Commencement Bay South Tacoma Channel Superfund Site
Well 12A Tacoma, Washington
U.S. Environmental Protection Agency, Region 10 May 2009

Proposed Plan Out for Public Comment

Public Comment Period

May 4, 2009 – June 3, 2009
Send comments on this Proposed Plan to:
Kira Lynch, EPA Project Manager
U.S. EPA Region 10, ECL-113
1200 6^{th} Avenue, Suite 900
Seattle, WA 98101
Or email: lynch.kira@epa.gov
Please put "Well 12A Proposed Plan Comments" in the subject line.

Public Meeting

Tuesday, May 19, 2009, 6:30-8:30 p.m.
Tacoma Public Utilities Administration Building
3628 South 35^{th} Street (35^{th} and Union)
Tacoma, WA

The U.S. Environmental Protection Agency (EPA), in consultation with the Washington State Department of Ecology (Ecology), has prepared a Proposed Plan for the Well 12A Superfund Site located in Tacoma, Washington. Despite previous cleanup actions, contamination at the site persists, creating the need for further action.

The Proposed Plan provides an overview of the site history, contamination, and risk; summarizes the cleanup alternatives that EPA is considering; and details EPA's preferred remedial (cleanup) alternative and supporting rationale.

From May 4, 2009 through June 3, 2009, the EPA invites you to provide your comments on the alternatives for addressing contaminated soil and groundwater at the site. The site includes the area surrounding the City of Tacoma Water Supply Well 12A and the suspected source of contamination, which is property formerly owned by Time Oil Company.

This plan is based on the Focused Feasibility Study prepared for the site, as well as other site documents. All site documents are contained in the administrative record and are available for public review. Administrative record locations are listed in the **Community Involvement** section at the end of this document.

EPA's preferred remedial (cleanup) alternative includes excavation and removal of contaminated shallow soils, in situ (in place) thermal remediation of deep soils, groundwater extraction and treatment along with in situ treatment of highly contaminated groundwater through enhanced anaerobic (without oxygen) biological treatment, and wellhead treatment at Well 12A.

EPA, in consultation with the Washington State Department of Ecology, will select a remedy for the site after the public comment period. Changes to the preferred alternative may be made based on comments collected during the public meeting or submitted in writing during the public comment period. The final decision regarding the selected remedy will be made and documented in a ROD Amendment after EPA has taken into consideration all comments from the public.

EPA is issuing this Proposed Plan in consultation with the Washington State Department of Ecology, as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

Site Background

The Well 12A Site is one of three distinct sites within the 2.5 square mile Commencement Bay - South Tacoma Channel Superfund Site in Tacoma, Washington. The two other distinct sites are the Tacoma Municipal Landfill and South Tacoma Field. The Well 12A Site has been designated as Operable Unit 1 (OU1).

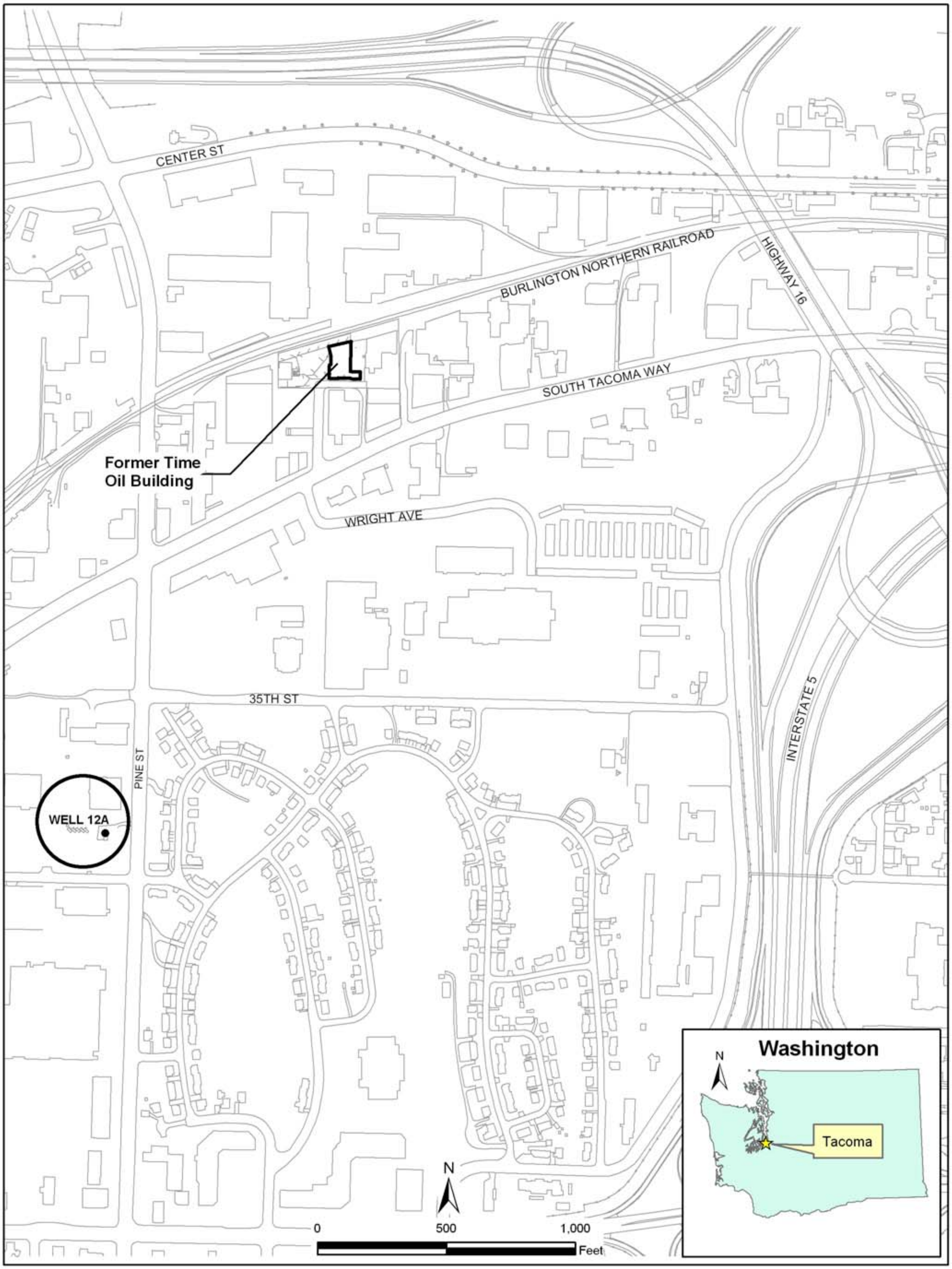


Figure 1
Site Location Map

Site History

The Well 12A Superfund Site is located approximately 4 miles southwest of the southernmost tip of Commencement Bay near the junction of Interstate 5 and Highway 16 (see Figure 1).

The site consists of a primary source area, which is property formerly owned by the Time Oil Corporation, and a groundwater contamination plume that extends from the source area approximately 2,000 feet to the east and approximately 2,000 feet to the southwest to Well 12A. Well 12A, located on Pine Street between 38th Avenue and South Tacoma Way, is the northernmost well in the City of Tacoma's south well field.

Around 1923, a paint and lacquer thinner manufacturing facility and an oil recycling facility began operating at the site. The paint and lacquer thinner manufacturing involved the use of many solvents that were stored on the site in barrels, which may have leaked. The waste-oil recycling process consisted of collecting waste oil in a large tank, adding chemicals (such as sulfuric acid), and pressurizing and heating the contents of the vessel. Absorbents and clay materials were also added to the oil. This process resulted in the formation of a tar-like sludge on the bottom of the tank. The sludge was filtered from the oil, and the resulting filter cake was disposed of or stored in various piles on the site. Some of this sludge was also used for fill around the site.

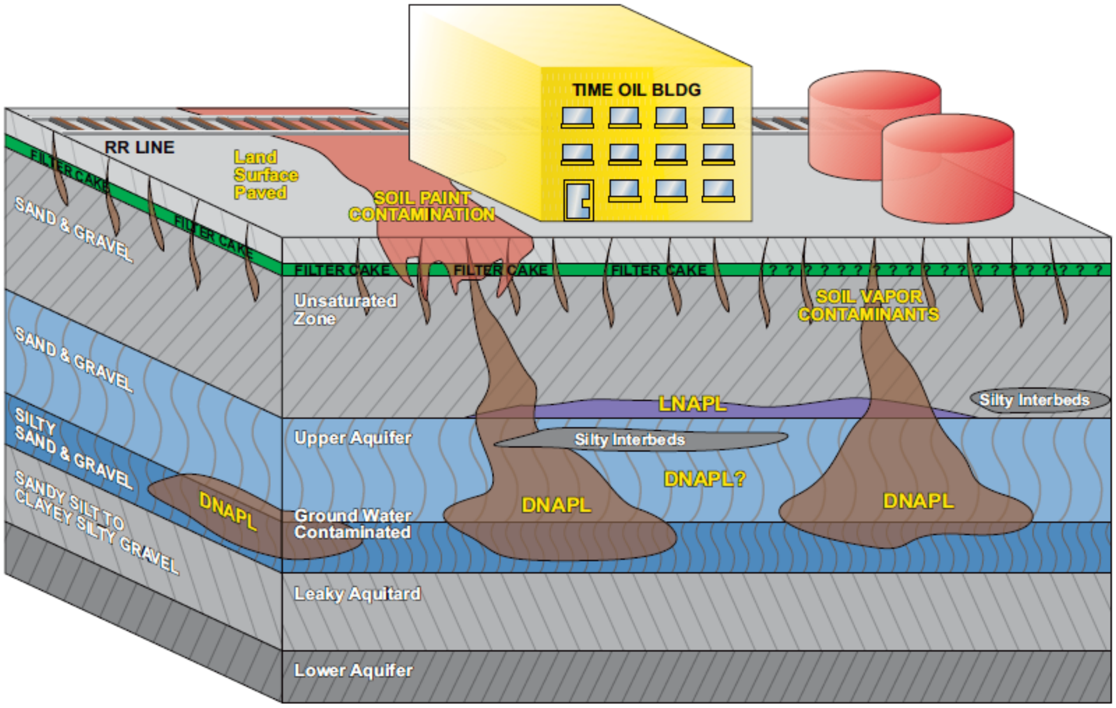
These operations continued until 1964, when Time Oil Company acquired the majority of the property at 3100 South Fife Street. Time Oil continued reprocessing waste oil at the facility until 1970. From 1970 to 1972, Time Oil used the facility as a warehouse for tires, batteries, and accessories.

In 1972, Golden Penn, Inc. leased a portion of the facility and continued the reprocessing operation until 1976 when a fire at the facility destroyed the waste-oil processing apparatus. In 1975 and 1976, the State of Washington ordered Golden Penn to remove some of the filter cake and spilled oil from the ground.

From 1976 until the early 1990s, Time Oil used the site for warehousing and canning oil. Recent uses of the Time Oil property include warehousing of heating, ventilating, and air conditioning (HVAC) equipment and small-scale manufacturing of kayaks. In 2003, the property was sold to Western Moving and Storage. Many types of items continue to be stored at the property today.

Previous Investigations and Remedial Actions

In 1981, chlorinated organic solvents were detected in Well 12A. In high concentrations, these substances can have harmful health effects. Following a site investigation conducted by EPA during the summer of 1981, the well was removed from service. Based on the findings of the investigation, the Well 12A Site was added to the National Priorities List (NPL) on September 8, 1983. The Conceptual Site Model prior to any cleanup activities executed by EPA is shown below.



Conceptual Site Model prior to cleanup activities

In accordance with the initial cleanup outlined in the 1983 ROD for the site, an air stripping treatment system was constructed for Well 12A and began operation in July 1983 whenever the well is pumped. Well 12A and the treatment system continued to be used to meet peak summer demand throughout the 1980s and 1990s. Well 12A is typically now pumped only during the summer or early fall.

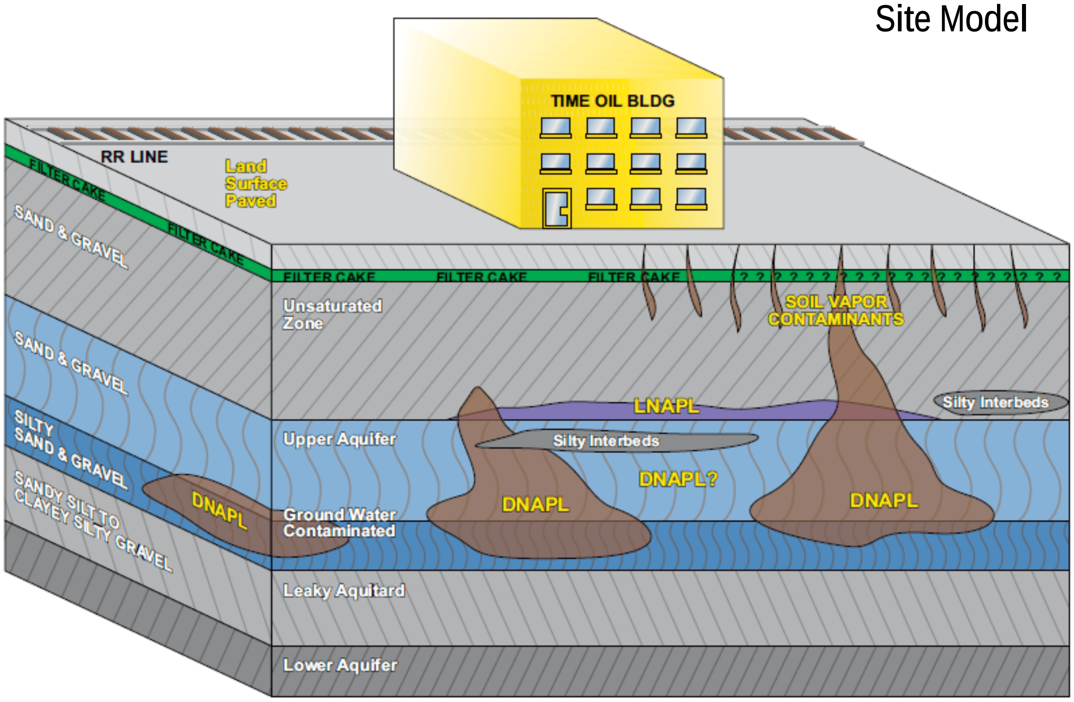
Following a remedial investigation and feasibility study, a 1985 ROD for the site detailed additional measures needed to address site soil and groundwater contamination. The Burlington Northern Railroad company right-of-way adjacent to the Time Oil facility was identified as an additional source of contamination to Well 12A in the 1985 ROD. In June 1986, Burlington Northern excavated approximately 1,200 cubic yards of contaminated soils along the rail spur.

In accordance with the 1985 ROD, a groundwater extraction and treatment system (GETS) was installed to pump and treat contaminated groundwater near the source on the Time Oil property in November 1988. The groundwater treatment system continuously extracts groundwater from the aquifer under the site and pumps it through activated carbon to remove volatile organic compounds (VOCs). In 1995, four additional extraction wells were added to the system. The objective of the groundwater extraction and treatment system, which continues to operate, is to limit migration of contaminants in the groundwater.

In 1987, the 1985 remedy was modified. As a result, in 1993, a soil vapor extraction (SVE) system was installed and began operation in the area where drum storage and disposal operations had previously occurred. During construction of the soil vapor extraction system, approximately 5,000 cubic yards of waste sludge (filter cake) from the oil recycling operations were excavated. Operation of the soil vapor extraction was discontinued in 1997 after soil contamination was reduced to concentrations that would not impact groundwater quality. The Conceptual Site Model shown in the figure below illustrates the current conditions after the cleanups were executed by EPA.

In 2004-2005, EPA collected soil and groundwater samples from the site to assess the effectiveness of the aging groundwater treatment system. Oily product was identified in some soil samples. Groundwater contaminant concentrations had decreased, in general, compared to previous samples, but elevated concentrations of chlorinated volatile organic compounds (CVOCs) are still found near the Time Oil property.

Current Conceptual Site Model



In September 2008, the third Five-Year Report was completed for Well 12A. The report found that the groundwater extraction and treatment system is not reducing contaminant concentrations and not limiting the migration of contamination as expected. The extraction wells' pumping rates have decreased below design rates over time and will likely continue to decrease due to aging pumps and systems. In addition, targeted achievable cleanup objectives for both groundwater and soil have not yet been established. Since the report concluded that the remedy was not protective, corrective actions were initiated. EPA conducted a Focused Feasibility Study analyzing potential remedial alternatives to address ongoing contamination.

Site Characteristics

The Well 12A Superfund Site consists primarily of industrial/commercial land, with a small amount of residential land, in southwestern Tacoma, Washington. The Time Oil property, located at 3011 South Fife Street, covers 2.5 acres in the northwest portion of the site, approximately one-third of a mile north-northeast of Well 12A. Figure 2 on page 6 shows a map of the site, including the locations of wells installed during previous remedial actions.

The site is located within the Puget Sound Lowland, approximately 6 miles south of Commencement Bay and within the Commencement Bay drainage area. The local geology is complex and permeability is highly variable across the site. A semi-confining layer (also called a leaky aquitard) exists between 120 and 150 feet above sea level. The shallow groundwater system above the semi-confining layer is referred to as the upper aquifer and the lower groundwater system below the semi-confining layer is referred to as the lower aquifer. The water table occurs at approximately 33 feet below ground surface. Almost no contamination was detected in the lower aquifer, which suggests that the semi-confining layer prohibits contamination from migrating downward.

The contaminants of concern at the site are tetrachloroethylene (PCE); trichloroethylene (TCE); cis-1,2-dichloroethene (DCE); trans-1,2-DCE; vinyl chloride (VC); and 1,1,2,2-tetrachloroethane (PCA). TCE is considered to be the most prevalent compound. Elevated concentrations of TCE are found in onsite soils and are used to define the extent of the site groundwater contaminant plume.

Soil contamination is greatest near the surface on the east side of the Time Oil building. Filter cake is also thought to be near the surface in this area, which is believed to be a continuing source of groundwater contamination. TCE is the most widespread volatile organic compound in groundwater. Its plume extends to the east of the site and to the southwest of the site toward Well 12A. Contaminants in the southern end of the plume are likely accelerated toward Well 12A when it is in operation. Despite previous source removal efforts, a number of sources of dissolved phase contamination still remain on or near the Time Oil property. Both light and dense non-aqueous phase liquids (LNAPL and DNAPL) have been identified beneath the property and an additional area of filter cake has been identified to the east of the Time Oil building. Non-aqueous phase liquids are liquids that do not dissolve or mix easily with water. Because they do not mix with water, they form a separate phase. Light non-aqueous phase liquids are less dense than water and float on top of water. Hydrocarbons, such as oil and gasoline, are examples of LNAPLs. Dense non-aqueous phase liquids are denser than water and sink into the aquifer. Many chlorinated solvents, such as TCE, are DNAPLs.

Contaminated soils containing residual source material, as well as filter cake material remaining on the site surrounding the Time Oil building are considered to be "principal threat wastes" because the chemicals of concern are found at concentrations that pose a significant risk. Although contaminated groundwater also poses a risk, it is not considered a "principal threat" as defined by EPA guidance. However, areas of LNAPL and DNAPL are also considered to be principal threat wastes.

What is a "Principal Threat"? The National Contingency Plan (NCP) establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material; however, non-aqueous phase liquids (NAPLs) in groundwater may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

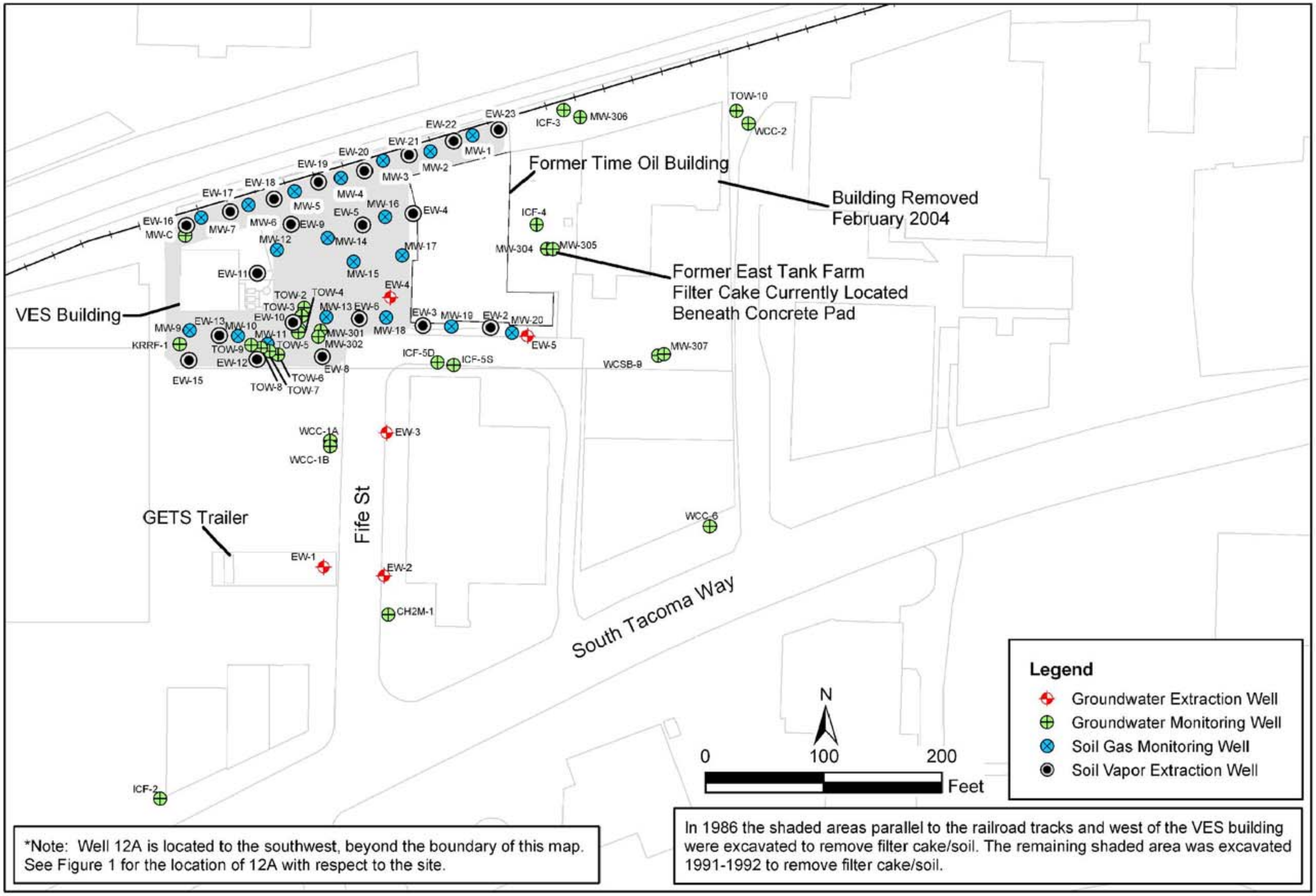


Figure 2
Site Map and Well Locations

Scope and Role of the Action

This Proposed Plan addresses contaminated soil and groundwater at the Well 12A site. In spite of site removal/remedial activities conducted to date, soil and groundwater contamination persists. EPA is proposing to aggressively treat or destroy source area contamination. The proposed cleanup action will result in a cost-effective remedial alternative that aggressively destroys contaminant mass and protects public health and the environment from the potential risks posed by soil and groundwater contamination.

Summary of Site Risks

Despite previous actions taken at the site, concentrations of soil contaminants exceed regulatory levels as established by the Washington State Department of Ecology Model Toxics Control Act (MTCA). Concentrations of groundwater contaminants also exceed maximum contaminant levels (MCLs). Non-aqueous phase liquids have been identified in the soil and groundwater. Vapor intrusion in onsite buildings is also a concern.

The area is developed by commercial and industrial businesses, and it is likely that this will not change. Examples of businesses located within the groundwater plume are machine shops, restaurants, industrial supply and storage space. The recommended alternative presented in this plan, or another active measure considered in this document, is needed to protect public health and the environment from risks posed by site soil and groundwater. Vapor intrusion will be evaluated by EPA after targeted soil and groundwater contamination is addressed.

Human Health Risks

Public health would be threatened either by direct contact at the source area or by consumption of contaminated drinking water if no additional remedial action is taken. Each of the contaminants of concern affects similar organs: the eyes, skin, liver, respiratory system and central nervous system. Assuming residential land use, exposure scenarios that would impact human health if no further action is taken are:

Shallow soil/filter cake: Ingestion and dermal contact

Groundwater: Ingestion, dermal contact, and inhalation of vapors

Contaminant concentrations in site soil exceed the Washington State Department of Ecology Model Toxics Control Act B cleanup levels. Soil to groundwater cleanup levels are also exceeded. The presence of soil contamination is an ongoing source of contamination to groundwater. Because groundwater concentrations also exceed MCLs, untreated groundwater could result in risk to human health via failure of the treatment system at Well 12A, migration of contaminants to another Tacoma well that does not have treatment, or inhalation of process vapors of process water from a hypothetical industrial well. The groundwater contaminant plume has extended to Well 12A. Well 12A is currently treated with an air stripper when used, however down gradient City of Tacoma wells do not have treatment systems. Well 9A, which is 1100 feet west/southwest down gradient of Well 12A, has already shown measurable detections of TCE. Changes to City of Tacoma pumping rates in the future would result in further migration of the groundwater plume that would cause contaminant levels above MCLs reaching other municipal supply wells unless actions such as the ones proposed in this plan are implemented.

Ecological Risks

No significant impacts to ecological receptors are predicted because the site is located in a largely developed area and the current contaminant plume does not reach nearby streams or rivers.

It is EPA's current judgment that the preferred alternative identified in this Proposed Plan, or one of the other active measures considered in this plan, is necessary to protect human health and the environment from actual or threatened releases of hazardous substances.

Remedial Action Objectives

Conceptual Site Model

The conceptual site model (which includes the nature and extent of contamination, the location of contamination, and the transport of contaminants) was used to identify four zones or areas that need to be addressed by some cleanup action.

Filter Cake and Shallow Impacted Soil

This zone needs to be addressed because it is at the surface and it appears to be contributing to subsurface contamination.

Deep Vadose Zone Soil and High Concentration Groundwater East of Time Oil Building

The vadose zone, also called the unsaturated zone, extends from the surface to the water table (saturated zone). Since technologies applied in the deep vadose zone would likely be applicable to the upper saturated zone, the two media are combined into this one treatment zone. The extension of vadose zone contamination into the water table suggests that it is a continuing source of contamination. If left untreated, these high concentrations of contamination would continue to impact groundwater.

High Concentration Groundwater West and South of Time Oil Building (TCE and cis-1,2-DCE greater than 300 ug/l)

This area is predominantly defined by groundwater with TCE and cis-1,2-DCE at concentrations above 300 ug/l. The 300 μg/L concentration was chosen because, beyond this concentration, negligible additional contaminant mass is gained. Also, where contamination drops below 300 ug/l, the aquifer begins to transition from anaerobic conditions (without oxygen) to aerobic conditions (with oxygen). Also included in this zone are the area east of the Time Oil building with elevated concentrations of 1,1,2,2-PCA and the area southwest of the Time Oil building for which limited data are available.

Low Concentration Groundwater (TCE and cis-1,2-DCE less than 300 ug/l)

This treatment zone includes groundwater with concentrations of TCE/cis-1,2-DCE less than 300 ug/l. Groundwater data from wells in this zone indicate that the degradation of chlorinated volatile organic compounds is probably occurring naturally under current conditions.

Remedial Action Objectives

Remedial Action Objectives (RAOs) have been developed for each zone as follows:

- Eliminate the risk of direct contact with filter cake and contaminated soil at and near the surface.
- Prevent or minimize the migration of contamination from the highly contaminated shallow soil and filter cake area into the deeper soils to prevent further degradation of groundwater.
- Eliminate/minimize the mass of contaminants in the source area to reduce the migration of this highly contaminated area into downgradient groundwater.
- Reduce the discharge of contaminants by 90%, a remediation level, from the source area into the low concentration groundwater treatment zone.
- Reduce contaminant concentrations to meet all applicable and relevant or appropriate requirements (ARARs) at specified points of compliance. Points of compliance designate the location on the site where the cleanup levels must be met. These points are established close to the source of contamination to ensure protection of human health and the environment. At the Well 12A Site, the designated points of compliance are: Well 12A (see Figure 1), proposed well CW-1 (approximately 1250 feet east of the Time Oil building), and proposed well CW-2 (approximately 1250 feet southeast of the Time Oil building).

Summary of Remedial Alternatives

Given the complexity of the site, no single remedial technology would be appropriate as a site-wide remedy. EPA has developed four remedial action alternatives comprised of combinations of the general response actions and technologies identified, screened, and retained in the Focused Feasibility Study. Thus, for the purpose of developing and evaluating appropriate remedial alternatives, the site was divided into the four treatment zones outlined above. Each of the alternatives described below includes a combination of individual technologies designed to address the four treatment zones.

Alternative 1: No Action

Capital Cost: $0
Annual Operations & Maintenance (O&M) Costs: $0
Total Present Worth: $0

The no action alternative is considered in accordance with NCP requirements and provides a baseline for comparison with the other alternatives. Under this alternative, no action would be taken to remedy the filter cake and shallow contaminated soils. The status of the deep vadose soil and shallow groundwater would remain unchanged. The groundwater extraction and treatment system would be shut down and the air stripping towers at Well 12A would not be operated. The status of the site groundwater would not be changed. CERCLA (Section 121(c)), as amended by SARA (1986), would require that the site be reviewed at least every 5 years since contamination would remain on site. This alternative does not include the implementation of any institutional controls such as deed restrictions or future groundwater monitoring.

Alternative 2: Institutional Controls and Existing Groundwater Treatment

Capital Cost: $0.15 million
Annual O&M Costs: $0.25 million
Total Present Worth: $5.1 million

Institutional Controls (ICs)

Alternative 2 includes institutional controls to limit access to and future development, improvement, and use of affected properties, to protect human health. ICs would include activity and use restrictions enacted through proprietary (e.g., easements, covenants) and/or governmental (e.g., zoning requirements) controls to prevent the use of the property that would pose an unacceptable risk to receptors (i.e., for residential use). Informational device ICs (e.g., warning signs, advisories, additional public education) would also be employed to limit access to contaminated soils and groundwater. Tacoma-Pierce County Board of Health Resolution No. 2002-3411, Land Use Regulations and applicable sections of Washington Administrative Code Titles 173 and 246 are current guidelines that would be considered, or possibly amended, for the location and installation of supply wells. An additional component of this alternative involves the continued monitoring of groundwater at the site for a period of 30 years. In accordance with CERCLA, this alternative would be evaluated at least every five years because contaminants would remain on site with this alternative.

Groundwater Extraction and Treatment

This alternative also includes the continued operation and maintenance of the existing groundwater extraction and treatment system to treat groundwater contamination. It does not include system replacement if the life cycle of the treatment plant is reached. Although the system has been operating for 20 years, substantial contaminant mass still remains in the soil and groundwater. Continuing to operate the groundwater extraction and treatment system will help limit the migration of contaminants away from the site. If no other aggressive actions are taken to reduce contaminant mass, the groundwater extraction and treatment system may need to continue to operate for an extended period. For cost estimating purposes, the duration of this alternative was assumed to be 30 years.

Wellhead Treatment at Well 12A

In 1983, five air stripping towers were installed to treat the discharge water at Well 12A. Tacoma Water has operated and maintained the towers since their installation. This alternative also includes the operation and maintenance of the five air stripping units for a period of 30 years and monitoring groundwater for volatile organic compounds at Well 12A. In addition, monitoring groundwater quality and attenuation between the source area and Well 12A are included in this alternative. Data suggest that naturally occurring attenuation is contributing to the breakdown and reduction of concentrations of volatile organic compounds in the low concentration groundwater plume. Natural attenuation occurs when physical, chemical, or biological processes act naturally to reduce the groundwater contamination. Nature can work in several ways to cause attenuation. 1) Microbes that live in soil and groundwater use some chemicals for food and, upon digestion, turn them into water and harmless gases. 2) Chemicals can stick to soil, which does not clean up the chemicals, but keeps them from polluting groundwater and leaving the site. 3) As pollution moves through soil and groundwater, it can mix with clean water, thus diluting the contamination. 4) Some chemicals, like oil and solvents, can evaporate and escape to the air at the ground surface where sunlight may destroy them. A health and safety plan would be developed and implemented to protect workers from contact to groundwater contaminants.

Alternative 3: Excavation; In situ Thermal Remediation; Enhanced Anaerobic Bioremediation (EAB); Groundwater Extraction and Treatment; Wellhead Treatment; Institutional Controls

Capital Cost: ***$9.3 million***
Annual O&M Costs: ***$0.98 million***
Total Present Worth: ***$14.2 million***

Alternative 3 is EPA's preferred alternative.

Excavation and Disposal of Soils in RCRA Subtitle C or D Landfill

This alternative consists of excavating filter cake and contaminated soils and transporting the waste off site to a RCRA-permitted landfill. An average excavation depth of 10 feet has been assumed; however, more or less excavation may be required based on observations and data to be collected during the remedial action. Assuming an average excavation depth of 10 feet, approximately 4,200 cubic yards of contaminated soils would require excavation and disposal. After the removal, the excavations would be backfilled with clean soil and gravel cover would be placed across the site surface. For areas where contaminated soils remain, further treatment would be performed and institutional controls, such as deed restrictions and information devices, would be used to further reduce the potential for exposure. Water would be used to minimize fugitive dust emissions during soil excavation, transport, and handling. Any stockpiles of material during interim storage would be covered by tarps or plastic sheeting to minimize fugitive dust emissions and runoff releases. Surface water runoff, fugitive emissions and treated soils would be monitored to ensure that the remedial action objectives were being met.

In situ Thermal Remediation

In situ thermal treatment methods heat polluted soil and groundwater. The heat helps push chemicals through the soil toward collection wells. The heat can also destroy or evaporate certain types of chemicals. When they evaporate, the chemicals change into gases, which move more easily through the soil. Collection wells capture the harmful chemicals and gases and pipe them to the ground surface for cleanup. Thermal methods can be particularly useful for DNAPLs and LNAPLs, which do not dissolve or move easily in groundwater and would remain a source of groundwater pollution for a long time without proper treatment.

Enhanced Anaerobic Bioremediation (EAB)

This component of Alternative 3 consists of in situ (in place) treatment of contaminated groundwater through enhanced anaerobic (not needing oxygen) biological treatment. Bioremediation allows natural processes to clean up harmful substances in the environment. Microbes that live in soil and groundwater like to eat certain harmful chemicals, such as those found in gasoline and oil spills. When microbes completely digest these chemicals, they change them into water and harmless gases such as carbon dioxide. In order for microbes to clean up harmful chemicals, the right temperature, nutrients, and amount of oxygen must be present in the soil and groundwater. If conditions are not right at a site, EPA works to improve them. At the Well 12A Site, TCE and cis-1,2-DCE could be effectively broken down with the addition of an amendment (carbon food source) to jump start the process. Monitoring will be performed to track the progress of the remedy.

Groundwater Extraction and Treatment

This alternative also includes the continued operation of the existing groundwater extraction and treatment system to prevent migration of contaminants while their mass is reduced via enhanced anaerobic bioremediation. Operation of the groundwater extraction and treatment system will be terminated when it is shown that: (1) mass flux (the rate of movement of contamination) has been reduced by 90% in the high concentration groundwater area, and (2) concentrations of contaminants are below maximum contaminant levels at the specified compliance points in the low concentration groundwater area.

Wellhead Treatment at Well 12A

See Alternative 2 for details on Wellhead Treatment at Well 12A. Groundwater monitoring and attenuation between the source area and Well 12A is also included in Alternative 3. As mentioned above, data suggest that naturally occurring attenuation is contributing to decreasing concentrations of volatile organic compounds in the lower concentration groundwater plume. The enhanced anaerobic bioremediation being implemented upgradient from this area is expected to increase this process in the low concentration plume.

Institutional Controls

This alternative also includes institutional controls as described in Alternative 2.

Alternative 4: Excavation; Capping: In situ Thermal Remediation; Enhanced Anaerobic Bioremediation; Air Sparging and Soil Vapor Extraction; Groundwater Extraction and Treatment; Wellhead Treatment; Institutional Controls

Capital Cost:	***$11.1 million***
Annual O&M Costs:	***$1.2 million***
Total Present Worth:	***$16.5 million***

This alternative includes all of the following actions that were included in Alternative 3 described on page 10:

Excavation
In situ Thermal Remediation
Enhanced Anaerobic Bioremediation
Wellhead Treatment at Well 12A

See Alternative 3 for details on how these technologies would be implemented at the site. In addition, Alternative 4 would include:

Air Sparging and Soil Vapor Extraction

This alternative uses in situ air sparging (AS) coupled with a soil vapor extraction system to remove volatile organics from the groundwater. Soil vapor extraction removes harmful chemicals, in the form of vapors, from the soil above the water table. Vapors are the gases that form when chemicals evaporate. The vapors are extracted from the ground by applying a vacuum. Air sparging uses air to help remove harmful vapors from polluted soil and groundwater below the water table. When air under pressure is injected into a well installed within the groundwater plume, the chemicals evaporate faster, which makes them easier to remove. Like soil vapor extraction, a vacuum then extracts the vapors. Certain chemicals, like solvents and fuels, evaporate easily. Soil vapor extraction and air sparging work best on these types of chemicals and are often used at the same time to clean up both soil and groundwater. Therefore, air sparging and soil vapor extraction are well suited for the treatment of the chlorinated volatile organic compounds found at the site. The locations of the air sparging and soil vapor extraction wells are proposed for the area west of the Time Oil building. The air sparging and soil vapor extraction is proposed in a small portion of the high concentration plume, but enhanced anaerobic bioremediation is proposed for most of the plume. Existing soil vapor extraction equipment and wells are at the site.

However, since the equipment has not been used in more than ten years and a cursory inspection of the equipment revealed poor conditions, the equipment was assumed to be unusable for this estimate. If the alternative is selected, a detailed inspection and evaluation can be performed during design to determine if any of the equipment (including wells) is usable. Field pilot studies will be necessary to adequately design and evaluate the system.

Groundwater Extraction and Treatment

This alternative includes the operation of the existing groundwater extraction and treatment system to prevent migration of contamination while contaminant mass is being reduced via air sparging and soil vapor extraction and enhanced anaerobic bioremediation. Operation of the groundwater extraction and treatment system will be terminated when it is shown that concentrations of site contaminants have been reduced and the mass discharge of contaminants of concern meets the RAO.

Capping

An asphalt cap would be placed on the area excavated. Currently, a concrete pad is located in a large portion of the area to be excavated. The pad will be removed during the excavation and the asphalt cap will be installed as a replacement to prevent direct contact exposure and reduce infiltration. Additionally, the cap will reduce infiltration of rainwater to a negligible amount so that percolating precipitation will not be a major transport mechanism from the soil to the groundwater.

Institutional Controls

This alternative also includes institutional controls as described in Alternative 2.

Evaluation of Alternatives

EPA evaluates remedial alternatives retained for detailed analysis using nine standard criteria. The criteria fall into three groups: threshold, primary balancing, and modifying. Each alternative must meet the threshold criteria. The primary balancing criteria are used to weigh major trade-offs among alternatives. Modifying criteria may be fully considered among alternatives. Modifying criteria may be fully considered only after public comment is received on the Proposed Plan.

Below is the "Evaluation Criteria for Superfund Remedial Alternatives". On page 13 is the Comparative Analysis of Alternatives summarized in a table. Within the table are ratings indicating how well the alternatives meet the evaluation criteria. For all but the No Action Alternative, alternatives are given a rating for each treatment zone (shallow soil and filter cake, deep vadose zone soil and groundwater east of the Time Oil building, high concentration groundwater, and low concentration groundwater). Multiple ratings are provided because the alternatives treat each zone differently. For more detailed information on the analysis of the alternative evaluation, see the Focused Feasibility Study which can be found on the web site listed on page 15.

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
THRESHOLD CRITERIA
Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
PRIMARY BALANCING CRITERIA
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
MODIFYING CRITERIA
State/Support Agency Acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.
Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES							
Alternative	Evaluation Criteria						
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment	Short-term Effectiveness	Implementability	Present Worth
Alternative 1: No Action	0	0	NE	NE	NE	NE	$0
Alternative 2: Institutional Controls and Existing Groundwater Treatment	Shallow Soil: 1 Deep Soil: 1 High Conc. GW: 3 Low Conc. GW: 5	Shallow Soil: 1 Deep Soil: 1 High Conc. GW: 3 Low Conc. GW: 5	Shallow Soil: 1 Deep Soil: 1 High Conc. GW: 2 Low Conc. GW: 4	Shallow Soil: 1 Deep Soil: 1 High Conc. GW: 3 Low Conc. GW: 3	Shallow Soil: 1 Deep Soil: 4 High Conc. GW: 4 Low Conc. GW: 4	Shallow Soil: 5 Deep Soil: 5 High Conc. GW: 5 Low Conc. GW: 5	$5.1
Alternative 3: Excavation; In situ Thermal Remediation; Enhanced Anaerobic Bioremediation; Groundwater Extraction and Treatment; Wellhead Treatment; Institutional Controls	Shallow Soil: 5 Deep Soil: 5 High Conc. GW: 4 Low Conc. GW: 5	Shallow Soil: 5 Deep Soil: 5 High Conc. GW: 4 Low Conc. GW: 5	Shallow Soil: 5 Deep Soil: 5 High Conc. GW: 5 Low Conc. GW: 5	Shallow Soil: 5 Deep Soil: 5 High Conc. GW: 5 Low Conc. GW: 3	Shallow Soil: 4 Deep Soil: 3 High Conc. GW 3: Low Conc. GW: 4	Shallow Soil: 4 Deep Soil: 4 High Conc. GW: 3 Low Conc. GW: 5	$14.0
Alternative 4: Excavation; Capping: In situ Thermal Remediation; Enhanced Anaerobic Bioremediation; Groundwater Extraction and Treatment; Wellhead Treatment; Institutional Controls	Shallow Soil: 5 Deep Soil: 5 High Conc. GW: 4 Low Conc. GW: 5	Shallow Soil: 5 Deep Soil: 5 High Conc. GW: 4 Low Conc. GW: 5	Shallow Soil: 5 Deep Soil: 5 High Conc. GW: 2 Low Conc. GW: 4	Shallow Soil: 5 Deep Soil: 5 High Conc. GW: 5 Low Conc. GW: 3	Shallow Soil: 4 Deep Soil: 4 High Conc. GW: 4 Low Conc. GW: 4	Shallow Soil: 4 Deep Soil: 4 High Conc. GW: 3 Low Conc. GW: 5	$16.4

Key: NE = Not Evaluated 0 = No Compliance 1 = Low 2 = Low to Moderate 3=Moderate 4=Moderate to High 5=High

Conc. = Concentration GW = Groundwater

Summary of the Preferred Alternative

The Preferred Alternative for cleaning up the Well 12A Site is Alternative 3, which includes: excavation of an average of 10 feet of shallow soil and remaining filter cake, in situ thermal remediation of deep soil and high concentration groundwater east of the Time Oil building, enhanced anaerobic bioremediation and groundwater extraction and treatment of high concentration groundwater west and south of the Time Oil building, wellhead treatment of low concentration groundwater, and institutional controls. In addition, low concentration groundwater will be further treated because the effects of bioremediation in the adjacent high concentration groundwater zone are expected to improve the capacity of the aquifer to naturally reduce contaminant levels in the low concentration groundwater zone.

The preferred alternative was selected because it is expected to achieve substantial, long-term risk reduction through treatment and source removal. In addition, Alternative 3 would reduce risk within a reasonable time frame and at less cost than Alternative 4. The institutional controls would be easily implemented, involving some administrative tasks, but no construction activities. The proposed excavation is in a relatively open area (i.e., minimal structure interference) and the estimated depths can be reached with standard equipment. The groundwater extraction and treatment system is constructed and is being operated and maintained. Similarly, the treatment system at Well 12A has been constructed and operated since 1983. It is estimated that construction of the in situ thermal remediation treatment system could be completed within six months of site mobilization and that the heating phase would last approximately six months. Therefore, the estimated time for the contaminant mass in this source area to be reduced by at least 90% is one year. Enhanced anaerobic bioremediation would require a testing program prior to implementation to refine the treatment technology's design. Using the speed of groundwater movement, EPA can estimate how long it will take for impacts from the bioremediation to reach specified points. For example, the distance from the south edge of South Tacoma Way (a proposed location to receive enhanced anaerobic bioremediation) to Well 12A is approximately 1,400 feet. Given that groundwater is moving on average at about 0.42 feet per day, impacts from the bioremediation are estimated to reach Well 12A in 3,333 days, or about 9 years. This estimate is based on current data and conditions; if additional data are collected or conditions change, then the estimate may change. For example, if the velocity is faster (e.g., two times faster) than estimated because the subsurface material differs in some areas then the impacts would be seen two times faster (4.5 years instead of nine years).

Based on the information at this time, EPA and the State of Washington believe that the Preferred Alternative would be protective of human health and the environment, would comply with ARARs, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The Preferred Alternative can change in response to public comment or new information.

Community Involvement

EPA and the Washington State Department of Ecology rely on public input to ensure that the concerns of the community are considered in selecting a remedy for the site. To this end, this Proposed Plan and other site documents have been made available to the public for a public comment period which begins on May 4 and concludes on June 3, 2009.

A public meeting will be held on May 19, 2009, 6:30 – 8:30 p.m. at the Tacoma Utilities Administration Building, 3628 South 35th Street (35th and Union), to present the conclusions of the FFS, further elaborate on the reasons for recommending the preferred alternative, and to receive public comments. EPA, in consultation with the State of Washington, will select a remedy for the site after consideration of all public comments. The final decision will be published in the ROD Amendment. All comments received during the public comment period will be documented, along with EPA's response to each comment, in the Responsiveness Summary section of the ROD Amendment.

EPA and the State of Washington encourage the public to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted to date. Copies of site documents can be reviewed as they become available, at the following locations:

U.S. Environmental Protection Agency
1200 Sixth Avenue, Suite 900
7th Floor Records Center
Seattle, WA 98101
206-553-4494

Citizens for a Health Bay
917 Pacific Avenue, Suite 100
Tacoma, WA 98402
253-383-2429

Documents will also be posted on the EPA website http://yosemite.epa.gov/r10/cleanup.nsf/sites/cbstc. If you have questions or for more information, contact

Kira Lynch
EPA Project Manager
206-553-2144,
or toll free at 1-800-424-4372, ext. 2144
or by email at lynch.kira@epa.gov.

Alternative formats are available. For reasonable accommodations, please call:

Jeanne O'Dell
EPA Community Involvement Coordinator
206-553-6919
or toll free at 1-800-424-4372, extension 6919
or by email at odell.jeanne@epa.gov.

Caryn Klaff
EPA Community Involvement Coordinator
206-553-1275
or toll free at 1-800-424-4372, extension 1275
or by email at klaff.caryn@epa.gov.

TTY users, please call the Federal Relay Service at 1-800-877-8339.

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Seattle, WA

Public Meeting, May 19, 2009
Proposed Plan - Well 12A
Commencement Bay, South Tacoma Channel
Tacoma, Washington