# SOURCE CONTROL EVALUATION WORK PLAN
# Former Westinghouse Property
# 614 North Tillamook Street
# Portland, Oregon

ECSI #4497

Prepared for

City of Portland
Bureau of Environmental Services

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# Abbreviations and Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| BES | City of Portland Bureau of Environmental Services |
| bgs | below ground surface |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| CFR | Code of Federal Regulations |
| City | City of Portland |
| CMMP | Contaminated Media Management Plan |
| COI | contaminant of interest |
| CSO | combined sewer overflow |
| CSM | conceptual site model |
| DEQ | Oregon Department of Environmental Quality |
| DO | dissolved oxygen |
| DOT | U.S. Department of Transportation |
| ECSI | Environmental Cleanup Site Information |
| Eh | oxidation-reduction potential |
| EPA | U.S. Environmental Protection Agency |
| HDPE | high-density polyethylene |
| IGA | Intergovernmental Agreement |
| Interstate Facility | Water Bureau North Interstate Avenue Maintenance Facility |
| MDL | method detection limit |
| mg/L | milligrams per liter |
| MRL | method reporting limit |
| mV | millivolt |
| NAPL | non-aqueous phase liquid |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| OAR | Oregon Administrative Rules |
| ORS | Oregon Revised Statutes |
| OVM | Organic Vapor Meter |
| OWRD | Oregon Water Resources Department |
| PCB | polychlorinated biphenyls |
| PE | Oregon licensed Professional Engineer |
| PID | photoionization detector |
| PWB | City of Portland Water Bureau |
| QA | quality assurance |
| QC | quality control |
| RBC | risk-based concentration |
| RBDA | risk-based disposal approval |

| | |
|---|---|
| RG | Oregon Registered Geologist |
| SCE | source control evaluation |
| SLV | screening level value |
| Site | Former Westinghouse Property |
| TOC | total organic carbon |
| TSCA | EPA Toxic Substances Control Act |
| TPH | total petroleum hydrocarbon |
| UST | underground storage tank |
| VOC | volatile organic compound |
| SVOC | semivolatile organic compound |
| Westinghouse | Westinghouse Electric and Manufacturing Company |
| WPCL | City of Portland Water Pollution Control Laboratory |

SECTION 1

# Introduction

On behalf of the City of Portland Water Bureau (PWB), the Bureau of Environmental Services (BES) entered into a Voluntary Agreement [1,2] (Agreement) with the Oregon Department of Environmental Quality (DEQ) to implement the *Revised Removal/Remedial Action Plan* (GSI, 2012) prepared for the former Westinghouse Electric and Manufacturing Company property (Site) located at 614 North Tillamook Street, Portland, Oregon. Due to the nature of Site contamination, the City has been working with DEQ and the U.S. Environmental Protection Agency on data collection, remedial action, materials management, and reporting needs for the Site. The *Revised Removal/Remedial Action Plan* was submitted to DEQ and EPA in May of 2012 for review and approval (DEQ, 2012a).

The *Revised Removal/Remedial Action Plan* presents the approved approach for obtaining a risk-based closure for the Site under DEQ's Cleanup Law and EPA's Toxic Substance Control Act (TSCA) regulations. Specifically, the *Revised Removal/Remedial Action Plan* includes:

- A conceptual site model (CSM) that describes potential current and future contaminant transport pathways and contaminant exposure pathways and receptors.
- A risk-based screening evaluation of available soil and groundwater data that identifies and discusses potential current and future risks to human health and the environment.
- A description of the planned final risk-based remedial action at the Site including:
    - Removal of PCB-contaminated soil hot spots;
    - Management and disposal of the contaminated soil in accordance with DEQ's solid and hazardous waste rules and EPA's TSCA regulations;
    - Engineering controls (e.g., capping of the property; stormwater management);
    - Deed restrictions/institutional controls (e.g., groundwater and land use restrictions; cap monitoring plan, contaminated media management plan);
    - Completion of a groundwater investigation;
    - Completion of groundwater and stormwater source control evaluations; and

[1] *Intergovernmental Agreement (IGA) for Oversight of Environmental Investigations and Remedial Actions*, entered into by the City and DEQ on February 1, 2010 (DEQ NO. LQVC-NWR•09-08).

[2] BES, 2012. Voluntary Cleanup Program – *Intent to Participate – Former Westinghouse Property – DEQ ECSI No. 4497*. Letter from John O'Donovan, P.E./BES to Dan Hafley, R.G./DEQ dated September 24, 2012 includes a site-specific Scope of Work as required by the Intergovernmental Agreement for Oversight of Environmental Investigations and Remedial Actions. DEQ approved the scope of work in a letter dated October 8, 2012.

- An evaluation of the protectiveness of the planned remedial action for human health.

DEQ issued a public notice on June 1, 2012, describing the planned PCB-soil removal and the elements of the final DEQ Site remedy and EPA risk-based disposal approval (RBDA). DEQ's Cleanup Program and the EPA's TSCA Program are providing oversight of the environmental assessment and removal action activities at the Site.

This Source Control Evaluation Work Plan is a requirement of the *Revised Removal/Remedial Action Plan*. The Work Plan describes the additional data needed to evaluate potentially complete current contaminant migration pathways from the Site to the Willamette River in accordance with the *Portland Harbor Joint Source Control Strategy* (JSCS)(DEQ/EPA, 2005). Work completed under this plan will support the preparation of a *Source Control Evaluation* (SCE), in accordance with the Agreement. The City revised the June 2013 Work Plan in response to comments provided by DEQ (2013) and EPA (2013).

The Site was purchased by the PWB in 1996 for expansion of the PWB Interstate Maintenance Facility. Under agreements with the PWB, BES has been assisting the PWB with addressing Site contamination concerns. The City has completed significant investigation and cleanup (i.e., source control measures) at the Site to address risks associated with polychlorinated biphenyl (PCB) contaminated soil and materials affiliated with historical Westinghouse operations and to support redevelopment of the property (GSI, 2012).

All buildings, known tanks, and onsite stormwater systems have been removed. Additional cleanup actions and site redevelopment activities have been completed or are currently underway in accordance with the approved *Revised Removal/Remedial Action Plan* and *Contaminated Media Management Plan* (CMMP; AMEC, 2013). The existing asphalt cap was removed to excavate targeted areas of PCB-contaminated soil; the hot spot soil excavations and disposal have been completed and a report is in development documenting soil removal, management, and disposal activities along with the confirmation sample results. Other elements of the remedial action are in progress or pending, such as the construction of engineering controls (e.g., capping the Site) and the development of institutional controls.

Following Site redevelopment, the entire Site will be capped; stormwater will be collected from structures (roofs) and other capped areas (i.e., impervious surfaces and lined swales), treated onsite in lined vegetated swales, and routed to an infiltration gallery at the Interstate Maintenance Facility. In addition, as of December 1, 2011, the portion of the City's stormwater conveyance system that received stormwater runoff from the Site was diverted to the City's wastewater treatment plant as part of the City's combined sewer overflow (CSO) abatement project, thereby eliminating current stormwater discharges to the Willamette River except during infrequent eastside tunnel overflow events.[3] Groundwater is not used on the Site and will not be used in the future. Under current and future conditions, as described in the approved *Revised Removal/Remedial Action Plan,* the Site is considered to be protective of human health and the environment.

[3] Site stormwater is managed onsite at the Interstate Maintenance Facility. The Interstate Maintenance Facility stormwater system includes an overflow point to the City's combined sewer system, in the event that the Interstate Facility system capacity is insufficient to handle stormwater volume.

Based on the source control priority level definitions presented in the JSCS (DEQ/EPA, 2005) and the removal/remedial actions implemented or ongoing, the Site is not a significant current or potential future source of contaminants to the river via groundwater (including the preferential groundwater migration pathway) or stormwater. Nonetheless, the City proposes to collect, evaluate, and present data to further support this conclusion.

Activities described in this Work Plan will be conducted in general accordance with:

- Oregon Environmental Cleanup Law (Oregon Revised Statute (ORS) 465.200 et seq.);
- Toxic Substance Control Act (Title 40 of the Code of Federal Regulations (CFR) Part 761 et seq.);
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (42 United States Code §§ 9601 et seq.);
- National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR 300 et seq.); and
- *Portland Harbor Joint Source Control Strategy* (JSCS) (DEQ/EPA, 2005).
- *CMMP* (AMEC, 2013).

## 1.1 Purpose and Objectives

The purpose of this Work Plan is to present the planned approach for completing a source control investigation and SCE at the former Westinghouse property to demonstrate that there are no ongoing sources of contaminants of concern (i.e., residual legacy PCB contamination) that have the potential to reach the Willamette River at unacceptable levels and that no additional characterization or source control is needed at the Site.

The source control investigation performed under this Work Plan and subsequent SCE will complement and incorporate existing data and information to meet the following objectives:

- Confirm that significant onsite groundwater contamination is not present based on a comparison of groundwater concentrations to risk-based concentrations (RBCs) and JSCS Screening Level Values (SLVs).
- Demonstrate in accordance with the JSCS that the Site is not a current or significant source of PCBs to the Willamette River via the stormwater or groundwater pathways by confirming that there is:
    - No significant or complete groundwater migration pathway to the river.
    - No significant or complete stormwater pathway to the river.
- Support a DEQ Source Control Decision for the Site.

In addition, this Work Plan provides the basis and methodology for conducting the field and laboratory activities associated with completing the source control investigation, including quality assurance (QA) and quality control (QC) protocols associated with proposed sampling activities.

## 1.2 Scope of Work

This Work Plan describes the additional data needed to support the forthcoming SCE. Based on the results of previous Site investigations, City stormwater basin source investigations, the removal/remedial actions implemented or planned at the Site and current and future site conditions, the Site is not believed to be a significant current or potential future source of contaminants to the river via groundwater (including the preferential groundwater migration pathway) or stormwater. The investigations and data evaluations described below will be performed under this Work Plan and documented in a subsequent Site report.

### 1.2.1 Groundwater Investigation

To confirm that significant groundwater contamination is not present and to demonstrate that the Site is not a current or significant source of PCBs to the Willamette River, groundwater monitoring wells will be installed and sampled, as described in Section 4. Data collected during the groundwater investigation also will be used to evaluate the potential for groundwater contaminants to migrate to the Willamette River via potential preferential migration pathways (e.g., groundwater infiltration into nearby subsurface conveyance systems).

### 1.2.2 Stormwater Investigation

To demonstrate that the Site is not a current or significant source of PCBs or other contaminants of interest (COIs) to the Willamette River via the stormwater pathway, existing data and information will be compiled and evaluated, as described in Section 5.

SECTION 2

# Site Background

## 2.1 Site Description

The Site is a 0.79-acre parcel located at the former address of 614 N. Tillamook Street (see Figure 1). Figure 2 shows the Site boundary. The topography of the Site is generally flat. The ground surface elevation is approximately 60 feet above mean sea level, and the nearest surface water is the Willamette River, located approximately 0.2 miles to the west.

The City purchased the Site in 1996 for expansion of the PWB Interstate Maintenance Facility (Interstate Facility). When the Site was purchased by the City, it was occupied for several months by a holdover tenant, Ebony Iron Works, Inc. The property consisted of a 16,000-square-foot building, an outbuilding,[4] and a parking area to the west of the building. City operations on the Site have been limited to Site remediation, pipe storage, and vehicle and equipment parking. Following the planned redevelopment, portions of the Site will be covered by a new warehouse that will be used in PWB Interstate Maintenance Facility operations and new lined, vegetated, flow-through stormwater swales (see Figure 2).

## 2.2 Site Investigations and Remediation History

The City has completed numerous environmental investigation and cleanup activities to address risks to human health and the environment associated with PCB-contaminated materials and soil from historical site activities.

The *Revised Removal/Remedial Action Plan* summarized the Site investigation and remediation history and evaluated the soil results to demonstrate that the nature and extent of soil contamination at the former Westinghouse property has been characterized (GSI, 2012). Locations of soil and groundwater samples collected at the time of that report are shown on Figure 3. The *Revised Removal/Remedial Action Plan* also provided the basis for evaluating potential risks to human health and the environment and developing the soil removal plan, described the planned final remedial action for the Site, and summarized available groundwater data. In the spring of 2013 the City completed targeted removal of PCB-contaminated soil from the two areas identified in the *Revised Removal/Remedial Action Plan* and construction-related removal of additional soil at the Site. Soil removal activities and results of confirmation sampling will be documented under separate cover in a forthcoming report.

[4] Based on the 1996 aerial and records there was also a smaller structure west of the main building that was demolished by the time of the 1998 aerial.

Existing Site groundwater data were collected from five geoprobe borings (P-1 through P-5), completed to depths of approximately 45 feet bgs between June 17 and 20, 2011, at the approximate locations shown on Figure 3. Soil and groundwater samples were collected at various depths from these borings and tested for PCBs, volatile organic compounds (VOCs), and total petroleum hydrocarbons (TPH). PCB groundwater results are shown on Figure 3.

Detectable concentrations of PCBs in groundwater[5] were reported in the perched and deeper groundwater samples collected from boring P-1, the deeper groundwater sample collected from boring P-2, and the perched groundwater sample collected from boring P-4. One or more VOCs also were detected in the perched groundwater (where present) in the borings and in the deeper groundwater sampled from three of the borings. Results for this investigation are reported in the *Data Report for Soil and Groundwater Investigation* (Shannon & Wilson, 2011).

## 2.3 Subsurface Conditions

Soil borings completed at the Site provide information on subsurface geologic conditions (PBS, 2011; Shannon & Wilson, 2011). At the time these borings were advanced, the asphaltic concrete surface at the Site was approximately 2 to 4 inches thick and was underlain by a layer of crushed base rock approximately 6 to 20 inches thick. The base rock overlies a fine-grained fill unit (consisting of silty sand and very soft fine-sandy silt to clayey silt) that was placed within a former ravine that historically crossed the Site (PBS, 2011). The thickness of the fill unit varies across the Site; it extends to a depth of approximately 5 feet below ground surface (bgs) in the northeastern corner of the Site and to depths of more than 40 feet bgs in the southern part of the Site (Shannon & Wilson, 2011; see Appendix A). Flood deposits consisting of loose to dense, silty fine to medium sand underlie the fill (PBS, 2011), and dense, gravelly sand of the Troutdale Formation is interpreted to underlie the flood deposits, based on published geologic maps of the area (Madin, 1990; PBS, 2011).

The depth to the regional groundwater table at the Site is estimated to be approximately 25 to 45 feet bgs (Shannon & Wilson, 2011; PBS, 2011). The general direction of regional groundwater flow in the Site vicinity is presumed to be to the west-southwest, toward the Willamette River, in accordance with the ground surface topography and groundwater monitoring data collected in the Site vicinity (Ash Creek, 2011). Zones of shallower perched groundwater also are present locally on Site; depths to the perched groundwater zones vary approximately from 13 to 20 feet bgs (Shannon & Wilson, 2011; PBS, 2011). While perched groundwater zones have been reported to be present at the site, the observations suggest that perched water occurs in localized areas (i.e., is not spatially continuous across the Site) and is temporal in nature (i.e., is not always present). The variability in soil types beneath the Site, the predominance of fine-grained soils in the upper 40 feet of soil, and the presence of perched water zones beneath the Site indicates that groundwater conditions beneath the Site may be somewhat complex. However, these

[5] Groundwater grab samples were collected from borings advanced using direct push technology. The results are considered biased high because the technology used to collect the samples often results in the presence of suspended solids in groundwater samples (sample turbidity) due to disturbances in surrounding soil at the same time the water samples are collected.

complexities are expected to result in reducing the potential for contaminant migration through the unsaturated soil column to the regional water-bearing zone for the reasons discussed in Section 3.3.2.

SECTION 3

# Conceptual Site Model

This section describes the current conceptual site model (CSM) for the former Westinghouse Site. The CSM describes the known and suspected Site sources of contaminants and considers whether the contaminants are likely to move (i.e., have a complete pathway) to the Willamette River. The CSM presented in this Section is intended to support the SCE that will be prepared in accordance with the JSCS. The *Revised Removal/Remedial Action Plan* provides a description of potential pathways and receptors in addition to the river (e.g., site workers).

## 3.1 Sources of Contamination

Westinghouse used the Site for 35 years as an electrical transformer repair operation, an activity frequently associated with PCB contamination. Primary sources of contaminants likely were associated with historical aboveground and belowground oil storage, equipment and material handling, surface spills, etc. Other hazardous materials were identified in the former building, including asbestos, lead-based paints, mercury vapor lighting, and petroleum (BES, 2005). The former building has been demolished and all debris disposed of offsite. All identified underground storage tanks (USTs) have been decommissioned. Based on the results of onsite environmental investigations, PCB-impacted soil is the primary current "source" of contaminants. Though substantial contaminated soil excavation has been conducted at the Site during previous remedial actions, lower-level PCB-impacted soil remains. The term "source" often refers to the initial or primary source of the release of hazardous substances (e.g., UST, spill); the term is used in this document to describe the COIs that are present and the environmental media in which they are contained.

The *Revised Removal/Remedial Action Plan* presents a summary of previous investigations at the Site, contaminant concentration ranges, and the results of a statistical evaluation of the site-wide PCB-soil concentrations.

## 3.2 Contaminants of Interest

Based on the investigation results described in the *Revised Removal/Remedial Action Plan*, PCBs are the primary COI. Other potential COIs that were described and screened in the *Revised Removal/Remedial Action Plan* included: volatile organic compounds (VOCs), semivolatile organic compounds (SVOC) and total petroleum hydrocarbons. The other COIs were not detected in Site soil and/or groundwater or were detected at low concentrations (i.e., near or below applicable risk-based screening concentrations or SLVs). Soil and groundwater data in areas of high PCB-soil concentrations do not indicate that potential cosolvents (i.e., VOCs or petroleum hydrocarbons) are present at concentrations that would facilitate the movement of PCBs in the subsurface through

cosolvency effects or free product migration.

As discussed in Section 4.5, groundwater samples will be analyzed for PCB Aroclors, VOCs, TPH, and total organic carbon (TOC). The planned analyses of TPH will serve as a surrogate for SVOC analyses.

## 3.3 Potential Contaminant Transport Pathways

This section discusses the potential pathways from the Site to the Willamette River as an introduction to the following sections which present the proposed tasks that will be undertaken for each pathway carried forward into the source control evaluation. The facility is located approximately 0.2 miles from the Willamette River. Therefore, the over-water/in-water pathway is not applicable. The remaining pathways warranting consideration and discussion are air, groundwater, and stormwater.

### 3.3.1 Air Pathway

The air pathway from the Site to the Willamette River is incomplete (i.e., wind erosion, particulate transport). Redevelopment is underway at the Site. Former pavement has been removed and construction activities are being conducted under an approved erosion control plan, minimizing the potential for subsequent offsite particulate transport. During the construction phase, appropriate controls and monitoring are being implemented in accordance with the approved CMMP to ensure that the air pathway does not pose an unreasonable risk of injury to health or the environment. Following redevelopment of the Site, all residual soil contamination will be capped by a building, asphaltic concrete, concrete, and lined vegetated stormwater swales eliminating the potential for a complete air migration pathway.

### 3.3.2 Groundwater Pathway

The Site is located ~0.2 miles from the river. Potential pathways for Site groundwater to reach the river include: 1) offsite migration and subsequent attenuation (advection, dispersion, adsorption, etc.) before discharging to the river; and 2) preferential migration to or along downgradient stormwater conveyance systems. While detectable concentrations of PCBs were observed in groundwater grab samples collected from Site borings (Shannon & Wilson, 2011), groundwater impacts are likely localized. The groundwater pathway from the Site to the Willamette River is likely incomplete or insignificant for the following reasons:

- Before groundwater contaminants associated with the Site could discharge to the river, the contaminants would have to successfully migrate through more than 1,000 feet of fine-grained flood deposits. During groundwater transport, natural physical (e.g., filtration, hydrodynamic dispersion) and chemical processes (e.g., adsorption, diffusion) would occur and significantly attenuate potential PCB contaminant concentrations.
- PCBs are characterized as having low solubility in water, adsorbing tightly to soil, and not significantly leaching in aqueous soil systems (EPA, 2012; DEQ/EPA, 2005), indicating that PCBs are unlikely to migrate significantly in groundwater.

- Chemical concentrations and contaminant mass are important parameters in understanding environmental fate and transport. For PCBs to have a complete pathway from the Site to the river, the PCB mass would have to be sufficient to overcome the physical and chemical processes along the transport pathway and discharge to river at concentrations that would pose unacceptable risk.
- Available soil and groundwater data in areas of high PCB soil concentrations do not indicate that potential cosolvents (i.e., volatile organic compounds (VOCs) or petroleum hydrocarbons) are present at concentrations that would facilitate the movement of PCBs in the subsurface through cosolvency effects or free product migration.
- PCBs have a well-documented hydrophobic nature and are unlikely to be found in the dissolved phase in groundwater without a solvent carrier (i.e., PCB insulating fluids or nonaqueous phase liquids [NAPL]). NAPL was not observed at the Site based on observations during tank removal activities and onsite drilling activities (soil and groundwater grab sampling). The potential for NAPL was further assessed by comparing soil concentrations to the three-phase partitioning equilibrium concentrations (concentration greater than this may indicate the presence of NAPL). Based on three-phase partitioning equilibrium concentrations in DEQ's *Risk Based Decision Making Guidance* (DEQ, 2003), the presence of NAPL or a highly mobile/not reliably-containable hot spot is considered unlikely (GSI, 2012). This information provides further weight-of-evidence that the groundwater pathway to the River is likely incomplete or insignificant.
- Most PCB concentrations in groundwater grab samples collected from the regional water bearing zone (>25 ft bgs) were less than analytical reporting limits or detected at concentrations less than DEQ's RBC for occupational exposure (see Figure 3 and Appendix A).
- PCB concentrations detected in Site groundwater appear to be localized and are considered biased high because of the drilling technology used to collect the samples.
- PCB concentrations in Site soil are generally highest in shallow soil less than 5 feet bgs and decrease rapidly with depth. The *Revised Removal/Remedial Action Plan* (GSI, 2012) demonstrates that the extent of PCB contamination is well-defined. Site soil data support that PCB mobility is limited and that PCB migration from Site soil to groundwater is extremely unlikely to result in significant groundwater concentrations that would have the potential to pose an offsite threat due to groundwater migration.
- In the unlikely event Site contaminants in groundwater migrate and infiltrate into offsite stormwater conveyance systems, the adjacent offsite systems have been diverted to the City wastewater treatment plant and no longer discharge directly to the river.

The groundwater pathway evaluation described in Section 4 is designed to support the conceptual site model and focuses on collecting groundwater samples in the regional water-bearing zone beneath the Site and downgradient of the identified PCB source areas

(i.e., hot spots) to demonstrate that the groundwater pathway is incomplete or insignificant.

### 3.3.3 Stormwater Pathway

The current stormwater pathway from the Site to the Willamette River is likely incomplete or insignificant for the following reasons:

- As of December 1, 2011, stormwater runoff from the Site was diverted to the City's wastewater treatment plant as part of the City's CSO abatement project. The conveyance system that receives stormwater from the Site is now part of the City's combined sewer system that discharges to the East Side CSO Tunnel. There it is combined with storm and sanitary flow from multiple drainage areas on the east side of the Willamette River. Site stormwater does not discharge to the river except during infrequent east side tunnel overflow events.
- The City recently removed the existing Site stormwater system as part of current redevelopment. Redevelopment at the Site will include capping the entire Site and constructing new stormwater lines and flow-through vegetated swales, as shown on Figure 2. Site stormwater (i.e., stormwater collected from the cap) will be treated onsite in lined vegetated swales and then managed at the redeveloped Interstate Maintenance Facility in a designated infiltration area. Although a swale overflow connection to the City's combined sewer system will remain, the new onsite system at the Interstate Facility is designed to treat flow volumes up to 2-year storm events. Any overflow stormwater discharges from the capped Site will be routed to the eastside tunnel and the City's wastewater treatment plant. Stormwater infiltration at the Site will be managed under the City's Water Pollution Control Facilities (WPCF) Permit No. 102830 for Class V Stormwater Underground Injection Control (UIC) permit. All City-owned UICs are managed under this permit, which was issued by DEQ in June 2005.
- Total PCB concentrations in soil in borings completed within and near the planned footprint of the infiltration gallery (Figure 3) are low (<0.101 mg/kg) and are significantly less than DEQ's RBC for leaching to groundwater for occupational uses (0.62 mg/kg). In one sample (Boring SB-15), located outside the footprint of the infiltration gallery, PCBs were detected in the upper five feet of soil (0-5 feet below ground surface) at a maximum concentration of 2.6 mg/kg (~ 4 times DEQ's groundwater leaching RBC). However, this area of higher concentration is expected to be limited in lateral and vertical extent based on other Site data and it is likely that during Site redevelopment activities (i.e., construction excavation and grading) some of the contaminated soil in this area was removed and disposed of at a DEQ permitted landfill. Soil removals conducted under the *Revised Removal/Remedial Action Plan* will be documented in a forthcoming report.

  The final Site closure report will describe residual soil contamination, will document the as-built location and depth of the infiltration gallery, and will present an evaluation of the Site stormwater and groundwater pathways. PCBs detected in Site soil are not expected to leach or migrate, based on the considerations presented in Section 3.3.2. Potential risks associated with groundwater will be addressed by

institutional controls, described in the *Revised Removal/Remedial Action Plan*, prohibiting groundwater use at the Site.

- Based on information collected under the City's UIC permit, the potential for groundwater mounding and subsequent transport of contaminants to the regional water-bearing zone is considered low, based on the highly variable rate and duration of stormwater flows into the infiltration gallery, subsurface soil properties, and the vertical separation distance between the bottom of the gallery and the regional water table (> 25 feet). During storm events, the gallery will periodically fill with water and infiltrate into adjacent soils. As water infiltrates through subsurface soils, water movement will be controlled by the properties of the soil (permeability, dispersivity, moisture content, soil heterogeneity, etc.). The numerous and complex wetting and drying cycles between storm events of varying duration and the complex infiltration pathways created due to the thickness and variability in the unsaturated soil column are expected to significantly reduce the potential for stormwater to reach the regional water-bearing zone and mound.
- Following redevelopment of the Site, any remaining contaminated areas of concern will be capped (i.e., covered by a building, asphaltic concrete, concrete, or lined stormwater swales) as shown on Figure 2. The redevelopment (building, pavement) will eliminate the potential for stormwater to contact and erode contaminated soil. Therefore, the erodible soil contaminant transport pathway will not be complete.
- The City collected stormwater data in the City's shared conveyance system, downgradient of former Site stormwater connections, before the Site stormwater system was removed. Data did not indicate that major sources of PCBs or other contaminants were present in this portion of the City's conveyance system.

The stormwater pathway evaluation, described in Section 5, is designed to support the conceptual site model and will focus on documenting current Site conditions and demonstrating the stormwater pathway is incomplete or insignificant.

## 3.4 Potential Pathways Conclusion

Based on an evaluation of the available information, the stormwater and groundwater pathways from the Site to the Willamette River are likely incomplete or insignificant. However, both pathways will be further evaluated, as described in Sections 4 and 5, to verify this conclusion.

SECTION 4

# Groundwater Investigation

This section presents the proposed scope of work and methodologies for the groundwater investigation and monitoring program. The groundwater pathway evaluation is designed to support the conceptual site model presented in Section 3 and focuses on collecting groundwater samples in the regional water-bearing zone beneath the Site and downgradient of the identified PCB source areas (i.e., hot spots) to demonstrate that the groundwater pathway to the river is incomplete or insignificant.

## 4.1 Objectives

The objective of this groundwater source control investigation is to demonstrate that the former Westinghouse property is not a significant current or future source of contaminants to the river and that a DEQ Source Control Decision is warranted. The specific objectives of the groundwater investigation include the following:

- Characterize the regional water-bearing zone beneath the Site;
- Assess whether Site contaminants are present in groundwater;
- Define the primary groundwater flow direction beneath the Site;
- Evaluate the potential for contaminated Site groundwater to migrate to the river via facilitated transport (e.g., preferential migration into and through subsurface utilities); and
- Evaluate whether groundwater beneath the Site poses a threat to the Willamette River in accordance with the *Portland Harbor Joint Source Control Strategy* (DEQ/EPA, 2005).

## 4.2 Monitoring Wells

Three monitoring wells will be installed at the approximate locations shown on Figure 4. Each well will be drilled and installed in accordance with Oregon Administrative Rules (OAR) Chapter 690, Division 240, Construction and Maintenance of Monitoring Wells and Other Holes in Oregon, and DEQ *Ground Water Monitoring Well, Drilling, Construction and Decommissioning Guidelines* (1992). Each well will have a unique identifier, starting with "MW" for monitoring well, and then a sequential number between 1 and 3. Thus, the wells will be identified as MW-1 through MW-3. The three proposed monitoring wells were located based on consideration of the following:

- **Spatial Distribution/Presumed Groundwater Flow Direction**. Monitoring wells were located to provide spatial data (i.e., triangulation) to determine /confirm the groundwater flow direction and hydraulic gradient in the regional water-bearing

zone beneath the property. Though groundwater flow direction is presumed to be west/southwest, the presence of a historical ravine in the vicinity of the Site has the potential to influence flow direction towards the north or northwest (see Appendix A). Therefore, one well is planned in the anticipated upgradient location (MW-1) and two wells are planned near the anticipated downgradient boundaries of the Site (MW-2 and MW-3).

- **Available Contaminant Distribution Data.** Available soil and groundwater data define the nature and extent of Site contamination and indicate that contaminant concentrations decrease with depth and distance from known contaminant sources. Monitoring wells were located to assess potential offsite migration from source areas to support the SCE evaluation and the planned remedy.
- **Potential Offsite Contaminant Migration**. Monitoring wells were located to provide groundwater quality data at the anticipated downgradient boundaries of the Site to address the SCE objective of assessing the potential for contaminated groundwater to migrate to the river. Therefore, two monitoring wells (MW-2 and MW-3) were placed between the known areas of onsite PCB contamination and the Willamette River. The groundwater quality data will be used to data to assess if contaminated groundwater is migrating offsite, and if so, whether it exceeds DEQ RBCs or source control SLVs. Institutional controls, proposed as part of the final remedial action, presented in the *Revised Removal/Remedial Action Plan*, will include a prohibition of future Site groundwater use without DEQ approval to mitigate potential onsite risks, if any, to human health.
- **Subsurface Utilities.** Monitoring wells were located in part to prevent potential damage to subsurface utilities (stormwater, electrical, water, sewer) installed as part of the property redevelopment. For example, Figure 2 presents the planned locations of Site stormwater lines. Monitoring well locations may need to be moved in the field, based on the as-built locations of subsurface utilities.
- **Other Site Constraints**. Construction will be occurring onsite during the proposed monitoring period and work includes construction of a new building that will cover more than half of the Site. Monitoring wells were located based on coordination with the onsite contractor and Water Bureau to ensure that the wells will be accessible and will not be prone to damage, and to avoid adversely impacting the construction schedule/costs by interfering in high traffic or contractor staging areas. Monitoring well locations may need to be moved in the field, based on the unanticipated presence of overhead utilities (power lines) or other aboveground structures.

### 4.2.1 Drilling and Geologic Sampling

A sonic drilling rig or truck-mounted hollow stem auger drilling rig will be used to advance soil borings for monitoring well installation. The borehole diameter should be at least 8-inches in diameter. Well drilling and construction activities will be performed by an Oregon-licensed driller. Drilling and well installation activities will be documented by a field hydrogeologist or environmental engineer working under the supervision of an Oregon Registered Geologist (RG) or Professional Engineer (PE). The RG or PE will oversee soil sampling, borehole logging, and well construction activities.

During drilling, continuous soil samples will be collected appropriate intervals (e.g., 5-foot cores with the sonic rig, 2.5-foot intervals with a hollow-stem rig). Downhole drilling and sampling equipment will be steam-cleaned before use and before leaving the site.

The following procedures more specifically describe the methodology to collect subsurface soil samples:

1) Driller drives the core sampler.
2) Driller retrieves core sampler from borehole.
3) The core sampler is opened and sample recovery measured.
4) The core is examined for evidence of contamination (i.e., discoloration, obvious odor, sheen).
5) A representative sample from the core is placed in a resealable plastic bag for field screening per Section 4.2.2 below.
6) The contents of the core sampler are described on the field log per Section 4.2.3.
7) The sampler is decontaminated by the procedures described per Section 4.6.
8) Soil cuttings and decontamination will be stored in U.S. Department of Transportation (DOT) approved 55-gallon drums, labeled as non-hazardous waste, and stored onsite in a secure location and managed in accordance with the CMMP and Section 4.7 pending appropriate disposal.

### 4.2.2 Field Screening

Bagged soil samples collected during drilling will be field screened for VOCs using a properly calibrated organic vapor meter (OVM) equipped with a photo ionization detector (PID). Field screening is performed by placing soil samples in a plastic resealable bag, disaggregating the sample, and after several minutes, inserting the OVM-PID probe through the bag into the space (headspace) above the soil. This screening technique is not a compound-specific analysis and is affected by, among other influences, climate (e.g., temperature and humidity), soil type and condition, and instrument calibration and operation. The intent of this analysis is to qualitatively compare samples.

In the event heavily petroleum stained soils are encountered, a petroleum sheen test may be used to determine if the soil sample is considered petroleum saturated:

- Place a small quantity of petroleum contaminated soil in a jar or on a large spoon.
- Add enough water to break apart and submerge the soil particles.
- If droplets of product are present on the water surface, the soil may be considered saturated with petroleum.

### 4.2.3 Soil Logging

Soil cores will be examined and classified in the field in general accordance with American Society for Testing and Materials (ASTM) D2488 – *Standard Practice for Description and Identification of Soils (Visual/Manual Procedure*) (ASTM, 2000). These classifications are based

on a visual examination of the soil and a determination of the predominant fractions of soil (e.g., gravel, sand, silt, and clay). Approximate physical or textural soil characteristics (color, odor, coarseness, gradation, particle shape and rounding, plasticity, soil moisture conditions, consistency, etc.) will be described.

The soil descriptions on the boring logs will represent a combination of field observed characteristics and drilling actions.

### 4.2.4 Monitoring Well Design and Construction

The proposed wells are intended to monitor the top of the unconfined regional water-bearing zone. Each well is intended to have a 15 foot screen section with approximately 10 feet submerged and 5 feet of screen above the top of the regional static water table. This type of design will ensure that water quality samples collected from these wells are representative of the top of the regional water-bearing zone.

A two-inch diameter groundwater monitoring well will be installed in each boring as the augers are extracted. The monitoring wells will be constructed of 2-inch-diameter Schedule 40, flush-threaded PVC pipe with 15 feet of 0.010-inch milled slot screen. The top of the screen will be placed approximately 5 feet above the groundwater surface to account for seasonal variation. A blank riser pipe attached to the top of the screen will extend to approximately ground surface. Well screen, casing, and caps will be precleaned by the manufacturer and shipped in plastic. A 10-20 graded silica sand pack will be installed within the annular space from the bottom of the screen to 2 feet above the top of the screen. During well construction, the sand pack will be poured slowly through the hollow stem augers as they are extracted to minimize any possibility of bridging. The well screen will be gently surged with a bailer during installation of the sand pack to reduce the potential for bridging and ensure a uniform distribution of the sand around the screen. The annular space above the sand pack will be sealed with bentonite chips to 2 feet below ground surface (bgs), followed by a concrete seal, which will extend to the ground surface. The monitoring wells will be completed with a traffic-rated flush mount monument set in concrete.

### 4.2.5 Well Development

The objective of the well development is to remove fine-grained material from the filter pack and borehole wall thereby improving the hydraulic connection between the well and the aquifer. Monitoring wells will be developed using a combination of surging, bailing, or other methods approved by the field hydrogeologist. A typical well development sequence is as follows:

1) Measure and record depth to water.
2) Collect a bailer of groundwater and measure pH, conductivity, and temperature.
3) Surge well to loosen sediment within sand pack. Surging is performed with a stainless steel bailer or surge block that has a slightly smaller diameter than the PVC well casing.

4) Bail and/or pump the well to remove sediment and groundwater. Measure pH, conductivity, and temperature and turbidity at regular intervals depending on the yield of the well (e.g., every 2 gallons, 15 minutes).
5) Terminate well development after the pH, conductivity, and temperature values stabilize within the goal of 10 percent and turbidity is low ( 5 - 10 NTU) or the field hydrogeologist terminates the effort.
6) Measure and record depth to water after development is complete.
7) Well development equipment will be decontaminated between wells following the procedures described in Section 4.6.

The new monitoring wells will be developed a minimum of 24-hours after the seal is installed. Well development water will be stored in DOT-approved 55-gallon drums, labeled as non-hazardous waste, and stored onsite in a secure location pending receipt of the groundwater monitoring results and appropriate disposal (see Section 4.7).

### 4.2.6 Survey

The locations and elevations each monitoring well will be surveyed by an Oregon licensed surveyor using an established datum. The elevation of the top of each well monument and the ground surface next to each well monument will be surveyed to the nearest 0.1 foot. The survey point at the top of each well casing will be marked by sawing a small, permanent indentation on the north side of the PVC casing.

## 4.3 Groundwater Monitoring

The collection of groundwater samples from site monitoring wells generally will consist of three steps:

1) Measurement of static water level.
2) Well purging and monitoring for field parameter stabilization following low flow standards.
3) Water quality sample collection.

### 4.3.1 Water Level Measurements

Groundwater levels will be manually measured immediately prior to groundwater sampling. The wells will be uncapped and allowed to equilibrate with atmospheric pressure prior to measurement of groundwater levels. The water level in each well will then be measured from the surveyed top of casing location using an electric sounder to the nearest 0.01 foot. Water level measurements and surveyed measuring point elevations will be used to compute groundwater elevations at each monitoring point. A complete set of static water level measurements will be obtained before initiating a water quality sampling event. In addition, groundwater levels will be measured on a monthly basis between the time the wells are first sampled and receipt of the second round of analytical testing results (estimated 4 – 5 months). Groundwater levels will be used to evaluate the groundwater flow directions and gradients across the Site.

### 4.3.2 Well Purging, Field Parameter Measurement, and Water Quality Sample Collection

In general, groundwater sampling will proceed in order from background wells (e.g., upgradient) to down gradient wells (i.e., detected groundwater concentrations of contaminants of interest), based on anticipated conditions and previous data collected at the site to reduce the potential for cross-contamination of water samples. Field personnel will determine the appropriate sampling order before conducting sampling in cooperation with the project manager, and BES staff.

Monitoring wells will be purged using appropriate precleaned equipment selected by the field hydrogeologist or engineer (e.g., bladder pump, low flow electric pump). Purge water will be directed through a flow through cell containing field water quality parameter sensors. Groundwater purging and parameter measurement techniques to be used for this project are described below:

1) Measure water depth to the nearest 0.01 foot using an electronic water-level sounder. Record depth to water measurement and the time of measurement on the groundwater sampling form.
2) Calibrate field meters daily according to factory instructions, with calibration results recorded on calibration forms.
3) Lower the pump tubing into the well and connect to the pump and the flow through cell.
4) Begin purging, typically at a rate of approximately 500 milliliters per minute, but no more than 1.0 liter per minute. Record the purge rate and time throughout the purging effort.
5) Field parameters will be measured using a flow-through device to minimize potential effects from atmospheric exposure. Monitor pH, temperature, conductivity, oxidation-reduction potential (Eh), dissolved oxygen (DO), and turbidity (from flow through cell discharge) and record readings record at regular intervals (e.g., approximately 2-liter purge interval or 5 minutes). Record parameter measurements on the groundwater sampling form.
6) Water levels will be recorded with each parameter set.
7) Purging will be considered complete only after one of the following purge conditions is met:
    - Low flow sampling: parameters have stabilized in accordance with EPA low flow purging and sampling procedures (EPA, 1996; EPA, 2010)
    - Other sampling methods:
        - A minimum of three well volumes have been removed and successive field parameter measurements agree to within the stability criteria given below.
        - At least five well volumes have been removed although field parameter stabilization criteria are not yet met.

- The well has been pumped dry and allowed to recover sufficiently such that adequate sample volumes for rinsing equipment and collecting samples can be removed.

Criteria for field parameter stabilization goals are as follows:

| Parameter (Units) | Stability Criteria* |
|---|---|
| pH (standard units) | ± 0.1 pH unit |
| Water temperature (°C) | ± 0.2 °C |
| Specific conductance (µmhos/cm) | ± 5% (SC ≤ 100 µmhos/cm)<br>± 3% (SC > 100 µmhos/cm) |
| DO milligrams per kilogram (mg/L) | ± 0.3 mg/L |
| Turbidity (NTU) ** | 10% for values greater than 5 NTUs; if three values are less than 5 NTU, consider the values as stabilized. |
| ORP/Eh (millivolts (mV) ** | ± 10 mV |

NOTE:

* Stability criteria obtained from USGS *National Field Manual for the Collection of Water Quality Data: Chapter A4, Collection of Water Samples* (USGS, 2006).

** Stability criteria from the US Environmental Protection Agency (EPA) Region 1. *Standard Operating Procedure for Low-Stress (low-flow) Purging and Sampling from Monitoring Wells* (EPA, 2010). Available from http://www.epa.gov/region1/lab/qa/pdfs/EQASOP-GW001.pdf

8) Record the final field measured parameters of pH, temperature, conductivity, turbidity, DO, and Eh.

9) Purge water will be stored in DOT-approved 55-gallon drums, labeled as non-hazardous waste, and stored onsite in a secure location pending receipt of the groundwater monitoring results and appropriate disposal (See Section 4.7).

Following well purging, groundwater quality samples will be obtained. Sample bottles will be filled directly from an appropriate sampling port (e.g., bailer, sampling port before the pumped water passes through the flow-through cell, low flow pump discharge). Sampling procedures will be performed in a manner that minimizes disturbance/agitation of the water column or sample (volatilization), and appropriate tubing material will be used to reduce the potential for organic sorption [Teflon or stainless is generally preferred, high-density polyethylene (HDPE) is acceptable]. Low flow rates will be used during sampling collection.

Water samples will be placed in appropriate, analytical laboratory-supplied precleaned and preserved containers. Water quality sample container and preservation requirements are specified in Table 1. Glass vials for VOC analyses will be filled so that there is a meniscus at the top of the vial and absolutely no bubbles or headspace present in the vial after it is capped. After the cap is securely tightened, the vial will be inverted and tapped on the palm of one hand to see if any bubbles are dislodged. If a bubble is present, the vial will be topped off using a minimal amount of sample to re-establish the meniscus. Care will be taken not to flush any preservative out of the vial during topping off. If, after topping off

and capping the vial, bubbles are still present, a new vial will be obtained and the sample recollected.

Groundwater sampling equipment reused between monitoring locations (e.g., pump system, low flow cell) will be thoroughly decontaminated between uses, as described in Section 4.6. If tubing is used during groundwater sampling, it will be discarded after each use or dedicated to a single monitoring well.

The effectiveness of the decontamination procedure will be evaluated through the periodic collection of equipment rinsate blanks, as outlined in Section 4.8.

### 4.3.3 Sampling Frequency

Two rounds of groundwater sampling and analyses are planned. The first round of samples will be collected at an appropriate time following well development activities (48 hours - 1 week). The second round of samples will be collected approximately 3 months (i.e., one quarter) after the initial sample. After completion of two quarterly sampling events, BES will determine in conjunction with DEQ whether additional groundwater monitoring is necessary (see Section 4.11).

## 4.4 Sample Handling and Documentation

All samples transferred to the laboratory for analysis will follow standard documentation, packing, and chain-of-custody procedures. Samples will be stored in iced coolers or refrigerated following collection, then hand-delivered to the laboratory in iced coolers to maintain sample temperatures of approximately 4 ± 2°C.

Sample custody (responsibility for the integrity of samples and prevention of tampering) will be the responsibility of sampling personnel until samples are shipped or delivered to the laboratory. Any containers used to ship samples via independent courier will be sealed with custody seals before shipping, and the receiving laboratory will record the condition of the seals upon arrival to ensure that the containers have not been opened during transport. Custody seals are not required for samples that are maintained under the direct custody of sampling personnel until being hand-delivered to the laboratory. Upon arrival at the laboratory, sample custody shifts to laboratory personnel, who are responsible for tracking individual samples through login, analysis, and reporting. At the time of sample login, the laboratory will assign a unique laboratory sample number, which can be cross-referenced to the field sample number and used to track analytical results.

Documents generated during sample collection will consist of:

- Sample collection field notes and forms;
- Chain-of-custody forms; and
- Shipping receipts in the event that samples are sent to a laboratory via independent courier.

Sampling activities will be recorded in a project-specific field notebook, and the appropriate water sample collection form will be completed. Each sample will be identified with a

unique sample number, along with the date and time of collection, on adhesive labels attached to sample bottles. All labels will be completed using waterproof ink.

Field notebooks will be used to record pertinent sampling information that is not included on Field Forms and may include the following:

- Project name
- Date and time
- Sample location
- Sample number
- Sample depth (if applicable)
- Media type
- Field meter calibration information
- Sampling personnel present
- Analyses requested
- Sample preservation
- Field parameter measurements
- Weather observations
- Other relevant project-specific site or sample information

Entries will be made in permanent ink. Corrections to field notebooks will be made by crossing out erroneous information with a single line and initialing the correction. Field books will be signed and dated at the bottom of each page by personnel making entries on that page.

Individual samples (including QC samples) will be assigned unique sample numbers according to the following sample numbering scheme:

FWP-MWx-YYMM-XXX

where FWP denotes the project (Former Westinghouse Property), MWx, is a 3-character code denoting the monitoring well identification (e.g., MW1), YYMM is a four-digit code denoting the year and month (e.g., 1108 for August 2011), and XXX is a three-digit code that is incremented sequentially for each successive sample.

## 4.5 Laboratory Analytical Procedures and Reporting

Laboratory analyses will be conducted by the City of Portland Water Pollution Control Laboratory (WPCL) or an equivalent laboratory. Field parameters will be analyzed by field personnel using the procedures outlined above. All laboratory analyses will be fully documented and conducted in accordance with EPA-approved and/or industry standard analytical methods.

Groundwater samples will be analyzed for PCB Aroclors (EPA Method 8082); VOCs by gas chromatography–mass spectrometry (GS/MS) using Method SW 8260B, total organic carbon (TOC) by Method SM 5310B and TPH by Northwest Method NWTPH-HCID with appropriate follow-up for gasoline, diesel, or other petroleum hydrocarbons as needed. Standard analytical laboratory parameter lists and method reporting limits are presented in Table 2.

## 4.6 Decontamination Procedures

### 4.6.1 Drilling Equipment

Drilling equipment, including the auger flights and sampling tools, will be decontaminated with a high pressure steam cleaner/pressure wash prior to each use. Decontamination water will be captured and will be stored in DOT-approved 55-gallon drums, labeled as non-hazardous waste, and stored onsite in a secure location pending receipt of the groundwater monitoring results and appropriate disposal (See Section 4.7).

### 4.6.2 Sampling Equipment

The following decontamination procedures will be used to decontaminate nondisposable sampling equipment.

1) Rinse and preclean with potable water.
2) Wash and scrub with nonphosphate-based detergent and potable water.
3) Rinse with potable water.
4) Rinse with distilled water.
5) Allow to air dry between sampling events.

## 4.7 Investigation-Derived Waste Management

Soil cuttings generated during fieldwork will be placed into 55-gallon drums pending laboratory analysis so that appropriate disposal can be determined. Following waste characterization of the drill cuttings, the waste material will be handled as required by applicable regulations.

Decontamination water and purge water will also be drummed for pending laboratory analysis so that appropriate disposal can be determined, based on the results of the initial groundwater sampling event.

Project waste, such as Tyvek suits, gloves, paper towels, etc., will be contained in 55-gallon drums or similar containers and labeled with the date, source of waste (well number and depth), and content description. Project waste also will be staged at the designated storage area until laboratory results are available and appropriate disposal is arranged.

# 4.8 Data Quality

## 4.8.1 Field Quality Control Samples

Field QC samples will be collected and analyzed as part of the groundwater monitoring program. The following QC sample types, to be collected at a frequency of one per groundwater sampling event:

- **Equipment rinsate blank**: A rinsate blank consisting of deionized water processed through decontaminated sampling equipment, collected into sample bottles and preserved.
- **Field duplicate sample**: A field duplicate samples is a replicate sample from a single sampling location submitted to a laboratory for the same set of analyses. For this project, field duplicates will be collected by filling two samples containers consecutively from the sampling location. Duplicates will be sent to the same laboratory, but will be identified with different sample numbers. The duplicate samples will not be collected from the upgradient well.

Field QC samples will be submitted blind to the laboratory (i.e., QC samples will be packaged and shipped in such a manner that the laboratory will not be aware of the nature of the samples).

## 4.8.2 Data Quality Evaluation

Laboratory reports containing analytical data and quality assurance/quality control (QA/QC) information will be reviewed for overall completeness of the data package. At a minimum, laboratory deliverables will include applicable notes regarding sample receipt, transmittal information, sample chain-of-custody forms, analytical results, methods and method detection limits (MDLs), method reporting limits (MRLs), and laboratory QC summaries. The reviewer will determine whether all required items are present and request copies of missing deliverables. Review of sample collection and handling procedures will include verification of the following:

- Completeness of samples submitted to laboratory for testing (i.e., where all planned samples collected)
- Completeness of field documentation, including chain-of-custody documentation
- Field equipment calibration and maintenance and/or quality of field measurements
- Adherence to proper sample collection procedures

Data validation will include a detailed review of all analytical results, including:

- MDLs and MRLs
- Holding times
- Analytical methods
- Field QC sample results
- Laboratory QC sample results

Data qualifiers will be applied, if needed, to any analytical results associated with QC exceedances.

## 4.9 Well Abandonment

Following completion of the two planned groundwater sampling events, the City plans to abandon (i.e., decommission) the monitoring wells if significant contaminant concentrations are not detected. BES will consult with DEQ before proceeding with well abandonment. Decommissioning will be conducted by an by an Oregon-licensed driller and will be conducted in accordance with Oregon Water Resources Department (OWRD) regulations, and DEQ's *Monitoring Well Drilling, Construction, and Decommissioning Guidance* (1992).

## 4.10 Schedule

This groundwater investigation plan will be initiated following completion of current site construction/redevelopment activities in the areas of the proposed wells. Monitoring well installation is currently planned to occur over a weekend in October or November, 2013. The actual installation date will depend on: the construction schedule, BES and contractor availability, and drill rig availability. It is anticipated that the monitoring well drilling, construction and development activities will require approximately one week to complete. The City plans to notify DEQ at least five working days in advance, but in no event less than 24 hours before monitoring well drilling and sampling activities in accordance with the IGA.

## 4.11 Additional Monitoring

The need for an additional groundwater monitoring well(s) or groundwater sampling event(s) will be assessed by BES and discussed with DEQ following the evaluation of the two proposed groundwater quality monitoring events and monthly groundwater level data. The following factors will be considered during the data evaluation and in making the determination of whether an additional monitoring well or sampling event is needed:

- Unanticipated groundwater flow direction(s);
- Adequacy of monitoring well network to assess groundwater quality at the downgradient property boundaries;
- Contaminant concentrations detected above DEQ RBCs or SLVs;
- Magnitude by which the RBC or SLV was exceeded;
- Detection of high levels of VOCs or TPH that indicate the potential presence of nonaqueous phase liquids (NAPLs); and
- Degree of variability in contaminant concentrations between events.

SECTION 5

# Stormwater Investigation

## 5.1 Objectives

The objective of this stormwater investigation is to evaluate existing data and document implementation of the redeveloped stormwater system to demonstrate: 1) that the former Westinghouse property is not a significant current or future source of contaminants to the river; and 2) that a DEQ Source Control Decision is warranted in accordance with applicable guidance (DEQ, 2009; DEQ, 2010b; DEQ/EPA, 2005). Specific objectives include describing the:

- Design and operation of the redeveloped Site stormwater system and fate of stormwater discharge from the Site during peak storms;
- Design and operation of the City's combined sewer conveyance system that serves the Site and fate of Site stormwater conveyed in the City system;
- Source control measures implemented at the Site as a result of Site redevelopment and future implementation of the institutional controls described in the approved *Revised Removal/Remedial Action Plan*;
- The potential for legacy contaminated sediments from the Site, within the City combined sewer conveyance downstream of the Site, to be a current source to the river; and
- Basis for the conclusion that Site stormwater does not pose a current or future threat to the Willamette River.

## 5.2 Stormwater Investigation Data Sources

This stormwater source control investigation will be performed using, but not limited to, the following sources of information and data:

- City outfall source investigations and line cleaning records;
- Information collected during implementation of the approved *Revised Removal/Remedial Action Plan* including:
    - Documentation of removal/abandonment of former stormwater system.
    - Documentation of residual PCB-contaminated soil and understanding of soil concentrations in areas of new stormwater system.
    - Site redevelopment records (e.g., new stormwater system design, placement of soil cap).

- City CSO abatement project as-built drawings and design documents to determine fate and transport of Site stormwater discharged offsite.

## 5.3 Site Stormwater System

Site redevelopment is currently underway. Redevelopment includes the removal of existing stormwater systems, the construction of lined vegetated stormwater swales, and the routing of Site stormwater to designated infiltration areas at the Interstate Maintenance Facility to manage stormwater onsite. The Site occupies the northeast corner of the Interstate Maintenance Facility; key features of the Interstate Maintenance Facility stormwater system that will manage Site stormwater following redevelopment (e.g., infiltration gallery, flow through planters, etc.) are shown on Figure 2 of the *Revised Removal/Remedial Action Plan*. The layout of the new stormwater system on the Site is shown on Figure 2. Although a swale overflow connection to the City's conveyance system will remain, this portion of the new Interstate Maintenance Facility system is designed to treat flows up to 2-year storm events.

Following redevelopment of the Site, the entire Site will be capped by a building, asphaltic concrete, concrete, or lined stormwater swales, eliminating the potential for stormwater to contact and erode contaminated soil. Therefore, no complete current or future stormwater pathway will exist.

## 5.4 City Stormwater System

As of December 1, 2011, the City completed diversion of the shared conveyance system that receives stormwater from the Site to the East Side CSO Tunnel. There it is combined with storm and sanitary flow from multiple drainage areas on the east side of the Willamette River, before it is discharged to the City's wastewater treatment plant. This diversion was completed as part of the City's CSO abatement project. Stormwater from the Site now discharges to the City's combined sewer system; stormwater from the Site only reaches the river during infrequent overflows from the East Side CSO tunnel.

## 5.5 Source Control Measures

Source control measures implemented at the Site as part of Site redevelopment and institutional controls described in the approved *Revised Removal/Remedial Action Plan* will be documented in the SCE.

SECTION 6

# Reporting and Analysis

Following completion of the source investigations described in this work plan, a Source Control Evaluation (SCE) will be prepared in accordance with the JSCS and DEQ guidance. The SCE will demonstrate that the Site is not a current or future significant source of contaminants to the Willamette River via the groundwater or stormwater pathways and will support a DEQ Source Control Decision for the Site.

SECTION 7

# References


AMEC. 2013. Contaminated Media Management Plan – Revision 1 - Former Westinghouse Property – Interstate Renovation Project – 614 N Tillamook Street – Portland Oregon. Prepared for City of Portland Bureau of Environmental Services. Prepared by AMEC Environmental & Infrastructure, Inc. Dated February 6, 2013.

Ash Creek. 2011. Remedial Investigation Report, Tarr Facility, Portland, Oregon. Prepared for Tarr, Inc. by Ash Creek Associates, Inc. November 15, 2011.

ASTM. 2000. Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). American Society for Testing and Materials (ASTM) Designation: D 2488-00. This standard is issued under the fixed designation D 2488; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision.

BES. 2005. Summary of Pre-Demolition Characterization Cleanup Project, 614 N. Tillamook, Portland, Oregon 97227. Prepared for City of Portland Water Bureau by City of Portland Bureau of Environmental Services Coordinated Site Analysis Program, Special Waste Division. October 13, 2005.

BES. 2012. Subject: Voluntary Cleanup Program – Intent to Participate – Former Westinghouse Property – DEQ ECSI No. 4497. Letter from J. O'Donovan, BES to D. Hafley, DEQ. September 24, 2012 and atttached: Scope of Work. CBS. 2008. Portland Harbor Superfund Site – 104(e) Response, Westinghouse Electric Corporation. June 27, 2008

DEQ. 1992. Ground Water Monitoring Well, Drilling, Construction and Decommissioning. DEQ Guidance Document. Prepared by the Oregon Department of Environmental Quality (DEQ). Dated August 24, 1992.

DEQ. 2003. Risk-Based Decision-Making for the Remediation of Petroleum-Contaminated Sites. Land Quality Division, Environmental Cleanup and Tanks Program, Oregon Department of Environmental Quality. (September 22, 2003; Table revised 2011).

DEQ. 2009. Guidance for Evaluating the Stormwater Pathway at Upland Sites. Oregon Department of Environmental Quality Environmental Cleanup Program. January 2009 (updated October 2010).

DEQ. 2010a. Intergovernmental Agreement (IGA) for Oversight of Environmental Investigations and Remedial Actions, entered into by the City and DEQ on February 1, 2010 (DEQ NO. LQVC-NWR•09-08).

DEQ. 2010b. "Tool for Evaluating Stormwater Data" – Appendix E to Guidance for Evaluating the Stormwater Pathway at Upland Sites. January 2009 (updated October 2010).

DEQ. 2012a. Revised RRAP - Former Westinghouse Site. Email from D. Hafley, DEQ to John O'Donovan (BES, dated June 5, 2012. Email provides approval of the Revised Removal/Remedial Action Plan (dated May 2012).

DEQ. 2012b. Subject: Agreement and Scope of Work - Former Westinghouse Site – ECSI# 4497. Letter from D. Hafley, DEQ to John O'Donovan (BES). October 8, 2012. Letter provides approval of the City's September 24, 2012 letter outlining the proposed approach for completion of site investigation, cleanup and source control activities.

DEQ. 2013. Source Control Evaluation Work Plan – Westinghouse Site – ECSI #4497. Letter from D. Hafley (DEQ) to John O'Donovan (City of Portland – Bureau of Environmental Services). July 3, 2013. Letter provides DEQ comments on June 2013 Source Control Evaluation Work Plan, prepared by GSI Water Solutions, Inc. for the City of Portland.

DEQ/EPA. 2005. Portland Harbor Joint Source Control Strategy. Final. December 2005, as amended July 2007.

EPA. 1996. Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures. Prepared by Robert Puls and Michael Barcelona. United States Environmental Protection Agency (EPA). Office of Research and Development - Office of Solid Waste and Emergency Response. EPA/540/S-95/504. Ground Water Issue. April 1996.

EPA. 2005. Polychlorinated Biphenyl (PCB) Site Revitalization Guidance Under the Toxic Substances Control Act (TSCA). November 2005. OPPT-2004-0123.

EPA. 2010. Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells. Prepared by Quality Assurance Unit. United States Environmental Protection Agency (EPA) – Region 1. EQASOP-GW001. Region 1 Low-Stress (Low-Flow) SOP Revision Number 3. Date July 30, 1996. Revised: January 19, 2010.

EPA. 2012. Technical Factsheet on: Polychlorinated Biphenyls (PCBs). Downloaded from http://www.epa.gov/ogwdw/pdfs/factsheets/soc/tech/pcbs.pdf. March 19, 2012.

EPA. 2013. Review Comments - Source Control Evaluation Work Plan – Former Westinghouse Property. Email from S. Sheldrake (DEQ) to Dan Hafley (DEQ). Dated August 8, 2013. Email provides EPA comments (including comments from Dave Bartus, EPA TSCA Program) on the June 2013 Source Control Evaluation Work Plan, prepared by GSI Water Solutions, Inc. for the City of Portland.

GSI. 2012. Revised Removal/Remedial Action Plan for the Former Westinghouse Property – 614 North Tillamook Street – Portland, Oregon – ECSI 4497. Prepared for the City of Portland Bureau of Environmental Services (BES) and the Portland Water Bureau (PWB) by GSI Water Solutions, Inc. (GSI). May 2012.

Landau Associates. 2012. Waste Oil Tank Removal Report, Former Westinghouse Property, 614 North Tillamook Street, Portland, Oregon, ECSI Number 4497. Prepared for City of Portland Bureau of Environmental Services. January 5, 2012.Madin, I. P. 1990.

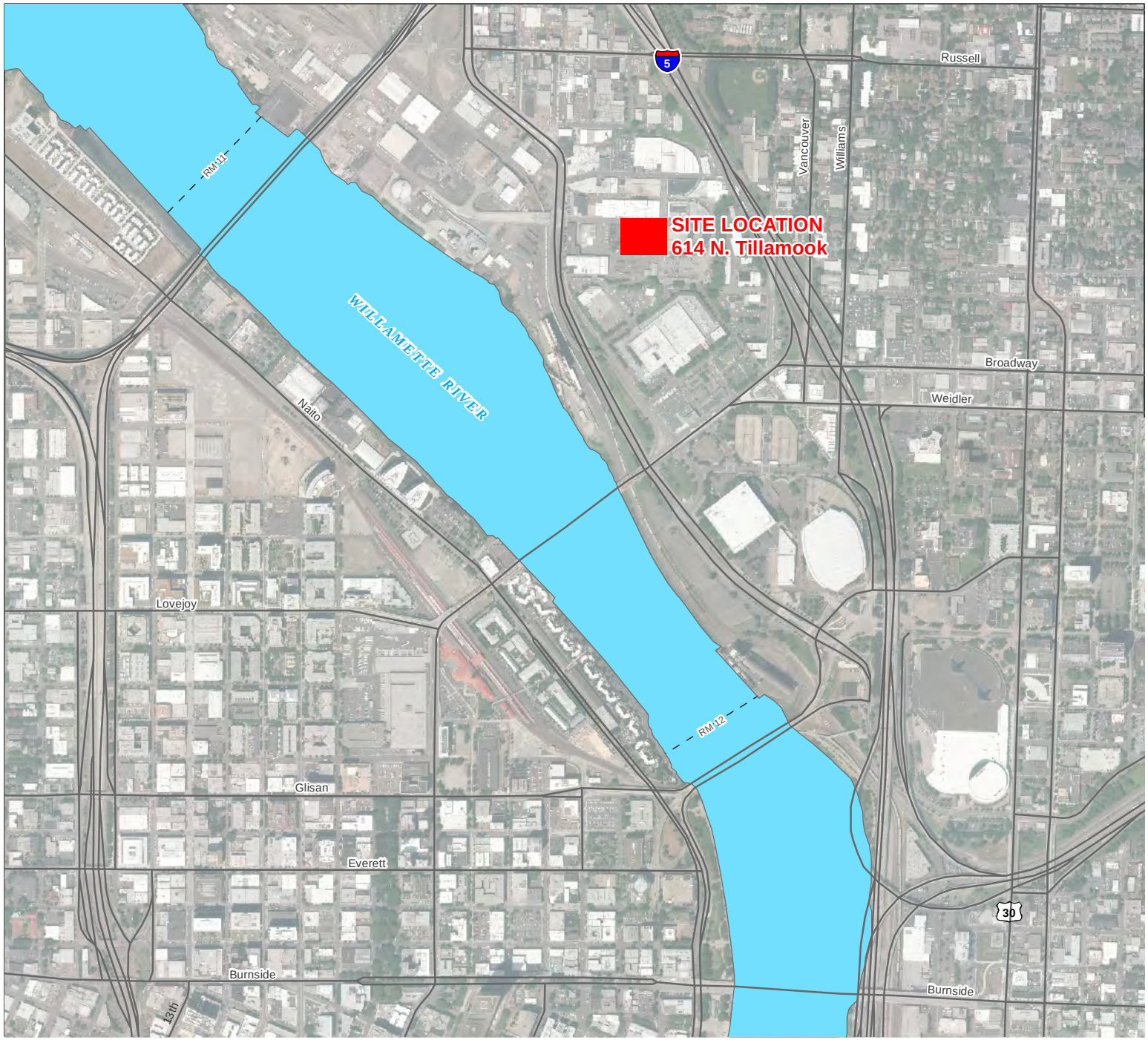
[Map]. Earthquake-hazard geology maps of the Portland Metropolitan Area, Oregon, OFR 0-90-02.

PBS. 2011. Geotechnical Investigation Report, Interstate Maintenance Facility – Portland Water Bureau, 1900 NE Interstate Avenue, Portland, Oregon. Prepared for Michael Willis Architects by PBS Engineering & Environmental. May 4, 2011.

Shannon & Wilson, Inc. 2011. Data Report for Soil and Groundwater Investigation, Former Westinghouse Facility– 7ESWACS00023, 1900 N Interstate Avenue, Portland, Oregon. Letter report to J. O'Donovan, City of Portland Bureau of Environmental Services. August 19, 2011.

USGS. 2006. National Field Manual for the Collection of Water Quality Data: Chapter A4, Collection of Water Sample. U.S. Geological Survey. Techniques of Water-Resources Investigations. Book 9 – Handbooks for Water-Resources Investigations. Version 2.0, September 2006.

# Figures




N

0 500 1,000
Feet

# FIGURE 1

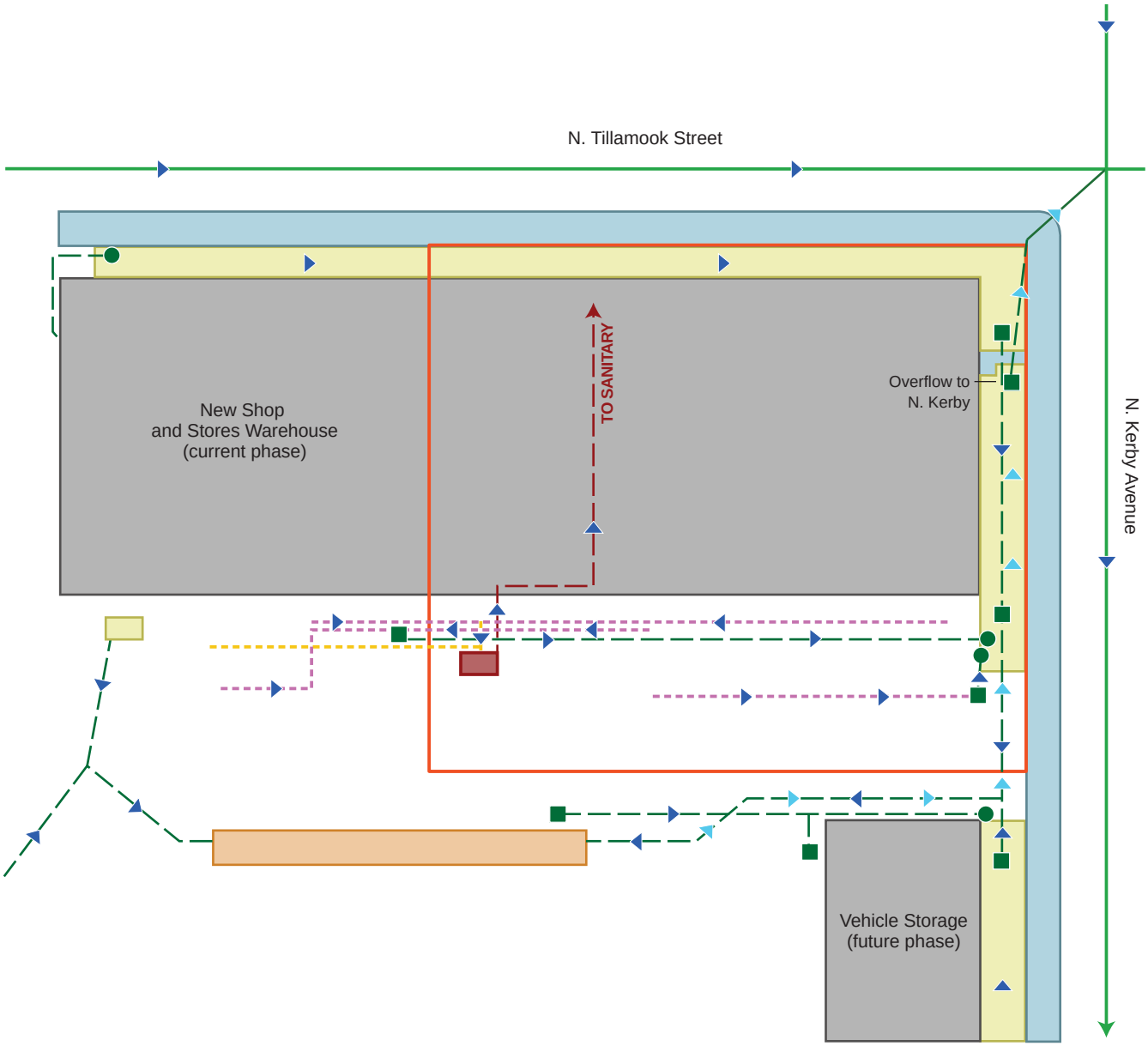
Former Westinghouse
Site Location

**Disclaimer:**
Information contained on this map is accurate according to available records, however the City of Portland makes no warranty, expressed or implied, as to the completeness or accuracy of the information published.

**Prepared By:**
GSI, March 10, 2013
005_SC\RI\OF_Basin_43\
Westinghouse\SCE

**Source:**
City of Portland BES,
Aerial Photo 2012

GSI Water Solutions, Inc.




**NOTES:**

1. The details and locations of the planned onsite stormwater features are based on available design drawings. Actual details and feature locations may be modified and/or relocated during construction. The final as-built stormwater system will be documented and presented in a subsequent report.
2. Modified from Development of Portland Water Bureau Utility Plan. Bid Set drawings prepared by MWA Architects/KPFF Consulting Engineers. Utility Plan - Overall Plan.
   - Drawing No. STE-C-140. Sheet No. 61 of 260. Dated 2/15/2012, plot date 8/15/2012.
   - Drawing No. SSW-P-130. Sheet No. 231 of 260. Dated 8/16/2012.
   - Drawing No. STE-C-142. Sheet No. 63 of 260. Dated 1/15/2013.

**LEGEND**

- Former Westinghouse Facility
- Existing Storm Line
- Flow Direction
- Overflow Direction

**Planned Development Features**

- Outfall
- Inlet
- Planned Storm Piping
- Planned Sanitary Piping
- Trench Drain
- Oil/Water Separator Input
- Lined Flow Through Planter and Perforated Pipe (discharge to infiltration gallery)
- Infiltration Gallery (subsurface)
- New Building
- Concrete Sidewalk
- Oil/Water Separator

# FIGURE 2

## Planned Stormwater Features Schematic

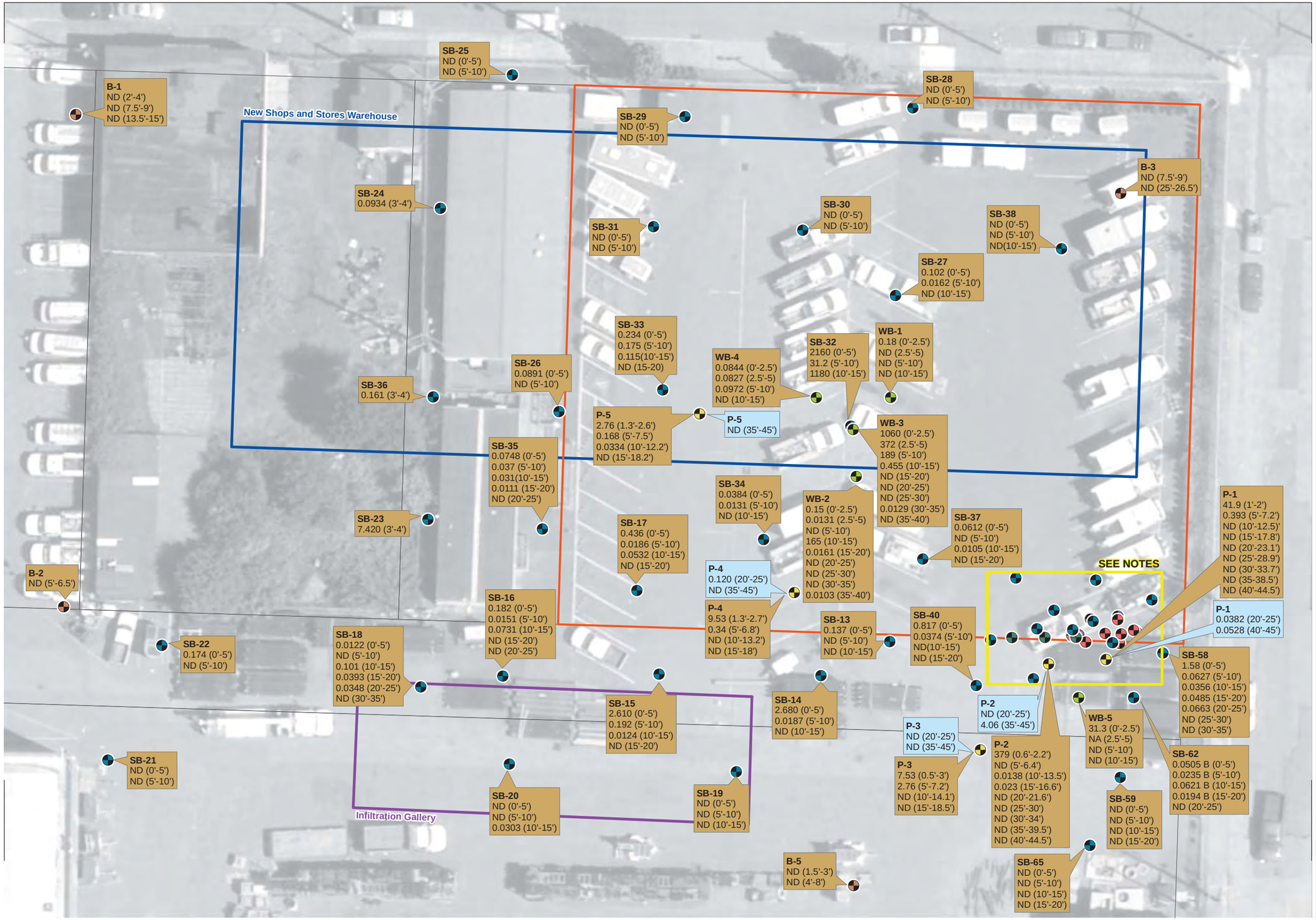
Former Westinghouse Facility

N

0 25 50

Feet

GSI Water Solutions, Inc.




## LEGEND

**Sample Dates**

- March 2012
- January 2012
- October 2011
- August 2011
- June 2011
- February 2011
- November 2007

**Sample Type**

- Soil Sample
- Groundwater Sample
- Former Westinghouse Facility
- Tax Lot

## NOTES:

Subsurface soil concentration in mg/Kg at (x) feet below ground surface.
Groundwater concentration in µg/L at (x) feet below ground surface.
ND = Not Detected
NA = Not Analyzed
B = PCBs were detected in associated method blanks; sample concentration may be biased high.

a) Figure includes only data presented in the Removal/Remedial Action Plan (GSI, 2012), data collected during removal and construction activities are not included and will be submitted at a later date.
b) Additional results presented in the Removal/Remedial Action Plan (GSI, 2012)

N

0 15 30
Feet

# FIGURE 3

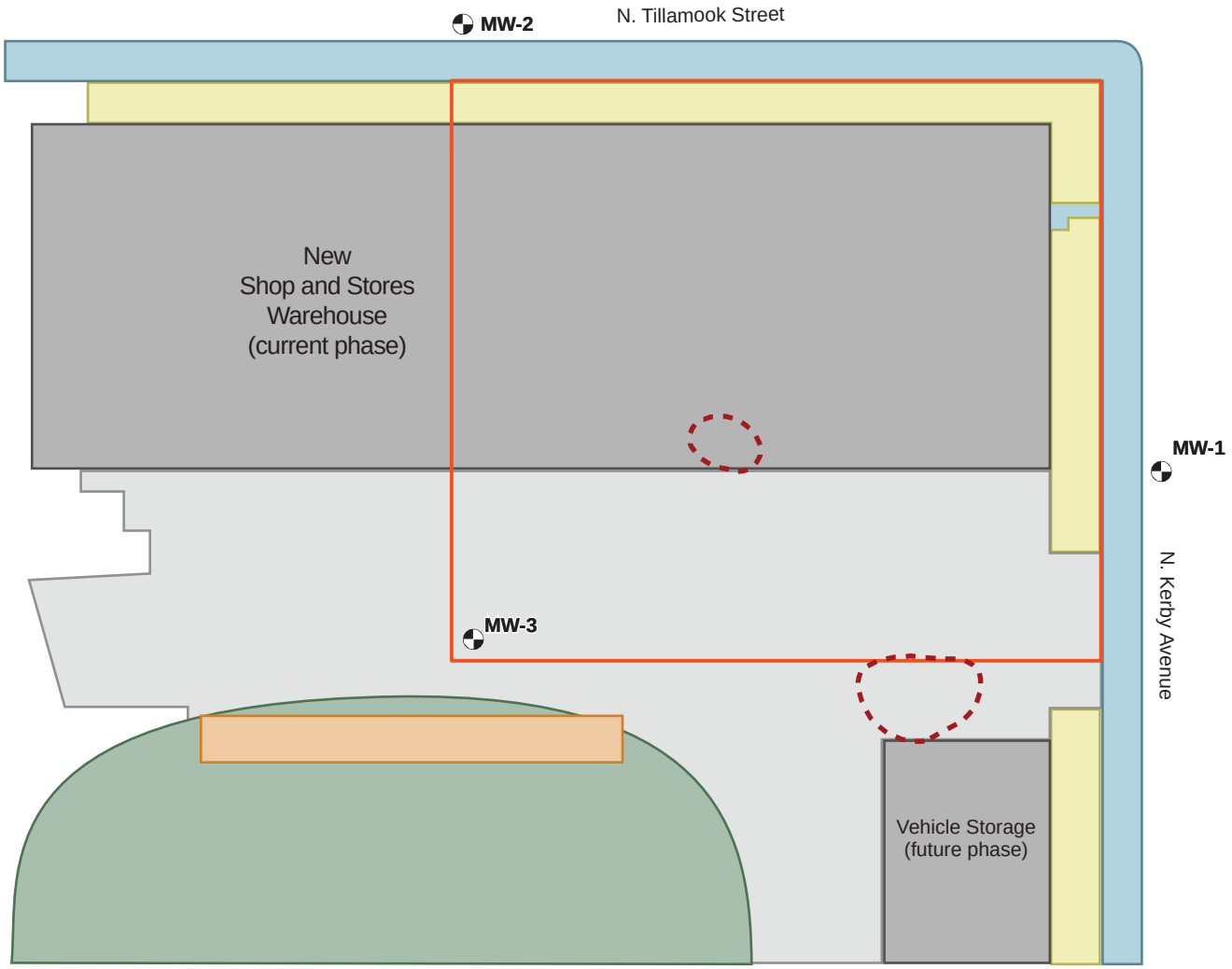
Summary of Total PCB Concentrations in Soil and Groundwater
Former Westinghouse Facility

**Disclaimer:**
Information contained on this map is accurate according to available records, however the City of Portland makes no warranty, expressed or implied, as to the completeness or accuracy of the information published.

**Prepared By:**
GSI, June 26, 2013
005_SC\RI\OF_Basin_43\
Westinghouse\SCE

**Source:**
City of Portland BES,
Aerial Photo 2010

GSI Water Solutions, Inc.




The details and locations of the planned onsite redevelopment features are based on available design drawings. Actual details and feature locations may be modified during construction. The final redeveopment features will be documented and presented in a subsequent report.

**LEGEND**

**Planned Development Features**

- New Building
- Asphalt
- Lined Flow Through Planter (discharge to infiltration gallery)
- Vehicular Concrete
- Infiltration Gallery (subsurface)
- Concrete Sidewalk
- Planned Monitoring Well Location
- Former Westinghouse Facility
- Targeted Soil Removal Areas (Removal/Remedial Action Plan; GSI, 2012)

**NOTES**

Modified from Development of Portland Water Bureau Interstate Maintenance Facility Site.
Permit set drawings prepared by MWA Architects/KPFF Consulting Engineers.
Utility Plan - Area 2. Drawing No. STE-C-142. Sheet No. 63 of 260. Dated 2/15/2012.

FIGURE 4

Proposed Monitoring Well Locations

Former Westinghouse Facility

N

0 25 50

Feet

GSI Water Solutions, Inc.

# Tables

**Table 1**
**Laboratory Methods, Sample Containers, and Holding Times for Analysis of Groundwater Samples**

| Analyte | Sample Preparation | | Quantitative Analysis | | Container Type | Preservation | Holding Time |
|---|---|---|---|---|---|---|---|
| | Protocol | Procedure | Protocol | Procedure | Groundwater Samples | | |
| Total Petroleum Hydrocarbons | NWTPH-HCID | Northwest Method NWTPH-HCID (with appropriate followup for TPH-Gx or -Dx as needed) | NWTPH-HCID | GC | 1-Liter Amber Glass | 4ºC | 14 days until extraction; 40 days after extraction |
| Total Organic Carbon | SM 5310B | Acid pretreatment | SM 5310C | Combustion; coulometric titration | 250ml Amber Glass | 4ºC H2SO4 to pH<2 | 28 days |
| PCB Aroclors | EPA 3510 | Separatory Funnel Liquid Liquid Extraction | EPA 8082 | GC/ECD | 1L Amber Glass | 4ºC | 1 year |
| | EPA 3665 | Sulfuric acid cleanup | | | | | |
| | EPA 3620C | Florisil Cleanup | | | | | |
| Volatile Organic Compounds (VOCs) | EPA 5030 | Purge & Trap | EPA 8260B | GC/MS | 3 - 40 ml Glass Vials with Teflon-lined Caps | 4ºC HCL to pH<2 | 7 days |

**Notes:**
EPA - U.S. Environmental Protection Agency
GC/ECD - gas chromatography/electron capture detection
GC/MS - gas chromatography/mass spectrometry
HCID - Hydrocarbon identification.
PCB - polychlorinated biphenyl

## Table 2

## Analytes, Method Detection Limits, and Target Method Reporting Limits for Groundwater Samples

| Analytes | Unit | MDL | MRL[a] |
|---|---|---|---|
| **PCB Aroclors** | | | |
| Aroclor 1016/1242 | ug/L | 0.025 | 0.025 |
| Aroclor 1221 | ug/L | 0.05 | 0.05 |
| Aroclor 1232 | ug/L | 0.025 | 0.025 |
| Aroclor 1248 | ug/L | 0.025 | 0.025 |
| Aroclor 1254 | ug/L | 0.025 | 0.025 |
| Aroclor 1260 | ug/L | 0.025 | 0.025 |
| Aroclor 1262 | ug/L | 0.025 | 0.025 |
| Aroclor 1268 | ug/L | 0.025 | 0.025 |
| Total Aroclors | ug/L | -- | -- |
| **Conventionals** | | | |
| Total Organic Carbon | mg/L | 1 | 1 |
| **VOCs** | | | |
| Standard Analyte List | ug/L | 0.2 - 20 | 0.2 - 20 |
| **Total Petroleum Hydrocarbons** | | | |
| Diesel | mg/L | 0.25 | 0.08 |
| Lube Oil | mg/L | 0.5 | 0.2 |
| Gasoline | mg/L | 0.08 | 0.1 |

**Notes:**

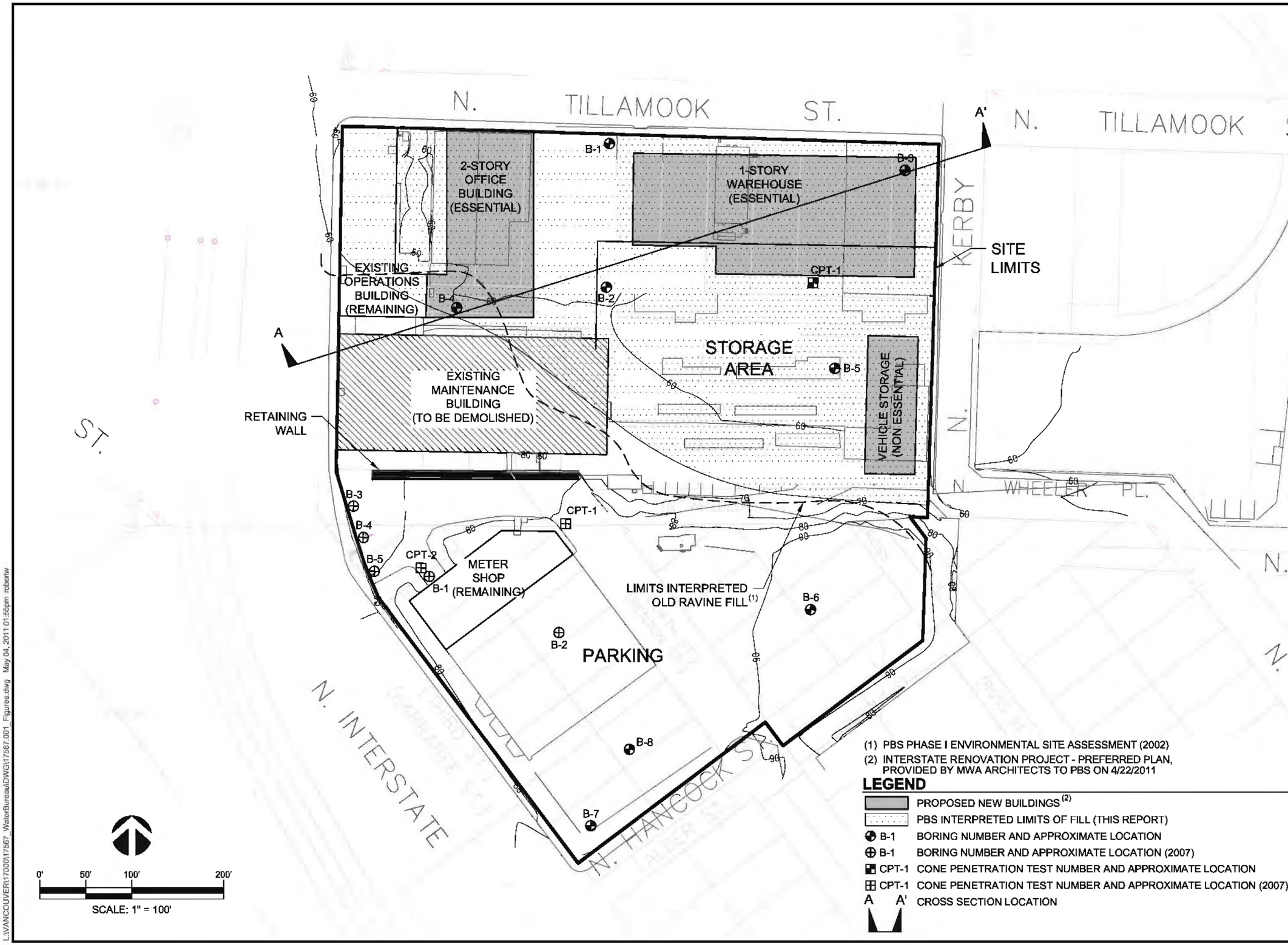
[a] The MRL generally represents the level of lowest calibration standard (i.e., the practical quantitation limit)

MDL = Method detection limit; MDLs are updated periodically by the laboratories. The MDLs that are in effect at the laboratory at the time analysis are completed will be used for sample analysis and data validation and, therefore, may differ slightly from the MDLs shown in this table.

MRL = Method reporting limit; MRLs are updated periodically by the laboratories. The MRLs that are in effect at the laboratory at the time analysis are completed will be used for sample analysis and data validation and, therefore, may differ slightly from the MRLs shown in this table.

# Appendix A

## Figures from Previous Reports




(1) PBS PHASE I ENVIRONMENTAL SITE ASSESSMENT (2002)
(2) INTERSTATE RENOVATION PROJECT - PREFERRED PLAN, PROVIDED BY MWA ARCHITECTS TO PBS ON 4/22/2011

## LEGEND

- PROPOSED NEW BUILDINGS (2)
- PBS INTERPRETED LIMITS OF FILL (THIS REPORT)
- B-1 BORING NUMBER AND APPROXIMATE LOCATION
- B-1 BORING NUMBER AND APPROXIMATE LOCATION (2007)
- CPT-1 CONE PENETRATION TEST NUMBER AND APPROXIMATE LOCATION
- CPT-1 CONE PENETRATION TEST NUMBER AND APPROXIMATE LOCATION (2007)
- A A' CROSS SECTION LOCATION

PBS
Engineering + Environmental
1310 Main Street
Vancouver, WA 98660
360.690.4331 Main
360.696.9064 Fax
www.pbsenv.com

# INTERSTATE MAINTENANCE FACILITY

1900 NORTH INTERSTATE AVENUE
PORTLAND, OREGON

**SITE EXPLORATION PLAN**

| | |
|---|---|
| PROJECT: | 17567.001 |
| DATE: | MAY 2011 |
| FIGURE: | 3 |

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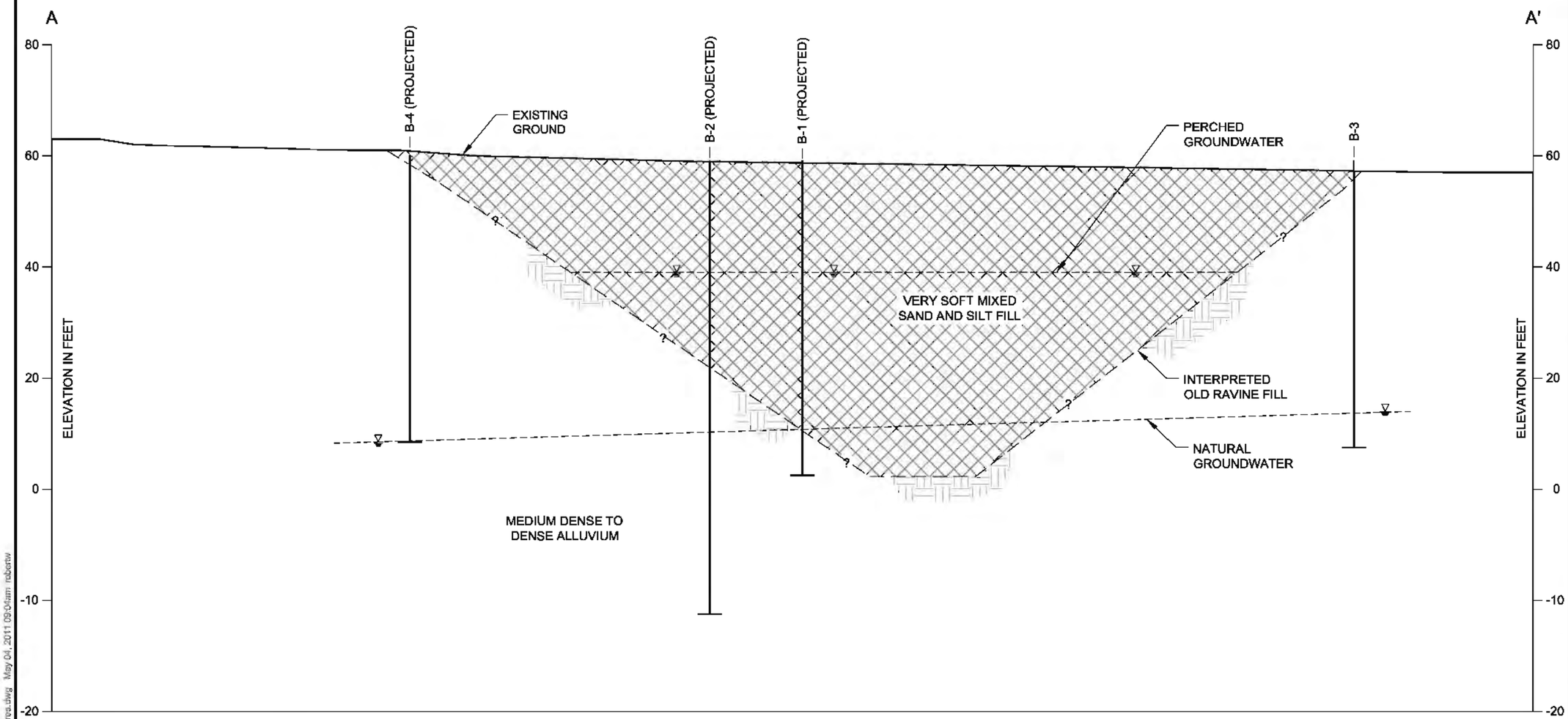


HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 1" = 20'

**LEGEND**

- GROUNDWATER ELEVATION OBSERVED IN BORINGS
- FILL

PBS
Engineering + Environmental
1310 Main Street
Vancouver, WA 98660
360.690.4331 Main
360.696.9064 Fax
www.pbsenv.com

# INTERSTATE MAINTENANCE FACILITY

1900 NORTH INTERSTATE AVENUE
PORTLAND, OREGON

**CROSS SECTION**

**A-A'**

| | |
|---|---|
| PROJECT: | 17567.001 |
| DATE: | MAY 2011 |
| FIGURE: | 4 |

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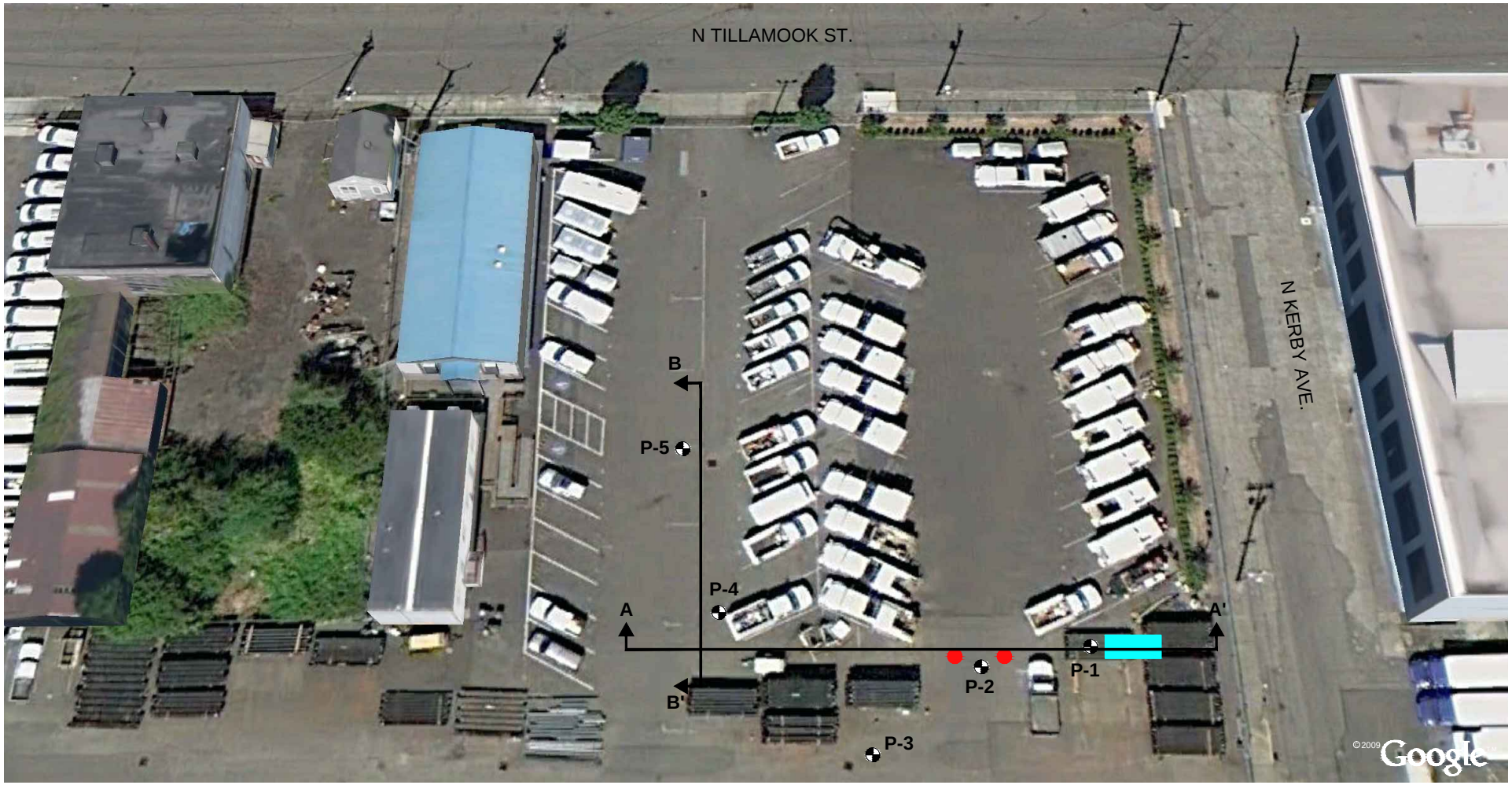



LEGEND

P-1 Boring Designation and Approximate Location

Vertical Pipe Approximate Location

Tank Approximate Location

A A' Profile Designation and Approximate Location

0 80 160

Approximate Scale in Feet

N

NOTE

Map adapted from aerial imagery provided by Google Earth Pro, reproduced by permission granted by Google Earth ™ Mapping Service.

Westinghouse DEQ Investigation
1900 N. Interstate Avenue
Portland, Oregon

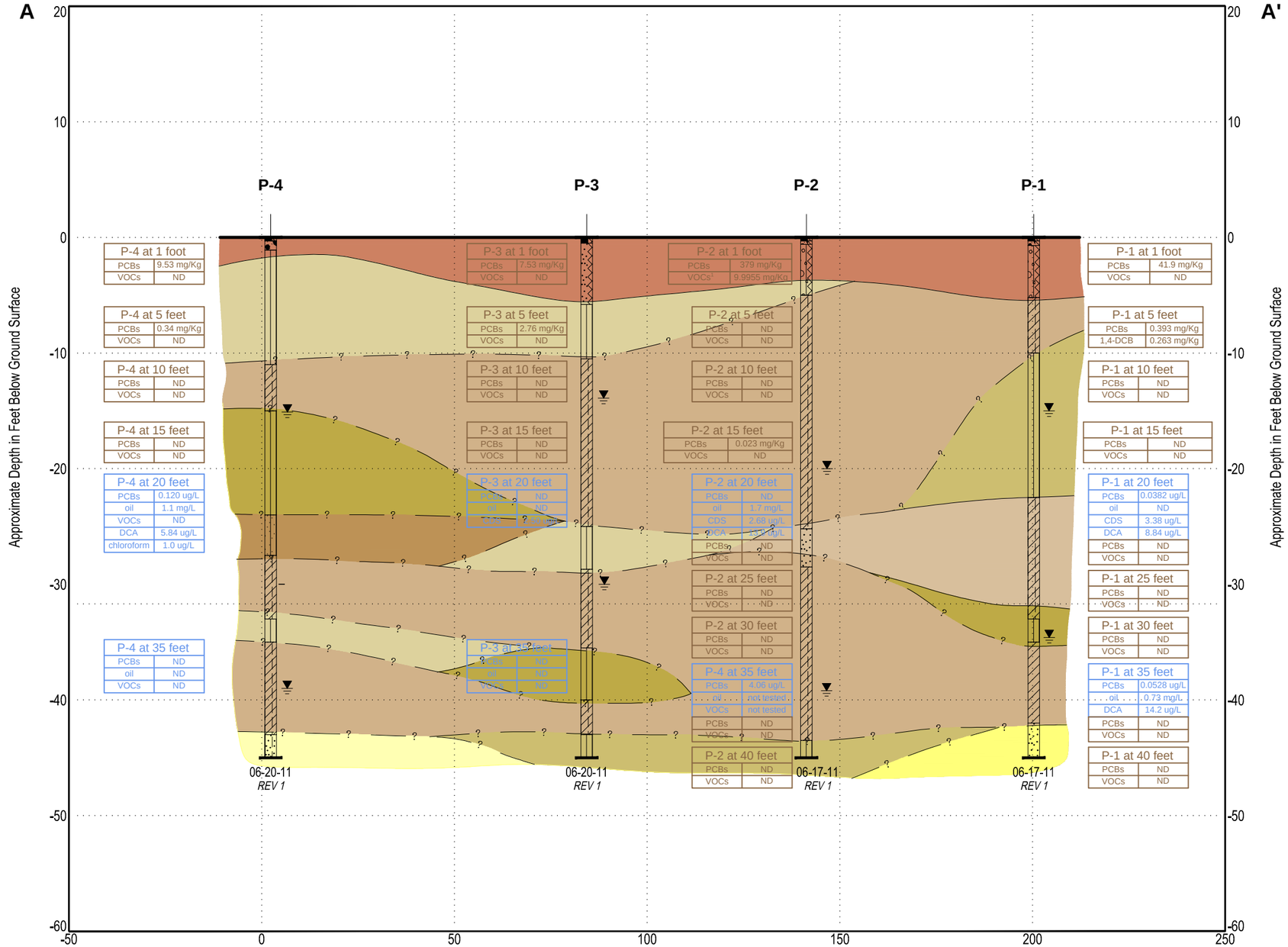
**EXPLORATION PLAN**

August 2011 24-1-03655-001

**SHANNON & WILSON, INC.**
Geotechnical and Environmental Consultants

**FIG. 2**

**FIG. 2**




## LEGEND

- Fill
- Silt with Sand
- Silty Clay
- Silt
- Clayey Silt
- Sandy Silt
- Sand with Silt
- Silty Sand
- Sand
- Water Level

| | |
|---|---|
| ug/L | micrograms per Liter |
| mg/L | milligrams per Liter |
| mg/Kg | milligrams per Kilogram |
| PCBs | polychlorinated biphenyls |
| VOCs | volatile organic compounds |
| DCB | dichlorobenzene |
| CDS | carbon disulfide |
| DCA | 1,1-dichloroethane |
| PCE | tetracloroethene |
| TCA | 1,1,1-trichloroethane |
| ND | Not Detected |

Typical:

| P-4 at 1 foot | |
|---|---|
| PCBs | 9.53 mg/Kg |
| VOCs | ND |

Concentrations in brown represent soil testing results

Typical:

| P-4 at 35 feet | |
|---|---|
| PCBs | ND |
| oil | ND |
| VOCs | ND |

Concentrations in blue represent groundwater testing results

Distance in Feet

| P-2 at 1 foot VOCs[1] | |
|---|---|
| Benzene | 0.0325 mg/Kg |
| Chlorobenzene | 0.226 mg/Kg |
| 1,2-DCB | 1.26 mg/Kg |
| 1,3-DCB | 1.46 mg/Kg |
| 1,4-DCB | 4.05 mg/Kg |
| toluene | 0.147 mg/Kg |
| 1,2,3-trichlorobenzene | 0.781 mg/Kg |
| 1,2,4-trichlorobenzene | 1.60 mg/Kg |
| 1,2,4-trimethylbenzene | 0.131 mg/Kg |
| total xylenes | 0.308 mg/Kg |
| | 9.9955 mg/Kg |

0 30 60

Horizontal Scale in Feet

0 10 20

Vertical Scale in Feet

Westinghouse DEQ Investigation
1900 N. Interstate Avenue
Portland, Oregon

**PLAN OF EXPLORATIONS**
**PROFILE A-A'**

August 2011 24-1-03655-001

**SHANNON & WILSON, INC.**
Geotechnical and Environmental Consultants

**FIG. 3**

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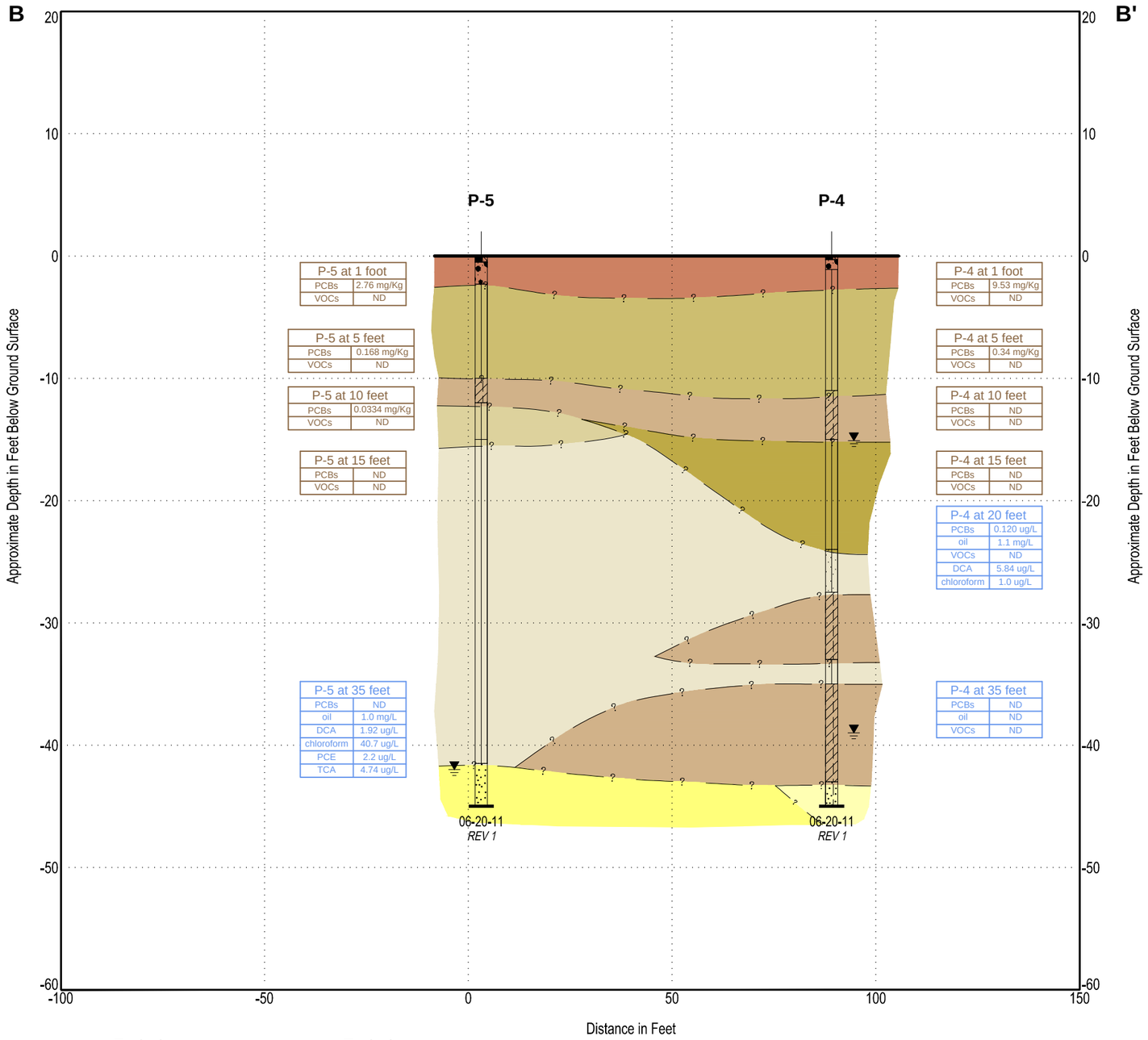


LEGEND

- Fill
- Silt with Sand
- Silty Clay
- Silt
- Clayey Silt
- Silty Sand
- Sand
- Water Level

| | |
|---|---|
| ug/L | micrograms per Liter |
| mg/L | milligrams per Liter |
| mg/Kg | milligrams per Kilogram |
| PCBs | polychlorinated biphenyls |
| VOCs | volatile organic compounds |
| DCB | dichlorobenzene |
| CDS | carbon disulfide |
| DCA | 1,1-dichloroethane |
| PCE | tetracloroethene |
| TCA | 1,1,1-trichloroethane |
| ND | Not Detected |

Typical:

| P-4 at 1 foot | |
|---|---|
| PCBs | 9.53 mg/Kg |
| VOCs | ND |

Concentrations in brown represent soil testing results

Typical:

| P-4 at 35 feet | |
|---|---|
| PCBs | ND |
| oil | ND |
| VOCs | ND |

Concentrations in blue represent groundwater testing results

0 20 40

Horizontal Scale in Feet

0 10 20

Vertical Scale in Feet

Westinghouse DEQ Investigation
1900 N. Interstate Avenue
Portland, Oregon

**PLAN OF EXPLORATIONS**
**PROFILE B-B'**

July 2011 24-1-03655-001

**SHANNON & WILSON, INC.**
Geotechnical and Environmental Consultants

**FIG. 4**

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