ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES

Main Street Fanno Creek Properties (aka Saxony-Pacific Properties)

12535 SW Main Street

Tigard, Oregon

Prepared for:

City Center Development Agency

c/o Jordan Ramis PC
Two Centerpoint Drive, 6th Floor
Lake Oswego, Oregon 97035

Prepared by:

Amec Foster Wheeler Environment & Infrastructure, Inc.

7376 SW Durham Road
Portland, Oregon 97224
(503) 639-3400

November 2015

Project No. 5-61M-0126803

DRAFT

November 20, 2015
Project No.: 5-61M-126803

City Center Development Agency
c/o Jordan Ramis PC
Two Centerpointe Drive, 6th Floor
Lake Oswego, Oregon 97035

Attention: Mr. Chris Reive

Subject: Analysis of Brownfield Cleanup Alternatives
Saxony-Pacific Properties
12535 SW Main Street
Tigard, Oregon

Dear Chris:

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) is pleased to submit this Analysis of Brownfield Cleanup Alternatives for the Saxony-Pacific property located at 12535 SW Main Street in Tigard, Oregon.

We appreciate the opportunity to serve you on this project. If you have any questions or require further information, please feel free to contact us at (503) 639-3400.

Sincerely,

Amec Foster Wheeler
Environment & Infrastructure, Inc.

DRAFT

John L. Kuiper, R.G.
Principal Geologist

DRAFT

Russ Bunker, R.G.
Sr. Associate Geologist

Attachments

CR/jm/ay

DRAFT

Amec Foster Wheeler Environment & Infrastructure, Inc.
7376 SW Durham Road
Portland, Oregon
USA 97224
Tel+1 (503) 639-3400
Fax+1 (503) 620-7892
www.amecfw.com

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1
1.1 Site Location and Description 1
1.2 Site Background 2
1.3 Assessment Chronology 3
2.0 CONCEPTUAL SITE MODEL 3
2.1 Land Use and Zoning 4
2.2 Beneficial Water use Determination 4
2.3 Screening-Level Human Health Risk Assessment 5
2.4 Receptors 5
2.4.1 Exposure Routes 5
2.5 Screening-Level Ecological Risk Assessment 6
3.0 ASSESSMENT SUMMARY 7
3.1 Geology and Hydrogeology 7
3.2 Site Soil 7
3.3 Surface Water Hydrology 8
4.0 NATURE AND EXTENT OF CONTAMINATION 8
4.1 Soil 9
4.2 Soil Gas 9
4.3 Sediment 9
4.4 Groundwater 10
5.0 ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES 11
5.1 Remedial Action Area and Objectives 11
5.2 Definition and Evaluation of Remedial Alternatives 12
5.2.1 Proposed Remedial Alternatives 12
5.2.2 Sustainability Considerations 14
5.2.3 Changing Climate Concerns 14
5.2.4 Major Assumptions 15
5.3 Cleanup Alternatives (Alternatives 1, 2, 3) 15
5.3.1 Alternative 1: No Action 15
5.3.2 Alternative 2: Vapor mitigation (engineering controls), source removal (“hot spot” soil only), institutional controls, and monitored natural attenuation (MNA) 16
5.3.3 Alternative 3: Source removal (both soil and groundwater), institutional controls, and MNA 17
6.0 PREFERRED REMEDIAL ALTERNATIVE 19
REFERENCES 20
LIMITATIONS 22

DRAFT

TABLE

Table 1 Ranking of Alternatives

FIGURES

Figure 1 Site Location Map

Figure 2 Site Plan

Figure 3 Schematic Conceptual Site Model

Figure 4 Human Health Risk Assessment (HHRA) Conceptual Site Model (CSM)

Figure 5 Site Topography and Anticipated Stormwater Flow Directions

Figure 6 Groundwater Total HVOC Concentration Contour Map

APPENDIX

Appendix A Analytical Tables

DRAFT

ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES

Saxony-Pacific Properties
12535 SW Main Street
Tigard, Oregon

1.0 INTRODUCTION

On behalf of the City Center Development Agency, Amec Foster Wheeler Environment, & Infrastructure, Inc. (Amec Foster Wheeler) has prepared this Analysis of Brownfield Cleanup Alternatives (ABCA) for the Saxony-Pacific Properties located at 12535 SW Main Street, Tigard, Oregon (Site). The Site is identified on the Oregon Department of Environmental Quality (DEQ) Brownfields database. A prospective purchaser agreement (PPA) between the City Center Development Agency and DEQ, stipulates cleanup requirements for the Site (DEQ, 2015).

The objective of this ABCA is to present cleanup remedy alternatives for the Site and guide selection of a remedy based on a systematic evaluation of the alternatives. Each alternative is evaluated using the following factors: 1) effectiveness, 2) long-term reliability, 3) implementability, 4) implementation risk, and 5) reasonableness of cost. This ABCA was completed in general accordance with US Environmental Protection Agency (EPA) guidelines for conducting removal actions (Code of Federal Regulations [CFR] 40, Part 300, Subpart E] and DEQ authority (Oregon Administrative Rules [OAR] 340-122). This document is a draft, and is presented for public comment.

1.1 SITE LOCATION AND DESCRIPTION

The Site is located at 12535 SW Main Street in downtown Tigard, Oregon, and is comprised of Tax Lots 2000 and 2100 of Section 02, Township 2 South, Range 1 West on Washington County Tax Assessment Map 2S102AB. The Site location is shown on **Figure 1**. The Site is developed with three wood-frame commercial buildings with adjoining walls. The westernmost building was constructed partially over Fanno Creek, such that the flow of Fanno Creek is directly beneath the western part of the building. This westernmost building is dilapidated and vacant. Current Site tenants are a drivetrain repair shop, Hiller's Emblem Shop (screen printing and embroidery), and a nail salon.

The Site is situated on approximately 0.44 acres within the downtown historical commercial area of Tigard. The Site is bordered on the southeast by SW Main Street, on the northeast by two commercial properties (12519 and 12525 SW Main Street), on the northwest by a vegetated

embankment sloping down from Highway 99 W, and on the southwest by Fanno Creek. The Site and the adjoining properties to the east are shown in **Figure 2**.

1.2 SITE BACKGROUND

Historical and current uses of the Site have included multiple tenants that used and stored petroleum products. Examples include a former sawmill, tire shop, and an Automotive Drivetrain repair shop. The western-most portion of the adjoined buildings is vacant, with the eastern-most portion, 12525 SW Main Street, formerly occupied by a welding shop, a printing shop, and a sealant shop (formerly Perma Treat). An active dry-cleaning business known as Tigard Cleaners, is located further to the east of the Site at 12519 SW Main Street. Kiss Carwash is located 300 feet east of the Site and was a former retail fuel station. Free-phase petroleum product has been identified at Kiss Carwash.

During the 1950s, the Site was occupied by the Tigard Planing Mill. It is assumed that small quantities of petroleum products and degreasing solvents may have been stored and used on-site for the operation of equipment. The eastern end of the Site currently is occupied by Automotive Drivetrain and was recently occupied by a tire shop.

Historical Sanborn fire insurance maps indicate that in 1950, the building located to the east of the Site at 12525 SW Main Street was occupied by a welding shop and a printing shop. Materials that could have been used in the welding shop include degreasing solvents and welding components containing metals, such as mercury and lead. Materials that could have been used in the printing shop include cleaning or degreasing solvents and kerosene for the cleaning plates, rollers, and other printing equipment.

Tigard Cleaners is located at 12519 SW Main Street, approximately 200 feet east and up slope (presumably up gradient) of the Site. A second dry cleaners, Tigard Main Street Cleaners, is located at 12155 SW Main Street, approximately 0.2 miles northeast of the Site. Both facilities are listed on the RCRA-Conditionally Exempt Small Quantity Generators (CESQGs) and Drycleaners databases. Although there are no known violations or releases currently associated with either facility, given the highly mobile properties of commonly used dry-cleaning solvents such as tetrachloroethylene (PCE), there is potential that an undocumented release from these facilities could have affected groundwater quality beneath the Site.

A former retail fuel station known as Tigard Shell or Tigard Area Station was located at 12475 SW Main Street, approximately 300 feet east of the Site in an inferred up gradient location. This location is now occupied by Kiss Carwash. Tigard Area Station (leaking underground storage tank

[LUST] #34-88-0081) and Tigard Shell (LUST #34-02-1149), are listed by DEQ as having cleanup completion dates of October 19, 1989 and November 30, 2006, respectively. Gasoline-contaminated soil and groundwater were discovered during underground storage tank (UST) decommissioning in 1989 and 2002. Free-product recovery occurred in 2003 and a site assessment occurred in 2005. The Tigard Shell was granted a “No Further Action” (NFA) determination by the DEQ in 2007. The DEQ’s NFA letter describes that the western extent of groundwater contamination was not delineated and that concentrations of gasoline-range and oil-range hydrocarbons in soil and groundwater exceed applicable risk-based concentrations (RBCs).

1.3 ASSESSMENT CHRONOLOGY

In October 2012, AMEC Earth and Environmental (now Amec Foster Wheeler) completed a Phase I Environmental Site Assessment (ESA) of the Site. Based on the results of the Phase I ESA, several phases of Phase II subsurface investigations were conducted from November 2012 through August 2014, culminating in the submittal of a Site Characterization Report in September 2014 (AMEC, 2014). These investigations included soil, sediment, surface water, groundwater, and soil gas sampling at the Site to evaluate whether historical use of the Site and properties up gradient of the Site have affected Site environmental conditions. The assessments are listed below.

- **Phase I Environmental Site Assessment:** Saxony-Pacific Properties, 12535 SW Main Street, Tigard, Oregon dated October 19, 2012 (AMEC, 2012a);
- **Phase II Subsurface Investigation:** Saxony-Pacific Properties, 12535 SW Main Street, Tigard, Oregon dated November 26, 2012 (AMEC, 2012b);
- **Phase II Subsurface Investigation:** Saxony-Pacific Properties, 12535 SW Main Street, Tigard, Oregon dated May 30, 2013 (AMEC, 2013); and
- **Site Characterization Report:** Saxony-Pacific Properties, 12535 SW Main Street, Tigard, Oregon, dated September 26, 2014 (AMEC, 2014).
- **Phase I Environmental Site Assessment:** Saxony-Pacific Properties, 12535 SW Main Street, Tigard, Oregon dated November, 2015 (Amec Foster Wheeler, 2015)

Results of these investigations are presented in Section 4.0.

2.0 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) defines the potentially complete exposure pathways by which human or ecological receptors could be exposed to Site contaminants under current or future land uses. A CSM diagram is presented as **Figure 3**. The CSM is used to select appropriate screening

criteria for assessing potential risk to human health and the environment. Information on current zoning and land use, and assumptions about potential future land uses made for the purposes of developing the CSM, are described in Sections 2.1 and 2.2. Screening levels selected to evaluate potential risk from Site conditions are discussed in Section 2.3.

2.1 LAND USE AND ZONING

The Site currently is zoned as Mixed-Use, Central Business District (MU-CBD). The Site's zoning designation is not expected to change, and it allows for commercial and urban residential development. The MU-CBD zoning district is designed to provide a pedestrian-friendly urban village in downtown Tigard. A wide variety of commercial, civic, employment, mixed-use, multifamily and attached single-family residences are permitted.

2.2 BENEFICIAL WATER USE DETERMINATION

A beneficial water use determination (BWUD) for the Site was developed as part of the September 2014 Site Characterization, the methodology and results of which are included in the 2014 Site Characterization report (AMEC, 2014).

Amec Foster Wheeler defined the Locality of Facility (LOF) using the Oregon Administrative Rule 340-122-115[34]), which defines an LOF as the area where a human or ecological receptor contacts or is reasonably likely to contact facility-related hazardous substances. For the Site, the LOF is the area encompassed by soil and groundwater impacts and the adjoining Fanno Creek to the west of the Site. This area is laterally delineated by Highway 99 W to the northwest, commercial development to the northeast, SW Main Street and commercial development to the east, southeast, and south, and the west bank of Fanno Creek to the west. Vertically the LOF is limited to the shallow water-bearing zone.

To determine whether there is a reasonably likely future beneficial use of water, Amec Foster Wheeler reviewed existing land use in the LOF and in the vicinity of the LOF, as well as current and historical water uses within the vicinity of the LOF. Amec Foster Wheeler searched online water well logs from the Oregon Water Resources Department (OWRD) as well as online water rights from the Oregon Watermaster. Amec Foster Wheeler also reviewed trends for groundwater and surface water use to determine what reasonably likely future beneficial uses exist for groundwater in the LOF and for surface water (Fanno Creek).

The findings of the BWUD indicate that for groundwater there are no reasonably likely future beneficial water uses related to residential use, because the entire area within a 0.5 mile radius of

the Site is connected to Tigard's municipal water supply. Although there is potential for beneficial use of groundwater from industrial or irrigation use, historical water well logs identified within 0.5 mile of the Site were identified as domestic and not industrial or irrigation.

For surface water, reasonably likely future uses would be related to irrigation, aquatic habitat, and aesthetics. Water rights were identified along Fanno Creek at both upstream and downstream locations relative to the Site. It is likely that several of these water rights are no longer used and have not been relinquished to the State. However, some of these water rights are still in use, the nearest anticipated to be the one associated with the Tigard Christian Church located at 13405 SW Hall Boulevard.

2.3 SCREENING-LEVEL HUMAN HEALTH RISK ASSESSMENT

Amec Foster Wheeler completed a screening-level Human Health Risk Assessment (HHRA) to establish appropriate human health RBCs for contaminants of concern (COCs) and evaluate if current site conditions meet them. RBCs for the Site were selected using DEQ guidance (DEQ, 2012). COCs at the Site are: halogenated volatile organic compounds (HVOCs), total petroleum hydrocarbons (TOH), metals, polynuclear aromatic hydrocarbons (PAHs), and polychlorinated biphynals (PCBs). The results of the HHRA were presented in the September 2014 Site Characterization report (AMEC, 2014).

2.4 RECEPTORS

Four types of human health receptors were considered for this Site: urban residential, occupational workers, construction workers, and excavation workers. Information about the current and reasonably likely future use of the Site was used to identify which receptors were likely to be exposed to soils and groundwater. The Site is located in Tigard's downtown urban area and is occupied by an active commercial business. The Site is within the city's MU-CBD zoning area indicating a possibility that future redevelopment in the area could allow for mixed-use development such as lower-level commercial with upper-level residential.

2.4.1 Exposure Routes

Two types of exposure routes generally are considered in the risk assessment process: Direct exposure routes and indirect exposure routes. A direct exposure route is complete when a receptor comes into direct contact with the impacted medium (e.g., dermal contact). An indirect exposure occurs when the chemical is transferred from the originally impacted medium to another and subsequently to a human receptor (e.g., volatilization of contaminants from groundwater into indoor air and subsequent inhalation).

DRAFT

The groundwater-to-tap water pathway is considered to be an incomplete pathway for this Site due to the low permeability of the shallow water table aquifer, the generally high turbidity of shallow groundwater, and the presence of a long-established municipal water supply.

For direct exposure at the Site, there is the potential for dermal contact by excavation workers to contaminants in soil and groundwater in excavated areas and trenches. There also is the potential for dermal contact by future residents, occupational workers, and construction workers to contaminants in sediments along Fanno Creek. It is not anticipated that the residents or workers will have direct contact with the groundwater via the tap water pathway because it is not used as drinking water.

Indirect exposure to HVOCs in soil and groundwater would be by inhalation of HVOCs migrating from subsurface media into a building or to outdoor air. This exposure route is not present for TPH (oil), PAHs, metals, and PCBs in sediments because these COCs are not volatile. The indirect exposure route for HVOC constituents is a potentially complete exposure route for future residents, occupational workers, construction workers, and excavation workers.

The HHRA CSM for the Site is shown as **Figure 4**. This HHRA CSM evaluates each complete exposure pathway.

2.5 SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT

Amec Foster Wheeler completed a screening-level ecological risk assessment (ERA) using Level II screening level values (SLVs) to evaluate if current site conditions and detected constituents meet those SLVs. These Level II SLVs for bioaccumulation (human and fish) are based on DEQ guidance (DEQ, 2007; DEQ, 2014a, DEQ, 2014b).

For ecological risk exposure at the Site, there is the potential for direct contact by organisms to contaminants in sediments; and there is a potential for human and bird/mammal consumption of fish and other organisms in this environment. Two federally-protected species occur near the project: Upper Willamette River (UWR) steelhead distinct population segment (DPS), and the UWR spring-run Chinook salmon evolutionarily significant unit (ESU). Fanno Creek was not designated critical habitat for UWR steelhead or UWR Chinook salmon.

As described in the Site Characterization report (AMEC, 2014), concentrations of metals, PAHs, and PCBs in sediments are greater than the Level II SLVs for bioaccumulation in humans from

consumption of fish or other organisms in Fanno Creek. Concentrations of selected metals and PAHs are also greater than Level II SLVs for freshwater fish (DEQ, 2007, DEQ, 2014a; DEQ, 2014b).

3.0 ASSESSMENT SUMMARY

3.1 GEOLOGY AND HYDROGEOLOGY

The Site is located within the Tualatin Valley, which consists of broad valley plains, ranging in altitude from 100 to 300 feet. The bedrock of the basin is the Columbia River Basalt (CRB) that has been deformed into a saucer-shaped syncline almost bisected lengthwise by a ridge. The bedrock basin has been partly filled by alluvium, which underlies the valley plains. Groundwater occurs in the CRB and in fine sands and silts in the upper part of the alluvial fill. The groundwater occurs under unconfined, confined, and perched conditions.

The unconsolidated alluvial deposits in the Site vicinity are considered moderately permeable and generally yield low to high quantities of water to wells. Regional groundwater migration is strongly influenced by surface drainage, topography, and the permeability of subsurface materials. Depths to water and flow directions also are expected to be seasonally variable in the Site vicinity. Based on our review of topographic maps, the Site is located at approximately 154 feet above mean sea level (msl). The Site slopes to the southwest and groundwater is anticipated to flow locally towards Fanno Creek and regionally to the southeast, in the direction of Fanno Creek flow. Fanno Creek is located near the western edge of the Site and flows beneath the part of the building located at the western edge of the Site. The Site boundary extends to the middle of Fanno Creek. In the upland portion of the Site, groundwater was encountered at depths of approximately 6 to 19 feet below ground surface (bgs) during AMEC's drilling investigations in 2012 and 2013 (AMEC, 2014).

3.2 SITE SOIL

The US Department of Agriculture Soil Survey of Washington County, Oregon, identifies Site and vicinity native soils as Aloha silt loam. The Aloha series is described as somewhat poorly drained with slow infiltration rates. Aloha silt loam formed in alluvium or lacustrine silt on broad valley terraces (AMEC, 2012a).

For the purposes of this report, "fill" is used as a generic term for imported soil, scrap materials, or reworked native soil placed at the Site during or after initial development in the early 1900s. The thickness of fill material across the Site and along Main Street ranges from 5 to at least 18 feet, and possibly to 22.5 feet, in the locations tested. The fill is generally thicker in the central and southwest portion of the Site (towards Fanno Creek). The fill consists of silt, clay, and fine sand,

DRAFT

with local basalt boulders. The native soil extends to at least 25 feet bgs, the maximum depth explored at the Site (AMEC, 2013).

3.3 SURFACE WATER HYDROLOGY

Surface water in the vicinity of the Site empties into the Fanno Creek Drainage system. The Fanno Creek Drainage can be characterized as an industrial waterway as it traverses the metro area. The creek receives water from many storm water run-off points. Flow can be highly variable in response to storm events and flow generally is high in the winter (rainy) season and low in the summer (dry) season.

Stormwater flow across the Site generally is directed down slope, towards Fanno Creek. The City of Tigard provided Amec Foster Wheeler with detailed Lidar-based topography that was used to map anticipated surface flow across the Site, adjoining properties, and Fanno Creek. As shown on **Figure 5**, surface flow is directed towards Fanno Creek from the south and north sides of Highway 99 W. The figure shows shallow drainage patterns around the elevated roadway and into Fanno Creek on the north side of the Site. Drainage patterns also are shown around the southern side of the building, between the Site and SW Main Street.

Two drainage outfalls are located to the north of the Site and both drainage outfalls are constructed of 16-inch-diameter corrugated metal. Neither outfall was identified on City of Tigard stormwater maps; therefore, it is likely that these outfalls are associated with drainage from Highway 99 W and are owned and mapped by Oregon Department of Transportation.

Five drainage outfalls are located beneath the SW Main Street Bridge, adjoining the southern property boundary. Three of the outfalls are located above the west bank of Fanno Creek and two outfalls are co-located above the east bank of Fanno Creek. Only two outfalls are actively used to direct surface water runoff. City of Tigard personnel confirmed that the remaining outfalls have been capped by the City.

4.0 NATURE AND EXTENT OF CONTAMINATION

The discussion of the nature and extent of contamination presented in this report is based on field observations and analytical data developed by the subsurface investigations and Site characterization field work described in Section 1.3. The results of the site characterization activities are included in selected tables which are presented in **Appendix A**. The results of the characterization activities demonstrate that groundwater and sediment impact at the Site is associated with past releases of contaminants, some of which clearly did not originate on the Site.

DRAFT

These releases are believed to have occurred over several decades, with most occurring before 1980. Specifically, COCs are categorized as follows:

- HVOCs have been detected in groundwater on the upland portion of the Site. The primary HVOC contaminants are PCE, trichloroethylene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (VC); and
- TPH, PAHs, metals, and PCBs have been detected in sediment along Fanno Creek.

The discussion of the extent of contamination in Site media is presented in Sections 4.1 through 4.4. *[Note: Based on the Site Characterization Report, DEQ stated in an email dated October 2, 2014: "We concur with your conclusion that the site does not appear to be a significant contributor to existing sediment contamination in Fanno Creek". In the same email DEQ goes on to state their expectation that the HVOC impacts on the upland portion of the site will require some form of action (DEQ, 2014c)].*

4.1 SOIL

Chemical analysis of soil samples collected from four locations on the upland part of the Site did not detect TPH or HVOCs at concentrations greater than laboratory method reporting limits. The presence of localized pockets of contaminated soil at the Site beneath the building is, however, suspected because the distribution of HVOCs in groundwater indicates a nearby source located along the northeastern portion of the building. No source soil material has been identified in accessible areas where soil samples could be obtained. Soil sampling could not be performed beneath the building due to the thickness of the floor slab (nearly one foot with an apparent secondary slab beneath). Refusal was also encountered (concrete) at a location attempted behind (northwest of) the building.

4.2 SOIL GAS

Low concentrations of HVOCs were detected in soil gas at the Site; however, no HVOC concentrations exceeded DEQ Urban Residential RBCs. The absence of significant HVOCs detected in the soil gas is evidence that vapor phase contamination is not of significant concern in the areas explored beneath the Site. However, the possibility of higher concentrations of soil gas near source soils (should they be identified in the future) cannot be ruled out.

4.3 SEDIMENT

The COCs for sediments along Fanno Creek are TPH, PAHs, metals, and PCBs. The greatest concentrations of these COCs were located on the west bank of Fanno Creek, opposite the Site.

Concentrations of these COCs appear to increase with depth, with the greatest concentrations of benzo(b+k)fluoranthene and dibenz(a,h)anthracene found in the deepest sediment sample collected (24 to 36 inches in depth).

Differing energy environments within Fanno Creek need to be considered when interpreting COC concentrations in the sediments. Those sections of the creek immediately upstream (Highway 99W bridge) and downstream (Main Street bridge) are relatively high energy environments compared to the stretch of creek adjacent along the Site, which is characterized by low energy flow and sediment accumulation. Because of this, sediments deposited along the bank of the Site are more fine-grained than those upstream or downstream. Fine-grained sediments tend to more readily bind COCs than coarser-grained sediments (due to greater surface area available for binding). Therefore, higher concentrations of COCs will be detected in lower energy environments. Changes in COC concentrations up and down this stretch of Fanno Creek likely are more related to the localized stream energy flow regime and associated depositional environment, than proximity to upland source material.

Considering the aforementioned variables in environment and laboratory dilutions, it does appear that a main source of contaminants of potential concern (COPCs) in sediment is from Highway 99 W. Southwest Main Street also may be a potential contributor. Because COPCs also were detected upstream of Highway 99 W, additional sources must exist further upstream of the Site and Highway 99 W.

Two COPCs were detected in sediment on the far west side of Fanno Creek. The presence of these COPCs (acenaphthylene and selenium) demonstrates that some concentrations of PAHs and metals in the area of Fanno Creek bordering the Site originate from the opposing drainage. The highest detected concentrations of the majority of the metals tested were found in the sediment sample collected on the west side of Fanno Creek. The elevated concentrations of lead, copper, cadmium, chromium, silver, and nickel demonstrate significant contribution originating from the opposing drainage.

4.4 GROUNDWATER

The COCs identified in groundwater are PCE, trichloroethene (TCE), dichloroethene (cis-1,2-DCE), and vinyl chloride (VC). The highest concentrations of these HVOCs detected are centered beneath the building canopy on the upland part of the Site, in an area that straddles both tax lots that comprise the Stie. HVOCs in site groundwater do not reach Fanno Creek.

DRAFT

Based on the lack of HVOC detections beneath Main Street southeast of the Site, the western boundary of the Site near Highway 99 W, and southwestern boundary of the site adjacent to Fanno Creek, it appears that HVOC impacts are confined to the northeastern and up-gradient half of the Site. A contour map depicting total HVOC concentrations is presented as **Figure 6.**

The lateral extent of HVOC contamination beneath the Site is defined in the cross-gradient and down-gradient directions. Delineation in the up-gradient direction is not complete because there are detections near the up-gradient property boundary. Some portion of HVOC constituents in this area may originate from an unidentified source located up-gradient and off-Site. Delineation in the vertical direction also is undefined. However, multiple lines of evidence suggest that significant vertical migration is not occurring: a) HVOC concentrations are relatively low in shallow groundwater indicating no evidence for dense non-aqueous-phase liquid (DNAPL); b) the low-permeability soil matrix of clay and silt slows groundwater and contaminant migration, and c) the elevation of the adjacent Fanno Creek is similar to the groundwater elevation as measure in borings drilled on the upland part of the Site.

5.0 ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES

The purpose of this ABCA is to define and evaluate cleanup alternatives that decrease contaminant concentrations to levels that are protective of human health and the environment. This ABCA contains the following elements:

1. Remedial action area.
2. Evaluation of proposed cleanup alternatives.
3. Presentation of the recommended alternative.
4. Discussion of the residual risks associated with the recommended alternative.

5.1 REMEDIAL ACTION AREA AND OBJECTIVES

Based on discussions with DEQ, the remedial action area and objectives are listed below.

The remedial action area consists of:

- Groundwater with HVOCs in the upland portion of the site (Figure 6), and
- Soil with HVOCs (source area soils) in the upland portion of the site.

DRAFT

The remedial action objectives are:

- Prevent direct contact between human receptors and soil exceeding applicable risk-based concentrations;
- Prevent direct contact between human receptors and groundwater exceeding applicable risk-based concentrations;
- Remediate/remove source-area soils to the extent feasible (especially if “hot spots” are encountered following building demolition);
- Prevent HVOC vapors from migrating into indoor air (eliminate the vapor migration pathway); and
- Utilize sustainable (“green”) remediation/removal strategies to the maximum extent practicable.

5.2 Definition and Evaluation of Remedial Alternatives

The remedial alternatives are defined and discussed below. A quantitative comparison of the remedial alternatives is provided in **Table 1**.

Under DEQ removal authority (OAR 340-122-0040) and EPA guidance (EPA, 2014; EPA, 2015), remedial alternatives are evaluated using the following criteria:

- Effectiveness,
- Long-term Reliability,
- Implementability,
- Implementation Risk,
- Sustainability,
- Reasonableness of Cost, and
- Susceptibility to Climate Change.

5.2.1 Proposed Remedial Alternatives

The objective of each alternative is to mitigate risk from chemical concentrations present at the Site, such that any potential exposures do not exceed levels protective of human health and the environment. Because of the structures present at the Site, the nature of the contaminants, their persistence in the environment, and the media in which the contaminants occur, only a few

DRAFT

remedial alternatives warrant detailed evaluation. For this reason, the following remedial alternatives are evaluated for soil and groundwater in this ABCA:

The general response actions are:

- No action
- Vapor mitigation (engineering controls), source removal ("hot spot" soil only), institutional controls, and monitored natural attenuation (MNA)
- Source removal (both soil and groundwater), institutional controls, and MNA

Alternative 1: No Action

Alternative 1, no action (e.g. leaving the Site in its current state), is the baseline against which all other alternatives will be measured.

Alternative 2: Vapor mitigation (engineering controls), source removal ("hot spot" soil only), institutional controls, and monitored natural attenuation (MNA)

Alternative 2 is based upon DEQ requirements identified in the PPA (DEQ, 2015). As required by DEQ in the PPA, engineering controls would be installed at the Site. These engineering controls would consist of a vapor mitigation system comprised of a network of perforated pipes in trenches, covered with gravel, and overlain by a heavy duty vapor barrier. The system would be passive in nature, allowing accumulated vapors to vent to outdoor air. The passive venting system would be enhanced through the use of a solar-powered low power fan to maintain a minimal negative pressure gradient in the system. Because a passive venting system is dependent upon the difference between the in-ground air pressure and the barometric pressure outside, the pressure gradient in the system can fluctuate from positive (air moving into the ground backwards through the system) to negative (air moving out of the ground as the system intends). By installing a low pressure fan, which only requires minimal power, the system can maintain a negative pressure gradient while the fan is operational. The fans typically use less than 300 watts and can easily be tailored for solar powering. Solar power also alleviates the work and costs associated with power connections and infrastructure.

Groundwater will be monitored (MNA) to provide a higher degree of confidence as to whether or not an exceedance of RBCs is significant over the longer term and constitutes a continuing risk. Alternative 2 will consist of installing a three or four groundwater monitoring wells within the area of the highest detected concentrations of VOCs (northeastern portion of Site) and sampling for HVOC and natural attenuation parameters for up to four quarterly sampling events.

DRAFT

Institutional controls would consist of the same Easement and Equitable Servitude (EES) that exists for the Site. This would enforce the maintenance of engineering controls and prevent use of groundwater. Prior to building demolition, a contaminated media management plan (CMMP) would be prepared for use by contractors. After building demolition source area “hot spot” soils would be removed and disposed of at an appropriate landfill. Building demolition would need to occur prior to soil removal (to access the soils). Following soil removal, confirmatory soil, soil gas, and groundwater sampling would be performed.

Alternative 3: Source removal (both soil and groundwater), institutional controls, and MNA

Alternative 3 is a more aggressive and comprehensive approach than Alternative 2, whereby most of the accessible impacted media would be removed or remediated in place. The building and slab would be removed (under guidance of a CMMP) to allow access to impacted soils. Impacted soils would be removed to the maximum extent practicable, and disposed of at an appropriate landfill. This would entail excavation to the water table and likely require shoring. An in-situ air sparging system would be installed, along with a corresponding soil vapor extraction (SVE) system, to remediate HVOCs in groundwater. Following soil removal and groundwater treatment, confirmatory soil and groundwater sampling would be performed. Groundwater sampling would include installation of three to four groundwater monitoring wells, which would be sampled for up to four quarters as part of an MNA program. Institutional controls would be in the form of an EES that would prevent use of site groundwater.

5.2.2 Sustainability Considerations

Sustainability has been considered in the design and selection of a cleanup plan for the Site:

- The passive vapor mitigation system will be enhanced via a solar-powered fan.
- Trucking contractors hired to transport contaminated soil from the Site will be encouraged to use diesel fuel blended with 10% biofuel, particularly if transport distances are large.
- The on-site separation of recyclable/reusable materials (concrete, gravel, etc.) from the soil stockpiles was considered as an alternative to transport of all stockpiled material to a landfill. However, this option was not retained in final cleanup plans due to the associated noise impacts and dust generation, as well as the cost and complexity of staging the necessary equipment in a small area.

5.2.3 Changing Climate Concerns

Changing climate concerns have been considered in the design and selection of a cleanup plan for the Site (EPA, 2014; EPA 2015). Considerations are based on predications of long-term changes to Pacific Northwest climate which include: increase in average temperature of up to 5 degrees

DRAFT

Fahrenheit by the 2080s, reduced winter snow pack, rising sea level (several inches to a few feet by end of century), and the possibility of enhanced seasonal precipitation cycle (wetter autumn/winter and drier summer), and more intense rainfall events (CIG, 2009).

5.2.4 Major Assumptions

The major assumptions listed below apply to the alternatives:

- The cost estimates presented in this ABCA are engineering cost estimates with a precision of +50%/-30%.
- The extent of the contamination, and thus the basis of the preliminary cost estimate, is defined in the Site Characterization Report (AMEC, 2014).
- Costs assume that the excavated soils, including “hot spot” soils can be disposed as non-hazardous waste.
- All costs are presented as 2015 dollars, with no discounting.
- Complete groundwater plume delineation upgradient and off site will not be required. The City will not be responsible for contaminants originating upgradient and off site (DEQ, 2004).

5.3 CLEANUP ALTERNATIVES (ALTERNATIVES 1, 2, 3)

5.3.1 Alternative 1: No Action

Alternative 1 is the baseline against which all other soil actions are compared.

Under this alternative, soil and groundwater that exceeds RBCs protective of potential future residents and occupational Site users will be left in place.

Effectiveness: Alternative 1 does not eliminate the potential for Site users to come into direct contact with contaminated soil or groundwater, nor does it protect Site users from exposure to soil gas (vapors) migrating to indoor air.

Long-term Reliability: Alternative 1 does not remove contamination or eliminate human or ecological exposure pathways, and therefore is unreliable in the long-term.

Implementability: Alternative 1 is considered easy to implement as it requires no action.

Implementation Risk: Alternative 1 implementation risk is low, because no activities are conducted.

DRAFT

Sustainability: Alternative 1 is not sustainable in that contaminated groundwater (and likely soils) have continued potential to produce vapors that could enter indoor air.

Climate Change Concerns: No Site-specific risk factors have been identified for the Site or for this alternative with respect to potential climate change.

Cost: The cost estimate to implement this alternative is approximately $10,000.

5.3.2 Alternative 2: Vapor mitigation (engineering controls), source removal ("hot spot" soil only), institutional controls, and monitored natural attenuation (MNA)

Under Alternative 2, the requirements of the PPA would be met. Although soil and groundwater that exceeds RBCs protective of potential future residents and occupational Site users will be left in place, hot spot soils would be removed resulting in a reduction in contaminant mass.

Engineering and institutional controls would be used to mitigate residual risk on the Site. Engineering controls would include installation of a solar-powered vapor mitigation system. Institutional controls in the form of an EES, or deed restriction, would be recorded with the Site deed. The EES would document the following requirements:

- Groundwater at the Site will not be extracted for drinking water, industrial use, or other purposes.
- A CMMP will be developed that will outline the location, and proper handling and disposal of soil and groundwater during construction activities at the Site.

Effectiveness: Alternative 2 is effective because engineering controls eliminate the indoor air pathway, and institutional controls reduce the potential for Site users to come into direct contact with contaminated soil or groundwater.

Long-term Reliability: Alternative 2 removes the most-impacted source soils and includes institutional controls which will enforce the maintenance of the vapor mitigation system and prevent use of Site groundwater. Implementation of an MNA program will provide added confidence in residual contaminant concentrations and potential contaminant flux. Therefore Alternative 2 is reliable in the long-term.

Implementability: Alternative 2 is considered relatively easy to implement because it utilizes available contractors and materials.

Implementation Risk: Alternative 2 implementation risk is low. Subcontractors hired to conduct the soil removal will be current with US Occupational Safety and Health Administration (OSHA)

DRAFT

40-Hour Hazardous Waste Operator (HAZWOPER) training. Work would be performed under a site-specific Health and Safety Plan (HASP).

Sustainability: Alternative 2 is sustainable, particularly with addition of a solar-powered enhancement to the vapor mitigation system.

Climate Change Concerns: Similar to Alternative 1, no Site -specific risk factors have been identified for the Site or this alternative.

Cost: The cost estimate to implement this alternative is $400,000 to $475,000.

5.3.3 Alternative 3: Source removal (both soil and groundwater), institutional controls, and MNA

Alternative 3 removes the majority of the impacted soil at the Site. In addition, impacted groundwater beneath the Site is treated.

Under this alternative, only minimal groundwater that exceeds RBCs protective of potential future residents and occupational site users will be left in place. Institutional controls would be used to mitigate residual risk on the Site. An EES would document the following requirement:

- Groundwater at the Site will not be extracted for drinking water, industrial use, or other purposes.

Effectiveness: Alternative 3 effectively eliminates the potential for current and future Site users to come into direct contact with contaminated soil and groundwater by removing contaminants from the Site and by preventing the future use of groundwater.

Long-term Reliability: Alternative 3 permanently removes the impacted soil and treats most of the impacted groundwater. An EES further reduces risk by preventing use of Site groundwater. Implementation of an MNA program will provide added confidence in residual contaminant concentrations and potential flux. Therefore Alternative 3 is reliable in the long-term.

Implementability: Alternative 3 is considered moderately complex to implement. Shoring may be required.

Implementation Risk: Alternative 3 implementation risk is low. Subcontractors hired to conduct the soil removal will be current with OSHA 40-Hour HAZWOPER training. Work would be performed under a site-specific HASP.

DRAFT

Sustainability: Alternative 3 is sustainable because most of the contamination is removed; however, this is partially offset by CO2 emissions generated by transport of large volumes of soil (estimated at 2,000 cubic yards) to an off-site landfill. Transport contractors will be encouraged to use diesel that includes 10% biofuel.

Climate Change Concerns: Similar to Alternatives 1 and 2, no Site-specific risk factors have been identified for the Site or this alternative.

Cost: The cost estimate to implement this alternative ranges from approximately $700,000 to $900,000.

DRAFT

6.0 PREFERRED REMEDIAL ALTERNATIVE

The preferred remedial alternative is Alternative 2, which, as can be seen in Table 1, has the highest cumulative score (57) compared to the Alternative 1 (43) and Alternative 3 (46). Alternative 2 outranks or equals the second highest alternative, Alternative 3, in all criteria except one (effectiveness). For effectiveness there is a very slight preference for Alternative 3 (source removal); however, this is outweighed by the preference for Alternative 2 in implementability, implementation risk, and cost (Table 1).

We appreciate the opportunity to be of service to the City Center Development Agency on this project. If you have any questions or comments regarding this report, please contact the undersigned at (503) 639-3400.

Sincerely,

Amec Foster Wheeler
Environment & Infrastructure, Inc.

REVIEWED BY:

John L. Kuiper, RG
Principal Geologist

Russ Bunker, RG
Sr. Associate Geologist

JK/ay

DRAFT

REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2015. Phase I Environmental Site Assessment, Saxony-Pacific Properties, 12535 SW Main Street, Tigard, Oregon, November, 2015.

AMEC, 2014. Site Characterization Report, Saxony-Pacific Properties, 12535 SW Main Street, Tigard, Oregon. September 26, 2014.

AMEC, 2013. Phase II Subsurface Investigation, Saxony-Pacific Properties, 12535 MW Main Street, Tigard, Oregon. May 30, 2013.

AMEC, 2012a. Phase I Environmental Site Assessment, Saxony-Pacific Properties, 12535 MW Main Street, Tigard, Oregon. October 19, 2012.

AMEC, 2012b. Phase II Subsurface Investigation, Saxony-Pacific Properties, 12535 SW Main Street, Tigard, Oregon. November 26, 2012.

Climate Impacts Group (CIG), 2009. The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate. Executive Summary. June 3, 2009.

Oregon Department of Environmental Quality (DEQ), 2015. Prospective Purchaser Agreement for the Saxony-Pacific Properties Site (12535 SW Main Street, Tigard, Oregon, Tax Lots 2000 and 2100). May 28, 2015.

DEQ, 2014a. Ecological Screening Level Hierarchy (Replaces 1998, 2000 and 2001 DEQ Guidance) as of January 2014. (Internal DEQ document).

DEQ, 2014b. Division 41 - Water Quality Standards: Beneficial Uses, Policies, and Criteria for Oregon. Table 31 - Aquatic Life Water Quality Guidance Values for Toxic Pollutants; Table 40 - Human Health Water Quality Criteria for Toxic Pollutants. Effective April 18, 2014.

DEQ, 2014c. Email communication to AMEC on October 2, 2014.

DEQ, 2012. Risk-Based Concentrations for Individual Chemicals. June 7, 2012.

DEQ, 2007. Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment, Updated April 3, 2007.

DRAFT

DEQ, 2004. Land Quality Division, Contaminated Aquifer Policy. May 20, 2004.

EPA, 2014. Checklist: How to Address Changing Climate Concerns in and Analysis of Brownfield Cleanup Alternatives (ABCA). April, 2014.

EPA, 2015. Climate Impacts in the Northwest. July 21, 2015.

DRAFT

LIMITATIONS

This Analysis of Brownfield Cleanup Alternatives report was prepared exclusively for the City Center Development Agency by Amec Foster Wheeler Environment & Infrastructure, Inc. The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in Amec Foster Wheeler 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 Analysis of Brownfield Cleanup Alternatives report is intended to be used by the City Center Development Agency for the Saxony-Pacific Properties Site only, subject to the terms and conditions of its contract with Amec Foster Wheeler. 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 Foster Wheeler site visits and should not be relied upon to represent conditions at later dates. 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 Foster Wheeler so the original conclusions and recommendations can be modified as necessary.

DRAFT

TABLE

DRAFT

TABLE 1
Ranking of Alternatives
Saxony-Pacific Properties
Tigard, Oregon

Alternative	Remediation Plan	RANKING														Total Score
		Effectiveness 1 = low effectiveness 10 = high effectiveness		Reliability 1 = low reliability 10 = high reliability		Implementability 1 = complex implementability 10 = easy implementability		Implementation Risk 1 = high risk 10 = low risk		Sustainability 1 = low sustainability 10 = high sustainability		Climate Change 1 = low remedial resilience 10 = high remedial resilience		Estimated Cost 1 = high cost 10 = low cost		
1	No Action	1	Leaves all contaminated media in place, does not eliminate the potential for direct contact with soil, groundwater, or vapor. Does not reduce plume mobility.	1	Unreliable in long-term.	10	Easy	10	Low risk.	1	Not sustainable in long-term, potential health risks.	10	Resilient to climate change, no affects anticipated.	10	$10,000 (DEQ and other administrative costs for documenting no action)	43
2	Vapor mitigation (engineering controls), source removal ("hot spot" soil only), institutional controls, and monitored natural attenuation (MNA). Plan would include demolishing building and floor slab to allow access to impacted "source" soils, excavate source soils that are significant (e.g."hot spot" soils), install vapor mitigation system, confirmatory soil, soil gas, and groundwater sampling, Institutional Controls consisting of Easement and Equitable Servitudes (EES) that will enforce the maintenance of a vapor mitigation system and prevent use of site groundwater.	8	Installs a barrier to prevent soil vapor from reaching building occupants. MNA provides greater confidence in long-term plume stability and/or reduction.	9	Reliable. Makes contaminant pathway incomplete.	8	Relatively easy. Utilizes available contractors and materials.	8	Low risk. Increased worker exposure to contaminants.	8	Sustainable, particularly with addition of solar-powered ventilation.	10	Resilient to climate change, no affects anticipated.	6	Approximately $400,000 to $475,000 depending on if SVE is passive or active (includes cleanup plans, removal of building/slap to access source soils, removal of source soils, soil and soil gas confirmation sampling, monitoring well installation and sampling for one year of MNA) (includes $25,000 in DEQ oversight costs)	57
3	Source removal (both soil and groundwater), institutional controls, and monitored natural attenuation (MNA). Plan would include demolishing building and floor slab to allow access to impacted "source" soils, excavate all impacted soils to groundwater table, install combined vapor mitigation and in-situ groundwater air sparging system, confirmatory soil, soil gas, and groundwater sampling, institutional controls consisting of EES that will enforce the maintenance of a vapor mitigation system and prevent use of site groundwater, MNA.	9	Removes most contaminant mass and installs a barrier to prevent residual soil vapor from reaching building occupants. MNA provides greater confidence in cleanup efficacy.	9	Reliable. Makes contaminant pathway incomplete.	4	Moderately complex	5	Low risk. Increased worker exposure to contaminants.	8	Sustainable because most contamination removed; however, this is partially offset by carbon dioxide emissions generated by transport of large volumes of soil (estimated at 2,000 cubic yards) to an off-site landfill.	10	Resilient to climate change, no affects anticipated.	1	Approximately $700,000 to $900,000 depending on final excavation dimensions and shoring requirements (includes cleanup plans, removal of building/slab to access source/impacted soils, removal of source/impacted soils, soil and soil gas confirmation sampling, in-situ sparging and active SVE system installation, monitoring well installation, and sampling for one year of monitored natural attenuation (MNA)) (includes $40,000 in DEQ oversight costs)	46

DRAFT

FIGURES

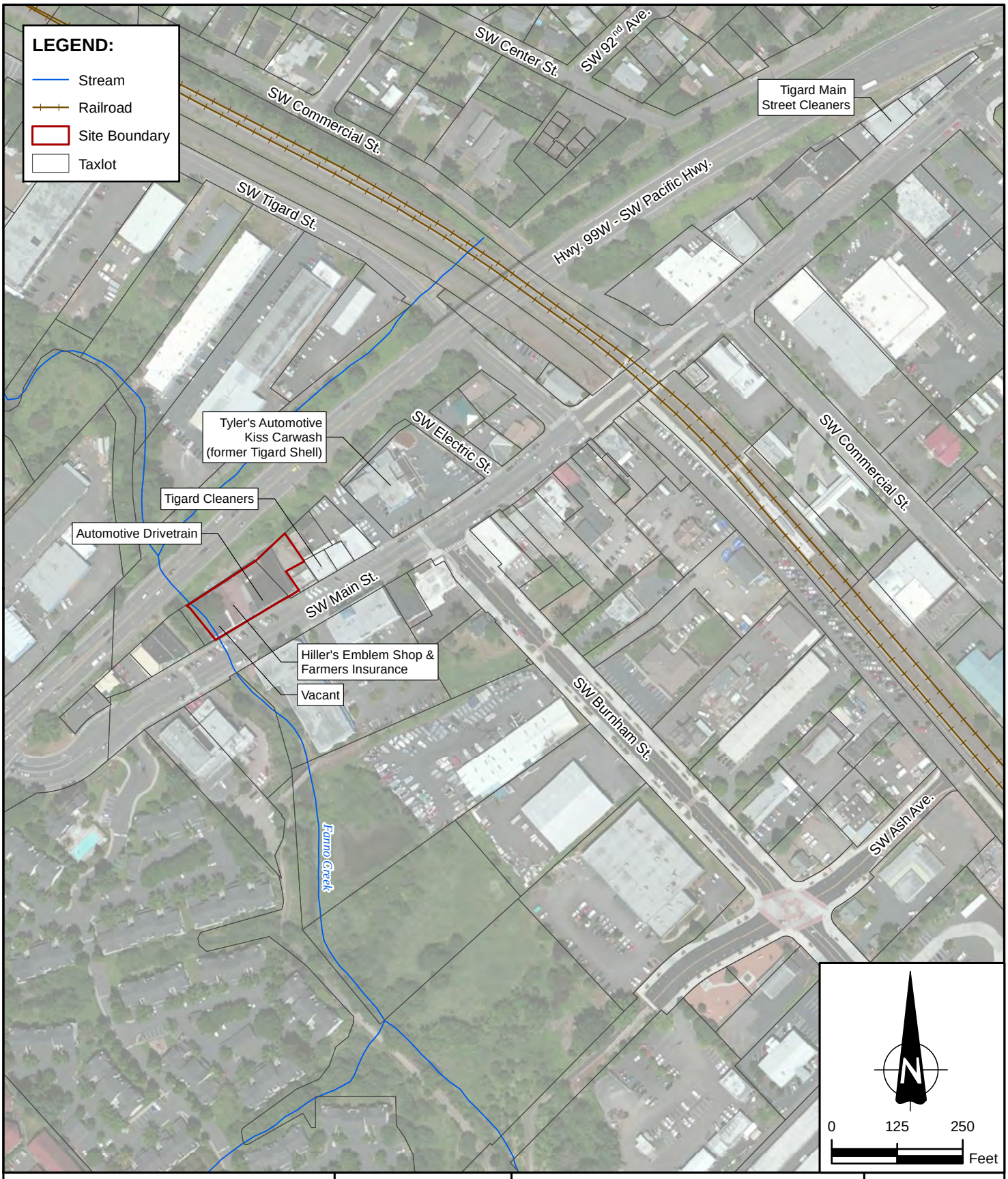
DRAFT

CITY CENTER DEVELOPMENT AGENCY	amec foster wheeler	ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES SAXONY-PACIFIC PROPERTY 12535 SW MAIN STREET, TIGARD, OREGON	DATE NOVEMBER 2015
			SCALE 1 " = 1,000 '
Amec Foster Wheeler Environment & Infrastructure, Inc. 7376 S.W. Durham Road Portland, OR 97224		SITE LOCATION MAP	PROJECT NO. 5-61M-12680-3
			FIGURE 1

DRAFT

DRAWN BY: SD CHECKED BY: JK

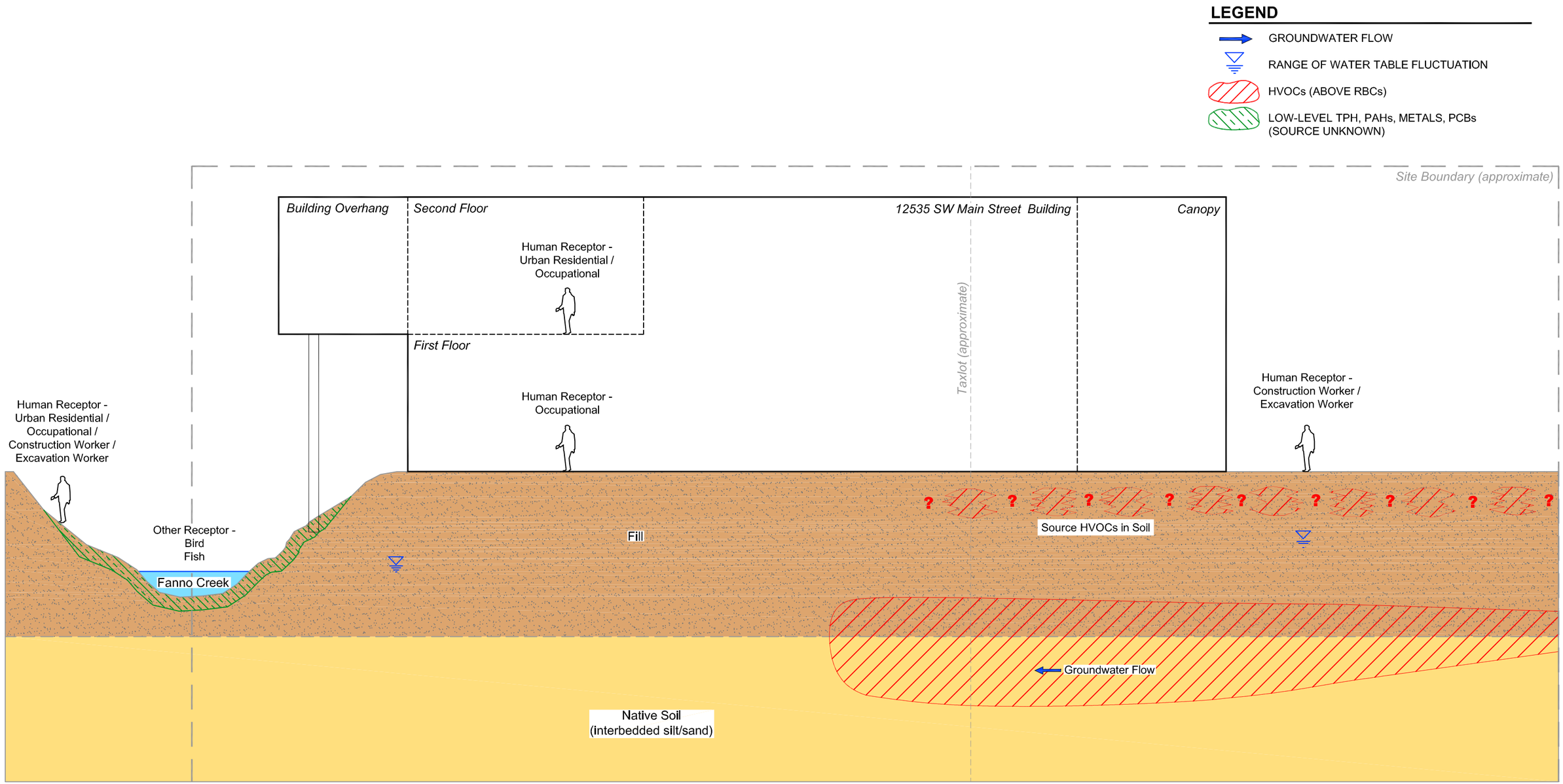
K:\12000\12600\12680\126803\dwg_ABCA\Figure 1 - Site Location Map.mxd - stephane.descombes - 11/16/2015 - 9:19:08 AM



CITY CENTER DEVELOPMENT AGENCY	amec foster wheeler	ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES SAXONY-PACIFIC PROPERTY 12535 SW MAIN STREET, TIGARD, OREGON	DATE NOVEMBER 2015 SCALE 1 " = 250 '
Amec Foster Wheeler Environment & Infrastructure, Inc. 7376 S.W. Durham Road Portland, OR 97224		SITE PLAN DRAFT	PROJECT NO. 5-61M-12680-3 FIGURE 2

DRAWN BY: SD CHECKED BY: JK

K:\12000\12600\12680\126803\dwg_ABCA\Figure 2 - Site Plan.mxd - stephane.descombes - 11/16/2015 - 9:21:45 AM



CITY CENTER DEVELOPMENT AGENCY

Amec Foster Wheeler Environment & Infrastructure, Inc.
7376 S.W. Durham Road
Portland, OR 97224

amec foster wheeler

ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES
SAXONY-PACIFIC PROPERTY
12535 SW MAIN STREET, TIGARD, OREGON

SCHEMATIC CONCEPTUAL SITE MODEL

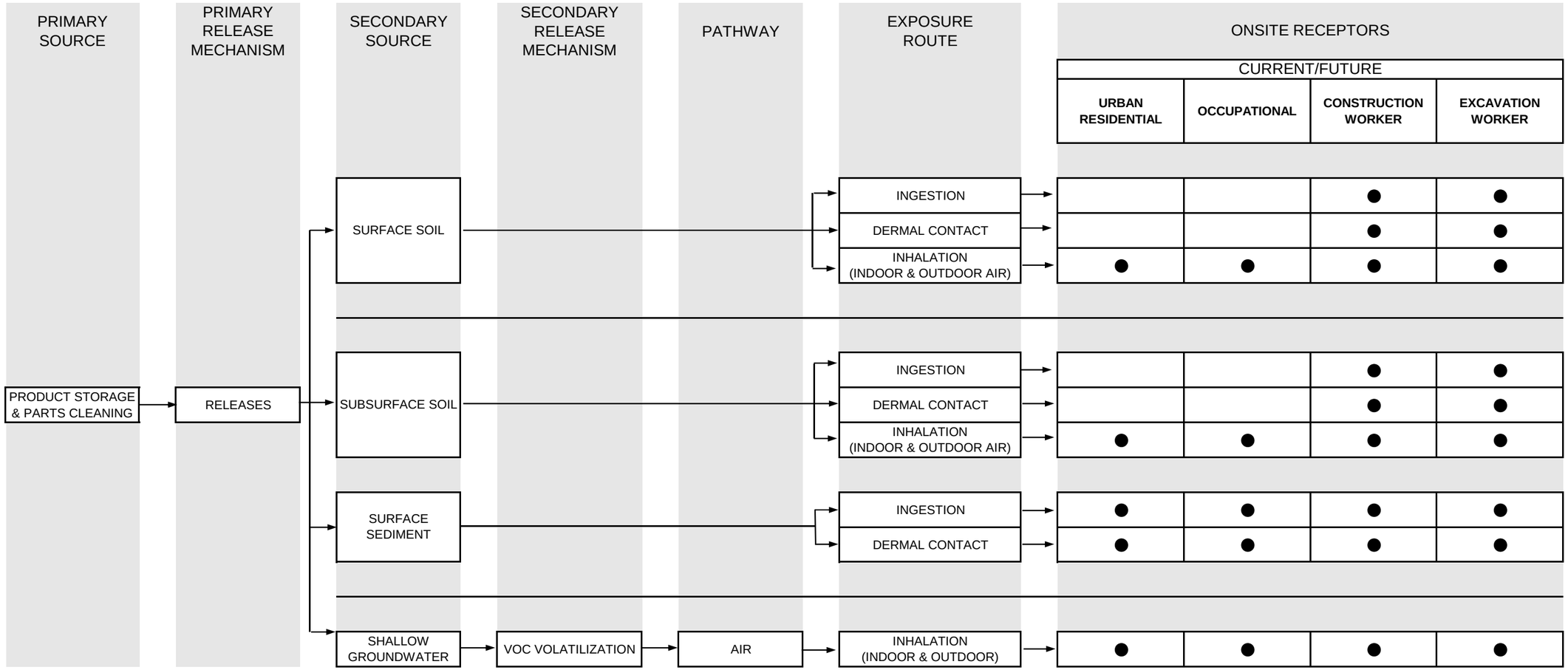
DRAFT

DATE	NOVEMBER 2015
SCALE	NOT TO SCALE
PROJECT NO.	5-61M-12680-3
FIGURE	3

DRAWN BY: SD CHECKED BY: JKH

K:\12000\12600\12680\126803\dwg_ABCA\Figure 3 – Schematic Conceptual Site Model.dwg – – – Nov. 16, 2015 9:28am – stephane.descombes

FIGURE 4
HUMAN HEALTH RISK ASSESSMENT (HHRA) CONCEPTUAL SITE MODEL (CSM)

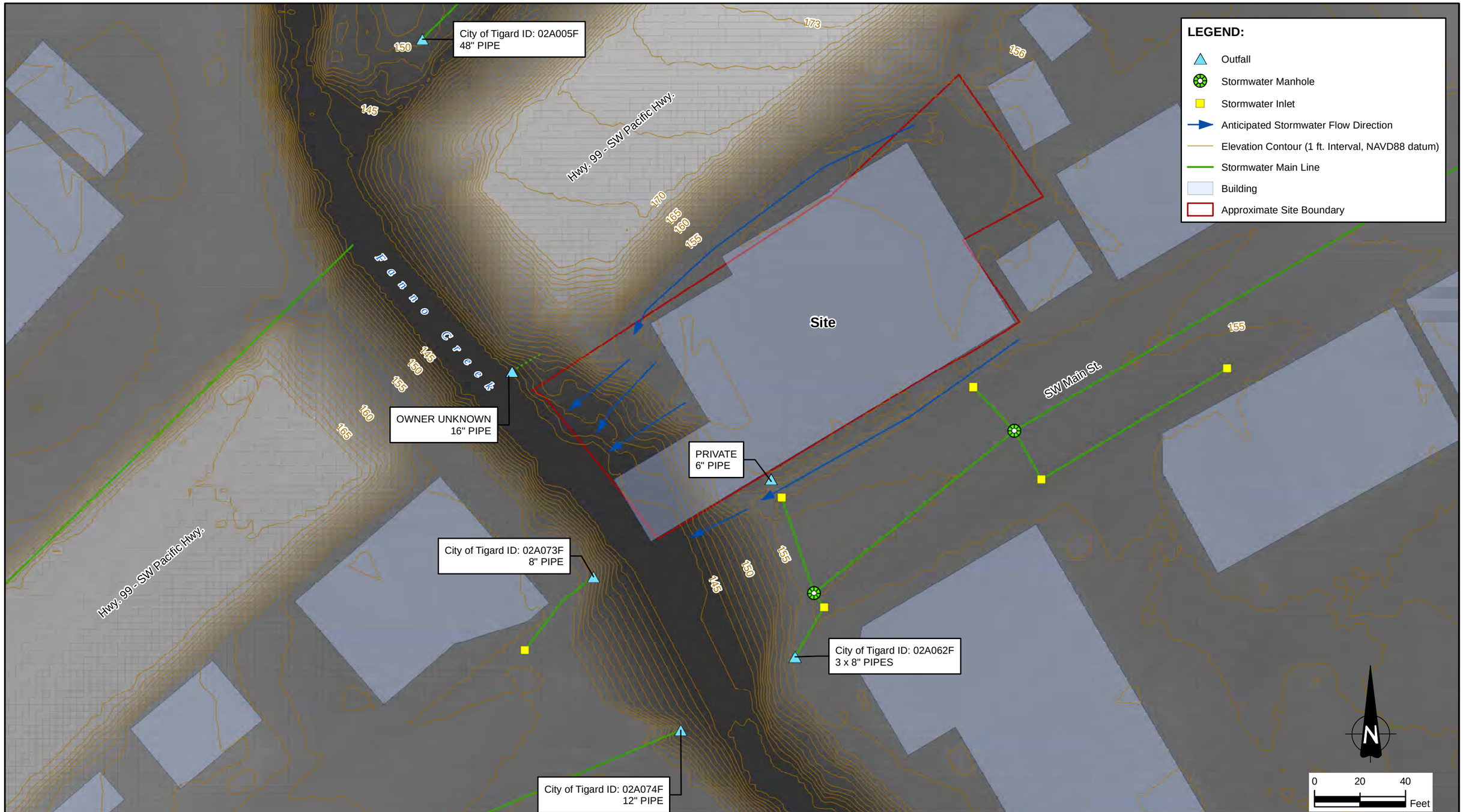


LEGEND

● POTENTIALLY COMPLETE PATHWAY

→ COMPLETE PATHWAY

DRAFT



CITY CENTER
DEVELOPMENT AGENCY

Amec Foster Wheeler
Environment & Infrastructure, Inc.
7376 S.W. Durham Road
Portland, OR 97224

amec foster wheeler

ANALYSIS OF BROWNFIELD
CLEANUP ALTERNATIVES
SAXONY-PACIFIC PROPERTY
12535 SW MAIN STREET, TIGARD, OREGON

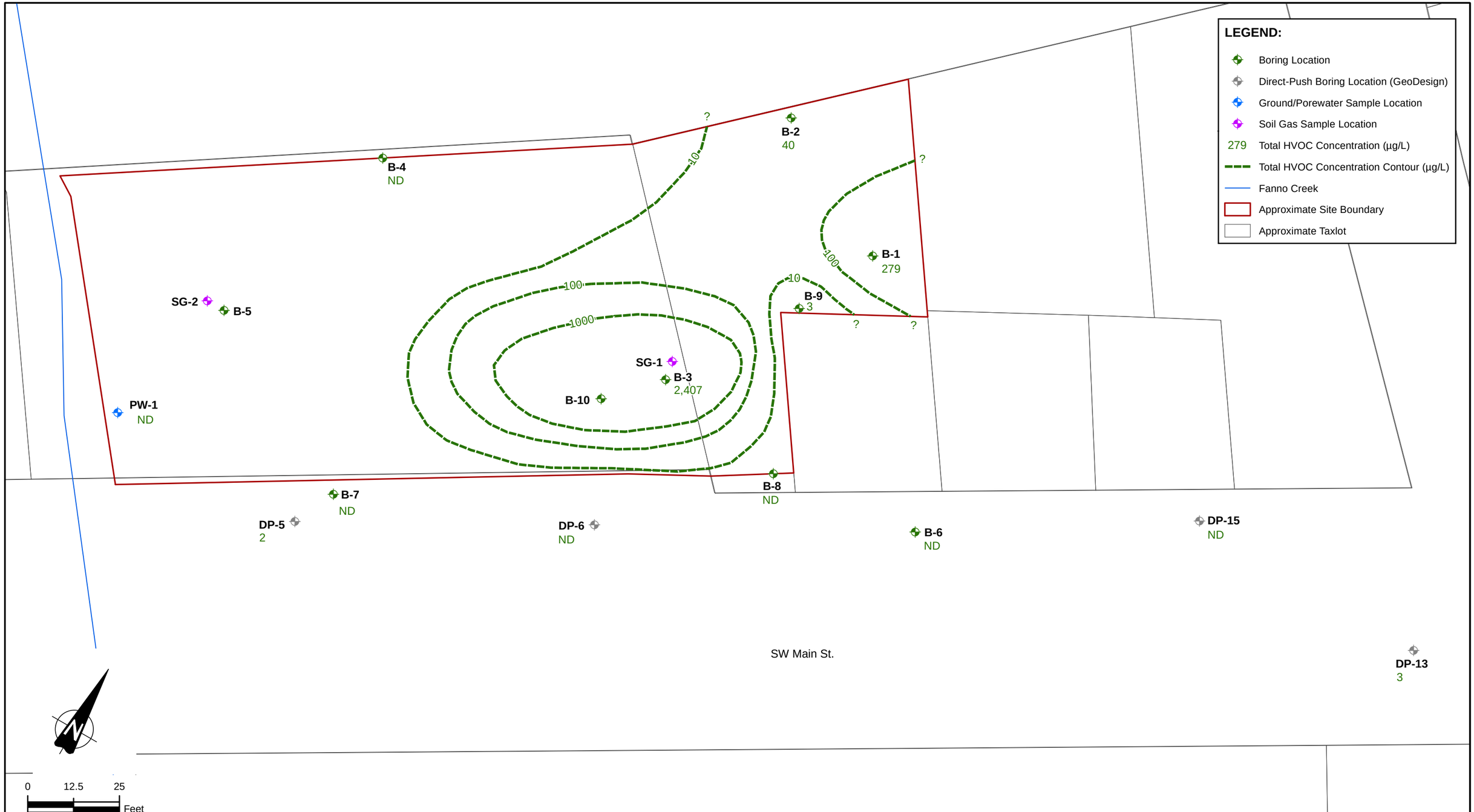
SITE TOPOGRAPHY AND
ANTICIPATED STORMWATER
FLOW DIRECTIONS

DRAFT

DATE	NOVEMBER 2015
SCALE	1 " = 40 '
PROJECT NO.	5-61M-12680-3
FIGURE	5

DRAWN BY: SD CHECKED BY: JKH

K:\12000\12600\12680\126803\dwg_ABCA\Figure 5 - Site Topography and Anticipated Stormwater Flow Directions.mxd - stephane.descombes - 11/16/2015 - 9:33:22 AM



NOTE:
1. Not from measurements made by licensed surveyor.
2. Taxlot data obtained from Metro Data Resource Center:
ftp.metro-region.org

CITY CENTER
DEVELOPMENT AGENCY

Amec Foster Wheeler
Environment & Infrastructure, Inc.
7376 S.W. Durham Road
Portland, OR 97224

amec foster wheeler

DRAFT

ANALYSIS OF BROWNFIELD
CLEANUP ALTERNATIVES
SAXONY-PACIFIC PROPERTY
12535 SW MAIN STREET, TIGARD, OREGON

GROUNDWATER TOTAL HVOC
CONCENTRATION CONTOUR MAP

DATE	NOVEMBER 2015
SCALE	1 " = 25 '
PROJECT NO.	5-61M-12680-3
FIGURE	6

DRAWN BY: SD CHECKED BY: JKH

K:\12000\12600\12680\126803\dwg_ABCA\Figure 6 - Groundwater Total HVOC Concentration Contour Map.mxd - stephane.descombes - 11/16/2015 - 9:40:13 AM

APPENDIX

DRAFT

TABLE 2.1
Analytical Laboratory Results - Soil Samples
Saxony-Pacific Properties

Soil Analyte	Units	Screening Criteria				Soil Samples			
		DEQ RBCss Urban Residential	DEQ RBCso Urban Residential	DEQ RBCsi Urban Residential	DEQ RBCsw Urban Residential	B2-8 (7.5 to 8.5 ft bgs)	B3-14 (13.5 to 14.5 ft bgs)	B4-14 (13.5 to 14.5 ft bgs)	B10 at 1.5 ft. (1.0 to 1.5 ft bgs)
TPH by NWTPH-HCID									
Gasoline Range (C6-C10)	mg/kg	na	na	na	na	26.4 U	25.1 U	25.8 U	NA
Diesel Range (C10-C22)	mg/kg	na	na	na	na	66.1 U	62.8 U	64.5 U	NA
Oil Range (C22-C40)	mg/kg	na	na	na	na	132 U	126 U	129 U	NA
TPH by NWTPH-Gx									
Gasoline Range (C6-C10)	mg/kg	2,500	5,900	94	31	NA	NA	NA	NA
TPH by NWTPH-Dx									
Diesel Range (C10-C22)	mg/kg	2,200	>Max	>Max	9,500	NA	NA	NA	NA
Oil Range (C22-C40)	mg/kg	5,700	>Max	>Max	>Max	NA	NA	NA	NA
Total Metals by 6000/7000 Series									
Arsenic	mg/kg	1.0	NV	NV	np	NA	NA	NA	NA
Barium	mg/kg	31,000	NV	NV	np	NA	NA	NA	NA
Cadmium	mg/kg	78	NV	NV	np	NA	NA	NA	NA
Chromium	mg/kg	230,000	NV	NV	np	NA	NA	NA	NA
Lead	mg/kg	400	NV	NV	30	NA	NA	NA	NA
Mercury	mg/kg	47	NV	NV	np	NA	NA	NA	NA
Selenium	mg/kg	na	na	na	na	NA	NA	NA	NA
Silver	mg/kg	780	na	na	na	NA	NA	NA	NA
PAHs by EPA 8270SIM									
Acenaphthene	µg/kg	9,400,000	>Max	>Max	>Csat	NA	NA	NA	NA
Acenaphthylene	µg/kg	na	na	na	na	NA	NA	NA	NA
Anthracene	µg/kg	47,000,000	>Max	>Max	>Csat	NA	NA	NA	NA
Benz(a)anthracene	µg/kg	340	NV	NV	10,000	NA	NA	NA	NA
Benzo(a)pyrene	µg/kg	34	NV	NV	2,700	NA	NA	NA	NA
Benzo(b+k)fluoranthene *	µg/kg	340	>Csat	>Csat	>Csat	NA	NA	NA	NA
Benzo(g,h,i)perylene	µg/kg	na	na	na	na	NA	NA	NA	NA
Chrysene	µg/kg	32,000	>Csat	>Csat	>Csat	NA	NA	NA	NA
Dibenz(a,h)anthracene	µg/kg	34	NV	NV	>Csat	NA	NA	NA	NA
Fluoranthene	µg/kg	4,600,000	>Max	>Max	>Csat	NA	NA	NA	NA
Fluorene	µg/kg	6,300,000	>Max	>Max	>Csat	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	µg/kg	340	NV	NV	>Csat	NA	NA	NA	NA
Naphthalene	µg/kg	25,000	18,000	18,000	470	NA	NA	NA	NA
Phenanthrene	µg/kg	na	na	na	na	NA	NA	NA	NA
Pyrene	µg/kg	3,400,000	>Csat	>Csat	>Csat	NA	NA	NA	NA
VOCs by EPA 8260B									
VOCs	µg/kg	various	various	various	various	ND	ND	ND	ND

Notes:
* = RBC for Benzo(b)fluoranthene used
>Csat = This soil RBC exceeds the limit of three-phase partitioning.
>MAX = Constituent RBC for this pathway is greater than 100,000 mg/kg.
µg/kg = micrograms per kilogram
bgs = below ground surface
DEQ = Oregon Department of Environmental Quality
DET = Detected
ft. = feet
in. = inches
mg/kg = milligrams per kilogram
NA = not analyzed for this constituent
na = not applicable
ND = No detections
np = leaching to groundwater RBCs not provided for these inorganic chemicals
NV = considered "nonvolatile" for the purposes of the exposure calculations.
NWTPH = Northwest Method Total Petroleum Hydrocarbons
PAHs = Polynuclear aromatic hydrocarbons
RBC = Risk Based Concentration from DEQ, 2012. Risk-Based Concentrations for Individual Chemicals
RBCsi = RBC for vapor intrusion into buildings exposure pathway
RBCso = RBC for volatilization to outdoor air exposure pathway
RBCss = RBC for soil ingestion, dermal contact, and inhalation exposure pathways
RBCsw = RBC for leaching to groundwater pathway
SLV = Screening Level Value from DEQ. Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment. April 3, 2007.
U = analyte not detected at method reporting limit concentration indicated
VOCs = Volatile Organic Compounds

TABLE 2.2
Analytical Laboratory Results - Groundwater Samples
Saxony-Pacific Properties

Groundwater Analyte	Units	Screening Criteria				Groundwater Samples									
		DEQ RBCtw Urban Residential	DEQ RBCwo Urban Residential	DEQ RBCwi Urban Residential	DEQ RBCwe Construction & Excavation Worker	B1A-GW	B2-GW	B3-GW	B4-GW	B-6	B-7	B-8	B-9	PW-1	PW-1 Dup
TPH by NWTPH-HCID															
Gasoline Range (C6-C10)	mg/L	110	>S	22,000	14,000	0.0980 U	0.0935 U	0.0935 U	0.0971 U	NA	NA	NA	NA	NA	NA
Diesel Range (C10-C22)	mg/L	100	>S	>S	>S	0.245 U	0.234 U	0.234 U	0.243 U	NA	NA	NA	NA	NA	NA
Oil Range (C22-C40)	mg/L	300	>S	>S	>S	0.245 U	0.234 U	0.234 U	0.243 U	NA	NA	NA	NA	NA	NA
VOCs by EPA 8260B															
Acetone	µg/L	na	na	na	na	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	NA	NA
Benzene	µg/L	1.7	7,600	510	1,700	0.250 U	0.43	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	NA	NA
Bromobenzene	µg/L	na	na	na	na	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Bromochloromethane	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromodichloromethane	µg/L	0.59	5,000	1,000	450	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromoform	µg/L	12.0	570,000	200,000	14,000	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromomethane	µg/L	17.0	40,000	2,800	1,200	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
2-Butanone (MEK)	µg/L	na	na	na	na	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA	NA
n-Butylbenzene	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	NA
sec-Butylbenzene	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	NA
tert-Butylbenzene	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	NA
Carbon Tetrachloride	µg/L	1.7	2,900	140	1,700	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Chlorobenzene	µg/L	180	NP	55,000	10,000	0.500 U	0.500 U	0.550 J	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Chloroethane	µg/L	42,000	NP	2,800,000	2,400,000	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Chloroform	µg/L	0.98	3,000	220	720	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloromethane	µg/L	380	500,000	26,000	22,000	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
2-Chlorotoluene	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
4-Chlorotoluene	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dibromo-3-chloropropane	µg/L	na	na	na	na	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Dibromochloromethane	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dibromoethane (EDB)	µg/L	0.031	520	130	28	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Dibromomethane	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichlorobenzene	µg/L	740	NP	NP	37,000	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
1,3-Dichlorobenzene	µg/L	na	na	na	na	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
1,4-Dichlorobenzene	µg/L	2	11,000	1,000	1,500	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Dichlorodifluoromethane	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1-Dichloroethane	µg/L	na	na	na	na	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
1,2-Dichloroethane (EDC)	µg/L	0.69	5,100	690	630	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
1,1-Dichloroethene	µg/L	680	550,000	27,000	43,000	0.500 U	0.500 U	6.23	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
cis-1,2-Dichloroethene	µg/L	150	NP	NP	24,000	**173**	22.7	**1,320**	0.500 U	0.500 U	0.500 U	0.500 U	1.24	0.500 U	0.500 U
trans-1,2-Dichloroethene	µg/L	210	430,000	28,000	14,000	1.02	0.500 U	7.89	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
1,2-Dichloropropane	µg/L	na	na	na	na	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
1,3-Dichloropropane	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
2,2-Dichloropropane	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichloropropene	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
cis-1,3-Dichloropropene	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
trans-1,3-Dichloropropene	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Ethylbenzene	µg/L	6.7	22,000	1,300	4,400	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	NA	NA
Hexachlorobutadiene	µg/L	na	na	na	na	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
2-Hexanone	µg/L	na	na	na	na	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA	NA

TABLE 2.2
Analytical Laboratory Results - Groundwater Samples
Saxony-Pacific Properties

Groundwater Analyte	Units	Screening Criteria				Groundwater Samples									
		DEQ RBCtw Urban Residential	DEQ RBCwo Urban Residential	DEQ RBCwi Urban Residential	DEQ RBCwe Construction & Excavation Worker	B1A-GW	B2-GW	B3-GW	B4-GW	B-6	B-7	B-8	B-9	PW-1	PW-1 Dup
Isopropylbenzene	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	NA
4-Isopropyltoluene	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	NA
4-Methyl-2-pentanone (MiBK)	µg/L	na	na	na	na	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA	NA
Methyl Tert-butyl ether (MTBE)	µg/L	53	610,000	110,000	62,000	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	NA
Methylene chloride	µg/L	na	na	na	na	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Naphthalene	µg/L	0.78	8,400	1,800	500	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	NA	NA
n-Propylbenzene	µg/L	na	na	na	na	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	NA	NA
Styrene	µg/L	3,200	NP	NP	160,000	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	NA
1,1,1,2-Tetrachloroethane	µg/L	na	na	na	na	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
1,1,2,2-Tetrachloroethane	µg/L	na	na	na	na	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Tetrachloroethene (PCE)	µg/L	49	110,000	5,900	5,400	16.5	2.39	**106**	0.500 U	0.500 U	0.500 U	0.500 U	1.22	0.500 U	0.500 U
Toluene	µg/L	4,600	NP	NP	210,000	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	NA
1,2,3-Trichlorobenzene	µg/L	na	na	na	na	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U
1,2,4-Trichlorobenzene	µg/L	na	na	na	na	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U
1,1,1-Trichloroethane	µg/L	18,000	NP	1,200,000	1,100,000	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
1,1,2-Trichloroethane	µg/L	0.83	5,300	800	49	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Trichloroethene (TCE)	µg/L	1.7	6,600	380	430	**10.9**	1.07	**803**	0.500 U	0.500 U	0.500 U	0.500 U	0.5	0.500 U	0.500 U
Trichlorofluoromethane	µg/L	2,600.0	590,000	27,000	160,000	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U
1,2,3-Trichloropropane	µg/L	na	na	na	na	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2,4-Trimethylbenzene	µg/L	29.0	na	5,000	1,700	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	NA
1,3,5-Trymethylbenzene	µg/L	730.0	na	na	23,000	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	NA
Vinyl Chloride	µg/L	0.059	500	22	1,200	**77.2**	**13.8**	**164**	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Xylenes	µg/L	410.000	NP	58,000	23,000	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	NA	NA

Notes:
>S = RBC exceeds the solubility limit.
Bold = constituent concentration exceeds one or more screening criteria
DEQ = Oregon Department of Environmental Quality
J = estimated value
NA = not analyzed for this constituent
na =not applicable
NP = not published; value exceeds either Csat, S, or Pv
NWTPH = Northwest Method Total Petroleum Hydrocarbons
RBC = Risk Based Concentration
RBCtw = RBC for ingestion and inhalation from tapwater exposure pathways
RBCwe = RBC for groundwater in excavation pathway
RBCwi = RBC for vapor intrusion into buildings exposure pathway
RBCwo = RBC for volatilization to outdoor air exposure pathway
U = analyte not detected at concentration greater than method reporting limit indicated
VOCs = Volatile organic compounds

DRAFT

TABLE 2.3
Analytical Laboratory Results - Soil Gas Samples
Detected Constituents Only
Saxony-Pacific Properties

Soil Gas Analyte	CAS Registry Number	Screening Criteria	Soil Gas Samples	
		DEQ RBCsv Urban Residential	SG-1	SG-2
VOCs by TO-15		**(µg/m^3)**	**(µg/m^3)**	**(µg/m^3)**
Acetone (2-Propanone)	67-64-1	na	7.5 U	8.6
Dichlorodifluoromethane (Freon-12)	75-71-8	na	2.1	2.0
Dichloroethene, cis-1,2-	156-59-2	>Pv	2.7	0.79 U
alpha-Pinene	80-56-8	na	0.75 U	1.4
Propene (Propylene)	115-07-1	na	0.92	0.79 U
Tetrachloroethylene (PCE); C2Cl4	127-18-4	5,100	60	0.79 U
Toluene; C7H8	108-88-3	1,000,000	1.3	1.3
Trichloroethylene; C2HCl3	79-01-6	200	6.9	0.79 U
Trichlorofluoromethane (Freon 11)	75-69-4	150,000	1.1	1.0
Helium Tracer		**(ppmV)**	**(ppmV)**	**(ppmV)**
Helium	7440-59-7	na	38 U	5,900

Notes:
>Pv = the air concentration reported for the RBC exceeds the vapor pressure of the pure chemical.
µg/m^3 = micrograms per cubic meter
Bold = constituent concentration exceeds one or more screening criteria
DEQ = Oregon State Department of Environmental Quality
NA = not analyzed for this constituent
na =not applicable
NWTPH = Northwest Method Total Petroleum Hydrocarbons
ppmV = parts per million by volume
RBC = Risk Based Concentration
RBCsv = RBC for vapor intrusion into building exposure pathways
TO-15 = United States Environmental Protection Agency (EPA) Compendium Method Toxic Organic 15
U = analyte not detected at concentration greater than method reporting limit indicated
VOCs = Volatile Organic Compounds

DRAFT

TABLE 2.4a
Analytical Laboratory Results - Sediment Samples
Human Health Screening
Saxony-Pacific Properties

Soil Analyte	Units	Screening Criteria						Sediment Samples										
		DEQ RBCss Urban Residential	DEQ RBCso Urban Residential	DEQ RBCsi Urban Residential	DEQ RBCsw Urban Residential	Human Health General SLV	Human Health Subsistence SLV	SS-1 (0 to 6 in. bgs)	SS-2 (6 to 12 in. bgs)	SS-3 (0 to 6 in. bgs)	SS-4 (0 to 12 in. bgs)	SS-4 (12 to 24 in. bgs)	SS-4 (12 to 24 in. bgs) Dup	SS-4 (24 to 36 in. bgs)	SS-5 (0 to 12 in. bgs)	SS-6 (0 to 12 in. bgs)	SS-7 (0 to 12 in. bgs)	SS-8 (0 to 12 in. bgs)
TPH by NWTPH-HCID																		
Gasoline Range (C6-C10)	mg/kg	na	na	na	na	na	na	19.8 U	19.0 U	19.0 U	na	na	na	na	na	na	na	na
Diesel Range (C10-C22)	mg/kg	na	na	na	na	na	na	49.4 U	47.4 U	47.5 U	na	na	na	na	na	na	na	na
Oil Range (C22-C40)	mg/kg	na	na	na	na	na	na	98.8 U	DET	95.0 U	na	na	na	na	na	na	na	na
TPH by NWTPH-Gx																		
Gasoline Range (C6-C10)	mg/kg	2,500	5,900	94	31	na	na	NA	NA	NA	na	na	na	na	na	na	na	na
TPH by NWTPH-Dx																		
Diesel Range (C10-C22)	mg/kg	2,200	>Max	>Max	9,500	na	na	NA	98.9 U	NA	54.8 U	112 U	257 U	262 U	427 U	25 U	95.9 U	37.3 U
Oil Range (C22-C40)	mg/kg	5,700	>Max	>Max	>Max	na	na	NA	271	NA	287	495	605	538	50 U	870	485	229
Total Metals by 6000/7000 Series																		
Antimony	mg/kg	na	na	na	na	na	na	NA	NA	NA	1.83 U	1.73 U	1.83 U	190 U	0.957	1.67 U	1.51 U	1.51 U
Arsenic	mg/kg	1.0	NV	NV	np	7	7	3.75	2.69	3.47	**6.58**	5.20	4.46	4.57	**18.2**	3.78	**6.91**	**19.5**
Barium	mg/kg	31,000	NV	NV	np	na	na	116	83.0	94.9	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	mg/kg	310	NV	NV	np	na	na	NA	NA	NA	0.493	0.449	0.402	0.379	NA	0.500	NA	NA
Cadmium	mg/kg	78	NV	NV	np	1	1	0.969 U	1.03 U	1.01 U	0.402	0.380	0.439	0.493	0.478	**2.43**	0.408	0.288
Chromium	mg/kg	230,000	NV	NV	np	na	na	11.4	11.7	11.6	19.0	16.3	15.8	18.5	15.5	22.6	18.2	17.4
Copper	mg/kg	6,200	NV	NV	np	na	na	NA	NA	NA	21.3	19.4	17.9	20.0	31.4	147	28.3	16.2
Lead	mg/kg	400	NV	NV	30	17	17	13.0	**23.1**	13.2	**18.7**	**19.4**	**24.2**	**30.2**	**36.6**	**69.1**	**48.8**	14.7
Mercury	mg/kg	47	NV	NV	np	0.07	0.07	0.0775 U	0.0821 U	0.0810 U	**0.0747**	0.138 U	0.146 U	**0.0779**	0.116 U	**0.0766**	0.121 U	0.121 U
Nickel	mg/kg	3100	NV	NV	np	na	na	NA	NA	NA	14.3	13.8	11.1	12.9	17.5	44.3	16.6	**21**
Selenium	mg/kg	na	na	na	na	2	2	1.94 U	2.05 U	2.02 U	7.31 U	6.91 U	7.31 U	7.58 U	1.45 U	1.73	1.51 U	1.51 U
Silver	mg/kg	780	na	na	na	na	na	0.969 U	1.03 U	1.01 U	0.292	0.259	0.201	0.379	0.290 U	0.633	0.151	0.303 U
Thallium	mg/kg	na	na	na	na	na	na	NA	NA	NA	0.365 U	0.346 U	0.365 U	0.379 U	0.290 U	0.333 U	0.302 U	0.303 U
Zinc	mg/kg	na	na	na	na	na	na	NA	NA	NA	199	179	171	167	280	229	200	255
PAHs by EPA 8270D SIM																		
Acenaphthene	µg/kg	9,400,000	>Max	>Max	>Csat	na	na	9.69 U	16.8	9.34 U	17.0 U	16.6 U	78.9 U	89.1 U	69.2 U	15.1 U	63.7 U	13.1 U
Acenaphthylene	µg/kg	na	na	na	na	na	na	9.69 U	9.51 U	9.34 U	17.0 U	16.6 U	78.9 U	89.1 U	69.2 U	22.9	63.7 U	13.1 U
Anthracene	µg/kg	47,000,000	>Max	>Max	>Csat	na	na	9.69 U	26.0	9.34 U	17.0 U	11.2	78.9 U	89.1 U	69.2 U	18.5	63.7 U	13.1 U
Benz(a)anthracene	µg/kg	340	NV	NV	10,000	na	na	17.7	114	40.4	45.0	54.8	115	249	68.6	48.2	40.0	8.03
Benzo(a)pyrene	µg/kg	34	NV	NV	2,700	na	na	18.1	**125**	**41.4**	**56.6**	**62.5**	**109**	**293**	**52.2**	**104**	63.7 U	19.2
Benzo(b+k)fluoranthene *	µg/kg	340	>Csat	>Csat	>Csat	na	na	40.9	204	74.4	114	130	209	**498**	105	165	127 U	**27.5**
Benzo(g,h,i)perylene	µg/kg	na	na	na	na	na	na	26.1	98.8	37.6	54.1	54.8	82.7	218	52.3	126	63.7 U	22.2
Chrysene	µg/kg	32,000	>Csat	>Csat	>Csat	na	na	27.8	163	51.2	71.8	86.5	132	269	75.5	100	40.2	12.5
Dibenz(a,h)anthracene	µg/kg	34	NV	NV	>Csat	na	na	9.69 U	22.8	9.34 U	17.0 U	10.4	78.9 U	**45.7**	69.2 U	12.5	63.7 U	13.1 U
Fluoranthene	µg/kg	4,600,000	>Max	>Max	>Csat	510	62	39.7	**297**	**96.5**	**119**	**128**	**252**	**432**	**109**	**140**	**64.9**	10.2
Fluorene	µg/kg	6,300,000	>Max	>Max	>Csat	na	na	9.69 U	16.2	9.34 U	17.0 U	16.6 U	78.9 U	89.1 U	69.2 U	15.1 U	63.7 U	13.1 U
Indeno(1,2,3-cd)pyrene	µg/kg	340	NV	NV	>Csat	na	na	21.9	102	36.8	50.6	51.8	83.3	230	44.8	106	63.7 U	17.5
Naphthalene	µg/kg	25,000	18,000	18,000	470	na	na	9.69 U	9.51 U	9.34 U	17.0 U	16.6 U	78.9 U	89.1 U	69.2 U	11.2	63.7 U	13.1 U
Phenanthrene	µg/kg	na	na	na	na	na	na	13.9	199	37.2	43.6	48.9	106	185	69.2 U	46.1	31.9	13.1 U
Pyrene	µg/kg	3,400,000	>Csat	>Csat	>Csat	380	47	42.2	**302**	**89.4**	**117**	**131**	**248**	**451**	**115**	**177**	**84.8**	17.1
PCBs by EPA 8082A																		
Arochlor 1016	µg/kg							NA	NA	NA	6.04 U	14.2 U	13.8 U	5.85 U	11.7 U	5.12 U	11.3 U	10.8 U
Arochlor 1221	µg/kg							NA	NA	NA	6.04 U	14.2 U	13.8 U	5.85 U	11.7 U	5.12 U	11.3 U	10.8 U
Arochlor 1232	µg/kg							NA	NA	NA	6.04 U	14.2 U	13.8 U	5.85 U	11.7 U	5.12 U	11.3 U	10.8 U
Arochlor 1242	µg/kg							NA	NA	NA	6.04 U	14.2 U	13.8 U	5.85 U	11.7 U	5.12 U	11.3 U	10.8 U
Arochlor 1248	µg/kg							NA	NA	NA	6.04 U	14.2 U	13.8 U	5.85 U	11.7 U	5.12 U	11.3 U	10.8 U
Arochlor 1254	µg/kg							NA	NA	NA	4.98	14.2 U	13.8 U	6.37	5.96	3.89	12.6	10.8 U
Arochlor 1260	µg/kg	310 (total)	>Csat	>Csat	550 (total)	0.39 (total)	0.048 (total)	NA	NA	NA	5.12	14.2 U	13.8 U	5.9	11.7 U	13.6	11.3 U	10.8 U

TABLE 2.4a
Analytical Laboratory Results - Sediment Samples
Human Health Screening
Saxony-Pacific Properties

Soil Analyte	Units	Screening Criteria						Sediment Samples										
		DEQ RBCss Urban Residential	DEQ RBCso Urban Residential	DEQ RBCsi Urban Residential	DEQ RBCsw Urban Residential	Human Health General SLV	Human Health Subsistence SLV	SS-1 (0 to 6 in. bgs)	SS-2 (6 to 12 in. bgs)	SS-3 (0 to 6 in. bgs)	SS-4 (0 to 12 in. bgs)	SS-4 (12 to 24 in. bgs)	SS-4 (12 to 24 in. bgs) Dup	SS-4 (24 to 36 in. bgs)	SS-5 (0 to 12 in. bgs)	SS-6 (0 to 12 in. bgs)	SS-7 (0 to 12 in. bgs)	SS-8 (0 to 12 in. bgs)
Organochlorine Pesticides by EPA 8081B																		
Aldrin	µg/kg	25	>Csat	>Csat	54	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
alpha-BHC	µg/kg	na	na	na	na	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
beta-BHC	µg/kg	na	na	na	na	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
delta-BHC	µg/kg	na	na	na	na	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
gamma-BHC	µg/kg	na	na	na	na	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
cis-Chlordane	µg/kg							NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
trans-Chlordane	µg/kg	4200 (total)	>Csat	>Csat	6500 (total)	0.37 (total)	0.046 (total)	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
4,4'-DDD	µg/kg	6400	NV	NV	250000	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	4.53 U	1.88 U
4,4'-DDE	µg/kg	4500	>Max	>Max	250000	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
4,4'-DDT	µg/kg	4500	NV	NV	>Csat	0.33	0.040	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Dieldrin	µg/kg	80	>Csat	>Csat	25	0.0081	0.0010	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endosulfan I	µg/kg					na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endosulfan II	µg/kg	730000 (total)	>Max	>Max	>Csat	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endosulfan sulfate	µg/kg	na	na	na	na	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endrin	µg/kg	37000	NV	NV	>Csat	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endrin Aldehyde	µg/kg	na	na	na	na	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endrin ketone	µg/kg	na	na	na	na	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Heptachlor	µg/kg	280	760000	760000	5900	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Heptachlor epoxide	µg/kg	140	NV	NV	540	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Methoxychlor	µg/kg	na	na	na	na	na	na	NA	NA	NA	8.43 U	7.52 U	7.95 U	8.42 U	5.85 U	6.80 U	5.91 U	5.65 U
Chlordane (Technical)	µg/kg	4200	>Csat	>Csat	6500	0.37 (total)	0.046 (total)	NA	NA	NA	84.3 U	75.2 U	79.5 U	84.2 U	58.5 U	68.0 U	59.1 U	56.5 U
Toxaphene (Total)	µg/kg	1200	NV	NV	14000	na	na	NA	NA	NA	84.3 U	75.2 U	79.5 U	84.2 U	58.5 U	68.0 U	59.1 U	56.5 U
Chlorinated Herbicides by EPA 8151A																		
2,4-D	mg/kg	NV	NV	NV	NV	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
2,4-DB	mg/kg	na	na	na	na	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
2,4,5-T	mg/kg	na	na	na	na	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
2,4,5-TP (Silvex)	mg/kg	na	na	na	na	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
Dalapon	mg/kg	na	na	na	na	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
Dicamba	mg/kg	na	na	na	na	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
Dichloroprop	mg/kg	na	na	na	na	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
Dinoseb	mg/kg	na	na	na	na	na	na	NA	NA	NA	0.90 U	0.80 U	0.80 U	0.86 U	0.70 U	0.78 U	0.60 U	0.60 U
MCPA	mg/kg	NV	NV	NV	NV	na	na	NA	NA	NA	90 U	80 U	80 U	86 U	70 U	78 U	60 U	60 U
MCPP	mg/kg	na	na	na	na	na	na	NA	NA	NA	90 U	80 U	80 U	86 U	70 U	78 U	60 U	60 U
Pentachlorophenol	mg/kg	NV	NV	NV	NV	0.25	0.030	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
Picloram	mg/kg	na	na	na	na	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U

DRAFT

Notes:

* = RBC for Benzo(b)fluoranthene used
>Csat = This soil RBC exceeds the limit of three-phase partitioning.
>MAX = Constituent RBC for this pathway is greater than 100,000 mg/kg.
µg/kg = micrograms per kilogram
bgs = below ground surface
Bold = constituent concentration exceeds one or more screening criteria
DEQ = Oregon State Department of Environmental Quality
DET = Detected
ft. = feet
in. = inches
mg/kg = milligrams per kilogram
NA = not analyzed for this constituent

na = not applicable
np = leaching to groundwater RBCs not provided for these inorganic chemicals
NV = considered "nonvolatile" for the purposes of the exposure calculations.
NWTPH = Northwest Method Total Petroleum Hydrocarbons
PAHs = Polynuclear Aromatic Hydrocarbons
RBC = Risk Based Concentration from DEQ, 2012. Risk-Based Concentrations for Individual Chemicals
RBCsi = RBC for vapor intrusion into buildings exposure pathway
RBCso = RBC for volatilization to outdoor air exposure pathway
RBCss = RBC for soil ingestion, dermal contact, and inhalation exposure pathways
RBCsw = RBC for leaching to groundwater pathway
VOCs = Volatile or VOCs = Volatil VOCs = Volatile or VOCs = Vol VOCs = Volatile organic compounds
U = analyte not detected at method reporting limit concentration indicated

TABLE 2.4b
Analytical Laboratory Results - Sediment Samples
Ecological Screening
Saxony-Pacific Properties

Soil Analyte	Units	Ecological Risk Screening Levels		Sediment Samples										
		Freshwater Sediment SLV	Freshwater Fish SLV	SS-1 (0 to 6 in. bgs)	SS-2 (6 to 12 in. bgs)	SS-3 (0 to 6 in. bgs)	SS-4 (0 to 12 in. bgs)	SS-4 (12 to 24 in. bgs)	SS-4 (12 to 24 in. bgs) Dup	SS-4 (24 to 36 in. bgs)	SS-5 (0 to 12 in. bgs)	SS-6 (0 to 12 in. bgs)	SS-7 (0 to 12 in. bgs)	SS-8 (0 to 12 in. bgs)
TPH by NWTPH-HCID														
Gasoline Range (C6-C10)	mg/kg	na	na	19.8 U	19.0 U	19.0 U	na	na	na	na	na	na	na	na
Diesel Range (C10-C22)	mg/kg	na	na	49.4 U	47.4 U	47.5 U	na	na	na	na	na	na	na	na
Oil Range (C22-C40)	mg/kg	na	na	98.8 U	DET	95.0 U	na	na	na	na	na	na	na	na
TPH by NWTPH-Gx														
Gasoline Range (C6-C10)	mg/kg	na	na	NA	NA	NA	na	na	na	na	na	na	na	na
TPH by NWTPH-Dx														
Diesel Range (C10-C22)	mg/kg	na	na	NA	98.9 U	NA	54.8 U	112 U	257 U	262 U	427 U	25 U	95.9 U	37.3 U
Oil Range (C22-C40)	mg/kg		na	NA	271	NA	287	495	605	538	50 U	870	485	229
Total Metals by 6000/7000 Series														
Antimony	mg/kg	3	na	NA	NA	NA	1.83 U	1.73 U	1.83 U	190 U	0.957	1.67 U	1.51 U	1.51 U
Arsenic	mg/kg	6	7	**3.75**	**2.69**	**3.47**	**6.58**	**5.20**	**4.46**	**4.57**	**18.2**	**3.78**	**6.91**	**19.5**
Barium	mg/kg	na	na	116	83.0	94.9	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	mg/kg	na	na	NA	NA	NA	0.493	0.449	0.402	0.379	NA	0.500	NA	NA
Cadmium	mg/kg	0.6	1	0.969 U	1.03 U	1.01 U	0.402	0.380	0.439	0.493	0.478	**2.43**	0.408	0.288
Chromium	mg/kg	37	na	11.4	11.7	11.6	19.0	16.3	15.8	18.5	15.5	22.6	18.2	17.4
Copper	mg/kg	36	na	NA	NA	NA	21.3	19.4	17.9	20.0	31.4	**147**	28.3	16.2
Lead	mg/kg	35	17	13.0	**23.1**	13.2	**18.7**	**19.4**	**24.2**	**30.2**	**36.6**	**69.1**	**48.8**	14.7
Mercury	mg/kg	0.2	0.07	0.0775 U	0.0821 U	0.0810 U	**0.0747**	0.138 U	0.146 U	**0.0779**	0.116 U	**0.0766**	0.121 U	0.121 U
Nickel	mg/kg	18	na	NA	NA	NA	14.3	13.8	11.1	12.9	17.5	**44.3**	16.6	**21**
Selenium	mg/kg	na	2	1.94 U	2.05 U	2.02 U	7.31 U	6.91 U	7.31 U	7.58 U	1.45 U	1.73	1.51 U	1.51 U
Silver	mg/kg	4.5	na	0.969 U	1.03 U	1.01 U	0.292	0.259	0.201	0.379	0.290 U	0.633	0.151	0.303 U
Thallium	mg/kg	na	na	NA	NA	NA	0.365 U	0.346 U	0.365 U	0.379 U	0.290 U	0.333 U	0.302 U	0.303 U
Zinc	mg/kg	123	na	NA	NA	NA	**199**	**179**	**171**	**167**	**280**	**229**	**200**	**255**
PAHs by EPA 8270D SIM														
Acenaphthene	µg/kg	290	na	9.69 U	16.8	9.34 U	17.0 U	16.6 U	78.9 U	89.1 U	69.2 U	15.1 U	63.7 U	13.1 U
Acenaphthylene	µg/kg	160	na	9.69 U	9.51 U	9.34 U	17.0 U	16.6 U	78.9 U	89.1 U	69.2 U	22.9	63.7 U	13.1 U
Anthracene	µg/kg	57	na	9.69 U	26.0	9.34 U	17.0 U	11.2	78.9 U	89.1 U	69.2 U	18.5	63.7 U	13.1 U
Benz(a)anthracene	µg/kg	32	na	17.7	**114**	**40.4**	**45.0**	**54.8**	**115**	**249**	**68.6**	**48.2**	**40.0**	8.03
Benzo(a)pyrene	µg/kg	32	na	18.1	**125**	**41.4**	**56.6**	**62.5**	**109**	**293**	**52.2**	**104**	63.7 U	19.2
Benzo(b+k)fluoranthene *	µg/kg	27	na	**40.9**	**204**	**74.4**	**114**	**130**	**209**	**498**	**105**	**165**	127 U	**27.5**
Benzo(g,h,i)perylene	µg/kg	300	na	26.1	98.8	37.6	54.1	54.8	82.7	218	52.3	126	63.7 U	22.2
Chrysene	µg/kg	57	na	27.8	**163**	51.2	**71.8**	**86.5**	**132**	**269**	**75.5**	**100**	40.2	12.5
Dibenz(a,h)anthracene	µg/kg	33	na	9.69 U	22.8	9.34 U	17.0 U	10.4	78.9 U	**45.7**	69.2 U	12.5	63.7 U	13.1 U
Fluoranthene	µg/kg	111	37	**39.7**	**297**	**96.5**	**119**	**128**	**252**	**432**	**109**	**140**	**64.9**	10.2
Fluorene	µg/kg	77	na	9.69 U	16.2	9.34 U	17.0 U	16.6 U	78.9 U	89.1 U	69.2 U	15.1 U	63.7 U	13.1 U
Indeno(1,2,3-cd)pyrene	µg/kg	17	na	**21.9**	**102**	**36.8**	**50.6**	**51.8**	**83.3**	**230**	**44.8**	**106**	63.7 U	**17.5**
Naphthalene	µg/kg	176	na	9.69 U	9.51 U	9.34 U	17.0 U	16.6 U	78.9 U	89.1 U	69.2 U	11.2	63.7 U	13.1 U
Phenanthrene	µg/kg	42	na	13.9	**199**	37.2	**43.6**	**48.9**	**106**	**185**	69.2 U	**46.1**	31.9	13.1 U
Pyrene	µg/kg	53	1.9	**42.2**	**302**	**89.4**	**117**	**131**	**248**	**451**	**115**	**177**	**84.8**	**17.1**

DRAFT

TABLE 2.4b
Analytical Laboratory Results - Sediment Samples
Ecological Screening
Saxony-Pacific Properties

Soil Analyte	Units	Ecological Risk Screening Levels		Sediment Samples										
		Freshwater Sediment SLV	Freshwater Fish SLV	SS-1 (0 to 6 in. bgs)	SS-2 (6 to 12 in. bgs)	SS-3 (0 to 6 in. bgs)	SS-4 (0 to 12 in. bgs)	SS-4 (12 to 24 in. bgs)	SS-4 (12 to 24 in. bgs) Dup	SS-4 (24 to 36 in. bgs)	SS-5 (0 to 12 in. bgs)	SS-6 (0 to 12 in. bgs)	SS-7 (0 to 12 in. bgs)	SS-8 (0 to 12 in. bgs)
PCBs by EPA 8082A														
Arochlor 1016	µg/kg			NA	NA	NA	6.04 U	14.2 U	13.8 U	5.85 U	11.7 U	5.12 U	11.3 U	10.8 U
Arochlor 1221	µg/kg			NA	NA	NA	6.04 U	14.2 U	13.8 U	5.85 U	11.7 U	5.12 U	11.3 U	10.8 U
Arochlor 1232	µg/kg			NA	NA	NA	6.04 U	14.2 U	13.8 U	5.85 U	11.7 U	5.12 U	11.3 U	10.8 U
Arochlor 1242	µg/kg			NA	NA	NA	6.04 U	14.2 U	13.8 U	5.85 U	11.7 U	5.12 U	11.3 U	10.8 U
Arochlor 1248	µg/kg			NA	NA	NA	6.04 U	14.2 U	13.8 U	5.85 U	11.7 U	5.12 U	11.3 U	10.8 U
Arochlor 1254	µg/kg			NA	NA	NA	**4.98**	14.2 U	13.8 U	**6.37**	**5.96**	**3.89**	**12.6**	10.8 U
Arochlor 1260	µg/kg	34 (total)	22 (total)	NA	NA	NA	**5.12**	14.2 U	13.8 U	**5.9**	11.7 U	**13.6**	11.3 U	10.8 U
Organochlorine Pesticides by EPA 8081B														
Aldrin	µg/kg	40	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
alpha-BHC	µg/kg	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
beta-BHC	µg/kg	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
delta-BHC	µg/kg	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
gamma-BHC	µg/kg	0.9	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
cis-Chlordane	µg/kg			NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
trans-Chlordane	µg/kg	4.5 (total)	0.50 (total)	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
4,4'-DDD	µg/kg	4	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	4.53 U	1.88 U
4,4'-DDE	µg/kg	1.5	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
4,4'-DDT	µg/kg	7	0.39	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Dieldrin	µg/kg	3	2.2	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endosulfan I	µg/kg	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endosulfan II	µg/kg	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endosulfan sulfate	µg/kg	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endrin	µg/kg	3	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endrin Aldehyde	µg/kg	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Endrin ketone	µg/kg	na	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Heptachlor	µg/kg	10	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Heptachlor epoxide	µg/kg	0.6	na	NA	NA	NA	2.81 U	2.51 U	2.65 U	2.81 U	1.95 U	2.27 U	1.97 U	1.88 U
Methoxychlor	µg/kg	na	na	NA	NA	NA	8.43 U	7.52 U	7.95 U	8.42 U	5.85 U	6.80 U	5.91 U	5.65 U
Chlordane (Technical)	µg/kg	4.5	0.50 (total)	NA	NA	NA	84.3 U	75.2 U	79.5 U	84.2 U	58.5 U	68.0 U	59.1 U	56.5 U
Toxaphene (Total)	µg/kg	na	na	NA	NA	NA	84.3 U	75.2 U	79.5 U	84.2 U	58.5 U	68.0 U	59.1 U	56.5 U

DRAFT

TABLE 2.4b
Analytical Laboratory Results - Sediment Samples
Ecological Screening
Saxony-Pacific Properties

Soil Analyte	Units	Ecological Risk Screening Levels		Sediment Samples										
		Freshwater Sediment SLV	Freshwater Fish SLV	SS-1 (0 to 6 in. bgs)	SS-2 (6 to 12 in. bgs)	SS-3 (0 to 6 in. bgs)	SS-4 (0 to 12 in. bgs)	SS-4 (12 to 24 in. bgs)	SS-4 (12 to 24 in. bgs) Dup	SS-4 (24 to 36 in. bgs)	SS-5 (0 to 12 in. bgs)	SS-6 (0 to 12 in. bgs)	SS-7 (0 to 12 in. bgs)	SS-8 (0 to 12 in. bgs)
Chlorinated Herbicides by EPA 8151A														
2,4-D	mg/kg	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
2,4-DB	mg/kg		na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
2,4,5-T	mg/kg	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
2,4,5-TP (Silvex)	mg/kg		na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
Dalapon	mg/kg	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
Dicamba	mg/kg	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
Dichloroprop	mg/kg	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
Dinoseb	mg/kg	na	na	NA	NA	NA	0.90 U	0.80 U	0.80 U	0.86 U	0.70 U	0.78 U	0.60 U	0.60 U
MCPA	mg/kg	na	na	NA	NA	NA	90 U	80 U	80 U	86 U	70 U	78 U	60 U	60 U
MCPP	mg/kg	na	na	NA	NA	NA	90 U	80 U	80 U	86 U	70 U	78 U	60 U	60 U
Pentachlorophenol	mg/kg	na	0.31	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U
Picloram	mg/kg	na	na	NA	NA	NA	0.60 U	0.53 U	0.53 U	0.57 U	0.47 U	0.52 U	0.4 U	0.4 U

Notes:
* = RBC for Benzo(b)fluoranthene used
>Csat = This soil RBC exceeds the limit of three-phase partitioning.
>MAX = Constituent RBC for this pathway is greater than 100,000 mg/kg.
µg/kg = micrograms per kilogram
bgs = below ground surface
Bold = constituent concentration exceeds one or more screening criteria
DEQ = Oregon State Department of Environmental Quality
DET = Detected
ft. = feet
in. = inches
mg/kg = milligrams per kilogram
NA = not analyzed for this constituent
na = not applicable
SLV = Screening Level Value from DEQ. Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment. April 3, 2007.
NWTPH = Northwest Method Total Petroleum Hydrocarbons
PAHs = Polynuclear Aromatic Hydrocarbons
U = analyte not detected at method reporting limit concentration indicated

DRAFT