State of Cleanup Report

Washington State Department of Ecology
Toxics Cleanup Program

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Note: Unless otherwise noted, data, facts, numbers, information, etc. in this report have come from:

- Agency Financial Reporting System
- Toxics Cleanup Program Integrated Site Information System
- Model Toxics Control Act Annual Reports
- Toxic Cleanup Program Quarterly Reports
- Sediment Cleanup Status Report April 2001
- "Superfund's Future: What will it cost?" by Katherine N. Probst and David M. Konisky
- Technical/Regulatory Guidelines for Phytotechnology Technical and Regulatory Guidance Document – April 2001
- "Counting Down to Zero", article from Chemical and Engineering News
- Superfund 20th Anniversary Report
- Handbook on the Management of Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites (EPA)

Executive Summary

In March of 1989, an innovative, citizen-mandated law went into effect in Washington. This law was passed by voters as Initiative 97, and changed the way hazardous waste sites are cleaned up in this state. The law is known as the Model Toxics Control Act (Chapter 70.105.D RCW), and from this, the Toxics Cleanup Program was developed.

It has been 14 years since the citizens of Washington State passed Initiative 97. This report is a review of the program and the state of cleanup in Washington.

The Cleanup Process

There are two primary ways sites get cleaned up: through a "formal" process; or, independently. Under the formal process, there are several steps to cleaning up a site. After a site is discovered, an initial investigation takes place which provides information to determine if the site needs emergency cleanup, additional investigation, or no further action. If further action is required, an assessment is conducted which may lead to ranking of the site. Ranking is done relative to other sites, and determines the relative risk the site may pose to human health and/or the environment. Sites are ranked to guide the program's use of resources.

The next step is a remedial investigation and a feasibility study to define the extent and magnitude of the contamination at a site. Potential effects on human health and the environment and alternatives for cleaning up the site are also evaluated. Public review and a comment period are required before a plan to clean up a site is finalized.

Sites are also cleaned up independently, without any assistance, approvals, or guarantees from Ecology about the completeness of the work being done. These sites are usually cleaned up more quickly and at a lower cost for the owner.

Status of Current Cleanup Sites

Cleanup Progress

When Ecology's cleanup program was first established, only a few hundred sites had been identified. As of January 2002, over 9,000 contaminated sites or releases had been identified in Washington State. Initially, the program focus was on cleaning up the most contaminated sites in the state, and most of these have now been cleaned up.

A "site" in the program could be a leak from an underground storage tank, or it could be a unit or collection of sites at a large facility.

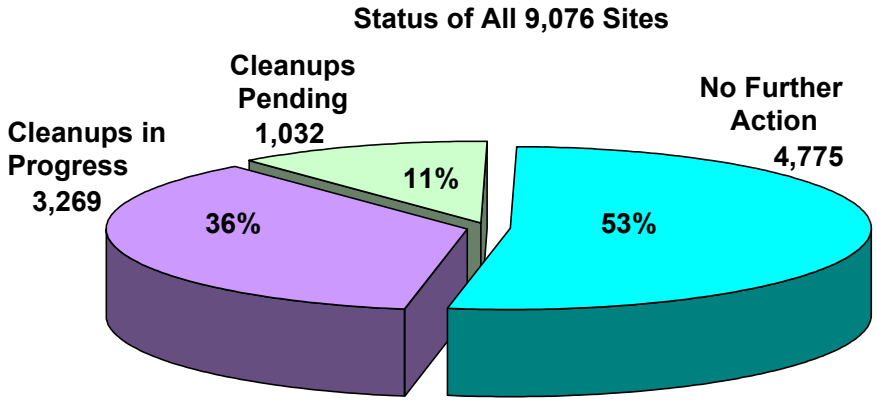

Figure 1 -- Cleanup Status of All Known and Suspected Contaminated Sites

Evolution of Cleanup

The Toxics Cleanup Program focuses its attention on cleaning up sites that pose the greatest threat to public health or the environment. In addition to the sites where the program was formally involved with the cleanup, many cleanups statewide were proceeding independently of Ecology oversight. By 1993, the program had received notice of over 3,000 such independent cleanup actions along with requests for assistance. The program continued to focus on sites that posed the greatest risk, though at the same time, the environmental community and the program had concerns about the adequacy of sites cleaned up independently.

It became clear the program needed to address these growing requests for assistance. In order to respond to these needs as well as maintain higher priority cleanups, Ecology developed the Voluntary Cleanup Program and established a fee to allow Ecology to recover its costs in reviewing and evaluating independent cleanup reports.

Voluntary Cleanups

Since October 1, 1997, changes in the state cleanup law allow the program to provide more assistance to persons conducting voluntary cleanups. The Voluntary Cleanup Program in Ecology's Toxics Cleanup Program provides services to site owners or operators who initiate a cleanup of their contaminated site. Voluntary cleanups are continuing to grow in popularity, with the unintended consequence of competing resources for staff time with high-priority cleanups.

Leaking Underground Storage Tanks

Currently, Ecology regulates approximately 11,000 active tanks on over 4,000 different properties. The program emphasizes technical assistance to tank owners so that owners can achieve compliance with the Environmental Protection Agency's Underground Storage Tank regulations.

Currently, Ecology regulates approximately 11,000 active tanks on 4,000 different properties. Over half of the cleanup sites in the state are from leaking underground storage tank sites.

Over half of the cleanup sites in the state are from leaking underground storage tank sites. The number of releases from these tanks has been steadily declining over the last several years, from a high of 963 releases in 1990, to 43 by mid 2002. From these releases, there is now an accumulation of over 2,500 sites in the process of being cleaned up or waiting for cleanup.

Facilitating Cleanups

There are several ways to get sites cleaned up in the Toxics Cleanup Program. The following briefly describes a few of those ways with more detail later in this report.

Remedial Action Grants

Remedial Action Grants provide dollars to local governments to clean up contaminated sites. Cleaning up contaminated sites is increasingly becoming the first step in the economic redevelopment process in the State of Washington. These sites were once seen as undesirable. Now, land near city centers is in demand, and when cleanup occurs, valuable land is restored and available for reuse, leaving more land for parks and green space. Economic benefits of redevelopment can create jobs and even improve a community's tax base. Approximately $20 million in grants are awarded to local governments each biennium.

Brownfields Cleanup Revolving Loan Fund

Brownfields are properties that are abandoned or underused because of environmental contamination from past industrial or commercial practices. There has been an increased interest in brownfields redevelopment, leading the program to work more closely with the Department of Trade and Economic Development. In 2000, several state and local governments submitted and won a bid to EPA to establish a statewide revolving loan fund. These funds provide below-market interest rate loans for environmental cleanup of contaminated brownfields in the State of Washington.

In addition, on January 11, 2002, President Bush signed the Small Business Liability Relief and Brownfields Revitalization Act, providing a federal tax change which has the potential to even further facilitate brownfields redevelopment projects in the State of Washington.

Mega Sites

Mega sites are contaminated sites that are often complex and costly to clean up, and can cover many square miles. Enforcement problems are likely, as well as the existence of complicated liability issues. The program is currently engaged in cleaning up contaminated yards around homes as part of a mega site, as well as investigating the possibility of low-level contamination throughout several counties.

Abandoned Mine Sites

Historically, Washington State has seen extensive mining. At this point there is no way to identify the exact number of abandoned mine sites, though one estimate shows there may be as many as 3,500 abandoned metal mines in Washington. During the current biennium, the program is working with other state and federal agencies to develop a protocol for identifying and addressing abandoned mine lands.

Challenges on the Horizon

The Toxics Cleanup Program faces a number of new sites that pose cleanup challenges beyond the norm for the program. Below is a description of those challenges, with more detail further in this report.

Areas of Wide-Spread Contamination

The Toxics Cleanup Program is increasingly finding large areas (several acres too many square miles) with low-to-moderate levels of soil contamination that have been caused by a range of historical activities. A strategy is currently under development in the program to begin addressing this environmental problem.

Institutional Controls/Periodic Reviews

At times, all of the contamination at a site cannot be cleaned up or removed. When this happens, restrictions are placed on future uses of the property. These restrictions, called institutional controls, are required to assure the continued protection of human health and the environment. They require a periodic review at least every five years. As more sites get cleaned up, the program faces a growing backlog of sites that need periodic- and five-year reviews. This work load is significant because it impacts the program's ability to begin work on new sites.

Persistent, Bioaccumulative Toxins (PBTs)

While scientists once thought that pollutants would disperse in the environment, they are now finding that some pollutants can actually accumulate and increase in concentration.

Persistent, bioaccumulative toxins (PBTs) stay in the environment for a long time, accumulate in humans and animals, and are toxic. They are different from most other chemicals because they don't go away and can increase in concentration as they move up the food chain. While scientists once thought that pollutants would disperse in the environment, they are now finding that some pollutants can actually accumulate and increase in concentration. This accumulation is difficult to purge, and may be creating problem areas that pose risks to human health and the environment, similar to some cleanup sites today.

Stormwater and Combined Sewer Overflows (CSOs)

Stormwater runoff and combined sewer overflows (CSOs) are potential sources of sediment contamination to state waters. CSOs are characterized by stormwater runoff from house roofs, parking lots, and streets that empty into the same sewer system that carries sanitary wastes to sewage treatment plants. Stormwater and CSO discharges are often untreated and may be located in quiet waters where sediments become readily contaminated.

Large-Scale Public Works Projects

These projects have the potential to create major work loads for staff. This is especially true in industrialized areas where state and local governments are exploring the purchase of properties for right-of-ways for their projects. The major challenge with these projects is that some of these properties are known or suspected of being contaminated, and the scope of the contamination and the potential health and environmental effects are often largely unknown. In addition, these projects are generally on tight schedules, which may be in conflict with the program's current high-priority cleanups.

Perchloroethylene (PCE or "Perc") Contamination

Perchloroethylene, or "perc," is a chemical that is carcinogenic and can cause major impacts to drinking water. It is associated primarily with dry-cleaning and old gas stations. It can significantly impact groundwater supplies because of its wide-spread use. Once it gets into the groundwater, it is difficult to locate and clean up, and may take decades to dissipate. It gets into the groundwater from leaks through joints and cracks in sewer lines, old septic systems, and floor drains or dumps.

Financial Overview

The Model Toxics Control Act has a provision in it that established a funding source for the Toxics Cleanup Program to clean up contaminated sites. The funding source is called the Toxics Control Account, which is split into a state and local account.

The 1989-91 biennium saw the first State Toxics Control Account appropriations. Revenue to this account, though highly variable, has slightly increased overall since 1989. The funds are disbursed among several state agencies, with Ecology getting the largest share. It is from the State Toxics Control Account that the legislature has appropriated funding to the Toxics Cleanup Program.

The State Toxics Control Account is the primary source of funding for the Toxics Cleanup Program. The account funds 68.7 full-time equivalent employees (FTEs) of the program's total 144.7 FTEs. Of Ecology's total share, the program has gradually received a smaller amount, from 50% in 1991 to 31% in 2000. The program has been able to maintain its staffing by applying for and receiving funding from other sources. In the next several years, this ability may begin to erode as the state's required match for the Environmental Protection Agency's cleanup projects begins to increase. This increase may need to come from the program's core operating budget.

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Reflections

A stronger systems approach to cleaning up sites will be key to finding more permanent solutions for areas that have contamination. Instead of viewing a site as an isolated problem, a systems approach includes integrating source control and cleanup efforts as well as consideration of social and economic conditions surrounding a complex contaminated site. This leads to better long-term land use planning, recovery of contaminated sites for productive use, and cross-media environmental assessment.

When Initiative 97 initially was passed, it was envisioned that most cleanups would occur through a traditional enforcement approach. Today, cleanups are largely accomplished, not because of enforcement action, but instead voluntarily because of redevelopment opportunities. This shift to voluntary cleanup has occurred because redevelopment brings additional new resources for cleanup. Timing can be a critical element as many cleanups begin to include these real estate transactions and redevelopment opportunities. This creates a challenge for a program that is geared toward cleaning up higher priority sites according to rank.

The program has made remarkable progress in getting contaminated sites cleaned up in this state, yet the number of new and pending cleanup sites continues to grow. Parallel to this growth is the number of sites that have cleanup actions completed, yet need a periodic- or five-year review conducted to ensure the remedy is working. The program has completed cleanup actions on nearly 5,000 sites, and once thought that it would eventually work itself out of business. It has become more apparent that additional needs, including these periodic- and five- year reviews, and property sales, will continue to place demands on the program for some time to come.

The program has completed cleanup actions on nearly 5,000 sites, and once thought that it would eventually work itself out of business. At the close of 2001, there were over 1,000 sites waiting to be cleaned up and approximately 500 new sites were reported to the agency.

The magnitude of the full cleanup perspective is beyond the scope of the Toxics Cleanup Program or Ecology alone. A broader view is needed to look at the connection among agencies, local governments, and communities. This broader view is continuing to build as the program works with other agencies to develop solutions for the long-term cleanup of sites. Extending this view to business and community activities would begin to balance the picture. It is this broader perspective that will help illuminate the consequences of multiple actions in a community, and ultimately bring about solutions to cleanup that are more permanent.

The Toxics Cleanup Program's highest priority has consistently been to clean up contamination and ensure that human health and the environment are protected. As the program evolves, so do solutions for how to achieve that highest priority. How to better deal with individual sites within the context of the bigger picture is moving to the forefront of current challenges. The bigger picture includes: community needs; multiple contamination sources; contamination spread over a wide area; and current activities that continue to contribute contamination to areas undergoing cleanup. The program's focus will include broader solutions for longer-term and more permanent cleanups in the State of Washington.

The Toxics Cleanup Program's highest priority has consistently been to clean up contamination and ensure that human health and the environment is protected. As the program evolves, so do solutions for how to achieve that highest priority.

Introduction

Purpose of this Report

It has been 14 years since the citizens of Washington State passed Initiative 97. This report is a review of the program and the state of cleanup in Washington. It is intended to show what has been accomplished since the state cleanup law was enacted. The information presented in this report shows the current status of sites, how cleanups are facilitated, challenges on the horizon, and a financial overview.

"Each person has a fundamental and inalienable right to a healthful environment, and each person has a responsibility to preserve and enhance that right. The beneficial stewardship of the land, air, and waters of the state is a solemn obligation of the present generation for the benefit of future generations."

Preamble to the Model Toxics Control Act.

Purpose of the Toxics Cleanup Program

The Model Toxics Control Act became law in 1989 with passage of Citizen's Initiative I-97. One of the major drivers of the initiative was to ensure there was public participation in the cleanup decision making, and that "back room deals" in favor of the polluter would not take place. Voted in by an overwhelming majority, the purpose of the Act was to establish a cleanup law and provide funding to:

- Clean up contaminated sites,
- Improve management of hazardous wastes, and
- Prevent future contamination through pollution prevention.

From this law, Ecology's Toxics Cleanup Program was founded.

The main purpose of the Toxics Cleanup Program is to get and keep contaminants out of the environment. With the assistance of cleanup fund dollars, the program has identified over 9,000 contaminated sites in the State of Washington. Of those, nearly 5,000 sites have completed cleanup activities and require no further action to be taken.

Cleaning Up Hazardous Waste Sites

Under state law, the Toxics Cleanup Program has the ability to investigate or require an investigation of any release or threatened release of a hazardous substance that poses a threat to human health or the environment. This investigation is intended to determine the types of hazardous substances and the extent it has spread – if at all. This is followed, if necessary, by actions to clean up the site.

Many of the sites the program works on are also listed on the U.S. Environmental Protection Agency's (EPA) National Priorities List. The program provides regulatory assistance to EPA at 63 federal cleanup sites in the state. In specific instances, the state is the principal regulatory agency responsible for cleaning up the sites. Washington State is one of the few states in the nation that has this type of arrangement with EPA for cleaning up sites.

Changes in the Program

"In 1991, Ecology adopted the Sediment Management Standards (Chapter 173-204 WAC). To date, Washington remains the only state with adopted standards for sediment quality. The Sediment Management Standards address three major points:
- Procedures for cleanup of historic sediment contamination,
- Procedures for preventing future sediment contamination from discharges, and
- Standards for defining sediment contamination.

Sediment Cleanup Status Report, April 2001

Over the years, the Toxics Cleanup Program has made changes in its business practices. These changes have been in response to requests by the public for assistance. For example, in the last several years the program has developed and implemented a Voluntary Cleanup Program, is developing guidance for freshwater sediments (which may be the only freshwater sediment guidance in the nation), begun work with other agencies on mining contamination, adopted revised rules, and begun developing strategies for addressing areas of low-level, wide-spread contamination in the state.

These changes took place over several years and shifted some staff away from working on higher priority sites to working on sites that are sometimes a lower priority. A challenge for the program is to look at how it has evolved over the last several years and determine to what degree, if any, these changes have affected the primary goal -- to get contaminants out of the environment and keep them out. This review is intended to present current and forecasted information to consider during future program planning.

Section One: Status of Current Cleanup Sites

The Toxics Cleanup Program currently tracks over 9,000 contaminated or previously contaminated sites throughout the state. A "site" could be a leak from an underground storage tank, or it could be a collection of many sites (units) at a large facility. Initially, the program focus was on cleaning up the most contaminated sites in the state. These sites are usually larger and more complex and take longer to clean up.

This section provides a status of the primary cleanup work load in the Toxics Cleanup Program. It covers:

The Cleanup Process
All Tracked Sites
Ranked Sites and Trends
High-Priority Sites
Evolution of a Cleanup Program
Two Priority Tracks
Voluntary Cleanups
Leaking Underground Storage Tanks
Types of Sites
New and Pending Sites

Section Two will cover the remaining day-to-day work and how some cleanups are facilitated, and Section Three will explore challenges that are on the horizon.

The Cleanup Process

Contaminated sites in Washington pose a variety of types and levels of risk to human health and the environment. Sites are "discovered" by Ecology primarily through reports by site owners and operators. The program also receives complaints about sites from current and former employees, neighbors and the general public. The discovery of a site is followed by an initial investigation by Ecology staff or county health district staff. This investigation provides information to determine if the site needs emergency cleanup, additional investigation, or no further action.

At many sites, cleanup proceeds independently without any oversight by Ecology. For sites where cleanup is not completed and further action is required, a site hazard assessment is conducted which may lead to ranking of the site. Ranking is done relative to other sites and determines the risk the site may pose to human health and/or the environment. Sites are ranked to guide the program's use of resources.

The next step for independent cleanups and cleanups under Ecology oversight is a remedial investigation and a feasibility study to define the extent and magnitude of the contamination at a site. Potential effects on human health and the environment and alternatives for cleaning up the site are also evaluated. For sites being cleaned up under Ecology oversight, public review and a comment period are required before a plan to clean up a site is finalized.

All Tracked Sites

When Ecology's cleanup program was first established in 1989 only a few hundred sites had been identified. As of January 2002, over 9,000 contaminated sites or releases had been identified in Washington State. As the figure below indicates, over half of these have been cleaned up and over one-third are in the process of being cleaned up.

In spite of this, there is much work left to be done. For a program that once believed it would eventually work itself out of business, it has become apparent that the continued discovery of new sites, plus additional needs for staff assistance will continue to place demands on the Toxics Cleanup Program for a long time to come. Figure 2 shows a breakdown of all sites tracked by the program.

When Ecology's cleanup program was first established in 1989 only a few hundred sites had been identified. As of January, 2002, over 9,000 contaminated sites or releases had been identified in Washington State.

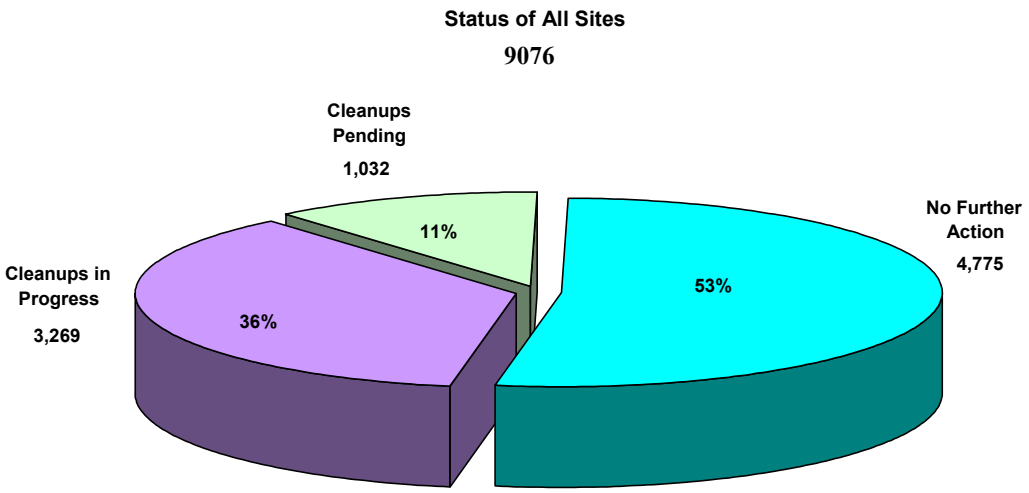


Figure 2. Cleanup Status of All Known and Suspected Contaminated Sites

Ranked Sites and Trends

All sites reported to the program are placed on a confirmed and suspected sites list. Sites that have been ranked are also placed on a hazardous sites list. There are 1,031 sites that have been ranked. A large portion of these (452) are leaking underground storage tank sites. In addition, the program works with county health departments to identify potential new sites, assess their hazard, and rank them.

Most of the state's sites waiting to be cleaned up (cleanups pending) have been ranked. They are ranked according to their environmental threat, as follows:

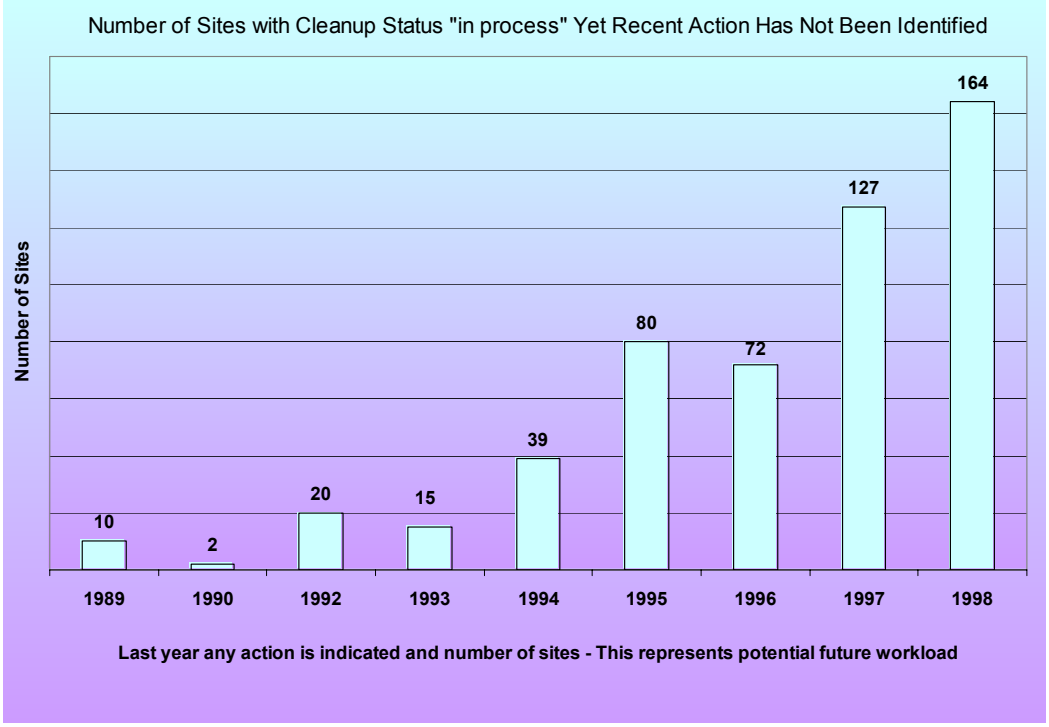
Rank 1 (highest relative environmental threat)	=	67 sites
Rank 2	=	63 sites
Rank 3	=	125 sites
Rank 4	=	94 sites
Rank 5 (lowest relative environmental threat)	=	178 sites

Over half of the ranked sites (more than 500) have cleanups that are "in-progress." Typically, site progress is updated quarterly in the program's database and just as typically, a site may remain in a particular phase for several years while it is undergoing investigation or involved in active cleanup actions.

For a program that once believed it would eventually work itself out of business, it has become more apparent that the continued discovery of new sites, plus additional needs for staff assistance will continue to place demands on the Toxics Cleanup Program for a long time to come.

The following figure identifies how long it has been since progress has been indicated for these "in-progress" sites. It shows the number of sites (ranked and unranked) where recent action has not been identified.

Figure 3 illustrates that for 363 sites, progress has not been documented since the years 1996 to 1998. For the remaining 166 sites, progress has not been documented for 7 to 12 years. This could mean that either the program's database has not been updated, or that no work has occurred on the site under Ecology oversight since the last database update. These sites represent an eventual work load for program staff, site managers and data managers, to, at a minimum, determine the status of the sites and update the database.



Progress has not been documented for 363 sites for the years 1996 to 1998. For 166 sites, progress has not been documented for 7 to 12 years. This could mean that either the database has not been updated, or that no work has occurred on the site.

Figure 3. Number of sites where recent action has not been identified.

High-Priority Sites

During the first few years after the Model Toxics Control Act was passed, the Toxics Cleanup Program focused its attention on cleaning up high-priority sites. High-priority sites are ones that pose the greatest threat to public health or the environment. A threat is due to the amount of the contamination, its toxicity, and how it could come into contact with people.

These sites include federal Superfund sites and state sites ranking 1 or 2 on the State's Hazardous Sites List. Public concern or need may also affect which sites get a higher priority. Generally, higher priority sites are larger, more complex, and/or costly to clean up. Many of them have groundwater or sediment contamination.

These sites often have Agreed Orders, Enforcement Orders, or Consent Decrees to facilitate cleanup activities.

Generally, higher priority sites are larger, more complex, and/or costly to clean up. Many of them have groundwater or sediment contamination.

- Agreed Orders are legally binding and agreed to by the potentially liable person and Ecology. It describes the site activities that must occur for Ecology not to take enforcement action for that phase of work.
- An Enforcement Order is issued to a potentially liable person by Ecology. It is usually issued when Ecology believes that a cleanup solution cannot be achieved expeditiously through further negotiation, or when an emergency exists.
- A Consent Decree is a formal legal agreement filed in court. The work requirements in the decree and the terms under which it must be done are negotiated and agreed to by the potentially liable persons, Ecology, and the state Office of the Attorney General.

Orders and decrees must undergo public review and a comment period before they can become final.

Prospective Purchaser Agreements are also used to facilitate cleanups. It is used for properties that are contaminated, and a person not responsible for the contamination wishes to purchase or lease the property for redevelopment or reuse. These sites may or may not be "high priority" due to risk to human health or the environment, but the cost of the cleanup is significant enough to impair the resale value of the property. The sites become part of the formal process so the prospective owners can settle their cleanup liability before purchasing the property. Generally, Ecology enters into "Prospective Purchaser Consent Decrees" when the settlement will bring substantial new resources to facilitate the cleanup of the property, and when the settlement will provide a substantial public benefit.

The following figure shows the number of orders and decrees, and includes Prospective Purchaser Agreements. Since 1986 the program has had over 380 of these orders and decrees for all sites, and nearly 50 of them have had amendments.

Table 1

Fiscal Year	Consent Decree	Agreed Order	Enforcement Order	Prospective Purchaser
1986	1	-	-	-
1987	4	-	-	-
1988	7	-	-	-
1989	7	1	1	-
1990	6	3	3	-
1991	4	5	14	-
1992	17	17	25	-
1993	13	14	9	-
1994	7	15	19	1
1995	12	20	14	5
1996	4	11	9	1
1997	12	9	6	-
1998	3	11	7	3
1999	6	10	7	1
2000	2	12	6	2
2001	5	2	4	-
2002	2	11	8	-
Totals	112	141	132	13

(note: information for 2002 still coming.)

Evolution of a Cleanup Program

As mentioned, the program initially focused its attention on cleaning up the sites that posed the greatest threat to public health or the environment. In addition to the sites where Ecology was formally involved with the cleanup, many cleanups statewide were proceeding independently of Ecology oversight. These "independent cleanups" were conducted without any assistance, approvals, or guarantees from Ecology about the completeness of the work being performed. Many of them were the result of leaking underground storage tanks at gas stations.

Property owners completing independent cleanups run the risk of being required to conduct additional cleanup actions to satisfy state cleanup requirements. Due to its higher priority work, the program did not review each independent report in detail or verify the cleanup work identified as complete by the property owner.

By 1993, the program had received notice of over 3,000 such independent cleanup actions. The environmental problems at most of these sites were resolved by the landowner within 90 days of their discovery, and they were never listed on Ecology's Confirmed and Suspected Contaminated Sites List. Program staff performed a cursory review to make sure no significant problems were left unaddressed, recognizing that if problems still persisted at these typically low-priority sites, they would reappear on the program's radar screen at a later date. Some sites were entered into the formal system as a result of this review.

As of 1993, the program had received notice of over 3,000 independent cleanup actions. The environmental problems at most of these sites were resolved by the landowner within 90 days of their discovery.

The program continued to focus on its highest priority work load. At the same time, the environmental community and the program had concerns about the completeness of these independent cleanup actions:

- Other site owners wanted to make sure independent cleanups were required to meet the same standards they were being held to;
- Many of the property owners conducting the independent cleanups wanted program assistance to help reduce their cleanup costs and potential liability and to prevent the possibility of being required to do additional work in the future; and
- The property owners needed the program's buyoff on their work to facilitate bank loans or property transactions.

Since July of 1993, Ecology site cleanup work has proceeded on two priority tracks:

1.) Ecology's high-priority work load of ranked sites, and

2.) The land owner/ operator's priority. These sites are typically low to medium environmental risk.

Even though the Toxics Cleanup Program allowed and encouraged independent cleanups (those that don't require Ecology's oversight or approval), the lending institutions were requiring the land owners to obtain Ecology's approval of their cleanups to help the lenders minimize their risk of loaning money on the potentially contaminated properties.

As a result, the department began to get more and more requests to provide support to those conducting independent cleanups. These land owners were willing to step forward and address their environmental problem, and they were offering to directly fund Ecology to redirect some of its efforts to help them meet their responsibilities under the new law.

It became clear from these growing needs that Ecology needed to respond to these requests as well as maintain its "worst first" effort. Ecology established a fee for the Voluntary Cleanup Program designed to allow Ecology to recover its costs in reviewing and evaluating independent cleanup reports.

Since July of 1993, Ecology site cleanup work has proceeded on two priority tracks:

1.) Ecology's high-priority work load – "Worst first," with ranked sites only -- site cleanup work is based on higher human health and environmental risk, conducted through the formal cleanup process utilizing administrative orders or consent decrees; and

2.) The land owner/operator's priority (ranked and unranked sites) -- site cleanup work driven by the market place, property transactions, and business loans. These sites are typically low-to-medium environmental risk and are conducted as an independent remedial action.

Two Priority Tracks

These transaction-driven cleanups are increasing the demand for cleanup review services that can meet the needs of the real estate market without sacrificing environmental protection. This need has created a competitive dynamic within the Toxics Cleanup Program for the allocation of resources between the worst-first sites and the market- or transaction-driven cleanups.

The Toxics Cleanup Program directs its site cleanup resources in two areas: 1) higher priority sites which include state lead cleanups or formal process, those under order or consent decree; and 2) independent cleanups, responsible party lead cleanups where Ecology provides a written determination following completion of the cleanup action. Additionally, individuals may conduct their own independent cleanups, where Ecology may provide technical assistance -- these cleanups are conducted without Ecology's oversight or approval. These independent cleanups represent a potential future work load as Ecology completes its higher priority work and begins to evaluate the lower priority independent sites.

Independent cleanups such as transaction-driven cleanups are increasing the demand for cleanup review services that can meet the needs of the real estate market without sacrificing environmental protection. Assistance requests for transaction-driven cleanups come to the program on short notice, while worst-first cleanups are ranked and then prioritized. This has created a competitive dynamic within the Toxics Cleanup Program for the allocation of resources between the market- or transaction-driven cleanups and the worst-first sites.

The program's organization is contributing to this competition, as there is not a clear boundary between the two cleanup activities. Staff typically work on a mix of formal process and voluntary cleanup sites. As a result, work brought in voluntarily by individuals may have to be set aside when work load demands on the formal process sites increase. Conversely, site managers may not be available to take on new formal process sites because their combined work load of voluntary and formal process sites is full.

Some constituents have suggested it would be easier to align the demand for services with resources if clearer dividing lines existed between the program areas and/or the funding sources. When voluntary cleanup fees are collected, they are placed in the State Toxics Account. Once in this account, the funds are redistributed, with the Toxics Cleanup Program receiving about 32%. There is also a delay in the appropriation, which contributes to the program's inability to allocate resources to address the backlog of requests and respond to the needs of the commercial property developer or real estate transaction.

The program organization can make it difficult to meet program service needs and to make improvements in the timeliness of decision making and predictability of review time frames. On several occasions property owners and consultants have requested the program allow them to pay for overtime or pay a premium so they can meet a property transaction deadline, or so they can get the bank's approval on a business loan.

Voluntary Cleanups

Since October 1, 1997, the Voluntary Cleanup Program in Ecology's Toxics Cleanup Program has provided services to site owners or operators who initiated cleanup of their contaminated sites. These sites generally are smaller and less complicated than the program's higher priority sites. At times they involve property transactions which create timing challenges for the program and the person conducting the cleanup. Changes were made to the state cleanup law and implementing regulation (RCW 70.105.D.030(i) and WAC 173-340-515(5)) allowing the program to provide more assistance to persons conducting independent cleanups.

The program may now provide site-specific advice to persons who are conducting, or are interested in conducting, an independent cleanup. While Ecology is authorized to recover the cost of providing this assistance, some level of service is provided without charge. Ecology's Voluntary Cleanup Program services include:

- One-hour free consultation on administrative or technical issues related to compliance with the state cleanup law for independent investigation or cleanup;
- Consultation for a fee on site-specific technical or administrative issues before, during, or after a cleanup;
- Prepayment Agreement: Ecology's oversight costs are provided in advance of issuing a decree that has been requested by the party responsible for the cleanup;
- Prospective Purchaser Agreement: Ecology's oversight costs are provided in advance of issuing an order or decree that has been requested by a prospective purchaser who wishes to redevelop or reuse the property; or
- Brownfields Redevelopment: Most sites usually have some type of redevelopment component. However, as used here this is intended to include only sites within specially targeted cleanup efforts aimed at getting abandoned or under-used real properties (brownfields) back into productive use (see Section Two).

Figure 4 shows the number of sites entering the cleanup process through the Voluntary Cleanup Program and those entering the standard site identification and listing process. The non-Voluntary Cleanup Program sites entering the cleanup system could eventually be ranked and prioritized for state oversight, and/or the sites could be submitted for assistance through the Voluntary Cleanup Program. Figure 4 illustrates that more sites are now being reported concurrently with requests for assistance under the Voluntary Cleanup Program.

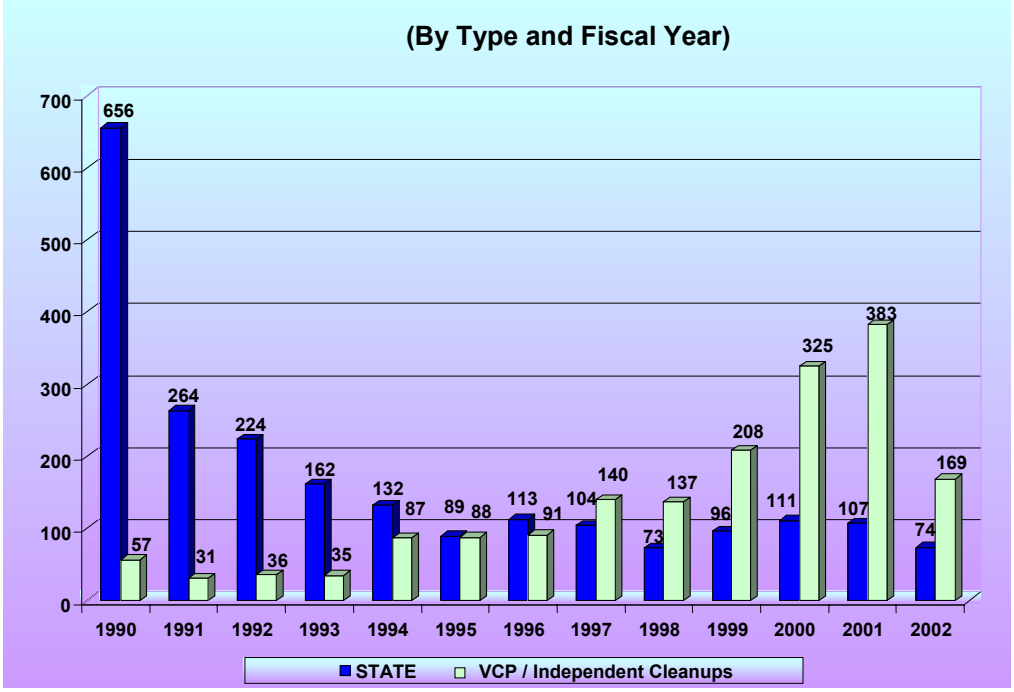


Figure 4. Formal or State Cleanups and Voluntary/Independent Cleanups

Notes: VCP: Voluntary Cleanup. Information is still coming in for 2002. Program

Figure 4

"State" refers to sites that have been ranked and cleaned up with state oversight. **"VCP/Independent Cleanups"** refers to sites that are being cleaned up without formal oversight – they are being cleaned up independently. The VCP program began October 1, 1997.

Figure 4 does not include releases from leaking underground storage tanks (LUST) (see below). These LUST sites represent another component of Ecology's current and future work load. See Appendix One to view a map of cleanup site locations in the state.

More information on the Voluntary Cleanup Program can be found in Appendix Two.

Leaking Underground Storage Tanks

Leaking underground storage tank sites (LUSTs) are included in the program's total number of sites, yet tracked separately due to various interests including reporting requirements to EPA. Figure 5 identifies these 5,724 LUST sites. They comprise over half of the program's total tracked sites (from Figure 1). These numbers represent reports of releases and independent actions from gas stations and other LUST sites. The numbers do not include any voluntary/independent cleanup sites or state cleanup sites identified in Figure 4. Fifty-seven percent of the LUST sites have been reported by the property owner as requiring no further action because of the cleanup action that has taken place on the property. It is possible that additional cleanup action could be required.

Although Ecology is not involved directly in the cleanups at most LUST sites, regional staff may provide technical assistance to landowners and their consultants, and may review sampling and cleanup reports. If landowners require a written "No Further Action" letter from Ecology, they must submit their cleanup report for review under the Voluntary Cleanup Program.

Toxics Cleanup Program staff have contributed to the reduction of the number of leaking underground storage tanks by providing technical assistance. This included assistance to bring tank owners and operators into compliance when the Environmental Protection Agency's requirements were changed.

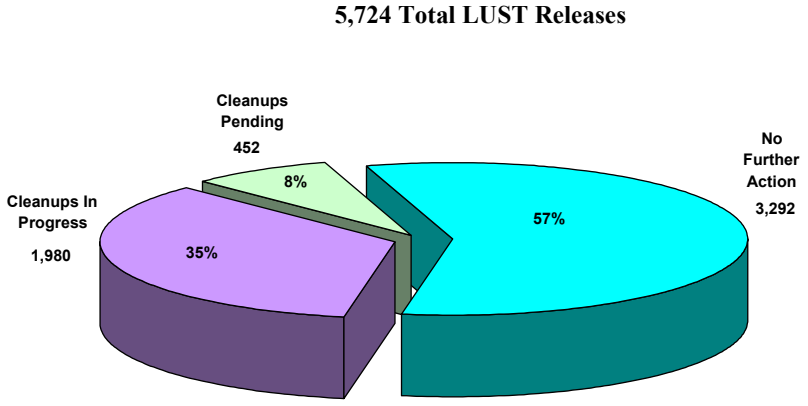


Figure 5: Sites Entered on the Leaking Underground Storage Tank Sites List:

Releases from Petroleum Sites Decreasing

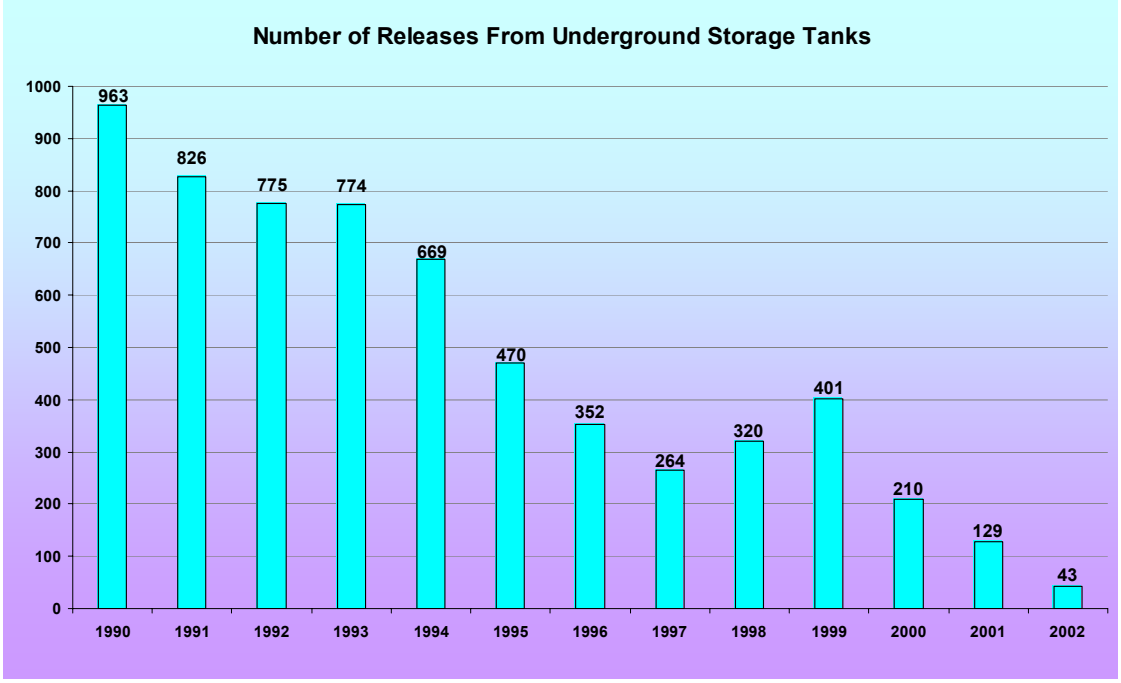
Currently Ecology regulates approximately 11,000 active tanks on over 4,000 different properties, including gas stations, industries, commercial properties and government agencies. These tanks must be installed and operated under a permit that is issued as part of the Master Business License by the Department of Licensing.

To achieve compliance with the Environmental Protection Agency's Underground Storage Tank regulations, the program is emphasizing technical assistance to tank owners. This provides face-to-face, site-specific service to tank owners for help in understanding the underground storage tank regulations. The program has about 14 employees who spend the majority of their time providing technical assistance to owners and operators in the field or over the phone. These staff work with the tank owners and operators to ensure that tanks are installed, managed, and monitored in a manner that prevents releases. They conduct inspections on about 500 sites per year, most with multiple tanks.

Figure 6 shows that the number of releases from petroleum underground storage tanks has been declining. This is likely due in part to the tank upgrade requirements that all gas stations have been required to implement, and staff efforts in providing technical assistance.

There is now an accumulation of 2,500 sites in the process of being cleaned up or waiting for cleanup. Though the total number of releases will continue to decline, discoveries of new releases are inevitable. Petroleum is the most prevalent contaminant, and not all abandoned tank locations are known.

See Appendix One for a map of all current and previous leaking underground storage tank sites in Washington.



Note: Information for 2002 still coming in

Figure 6: Releases Reported from Underground Storage Tanks by Fiscal Year:

A more detailed breakdown of the remainder of the program's sites can be found in Appendix Two.

New and Pending Sites

When the Toxics Cleanup Program first began, there were a few hundred sites being tracked. Now there are over 9,000. New sites from a wide range of industries are continuing to be discovered and reported to the program.

Following is a figure that shows a breakout of the types of sites that are being reported to the program. These sites are currently waiting to be cleaned up, and are in "pending status". This table only suggests what kind of industrial sitees are left to be cleaned up and which industry may be responsible for the contamination. Some of the names listed on this chart may be the name of a party that purchased the contaminated property to clean up and redevelop, and may not have been responsible for the contamination.

A similar figure showing only ranked sites can be found in Appendix Two.

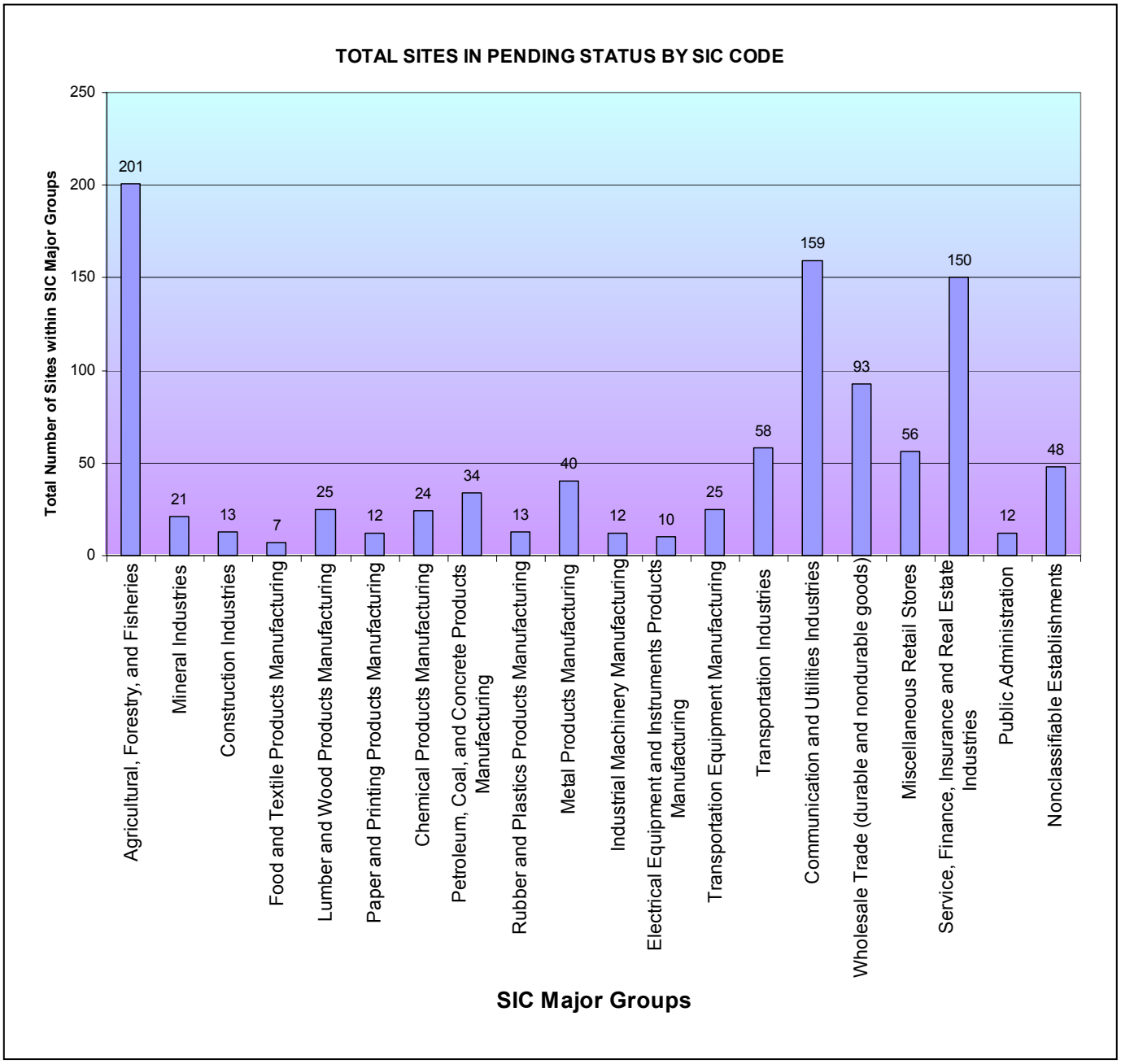


Figure 7. Total sites listed by the Standard Industrial Classification (SIC)

Last year, over 500 new sites were reported to the program. Figure 8 shows the number of new sites reported to the program each year since the late 1980s. The trend has been steadily increasing since 1995. Information for 2002 is still coming in, yet at the current rate, it is anticipated the number will easily surpass the 500 new sites reported last year. As a side note, the program has completed cleanup actions at approximately 440 sites per year in the last five years.

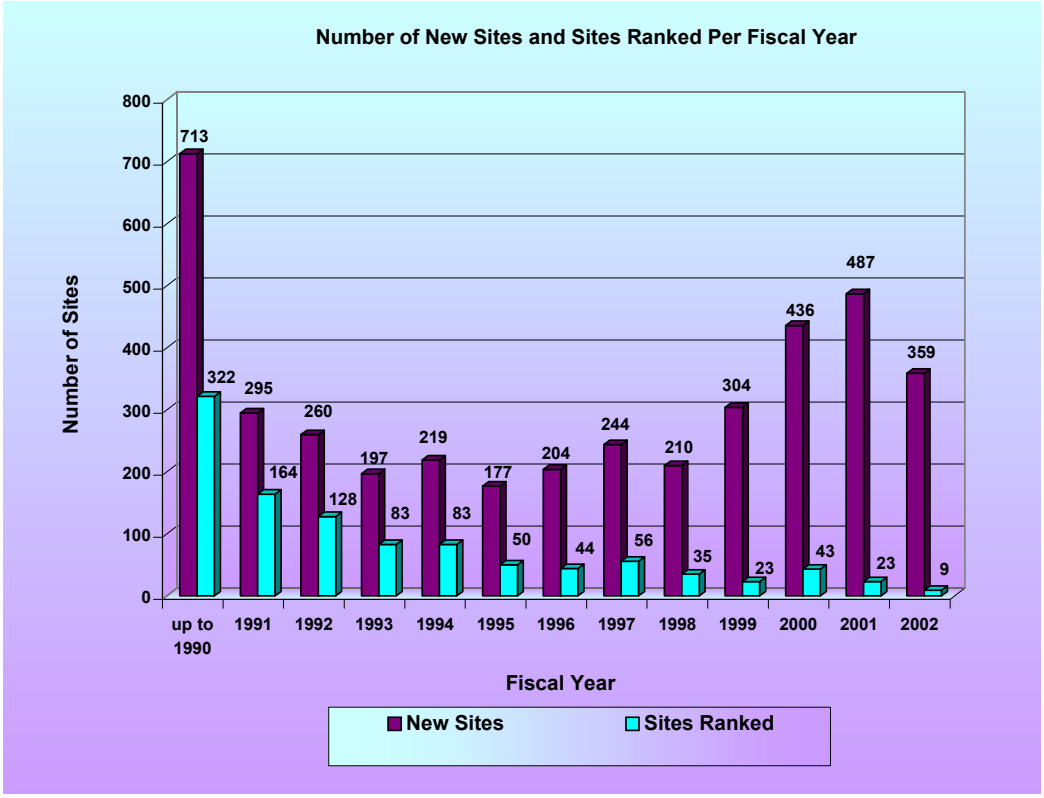


Figure 8

Petroleum has been and continues to be the primary substance found at contaminated sites in Washington. The program tracks this and other contaminants by categories and by the number of sites where these contaminants have been found. This is illustrated in Figure 9 on the following page.

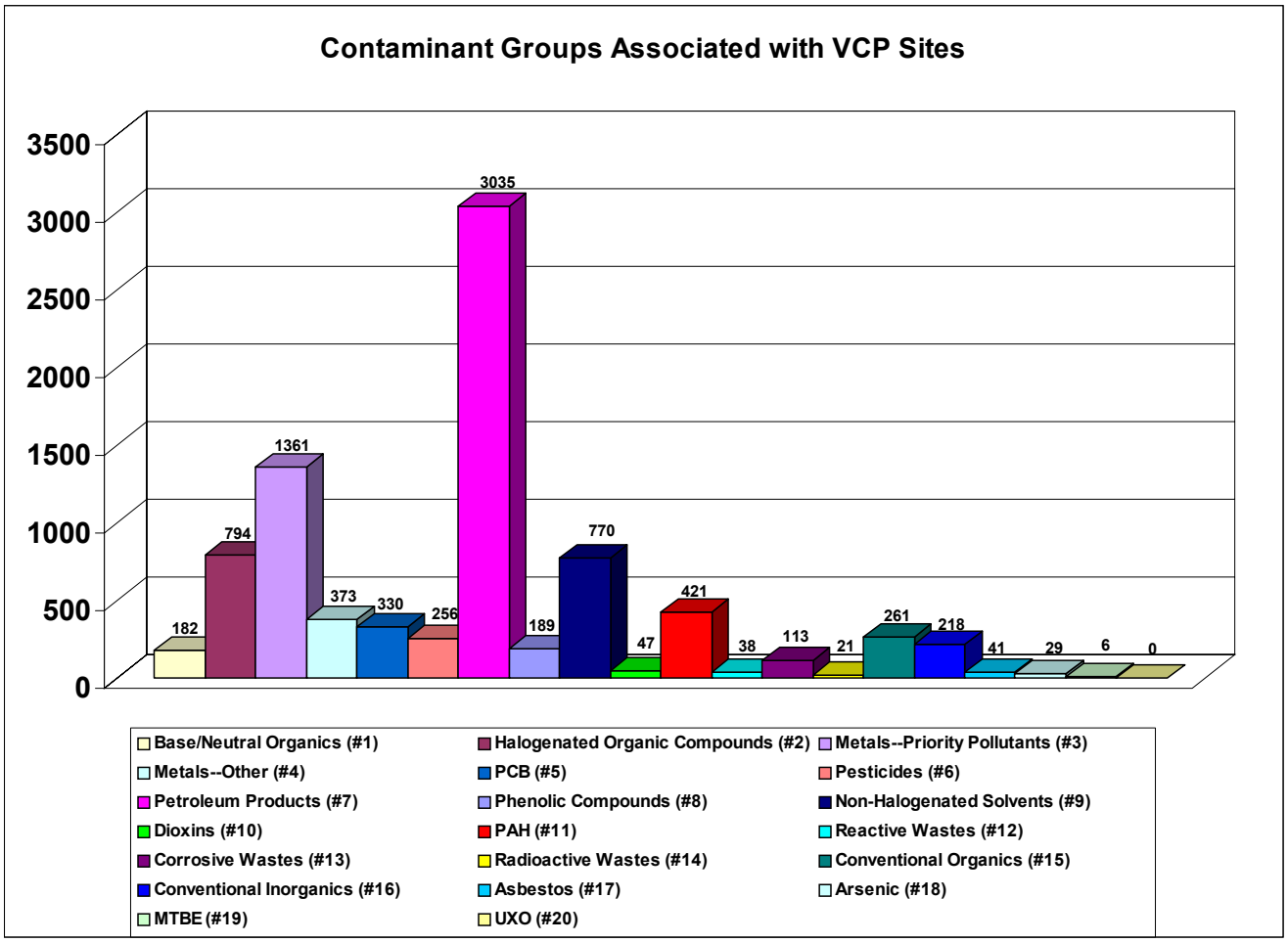


Figure 9

In this figure, the number of sites appears in the vertical column on the left. The contaminant names read across (#1, #2, #3…) and correspond with the bars above.

This last figure shows the number of sites reported to the program as well as the number of sites with specific types of contaminants.

Section Two: Facilitating Cleanups

This section will identify the various means by which cleanups are facilitated in the Toxics Cleanup Program. These include resource and grant opportunities, program initiatives, and processes that are being developed to clean up sites or areas that are different from the typical site cleanup. In Section One, the program's primary work was discussed. This included:

- High-Priority Sites
- Voluntary Cleanup Program
- Leaking Underground Storage Tank Sites

Section Three will address issues that are believed will unfold over the next six years.

Two things are certain in the Toxics Cleanup Program. The number of sites to be cleaned up in the State of Washington continues to grow; however, at a slower rate; and future work is becoming more defined by the type of site rather than the number of sites. This future work is evolving due to the nature of the contaminants found at sites, the size of the sites, economic redevelopment, contamination that crosses state or national boundaries, abandoned or orphan sites, or the distribution of the contamination over wide areas of land or water bodies.

Some of the issues and mechanisms for facilitating cleanups in this state include:

- Remedial Action Grants
- Brownfields Cleanup Revolving Loan Fund
- Clean Sites Initiative
- Sediment Cleanup Sites
- Mega Sites
- Abandoned Mine Sites
- Innovative Technologies

Remedial Action Grants

Just as the State Toxics Control Account provides dollars to the Toxics Cleanup Program to clean up contaminated sites, the Local Toxics Control Account provides dollars, in the form of grants, to local governments to clean up contaminated sites. The term "local government" includes towns, cities, school districts, fire districts, public utility districts, and port districts. Approximately $20 million in grants are awarded to local governments each biennium.

There has been an increasing demand for these local toxics grant dollars, and this is expected to continue. In the last couple years, the demand has exceeded the available dollars for the first time. As of January 2002, over 400 publicly owned contaminated sites were in the cleanup stage or awaiting cleanup. The majority of sites are located along industrial corridors and include public works sites and ports. During the 90s, most of these publicly owned sites in the cleanup phase were landfills.
For many of the currently identified publicly owned sites, there have not yet been grant requests. For example, there are 73 Voluntary Cleanup Program sites identified as being publicly owned, and there are grant requests in for 5 of these sites. In addition, port and shoreline districts face costly fresh and marine water sediment cleanup issues. A placeholder for next biennium grant dollars has been requested for one of these

sediment sites in the amount of $3 million. This means the cleanup is anticipated to be as much as $6 million (assuming 50% local match).

The Toxics Cleanup Program faces competing demands for its oversight services by governmental agencies working to serve the public and economic growth needs for the state, and those individual property and business owners who also can benefit the state economically through the generation of taxes and jobs.

The program intends to work more closely with the Office of Trade and Economic Development in the coordination of the cleanup and development processes, and to better align resources and grant dollars for more timely and predictable cleanup decisions. There is also benefit in joining with others in an analysis of the program's organization and funding mechanisms and how that impacts its ability to provide timely and predictable service and environmental protection.

The following figure illustrates grant dollars awarded each biennium to local governments. Note: information for 01–03 biennium is still coming.

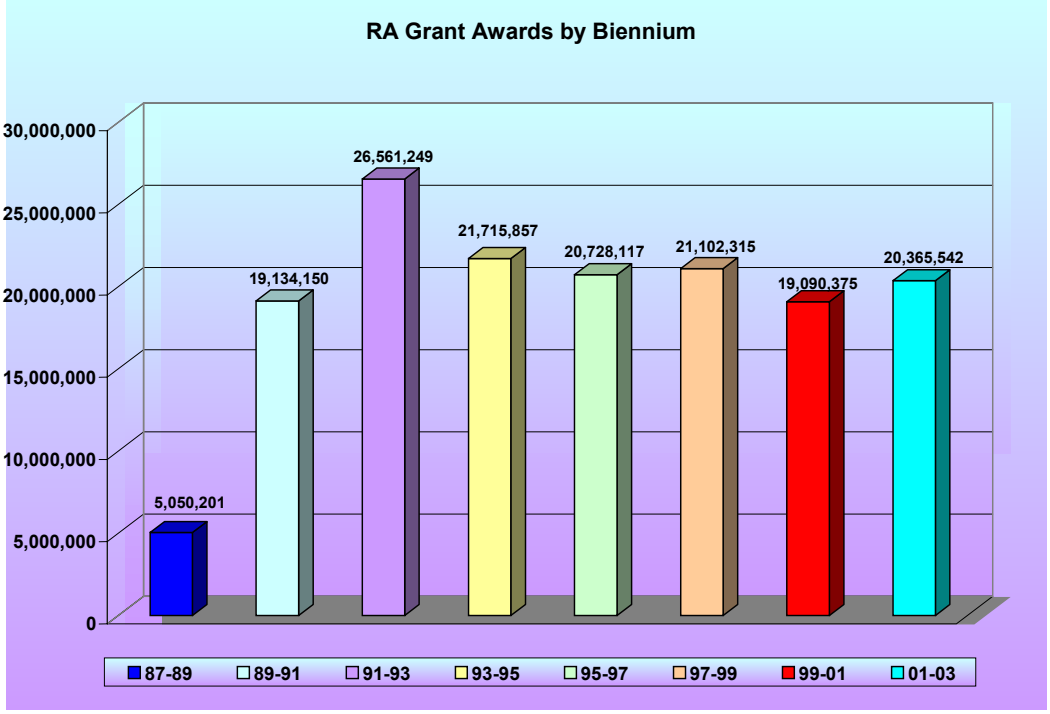


Figure 10. Remedial Action Grants Total Award Amounts by Biennium

Brownfields Cleanup Revolving Loan Fund

The Department of Trade and Economic Development has completed a Brownfields Loan Guide to be used by all Coalition members, and Ecology has been identifying priority sites to participate in the new program.

Brownfields are properties that are abandoned or underused because of environmental contamination from past industrial or commercial practices. Often the potential liability associated with the contamination complicates business development, property transactions, or expansion on the property. Communities, developers, government officials, and others are working to change the way brownfields are managed and regulated to encourage redevelopment of these sites.

In 2000, the State of Washington Department of Trade and Economic Development, Department of Ecology, King County, the City of Seattle, and the City of Tacoma (the Washington Coalition), submitted and won a bid to the Environmental Protection Agency (EPA) to establish a statewide revolving loan fund. The Coalition received an initial $1.5 million grant to capitalize the Brownfields Cleanup Revolving

Loan Fund. This year, the City of Spokane joined the Coalition through a grant of $800,000. These funds provide below-market interest rate loans for environmental cleanup of contaminated brownfields in the State of Washington.

In addition, on January 11, 2002, President Bush signed the Small Business Liability Relief and Brownfields Revitalization Act, providing a federal tax change which has the potential to even further facilitate brownfields redevelopment projects in the State of Washington.

To date, the Departments of Ecology and Trade and Economic Development have developed an Interagency Agreement for brownfields agency coordination. The Department of Trade and Economic Development has completed a Brownfields Loan Guide to be used by all Coalition members, and Ecology has been identifying priority sites to participate in the new program. Prospective Purchaser Agreements are being prepared for several sites to proceed with purchase and cleanup.

Clean Sites Initiative

The Clean Sites Initiative is a one-time appropriation of funds for the Toxics Cleanup Program granted in the 2001-2003 biennium. These funds will increase the capacity of the program to clean up 15 additional large and complex contaminated sites. The funds will also be used to partially meet state obligations for its share of cleanup costs incurred by EPA under the federal Superfund program. The funding has been targeted for sites where the state is the only viable entity to conduct the cleanup.

The program is now conducting cleanup activities at these additional sites around the state. For at least one site, the primary focus is on child safety issues such as arsenic contamination in Everett neighborhoods. Other issues include contamination over a very large area as in the Spokane River, which has PCB contamination. This funding is for one biennium. Appendix One includes a map of the Clean Sites locations.

Sediment Cleanup Sites

In addition to contaminated "upland" sites, point and non-point discharges (including contaminated stormwater runoff from industries, municipalities, highways, etc.) contribute to sediment contamination. Contaminated sediments are known to cause adverse effects to fish and shellfish, humans, and the environment. Cleaning up sediment sites is often more costly and complex than cleaning upland sites. To compound the problem, pollution discharges continue to impact and/or recontaminate sites.

Cleaning up sediment sites is often more costly and complex than cleaning upland sites. To compound the problem, pollution discharges continue to impact and/or recontaminate sites.

There are approximately 134 sites with sediment contamination in the State of Washington. Investigations and cleanup activities are completed or are in process at over 120 of these sites, which average approximately 27 acres each. The predominant source of contamination comes from industrial activities (52%), followed by Navy and shipyard operations (20%), and then combined sewer overflows (13%), stormwater (10%), and spills (5%). See Appendix One for a map of sediment sampling locations with detected chemical contamination.

The addition of sediment staff to the program several years ago has increased the program's capacity to clean up contaminated sediment sites. Technical support includes updating sediment management standards based on current scientific information, maintaining the sediment information database, participating in a multi-agency effort to select and construct a disposal facility for contaminated sediments, and implementing guidelines for disposing of relatively clean sediments. Staff also manage

a multi-agency sediment cleanup pilot project that is designed to integrate cross-agency actions and accelerate sediment cleanup.

Mega Sites

Mega sites are often complex and costly to clean up, can cover many square miles, usually involve enforcement problems, and have complicated liability issues.

Mega sites are often complex and costly to clean up, can cover many square miles, usually involve enforcement problems, and have complicated liability issues. An example of a mega site is area-wide soil contamination caused by operating practices and air emissions from the former Asarco smelter in Everett. The program is engaged in replacing contaminated soil around homes near the smelter.

The Environmental Protection Agency (EPA) predicts that on a national level there will be an increased number of mega sites discovered. EPA defines these sites as primarily:

- Contaminated sediment sites, which are a major source of persistent, bioaccumulative, toxic chemicals and heavy metals. The contamination at these sites is old, often meaning finding the source or owner/operator will not be easy or likely.
- Mining sites that have the potential to threaten groundwater and surface water (there may be as many as 3,500 abandoned metal mines in Washington State). Groundwater contamination can affect municipal water supplies.
- Former smelter sites.

How EPA and the Toxics Cleanup Program define a mega site sometimes overlaps with how the program also defines "areas of wide-spread contamination." At present, the biggest difference is "mega sites" have contamination from a single source, and "areas of wide-spread contamination" come from multiple sources. Information on areas of wide-spread contamination can be found in Section Three.

Abandoned Mine Sites

One estimate indicates there may be as many as 3,500 abandoned metal mines in Washington.

Historically Washington State has seen extensive mining throughout its 68 mining districts. At this point there is no way to identify the exact universe of abandoned mine sites in Washington. One estimate indicates there may be as many as 3,500 abandoned metals mines in Washington. Of these, it is estimated that approximately 500-600 are considered significant (more than 200 pounds of product produced during the life of the mine).

During the current biennium the program is working on developing a protocol for identifying abandoned mine lands. Once an abandoned mine site has been identified, the program can:

- Identify potential contaminants of concern;
- Conduct an initial determination of the extent and kind of release(s) or potential release(s) and determine the migration route;
- Collect general site information and site characteristics such as waste type/quantity, owner status; and
- Identify physical hazards at mines.

Once this information is gathered, a determination can be made of the potential risks to human health or the environment. Future activities will focus on the identification and

prioritization of abandoned mine lands and the short- and longer-term actions needed, including cleanup. This will be done in conjunction with the state and federal land management agencies. While this will make the work load more manageable, it will still be a challenge for the program.

Innovative Technologies

Ecology recognizes that achievement of environmental cleanup goals requires more than continued reliance on existing technologies. Available technologies are ineffective for solving many environmental problems, or in some cases, are too costly to implement. For example, most existing groundwater remedies involve conventional *ex-situ* "pump and treat" systems, which operate for years at high costs without meeting cleanup goals in many cases.

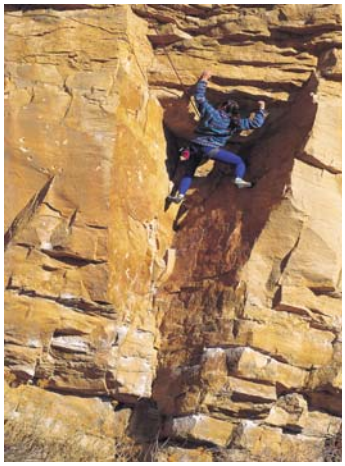
Innovative technologies are newly introduced and technically feasible remedies. They are not yet established due to lack of wide-spread use under different site-specific conditions, and therefore have very limited cost and performance data available. New technologies such as permeable reactive barrier (PRB), dual-phase extraction and density-driven convection (DDC) are reducing restoration time at significant cost savings. Other promising technologies include *in-situ* advance oxidation processes (AOP), bio-slurping, natural attenuation, and phytoremediation (see photograph and box below).

In some instances, ferns can be used to accumulate arsenic.

Ecology encourages the use of innovative technologies. Selected remedies, existing or innovative, are evaluated on the basis of reasonable likelihood of success, subject to provision for the appropriate performance and confirmation monitoring. Uncertainties regarding the performance of a selected remedy may be resolved by requiring a pilot or treatability study. The potentially liable person is ultimately responsible for meeting cleanup standards.

On Earth Day, 1999, NUWC Keyport, a navy site in Kitsap County, invited community members to a tree planting celebration. Poplar trees were planted in an old landfill area, to help take up contaminated groundwater and treat it, an alternative to mechanical "pump-and-treat" systems.

Section Three: Challenges on the Horizon



The Environmental Protection Agency has found a trend in the sites that are currently being discovered. They are more complex and costly. The same is being found in the Toxics Cleanup Program. While the program continues to clean up contaminated sites in the state, there is also an observable trend of newly discovered sites that pose new challenges for the program. The purpose of this section is to begin to identify those challenges that will add work-load issues for the program. This includes issues and challenges currently under development or just beginning to appear on the horizon. It is believed these challenges will continue to unfold over the next several years.

Some of the issues in this section, such as "areas of wide-spread contamination," have strategies under development. Other issues, such as "persistent, bioaccumulative toxins," are unfolding, as the program is beginning to see the gravity of the impacts on areas such as the Spokane River. Another issue, "perchloroethylene," is a continuing drinking water problem, based on the program's experience with the chemical in communities such as Yakima, Tumwater, and the Lakewood area, and pervasive problems with drinking water in states such as California and Florida.

Specific areas of developing interest for the program are:

- Areas of Wide-Spread Contamination
- Institutional Controls and Periodic Review Sites
- UXO – Unexploded Ordnance
- Perchloroethylene
- Stormwater and Combined Sewer Overflows (CSOs)
- Persistent, Bioaccumulative Toxins (PBTs)
- Large-scale Public Works Projects

Areas of Wide-Spread Contamination

The Toxics Cleanup Program is increasingly finding large areas (several acres to many square miles) with low-to-moderate levels of soil contamination that have been caused by a range of historical activities. The Model Toxics Control Act (MTCA) Policy Advisory Committee recommended that the Toxics Cleanup Program evaluate the problem of area-wide contamination, including the development of area-wide investigations and remedies. The current law was designed for typical industrial/commercial sites with a relatively limited area of contamination. The problem of area-wide contamination doesn't fit as neatly into the current cleanup law.

The soil and groundwater in many existing and proposed residential, commercial, and industrial areas in Washington State are contaminated from the accumulation of pesticides, aerial discharges from industrial manufacturing or smelters, or from the past operations and disposal practices of businesses of all sizes. In many instances the contaminants are found in concentrations above the state cleanup

A task force has been formed to develop strategies to address wide-spread soil contamination problems found in the western and eastern parts of the state. This task force includes the Departments of Agriculture, Health, Community Development, and Ecology.

standards. Communities in both eastern and western Washington have been impacted by area-wide contamination.

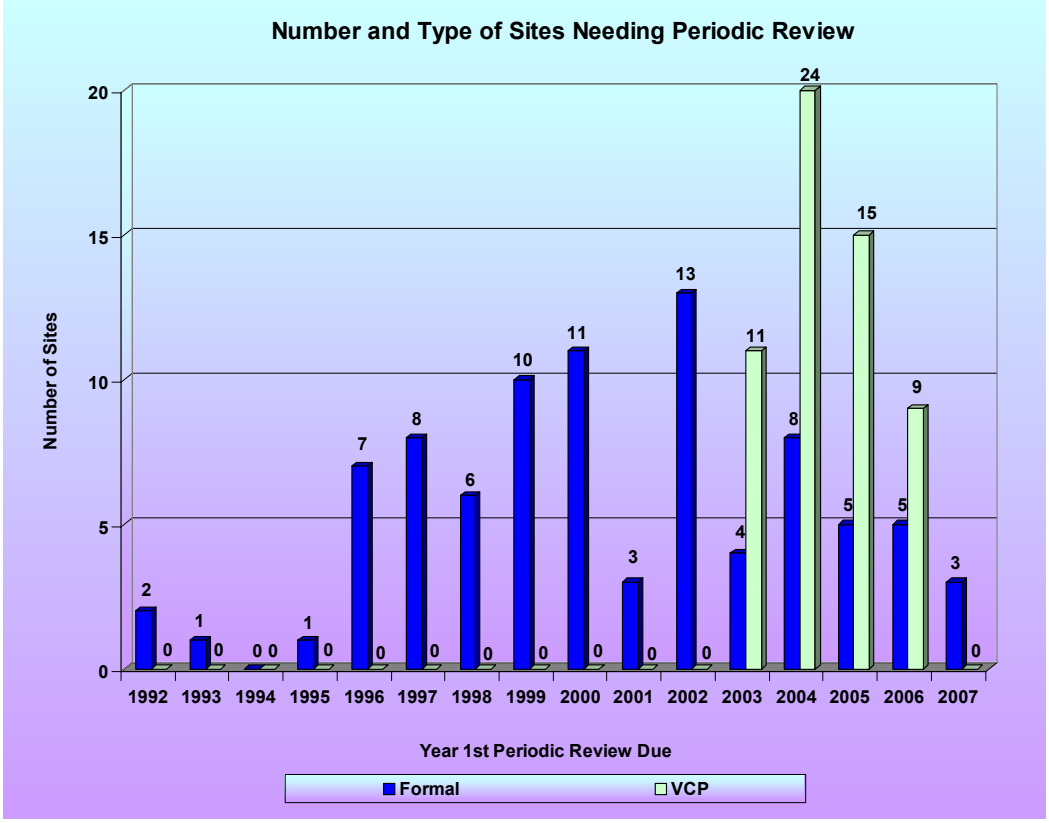
Many of these areas have been or are being developed into residential neighborhoods, schools, and parks. These development activities have raised a variety of health and environmental concerns, related primarily to arsenic, and have lead to the cleanup of yards around some homes. An Area-wide Task Force has been formed to examine these issues and concerns. The task force includes the Departments of Agriculture, Health, Community Development, and Ecology. They will develop strategies to address wide-spread soil contamination problems found in the western and eastern parts of the state. The strategy will initially focus on arsenic contamination from stationary emission point sources (such as smelters) and historic uses of agricultural pesticides.

Institutional Controls / Periodic Reviews

At times, all of the contamination at a site cannot be cleaned up or removed. When this happens, restrictions are placed on future uses of the property. These restrictions, called institutional controls, are required to assure the continued protection of human health and the environment. These institutional controls restrict the use of the property and have been used as part of a cleanup remedy for 86 sites under orders or consent decrees and 74 sites that are participating in the program's Voluntary Cleanup Program (VCP).

When institutional controls are used, a periodic review is required to determine if the remedy and the institutional control remain effective in protecting human health and the environment. Periodic reviews are to be conducted by the program at least every five years after the initiation of the cleanup action. The program faces a growing number of sites that will need five-year reviews. This is not a new work load, but is a continuation of the site cleanup process that requires past work to be analyzed and an evaluation of its effectiveness to be completed. This work load is particularly significant because it impacts the program's ability to begin work on new sites.

Figure 11 shows the number of sites by year in which the first periodic review was or will be required. Periodic reviews are not currently tracked on the program's database, so information is not readily available to determine how many periodic reviews have been conducted. This is an issue for the program, and a new component to the program's database will soon be designed to track institutional controls and trigger five-year reviews.



"Formal" sites are ones being cleaned up with Toxics Cleanup Program oversight.

"VCP" sites are ones being cleaned up independently through the Voluntary Cleanup Program.

Figure 11. Number and Type of Sites Needing Periodic Reviews

UXO – Unexploded Ordnance

UXO is unexploded ordnance which comes from the use of military munitions. It is the result of ordnance that has been fired, dropped, projected, mishandled, discarded, or used in a way that then creates a hazard. UXO contamination is a hazard for military personnel and the general public. The risk to the general public is increasing as:

- Active installations are performing cleanups at their ranges,
- Installations are designated for base realignment and closure (BRAC), and
- Areas are designated as Formerly Used Defense Sites (FUDS).

Hazards range from explosive threats to several human health effects.

During WWII, Washington State played an enormous role in the training of combat ground, air and naval forces. Seaports and airfields supplied the Pacific area with ammunition and explosives. The Navy loaded and unloaded a large quantity of ammunition from several piers throughout Puget Sound. Some examples include Tulalip, Indian Island, Mukilteo, Manchester and Jackson Park. Many of these munitions were mishandled and lost in the water around these piers. For example, Jackson Park has performed underwater clearing of UXO three times since the ammunition pier was closed. The most recent search yielded 3,410 ordnance items.

Examples of UXO include:
* Hand Grenades
* Mortar shells
* Projectiles/ artillery rounds
* Submunitions
* Rockets and missiles
* Bombs

Sites with UXO contamination have technical and safety issues related to the UXO contamination as well as legal problems which are becoming increasingly complex.

Also, memorandums from Navy commanders in that time frame authorized disposal by dumping at sea within Puget Sound and it's near coastal waters.

Today, there are 325 known FUDs in this state. These sites are real properties that were formerly owned, leased or under the jurisdiction of the Department of Defense. Of those, the Toxics Cleanup Program has identified approximately thirty sites to date that have UXO contamination. This number is considered approximate as the program continues its review of FUD sites and because new sites are continuing to be discovered, especially underwater sites. In addition, the Navy has approximately 20 closed or transferring ranges within the state where UXO may have been used.

When UXO contamination is found at a facility, Ecology requests the facility to provide institutional controls to keep non essential personnel out of these areas. The same will be requested of the Army Corps of Engineers on some of their FUD sites. These steps will minimize the risk of human contact with UXO until the Department of Defense receives the funding to clean up these sites.

There are currently two sites in Washington that have active UXO cleanups in progress. They are Jackson Park and Camp Bonneville. This photo was taken at the Camp Bonneville site.

Perchloroethylene (PCE or "Perc") Contamination

Perchloroethylene, or "perc," is a chemical that is carcinogenic and can cause significant impacts to drinking water. More than one million pounds of this chemical is produced annually in the U.S., and is distributed for cleaning and consumer products, used in industrial operations, and most frequently, used as a common dry-cleaning fluid by drycleaner businesses. "Perc" has significantly impacted groundwater supplies because of its wide-spread use and its ability to migrate from soil into groundwater. Once it gets into the groundwater, it "sinks" and is difficult to locate and clean up. It may take decades for the "perc" to dissipate.

Perchloroethylene, or "perc", is a chemical that is carcinogenic and can cause significant impacts to drinking water. Perc has had wide-spread use and can migrate from soil into groundwater. Once it gets into the groundwater, it "sinks" and is difficult to locate and clean up. It may take decades for the "perc" to dissipate.

It is estimated by regional staff that any drycleaner establishment with equipment over four years old, has or will have a release of PCE. At many gas station cleanup sites PCE is found in the groundwater, having migrated from a (past or present) dry-cleaning operation by way of leaks through joints and cracks in sewer lines, discharges to septic drainfields, or due to the use of solvents at gas stations. This doesn't mean all of these sites will require cleanup, but it does bring light to the potential scope of PCE threats to the water and air quality of Washington State.

A State Coalition for the Remediation of Drycleaners (SCRD) report currently estimates that of the approximately 22,300 active drycleaner facilities in the nation, **75%**, or 17,000, contain some level of contamination. (Schmidt, Robin, Richard De Zeeuw, Leo Henning, and Dale Trippler, State Programs To Clean Up Drycleaners. http://www.drycleancoalition.org/survey/, 6 June 2001.) In addition to the operating drycleaners, drycleaners that have closed or ceased operations may not be easily identifiable, yet their contamination continues migrating through the soil and groundwater and generally is identified only during cleanups at other facilities.

According to the Department of Revenue, there are at least 7,020 drycleaners licensed for business in Washington State. When viewing the list of cleaners, it is impossible to tell which of these sites actually dry cleans with PCE on-site, or is a "drop-off" site. Staff estimates of drycleaner sites that use PCE on-site is closer to about 800. If this is so and the national average is applicable to Washington State, it can be anticipated that about 600 of these have had releases that may require cleanup. The program has identified 99 to date.

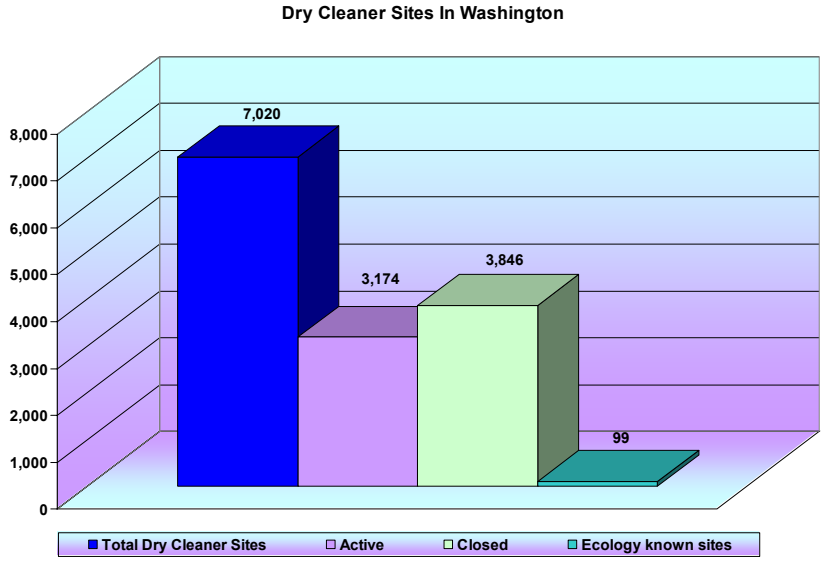


Figure 12

This chart shows the number of sites in Washington State that are associated with dry cleaning. What is not known is how many of these sites actually dry clean using PCE or perc on site.

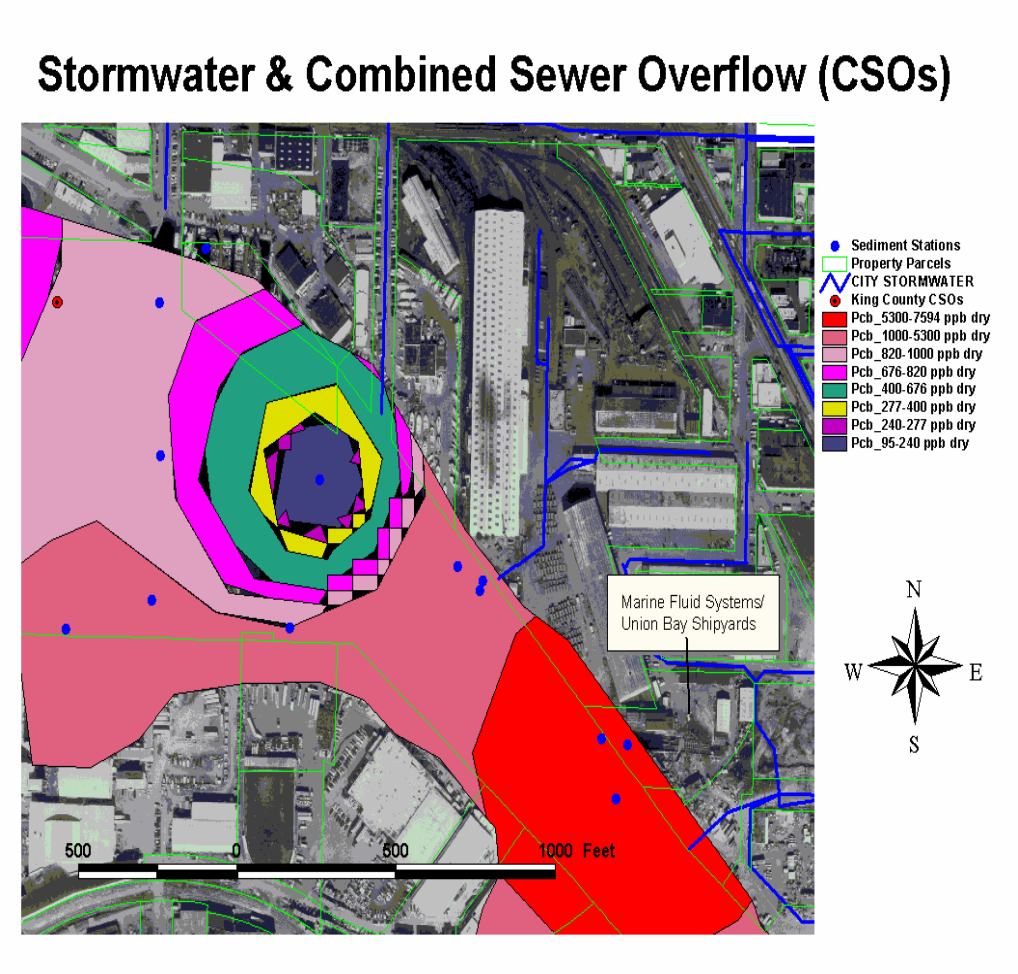


Figure 13

Lake Union Ship Canal PCB Sediment Contamination

Stormwater runoff and combined sewer overflows (CSOs) are potential sources of sediment contamination to state waters. Stormwater runoff may cause flooding which results in erosion, endangers or destroys aquatic wildlife and wildlife habitats, and endangers public health by contaminating drinking water. Similarly, CSOs are characterized by stormwater runoff from house roofs and parking lots and streets that empty into the same sewer system that carries sanitary waste to sewage treatment plants. This system is referred to as a combined sewer, which may contain a variety of chemicals, oils, and coliform bacteria that may adversely affect human health and the environment. Stormwater and CSO discharges often are untreated and may be located in quiet waters where sediments become readily contaminated.

Stormwater and CSO discharge regulatory programs historically have not focused on receiving-water and sediment quality impacts. Using today's geographical and sediment quality information systems, it can be shown that sediment contamination and potential cleanup sites may be associated with existing stormwater and CSO discharges (see figure above). Additional sharing of information and tools between Ecology and municipal governments may reduce duplication of monitoring efforts and help prioritize new proposed water and sediment quality studies at stormwater and CSO discharges.

Identification of new sediment cleanup sites and source controls could significantly impact program work load. Lake Union is an example of one of many state waterways that will need restoration due to stormwater and CSO discharge. CSOs and impact on sediment will result in increased demand of state resources.

Appendix One provides a map of the location of discharge sites and treatment outfalls.

Large-Scale Public Works Projects

Large-scale public works projects have the potential to create major work loads for staff. This is especially true in industrialized areas where state and local governments are exploring the purchase of properties for right-of-ways for a variety of projects. These projects include the Sound Transit Project and other transportation projects (see Appendix Four). The major challenge with these large-scale public works projects is that many of these properties are known or suspected of being contaminated.

When state and local governments first contact the program about contamination on properties, the scope of the contamination and the potential health and environmental effects are often largely unknown. In addition, these projects are generally on tight schedules, and the acquired sites with potential contamination do not go through a typical site hazard assessment and ranking to be added to the hazardous sites list for future work.

When Ecology staff are called for assistance, they do not know if they will be needed for a few hours or a few months. At times, these projects with contamination consume as much time as a site where the program is implementing an Order or Consent Decree. Appendix Four has more information on these projects and a list of some specific examples.

Persistent, Bioaccumulative Toxins (PBTs)

Effect of PBTs

"These killer whales can now be considered among the most contaminated marine mammals in the world."

Dr. Peter Ross, Institute of Ocean Sciences, Canada, commenting on Orca whales in Puget Sound.

Persistent, bioaccumulative, toxins (PBTs) are ones that stay in the environment for a long time, accumulate in humans and animals, and are toxic. They are getting an increased focus in Washington State and in the country because they are different from most other chemicals: they don't go away and can increase in concentration as they move up the food chain. *While scientists once thought that pollutants would disperse in the environment, they are now finding that some pollutants can actually accumulate, and so increase in concentration.* This accumulation is difficult to purge and may be creating problem areas that pose risks to human health and the environment. Many cleanup sites today are due to past practices. Many industrial and other site owners, operating under past permits and regulations, are now finding a need to go back and perform cleanups at sites that have become hazardous to human health and the environment because of these past practices. An example of a current problem is PCB.

Though banned 25 years ago, trace amounts are still found in human blood. PCBs are also found in the Spokane River and in Orca whales in the Puget Sound -- at levels that make them one of the most contaminated marine mammals in the world. See Appendix One for a map of the locations of mercury above cleanup levels in the state (water bodies). Appendix Four contains the initial PBT list and a list of sites that have or had these compounds, and the proposed PBT list.

Section Four: Financial Overview

State and Local Toxics Control Accounts

In 1987, the legislature passed an environmental cleanup bill (70.105B). This established a legal framework for the cleanup of contaminated sites and funding through a tax on hazardous substances.

In November 1988, the voters of the state of Washington rejected the legislative program and replaced it with Initiative I-97, which became known as the Model Toxics Control Act (Chapter 70.105D RCW). The Toxics Cleanup Program became effective six months later.

The Model Toxics Control Act had a provision in it that established a funding source available for the Toxics Cleanup Program to clean up contaminated sites. The funding source is called the Toxics Control Account.

The Toxics Control Account is funded by a tax imposed on the "first in-state possessor" of hazardous substances at the rate of $7 per $1000. It is separated into two fund sources to meet the objectives of the Model Toxics Control Act. One is the State Toxics Control Account (STCA) and the other is the Local Toxics Control Account (LTCA). By statute, 47 percent of the tax collected is deposited into the State Toxics Control Account. The remainder of the fund is deposited into the Local Toxics Control Account where it is used by local governments. Additional sources of money to the State Toxics Control Account include dollars collected through cost recovery, fines, penalties, and miscellaneous revenue.

The STCA depends on the price of crude oil. Since the price of crude oil has fluctuated dramatically over the last few years (between $10 and $40 a barrel), revenue collections are highly volatile.

The 1989-91 Biennium saw the first State Toxics Control Account appropriations. Each biennium since then, the legislature has appropriated funding to the Toxics Cleanup Program as well as several other programs and agencies. The State Toxics Control Account is the primary source of funding for the Toxics Cleanup Program.

Expenditures and Revenue

Cleanup expenditures are the costs the program incurs for providing oversight to liable parties at high-priority contaminated sites; providing technical assistance to those involved in cleaning up lower-priority contaminated sites; investigating new sites; writing guidance documents, policies, and procedures to assist those cleaning up contaminated sites; and providing program support to staff managing cleanup sites (program support includes computer staff, public involvement staff, attorney general staff, and administrative staff).

The following figure illustrates total STCA revenue collected each fiscal year since 1989 (shown in green), the Toxics Cleanup Program's expenditures each fiscal year (purple), and the program's "cleanup proviso" appropriation for each year (blue).

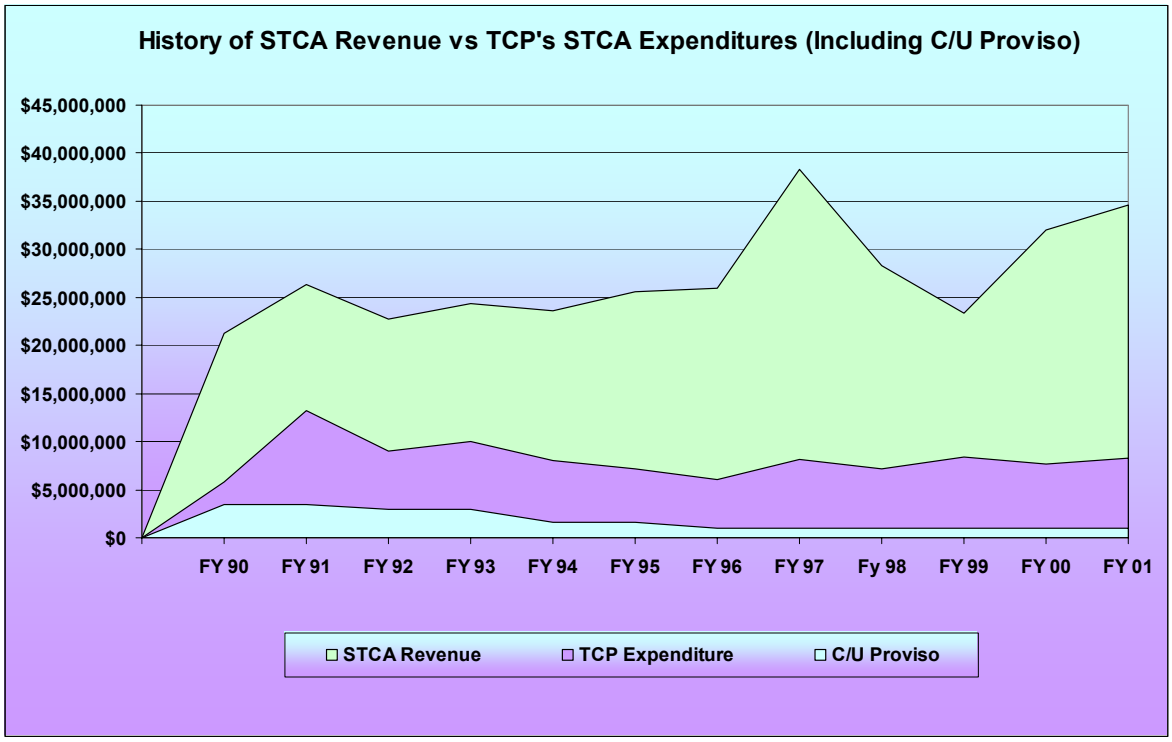


Figure 14

Several agencies and activities besides Ecology are funded by the STCA. Figure 15 identifies these expenditures in support of direct cleanup activities by the Toxics Cleanup Program, other Ecology activities such as pollution prevention, hazardous waste management, and other agency activities.

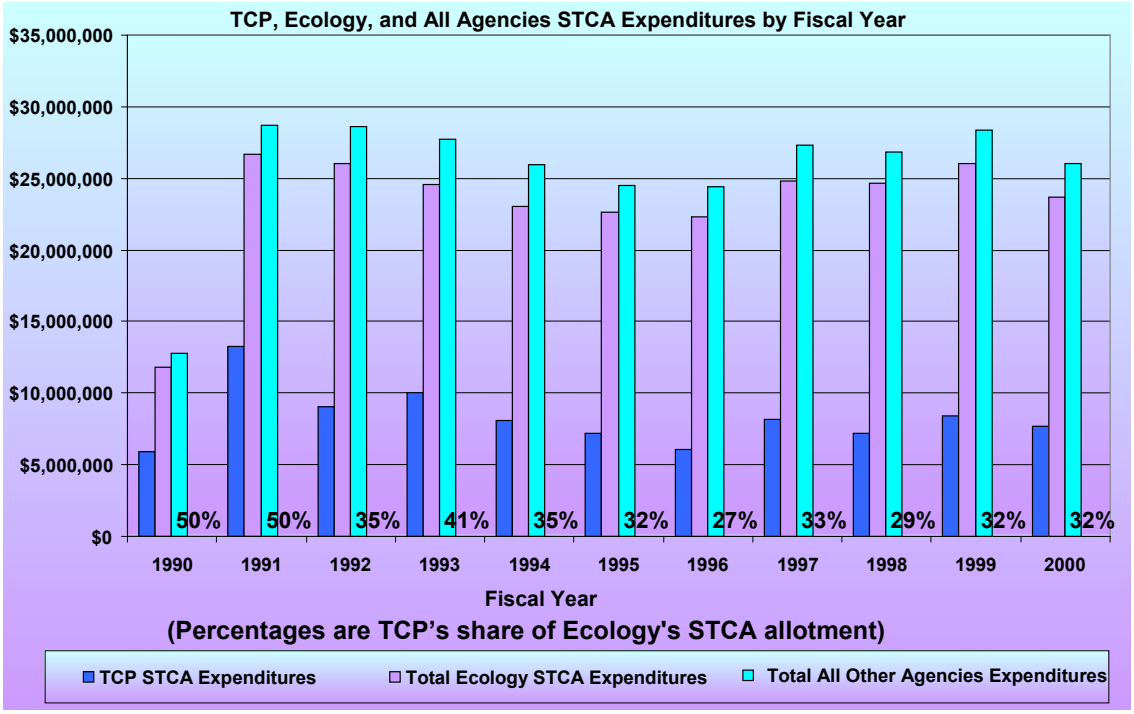


Figure 15. Distribution of State Toxics Control Account (STCA) Dollars Among Toxics Cleanup Program, Ecology, and all other Agencies

Staffing Levels

Figure 16 identifies the historical staffing levels for the Toxics Cleanup Program supported by the STCA and other funding sources. The STCA has been the primary source of funding for the program. The program currently has approximately 144.7 FTEs (full-time equivalent employees).

During the current biennium, 68.5 of the 144.7 FTEs the program employs are funded by the STCA. In the past, the STCA revenue and appropriations fluctuated dramatically, with the STCA supported staffing level ranging from 68.5 to 118.6 FTEs. The program has been able to receive support from other funding sources to help balance out this fluctuation.

Due to the continuing interest in site cleanup, the Toxics Cleanup Program's demands on the State Toxics Control Account will remain strong.

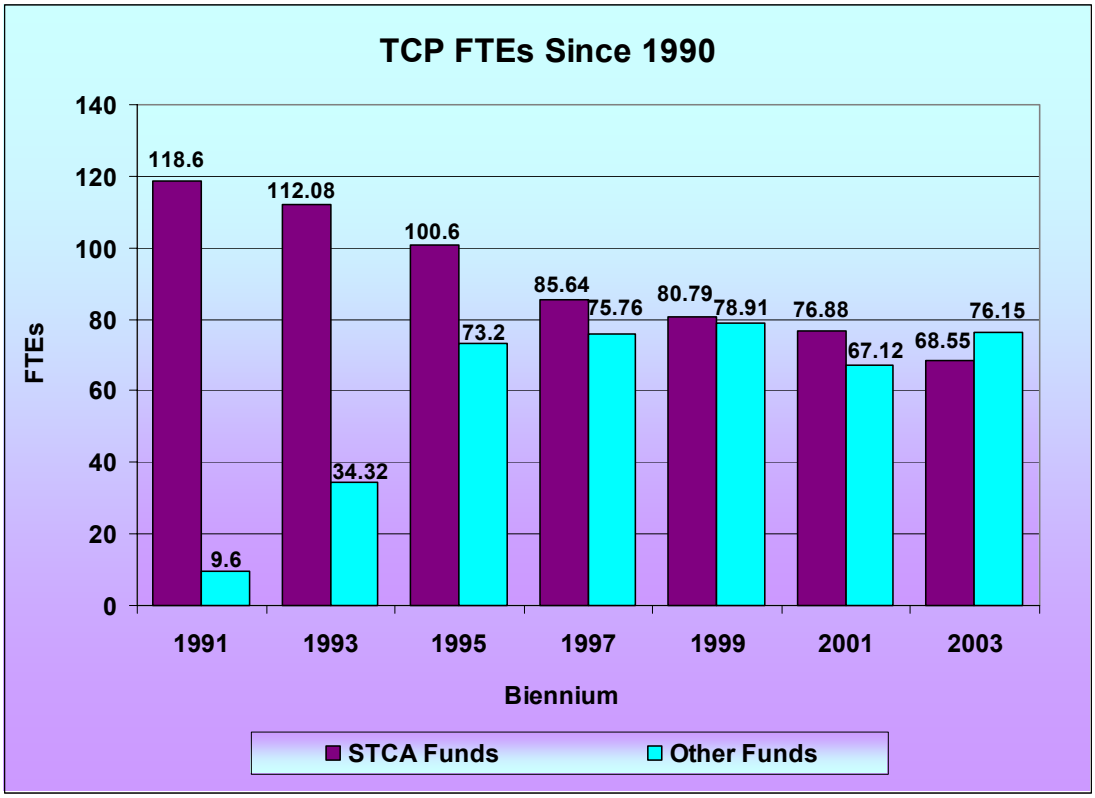


Figure 16. State Toxics Control Account funded FTEs

The Toxics Cleanup Program receives other state and federal funding as well. The program receives grant funds from the Environmental Protection Agency and the Department of Defense for work on federal priority and military sites; the State Underground Storage Tank Account; State General Fund; the Local Toxics Control Account; Worker and Community Right to Know Fund; and a Water Quality Permit Account.

A related function to keep in mind when evaluating State Toxics Control Account funded FTEs and the State Toxics Control Account revenue is "cost recovery." The Toxics Cleanup Program cost-recovers a portion of the money it spends providing oversight and technical assistance. This money comes from potentially liable persons and/or interested parties such as developers and prospective property owners.

These dollars are deposited into the State Toxics Control Account where they are appropriated to various state agencies and programs, including the Toxics Cleanup Program. The amount of monies cost-recovered is largely dependent on the number of staff working on sites. Reducing the program's State Toxics-funded FTEs can actually reduce the total amount of revenue accruing in the State Toxics Control Account. For instance, last fiscal year the Toxics Cleanup Program cost-recovered $1 million. In previous years when staffing levels were higher, the program cost recovered more than $3 million yearly.

EPA Operations/Maintenance Fund Lead Sites

Washington State is responsible for contributing to expenses incurred by the Environmental Protection Agency (EPA) Fund Lead Cleanups. Fund Lead sites are ones where the federal cleanup program is paying for the cleanup because the owner is unable to pay for the cleanup, or the owner cannot be found. State contributions for these sites undergoing remedial actions amount to 10% of the total cleanup costs, and 100% of the costs for operations and maintenance (O&M) phase, after the cleanup has occurred.

Currently, the state has a number of sites under contract with EPA. Of these sites, the state is still responsible for 10% of the remedial action costs of seven sites. Six other sites are in various phases of operation and maintenance. In the next few years, the state's obligation for payment on these sites undergoing remedial action will be in the millions of dollars. It is anticipated that the costs associated with operation and maintenance of all Fund Lead cleanups will be in the hundreds of thousands per biennium.

As described earlier, the Toxics Cleanup Program receives funding from the State Toxics Control Account through legislative appropriation. The volatility and budgetary pressures on this account raise concerns regarding the ability of the state to pay the required 10% match as well as the on-going operation and maintenance costs. Without additional funding being provided above existing levels, the costs associated with cleanups and operation and maintenance may need to come out of the Toxics Cleanup program's operating budget; thus resulting in an erosion of the state's capacity to respond to environmental and public health threats.

Decline of the Environmental Protection Agency's Superfund

Sources of Superfund dollars come from taxes on:

* Crude oil received at U.S. refineries
* Petroleum products imported into the U.S.
* Some chemicals
* Environmental levy on corporations, and
* General revenues

Funds are also recovered from the cleanup costs from responsible parties.

The Environmental Protection Agency's (EPA) Superfund program manages the cleanup of large and complex contaminated sites across the United States. It does so with funds collected through superfund taxes. This special fund has been steadily decreasing since the taxes expired in 1995. The EPA's Office of Emergency Response predicts there will be a balance of zero by the end of 2003.

Historically the Superfund program has received approximately 20% of its funding from federal general tax revenues. By 2000 the fund was declining, and Congress increased that amount to 50% of the total funding to keep the program going. This amount is expected by some to rise again as the Superfund account reaches zero.

There is great controversy over the shrinking balance of the dedicated Superfund account and distrust with funding from the general account. Concerns raised have included:

- Budgetary competition will lead to decreased funding for cleanup;
- Need for a dedicated source of funding for contaminated sites;

- Desire to continue to have polluters pay for cleanups, a major principle established in the Superfund law;
- Current cleanups at Superfund sites will slow or stop entirely as a result of lack of funding;
- EPA will not be able to address new sites in a timely manner or at all due to funding constraints;
- Without EPA's support, these sites and the associated costs will fall to the state; and
- Site owners with limited resources will not be able to clean up their sites in a timely manner or at all.

Last biennium, the program was able to secure a one-time appropriation through its "Clean Sites Initiative" to pay for cleanup actions at 15 large and complex sites throughout the state (Section Two). As EPA's dedicated Superfund account reaches zero in 2003, it will become even more critical for Washington State to be able to acquire additional funding to begin cleanup of these larger sites, and to continue the cleanup once it has started.

The Superfund law was passed by Congress in 1980 after two sites gained national attention. One was Love Canal in New York, where wastes from the former Hooker Chemical Company forced the move of a community by the federal government. The other was the "Valley of Drums", an open dump in Kentucky which leached chemical contamination into the surrounding area. This photograph and caption is from "Counting Down to Zero", published in the September 2002 Chemical and Engineering News web site.

THEN The Valley of the Drums, outside of Louisville, Ky., was one of the most notorious hazardous waste sites of the late 1970s. It helped trigger passage of the Superfund law.

U.S. Coast Guard photo

Remedial Action Grants

When local governments need to clean up publicly-owned contaminated sites, they can receive remedial action grants to help fund the cleanups. Local governments include towns, cities, counties, school districts, fire districts, public utility districts, and port districts. Grants have been awarded to study and remediate contaminated sites, clean up brownfield or former industrial properties, remove underground storage tanks, clean up related soil and groundwater contamination, investigate and conduct site hazard assessments, and provide clean drinking water to residents whose well water supply was polluted by a contaminated site.

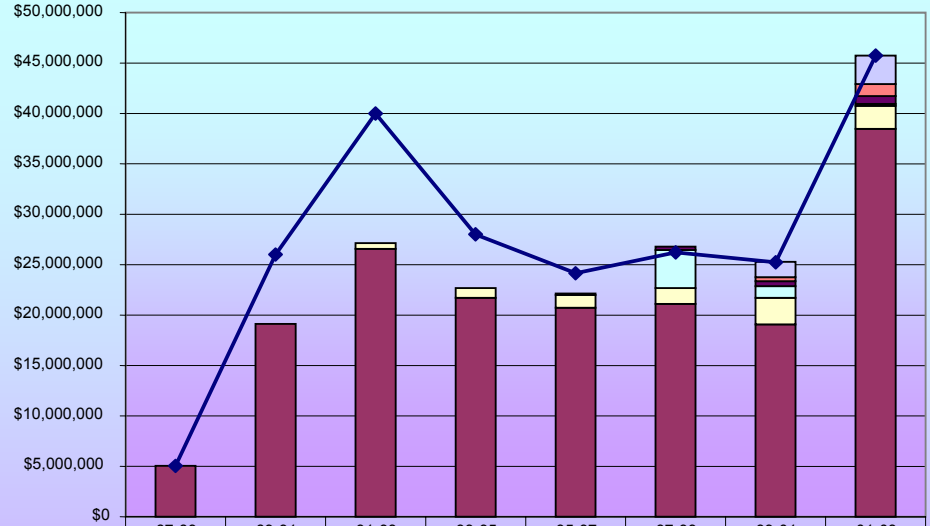
The administrative and accounting functions of the grants program are administered by Ecology's Solid Waste and Financial Assistance Program. It awards grants from the Local Toxics Control Account based on criteria and funding decisions made by the Toxics Cleanup Program.

In the last several years, awards have been about $25 million each biennium. At the end of February 2002, the grants program had distributed approximately $145 million to local governments for remedial action projects. Local governments generally contribute a fifty percent (50%) match.

The primary recipients of remedial action grants have been counties, cities, and ports. Funding has also been provided to a significant number of school districts for petroleum cleanups associated with the removal or upgrading of underground storage tanks. The distribution of grant funds corresponds with the local government's responsibility for planning, preventing, and cleaning up contaminated properties. In the past decade, cities have received twice as much in grant funds as counties and ports. A relatively equal amount of grant funds have been distributed among counties and ports.

The following figure shows the distribution of Remedial Action Grant dollars. A list of Remedial Action Grant recipients for the 2001 – 2003 biennium is in Appendix Five.

Remedial Action Grant Distribution Over Past Eight Biennia



	87-89	89-91	91-93	93-95	95-97	97-99	99-01	01-03
TSP							1,529,085	2,821,412
Derelict Ships								0
VCP							380,816	1,194,720
Drug Labs						342,352	508,359	768,917
UST Grants					113,134	3,780,078	1,151,553	191,204
SHA's			565000	960,000	1,276,064	1,569,191	2,622,485	2,282,127
Remedial Grants	5,050,201	19,134,150	26,561,249	21,715,857	20,728,117	21,102,315	19,090,375	38,473,557
Allocation	5,050,201	26,000,000	40,000,000	28,000,000	24,150,000	26,226,400	25,232,526	45,731,937

TSP: Tacoma Smelter Plume **VCP:** Voluntary Cleanup Program **UST:** Underground Storage Tanks **SHA:** Site Hazard Assessment

Figure 17

Notes:

Tacoma Smelter Plume: Grants have been given to several local governments to investigate large areas of low-level contamination of arsenic and lead, from a former smelter site in the area. See Section Three "Areas of Wide-Spread Contamination" for more information.

Derelict Ships: Grants are also available to local governments for the cleanup of derelict ships. These are vessels that have been abandoned and/or are contributing contamination to the state's water bodies.

Section Five: Reflections

A Systems Approach

A systems approach to cleaning up sites will be key to finding more permanent solutions for areas that have contamination. Instead of viewing a site as an isolated problem, a systems approach includes integrating source control and cleanup efforts as well as consideration of social and economic conditions surrounding a complex contaminated site. Taking this broader view can provide insight on the past, present, and future impacts a site and the surrounding community have on each other. This leads to better long-term land use planning, recovery of contaminated sites for productive use, and cross-media environmental assessment.

Strategies are being developed to examine the cleanup challenges of low-level, wide-spread contamination (Section Three), sediment contamination (Section Two and Three), and mining issues (Section Two). The program has also actively participated in natural resource damage assessments where several parties that contributed to an area of contamination are evaluating ways to restore environmental damage.

With the emergence of projects such as mega sites (Section Two) and large-scale public works projects (Section Three, Appendix Four), the program has an opportunity to continue to build models of system approaches for its more complex sites.

Sometimes a contaminated site undergoing a cleanup may also have contamination that is continuing due to existing governmental, industry, or community practices. This can be illustrated with the Spokane River, where cleanup progress is impaired or threatened by continuing contamination from current permitting (including CSOs) or past industry practices.

Moving from Remediation to Redevelopment

When Initiative 97 was initially passed, it was envisioned that most cleanups would occur through a traditional enforcement approach. That is, it was expected that most potentially liable persons would resist spending resources on cleanup and most cleanups would not occur unless Ecology issued enforcement orders.

Today, cleanups are largely accomplished not because of enforcement action, but instead, voluntarily because of redevelopment opportunities. This is not to say that enforcement action is no longer needed. Indeed, there have been several notable sites where cleanup did not occur until Ecology took (or threatened to take) enforcement action.

This shift to voluntary cleanup has occurred because redevelopment brings additional new resources for cleanup. Environmental consultants and developers appear to have come to accept cleanup as a cost of doing business and may be more comfortable dealing with Ecology. Developers and lending institutions understand that cleaning up a property also protects their investments.

Timing can be a critical element as many cleanups begin to include real estate transactions and development pressure. In some cases, developers have even offered to pay overtime or a premium to the program for assistance so they can meet a property transaction deadline. This creates a challenge for a program that is geared toward cleaning up higher priority sites according to rank. The program faces competing demands for its oversight services by both local governments and business.

This competition for staff resources emerges as staff who are assigned to work primarily on highest priority sites are also asked to provide assistance for voluntary cleanups, and to businesses and local governments engaged in the redevelopment process of brownfields (Section Two) and large-scale public works projects.

Staff in regions that have a greater number of industrial areas get more requests for assistance on large-scale public works projects and other property transaction-

based cleanups. If the number of requests for assistance continues to grow, the program may need to organize to match the two tracks the program has taken (Section One), a) high-priority contaminated sites; and b) voluntary cleanups and other requests for assistance. This shift to align services and demand would accommodate both time and predictability needs for those seeking to engage in voluntary cleanups and property transactions, and ease the competition for staff resources with the program's priority sites.

Number of New Sites Continues to Grow

The program has completed cleanup actions on nearly 5,000 sites, and once thought that it would eventually work itself out of business. At the close of 2001, there were over 1,000 sites waiting to be cleaned up and approximately 500 new sites were reported to the agency.

The program has made remarkable progress in getting contaminated sites cleaned up in this state, yet the number of new and pending cleanup sites continues to grow. At the close of 2001, there were over 1,000 sites waiting to be cleaned up and approximately 500 new sites reported to the agency just that year. While the dominant contaminant type continues to be petroleum products, many new sites are more complex, and sources of contaminants are widely varied without a clear leader in any one industry type.

Parallel to this growth is the number of sites that have cleanup actions completed, yet need a periodic or five-year review conducted to ensure the remedy is working. This is due to cleanup actions that may take many years to complete, or other sites where contamination has been "contained in place." At the close of 2001, nearly 50 sites reached the phase where they needed to have this review conducted. This is not new work – it is a continuation of work begun years ago, and impedes the program's ability to begin work on additional sites.

The program has completed cleanup actions on nearly 5,000 sites, and once thought that it would eventually work itself out of business. It has become more apparent that additional needs, including these periodic and five year-reviews and property sales, will continue to place demands on the program for some time to come.

Broadening the Cleanup Perspective

With limited resources and competing demands, it may be valuable to have local community members and businesses with multiple perspectives look at the community and area aspects of complex or multiple cleanups and help prioritize work within a "cleanup shed."

The magnitude of the full cleanup perspective is beyond the scope of the Toxics Cleanup Program or Ecology alone. Contaminated properties can affect land use and development patterns, creating downtown "brownfields" or rendering some close-in agricultural lands unsuitable for suburban development. Containment of contamination on-site can restrict future land uses and pose a long-term threat to public and private water supplies or limit surface water uses. A broader view is needed to look at the connection among agencies, local governments, and communities. This broader view is continuing to build as the program works with other agencies to develop solutions for the long-term cleanup of sites.

The program has developed working relationships with federal, state, and local governments. This is evident in the partnerships the program is developing related to the issues of mining, area-wide contamination, and mega-site cleanups for example. Partnerships should also continue to develop in areas where cleanups seem to be at odds with local environmental practices such as the cleanup of the Spokane River, or Lake Union.

Extending this broader view to business and community activities would bring even more balance to the picture. The program has diverse and competing requests for its assistance on contaminated sites. Although most of the worst sites have cleanup actions in place, the work load is shifting, with new demands being placed on it by the

evolving marketplace. At times, the program still operates in a mode of "putting out fires," leaving less time to take in a broader area perspective.

Yet it is the broader perspective, looking at the cleanup action in relation to other agency regulatory activities, such as issuing air and water discharge permits and growth management, that will help illuminate the consequences of multiple actions of the agency within a community. Ultimately, this will bring about solutions to environmental protection and cleanups that are more permanent.

With limited resources and competing demands, it may be valuable to have local community members and businesses with multiple perspectives look at the community and area aspects of complex or multiple cleanups and help prioritize work within a "cleanup shed." This will become even more important as resources continue to erode for government agencies.

Highest Priority of the Program

The Toxics Cleanup Program's highest priority has consistently been to clean up contamination and ensure that human health and the environment is protected. As the program evolves, so do solutions for how to achieve that highest priority. The program developed the Voluntary Cleanup Program in recognition of a growing demand for an alternative system to clean up sites and in recognition that voluntary cleanup contributes to the program's highest priority.

The Toxics Cleanup Program's highest priority has consistently been to clean up contamination and ensure that human health and the environment is protected. As the program evolves, so do solutions for how to achieve that highest priority.

How to better deal with individual sites within the context of the bigger picture is moving to the forefront of current challenges. The bigger picture includes: community needs; multiple contamination sources; contamination spread over a wide area; and current agency actions that allow continued contamination to areas undergoing cleanup.

These are part of the challenges on the program's horizon which includes the ability to bring in resources to be able to look at an area with contamination and to identify sources that are continuing to contaminate an area. The program needs partners to improve the coordination of environmental restoration and cleanup with community development needs and activities. While the program usually works with historical information (past practices), it also needs information on future development plans.

The program's increasing focus will be to broaden solutions for longer-term, and permanent cleanups in the State of Washington. The program's focus will also be with local government and other state agencies to ensure cleanup plans are integrated into other plans. This will be done by building on its current successes, responding to the needs of the public, and working within the agency to assure future contamination is prevented.

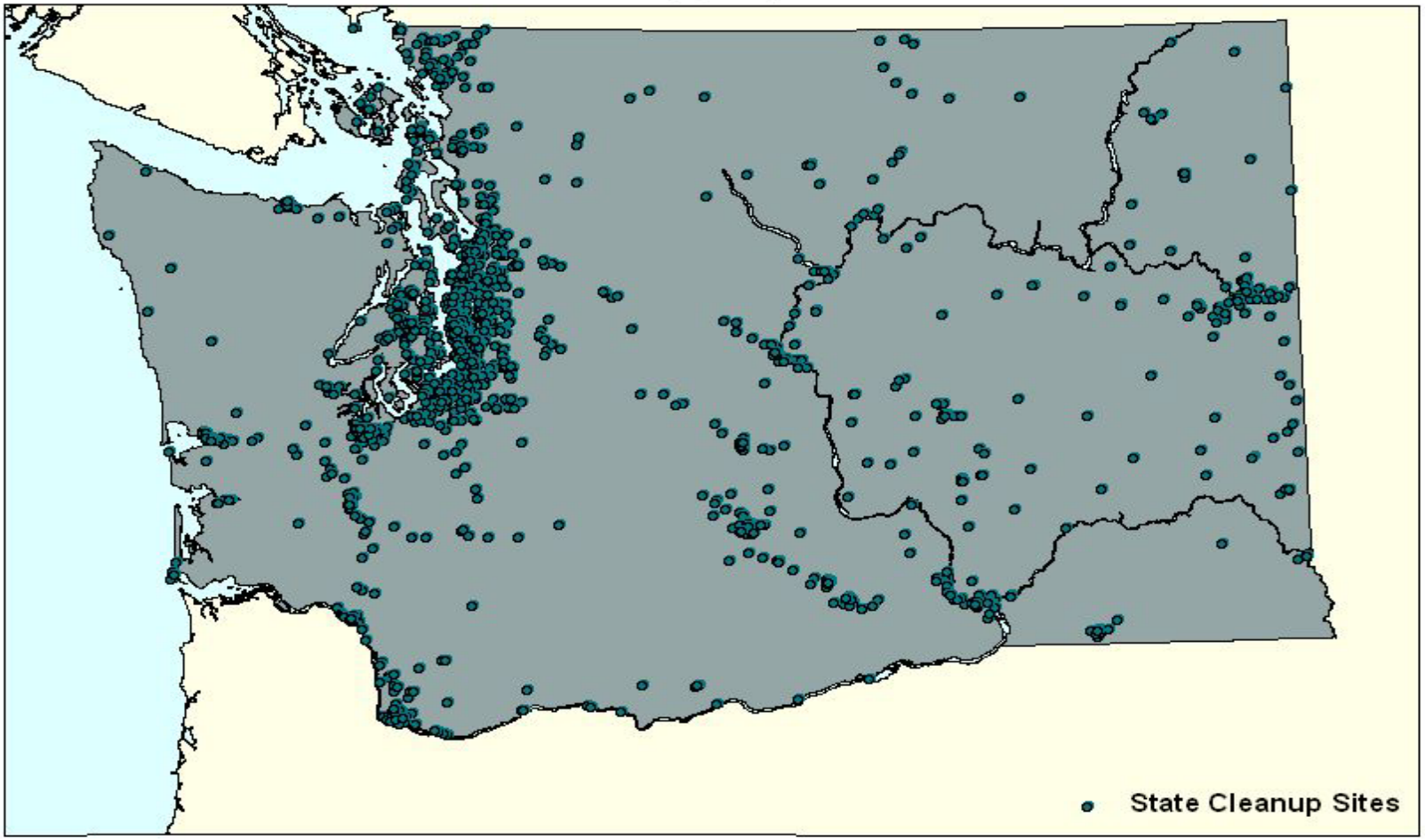
Appendix One: Maps

All the maps from this report are in this section. They are as follows:

- **State Cleanup Sites**
  Related text in Section One: Sites entered on Confirmed and Suspect Contaminated Sites List
- **Tracked Leaking Underground Storage Tank Sites**
  Related text in Section One: Sites entered on the Leaking Underground Storage Tank Sites List. These are cleanup sites where tanks are or were previously leaking.
- **Sediment Sampling Locations with Detected Chemical Contamination**
  Related text in Section Two: Sediment Cleanup Sites
- **Clean Sites Initiative**
  Related text in Section Two: Clean Sites Initiative
- **Location of Discharge Sites and Treatment Plant Outfalls**
  Related text in Section Three: Stormwater and Combined Sewer Overflows (CSOs)

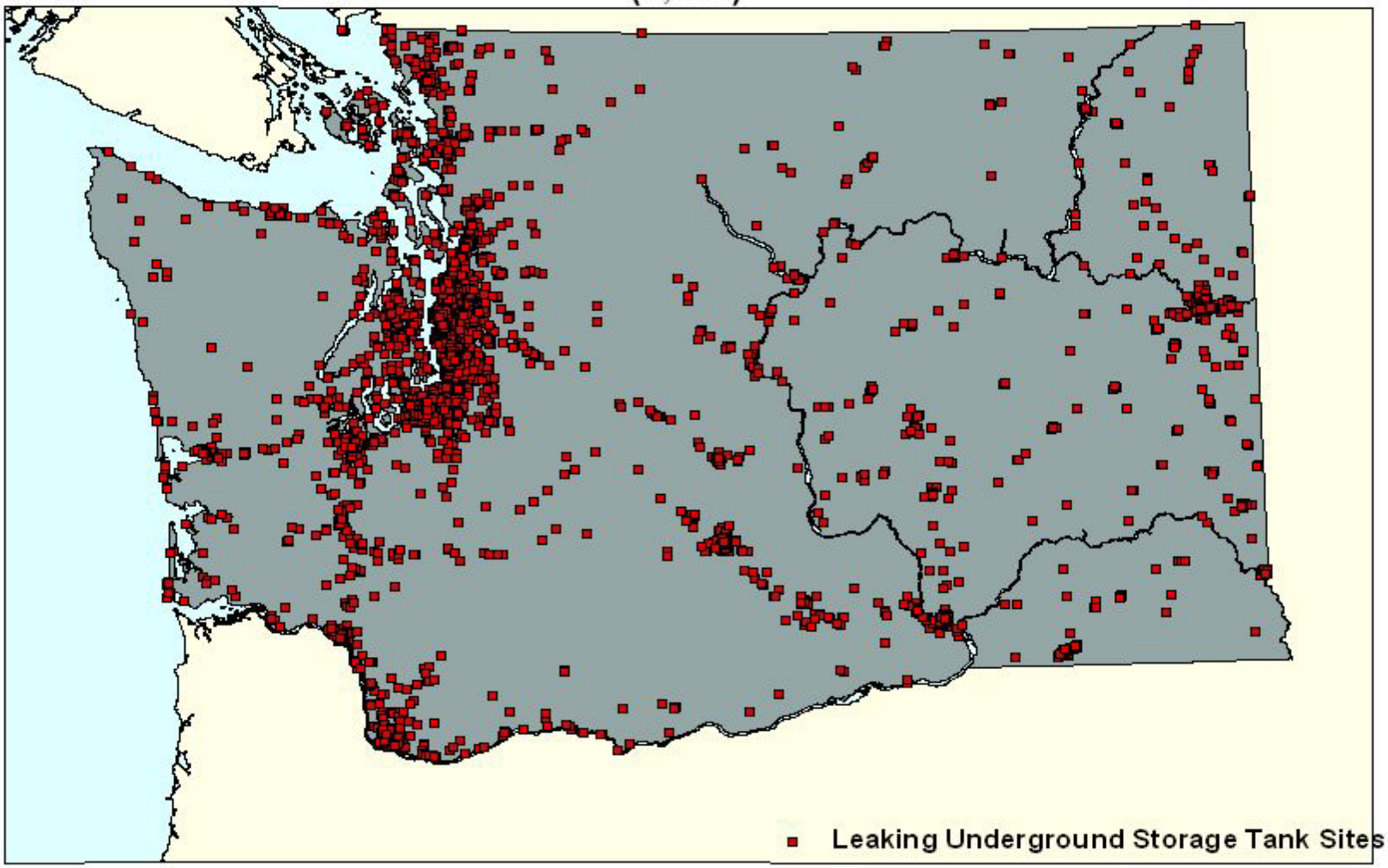
Washington State Department of Ecology
Toxics Cleanup Program
Data as of May 2, 2002

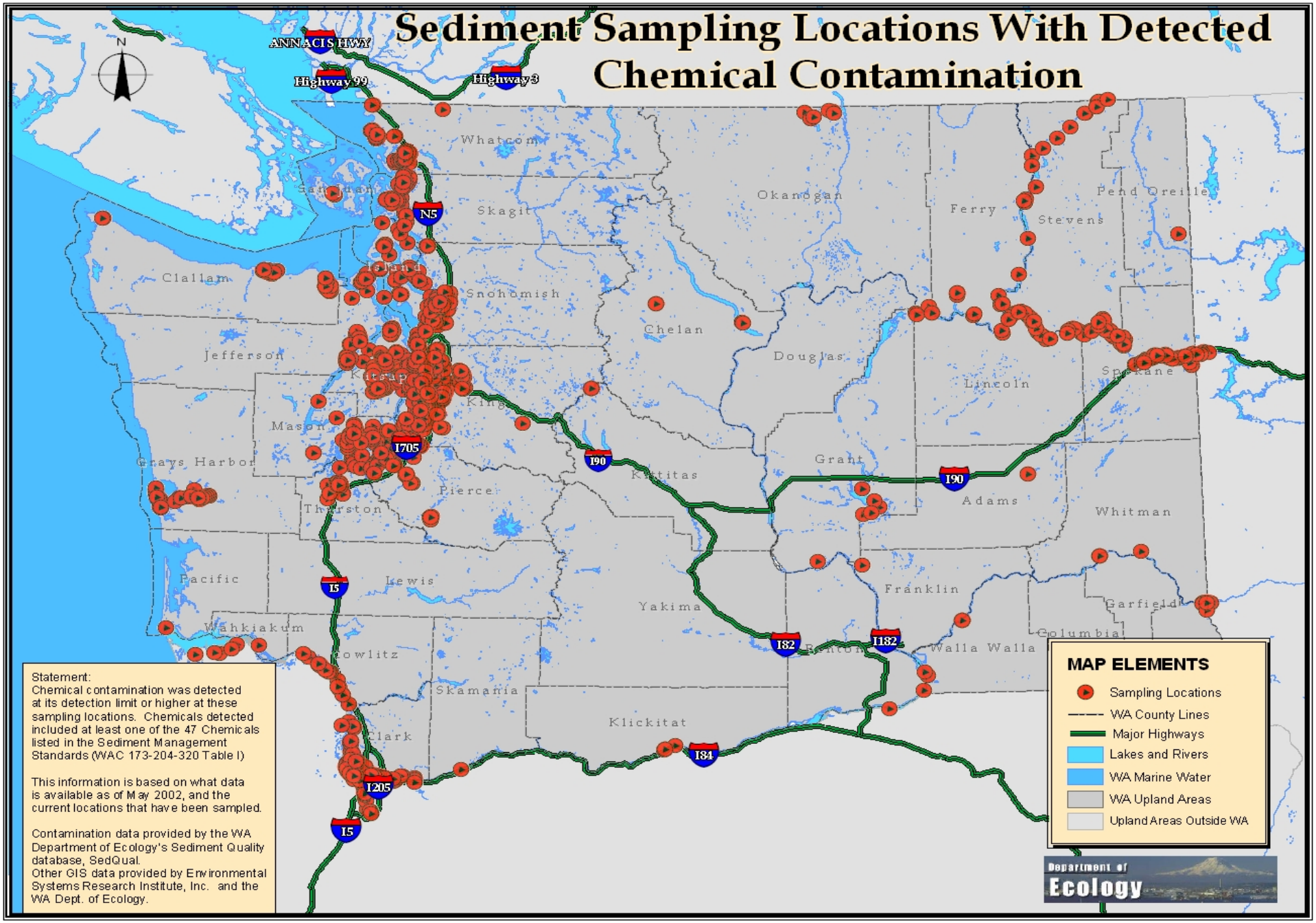
State Cleanup Sites
(2,096)



Washington State Department of Ecology
Toxics Cleanup Program
Data as of May 2, 2002

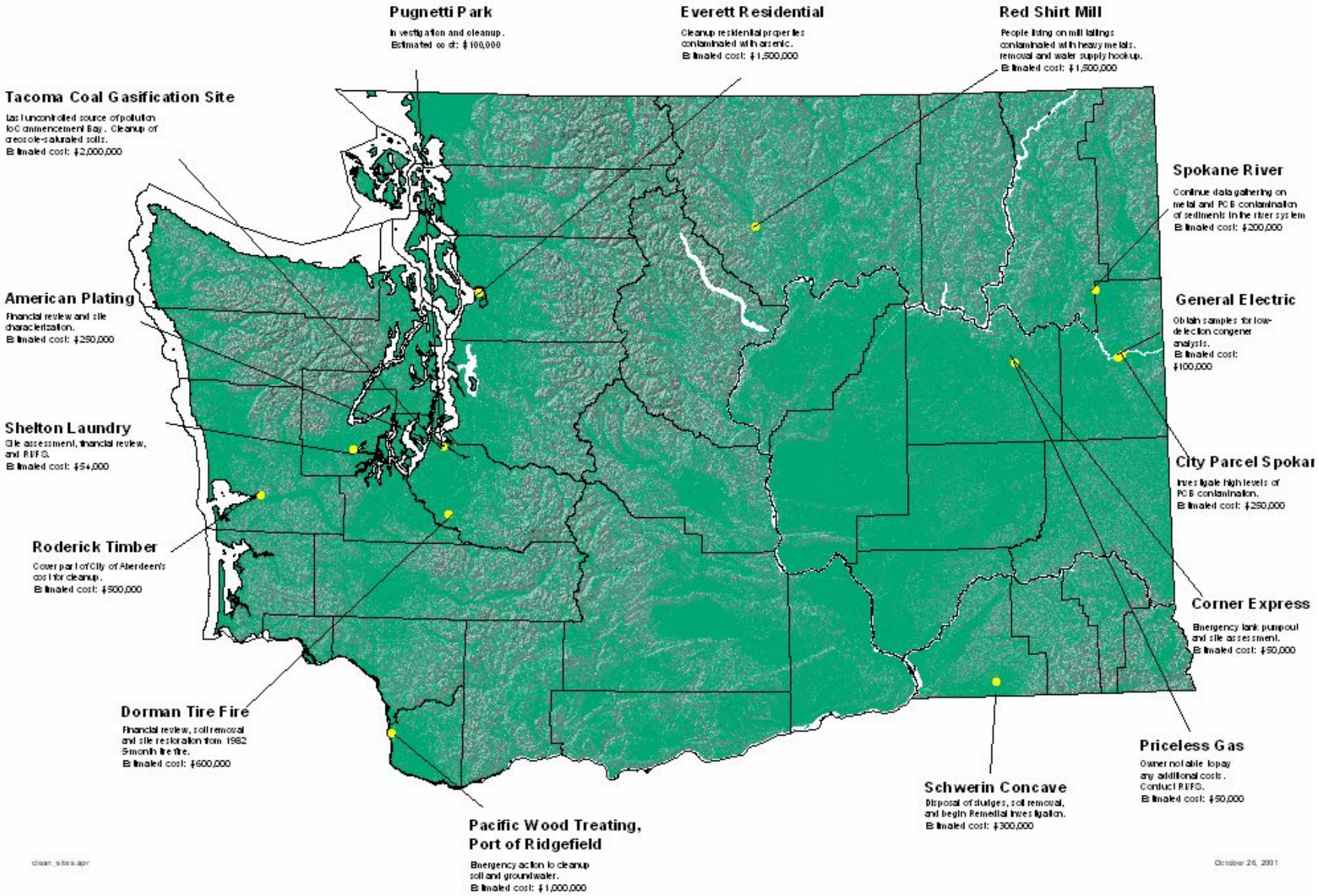
Leaking Underground Storage Tanks
(5,508)

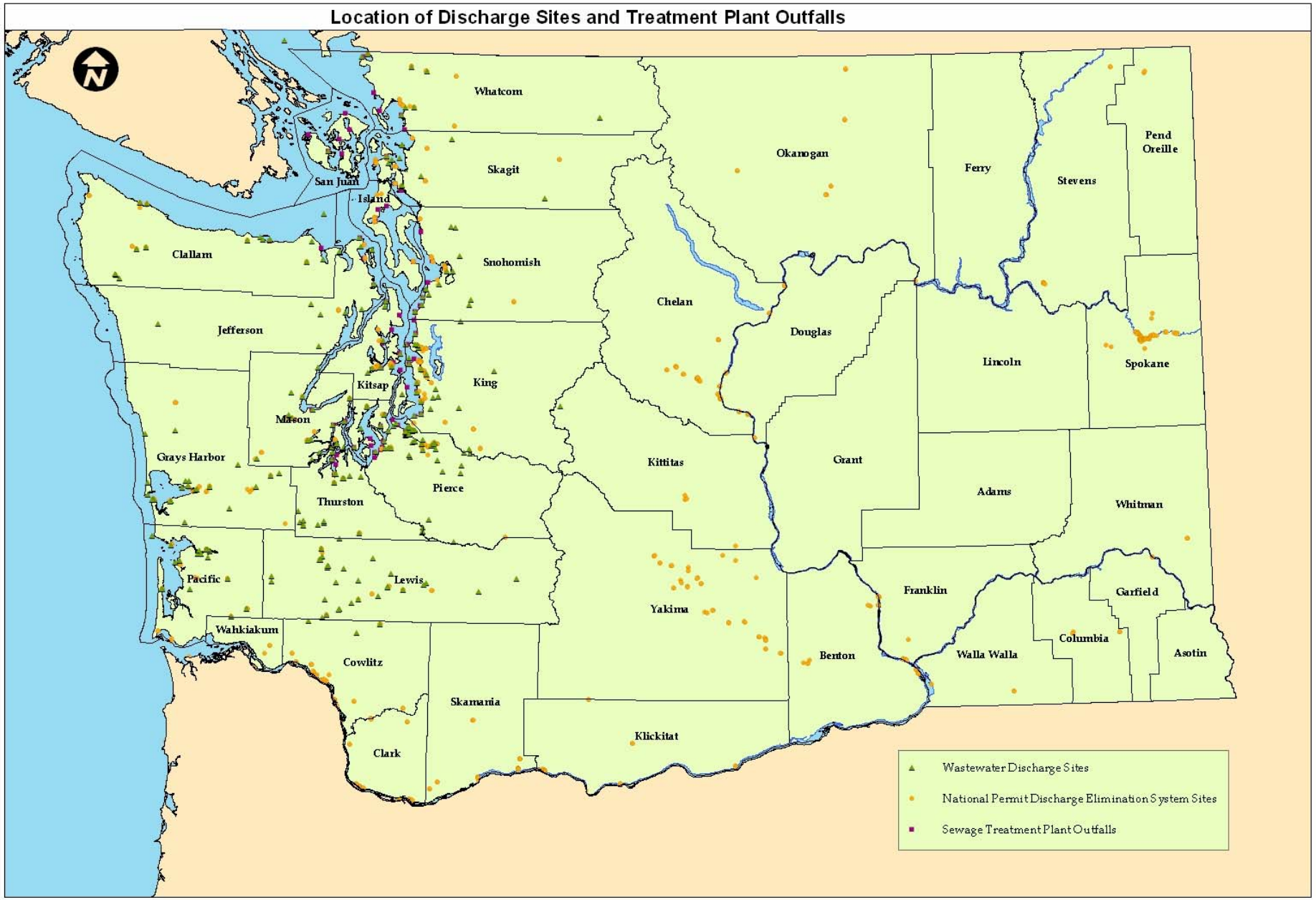



Sediment Sampling Locations With Detected Chemical Contamination
N
ANNACIS HWY
Highway 99
Highway 3
N5
I705
I90
I5
I205
I82
I182
I84
Whatcom
Skagit
Island
Snohomish
Clallam
Jefferson
Kitsap
King
Mason
Grays Harbor
Pierce
Thurston
Pacific
Lewis
Wahkiakum
Cowlitz
Skamania
Clark
Klickitat
Okanogan
Ferry
Pend Oreille
Stevens
Chelan
Douglas
Lincoln
Spokane
Grant
Kittitas
Adams
Whitman
Yakima
Franklin
Garfield
Columbia
Walla Walla
Benton
Statement:
Chemical contamination was detected at its detection limit or higher at these sampling locations. Chemicals detected included at least one of the 47 Chemicals listed in the Sediment Management Standards (WAC 173-204-320 Table I)
This information is based on what data is available as of May 2002, and the current locations that have been sampled.
Contamination data provided by the WA Department of Ecology's Sediment Quality database, SedQual.
Other GIS data provided by Environmental Systems Research Institute, Inc. and the WA Dept. of Ecology.
MAP ELEMENTS
Sampling Locations
WA County Lines
Major Highways
Lakes and Rivers
WA Marine Water
WA Upland Areas
Upland Areas Outside WA
Department of Ecology

Toxics Cleanup Program

Clean Sites Initiative




Location of Discharge Sites and Treatment Plant Outfalls
Whatcom
Skagit
San Juan
Island
Clallam
Snohomish
Jefferson
Kitsap
King
Mason
Grays Harbor
Pierce
Thurston
Pacific
Lewis
Wahkiakum
Cowlitz
Skamania
Clark
Okanogan
Chelan
Douglas
Kittitas
Yakima
Klickitat
Ferry
Stevens
Pend Oreille
Lincoln
Spokane
Grant
Adams
Whitman
Franklin
Garfield
Benton
Walla Walla
Columbia
Asotin
Wastewater Discharge Sites
National Permit Discharge Elimination System Sites
Sewage Treatment Plant Outfalls

Appendix Two: Section One Information

Types of Sites

The figures below highlight state lead and Voluntary Cleanup Program sites and those listed on Ecology's Confirmed and Suspected Contaminated Sites List. These sites represent less than half of the program's total sites (Figure 1). Leaking Underground Storage Tank (LUST) sites are included if they are undergoing formal Ecology oversight or Voluntary Cleanup Program review. Figures 18, 19, and 20 identify the status of these sites as of January 2002.

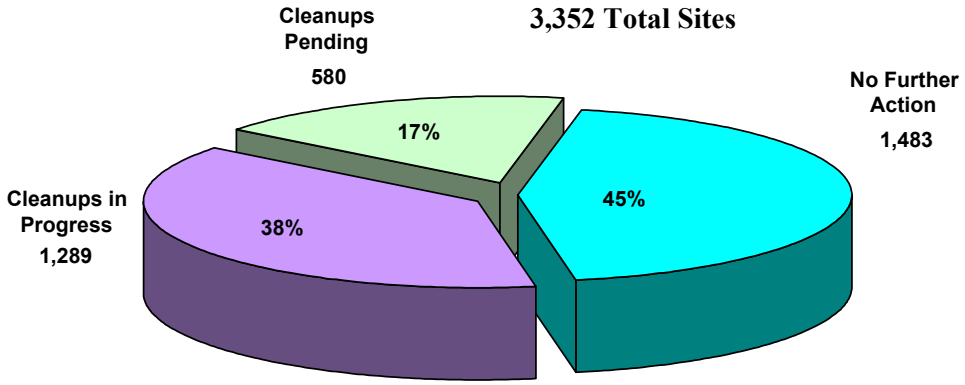


Figure 18. Status of Sites on the Confirmed and Suspected Contaminated Sites List

This includes ranked and unranked sites and Voluntary Cleanup Program sites (LUST and non-LUST). This figure does not include the LUST releases (5,724 sites) identified in Figure 6. Of these 3,352 sites, 31% are ranked and 73% are in private ownership. Figures 19 and 20 are a subset of Figure 18.

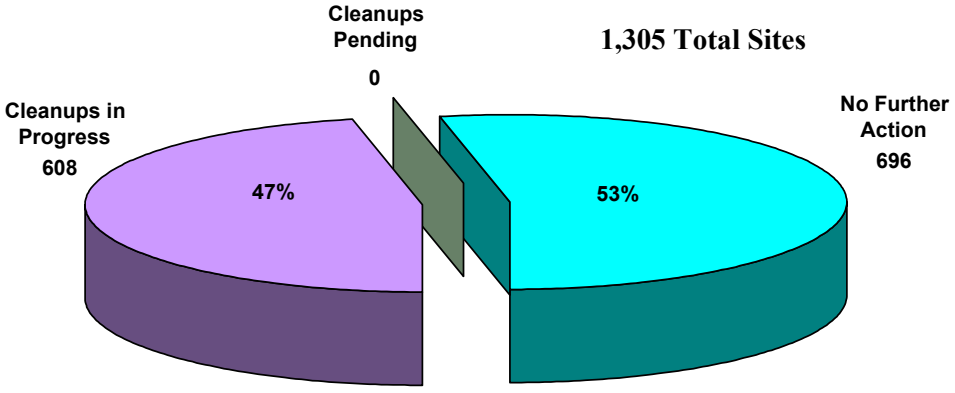


Figure 19. Status of Voluntary Cleanup Program Sites

Of the sites mentioned in Figure 7, Voluntary Cleanup Program sites comprise 39%.

- They account for 47% of the program's "No Further Action" sites, and 8% of them are ranked.
- Out of this group, 488 are leaking underground storage tank sites, of which 288 have completed cleanups.

- Another 857 of these are not leaking underground storage tanks, and 408 of these have completed cleanups.

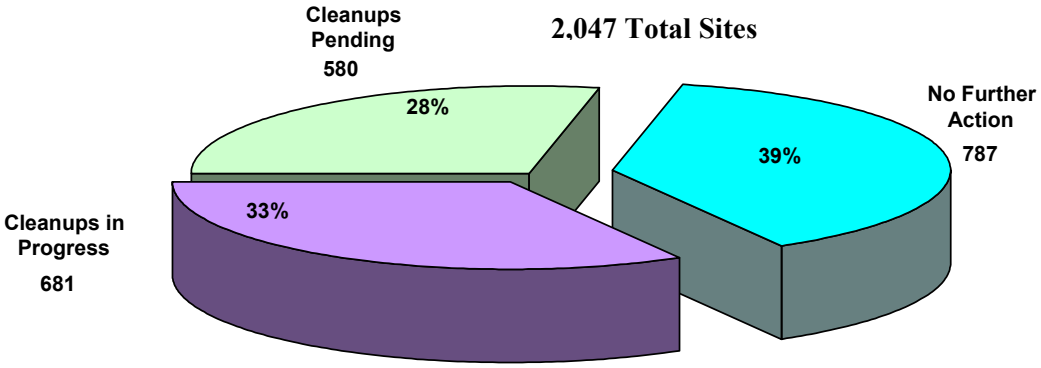


Figure 20. Status of Non-Voluntary Cleanup Program Sites

Of the group illustrated in Figure 7, sites that are not being cleaned up voluntarily include ranked and unranked sites, and sites being cleaned up under order or decree. Some of these sites could eventually be submitted for review under the Voluntary Cleanup Program.

- These sites comprise 61% of Figure 7's sites.
- Another 39% have completed cleanups.
- Sites that are "pending" or "in-process" are candidates for the Voluntary Cleanup Program.

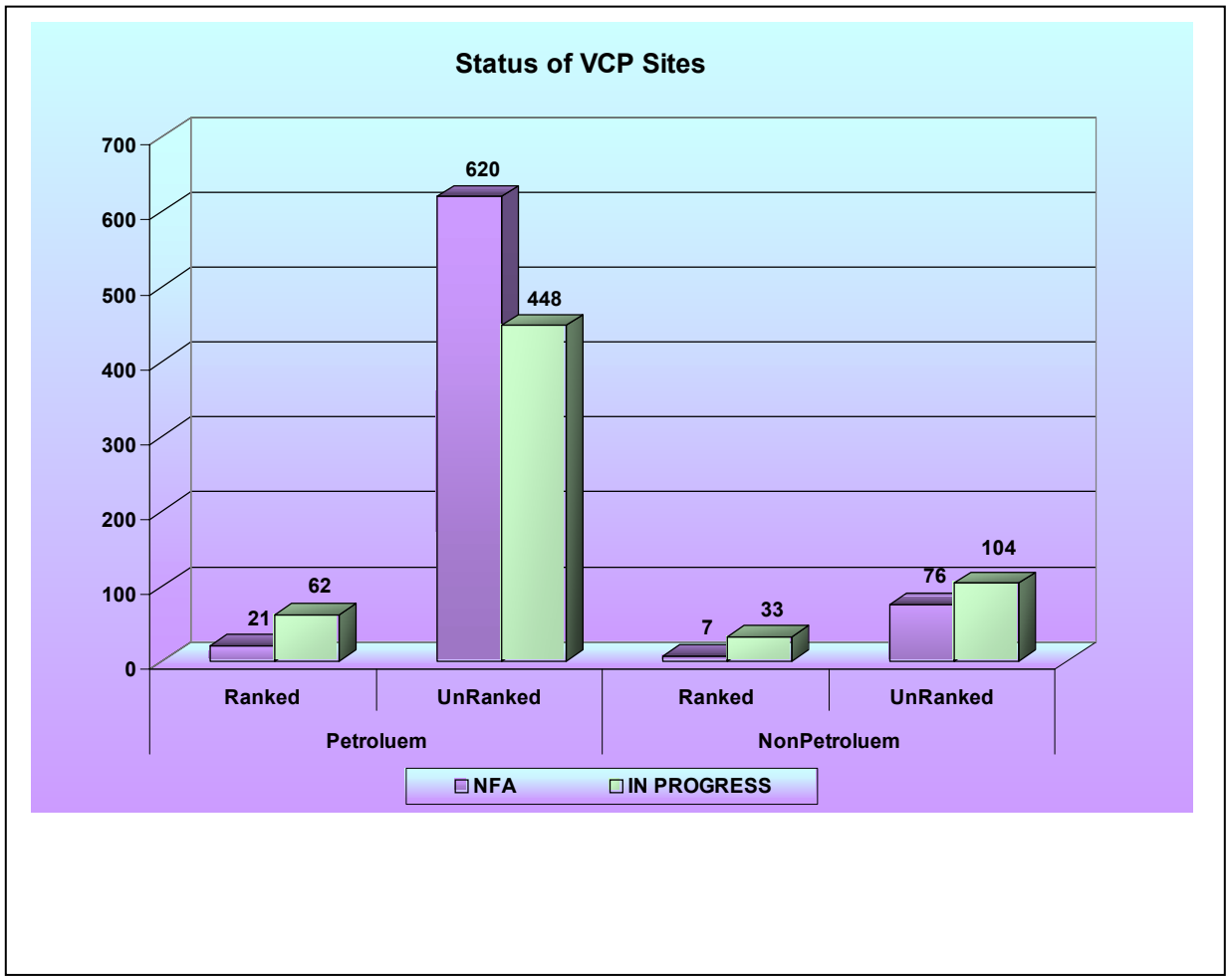


Figure 22 – Status of Voluntary Cleanup Sites

Section One includes a figure that shows all sites in pending status reported to the program, and their industry type. The figure below illustrates only ranked sites that are pending.

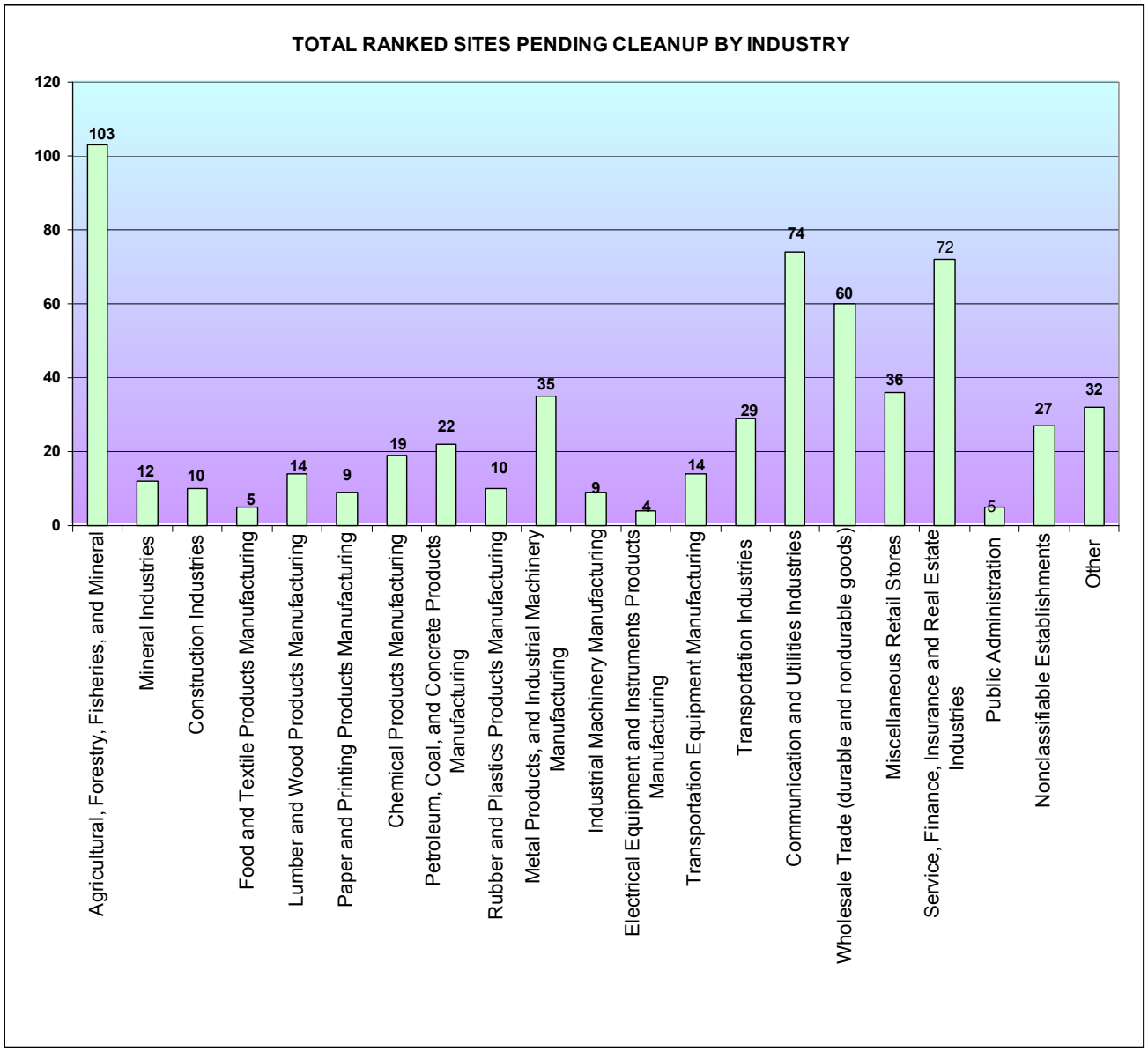


Figure 21. Industry type of sites that have been ranked

Appendix Three: Section Three Information

Sediment Sites

Section Three mentions the existence of 134 sediment sites. Below is the April 2001 list of sediment sites from the Sediment Cleanup Status Report.

Table Two

Waterbody	No. of Sites
Bellingham Bay	9
Bremerton/Kitsap Inlets	11
Columbia River	5
Commencement Bay	12
Duwamish River	8
Elliott Bay	19
Everett/Port Gardner	9
Fidalgo Bay	6
Lake Union	7
Lake Washington	7
Waterbodies with 3 or less sites	41
Total	**134**

The report is currently being updated and will be released at the end of this year. The current report can be reviewed at: http://www.ecy.wa.gov/programs/tcp/smu/2001SiteStatus.htm

Appendix Four: Section Four Information

Large-scale Public Works Projects

Large-scale public works projects have the potential to create major work loads for staff. This is especially true in industrialized areas where state and local governments are exploring the purchase of properties for sites or right-of-ways for a variety of projects. The major challenge with these large-scale public works projects is that some of these properties are known or suspected of being contaminated. When Ecology is first contacted, the scope of the contamination and the potential health and environmental effects are often largely unknown. The projects are generally on tight schedules, and these sites do not go through a typical site hazard assessment and ranking to be added to the Hazardous Sites List for future work. When Ecology staff are called for assistance, staff do not know if they will be spending a few hours or a few months working on a project that consumes as much time as a large site where Ecology is implementing an Order or Consent Decree.

Some examples of large-scale projects include:

Sound Transit Project This is a light rail system from Tacoma to Everett. Property was purchased for stations and parking areas between the three cities. Nearly all of these properties had some contamination on them, and Ecology's assistance was requested through the voluntary cleanup process. Two site managers, one in the Southwest Regional Office and one in the Northwest Regional Office, were assigned to review voluntary cleanup reports. Most of the work was in the northwest region. Generally the stations involve several parcels that had different businesses and contaminant sources. The reviews are most often handled on a parcel-by-parcel basis. While a dispute over the appraised value of one of the station sites ended in litigation that created an unanticipated work load for the Ecology reviewer, the time spent on each station (multiple parcels) has averaged 20 - 30 hours.

Transportation projects The process of widening roads and highways, building new interchanges, and developing right-of-ways for monorails, trolley lines, and access roads, frequently results in the discovery of one or more previously unknown contaminated sites. The level of involvement desired or required by the transportation agency depends on how significant the contamination is, whether there are any adjacent properties affected by or causing the contamination, community concerns, etc. Some of the projects being discussed in the northwest region:

Examples of projects:
Sound Transit
Alaskan Way Viaduct
Seattle Monorail
Sewer pipelines
Industrial Dumps

- Alaskan Way Viaduct: This elevated highway runs along the Seattle waterfront over fill. Some of the areas under and adjacent to the viaduct have been used for industrial purposes including locomotive repair, coal bunkers, shipbuilding, and sawmills. The project will likely involve other programs at the Northwest Regional Office (NWRO), including Water Quality, and Shorelands and Environmental Assessment (SEA).
- Seattle Monorail: The proposed routes could require excavation in contaminated areas. The project could involve other programs at NWRO, including Water Quality and SEA.
- Snohomish County: The County has identified 35 projects ranging from ramp and interchange improvements to construction of multi-modal transit facilities on contaminated sites. While the effort of many of these will involve primarily Water Quality and the SEA

programs, there are several that, if funded, will require Toxics Cleanup Program involvement, especially the Edmonds and Mukilteo multi-modal terminals.

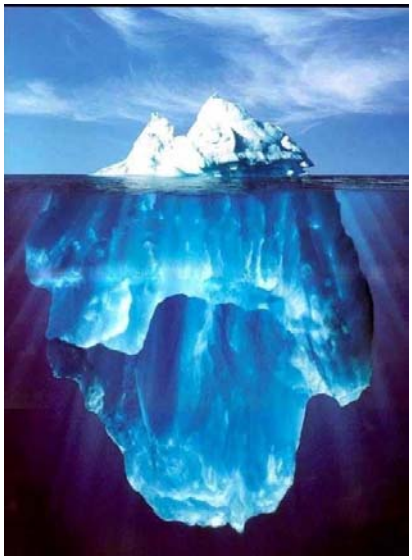
Examples of other projects:

Water Department Storage Towers Soil sampling in the yards of residential homes around a water tower found significant lead contamination. Further investigation showed that previous sandblasting of this and several other water towers had contaminated residential properties. While the work load originally proposed was significant, the actual level of effort has been much less than expected.

King County Wastewater Treatment Division (formally Metro) The County is building a new sewer pipeline and outfall to Elliott Bay. Staff discovered that the pipeline would be running through an area that was heavily contaminated with creosote from an old wood treating facility. The area may also be affected by a gasoline plume from a service station that was demolished in the 1980s. Preliminary borings suggest that the pipeline will be above the level of contamination, but it won't be known for certain until they actually start digging in the area. The work load for Ecology is unknown at this time.

Industrial Area Dumps Many tide lands and depressions in industrial areas were filled in to create a level spot for commercial or industrial buildings or uses. There are a number of areas (King, Snohomish, Whatcom and Pierce Counties) where tide lands or low spots in industrialized areas were used as dumps. These sites were filled with garbage, construction debris (lead-based paint, asbestos, oily wood, or concrete), industrial waste, sludge, and then covered with clean dirt. Some of these filled areas cover multiple city blocks. The contamination from the fill remains on site and can become a problem for future development.

Persistent, Bioaccumulative Toxins (PBTs)



Persistent, bioaccumulative toxins are different from other substances because they break down very slowly and accumulate up the food chain when released into the environment. This accumulation can be toxic to humans and animals. Exposure to PBTs has been linked to a wide range of toxic effects in fish, wildlife, and humans, including effects on the nervous system, reproductive and developmental problems, immune-response suppression, cancer, and endocrine disruption. PBTs can be transported long distances on wind and water currents as air particulates or sediments.

While scientists once thought that pollutants would disperse in the environment, they are now finding that some pollutants can actually accumulate, and so increase in concentration.

State and federal regulatory programs have been in place for several years and have significantly reduced the uses, releases, and environmental concentrations of several PBTs. However, the present system is oriented toward implementing *single-medium* (air, land, or water-based) statutes that do not fully address the potential for the cross-media effects that PBTs present. The current, single-medium focus has also produced a system that emphasizes *treating* of pollution, rather than *preventing* the pollution through process and/or product changes.

This contributes to PBT contamination because low levels of PBTs can escape detection and/or end-of-pipe treatment, and then can persist in the environment where they are able to accumulate in human and animal tissues to potentially harmful levels.

Significant strides have been made to reduce and clean up pollution of many PBT chemicals. **Yet, new and growing information is showing that PBT chemicals continue to exist in our environment and may pose a greater threat to our health and quality of life than previously believed.** Further progress on reducing and eliminating PBT chemicals needs to be made by changing how we do business and changing some of our day-to-day activities.

The following table shows the most recent draft working list of PBTs prioritized by the agency. The list is consistent with PBT priorities set by other state, federal, and international organizations. The agency's current focus is on mercury.

"In summary, large numbers of chemicals are widely used in consumer products and regularly discharged to the environment, resulting in wide-spread exposures. Our limited under standing of their full neurotoxic potential, has one particularly unsettling implication: What we already know about neuro-developmental toxic threats to children is likely to be only the tip of the iceberg."

In Harm's Way: Toxic Threats to Child Development, Greater Boston Physicians for Social Responsibility

Table Three (This draft list currently out for public comment)

PBT Working List by Category (22)	
***Metals**	Cadmium, Lead, Mercury
Pesticides	Dicofol, Endosulfan, Lindane Methoxychlor, Pendimethalin, Pentachlorobenzene/ Pentachloronitrobenzene, Trifluralin, 1,2,4,5-tetrachlorobenzene
Banned Pesticides	Aldrin/Dieldren, Chlordane, DDT/DDD/DDE Heptchlor epoxide, Toxaphene
Organic Chemicals	Pentabromo diphenyl ether, Hexachlorobenzene Hexachlorobutadiene
Combustion By-products	Dioxins & Furans, PAHs
Banned Organic Chemicals	PCBs

***Note:** EPA is currently working with its Science Advisory Board to develop comprehensive cross-agency guidance for assessing the hazards and risks of metals. Ecology will revise any PBT Working List so as to be consistent with EPA's waste minimization treatment of metals.

PBTs and Cleanup Sites around the State

In August 2000, the Toxics Cleanup Program compiled a list of examples of sites in the state that had or have PBTs at them. At that time, the state had identified nine substances for their PBT list (the current proposed list is 23). *This information was compiled around those original nine substances in the PBT list and may not include all the sites with those substances.*

Original PBT list

Aldrin/Dieldrin	Benzo(a)pyrene	Chlordane
DDT (& DDD/DDE)	Dioxins & Furans	Hexachlorobenzene
Mercury	PCBs	Toxaphene

Table Four. Specific sites that have or had PBTs at them (compiled in August 2000):

Site Name	City	Contaminants	Status
Able Pest	Kenmore	Aldrin/Dieldrin Chlordane DDT	Cleanup in progress
Alcoa Vancouver	Vancouver	PCBs and Benzo(a)pyrene	Cleaned up and in process of being cleaned up
American Crossarm	Chehalis	Benzo(a)pyrene, DDT	Process of clean up
American Crossarm	Chehalis	DDT (&DDD/DDE)	Cleaned up
Bangor	Bremerton	DDT (&DDD/DDE)	Process of cleanup
Birmingham Steel	Seattle	PCB's	Awaiting Cleanup
Boeing Plant 2	Seattle	PCBs	Cleanup in progress
Boeing/Renton	Renton	Dioxins & furans PCBs	Cleanup in progress
Cameron	Yakima	Multiple PBTs	Cleaned up
Camp Bonneville	Vancouver	Benzo(a)pyrene	Process of cleanup
Camp Bonneville	Vancouver	DDT (&DDD/DDE)	Process of cleanup
Cascade Pole	Olympia	Dioxin	
Cedar Hills Landfill	Maple Valley	PCBs	Independent RA, (SHA score = 5)
Clear Lake Site	Clear Lake	Chlordane	Cleanup in progress: removal of contaminated soils
Cornwall Avenue Landfill	Bellingham	PCBs in sediments	Draft cleanup action plan in development, proposes containment
Eagle Harbor	Bainbridge	Benzo(a)pyrene, mercury	Cleaned up or in process of cleanup
Former Lake Hills Sewage Treatment Plant	Redmond	Mercury PCBs	Cleanup complete. Excavation and off-site disposal.
Former Spokane Transformer	Spokane	PCBs	Some site characterization done
General Electric	Spokane	PCBs	Cleaned up, institutional controls
Georgia Pacific	Bellingham	Mercury	Remedial Investigation, some cleanups completed, some in process
Great Western Chemical	Seattle	Benzo(a)pyrene	Cleanup in progress
Harbor Island (multiple sites)	Seattle	PCBs	Cleanup in progress
Hauser Property	Des Moines	Benzo(a) pyrene	Cleanup complete
J.H. Baxter	Renton	PCBs Dioxins & Furans	Cleanup in progress
J.H. Baxter	Arlington	Dioxins & Furans PCBs Benzo(a)pyrene	Cleanup in progress
Jackson Park	Bremerton	Benzo(a)pyrene	Process of cleanup
Jackson Park	Bremerton	DDT (&DDD/DDE)	Process of cleanup
Kaiser Tacoma Smelter	Tacoma	Benzo(a)pyrene	Cleaned up
Keyport		PCBs	Process of cleanup
King County Metro Lake Union site	Seattle	Benzo(a)pyrene Mercury	Cleanup in progress. Excavation and off-site disposal at a subclass C landfill.
Lake Union	Seattle	Dieldrin Benzo(a)pyrene Mercury PCBs	Pre-RI stage, waiting to be cleaned up

Site Name	City	Contaminants	Status
Lower Duwamish Waterway	Seattle/ Tukwila	PCBs Benzo(a)pyrene Furans Hexachlorobenzene Mercury	RI/FS planned
Malarkey Asphalt	Seattle	PCBs Dioxins & Furans	EPA supervised cleanup completed
Manchester		Dioxins/Furans	Process of cleanup
Manchester		PCBs	Process of cleanup
Martin Airfield	Walla Walla	Agricultural chemicals	Cleaned up
Noble Metals	Seattle	Mercury	Remediation complete
North Landfill	Spokane	Benzo(a)pyrene, DDT	Process of cleanup
Oeser Cedar	Bellingham	Dixon	Cleanup in progress (EPA lead) Capping
Paccar	Renton	PCBs	Cleanup complete, long term monitoring
Park Marsh	Fort Lewis	Benzo(a)pyrene	Process of cleanup
Port of Anacortes (former Scott Paper)	Anacortes	Dioxins & Furans	Cleanup planned
Puget Sound Naval Shipyard OUB	Bremerton	PCBs, mercury	Process of cleanup
R. G. Haley	Bellingham	Dioxins & furans	Cleanup in progress
S. 96th Street Ditch	Seattle	Benzo(a)pyrene	Awaiting Site Hazard Assessment
Seattle City Light/Georgetown Boeing North Field	Seattle	PCBs	Awaiting Cleanup
South Park Landfill	Seattle	PCBs	Awaiting Cleanup
Sternoff Metals	Renton	PCBs	Cleanup in progress
Tuttle Property	Langley	Aldrin/Dieldrin Chlordane DDT	Cleanup complete
Wenatchee Tree Fruit Research Station	Wenatchee	Multiple PBTs	Cleaned up
Western Farm Services	Pasco	Agricultural chemicals with PBTs	Remedial Investigation
Western Processing	Kent	Dioxins/Furans	O&M, Cleaned up
Western Processing	Kent	PCBs	O&M, Cleaned up
Weyerhaeuser	Everett	PCBs, benzo(a)pyrene, dioxin,	Cleaned up
Weyerhauser	Longview	Mercury	Majority of mercury on site removed, final studies under review
Whatcom Waterway site	Bellingham	Mercury in sediments	draft cleanup action plan in development, proposes containment/possible treatment
Wood Industries		Multiple PBTs	Cleaned up

Appendix Five: Remedial Action Grant Recipients

Table Five

Grant Recipient 01 – 03 Biennium	Grant Number	Description
New Grants Written:		
Bremerton-Kitsap Co Health Dist	G0200011	SHA various sites
Centralia City of	G0200369	RA Centralia Landfill remediation report
Centralia City of	G0200370	RA Centralia Landfill property acquisition
Centralia Puget Sound Regional Transit	G0300072	VCP-Berg property cleanup - Auburn Commuter Rail Station
Chelan Co Public Works	G0200123	Site study and remediation agreement for Cascade Dryden Airport in Cashmere.
Chelan-Douglas HD	G0200256	SHA various sites
Clallam Co Dept of Community Development	G0200284	SHA various sites
Everett City of	G0200099	City of Everett Landfill CAP/CD requirements
Grandview School District	G0200363	UST removal
Grays Harbor Co	G0200265	SHA - meth labs
Hoquiam City of	G0200257	UST - tank removal and remediation
Hoquiam School District	G0200303	VCP - UST removal Emerson School
Island County Health Dept	G0200037	SHA various sites
Kitsap County	G0200100	Bainbridge Island Landfill remediation
Kitsap County (Hansville LF)	G0300027	RI/FS Hansville Landfill
Lewis Co HD	G0200307	SHA - various sites
Lewis County	G0200145	Lewis County Central Shop Phase 1 of the RI/FS, Interim and Source Control Actions, and Cleanup Action Planning
Lincoln County	G0200322	South Wilbur Contamination Site remediation
Museum Development Authority	G0200111	Cleanup of 10 Broad Street, Seattle
Port Angeles School District	G0300007	UST removal
Public Health Seattle-King Co	G0200101	SHA various sites
Ridgefield Port of - grant	G0200088	Port of Ridgefield RI/FS and remediation
Ridgefield Port of - loan	L0200001	Port of Ridgefield RI/FS and remediation
Seattle City of	G0200290	VCP - Mountain Tree Farm remediation
Seattle Dept of Parks & Recreation	G0200261	Gas Works Park environmental cleanup, remedial design, and construction
Seattle Port of	G0200213	Lower Duwamish Remedial Investigation
Seattle School District	G0200305	VCP - Madrona Elementary School
Seattle School District	G0200306	VCP - West Seattle High School remediation
Snohomish Co HD	G0200267	SHA - various sites
Sno-Isle Regional Library System	G0200323	VCP-Central Feed Mill site (BF)
Spokane Regional Health District	G0200066	SHA various sites
SW Washington HD	G0200285	SHA - various sites
Tacoma City of	G0200146	UST removal
Tacoma City of	G0300044	Cleanup of the Olympic View Resource Area, Commencement Bay
Tacoma Port of	G0300063	Clean up of Hylebos Waterway

Grant Recipient 01 – 03 Biennium	Grant Number	Description
Thurston Co	G0200304	VCP- Thurston Co Fairgrounds improvements
Thurston Co Public Health	G0200027	SHA - various sites
Whatcom Co Health	G0200122	SHA - various sites
Yakima City of	G0200336	Kissel Park - Phase II Remedial Construction
Amendments written:		
Bellingham Port of	C9900113(2)	Bellingham Bay project
Bremerton-Kitsap Co Health Dist	G0200011(2)	SHA various sites
Centralia City of	G9900122(5)	RA-Drinking Water Fords Prairie Aquifer Restoration
Chelan-Douglas HD	G0200256(1)	SHA various sites
Everett City of	G0000252(6)	RA Landfill/tire fire
Everett City of	G0200099(1)	City of Everett Landfill CAP/CD requirements
Kitsap Co	G0200100(2)	Bainbridge Island Landfill remediation
Kitsap Co	G0200100(3)	Bainbridge Island Landfill remediation
Lynden City of	G0100185(1)	RA - Drinking Water Birch Bay Lynden Road EDB watermain extension
Museum Development Authority	G0200111(1)	Cleanup of 10 Broad Street, Seattle
Okanogan Co HD	G0100106(1)	SHA various sites
Olympia Port of	G0000297(2)	RA Cascade Pole - Olympia
Public Health Seattle-King Co	G0200101(1)	SHA various sites
Seattle-King Co Public Health	G0000004(9)	SHA various sites; Tacoma Smelter Plume assessment
Skagit Co HD	G0100019(4)	SHA various sites
Tacoma-Pierce Co HD	G0100077(4)	SHA - various sites including Clean Care site; Tacoma Smelter Plume assessment
Tacoma-Pierce Co Health Dept	G0100077(2)	SHA - various sites including Clean Care site; Tacoma Smelter Plume assessment
Tacoma-Pierce Co Health Dept	G0100077(3)	SHA - various sites including Clean Care site; Tacoma Smelter Plume assessment
Vancouver Port of	G9800276(6)	IRM-BF Swan Manufacturing site
Vancouver Port of	G9800276(7)	IRM-BF Swan Manufacturing site

Key
SHA – Site Hazard Assessment
RA – Remedial Action
VCP – Voluntary Cleanup Program
UST – Underground Storage Tank
RI/FS – Remedial Investigation/Feasibility Study
IRM-BF – Interim Remedial Measures – Brown Fields