STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

CERTIFIED MAIL
7007 2560 0000 6214 0891

October 2, 2008

Mr. Eric Weber
Landau Associates
950 Pacific Avenue, Suite 515
Tacoma, WA 98402

Re: Opinion on Proposed Cleanup of the following Site:

- **Site Name:** City of Tacoma 35th Street Landfill
- **Site Address:** 35th Street and Pacific Avenue, Tacoma
- **Facility/Site No.:** 5774537
- **VCP Project No.:** SW0938

Dear Mr. Weber:

The Washington State Department of Ecology (Ecology) received your request for an opinion on your proposed independent cleanup of the City of Tacoma 35th Street Landfill facility (Site). This letter provides our opinion. We are providing this opinion under the authority of the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

Issue Presented and Opinion

Upon completion of the proposed cleanup, will further remedial action likely be necessary to clean up contamination at the Site?

NO. Ecology has determined that, upon completion of your proposed cleanup, no further remedial action will likely be necessary to clean up contamination at the Site.

This opinion is based on an analysis of whether the remedial action meets the substantive requirements of MTCA, Chapter 70.105D RCW, and its implementing regulations, Chapter 173-340 WAC (collectively "substantive requirements of MTCA"). The analysis is provided below.

Description of the Site

This opinion applies only to the Site described below. The Site is defined by the nature and extent of contamination associated with the following releases:

- Petroleum hydrocarbons as carcinogenic polynuclear aromatic hydrocarbons (cPAHs) into the Soil.
- Methane as Soil Vapor into the Air.

Enclosure A includes a detailed description and diagram of the Site, as currently known to Ecology.

Basis for the Opinion

This opinion is based on the information contained in the following documents:

1. Applied Geotechnology Inc., **Preliminary Report, Phase 2 Environmental Assessment, South 37th Street and Pacific Avenue, Tacoma, Washington,** May 30, 1990.

2. Tacoma Refuse Utility, **Final Report, Environmental Site Assessment, 35th Street Landfill,** April 1992.

3. Tacoma Pierce County Health Department, **Initial Investigation Field Report, ERTS # S541074, Parcel #2084140040, County: Pierce,** August 05, 2005.

4. Landau Associates, **35th Street Landfill, Additional Methane, Surface Water, and Soil Data,** March 11, 2008.

5. Landau Associates, **Report, Remedial Investigation/Feasibility Study/and Cleanup Action Plan, 35th Street Landfill, Tacoma, Washington,** August 5, 2008.

Those documents are kept in the Central Files of the Southwest Regional Office of Ecology (SWRO) for review by appointment only. You can make an appointment by calling the SWRO resource contact at (360) 407-6365.

This opinion is void if any of the information contained in those documents is materially false or misleading.

Analysis of the Cleanup

Ecology has concluded that, upon completion of your proposed cleanup, **no further remedial action** will likely be necessary to clean up contamination at the Site. That conclusion is based on the following analysis:

1. Characterization of the Site.

Ecology has determined your characterization of the Site is sufficient to establish cleanup standards and select a cleanup action. The Site is described above and in **Enclosure A.**

Field observations during test pit and drilling activities conducted for the Remedial Investigation (RI) indicate that mixed fill material and soil exists to the full depths of the test pits and direct push borings (maximum depth 30 feet below ground surface [ft bgs]). It is also likely that fill is present to the full depth of the hollow-stem auger boring (81 ft bgs) based on the presence of wood debris and gravel observed in the auger hole. Analytical results indicate that none of the soil concentrations from the RI or the historical results exceed MTCA Method A cleanup levels, except for the following:

- ***Motor Oil Range Petroleum Hydrocarbons*** *– Total Petroleum Hydrocarbons (TPH) was analyzed in 41 RI samples. Only one soil sample exceeded the MTCA Method A cleanup level of 2,000 milligram per kilogram (mg/kg) TPH as motor-oil range hydrocarbons in auger hole B-LAI-01 at 35-36.5 ft bgs. This soil sample concentration was 4,000 mg/kg. While a single RI sample exceeded the MTCA Method A soil cleanup level, the RI TPH data set is in compliance with TPH cleanup levels based on the Ecology three-part decision rule for demonstrating compliance with a cleanup level.*
- ***Arsenic*** *– Arsenic was analyzed in 41 RI samples. A single soil concentration of arsenic of 21.5 mg/kg was observed at direct push boring GP-LAI-04 at 16-20 ft bgs, exceeding the MTCA Method A cleanup level of 20 mg/kg. While a single RI sample exceeded the MTCA Method A soil cleanup level, the RI arsenic data set is in compliance with arsenic cleanup levels based on the Ecology three-part decision rule for demonstrating compliance with a cleanup level.*
- ***cPAHs*** *– cPAHs were analyzed at 11 locations where soil was estimated to have the highest potential for cPAH impact. Concentrations, adjusted to Toxicity Equivalency Factors (TEFs), exceeding the MTCA Method A soil cleanup level of 0.1 mg/kg were observed at eight locations with total cPAH concentrations ranging from 0.103 to 0.614 mg/kg at depths ranging from 4 to 20 ft bgs.*
- ***Methane*** *– Methane measurements were made in six gas probes during three events in May 2008. Methane exceeded the Lower Explosive Limit (LEL) at LAI-05 and LAI-06 during the first sampling event, but not in two subsequent sampling events. The highest methane concentration was 27% (May 15, 2008 event) and declined to*

1.7% (May 29, 2008 sampling event). Multiple methane measurements have been conducted historically by the City or Tacoma-Pierce County Health Department (TPCHD) between 1990 and 2006. These measurements indicated that relatively high methane concentrations were detected initially, but concentrations decreased over time to well below cleanup levels. During the six sampling events conducted between 2004 and 2006, overall methane levels were low, with the highest sampling result being 3.1% LEL (i.e., 0.15 % methane).

A ground-water seep sample was collected from the seep located beneath the 34th Street bridge. The sample represents ground water that infiltrates through the fill and discharges along the base of the old ravine. Ground-water seep samples did not detect any constituents above cleanup levels. Multiple ground-water seep samples were collected by the City of Tacoma or its contractors between 1999 and 2004. None of the samples exceeded MTCA Method A values for drinking water.

2. Establishment of cleanup standards.

Ecology has determined the cleanup levels and points of compliance you established for the Site meet the substantive requirements of MTCA.

a. Cleanup levels.

Soil cleanup levels for unrestricted land use were developed in accordance with WAC 173-340-740, using exposure pathways based on the following:

- *Human contact through dermal, incidental ingestion, or inhalation with contaminants in soil at the site.*
- *Human ingestion of constituents in ground water affected by contaminants leached from site soil.*
- *Uptake of contaminants in site soil by terrestrial biota is not considered a potential exposure pathway because the site qualifies for an exclusion according to WAC 173-340-7491.*
- *Exposures to methane in air are not addressed by the MTCA. Therefore, the Minimum Functional Standards for Solid Waste Handling regulations (WAC 173-350-400) were used to assess acceptable levels for human exposure.*

Based on the known contaminants present at the site, MTCA Method A residential soil cleanup levels and MTCA Method A ground water as drinking water levels (WAC 173-340-740 and WAC 173-340-720, respectively) have been established as conservative cleanup levels for the site. The site has relatively few hazardous substances, and is expected to undergo a routine cleanup action.

To evaluate whether the residual TPH concentrations would be protective of ground water, Extractable Petroleum Hydrocarbon (EPH) method concentrations were used to develop TPH cleanup levels for six of the test pit samples. The EPH evaluations indicated that the soil concentrations sampled are protective of ground water.

For assessing exposures to methane in air, the LEL for methane of 5% was used. This is the allowable level for protection of human health at the property boundary, as specified in the Minimum Functional Standards for Solid Waste Handling.

b. Points of compliance.

Under MTCA, the point of compliance is the location on a site where the cleanup levels must be attained. The point of compliance for soil at the City of Tacoma 35th Street Landfill site is throughout the site to a depth of 15 ft bgs for human exposure due to direct contact, in accordance with WAC 173-340-740. The point of compliance for protection of ground water is soil throughout the site. The point of compliance for ground water is throughout the site in accordance with WAC 173-340-720. The point of compliance for methane in air is assumed to be throughout the site to a depth of 15 ft bgs.

Please note that other requirements apply to the cleanup based on the type of the action and location of the Site. Those requirements are specified in the reports referenced above.

3. Selection of cleanup action.

Ecology has determined the cleanup action you proposed for the Site meets the substantive requirements of MTCA.

The recommended cleanup action for this site consists of the following combination of active and passive cleanup actions:

- *In-situ containment of impacted soil left in place.*
- *Venting and monitoring of soil gas for methane.*
- *Deed restrictions in the form of an environmental covenant.*
- *Preparation of an Operations & Maintenance (O&M) manual for the site for compliance monitoring.*
- *Preparation of a health and safety plan.*

Recommended in-situ containment activities consist of placing and maintaining a soil and vegetative soil cover over areas across the site where cPAHs exceed MTCA cleanup standards in the upper 15 ft bgs. Currently it appears that cPAHs may be present throughout the site. However, additional sampling should be conducted to determine more precisely the cPAH distribution and delineate areas where capping is necessary. Sampling should be

completed on a regular grid pattern with samples collected from two depths between 0 and 15 ft bgs in each grid. Vegetation should be removed and composted in areas where containment is necessary. A 1½ ft thick soil layer consisting of clean soil or structural fill and a vegetative surface layer should be placed over the fill. This cap should be placed in areas where cPAHs exceed cleanup levels but not in areas occupied by buildings or paved surfaces, or in areas where cPAHs do not exceed cleanup levels.

The final design of the gas venting system should be developed as part of the building construction design. It is anticipated that gas vents will consist of installation of a minimum of three soil vapor extraction wells per residential development area. Wells will be installed within structural backfill and will extend beneath the buildings. The backfill should facilitate positive pressure gradients towards the wells underneath the building, thereby passively intercepting methane gas before it migrates into the structure. In the case that passive venting is not effective in preventing methane gas from migrating into the building, a manifold and blower system will be installed for each residential development area. Within the first month after the containment cap is installed, indoor air monitoring should be conducted at a minimum of three locations in high occupancy living spaces. The indoor air quality monitoring should be conducted over 8-hour periods using Summa canisters and continue on a quarterly basis. Indoor methane monitoring should continue until a full year of results are non-detect for methane. Methane monitoring should be conducted in each passive/active vents quarterly for the first year. Afterwards, monitoring should continue annually until concentrations are below the LEL for two consecutive years. Methane monitoring procedures will be defined in a site O&M manual.

The property deed will be amended with an environmental covenant. The covenant will be consistent with the Uniform Environmental Covenants Act (RCW 64.70.040) and be signed by the property owner and Ecology. The covenant will document the occurrence of elevated cPAHs in soil and methane in soil gas, the location of in-situ containment areas, require the maintenance of the in-situ containment areas, and require protection of workers exposed to contained materials and the proper disposal of contained materials if generated during future construction work. The requirement for an O&M manual will also be included in the environmental covenant.

An O&M manual will be prepared for the site. The purpose of the manual will be to document current contamination conditions at the site and identify appropriate health and safety procedures and requirements for construction activities. The O&M manual will document the location and as-built specification of the containment cell and define specific procedures for maintaining the in-situ containment areas, define specific procedures for methane monitoring, and define worker health and safety procedures. The site owner will maintain and implement the manual. The manual will be developed as part of the development activities and updated as appropriate during subsequent construction phases.

A health and safety plan (HSP) will be developed that is consistent with the MTCA requirements in WAC 173-340-810. Appropriate health and safety procedures in the HSP will be implemented by the contractors and consultants working on site during remedial and construction activities. The HSP will address physical and chemical hazards.

Limitations of the Opinion

1. Opinion does not settle liability with the state.

Liable persons are strictly liable, jointly and severally, for all remedial action costs and for all natural resource damages resulting from the release or releases of hazardous substances at the Site. This opinion **does not**:

- Resolve or alter a person's liability to the state.
- Protect liable persons from contribution claims by third parties.

To settle liability with the state and obtain protection from contribution claims, a person must enter into a consent decree with Ecology under RCW 70.105D.040(4).

2. Opinion does not constitute a determination of substantial equivalence.

To recover remedial action costs from other liable persons under MTCA, one must demonstrate that the action is the substantial equivalent of an Ecology-conducted or Ecology-supervised action. This opinion does not determine whether the action you proposed will be substantially equivalent. Courts make that determination. *See* RCW 70.105D.080 and WAC 173-340-545.

3. Opinion is limited to proposed cleanup.

This letter does not provide an opinion on whether further remedial action will actually be necessary at the Site upon completion of your proposed cleanup. To obtain such an opinion, you must submit a report to Ecology upon completion of your cleanup and request an opinion under the VCP.

4. State is immune from liability.

The state, Ecology, and its officers and employees are immune from all liability, and no cause of action of any nature may arise from any act or omission in providing this opinion. *See* RCW 70.105D.030(1)(i).

Contact Information

Thank you for choosing to clean up the Site under the Voluntary Cleanup Program (VCP). As you conduct your cleanup, please do not hesitate to request additional services. We look forward to working with you.

For more information about the VCP and the cleanup process, please visit our web site: www.ecy.wa.gov/programs/tcp/vcp/vcpmain.htm. If you have any questions about this opinion, please contact me at (360) 407-6267.

Sincerely,

Charles S. Cline
SWRO Toxics Cleanup Program

CSC: [SECRETARY INITIALS]

Enclosures (1): A – Description of the Site

cc: Mr. John O'Loughlin, City of Tacoma
Ms. Sharon Bell, Tacoma-Pierce County Health Dept.
Mr. John Wright, Tacoma-Pierce County Health Dept.
Scott Rose, Ecology

Enclosure A

Description and Diagram of the Site

The site is an approximate 5-acre parcel, which over a 30-year period has been filled with various construction spoils and street sweepings. The site is bordered on the west by Pacific Avenue, on the north by the 34th Street Bridge, on the east by "A" Street, and on the south by a vacant parcel at 35th Street. Apparently, the site is encompassed by six Pierce County Parcels #2084140040, #2084140050, #2085130060, #2085130070, #2085140040, and #2085140070 (see Figure 3). The site is situated within the City of Tacoma boundaries, Pierce County, Washington State. The surrounding area is mostly residential. Figures 1 and 2 show the approximate site location and configuration.

The 35th Street Landfill site is located within what had been a natural ravine that drained into Commencement Bay. The underlying soil consists of glacially derived sand and silty sand. The southern limits of the ravine are uncertain, but extended at least as far as South 38th Street at one time. The ravine is now filled at the southern end, with the fill now extending to an area between South 34th Street Bridge and South 35th Street. The 35th Street Landfill site was used by the City of Tacoma to dump waste materials from the early 1960's through 1992. The construction debris originated, primarily, from the Interstate-5, Interstate-705, and Highway 7 extensions, Tacoma Public Utilities construction projects, and various large private construction projects. Reported materials dumped included waste concrete, asphalt, other inert materials, street sweepings, and vactor waste (catch basin cleanings). The Tacoma-Pierce County Health Department (TPCHD) states that the street sweepings and vactor waste were placed primarily at the northern end of the fill. Interviews with area residents confirm that organic materials were disposed at the site. Apparently, cleanings from catch basins were dumped at the site from 1985 until 1990. The Environmental Site Assessment (ESA) conducted by the City of Tacoma indicates that most of the organic materials were disposed at the eastern edge at "A" Street and 35th Street, which conflicts with TPCHD.

The site is undeveloped and currently slopes gently downward to the west and north, with a steeper north-facing slope that terminates in the bottom of a ravine. Surface cover consists of grass, brambles, scattered patches of soil and gravel, and piles of construction debris composed of concrete, reinforcing steel, and wood. Currently, the surrounding area land use (including filled portions of the area to the south of the site) is mixed, consisting of residential, commercial, and light industrial land uses.

The City plans to transfer the site property to a private developer as part of a partnership to develop apartment housing. Currently, there are no specific development plans; however, it is likely the project will support multiple buildings, parking areas, and associated infrastructure. The Remedial Investigation/Feasibility Study/Cleanup Action Plan (RI/FS/CAP) is being conducted to document current site soil, ground water, surface water, and air conditions and to identify a final cleanup action that is protective of human health and the environment and consistent with future development plans.

Subsurface conditions at the site consist of up to 80 feet (ft) or more of fill overlain by glacially-derived sand and silty sand. A ground-water seep emanates from the toe of the north-facing fill slope in the area of a buried concrete pipe. Ground water beneath the site is anticipated to be greater than 100 ft below ground surface (bgs), and below the bottom of the fill in this area. Therefore, the seeps at the base of the slope likely represent water that has percolated through the fill and collected on the original ground surface soil horizon or relatively lower permeability layers below this surface to form isolated areas of perched ground water.

In November 1990, organic vapors (methane) were detected in shallow probes at the site. This prompted the TPCHD to request an environmental investigation of the site. City of Tacoma Public Works Department personnel conducted a site assessment that addressed gas generation, surface-water contamination potential, and characterized the soil material comprising the fill. TPCHD also expressed concerns about site stability. City personnel determined that a three-to-one slope for the site would be needed to address this concern. In 1991, the City of Tacoma regraded the fill to provide better stability, covered the site with topsoil, and hydro seeded.

On behalf of the City of Tacoma, Landau Associates (Landau) submitted a Voluntary Cleanup Program (VCP) application to Ecology on February 27, 2008 to conduct independent remedial actions under Ecology supervision. Landau subsequently submitted an independent remedial action report on March 11, 2008, and requested a no further action (NFA) determination for the site based on previously collected data. After reviewing the data, Ecology issued a further action determination on April 19, 2008 requiring additional remedial actions to characterize the site. In response, the **Report, Remedial Investigation/Feasibility Study/and Cleanup Action Plan, 35th Street Landfill, Tacoma, Washington,** (CAP) was submitted on August 7, 2008 for Ecology review. It is the intent of the City of Tacoma to request an NFA determination from Ecology after implementation of the CAP.

In response to Ecology's further action determination, the City conducted a RI in May 2008 to further define the nature and extent of contamination at the site. The RI included a field investigation approach using a combination of test pits, direct push borings, a single hollow-stem auger (HSA) boring, ground-water seep, and methane sampling. Prior to initiating field activities, a work plan was prepared, and submitted to Ecology for review. Ecology subsequently approved the work plan.

Ten test pits (TP-LAI-01 through -10) were excavated to observe shallow soil conditions and to collect soil samples. The depth of the test pits ranged from 12 ft to 14.5 ft bgs. Two soil samples were collected from each location for laboratory analysis. Each sample was tested for select metals and diesel-range total petroleum hydrocarbons (TPH). Based on field observations, six samples were selected for additional analyses for benzene, toluene, ethylbenzene, and total xylenes (BTEX), extractable petroleum hydrocarbon fraction (EPH), and carcinogenic poly aromatic hydrocarbons (cPAHs). After sampling was completed, the excavated soil was returned to the test pit, and graded to its original profile.

One HSA boring (B-LAI-01) was drilled in the center of the landfill site to a depth of 81 ft bgs with a truck-mounted hollow-stem auger drill rig. Soil samples were collected at 5-ft intervals using a split spoon sampler driven 18 inches with a 140-pound automatic hammer with a 30-inch fall. Three of the samples (collected at 15-16.5 ft, 35-36.5 ft, and 75-76.5 ft bgs) were retained for laboratory analysis based on field observations. Each sample was tested for metals and TPH. One sample from the 35-36.5 ft depth was also tested for cPAHs and BTEX.

Six direct push (geoprobe) borings (GP-LAI-01 through -06) were installed using a direct-push probe rig. Boring depths ranged from 25 to 30 ft bgs. After the borings were completed, gas monitoring wells were installed in all six borings. Three soil samples were collected for laboratory analysis from each boring based on field observations. Each sample was tested for metals and TPH. Based on field observations, a total of four samples were also analyzed for cPAHs and BTEX.

The wells were constructed with a 20 ft, 0.010-inch slot size screen, and backfilled with 10- to 20- filter sand pack. The top of the screen was set 5 to 10 ft bgs. Each well was completed with a flush-mount monument. The gas probe wells were used to monitor methane concentrations during three events on May 15th, May 22nd, and May 29th, 2008. Barometric pressure, Lower Explosive Limit (LEL), oxygen, and hydrogen sulfide levels were also measured. Mike Gore from the City of Tacoma and John Wright from the TPCHD sampled methane in the initial sampling event. During subsequent events, methane was measured by the City. The final two sampling events included standard City procedures, which included evacuating the probes prior to sampling.

A ground-water seep sample was collected from the north-facing edge of the landfill. The ground-water seep surfaces on the north side of the East 34th Street bridge through a concrete pipe that collects water from the base of the fill. The water sample was analyzed for dissolved metals, TPH, BTEX, cPAHs, and naphthalenes.

Field observations during test pit and drilling activities conducted for the RI indicate that mixed fill material and soil exists to the full depths of the test pits and direct push borings (30 ft bgs). It is also likely that fill exists to the maximum depth of the HSA boring (81 ft bgs). Analytical results indicate that none of the soil concentrations from the RI or the historical results exceed MTCA Method A cleanup levels, except for the following:

- **Motor Oil Range Petroleum Hydrocarbons** – TPH was analyzed in 41 RI samples. Only one soil sample exceeded the MTCA Method A cleanup level of 2,000 milligram per kilogram (mg/kg) TPH as motor-oil range hydrocarbons in auger hole B-LAI-01 at 35-36.5 ft bgs. This soil sample concentration was 4,000 mg/kg. While a single RI sample exceeded the MTCA Method A soil cleanup level, the RI TPH data set is in compliance with TPH cleanup levels based on the Ecology three-part decision rule for demonstrating compliance with a cleanup level, as follows:

1. The upper 95th percent confidence level of the mean of the data is 1,132 mg/kg, which is below the MTCA Method A cleanup level as determined by Ecology's MTCA Stat work package. [WAC 173-340-740(d)(i)]
2. Less than 10% of the samples concentrations exceed the MTCA Method A soil cleanup level. [WAC 173-340-740(7)(e)]
3. No single sample is greater than two times the MTCA Method A cleanup level. [WAC 173-340-740(7)(e)]

The single exceedence of the cleanup standard was from the sample collected at 35-36.5 ft bgs, below the point of compliance for direct contact (15 ft bgs). There are no TPH impacts to ground water, based on the depth to ground water and the sample collected from the HSA borehole at 75-76.5 ft bgs.

- **Arsenic** – Arsenic was analyzed in 41 RI samples. A single soil concentration of arsenic of 21.5 mg/kg was observed at direct push boring GP-LAI-04 at 16-20 ft bgs, exceeding the MTCA Method A cleanup level of 20 mg/kg. While a single RI sample exceeded the MTCA Method A soil cleanup level, the RI arsenic data set is in compliance with arsenic cleanup levels based on the Ecology three-part decision rule for demonstrating compliance with a cleanup level, as follows:
  1. The upper 95th percent confidence level of the mean of the RI data is 9.8 mg/kg, below the MTCA Method A cleanup level as determined using Ecology's MTCA Stat work package. [WAC 173-340-740(d)(i)]
  2. Less than 10% of the samples concentrations exceed the MTCA Method A soil cleanup level. [WAC 173-340-740(7)(e)]
  3. No single sample is greater than two times the MTCA Method A cleanup level. [WAC 173-340-740(7)(e)]

- **cPAHs** – cPAHs were analyzed at 11 locations where soil was estimated to have the highest potential for cPAH impact. Concentrations, adjusted to Toxicity Equivalency Factors (TEFs), exceeding the MTCA Method A soil cleanup level of 0.1 mg/kg were observed at eight locations with total cPAH concentrations ranging from 0.103 to 0.614 mg/kg at depths ranging from 4 to 20 ft bgs.

- **Methane** – Methane measurements were made in six gas probes during three events in May 2008. Methane exceeded the Lower Explosive Limit (LEL) at LAI-05 and LAI-06 during the first sampling event, but not in two subsequent sampling events. The highest methane concentration was 27% (May 15, 2008 event) and declined to 1.7% (May 29, 2008 sampling event). Multiple methane measurements have been conducted historically by the City or TPCHD between 1990 and 2006. These measurements indicated that relatively high methane concentrations were detected initially, but concentrations decreased over time to well below the cleanup level established for this site (5% of the LEL). During the six sampling events conducted

between 2004 and 2006, overall methane levels were low, with the highest sampling result being 3.1% LEL (i.e., 0.15 % methane).

A ground-water seep sample was collected from the seep located beneath the 34th Street bridge. The sample represents ground water that infiltrates through the fill and discharges along the base of the old ravine. Ground-water seep samples did not detect any constituents above cleanup levels. Multiple ground-water seep samples were collected by the City of Tacoma or its contractors between 1999 and 2004. None of the samples exceeded MTCA Method A values for ground water.

Feasibility Study – Based on the RI, a Feasibility Study (FS) was developed to address cPAHs in soil and methane in soil gas. The FS develops alternatives that achieve Cleanup Action Objectives (CAOs), compares the alternatives against criteria established in MTCA, and selects the alternative that is permanent to the maximum extent practicable. A consideration for this site was to evaluate technologies and alternatives compatible with the redevelopment of the property.

The CAOs for site remediation are:

- Prevent human contact (dermal, incidental ingestion, or inhalation) with site soil containing cPAHs above the proposed soil cleanup level.
- Prevent terrestrial ecological exposure above acceptable levels.
- Provide measures to monitor and control methane gas at the site.
- Return the site to productive use.

The point of compliance for human/ecological receptors is defined in MTCA as throughout the site from the surface to a depth of 15 ft bgs. If site development requires excavation of soil below 15 ft bgs, the point of compliance will extend to the maximum depth of site excavation.

MTCA provides a hierarchy for selecting cleanup technologies with more permanent technologies (such as destruction) preferred over less permanent technologies (such as containment). However, either approach results in an acceptable cleanup action, provided the risk posed by the site is reduced to an acceptable level as a result of the cleanup action and it can be shown, through a disproportionate cost analysis, that the cleanup action uses permanent solutions to the maximum extent practicable. [WAC 173-340-360]

Cleanup actions have been divided into active and passive cleanup actions. Potentially viable active cleanup actions that have been identified for the site are:

- Excavation and off-site disposal.
- Soil stabilization or encapsulation.

- Containment.

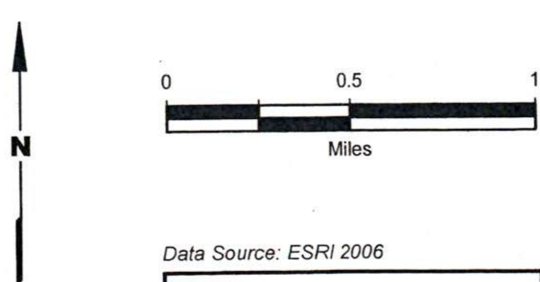
Potentially viable passive cleanup actions identified for the site are:

- Soil gas venting and monitoring.
- Institutional controls.
- Education.
- Fencing or other access constraints.

Actions are evaluated based on effectiveness, implementability, and cost. Applicable actions are combined into proposed cleanup action alternatives.

From this list, Containment is the active cleanup action that was identified as most appropriate and applicable to meet CAOs for the site. Containment is the preferred option because it is effective at isolating underlying contamination from direct contact, thereby providing reasonable protection, given the low concentrations of cPAHs in soil and absence of ground-water contamination. Excavation and off-site disposal and soil stabilization were not considered appropriate due to the minimal additional effectiveness in providing protection to human health and the environment combined with higher implementation difficulty and cost.

From the passive cleanup actions list, soil gas monitoring, institutional controls, education, and access constraints were all selected as viable and most applicable for future development of the site. These actions would be applied to the site to reduce potential exposure to contaminated fill/soil and methane in air and to maintain active remedies.



Data Source: ESRI 2006

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LANDAU ASSOCIATES

35th Street Landfill Tacoma, Washington	**Vicinity Map**	Figure 1

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Data Source: Google Earth

0 125 250

Scale in Feet

LANDAU ASSOCIATES

35th Street Landfill Site
Tacoma, Washington

Current and Historical Sampling Locations

Figure
2

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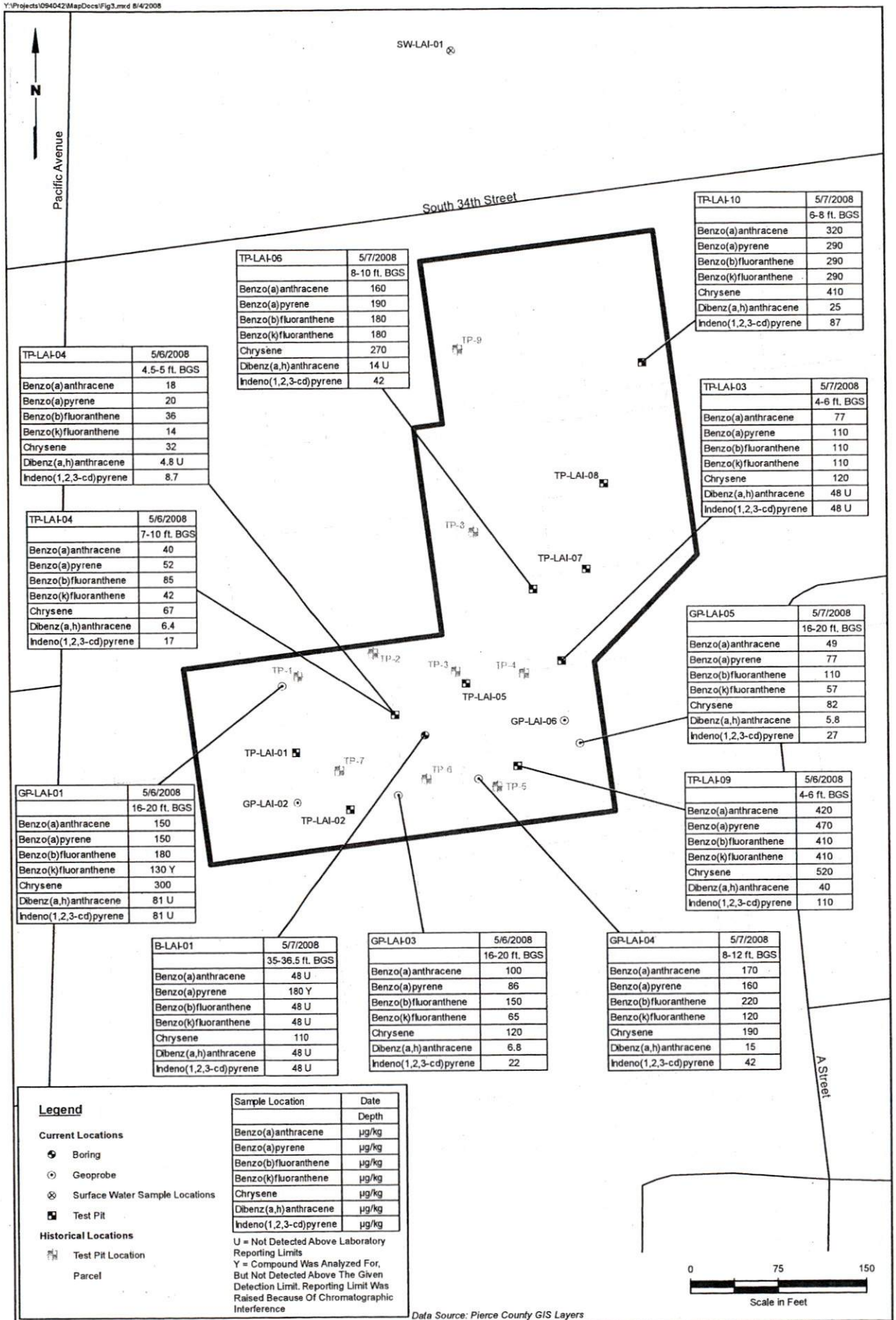

TP-LAI-06	5/7/2008
	8-10 ft. BGS
Benzo(a)anthracene	160
Benzo(a)pyrene	190
Benzo(b)fluoranthene	180
Benzo(k)fluoranthene	180
Chrysene	270
Dibenz(a,h)anthracene	14 U
Indeno(1,2,3-cd)pyrene	42

TP-LAI-10	5/7/2008
	6-8 ft. BGS
Benzo(a)anthracene	320
Benzo(a)pyrene	290
Benzo(b)fluoranthene	290
Benzo(k)fluoranthene	290
Chrysene	410
Dibenz(a,h)anthracene	25
Indeno(1,2,3-cd)pyrene	87

TP-LAI-04	5/6/2008
	4.5-5 ft. BGS
Benzo(a)anthracene	18
Benzo(a)pyrene	20
Benzo(b)fluoranthene	36
Benzo(k)fluoranthene	14
Chrysene	32
Dibenz(a,h)anthracene	4.8 U
Indeno(1,2,3-cd)pyrene	8.7

TP-LAI-03	5/7/2008
	4-6 ft. BGS
Benzo(a)anthracene	77
Benzo(a)pyrene	110
Benzo(b)fluoranthene	110
Benzo(k)fluoranthene	110
Chrysene	120
Dibenz(a,h)anthracene	48 U
Indeno(1,2,3-cd)pyrene	48 U

TP-LAI-04	5/6/2008
	7-10 ft. BGS
Benzo(a)anthracene	40
Benzo(a)pyrene	52
Benzo(b)fluoranthene	85
Benzo(k)fluoranthene	42
Chrysene	67
Dibenz(a,h)anthracene	6.4
Indeno(1,2,3-cd)pyrene	17

GP-LAI-05	5/7/2008
	16-20 ft. BGS
Benzo(a)anthracene	49
Benzo(a)pyrene	77
Benzo(b)fluoranthene	110
Benzo(k)fluoranthene	57
Chrysene	82
Dibenz(a,h)anthracene	5.8
Indeno(1,2,3-cd)pyrene	27

GP-LAI-01	5/6/2008
	16-20 ft. BGS
Benzo(a)anthracene	150
Benzo(a)pyrene	150
Benzo(b)fluoranthene	180
Benzo(k)fluoranthene	130 Y
Chrysene	300
Dibenz(a,h)anthracene	81 U
Indeno(1,2,3-cd)pyrene	81 U

TP-LAI-09	5/6/2008
	4-6 ft. BGS
Benzo(a)anthracene	420
Benzo(a)pyrene	470
Benzo(b)fluoranthene	410
Benzo(k)fluoranthene	410
Chrysene	520
Dibenz(a,h)anthracene	40
Indeno(1,2,3-cd)pyrene	110

B-LAI-01	5/7/2008
	35-36.5 ft. BGS
Benzo(a)anthracene	48 U
Benzo(a)pyrene	180 Y
Benzo(b)fluoranthene	48 U
Benzo(k)fluoranthene	48 U
Chrysene	110
Dibenz(a,h)anthracene	48 U
Indeno(1,2,3-cd)pyrene	48 U

GP-LAI-03	5/6/2008
	16-20 ft. BGS
Benzo(a)anthracene	100
Benzo(a)pyrene	86
Benzo(b)fluoranthene	150
Benzo(k)fluoranthene	65
Chrysene	120
Dibenz(a,h)anthracene	6.8
Indeno(1,2,3-cd)pyrene	22

GP-LAI-04	5/7/2008
	8-12 ft. BGS
Benzo(a)anthracene	170
Benzo(a)pyrene	160
Benzo(b)fluoranthene	220
Benzo(k)fluoranthene	120
Chrysene	190
Dibenz(a,h)anthracene	15
Indeno(1,2,3-cd)pyrene	42

Legend

Current Locations

- Boring
- Geoprobe
- Surface Water Sample Locations
- Test Pit

Historical Locations

- Test Pit Location
- Parcel

Sample Location	Date
	Depth
Benzo(a)anthracene	µg/kg
Benzo(a)pyrene	µg/kg
Benzo(b)fluoranthene	µg/kg
Benzo(k)fluoranthene	µg/kg
Chrysene	µg/kg
Dibenz(a,h)anthracene	µg/kg
Indeno(1,2,3-cd)pyrene	µg/kg

U = Not Detected Above Laboratory Reporting Limits
Y = Compound Was Analyzed For, But Not Detected Above The Given Detection Limit. Reporting Limit Was Raised Because Of Chromatographic Interference

Data Source: Pierce County GIS Layers

LANDAU ASSOCIATES

35th Street Landfill Site
Tacoma, Washington

Analytical Results for Carcinogenic Polycyclic Aromatic Hydrocarbons in Soil

Figure 3

WASHINGTON STATE DEPARTMENT OF ECOLOGY
TOXICS CLEANUP PROGRAM
VCP SITE LOG #4

SITE NAME: City of Tacoma 35th Street Landfill	
FACILITY / SITE NUMBER: 5774537	**YEAR:** 2008
VCP PROJECT (ACCOUNT) NUMBER: SW0938	**MONTH: September**
SIC: J1C55	**PAYROLL PERIOD** 1-15 ☐ 16-31 ☒
EMPLOYEE'S NAME: Chuck Cline	

DATE	HOURS	ACTIVITY DESCRIPTION
9/16/2008	5.5	Continue document review.
9/18/2008	5.5	Start opinion letter "Likely to meet substantive requirements".
9/22/2008	3.5	Continue with opinion letter.
9/23/2008	1.0	Complete opinion letter, submit for peer review.

ON-DEMAND BILLING

For use only by the Site Manager assigned to the VCP project, not other staff or attorneys working on the project.

- If this site log contains your final charges for this VCP project and you want to use on-demand billing to invoice those charges, then check the following box: ☐
- If other staff or attorneys need to submit site logs before final invoicing can occur, then also check the following box: ☐ If so, how many **other site logs** need to be submitted? [ ]

DATA ON THIS FORM IS CONSISTENT WITH THE EMPLOYEE'S TIMESHEET.

EMPLOYEE'S SIGNATURE Chuck Cline **DATE** 10/2/08

SUPERVISOR'S SIGNATURE Scott Rose **DATE** 10/7/08