alaska nearly doubled. People came to work in the oil fields, to build the Trans-Alaska Pipeline, and to provide services to the workers.

The communities of Anchorage, Fairbanks, and Valdez experienced rapid growth. The Eagle River and Matanuska Valley communities developed into Anchorage suburbs while further north in Fairbanks both North Pole and Ester experienced similar expansion.



First development at Prudhoe Bay, on Alaska's North Slope, is pictured above in 1969 (cropped). *Photo courtesy of the Atlantic Richfield Company collection, UAF-1982-146-4, Archives, Alaska and Polar Regions Collections, Rasmuson Library, University of Alaska Fairbanks.*



Improper disposal of dry cleaning fluids was a significant source of contamination before strict hazardous waste laws took effect. Small amounts of its hazardous components are highly toxic and don't break down easily. This cleanup of a former dry cleaner next to the Kenai River has involved treating contaminated surface soil at the site, and innovative underground injections (shown) of hydrogen-releasing compounds to speed decomposition of tetrachlorethene and its "daughter products" in subsurface soil. The Kenai River is visible through the trees. *DEC photo.*

The conception of the Trans-Alaska Pipeline in 1969 was almost concurrent with the National Environmental Policy Act (NEPA). NEPA's purpose was foster "productive harmony" between "man and nature," so as to "fulfill the social, economic, and other requirements of present and future generations of Americans." Under NEPA, agencies were required for the first time to prepare environmental analyses, with input from the state and local governments, Tribes, the public, and other federal agencies, when considering a proposal for a major federal action. As a result, the environmental controls on the pipeline were the most rigorous of any project in Alaska. The legislation to authorize construction of the pipeline also hastened the transfer of land to the state, municipal and Native entities.

Congress passed the Alaska Native Claims Settlement Act in 1971 in part to clear title for a land corridor for the Trans-Alaska pipeline. The Act also intended to resolve long-standing aboriginal land claims, hastening the transfer of land to state, municipal and Native entities. Native claims to almost all of Alaska were extinguished in exchange for approximately one-ninth of the State's land plus \$962.5 million in compensation. Some of these land conveyances are still taking place, and the need to resolve contamination issues has both helped spur cleanup and also hindered changes of ownership.

DEC was created in 1971 in part to provide oversight for the Trans-Alaska pipeline, and the federal government created similar environmental protection programs around the same time. An oil spill contingency plan guided responses to the estimated 16,024 oil spills with a total aggregate amount of more than 771,000 gallons spilled during construction of the pipeline.* Many of the spills and leaks during the 1970s and 1980s were a result of the growing industrialization and accompanying support services and infrastructure development stimulated by construction of the pipeline. Fuel storage and distribution facilities, salvage yards, dry cleaners, and maintenance shops supported the construction boom, but also significantly contributed to the legacy of contamination.

Residential areas and commercial enterprises expanded and intermingled as Alaskans used and stored more chemicals and oil. The prevalent frontier attitude and "out of sight, out of mind" philosophy resulted in careless handling and disposal. A formerly common practice was to discharge waste materials into the ground via Class V injection wells (i.e. floor drains running to log cribs, community cess pools and septic systems, cooling water return, storm runoff, dry wells for injection of wastes and some mining uses). Barrels were left to rust and leak, oils and toxic solvents were often dumped on vacant properties, or out the back door. These practices resulted in widespread soil and groundwater contamination in both urban and rural areas throughout the state. Today strict laws exist for handling and disposing of larger quantities of toxic compounds, and many cities and towns have approved collection and disposal means for household hazardous materials.

Alaska's Oil Industry

In the late 1970s, DEC's attention was drawn to problems associated with the North Slope oil fields and the region's first major hazardous waste incident. During development of the Prudhoe Bay Field, the numerous oil field support contractors routinely stored and used hazardous substances. The North Slope Salvage Company reportedly dumped 15,000 drums of hazardous materials on a gravel pad and subsequent enforcement action by EPA and DEC ensued, requiring cleanup.

*Source: *The First Ten Years*, Alaska Department of Environmental Conservation, November 1981

Increased federal and state surveillance of industrial activities on the North Slope in the 1980s documented many problems. These included contaminated gravel pads and campsites, unreported spills, more than 400 disposal pits for drilling mud, plus a full spectrum of solid waste from drilling operations and camps. Effective federal and state regulation of the oil industry eventually brought an end to outdated disposal practices of liquid and solid drilling mud and other wastes. However, contamination resulting from those practices remains and is part of the legacy of sites overseen by the Contaminated Sites Program.



East Kuparuk #1, on the North Slope, is an “orphan” site: a contaminated area for which the responsible entity is unknown. In 2001 under the Charter Agreement for Development of the North Slope, British Petroleum cleaned over 1900 drums collected from eight orphan sites, and half were crushed and removed. [Source: “The Environmental Commitment to Protect Alaska’s North Slope” ADEC, March 2002.]

The Charter for Development of the Alaskan North Slope was signed December 2, 1999. The Charter was an agreement between the State of Alaska, BP Exploration (Alaska)

Inc., and ARCO, which led to State of Alaska support of a merger between BP and ARCO. As set forth in the Charter, ARCO and BP agreed to sell a pre-determined percentage of their Alaska interest to a third “qualified company” prior to their merger in order to ensure continued competition. Phillips Petroleum Company (now Conoco Phillips) purchased the stock of ARCO Alaska, Inc. and, with BP, assumed responsibility for fulfilling the Charter obligations.

The Charter was the first antitrust agreement in the U.S. to include environmental provisions. The Alaska Department of Environmental Conservation (DEC) was charged with managing and overseeing the environmental provisions described under sections II.A and II.B of the Charter agreement. These environmental provisions include Arctic spill response research and development; state oversight of industry’s pipeline corrosion monitoring and structural integrity program on the North Slope; clean-up of North Slope contaminated sites including “orphan sites” (sites abandoned by unknown parties); and a renewed commitment to the Oil Pollution Act of 1990, which includes the replacement of crude oil tankers with new state of art double hulled tankers.

The agreement recognized outstanding environmental issues that were significant to the Program and provided funds to accelerate cleanup of the contaminated sites on the North Slope. The agreement established a \$10 million funding source to clean up the abandoned (orphan) contaminated sites by 2007. It also established a deadline before which the major oil companies had to address the contaminated sites for which they were responsible.

Sites Owned by the State of Alaska

In the past, public facilities owned and operated by the state used the same careless practices for handling oil and hazardous substances commonly used elsewhere. Contamination stemmed largely

from fuel storage tanks used for heating purposes and for fueling vehicles. Roads, airports, the railroad, public buildings — these facilities required barrels of oil and other hazardous substances for maintenance and service shops. Many storage areas for fuel, oil, paint, solvents and road salt became sources of contamination.

The DEC has a memorandum of agreement with other state agencies to address state-owned contaminated sites. This 1991 agreement established DEC as the lead agency in addressing contamination issues on state owned properties and acquiring the necessary funding to investigate and clean them up. This provides consistency and avoids the situation of each agency separately seeking funding through the Legislature. Each agency designates a contact person who identifies the contaminated sites their agency owns or manages. The CS Program then prioritizes these sites according to risk, community interest, funding, and other concerns and seeks cleanup funding through the Capital Improvement Project budget process.



The former maintenance yard of the Alaska Department of Transportation and Public Facilities in Soldotna is now a grassy park next to the Kenai River. In 1992, soil and groundwater were found to be contaminated with fuel, oil, paint, solvents and chlorides from winter road salt. Cleanup included soil removal and treatment, abandonment of a drinking water well, and groundwater monitoring. Painted cement cylinders covering monitoring wells also provide seating for park users. (DEC photo)

Sites Owned by Local Government

Under state law, Alaska’s local governments consist of cities and organized boroughs. Alaska has 16 organized boroughs and 149 cities, including 12 home-rule cities, 21 first-class cities and 116 second-class cities. About 57 percent of the state is not within a borough and is considered a single “unorganized borough.” The unorganized borough does not have a local government — under the constitution, the Legislature provides its necessary services.

Alaska’s boroughs are required to form municipal school districts. In the unorganized borough, education is offered through nineteen Regional Education Attendance Areas funded by the state.*

Schools, landfills, power generation facilities, maintenance shops and other public works form the majority of contaminated sites owned by local governments. Careless handling practices and intentional disposal of oil and hazardous substances were the primary causes of contamination. The contaminant at most local government sites is petroleum.



With DEC oversight, this City of Seldovia waterfront property, a former cannery, was cleaned up to full closure levels so that the City can either sell or redevelop the land. (DEC photo)

* Source: 2004 Alaska Humanities Forum, www.akhistorycourse.org/

Local governments in Alaska often struggle to find funding to accomplish their missions. In the past, cities acquired the burden of cleaning up contaminated land when they initiated foreclosure on properties with tax delinquencies. In 1999, the Alaska Legislature adopted SB 110, which provided liability protections to certain governmental acquisitions of contaminated properties. This provision, codified in AS 46.03.822(k), allows a unit of state or local government to acquire a facility through means such as tax foreclosure, eminent domain and others, without acquiring liability for contamination present at the time of acquisition.

The CS Program has worked closely with several local governments to put contaminated properties back into productive use. Federal funding available in the past several years through EPA's Brownfield program has added opportunities for local governments to address contaminated sites. See page 24 for more information on DEC's Reuse and Redevelopment Initiative, with its Brownfield component.

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III. THE CONTAMINATED SITES PROGRAM

The Alaska Department of Environmental Conservation (DEC) was created in 1971 to “conserve, improve, and protect its natural resources and environment and control water, land, and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well-being.” It began with 14 employees. The fledgling department organized itself in units for air quality, solid waste, water quality, wastewater and sanitation. Oil and hazardous substance response efforts were initially handled on a case-by-case basis with no dedicated Spill Prevention and Response program staff.

Beginning Efforts

Alaska’s Coastal Protection Fund, established in 1976, and its reincarnation, the Oil Spill Reserve Account in 1980, were set up as a means to fund oil spill cleanup efforts; neither funded cleanup of hazardous (non-petroleum) contaminants.

DEC first began documenting sites contaminated with hazardous substances in 1982 with a federal appropriation under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). In 1985, DEC discovered alarmingly high levels of a form of the hazardous substance trichloroethane in 100 barrels abandoned near the Kenai Spur Highway at Nikiski. Early the next year, urea formaldehyde leaked from a railroad car near Moose Pass, causing an evacuation of the area. In response to these events, legislation was passed later in 1986 to expand the use of the oil spill response fund to include responses to unpermitted releases of hazardous substances. The Fund’s enacting legislation, HB 470, renamed it the Oil and Hazardous Substance Release Response Fund (or the “470 Fund”), and helped pave the way for the state’s effort to address contaminated sites.

Various DEC programs continued to work on the backlog of hazardous substance releases on an incidental basis until 1988, when the department created the Oil and Hazardous Substance Spill Response Section within the Division of Environmental Quality in concert with the Kenai Special Appropriation funding. That program continued to mature with the addition of the federal Defense Environmental Restoration Account (DERA) in the late 1980s to address contaminated military sites.

As a result of the growing number of contaminated sites and the March 1989 tanker vessel *Exxon Valdez* disaster, increased emphasis was placed on spill response and site cleanup. The *Exxon Valdez* spilled almost 11 million gallons of crude oil into the pristine Prince William Sound south of the Port of Valdez.



Laws passed in the 1980s and 1990s acknowledged that leaks from gas stations were the sources of a great deal of underground contaminated soil and groundwater, sometimes contaminating drinking water. (DEC photo)

Over 200 miles of shoreline were heavily or moderately impacted, with another 1,100 miles lightly oiled in an area containing 9,000 miles of shoreline.

In 1984, the federal Resource Conservation and Recovery Act (RCRA) was amended to regulate certain underground storage tanks (primarily at gas stations) containing petroleum and hazardous substances. The Environmental Protection Agency established requirements for spill protection tank upgrades and closures with a 1998 deadline for compliance.

The Contaminated Sites Section was formed in 1990 in a shared effort with the oil spill response program that existed only in the central office. DEC's regional offices (no longer existing) housed the program, and it was executed with cross divisional funding. This new group focused on cleaning up sites contaminated by past improper disposal or discharges of hazardous substances. Also in 1990, the State Legislature passed House Bill 220 to provide financial assistance to help owners and operators of underground storage tanks (UST) meet the new federal requirements. HB 220 authorized DEC to develop the UST program to oversee the spill prevention requirements and address historical contamination associated with regulated tanks.

Ranking of Sites by Risk

In July 1992, DEC established the Spill Prevention and Response (SPAR) Division in order to streamline and focus State responsibility and authority for developing and managing the state's programs for prevention and response to oil and hazardous substance releases. The Underground Storage Tank (UST) Program and the Contaminated Sites Section (renamed the Contaminated Sites Program) were both housed in the new division. A program to address leaks and spills from USTs, or the "Leaking Underground Storage Tank" (LUST) program, had jurisdiction over sites where the release resulted from a regulated underground storage tank. Regulated USTs generally are tanks which hold 110 gallons or more of some kind of petroleum and are not for home heating purposes. Gas stations are a typical example of a facility where regulations now require inspection, leak detection and corrosion protection.

A major advance in the department's ability to address the rapidly growing number of contaminated sites on a relative priority ranking basis occurred with the development of the Alaska Hazard Ranking Model in 1991. The model utilized a database to track sites and rank them in priority according to the risks the contamination posed. The same model is used today, although a new model which more accurately assesses risk to human health and the environment is under development.



The former Arctic Surplus salvage yard, near Fairbanks, was a Superfund site, on the National Priority List. It also ranked high on the Alaska Hazard Ranking Model because of the high risk of harm to people and the environment if exposure to contaminants were to occur. A \$23.5 million cleanup removed massive amounts of asbestos, lead, PCBs, chlordane and even explosives over a period of 15 years. Now the land is available for commercial use, with some restrictions on that use. (*Defense Logistics Agency photo*)

In 1992, the Contaminated Sites Section grouped the sites into “management units” based on site ownership. The units were Department of Defense, other Federal, State-owned, Local government, Private, Native-owned and Orphan. The internal organization of the CS Program still echoes this structure somewhat, and this report also generally follows the 1992 organization. One important distinction is that the data presented later in this report is based on the responsible party - this allows the CS Program to evaluate who is responsible for cleanup.

In 2001, three years after the UST upgrade deadline, DEC determined that a separate program to address contamination from regulated tanks was no longer necessary. A single Contaminated Sites Program was formed to oversee all contaminated sites regardless of the source of pollution.

Regulations Development

DEC began its work on oil and hazardous substance site cleanup using regulations with very general requirements. For Underground Storage Tank (UST) owners and operators, emergency regulations in 1990 (Title 18, Chapter 78 of the Alaska Administrative Code, or 18 AAC 78) provided for technical and financial assistance, cleanup of existing contamination and prevention of future releases.

For non-UST contaminated sites, there were neither cleanup levels nor a cleanup process defined in regulation during the early years and the guidance for cleanup was loosely defined in 18 AAC 75 as being to “the satisfaction of the Department.” In 1990 the department published an internal Interim Guidance for Surface and Groundwater Cleanup Levels. Another internal Interim Guidance for Non-UST Soil Cleanup Levels was published in 1991. Both guidance documents stated that cleanup levels would be established on a site-specific basis.

After thorough deliberation over a number of years on the elements needed in regulation, coupled with an extensive public involvement process, cleanup regulations were adopted in January 1999 (18 AAC 75.325-390). Termed the “Site Cleanup Rules”, these regulations set numeric risk-based cleanup standards for soil and groundwater. The regulations also allowed for alternative cleanup levels by completing a risk assessment to demonstrate that alternative action levels are protective of human health and the environment.

Regulations and guidance documents are on the Internet at www.dec.state.ak.us/spar/csp



The concept of risk-based cleanup standards began on a nationwide level with the development of American Society for Testing and Materials (ASTM) Risk Based Corrective Action guidance, which was adopted in one form or another by most states. The concept of evaluating risk through the use of “exposure pathways” is generally referred to as Risk Based Decision Making, and utilizes a Conceptual Site Model to analyze these exposure pathways (i.e. how human and ecological species are exposed to various contaminants). The Site Cleanup Rules are currently under review to consider updating cleanup levels to reflect recent toxicological findings and to make them more “user friendly.” Additional revisions are expected over the next few years. DEC conducts a formal public comment process before changes are made to any regulations, allowing the department to hear and consider these comments before they become law.

IV. EXPOSURE TO CONTAMINANTS

The primary focus of the Contaminated Sites Program (CS Program) is to protect human health and the environment from exposure to harmful pollutants released to soil or groundwater. Due to the large number of contaminated sites, the CS Program has developed a new ranking system called the Exposure Tracking Model (ETM) to determine which sites present the greatest risk of exposure.

The ETM evaluates sources of contamination, ways that contaminants move through the environment, type of contaminated media (soil, groundwater, stream sediments, wetlands, etc.), and the routes of potential exposure to humans, plants, or animals (ingestion, contact with skin, inhalation). Contaminated sites that present the greatest risk to human health are the highest priority for cleanup.

The risk of harm to human health and the environment rises through exposure to oil or hazardous substances:
Breathing, skin contact, eating and drinking.

Human Health

Exposure to hazardous substances can adversely impact human health. The effect of the exposure to contamination can include minor impacts such as headaches, serious acute effects including death, or long-term effects such as liver damage or cancer.

The three main ways in which humans can be exposed to hazardous substances are through ingestion (eating and drinking), skin contact or by inhalation (breathing). For example, children playing in contaminated soil can be exposed to the contamination through skin contact or even ingestion through hand-to-mouth contact. People can also be exposed by eating contaminated food - the potential contamination of wild subsistence foods is of particular concern to Alaskans.

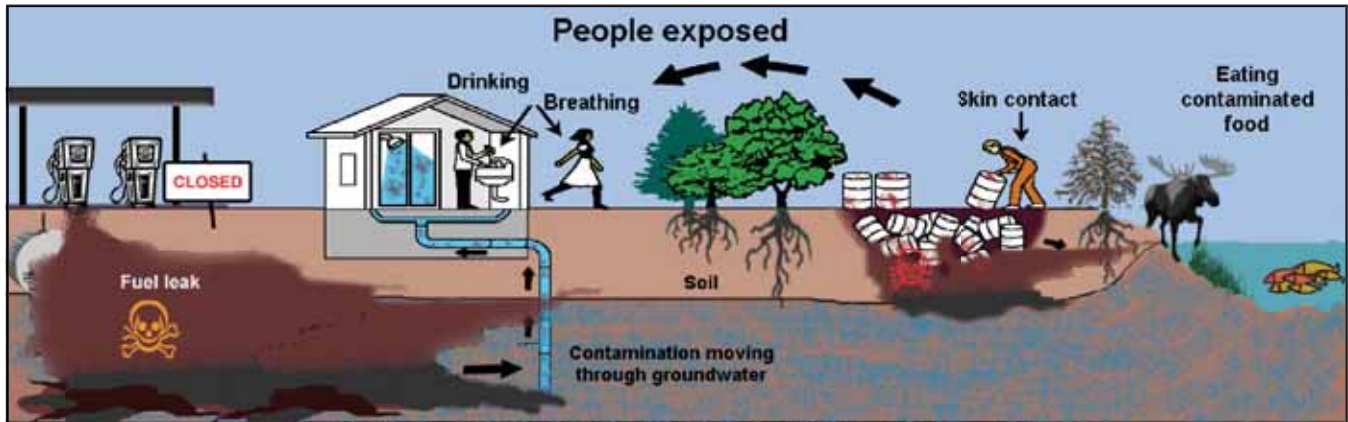
Figure 4-1, next page, depicts the basic ways people can be exposed to contamination, or the exposure pathways. An exposure pathway is considered complete when contamination is present and a nearby person could be exposed.

Health of the Environment

The Contaminated Sites Program also works to protect fish and wildlife populations and other natural resources, such as groundwater, from the effects of harmful pollutants. Some contaminants build up in the tissues of plants and animals and continue to accumulate as larger animals eat them. This built-up contamination can impact the health of plant and animal populations. Other hazardous substances may destroy entire populations of plants or animals that are important to the health of the ecosystems they occupy.

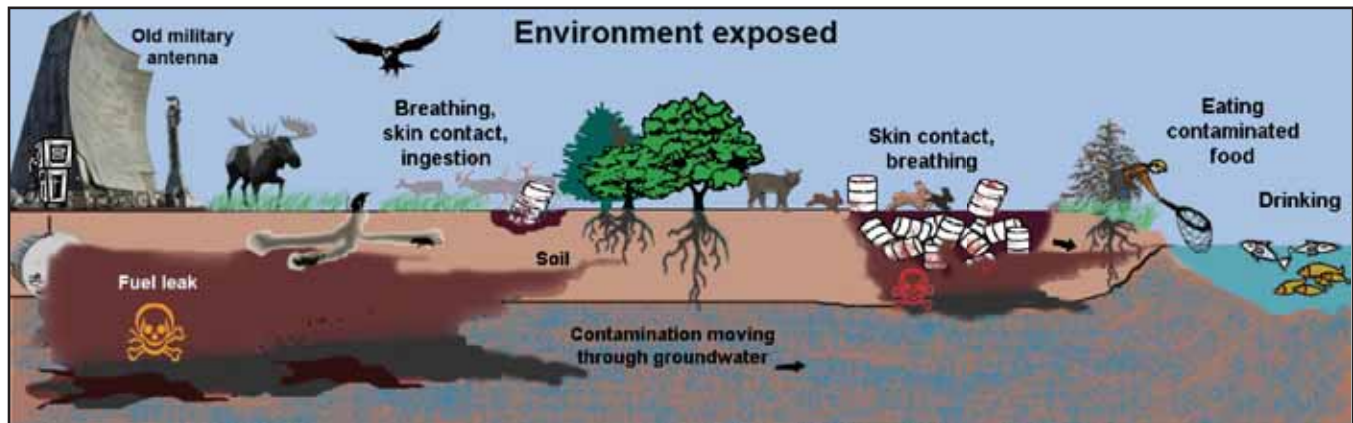
The Contaminated Sites Program evaluates risks to natural resources, in addition to risks to human health, as part of the ranking process. Figure 4-2, below, depicts the basic ways the environment can be exposed to contamination.

FIGURE 4-1



People can be exposed to pollutants by eating and drinking, skin contact, and breathing.

FIGURE 4-2



Plants and animals can absorb pollutants into their systems. Entire populations in an area can be affected, reducing the food available for other organisms that consume them. Contaminants can also be passed along to other organisms in the food chain, and some of these contaminants build up in tissues over time.

Kinds of Pollutants

The contamination of land and water in Alaska was often the result of past disposal practices of commonly used chemicals before the impacts of exposure to the human health and the environment were as well known as they are today.

Approximately four-fifths of Alaska's contaminated sites are polluted by petroleum products (Figure 4-3, page 17). The prevalence of this contaminant is due to the common use of petroleum products in our everyday lives.

Petroleum compounds naturally decompose when exposed to oxygen, sunlight and soil bacteria. However, due to Alaska's cold climate, petroleum products released to the environment decompose more slowly than in more temperate areas, sometimes taking many years or even decades to break down.

In the time it takes for petroleum pollutants to breakdown, they may contaminate soil and groundwater and pose a risk to human health. Petroleum products may present both carcinogenic (cancer causing) and non-carcinogenic risks. Benzene is an example of a common carcinogen found in petroleum products. Other harmful substances, including gasoline additives such as lead and ethyl-dibromide, are found at some petroleum contaminated sites.

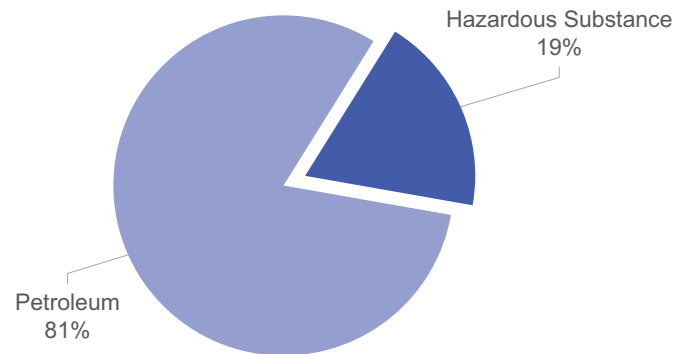
Non-petroleum pollutants are the primary contaminant at approximately one fifth of Alaska's contaminated sites (Figure 4-3). Examples of these hazardous substances include chlorinated solvents, commonly used in the past by a wide variety of commercial facilities and individual households as degreasers, paint strippers, paint and lacquer thinners and dry cleaning compounds. Many of these compounds are carcinogenic and tend to be more toxic and persist longer in the environment than petroleum products.

Hazardous substances also include pollutants known collectively as Persistent Bioaccumulative Toxins (PBTs). PBTs are long-lasting substances that can build up in the food chain to levels that are harmful to human and ecological health. They are associated with a range of adverse human health effects, including effects on the nervous system, reproductive and developmental problems, cancer, and genetic impacts. Examples of PBTs are polychlorinated biphenyls (PCBs), mercury, herbicides, and dioxins and furans. PBTs are especially harmful to children.

PCB use was particularly common in the past in Alaska. PCB's are typically associated with military facilities operated from 1930 until 1979, when their use was banned in the United States. The largest use of PCBs was in electrical transformers, switches and capacitors. Contamination mainly occurred from leaking transformers or the dumping of PCB oil on the ground as a disposal practice.

Mercury is another PBT that is found at some Alaskan contaminated sites. The largest user of mercury is

FIGURE 4-3 Kinds of Pollutants



the mining industry. Alaska has a rich mining history that began in the late 1800s. Many of these mines were abandoned and efforts are underway to address contamination at those sites.

In addition to mercury, other metals are also considered hazardous substances and may be present as environmental contaminants in soil or water because of human activity. Lead and cadmium from batteries, gasoline, and paint are especially common. Exposure to these so-called “heavy metals” may result in vital organ and central nervous system damage and other damage that mimics Alzheimer’s disease, Parkinson’s disease, muscular dystrophy and multiple sclerosis.

V. CLEANUP AND MANAGEMENT

The Contaminated Sites (CS) Program is responsible for providing regulatory oversight to responsible parties conducting cleanup of soil and groundwater pollution. The process involves many components, from the time we first learn of the site and make a preliminary risk analysis, through developing detailed investigation and cleanup work plans, to overseeing and completing cleanup. Each project is different, and many assessment methods and cleanup scenarios may be followed. Small and simple problems may be rapidly managed with limited oversight, whereas more complex contaminant problems require significant technical oversight and management over several years. Some issues require immediate response, and when the responsible person is unable or unwilling to provide financial commitment, the CS Program has authority to take over the cleanup and recover its costs from the responsible person.

Site Intake

Sites are reported in a variety of ways. Often they are identified and reported to the department following a property assessment conducted by a consultant working for a responsible party (such as a federal agency or a business owner). New spills and releases are first managed by the Prevention and Emergency Response Program; those sites that are historical in nature or that will require long-term oversight and stewardship are handled by the CS Program. The process of entry into the CS Program database is known as “site intake.” Communication between staff, the responsible party and their consultant takes place to ensure that all available and necessary information is collected and entered into the Program databases. This information is retained for all confirmed sites and is available on a publicly accessible website.



Before equipment is mobilized to assess contamination, extensive planning must be done. Drilling holes to sample soil and water below-ground can sometimes spread the contamination to other subsurface layers. Spills on the surface of the ground can often be addressed rapidly, but the location and treatment of underground contaminants should be a careful, methodical process which can take much time. *(Photo of Galena Airport investigation courtesy of the U.S. Air Force.)*

Preliminary Exposure Assessment

The fundamental strategy we use in cleaning up and managing contaminated sites is to identify those sites with the greatest potential to expose people, fish and wildlife to oil and hazardous substances, and to ensure that appropriate and timely actions are taken to lessen that potential.

The Alaska Hazard Ranking Model (AHRM) has been used since 1991 to initially rank each site as high, medium, or low priority based on the potential hazards present. This model is currently being redesigned with additional elements that will provide program management with greater capability to rank sites

based on current or potential exposure to harmful contaminants. The new ranking system evaluates “exposure pathways” such as direct contact (with soil or water), ingestion (of surface water, subsurface water, wild foods or soil), and/or inhalation (of indoor or outdoor air). The redesigned model, called the Exposure Tracking Model (ETM), will also have the capability to track the relative reduction in risk at a site as various actions are taken throughout the life of a cleanup project. Accurate ranking is critical in order to direct limited resources to the worst sites. Tracking relative risk reduction also demonstrates progress on cleanup projects that may last for years.

Prioritization

Any site for which a current exposure exists is considered a top priority. Other categories which help rank a site include high or low potential exposure, future exposure and controlled exposure. The immediate concern is to determine how to lessen or prevent the ways in which a contaminant travels from its source through soil, groundwater, surface water or other animals to expose humans and ecological “receptors” such as plants, fish and wildlife. The action and timeframe are dependent on the contaminant(s) and the complexity of the exposure pathway(s).

Cleanup decisions are based on land use, including the two basic land use categories of “residential” or “commercial/industrial.” Not all sites pose immediate concerns, but if the use of the property should change, so may the potential for exposure. Sites without immediate or critical concerns are identified, the responsible parties are engaged, and an appropriate work plan and time schedule is developed in coordination with regulatory requirements.

The CS Program focuses first and foremost on high-risk sites. At the same time, some projects require oversight, coordination and attention because of priorities important to the responsible party. These may include community-based, social and economic priorities often associated with property sales, new construction, property foreclosures, utility and road construction and expansion, or redevelopment projects.

Cleanup Process

The CS Program can use its enforcement authority to compel cleanup of contaminated sites. Our preferred approach, however, is to work with responsible parties in manner that promotes voluntary compliance. This is achieved through open communication, clear direction, and known end points



Possible **future** as well as **current** uses of a site are considered when assessing exposure to contamination in order to rank a site's priority. A preliminary assessment of contamination under a DEC Brownfield grant has been performed at this historic gold mining camp near Deering. The site is used periodically by local residents, and is being considered for use in the future as a tourist attraction. (Photo courtesy of SLR.)

during the cleanup process. The CS Program has been highly successful with this voluntary approach and only rarely has had to resort to formal enforcement.

Our site cleanup project managers work closely with responsible parties and their consultants to ensure they understand their responsibilities and their options. Our project managers thoroughly review work plans and technical reports to ensure that regulatory requirements are met.

Less complex, low-risk sites may be addressed using a streamlined cleanup approach. This approach provides for expedited cleanup, minimal department oversight, and waiver from certain regulatory requirements. The intent is to decrease cleanup costs while ensuring more low-risk sites are cleaned up. This can be especially important when contamination is hindering a property transaction or productive use of a site.

Site Closure and Long-Term Management

A site closure determination, sometimes called a record of decision, summarizes the investigation and cleanup, formulates the basis for the department's decision, and documents any conditions that may be required to ensure that human health and the environment are protected for the long-term. A site is "unconditionally closed" when contamination is cleaned up to meet the most stringent regulatory cleanup levels. The successful outcome is a site that no longer poses a threat to human health or the environment. A site is "conditionally closed" when the most stringent cleanup levels have not or cannot be attained.

Regulators, neighbors and landowners alike would prefer to see the land put back the way it was. Completely cleaning soil and water as if it had never happened, however, is almost impossible. Alaska's cleanup standards are based on contaminant levels considered safe for people, plants and animals to be exposed to, and these standards are set through state regulation.

Often it is technically or economically infeasible to clean up all contamination. For example, contamination is often found beneath buildings or deep below the ground surface beyond the practical limits of excavation equipment. Innovative technologies which treat soil or water in place can substantially reduce costs but often leave low levels of contaminants still above the strictest cleanup levels.

Conditional closure is a risk-based solution that allows residual contamination to be left in place as long as people and the environment are protected. Responsible parties may request a reduced site cleanup effort if technical or economic considerations are limiting factors. A clear demonstration that remaining contamination is stable and does not pose a risk to people or the environment is critical to the department's decision to leave contamination in place. This

Conditional closure is appropriate when:

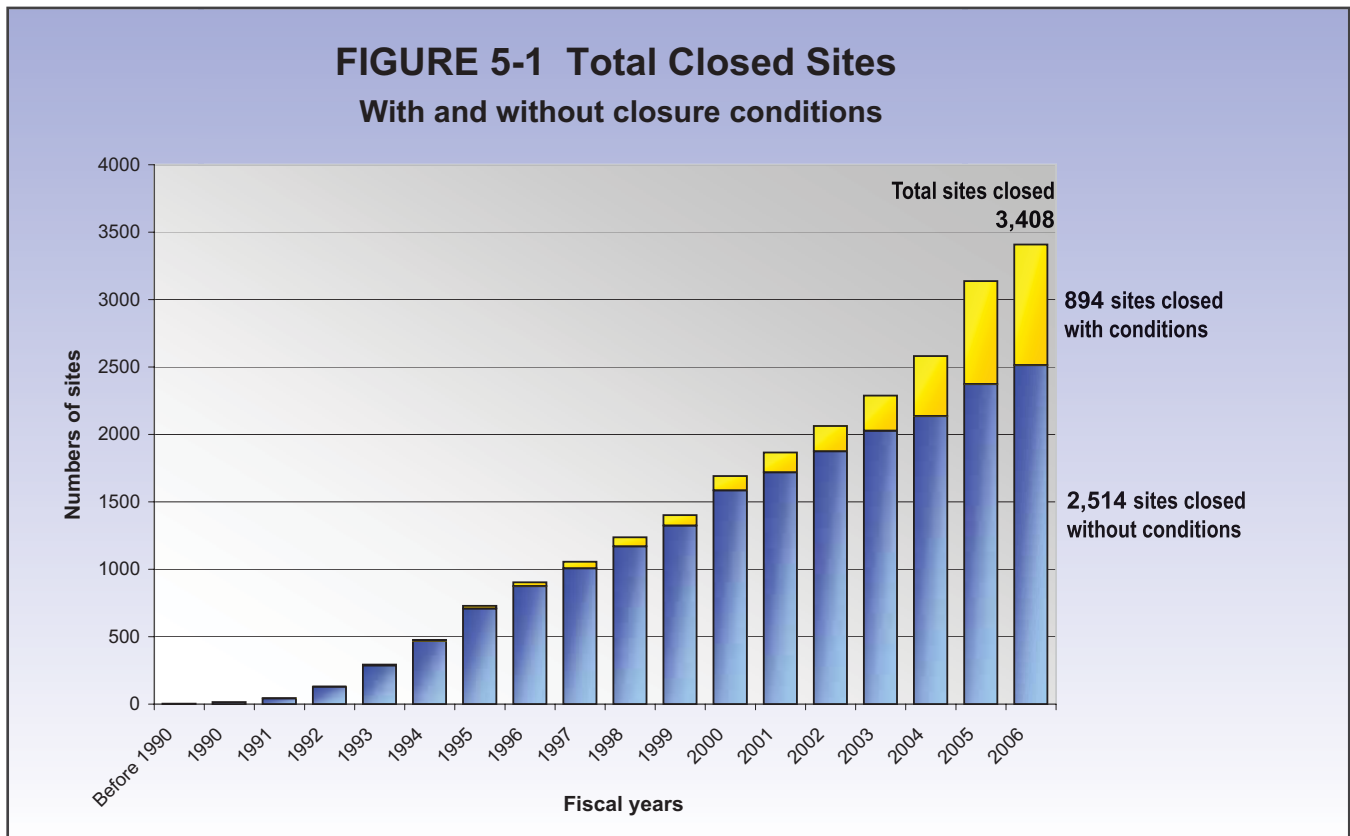
- 1) potential human health and environmental exposure is controlled,*
- 2) measures can be taken to assure continued protection,*
- 3) the costs of additional cleanup are disproportionate with the reduction in risk.*

may require that the responsible party agree to limit use of the property, thus restricting the potential development opportunities for the site. This is an economic decision that is incorporated into the cleanup strategy for a site, and one that is made in conjunction with the site cleanup project manager.

Allowing residual contamination to remain when it does not present an exposure risk may reduce the short-term costs. Long-term site management costs, however, may outweigh the economic benefit of leaving residual contamination behind. For example, the responsible party may be required to conduct periodic groundwater monitoring for many years into the future to demonstrate that contaminant concentrations are diminishing over time through natural breakdown processes.

Figure 5-1 below shows a comparison of the number of conditionally closed and unconditionally closed sites at the end of each fiscal year since 1990.

What kinds of conditions does the CS Program require in order to grant conditional closure? One requirement in virtually all cases is to notify the CS Program before soil with lingering contamination is moved off the property. Another common condition is that the landowner or responsible party must periodically monitor (through laboratory testing) the contaminated soil and/or water to show the progress of natural breakdown. The responsible party may be required to restrict use of groundwater for drinking water through a notice attached to a public record such as a deed. The land may need to have a commercial land use designation, since exposure to low levels of contamination is less for visitors and workers at a commercial establishment than for residents of a home. A fence or cap over soil may be required to be placed and maintained over years, protecting humans and animals from exposure to contaminated areas. Periodic reporting to the CS Program may be required to *(continued, page 24)*



Figures 5-2 and 5-3 show how people and the environment can be protected from exposure to contamination which remains after active cleanup stops.

FIGURE 5-2

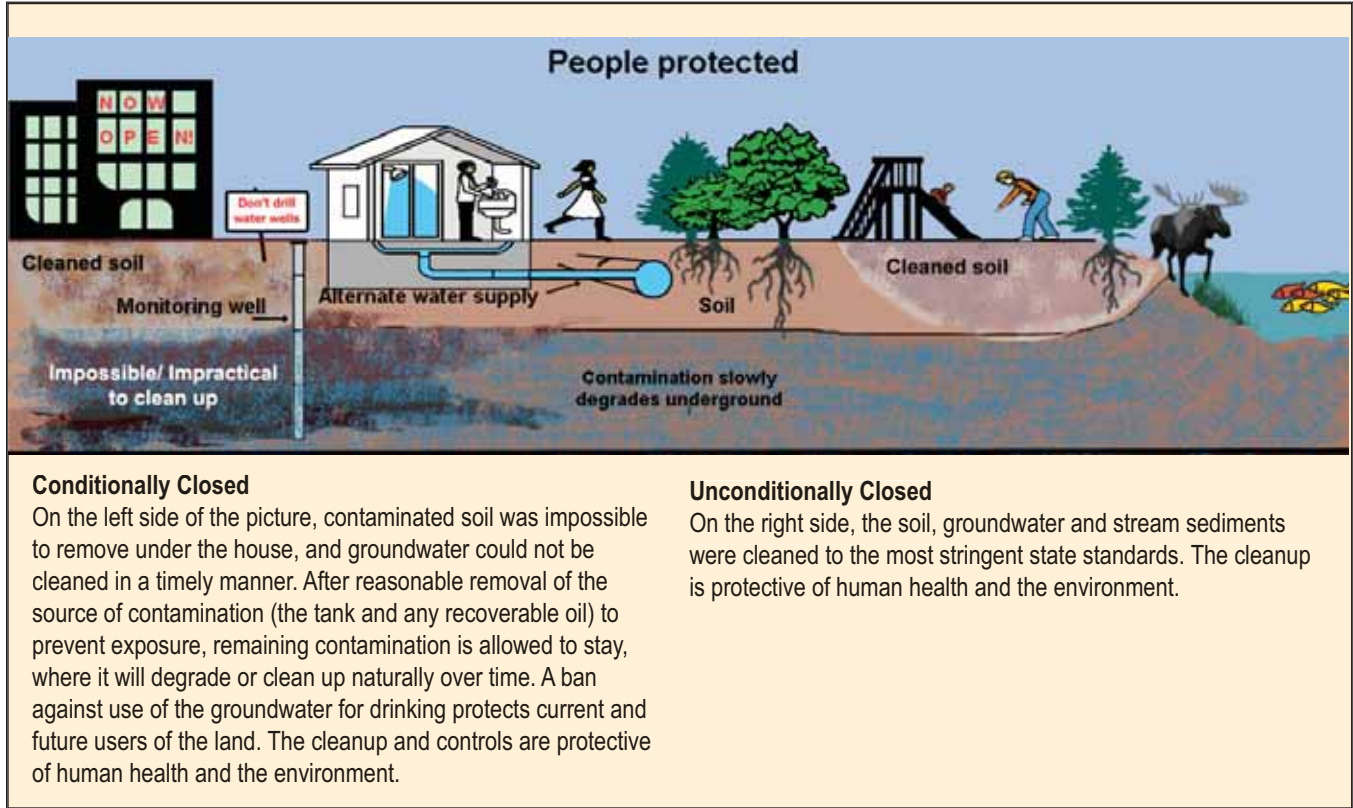
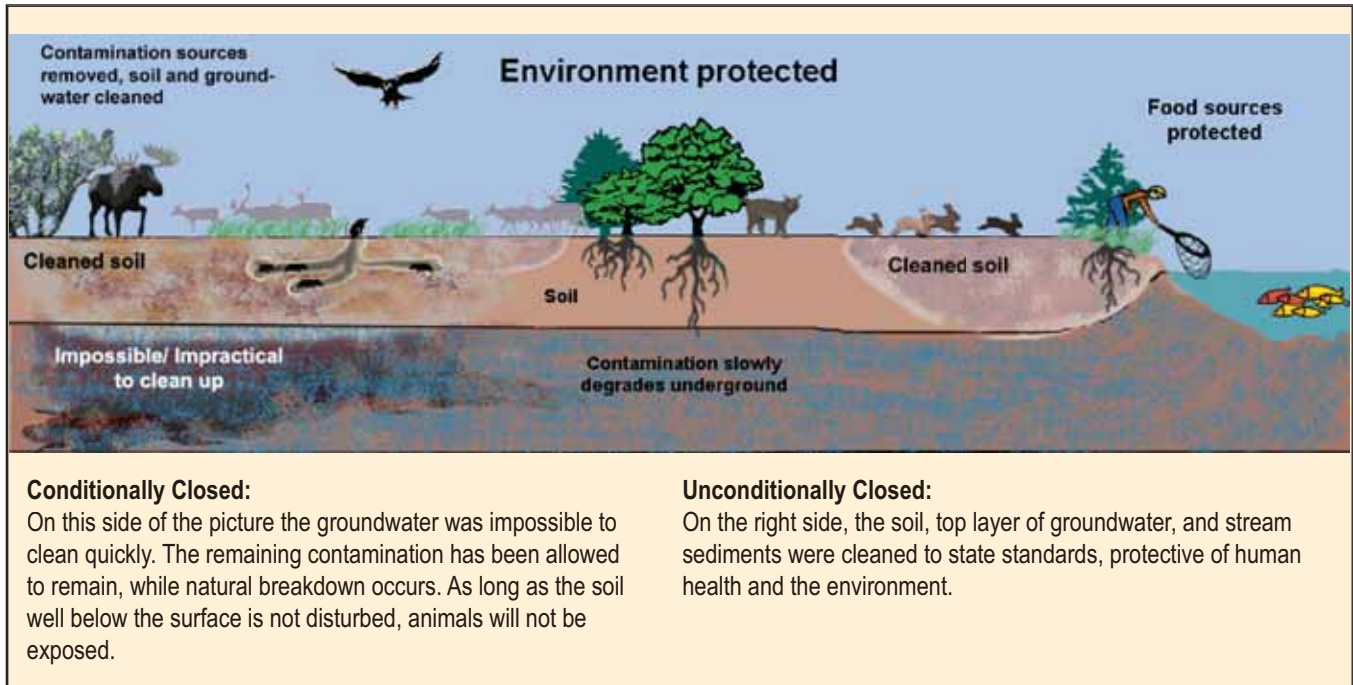


FIGURE 5-3



(continued from page 22) show controls are being maintained. Records of all contaminated sites, whether open or closed, are maintained on our database, accessible to the public via the internet.

Administrative documentation and follow-up are essential to determine the effectiveness of land and activity use controls. The responsible party (or the current property owner) must be willing to comply with any conditions that are attached to the property to ensure the residual contamination does not pose a current or future risk. That documentation is tracked in the program's databases and made available to the public.

Reuse and Redevelopment

Nearly every city and small town or village has vacant, underused and potentially contaminated properties. For many years the CS Program has used a variety of tools to promote reuse of this land, facilitate redevelopment and protect future land users from exposure. Real or perceived contamination can complicate the reuse of property and impact the economic well-being of many Alaskans.

Contamination in either subsurface soil or water may present little or no risk to human health unless the land is disturbed. This happens frequently with redevelopment projects.



A 154 acre lot in Fairbanks, owned by the Bentley Family Charitable Trust, was used in the 1970s as a construction and storage yard for the Trans-Alaska Pipeline. Pipeline-era contamination from multiple sources, not including the current owners, was characterized and cleaned up in order to allow commercial redevelopment. Much of this site has been redeveloped with a mall and box-stores, such as Home Depot, WalMart, Fred Meyer, First National Bank, and Chili's. (DEC photos)

Recognizing that human health and economic considerations go hand-in-hand when revitalizing contaminated properties, the CS Program emphasizes efforts to put land back into use through the Reuse and Redevelopment Initiative. The intent of this initiative is to ensure that site cleanup and long-term management of residual contamination are not at cross purposes with the economic redevelopment needs of the community. Our site cleanup project managers are responsive to developers and property owners, understand end-use scenarios and assist in designing cleanup strategies that account for economic factors while ensuring the protection of human health and the environment. The program's Reuse and Redevelopment Initiative is an important part of the CS Program's effort to support Alaska's economic growth in both urban and rural areas through reasonable regulatory oversight. More details on the Reuse and Redevelopment Initiative, as well as examples of redevelopment projects, can be found on the program's web site (www.dec.state.ak.us/spar/csp/).

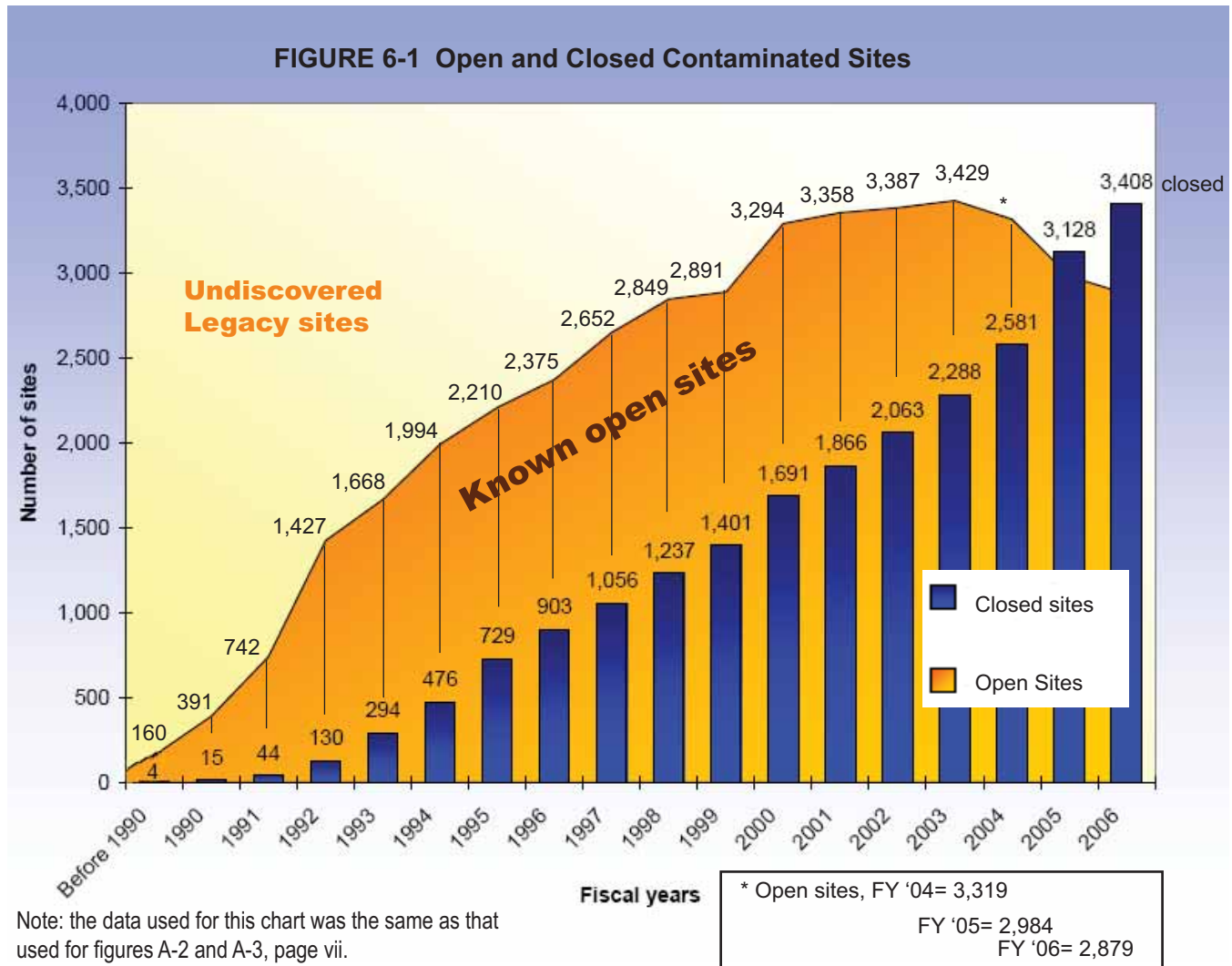
Many of the principles associated with the Reuse and Redevelopment Initiative are directly aligned with what are often termed "brownfields." Brownfield sites are properties at which use or redevelopment is hindered by real or perceived contamination. The CS Program focuses on public outreach, technical assistance, grant development, and conducting site assessments at identified brownfield sites. To date, more than 158 potential brownfield sites have been identified in Alaska.

Another method through which DEC can facilitate a property transaction is a "Prospective Purchaser Agreement" (PPA). A PPA is a negotiated, legally binding agreement between the State of Alaska and a potential buyer of contaminated property or another holder of interest in a property (e.g. lessee). The agreements define and limit the extent of a purchaser's liability to the State for environmental cleanup under State law.

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VI. PROGRESS

The Contaminated Sites Program (CS Program) has made significant progress over the last 16 years in addressing Alaska's contaminated sites. Figure 6-1 shows that progress since 1990. At the end of Fiscal Year (FY) 2005, the number of closed sites surpassed the number of open sites for the first time. That trend deepened in FY 2006.



It is important to note that the number of sites has no relationship to the quantity of oil or hazardous substance released at a site. Quantities can be extremely difficult to estimate for old releases, where often there is minimal information concerning release duration or volume. Quantities range from tens of gallons to thousands of gallons.

Figures 6-2, 6-3, and 6-4, next page, provide an overview for progress at all known contaminated sites, including leaking underground storage tanks (LUST sites) since the CS Program began keeping records

in 1990. Progress is reported based on the different stages of the cleanup process:

Preliminary evaluation: When a site is discovered or reported to us, the CS Program first evaluates the risk it presents to humans. The site is then ranked in relation to others, and the high-priority sites are typically worked on first.

Assessment: More detailed information is gathered about the site's contaminant(s); the extent of contamination, toxicity and presence of receptors, the potential for contaminant migration and other important information.

Active cleanup: Work has begun to remove contamination.

Conditional closure: Active cleanup has been terminated and measures have been taken to protect human health and the environment from current and future exposure. The responsible party may need to continue monitoring soil or groundwater to track the natural breakdown of contamination. Physical measures or land and activity use controls may be required to prevent exposure.

Closure: Cleanup levels set in state regulation have been met for both soil and groundwater.

FIGURE 6-2 Progress of All Contaminated Sites

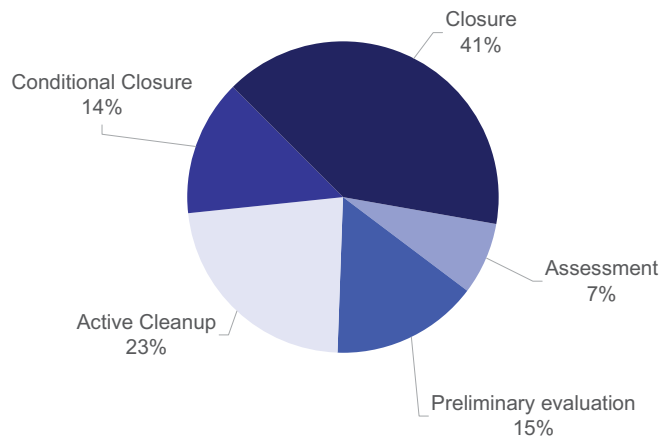


FIGURE 6-3 Total Contaminated Sites by Responsible Party

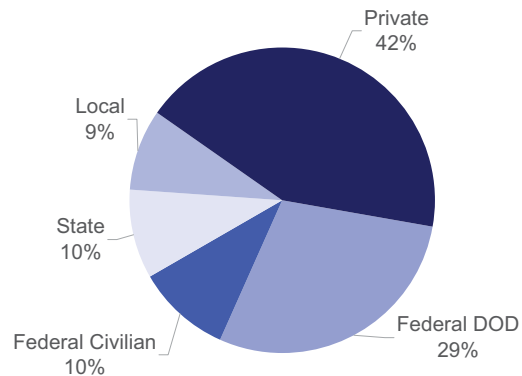
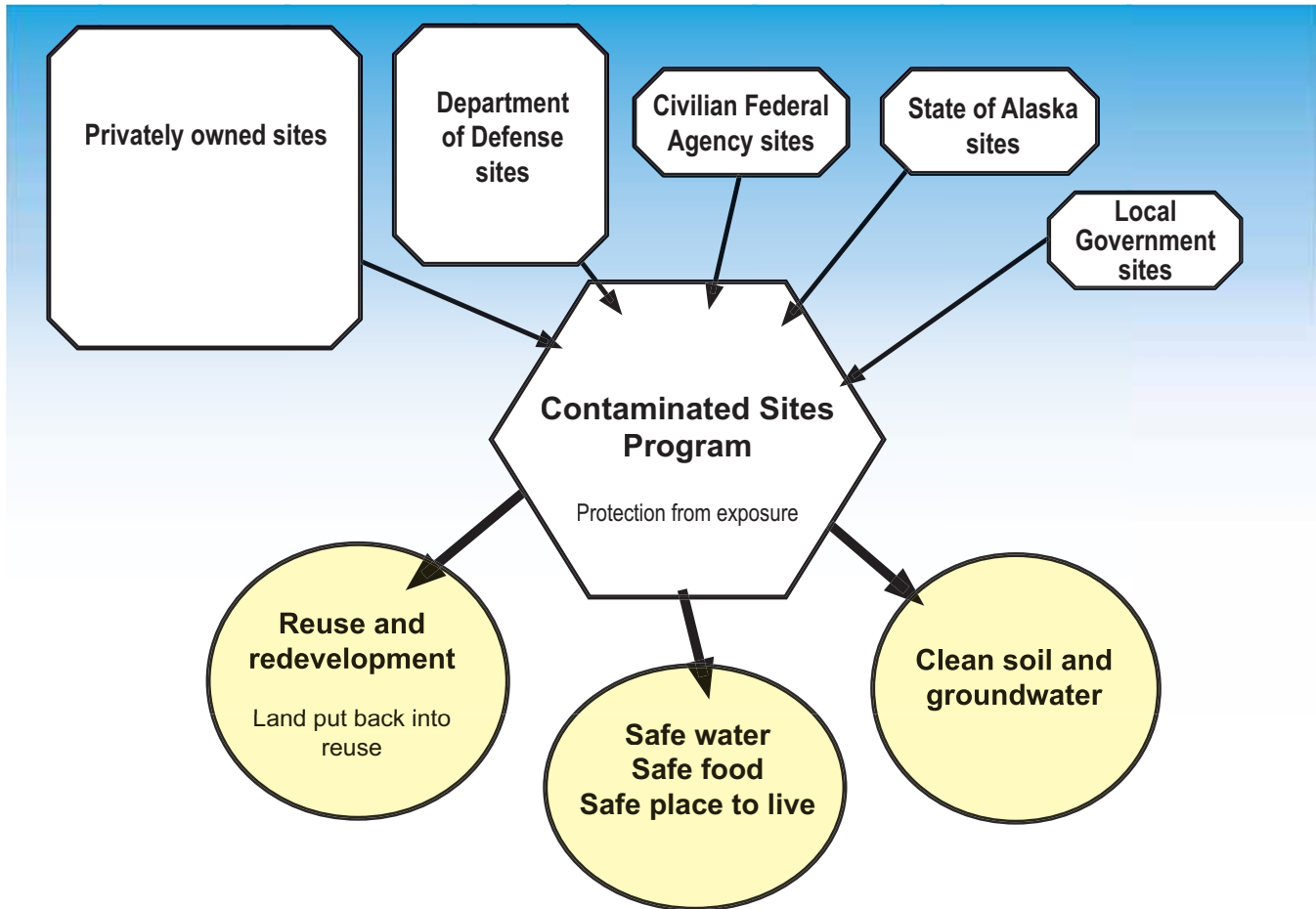


FIGURE 6-4 Addressing Alaska's Contaminated Sites



Progress at Military Sites

Contaminated sites at military and former military installations in Alaska number over 1800 sites and comprise about 29% of the total number (open and closed) of contaminated sites in Alaska (see figure 6-3). As stated in Section II, Alaska has played a critical role in national defense over the past sixty to seventy years. From World War II through the Cold War, and even today, the Department of Defense (DOD) has been a major entity in Alaska in both cities and at remote sites throughout the state.

In 1986, Congress established an environmental program specifically to address DOD's historic contamination: the Defense Environmental Restoration Program. Under this program, the federal government is required to comply with both state and federal cleanup requirements. DOD cleanup efforts started in the late 1980s but saw the most progress during the 1990s. Just over half of the military sites have been conditionally closed or unconditionally closed as of the end of June 2006. DOD cleanup costs have been in the hundreds of millions, mostly due to the increased cost of operating in harsh weather and remote conditions. Another cost factor is that DOD sites tend to be more complex and contain more difficult chemical compounds to investigate and remediate.

At active military and former military sites the responsible branch (called service component) of the military and the CS Program work together to ensure that cleanup meets state standards. Each service component – Army, Air Force, Navy, and Defense Energy Support Center (DESC) – is responsible for cleaning up sites under its jurisdiction. The U.S. Army Corps of Engineers is responsible for cleanup at Formerly Used Defense Sites (FUDS), properties that as of 1986 had been transferred from DOD ownership or control to other federal, state, local, or tribal entities or private parties.

The CS Program and DOD signed a Defense State Memorandum of Agreement (DSMOA) in 1991. This agreement provides a basis for working cooperatively and to fund the CS Program’s oversight. Wherever there has been sufficient interest, the military branch has established a “Restoration Advisory Board” to involve interested community members in the cleanup process. For example, during cleanup of unexploded ordnance at Adak, stakeholders served on a technical project team to create methodologies for ordnance clearance. These methodologies are now used by cleanup personnel at other sites throughout the country, and elements of the process are now mentioned in both the Environmental Protection Agency (EPA) and DOD guidance for remediation of unexploded ordnance.

The figures in this section show the percentage of contaminant types found at the DOD sites (Figure 6-5), the progress at all their sites (Figure 6-6), and the percentages of the total DOD sites for which each branch of the military is responsible (Figure 6-7).

FIGURE 6-5 Contaminants at DOD Sites

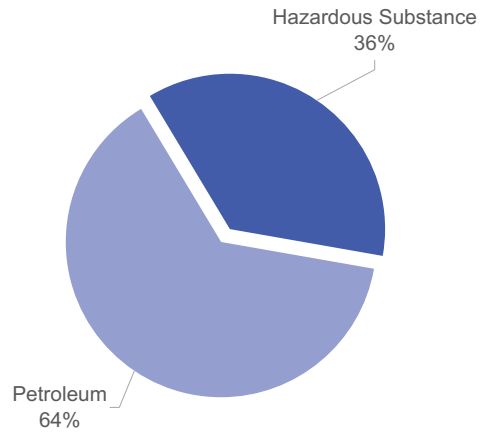


FIGURE 6-6 Progress at DOD Sites

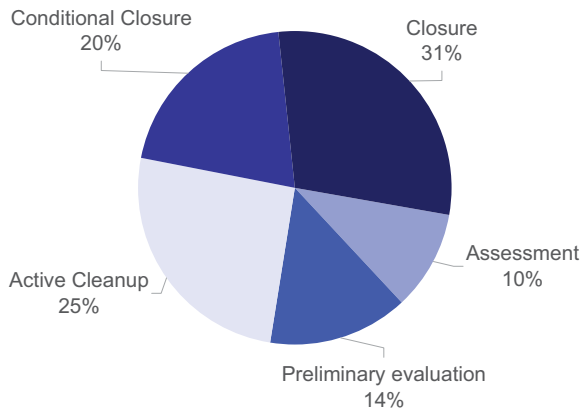
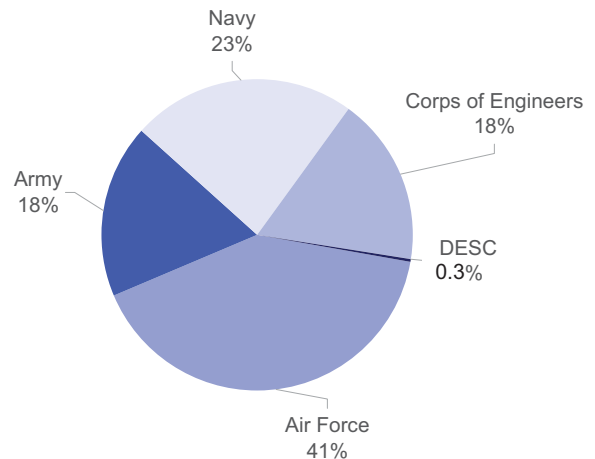


FIGURE 6-7 DOD Sites by Service

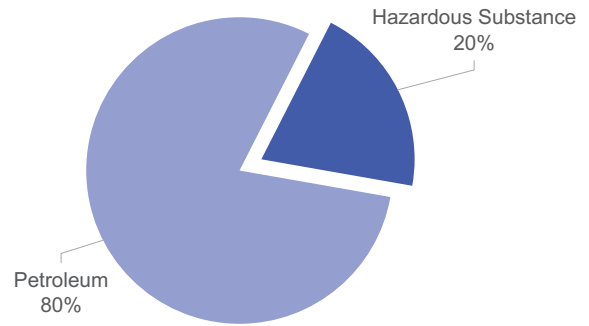


Progress at Civilian Federal Agency Sites

Contaminated sites for which civilian federal agencies are responsible for cleanup represent just over 600 sites or about 10% of the total number of contaminated properties in Alaska. About 49% of these sites were conditionally closed or unconditionally closed as of the end of June 2006.

Eighty percent of civilian federal agency sites are contaminated with petroleum and 20% are other hazardous substances (Figure 6-8). One of Alaska's growing legacy issues is abandoned mines. These abandoned mines, which may number in the thousands, are often contaminated. They have not been identified as sites in our database. Many are located on lands administered by the federal government. Many of the companies that operated these mines in the early 1900s may no longer exist: the responsibility for investigation and cleanup of these "orphan" sites thus defaults to the appropriate land management agency. The reality of limited financial resources to address the physical hazards, solid waste, and hazardous substance contamination problems that usually accompany most abandoned mine sites has hampered the ability of both federal agencies and the state to identify and clean up these sites. The CS Program anticipates a greater emphasis on abandoned mines in the future as resources become available.

FIGURE 6-8 Civilian Federal Sites Contaminants



Figures 6-9 and 6-10 show the status of cleanup progress at the 624 civilian federal agency sites and the percentage of sites for which agency is responsible. Agency abbreviations stand for: National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), U.S. Forest Service (USFS), Bureau of Land Management (BLM), and Federal Aviation Administration (FAA).

FIGURE 6-9 Civilian Federal Sites Progress

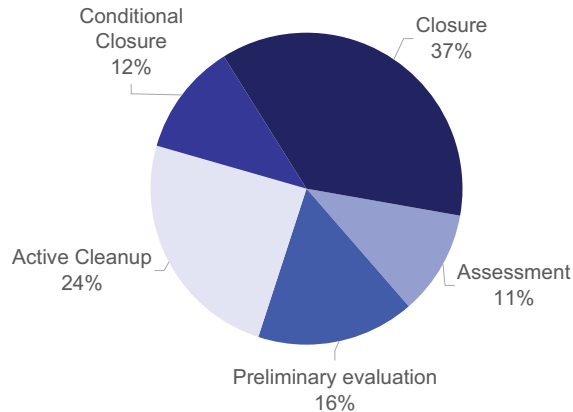
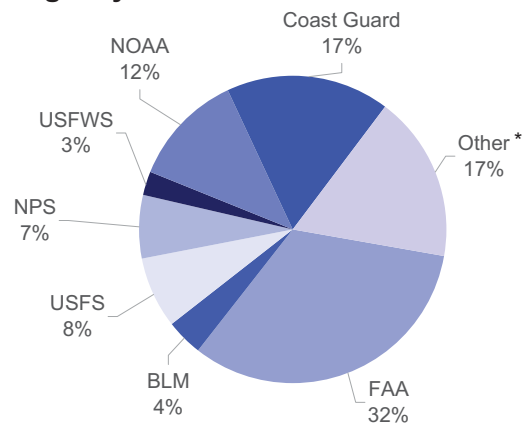


FIGURE 6-10 Civilian Federal Sites by Agency



* The "Other" category includes the U.S. Post Office, U.S. Department of Health and Human Services, U.S. Public Health Service, U.S. Department of Energy, Federal Communications Commission, General Services Administration, as well as some sites which need to be re-categorized.

Progress at Private Sites

Contaminated sites for which private parties are responsible for cleanup represent about 42% of the total contaminated sites in the state. These sites include contamination originating from small-scale releases at private residences and/or businesses, larger scale spills at commercial facilities, and major industrial operations. The contaminants of concern are primarily petroleum products but there are also chlorinated compounds from industrial/commercial facilities and metals contamination at numerous mining sites.

About 59% of the privately owned contaminated sites were conditionally closed or unconditionally closed as of the end of 2006.

Figures 6-11 and 6-12 show the type of contaminants at the over 2700 private sites and the status of cleanup progress at those sites.

FIGURE 6-11 Private Sites Contaminants

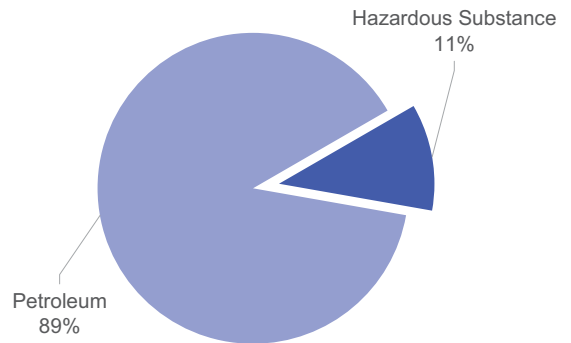
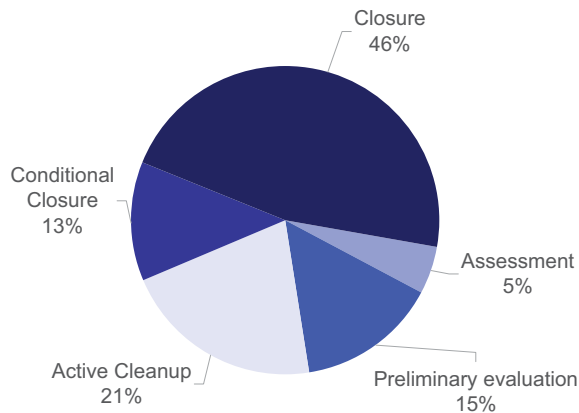


FIGURE 6-12 Private Sites Progress



Progress at State Sites

Properties owned or managed by state entities comprise about 10% of the 6,287 contaminated sites in Alaska. Forty-two percent of these sites are owned or managed by the Department of Transportation and Public Facilities. Other State entities with responsibility for a number of contaminated sites are the Alaska departments of Fish and Game, Corrections, Military and Veterans Affairs, Natural Resources, and Commerce, Community and Economic Development. Also included are the Alaska Housing Finance Corporation, the Alaska Railroad, and the University of Alaska. About 51% of the state-owned contaminated sites have been unconditionally or conditionally closed as of the end of June 2006. Figure 6-13 shows the type of contaminants at the 600 State sites. Figures 6-14 and 6-15 show the status of cleanup progress at those sites and the percentages of sites for which the various agencies are responsible.

FIGURE 6-13 State Sites Contaminants

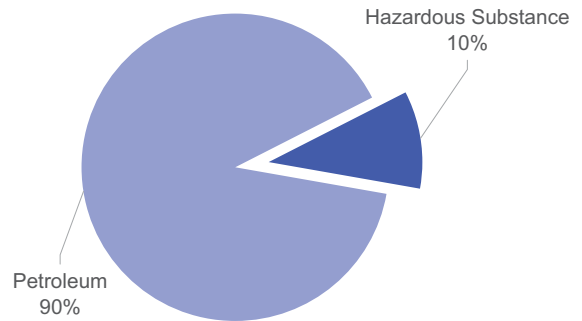


FIGURE 6-14 State Sites Progress

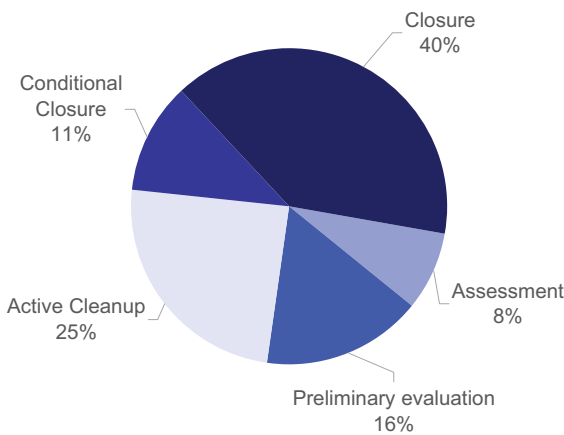
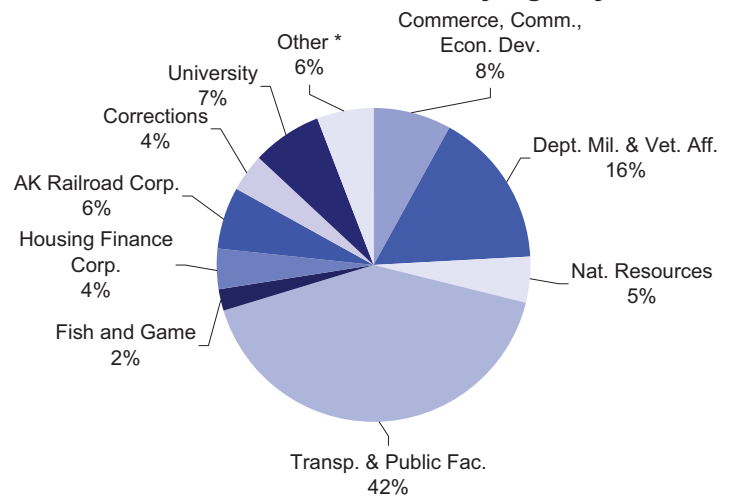


FIGURE 6-15 State Sites by Agency*



* The "Other" category includes the Alaska departments of Administration, Education and Early Development, Health and Social Services, Public Safety, Revenue. It also includes the Alaska Industrial Development and Export Authority, the Alaska Court System, Alaska Energy Authority, and the Alaska Power Administration

Progress at Local Government Sites

Local government-owned contaminated sites in Alaska represent about 9% of the total contaminated sites in the state. Of these, about 57% were conditionally closed or unconditionally closed as of the end June 2006.

Figures 6-16 and 6-17 show the type of contaminants at the 535 local government sites and the status of cleanup progress at those sites.

FIGURE 6-16 Local Government Sites Contaminants

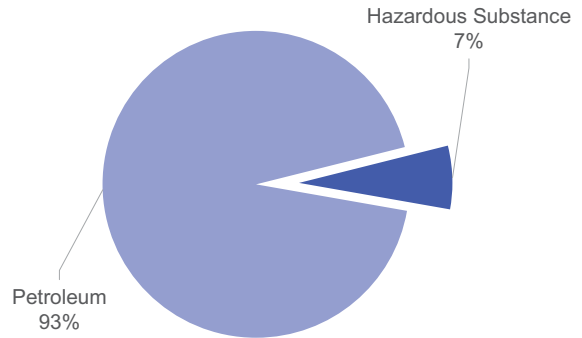
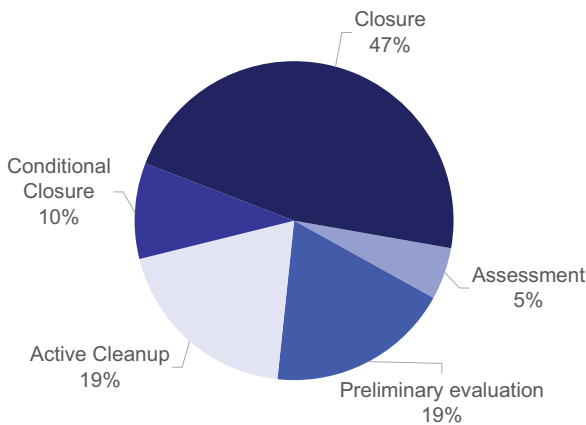


FIGURE 6-17 Local Government Sites Progress



The LUST Program

The Contaminated Sites Program currently tracks 2,291 Leaking Underground Storage Tank (LUST) sites. These sites are included in the preceding progress reports. However, since federal and state regulation now require controls to be in place to minimize spills at these sites, it is useful to view progress at LUST sites separately.

Approximately 36% of Alaska's contaminated sites are the result of leaking underground storage tanks. Most of these tanks were at gas stations, and many had leaked for a number of years before the contamination was discovered. In 1988, the Environmental Protection Agency (EPA) set a deadline for all commercial underground storage tanks to be upgraded or closed by December 1998. During that 10-year upgrade process, over 1,870 leaking underground storage tank site were discovered. Through June 2006, over 410 additional sites were identified. Cleanup is now complete at 69% of the leaking underground storage tank sites as of the end of June 2006.

The contaminant at LUST sites is petroleum. Figures 6-18 and 6-19 show the progress of cleanup at these sites and the percentages of types of entities responsible for cleanup.

FIGURE 6-18 LUST Sites Progress

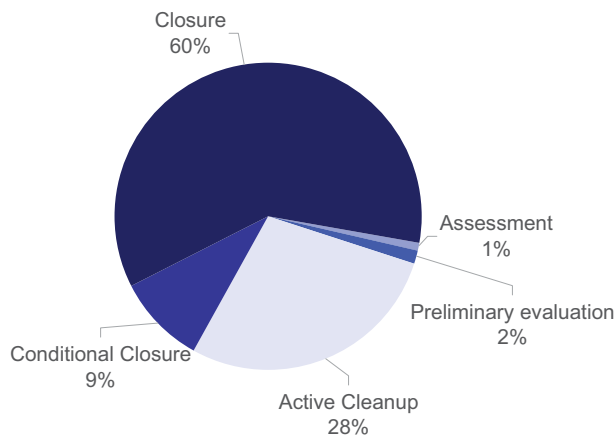
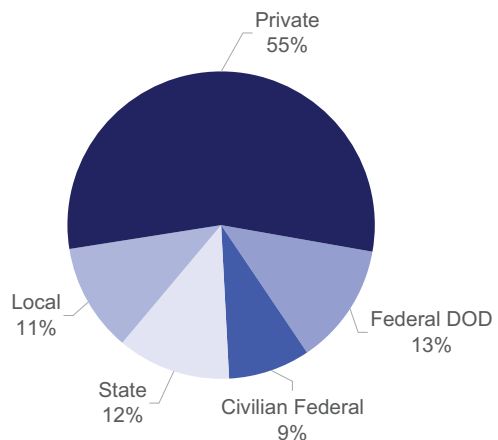
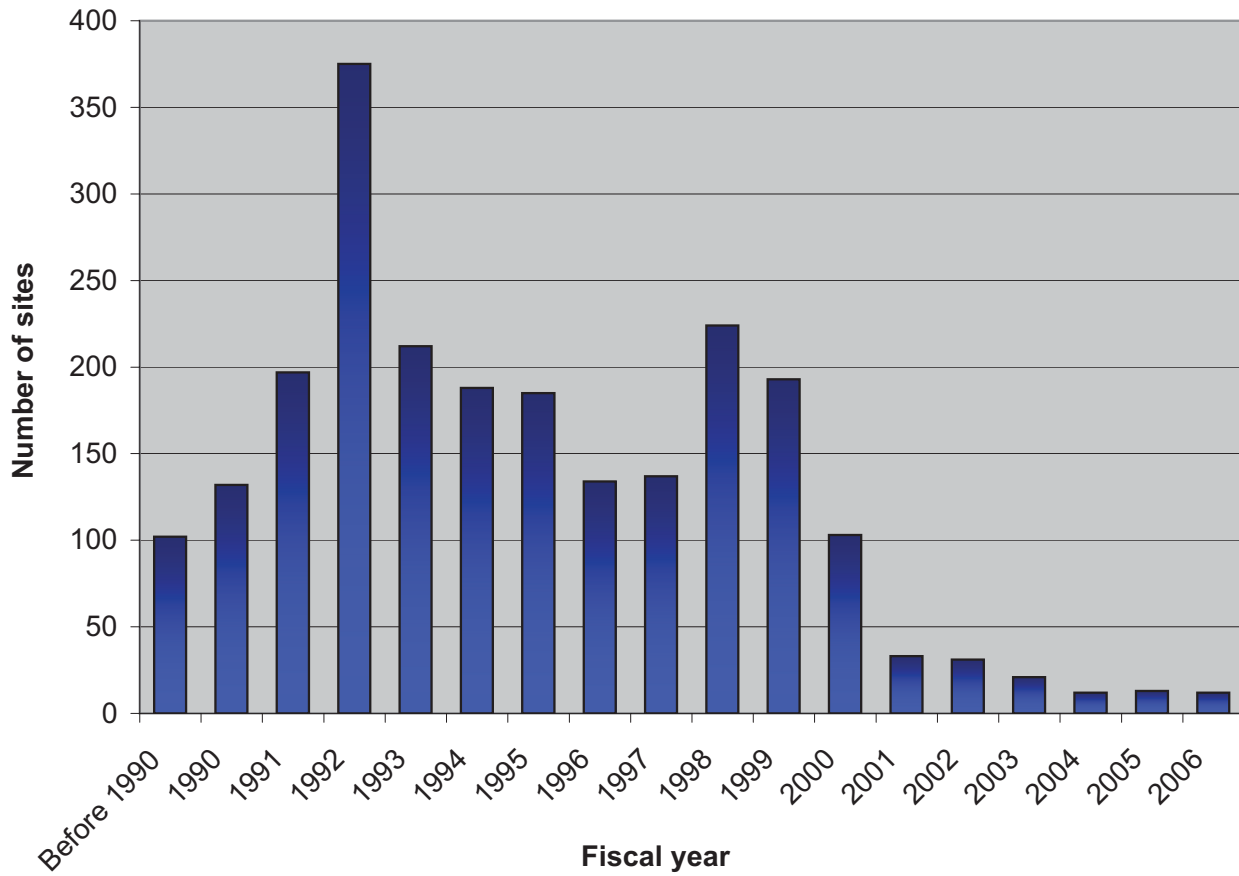


FIGURE 6-19 LUST Sites by Responsible Party



The history of underground fuel storage tanks shows that the increased regulation of this industry has paid off in terms of protecting the environment. The various measures now required for operating systems, leak detection and corrosion protection have resulted in dramatically fewer spills. The figure on the following page (Figure 6-20) shows the number of spills and leaks added to the CS Program database each year. As leaking equipment was cleaned, closed, and replaced, the number of new spills dropped dramatically. The peak was 375 in Fiscal Year 1992 to much lower figures in the last 6 years, with only 12 in FY 2006.

FIGURE 6-20 Numbers of New Leaking Underground Storage Tank Sites Added Yearly to Database



VII. CONCLUSION

The Contaminated Sites Program (CS Program) has made significant progress since the department first began to address sites contaminated with oil and hazardous substances in the 1980s. As of the end of June 2006, about 55% of Alaska's 6,287 contaminated sites have been cleaned up to the point that they no longer pose a risk to human health and the environment. Another 30% are either in the active cleanup stage or have undergone detailed assessment, leaving about 15% in the "preliminary evaluation" phase. These are sites that have been documented and have received an initial evaluation that takes into account the types of contaminants, size of the contaminated area, and the presence of humans, fish and other wildlife.

Continuing challenges we face include determining the best way to deal with a large number of abandoned mines on public land. The Environmental Protection Agency (EPA) has estimated that there are as many as 4,000 abandoned mines in Alaska. Toxic metals such as mercury and arsenic were common by-products of mining and the risks posed by these sites are uncertain. In addition, the location of many of these sites is not well documented; very few have been confirmed and listed on our database. We will soon begin work on a management plan to identify and address contaminant issues at abandoned mines. The CS Program also faces challenges posed by discarded munitions and unexploded ordnance from past military operations. Characterization and cleanup approaches for ordnance sites are significantly different than those used for hazardous chemicals. We are actively working with the U.S. Department of Defense to determine the best way to manage and clean up these sites.

The risk-based approach we use for the cleanup and management of contaminated sites balances the risk of exposure to oil and hazardous substances with economic and land-use considerations. We are confident in our ability to make pragmatic cleanup decisions while protecting human health and the environment.

It is important to note that risk-based cleanup often means that some residual contamination above cleanup levels is left in place. When that occurs, the site must be managed to keep humans, fish and wildlife from being exposed. This requires that "conditionally closed" sites be tracked and information be made available to future owners of the impacted property. The CS Program is currently developing a webpage that makes this information available to the public. If physical measures or land and activity use controls are required for a site, we will monitor those controls to ensure their long-term effectiveness. Tracking an increasing number of conditional closures requires a significant effort and is a necessary component of the risk-based approach.

The effort to refine regulations continues. Over the next two years the CS Program will seek to completely merge the cleanup requirements for Leaking Underground Storage Tanks under 18 AAC 78 with the Site Cleanup Rules under 18 AAC 75. We will also continue to improve the technical defensibility of the regulations to reflect ongoing scientific research and new findings. Finally, we will completely restructure the regulations for greater clarity and flexibility.

The CS Program is assertively moving forward with a more efficient and exact way to assess risk at sites using the Exposure Tracking Model. The Exposure Tracking Model will more accurately determine the

relative risk of exposure to oil and hazardous substances at the contaminated sites listed in our inventory. The new site ranking model will allow the CS Program to improve resource allocation and ensure that the highest risk sites are addressed in a timely manner. The Exposure Tracking Model will also enable us to track and quantify multi-phased risk reduction efforts at complex cleanup projects that may take years to complete.

The CS Program will actively pursue the Reuse and Redevelopment Initiative. We will continue to be responsive to owners of contaminated properties who want to move forward with cleanup in order to complete a property transaction. When expedited cleanup is not feasible, we work with buyers and sellers of contaminated properties to clarify future liability issues. The CS Program will explore innovative ways to help put the land back into productive use as quickly as possible.

The CS Program is a mature program with a seasoned, professional staff and management and will continue to efficiently and effectively clean up and manage Alaska's contamination legacy in the years to come.

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