



**SITE CLOSURE
SUBSURFACE INVESTIGATION REPORT**

PORTLAND STATE UNIVERSITY URBAN CENTER
SW SIXTH AVENUE AND SW MILL STREET
PORTLAND, OREGON

Submitted To:

Mr. Chuck Cooper
Portland State University
PO Box 751
Portland, Oregon 97207

Submitted By:

AMEC Earth & Environmental, Inc.
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Mr. Chuck Cooper
Portland State University
PO Box 751
Portland, Oregon 97207

Dear Mr. Cooper:

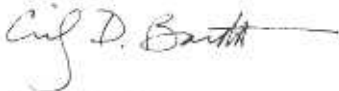
**Re: Site Closure Subsurface Investigation Report
Portland State University Urban Center
SW Sixth Avenue and SW Mill Street
Portland, Oregon**

AMEC Earth & Environmental, Inc. (AMEC) is pleased to provide Portland State University with this report summarizing the results of soil sampling conducted on September 17, 2001 at the above-referenced site in Portland, Oregon. The soil sampling work scope was based on recommendations by the Oregon Department of Environmental Quality to provide the necessary information for a no further action determination for the site.

We appreciate the opportunity to be of service to you on this project. If you have any questions or need further assistance, please do not hesitate to contact the undersigned at (503) 639-3400.

Sincerely,

AMEC Earth & Environmental, Inc.

A handwritten signature in black ink, appearing to read "Cindy D. Bartlett".

Cindy D. Bartlett
Geology Staff

A handwritten signature in black ink, appearing to read "Leonard C. Farr, Jr.".

Leonard C. Farr, Jr., R.G.
Associate

Attachments

CDB/skh

1.0 INTRODUCTION

This report documents the results of soil sampling conducted by AMEC Earth & Environmental, Inc. (AMEC) on behalf of Portland State University (PSU), at the PSU Urban Center (Site). The Site is located at the intersection of SW Mill Street and SW 6th Avenue in Portland, Oregon (Figure 1). Previous soil sampling was conducted by AMEC at the Site in 1999 and was described in a May 22, 2000 report entitled, Cleanup Of Petroleum-Containing Soil, Portland State University Urban Center Project. Following a review of the AMEC report, the Oregon State Department of Environmental Quality (DEQ) recommended additional subsurface investigation to further delineate the extent of the petroleum in soil.

2.0 PROJECT BACKGROUND

2.1 Site Description

The Site is located at the southeast corner of the intersection of SW Mill Street and SW 6th Avenue, adjacent to the PSU Urban Affairs Building and Distance Learning Center (Figure 2). Portland Street Car Company tracks run along the northeast portion of the Site, and Tri-Met bus stops occupy the curb-lane along SW 6th Avenue. The Site is relatively flat topographically and is paved with bricks and cement in the sidewalk and asphalt in the street. Properties adjacent to the Site consist of buildings associated with PSU and St. Mary's Academy across SW Mill Street to the north. Vicinity properties also include retail businesses and restaurants.

2.2 Site Background and Previous Environmental Work

During November 1999, petroleum-containing soil (PCS) was encountered while excavating for a tree planter at the Site. Soil samples collected within the excavated area at depths of 2.5 to 5.0 feet below ground surface (bgs) had concentrations of gasoline ranging from 2,700 to 5,100 milligrams per kilogram (mg/kg). Following further excavation work, two closure samples had concentrations of total petroleum hydrocarbons as gasoline (TPH-G) that exceeded the DEQ's cleanup level for gasoline. The concentrations of gasoline detected in these samples were 2,800 mg/kg in the west sidewalk at 7.0 feet bgs, and 400 mg/kg in the north sidewalk at 3.0 feet bgs. The TPH-G concentration in the other three excavation floor and sidewalk soil samples was near or below laboratory detection limits. Further removal of the gasoline-impacted soil in these areas was not possible without damaging utilities that were located north and west of the excavation. Soil samples collected from hand auger borings (HA1 and HA2) to the north and west of the excavation indicated that the gasoline-impacted soil does not extend more than 10 feet from the excavation. A total

of 44.5 tons of gasoline-containing soil was removed and transported to TPS Soil Recyclers of Oregon for thermal treatment and recycling.

The soil sample that yielded the highest concentration of gasoline (5,100 mg/kg) was tested for volatile organic compounds (VOCs). All VOC concentrations, except 1,2,4-trimethylbenzene (1,2,4-TMB), were below generic DEQ occupational risk-based concentrations (RBCs) for direct contact, ingestion, and inhalation. The concentrations of 1,2,4-TMB were above the volatilization to indoor/outdoor air and leaching to groundwater RBCs. A discussion of these RBC exceedances is provided in Section 5.0. 1,2,4-TMB RBCs are summarized in Table 2.2, below. An analytical report for the soil sample (soil sample III) was included in the May 2000 report.

Table 2.2
Summary of VOC Concentrations in Soil Sample III (1999) and RBCs for Occupational Exposure Scenarios

	Concentration (mg/kg)	Surface Soil Ingestion, Dermal Contact, and Inhalation (mg/kg)	Volatilization to Outdoor Air (mg/kg)	Vapor Intrusion into Buildings (mg/kg)	Leaching to Groundwater (mg/kg)
1,2,4-trimethylbenzene	57	720	4.8(=Csat)	4.8(=Csat)	4.8(=Csat)

Csat - Saturation Constant
 mg/kg – milligrams per kilogram

Soil sample III had been collected from the base of the excavation at 5.0 feet bgs. This soil was removed and subsequent closure soil sampling indicated that TPH-G concentrations in the floor of the excavation were below DEQ cleanup levels. No other samples were tested for VOCs.

Additional soil sampling was recommended during a July 23, 2001 telephone discussion between AMEC and Rob Hood of the DEQ. This subsurface investigation was designed to further explore the vertical and horizontal extent of petroleum hydrocarbons in soil, and to provide additional information to aid in obtaining a no further action (NFA) determination for the Site.

3.0 SUBSURFACE INVESTIGATION

Boring locations were selected in order to delineate the extent of the remaining gasoline-containing soil. However, current Site development features, utility lines, and

the Portland Street Car Company tracks restricted access for placement of the borings. Soil samples to the north GP2 could not be collected because of restricted access. Boring locations and Site features are included on Figure 2.

The purpose of borings GP1 and GP2 was to extend the sampling depths below the depth of the previous hand auger sampling (HA1 and HA2). GP1 and GP2 were located near the hand auger borings HA1 and HA2 to the west and north of the former excavation, respectively. The third boring, GP3, was located along the eastern side of the former excavation to delineate the lateral extent of gasoline in soil to the east.

3.1 Soil Sampling

Soil sampling activities were conducted at the Site on September 17, 2001. Geo-Tech Explorations, Inc., of Tualatin, Oregon provided drilling services. The subsurface investigation included collecting soil samples from three direct-push borings. The borings were advanced to depths of 20 feet below ground surface (bgs) using a truck mounted Geoprobe® hydraulic drilling rig. Soil samples were collected and logged continuously in four-foot intervals in each of the three borings. Soil recovery rates for each sample interval were recorded and AMEC field personnel classified soil types. Recovered soils were field screened with a photoionization detector (PID) for evidence of VOC vapors, as measured in parts per million (ppm). Boring logs are included in Appendix A.

Selected soil samples from each four-foot interval were collected in airtight Teflon-sealed containers. All samples were labeled, placed on-ice, and transported under chain-of-custody procedures to North Creek Analytical (NCA) laboratory in Beaverton, Oregon, for analyses.

Following the completion of sample collection, each boring was abandoned by filling the borehole with dry bentonite chips. The bentonite was hydrated, and the borings were capped with asphalt or concrete patches to match the surrounding pavement.

3.2 Subsurface Conditions

Subsurface conditions did not vary significantly across the Site. Surficial asphalt and sub-pavement grading materials were approximately 1.0-foot thick in boring GP1, and 0.5 to 1.5 feet thick in the sidewalk borings (GP2 and GP3). Soils consisted of medium brown, dry to slightly damp silts and silty-sands with occasional clayey silts. Thinly interbedded sandy gravels were noted in boring GP2. No groundwater was encountered in any of the borings.

Petroleum-stained soils were encountered in boring GP2 from 0.0 to 4.0 feet bgs, and in thin (usually less than 0.5-foot thick), intermittent beds to 16.0 feet bgs. The stained soils were typically encountered within thinly interbedded sandy gravels. PID readings for this boring were 1,252 ppm at 0.0 to 4.0 feet bgs and 28.1 ppm at 16.0 to 20.0 feet bgs.

No visual or olfactory evidence indicating the presence of petroleum-impacted soils was noted in borings GP1 and GP3, and PID readings ranged from 0.0 to 1.5 ppm. These measurements are not considered elevated above normal background levels.

4.0 LABORATORY TESTING

Four soil samples collected from the three borings were submitted to NCA for gasoline range petroleum hydrocarbon testing using method NWTPH-Gx. The results of laboratory testing are described below. Laboratory reports and chain-of-custody documents are provided in Appendix B.

4.1 Analytical Results

Samples from borings GP1, GP2, and GP3 at 12 to 16 feet bgs, and one sample from boring GP2 at 0 to 4.0 feet bgs were submitted for analytical testing. Detected levels of gasoline were as follows:

GP1@12-16	4.32 mg/kg
GP2@0-4	1,270 mg/kg
GP2@12-16	25.2 mg/kg
GP3@12-16	4.02 mg/kg

No follow-up or additional analytical testing was performed on any of the samples.

5.0 CONCLUSIONS & RECOMMENDATIONS

AMEC completed soil sampling at the PSU Urban Affairs Building, located at the corner of SW 6th Avenue and SW Mill Street in Portland, Oregon. Additional soil sampling was recommended by the DEQ to further delineate the vertical and horizontal extent of gasoline in soil.

Gasoline was detected in all four of the soil samples submitted for analytical testing. Three of the soil samples yielded gasoline concentrations below DEQ soil matrix Level 2 cleanup standards. The fourth sample, collected from boring GP2 at 0.0 to 4.0 feet

bgs, yielded a gasoline concentration less than previously detected, and in the same depth interval where gasoline-containing soils previously were encountered. This sample confirms that a limited volume of gasoline containing soil remains in-place north of the excavation area. The soil sample collected in boring GP2 at 12 to 16 feet bgs yielded a gasoline concentration of only 25.2 mg/kg, which is well below DEQ Level 2 soil matrix cleanup levels. Therefore, the vertical extent of remaining gasoline-containing soil appears to be limited in depth to 12 feet bgs and above.

Follow-up analytical testing for VOCs and lead was not performed on any of the samples because the concentrations of gasoline in the samples did not exceed the 5,100 mg/kg gasoline concentration previously detected during the 1999 cleanup. The concentration of 1,2,4-TMB detected in the sample yielding the maximum gasoline concentration (5,100 mg/kg) was below DEQ generic occupational RBCs for surface soil ingestion, dermal contact, and inhalation, but was above the volatilization/vapor intrusion to outdoor/indoor air RBC, and the leaching to groundwater RBCs. No other VOC concentrations exceeded DEQ generic occupational RBCs. Residential RBCs are not considered applicable for the Site because it currently is not residential in use and is not likely to be redeveloped as a residential property in the future.

Although some RBCs for 1,2,4-TMB were exceeded, these RBCs are equal to the saturation concentration (C_{sat}) and are not risk-based. The risk-based screening levels for 1,2,4-TMB can be calculated using DEQ exposure factors, chemical, and toxicological data. These calculations are presented in Appendix C. Using this data for 1,2,4-TMB, the risk-based screening levels were calculated for the volatilization/vapor intrusion to outdoor/indoor air and leaching to groundwater exposure pathway for an occupational scenario. In all cases, the concentration of 1,2,4-TMB detected in site soils was below the risk-based screening levels. Therefore, the concentration of 1,2,4-TMB previously detected in soil does not present an unacceptable level of risk via the leaching to groundwater or volatilization pathways. As such, the gasoline-containing soil remaining north of the excavation does not pose an unacceptable risk to human health or the environment.

While access limitations prevented the full delineation of gasoline in soil to the north, AMEC recommends that the Site be granted "no further action" status. This recommendation is based upon the following:

1. The soil sample collected in the interval 0-4 feet bgs in boring GP2 indicates that gasoline concentrations in soil decrease rapidly to the north.

2. The vertical extent of gasoline in soil has been delimited. Furthermore, risk-based screening levels for volatilization/vapor intrusion to outdoor/indoor air and leaching to groundwater scenarios were not exceeded. The probability that gasoline in soil will leach to groundwater is considered very low.
3. A comparison of "worst case" constituent concentrations to generic DEQ RBCs indicates that constituent concentrations do not exceed acceptable levels. This means that gasoline-containing soil remaining at the Site does not pose an unacceptable risk to human health or the environment.

We appreciate the opportunity to be of service to you on this project. If you have any questions or need further assistance, please do not hesitate to contact the undersigned at (503) 639-3400.

AMEC Earth & Environmental, Inc.

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Cindy Bartlett
Staff Geologist

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Leonard C. Farr, Jr., R.G.
Associate

CDB/skh

LIMITATIONS

This report was prepared exclusively for Portland State University by AMEC Earth & Environmental, Inc. The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions and qualifications set forth in this report. This Site Closure Subsurface Investigation Report is intended to be used by Portland State University for the SW 6th Avenue and SW Mill Street Site in Portland, Oregon only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

The findings contained herein are relevant to the dates of the AMEC Site visits and should not be relied upon to represent conditions later. In the event that changes in the nature, usage, or layout of the property or nearby properties are made, the conclusions and recommendations contained in this report may not be valid. If additional information becomes available, it should be provided to AMEC so the original conclusions and recommendations can be modified as necessary.