



## **Public Review Draft**

### **Cleanup Action Plan Block 38 West**

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**500 through 536 Westlake Avenue North  
Seattle, Washington**

By

Washington State Department of Ecology  
Shoreline, Washington

October 2024

## Publication Information

This document is an attachment (Exhibit B) to the Consent Decree for the Block 38 West Site, available on the Department of Ecology's Block 38 West cleanup site page at:

<https://apps.ecology.wa.gov/publications/summarypages/15008.html>

### Related Information

- Clean-up site ID: 15008
- Facility site ID: 62773

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DEPARTMENT OF  
**ECOLOGY**  
State of Washington

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# Acronyms and Abbreviations

AO	Agreed Order No. DE 17963
ARARs	applicable or relevant and appropriate requirements
bgs	below ground surface
Block 38 West Site	the location where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, placed, or otherwise come to be located
Block 38 West Property	500 through 536 Westlake Avenue North in Seattle, Washington
CAP	Cleanup Action Plan
cDCE	cis-1,2-dichloroethene
CFR	Code of Federal Regulations
City Investors IX	City Investors IX LLC
CMP	Compliance Monitoring Plan
COCs	constituents of concern
COPCs	constituents of potential concern
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
CSWGP	Construction Stormwater General Permit
CVOC	chlorinated volatile organic compound
DAHP	Department of Archaeology and Historic Preservation
dCAP	Draft Cleanup Action Plan
DRO	diesel-range organics
Ecology	Washington State Department of Ecology
EHD Map	Washington State Department of Health’s Environmental Health Disparities Map
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EJ Screening Tool	EPA Environmental Justice Screening and Mapping Tool
Farallon	Farallon Consulting, L.L.C.
FFS	Focused Feasibility Study
IAR	Interim Action Report

IAWP	Interim Action Work Plan
mg/kg	milligrams per kilogram
MTCA	Washington State Model Toxics Control Act Cleanup Regulation
NAVD88	North American Vertical Datum of 1988
ORO	oil range organics
RCW	Revised Code of Washington
RI	Remedial Investigation
RI/FFS	Remedial Investigation and Focused Feasibility Study
RIWP	Remedial Investigation Work Plan
SEPA	State Environmental Policy Act
TEC	Toxicity Equivalent Calculation per Ecology Implementation Memorandum #10
UST	underground storage tank
WAC	Washington Administrative Code

# 1.0 Introduction

This document presents the Cleanup Action Plan (CAP) for the Block 38 West Site located in Seattle, Washington (Figure 1). The CAP was prepared in accordance with the requirements of the Model Toxics Control Act, Chapter 70A.305 of the Revised Code of Washington, and its implementing regulations, Chapter 173-340 of the Washington Administrative Code (WAC) (collectively, MTCA)

## 1.1 General Facility Information and Site/Property Definitions

**Site Name:** Block 38 West Site

**Facility Site ID No.:** 62773

**Cleanup Site ID No.:** 15008

**Property Address:** 500–536 Westlake Avenue N., Seattle, WA 98109

**Parcel Numbers:** 1983200196, 1983200180, 1983200170

**Owner:** City Investors IX LLC

The Block 38 West **Site**, as defined under MTCA, is where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, placed, or otherwise come to be located. The Block 38 West Site includes multiple parcels where hazardous substances were released or have come to be located from historical commercial and industrial operations.

The Block 38 West **Property** (Figure 2) comprises the western half of the block bounded by Mercer Street to the north, Westlake Avenue North to the west, Republican Street to the south, and a north-south-trending alley (City of Seattle public right-of-way) that bisects the block to the east. The eastern half of the same block is referred to as the Block 38 East Property; the whole block comprising the Block 38 West and Block 38 East Properties and the alley is referred to as Block 38.<sup>1</sup> The Block 38 West Site includes the Block 38 West Property, the north-south-trending alley that bisects Block 38, and portions of the surrounding public right-of-way.

## 1.2 Purpose and Objective

This document is a requirement of MTCA. The purpose of the CAP is to document the selected cleanup action for the Site and to specify the cleanup standards and other requirements the cleanup action must meet.

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<sup>1</sup> “Block 38” and other block numbers used in this document were assigned for property development planning purposes and do not correspond to the block numbers designated by the City of Seattle (e.g., the property on which Block 38 is located is known as Block 94 by the City of Seattle).

Specific MTCA requirements for CAPs are set forth in WAC 173-340-380(5). Consistent with these requirements, this CAP provides the following:

- A general description of the cleanup action developed in accordance with WAC 173-340-350 through 173-340-390;
- A summary of the rationale for selecting the cleanup action;
- A summary of how impacts on likely vulnerable populations and overburdened communities were considered when selecting the cleanup action;
- Cleanup standards for each hazardous substance and for each medium of concern at the Block 38 West Site;
- The schedule for implementation of the cleanup action plan and restoration time frame;
- Institutional controls required as part of the cleanup action;
- Applicable state and federal laws for the cleanup action;
- A preliminary determination by the department that the cleanup action will comply with WAC 173-340-360; and
- Given that the cleanup action involves on-site containment, specification of the types, levels, and amounts of hazardous substances remaining on-site and the measures that will be used to prevent migration and contact with those substances.

In addition, this CAP includes a Compliance Monitoring Plan (CMP) as Appendix A, which provides procedures and locations for compliance monitoring at the Block 38 West Site.

### **1.3 Preliminary Determination**

The Washington State Department of Ecology (Ecology) has made a preliminary determination that the cleanup action described in this CAP will comply with the requirements specified in WAC 173-340-360. Specifically, these requirements include a cleanup action that will be protective of human health and the environment (including likely vulnerable populations and overburdened communities), comply with applicable state and federal laws, comply with cleanup standards, prevent or minimize present and future releases and migration of hazardous substances in the environment, provide for compliance monitoring, use permanent solutions to the maximum extent practicable, provide for a reasonable restoration time frame, and consider public concerns and tribal rights and interests.

### **1.4 Project Background and Regulatory History**

Contamination was discovered in soil and groundwater at the Block 38 West Property during investigations conducted by Farallon Consulting, L.L.C. (Farallon) on behalf of City Investors IX L.L.C. (City Investors IX) between 2014 and 2018 to support redevelopment of the Property. The results were documented in environmental reports submitted to the City of Seattle for the

redevelopment construction permit. Those reports were reviewed by Ecology through the State Environmental Policy Act (SEPA) process in July 2019. Based on the information provided in the reports, Ecology listed Block 38 West as a contaminated site in August 2019, with Facility Site ID No. 62773 and Cleanup Site ID No. 15008. Ecology issued an early notice letter with preliminary determination of liability on August 13, 2019 (Ecology 2019). City Investors IX accepted its status as a potentially liable person in a letter dated August 27, 2019. Subsequently, Ecology and City Investors IX negotiated Agreed Order No. DE 17963 (AO) for the Block 38 West Site. The AO became effective on April 20, 2020 and required City Investors IX to conduct a Remedial Investigation (RI) and Feasibility Study (FS), complete remaining elements of an interim cleanup action that began independently on the Block 38 West Property in 2019, and prepare a preliminary draft CAP for the Block 38 West Site.

Following execution of the AO, a work plan for additional interim action cleanup work within the Block 38 alley area was submitted to Ecology. The interim action work plan (IAWP) for the alley was finalized and approved by Ecology in February 2021 (Farallon 2021). Substantial cleanup of the Block 38 West Site was performed through the independent and formal interim actions from December 2019 through July 2021 in conjunction with redevelopment of the Block 38 West Property. The independent interim action performed on the Block 38 West Property is described in the *Final Interim Action Report, Block 38 West Site, 500 through 536 Westlake Avenue North, Seattle, Washington* dated December 28, 2023 (2023 IAR; Farallon 2023b). The interim action performed in the alley east of the Block 38 West Property is described in the *Final Interim Action Report, Alley Area of Block 38 West Site Between Republican Street and Mercer Street, 500 through 536 Westlake Avenue North, Seattle, Washington* dated January 5, 2024 (2024 Alley IAR; Farallon 2024a).

A draft RI Work Plan (RIWP) was submitted to Ecology in July 2020. Prior to submittal of the draft RIWP, technical memoranda containing scopes of work for installing wells on the Block 38 West Property and collecting soil samples within the east-adjacent alley were submitted to Ecology in May and June 2020. Ecology worked with City Investors IX and provided approvals for these scopes of work and other portions of the RI scope of work between June 2020 and February 2022 to facilitate data collection while specific areas of the Site were accessible during construction. The RIWP was finalized in April 2023 (Farallon 2023a) and approved by Ecology in correspondence dated May 1, 2023. Final RI field activities were performed between May 2023 and February 2024. The work included collection of soil and groundwater data to evaluate post-construction conditions and fill remaining data gaps necessary to complete the RI and Focused FS (FFS) for the Block 38 West Site. A draft RI/FFS report was submitted to Ecology in February 2024 and a final draft was submitted in August 2024 for public review and comment (Farallon 2024b). A complete regulatory history of the Block 38 West Site is provided in the RI/FFS.

Based on the results from the RI and interim actions, isolated areas of petroleum hydrocarbons and PAHs remain at concentrations exceeding regulatory screening levels in soil at the Block 38 West Site. The RI/FFS prepared by Farallon is the technical basis for the cleanup action to be conducted at the Block 38 West Site.

## 2.0 Block 38 West Site Description and Background

This section provides the Block 38 West Site description, a summary of current and historical uses of the Block 38 West Property, the geology and hydrogeology of the South Lake Union region, summary information regarding vulnerable populations and overburdened communities, and climate change considerations.

### 2.1 Block 38 West Property Location and Description

The Block 38 West Property is in a commercial and light industrial area zoned as mixed residential and commercial in the South Lake Union area (SM-SLU 175/85-280) approximately 1 mile north of downtown Seattle. According to the King County GIS Center (2018), the Block 38 West Property comprises three tax parcels: King County Parcel No. 1983200196 on the northern portion (534 and 536 Westlake Avenue North), King County Parcel No. 1983200180 on the central portion (520 Westlake Avenue North), and King County Parcel No. 1983200170 on the southern portion (500 and 510 Westlake Avenue North) (Figure 2).

The Block 38 West Property totals approximately 1.06 acres of land developed with a multi-story mixed-use building from lot line to lot line. Adjacent street elevations vary from an approximate elevation of 41 feet relative to the North American Vertical Datum of 1988 (NAVD88) on Republican Street at the south end the Block 38 West Property, to an approximate elevation of 31 feet NAVD88 on Mercer Street at the north end of the Block 38 West Property (Figure 2). The alley bisecting Block 38 is accessed from Republican Street and Mercer Street and descends from street level at both ends to an approximate elevation of 25 feet NAVD88. The alley is used for vehicle access to parking garages on the Block 38 West Property and Block 38 East Property.

### 2.2 Block 38 West Property History

The Block 38 West Property historically was undeveloped marshland that extended along the southern shore of Lake Union and onto the north-adjacent property in the late 1880s (Farallon 2019a, Hart Crowser, Inc. 1999). Historical operations at the Block 38 West Property have included the following:

- A lumber storage yard across the majority of the Block 38 West Property from the 1890s until approximately 1920;
- Small commercial operations (e.g., a blacksmith shop, a wagon shop) in pile-supported buildings on the southern parcel in the early 1900s, which were replaced in 1919 by a two-story masonry building with a basement level at 500 and 510 Westlake Avenue North;
- Retail and commercial operations (e.g., auto parts, appliances, school and office supplies, furniture storage, clothing, and outdoor equipment) at 500 and 510 Westlake Avenue North from the 1920s to 2019;



- Commercial operations (e.g., a horse stable and wagon house, a blacksmith shop, a wagon shop, an auto repair facility, and a veterinary hospital) from the early 1900s until 1950s on the central parcel at 520 Westlake Avenue North, which were replaced in 1964 with a two-story building with rooftop parking through 2019;
- Retail operations at 520 Westlake Avenue from 1964 to 2019; and
- Warehouse storage starting in the early 1920s and transitioning into commercial and retail operations, including a commercial printer, on the northern parcel at 534 and 536 Westlake Avenue North through 2019.

The structures on the Block 38 West Property that were used as retail, temporary office space, storage, and parking remained unchanged from 1969 through August 2019. The structures were demolished in late 2019 and early 2020 as part of the redevelopment of the Block 38 West Property. A historical timber-framed trestle previously extended north from Republican Street into the alley approximately 120 feet; its constructed height was approximately 18 feet higher than the ground surface of the southern portion of the alley and it was removed during the independent interim action. The trestle was constructed for support of the rail spur that extended out to the former southern shoreline of Lake Union (Farallon 2018).

Historical operations resulted in the release of hazardous substances that caused contamination of soil and/or groundwater at the Block 38 West Property.

## 2.3 Block 38 West Property Current Land Use

The Block 38 West Property redevelopment included construction of a multi-story mixed-use building, with 12 stories above street level and four levels of underground parking. The finished floor elevation of the lowest level of parking is -3.25 feet NAVD88, with the bottom of footing elevation for the majority of the foundation at approximately -6.5 feet NAVD88. The excavation extended deeper in areas for footings or elevator pits. The mass excavation and installation of building superstructure has been completed. On May 6, 2022, the City of Seattle issued a certificate of occupancy for the new building.

## 2.4 Geology and Hydrogeology

The Puget Sound region is underlain by Quaternary sediments deposited by a number of glacial episodes. Deposition occurred prior to, during, and following glacial advances and retreats, creating the existing subsurface conditions. The naturally occurring sediments in the South Lake Union area consist primarily of interlayered and/or sequential deposits of alluvial clays, silts, and sands that typically are situated over deposits of glacial till that consist of silty sand to sandy silt with gravel. Outwash sediments consisting of sands, silts, clays, and gravels were deposited by rivers, streams, and post-glacial lakes during glacial advances and recessions. Advance outwash sediments have been largely over-consolidated by the overriding ice sheets. These advance outwash sediments are overlain by a till-like layer and/or recessional outwash sediments that are less consolidated (Galster and Laprade 1991).

The Block 38 West Property is approximately 600 feet south of Lake Union. According to a U.S. Geological Survey (1909) quadrangle map for Seattle, the original shoreline of Lake Union extended farther south than its current location, to as far as the current location of Mercer Street. In the late 1800s and the early 1900s, the southern end of Lake Union was filled with sawdust and wood waste generated by lumber mill operations and with other fill materials. The historical use of Block 38 as a lumber mill and for lumber storage resulted in deposition of wood waste across Block 38. Field observations made during subsurface investigations conducted by Farallon and others confirmed a wood debris layer was present beneath the Block 38 West Property prior to the redevelopment excavation.

A description of the general lithology and hydrogeology of the Block 38 West Property is provided below, based on field observations made during the subsurface investigations conducted by Farallon and others. According to Farallon observations during drilling and excavation at the Block 38 West Property and a review of boring logs from geotechnical drilling (GeoEngineers, Inc. [GeoEngineers] 2018), three general stratigraphic units were present at the Block 38 West Property and immediate vicinity prior to excavation:

- The shallowest unit consists of fill material with recent deposits, including lacustrine sediments, and comprises silt, sandy silt, and sand with variable gravel content. In some areas, this shallowest unit includes wood waste, peat, and organic silt.
- The fill and recent deposits are underlain by a dense stratum of heterogeneous glacially consolidated deposits comprising dense sand and variable silt and gravel content and very stiff to hard silt with variable sand and gravel content. According to GeoEngineers (2018), the recent glacially consolidated soil contact typically slopes down to the north toward Lake Union. Prior to remedial and mass excavations conducted as part of redevelopment activities at the Block 38 West Property, the contact between fill/recent deposits and glacially consolidated deposits occurred between approximate elevations of 11 to -6 feet NAVD88.
- A poorly graded dense advance glacial outwash sand with minor silt is encountered beneath the intermediate unit of glacially consolidated soil at elevations ranging from -30 to -40 feet NAVD88. The sand and gravel layer that was observed in the boring for monitoring well FMW-130 at an elevation of -22 feet NAVD88 is likely the transition zone between the intermediate unit of glacially consolidated soil and the poorly graded dense advance glacial outwash sand. In some areas where the intermediate glacially consolidated unit is thin or absent, the top of the outwash sand is encountered at shallower depths. The glacial outwash has been noted to be underlain by very dense fine-grained soil during drilling of borings several hundred feet northwest of the Block 38 West Property.

Mass excavation removed the entirety of the fill and the recent deposits from within the boundaries of the Block 38 West Property. The bottom of the mass excavation at elevation -7 feet NAVD88 was in glacially consolidated soils. Cross-sections depicting the post-excavation conditions of the Block 38 West Property are presented on Figures 4 through 6. The locations of

the cross-sections are shown on Figure 3, along with sampling locations from the subsurface investigations.

Three general water-bearing zones are present at the Block 38 West Property:

- The uppermost water-bearing zone encountered in the fill and underlying recent deposits is referred to as the Shallow Water-Bearing Zone. The Shallow Water-Bearing Zone at the Block 38 West Property varies in thickness from approximately 5 to 15 feet and was encountered at depths ranging from approximately 5 to 8 feet below ground surface (bgs). Monitoring wells formerly located on the Block 38 West Property were screened within the Shallow Water-Bearing Zone, with the exception of monitoring wells FMW-130, FMW-136, FMW-144 through FMW-147, and FMW-149, which were screened in glacially consolidated deposits comprising the Intermediate Water-Bearing Zone described below, and monitoring wells FMW-137 and FMW-138, which are screened in the outwash sand deposits comprising the Deep Outwash Aquifer that is also described below.
- A deeper water-bearing zone below the Shallow Water-Bearing Zone, referred to as the Intermediate Water-Bearing Zone, is present in the glacially consolidated soil at the Block 38 West Property encountered at approximate elevations of 5 to 10 feet NAVD88 (at depths of approximately 15 to 20 feet bgs). The Intermediate Water-Bearing Zone is continuous across the Block 38 West Property. Based on previous subsurface investigations, the Shallow Water-Bearing Zone at the Block 38 West Property (prior to removal during mass excavation ) was in direct communication with the Intermediate Water-Bearing Zone (i.e., there is no aquitard separating these groundwater-bearing zones).
- The third water-bearing zone is referred to as the Deep Outwash Aquifer, the top of which is present at approximate elevations of -30 and -40 feet NAVD88 (approximately 55 to 65 feet bgs) in dense advance outwash sand deposits consisting of sand with minor silt. The Deep Outwash Aquifer is continuous across the Block 38 West Property. The thickness of the Deep Outwash Aquifer at the Block 38 West Site is not known. Based on previous subsurface investigations, the Intermediate Water-Bearing Zone at the Block 38 West Property is in direct communication with the Deep Outwash Aquifer (i.e., there is no aquitard separating these groundwater-bearing zones).

Mass excavation removed the entirety of the Shallow-Water Bearing Zone and the upper portion of the Intermediate Water-Bearing Zone within the boundaries of the Block 38 West Property.

## 2.5 Vulnerable Populations and Overburdened Communities

An evaluation of potential impacts to likely vulnerable populations and overburdened communities in the vicinity of the Block 38 West Site was conducted in accordance with *Implementation Memorandum No. 25: Identifying Likely Vulnerable Populations and Overburdened Communities under the Cleanup Regulations* dated January 2024, prepared by

Ecology (2024) (Implementation Memorandum No. 25). The complete evaluation is presented in the RI/FFS; primary findings are summarized below.

The Block 38 West Site appears likely to be in proximity to vulnerable populations and overburdened communities due primarily to the potential for environmental exposures (e.g., heavy vehicle traffic and proximity to major roadways), and less attributed to socioeconomic or demographic factors.

Vulnerable populations and overburdened communities are not more susceptible to exposure to contaminated media associated with the Block 38 West Site than the general population. Site-specific evaluation of the interim actions, redevelopment activities, and evaluation of potential human exposure pathways presented in the RI/FFS confirm that the proposed final cleanup action will be protective of human health and the environment. The site-specific evaluation of human exposure pathways for the Block 38 West Site meets the criteria for medium confidence specified in Implementation Memorandum No. 25 and supports making a final cleanup decision under WAC 173-340-350 through 173-340-390.

## 2.6 Climate Change

The evaluation of climatological characteristics is presented in the RI/FFS. In accordance with WAC 173-340-350(6)(f), an evaluation of current and projected local and regional climatological characteristics was conducted to determine whether these characteristics could affect the migration of hazardous substances or the resilience of cleanup action alternatives for the Block 38 West Site.

Based on the results of the evaluation and the location of the Block 38 West Site in a highly developed area in Seattle, current and projected local and regional changes in climate are not anticipated to affect the migration of hazardous substances or the resilience of the cleanup action at the Block 38 West Site.

## 3.0 Summary of Investigations and Remedial Actions

Subsurface investigations and/or remedial actions have been conducted at the Block 38 West Site since 1994. This section summarizes the activities and results from the subsurface investigations and remedial actions. The objectives of the subsurface investigations were to obtain lithologic, hydrogeologic, and analytical data to characterize environmental conditions.

Boring locations associated with these investigations are shown on Figure 3. A complete summary of subsurface investigations and remedial actions conducted at the Block 38 West Site is presented in the RI/FFS.

### 3.1 1994-2022 Subsurface Investigations

The following subsurface investigations were completed at the Block 38 West Site from 1994 to 2022. Sample locations are shown on Figure 3.

- 1994 Phase II soil investigation by Dames & Moore (as cited in Hart Crowser, Inc. 1999; sampling locations unknown) in the area of a former 1,500-gallon heating oil UST removed from the sidewalk north-adjacent to Republican Street along the southern portion of the Block 38 West Property.
- 2014 installation of monitoring well FMW-130 by Farallon, including collection and analysis of soil and groundwater samples from this location on the Block 38 West Property.
- 2017 sampling and analysis of groundwater from monitoring well FMW-130 by Farallon.
- 2018 advancement of six soil borings (FB-01 through FB-06) and seven groundwater monitoring wells (FMW-132 through FMW-138) by Farallon, including collection and analysis of soil and groundwater samples from these locations and evaluating groundwater flow conditions.
- 2018 geotechnical investigation by GeoEngineers summarizing lithologic conditions observed during advancement of borings FB-01 through FB-06 and the borings for monitoring wells FMW-132 through FMW-136.
- 2019 advancement of 10 utility potholes (NGas-1, NGas-2, PH-1, PH-2, PH-4, PH-11, PH-11A, PH-12, PH-13, and PH-13A), three soil borings (FB-07 through FB-09), and installation of five monitoring wells (FMW-144 through FMW-147 and FMW-149) by Farallon. This work included collection and analysis of soil samples from select locations and groundwater sampling and analysis from the wells during multiple monitoring events conducted throughout the year.
- 2019 to 2020 advancement of eighteen test pits (TP-1 through TP-18) by a City Investors IX subcontractor. Test pits were observed and sampled by Farallon for laboratory analysis.

- 2020 to 2021 installation of four monitoring wells (FMW-150 through FMW-153) through the basement slab of the P4 parking garage level of the recently constructed building and advancement of seven soil borings (FB-10 through FB-16) within the alley east of the Block 38 West Property and two soil borings (FB-18 and FB-19) west of former soil sample location TP-12 by Farallon. This work included collection and analysis of soil samples from the nine soil borings; no soil or groundwater samples were collected from the four well locations.
- 2022 installation of four monitoring wells (FMW-154 through FMW-157) in the alley east of the Block 38 West Property and advancement of soil borings FB-20 and FB-21 north of the northwest Block 38 West Property corner and north of the alley east of the Block 38 West Property, respectively. This work was performed by Farallon and included collection and analysis of soil samples from the two soil borings; no soil or groundwater samples were collected from the four well locations.

## 3.2 2019-2021 Independent Interim Action

An independent interim action was performed at the Block 38 West Site between October 2019 and July 2021 in conjunction with redevelopment of the Block 38 West Property. The objective of the independent interim action was to reduce the threat to human health and the environment at the Block 38 West Property. The independent interim action scope of work was presented in *Interim Action Work Plan, Block 38 West Property, 500 through 536 Westlake Avenue North, Seattle, Washington* dated November 8, 2019, prepared by Farallon (2019b). Implementation of the independent interim action is detailed in the 2023 IAR that was approved by Ecology on January 4, 2024. Components of the independent interim action included excavation of contaminated soil to eliminate source material, construction dewatering and treatment of contaminated groundwater, installation of a vapor barrier around the entire perimeter and below the building foundation, and construction of the exterior walls and floor slab for the underground portion of the building using waterproof concrete. The independent interim action was conducted to meet the requirements of MTCA as defined in WAC 173-340-430. The results of the independent interim action are summarized in this section.

### 3.2.1 Construction Dewatering and Treatment

Construction dewatering and treatment were performed in conjunction with redevelopment, resulting in draw-down of groundwater elevations to below the maximum excavation depth required for redevelopment design, temporarily eliminating the Shallow Water-Bearing Zone and a portion of the Intermediate Water-Bearing Zone at the Block 38 West Property. Water generated from construction dewatering and any stormwater impacted by construction activities was treated prior to discharge in accordance with Ecology's Administrative Order Docket No. 16629 for the National Pollutant Discharge Elimination System Construction Stormwater General Permit and King County Industrial Waste Discharge Authorization No. 4493-02. During the system operation between January 2020 and March 2021, a total of approximately 186,500,000 gallons of water from the construction dewatering system and stormwater was collected, treated, and discharged via a private stormwater lateral to the City

of Seattle stormwater system. In addition, approximately 2,545,000 gallons of water from the construction dewatering system and stormwater were also collected, treated, and discharged via the municipal sanitary sewer during operation of the system.

### **3.2.2 Monitoring Well Decommissioning**

The monitoring wells installed on the Block 38 West Property during the 2014-2019 subsurface investigations (FMW-130, FMW-132 through FMW-136, FMW-148 through FMW-149) were decommissioned by a licensed well driller in accordance with the Washington State Water Well Construction Act (RCW 18.104) and WAC 173-160-460.

### **3.2.3 Excavation and Off-Property Disposal of Contaminated Soil**

The mass excavation extended across the entire area of the Block 38 West Property to approximate elevation -6.5 feet NAVD88 or approximately 30 to 35 feet below existing grade. A total of approximately 64,200 tons of soil containing detectable concentrations of hazardous substances and wood and organic debris was removed from the Block 38 West Property between November 2019 and June 2020 and disposed of off-property at appropriately permitted facilities. Of this total, approximately 44,000 tons of soil contained hazardous substances at concentrations exceeding the applicable screening levels. Approximately 50 percent of the 44,000 tons (23,000 tons) of soil with hazardous substances at concentrations exceeding the screening levels was associated with wood and organic debris encountered across the Block 38 West Property. The final limits of the mass excavation and the locations of confirmation soil samples are shown on Figures 4 through 8. A complete summary of excavation activities on the Block 38 West Property is provided in the 2023 IAR.

### **3.2.4 Utility Decommissioning – Side Sewer Line**

During excavation, a side sewer line with dark liquid was encountered on the southeastern portion of the Block 38 West Property (Figure 3). The line was observed to extend west onto the Block 38 West Property<sup>2</sup> from the adjacent alley and was not documented on Seattle Public Utilities maps. The line was breached when it was exposed and Farallon personnel collected a sample of the liquid for laboratory analysis. The sample result indicated the presence of total petroleum hydrocarbons (TPH) in the liquid. The side sewer line was cut and capped at the eastern Property boundary and inspected over the length of the line to the maximum extent practicable. No source of the petroleum hydrocarbons contained within the side sewer line was identified during subsequent demolition and excavation activities. Additional field screening in the southeastern portion of the Block 38 West Property did not indicate a release of petroleum hydrocarbons to soil or groundwater.

### **3.2.5 UST Decommissioning**

Two previously unidentified underground storage tanks (USTs) containing bunker oil and a fuel product line were encountered in the northwestern corner of the Block 38 West Property. The

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<sup>2</sup> This side sewer extended onto King County Parcel No. 1983200170 on the southern portion of the Block 38 West Property (500 and 510 Westlake Avenue North).

USTs (“UST01” and “UST02”) and product line were associated with a former mechanical equipment area that had been located below grade within the Westlake Avenue North right-of-way, west-adjacent to the former building on the Block 38 West Property (Figure 3). The mechanical equipment area housed equipment servicing the former building utilities. As part of the Block 38 West Property redevelopment, the mechanical equipment area was decommissioned, removed, and backfilled with controlled-density fill.

UST01 was discovered on January 21, 2020, during the removal of the concrete foundation and was approximately 1,200 gallons in volume. UST02 was discovered on February 5, 2020, during mass excavation activities in the northwestern corner and was approximately 2,200 gallons in volume. UST02 was approximately 10 feet west of UST01, along the western shoring wall, and was approximately 5 feet below the former concrete foundation. The product line was discovered on January 31, 2020, in the western sidewall of the excavation directly west of UST02. The line extended north to the northwestern corner of the former building foundation (Figure 3).

Both USTs were permanently decommissioned by excavation and removal in accordance with Washington State *Underground Storage Tank Regulations* (WAC 173-360A) and Ecology’s *Guidance for Remediation of Petroleum Contaminated Sites* (Ecology 2016). Soil samples were collected from the area and analyzed for TPH as diesel-range organics and heavy oil-range organics (DRO+ORO) and related compounds. The results for DRO+ORO are provided on Figure 7. Petroleum contaminated soil in this area was removed from within the limits of the Block 38 West Property boundary. A summary of the UST decommissioning and associated sampling activities at the Block 38 West Property is provided in the 2023 IAR.

### **3.2.6 Vapor Barrier Installation and Waterproof Foundation**

A chemical resistant vapor barrier known as Drago Wrap, manufactured by Stego Industries, LLC of San Clemente, California<sup>3</sup>, was installed around the entire building perimeter from the top of the shoring wall to the base of the mat slab foundation and horizontally across the entire building foundation (Figure 9). The Drago Wrap vapor barrier material was placed prior to the mat slab foundation concrete pour. The exterior foundation walls and floor slab of the underground portion of the building were constructed of waterproof concrete up to a maximum of 2 feet above the static water table. The waterproofing product installed for the building foundation was the Hycrete Endure WP System produced by Hycrete, Inc. of Fairfield, New Jersey. The purpose of the vapor barrier is to mitigate potential vapor intrusion exposures from contaminated groundwater and associated soil vapor that could come into contact with the building. In addition to the vapor barrier, the thickness of the mat slab foundation and high-performance waterproof concrete that reduces water vapor transmissivity will augment the attenuation of soil vapor, if present.

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<sup>3</sup> The vapor barrier and Hycrete specifications were provided to Ecology in the Technical Memorandum regarding Supplemental Subsurface Investigation and Foundation Elements (Farallon 2020d).



Specifications for and a summary of the installation of the Drago Wrap and Hycrete concrete at the Block 38 West Property are provided in the 2023 IAR.

### **3.3 2021 Alley Area Interim Action**

This section summarizes the results from the alley interim action conducted at the Block 38 West Site between February and July 2021. Additional details regarding the implementation of the alley interim action are summarized in the 2024 Alley IAR.

An interim action was performed in the alley area east of the Block 38 West Property in conjunction with redevelopment, specifically during utility upgrades and structural improvements to the alley. The objective of the alley area Interim Action was to remove soil containing hazardous substances at concentrations exceeding applicable screening levels in order to reduce the threat to human health and the environment. The construction excavation activities within the alley extended to a depth of approximately 5 feet bgs or an elevation of 25 to 18 feet NAVD88 (north to south) in order to place structural backfill to support the new concrete road surface and access utilities (Figure 6). Approximately 2,382 tons of soil containing detectable concentrations of hazardous substances and wood and organic debris were removed from the alley area between March 1 and July 23, 2021. The soil was disposed of offsite at appropriately permitted facilities as detailed in the 2024 Alley IAR. The final limits of the alley interim action excavation and the locations of confirmation soil samples are included on Figures 6 through 8.

### **3.4 2023-2024 Remedial Investigation Summary**

RI activities were completed at the Block 38 West Site between 2023 and 2024 to characterize the distribution of constituents of potential concern (COPCs; see Section 3.5.1) remaining after interim actions were completed. The data from these activities were used to establish cleanup standards and support the evaluation of technically feasible cleanup alternatives in accordance with the provisions of WAC 173-340-350.

The previous subsurface investigations and interim actions conducted at the Block 38 West Site had defined the lateral and vertical extent of COPCs in soil and groundwater within the Block 38 West Property boundary. The 2023 to 2024 RI activities addressed remaining data gaps. This included evaluating groundwater conditions in the Shallow and Intermediate Water-Bearing Zones following the interim actions, and characterizing residual soil and groundwater contamination that may remain beyond the Block 38 West Property boundary. Soil and groundwater data gaps that were addressed during the 2023 to 2024 RI activities include:

- The lateral extent of COPC exceedances in soil west and north of UST01 and UST02 and the associated fuel product line.
- The vertical and lateral extents of COPC exceedances in soil at the southwestern Block 38 West Property corner in the vicinity of monitoring well FMW-134.

- The lateral extent of COPCs at concentrations exceeding the screening levels within the Shallow Water-Bearing Zone south and west of former monitoring well FMW-134; to the west of soil boring FB-03; and to the east of former monitoring well FMW-130.
- The presence of benzene in a reconnaissance groundwater sample collected from former monitoring well FMW-130.
- The lateral extent of COPCs at concentrations exceeding screening levels within the Intermediate Water-Bearing Zone to the west, south, and east.
- Post-excavation groundwater conditions beneath the new building.

A total of nine soil borings (FB-17 and FMW-158 through FMW-165), including those completed as monitoring wells, were advanced in May 2023:

- Monitoring wells FMW-158, FMW-160, FMW-161, and FMW-163 were installed within the Shallow Water-Bearing Zone.
- Monitoring wells FMW-159, FMW-162, and FMW-164 were installed within the Intermediate Water-Bearing Zone.
- Monitoring well FMW-165 was installed within the Deep Outwash Aquifer.

Groundwater monitoring events were conducted at the Block 38 West Site in May, August, and November 2023, and February 2024 using the newly installed and existing monitoring wells. The monitoring well network consisted of:

- Seven monitoring wells screened in the Shallow Water-Bearing Zone (FMW-154, FMW-155, FMW-156, FMW-158, FMW-160, FWM-161, and FMW-163);
- Eleven monitoring wells screened in the Intermediate Water-Bearing Zone (FMW-150 through FMW-153, FMW-157, FMW-159, FMW-162, FMW-164, OW-1 through OW-3, and OW-5); and
- Three monitoring wells screened in the Deep Outwash Aquifer (FMW-137, FMW-138, and FMW-165).

The soil boring and monitoring well locations are shown on Figure 3. The results of the 2023 to 2024 RI activities were used to determine the nature and extent of contamination at the Block 38 West Site presented in Section 3.5 below.

### **3.5 Nature and Extent of Contamination**

Based on the results from the previous investigations, interim actions, and the RI, the nature and extent of contamination at the Block 38 West Site has been adequately characterized to establish cleanup standards and support the evaluation of technically feasible cleanup action alternatives. This section presents a brief discussion on the nature and extent of contamination by affected media at the Block 38 West Site following completion of interim actions.

### 3.5.1 Constituents of Potential Concern

Hazardous substances investigated during the RI, including investigations conducted prior to the interim actions, were based on historical uses of the Block 38 West Property and surrounding historical land use, historical fill known to have been placed in this area, USTs encountered during redevelopment, and the interim actions that were completed. Those hazardous substances that exceeded screening levels protective of human health and the environment were retained as constituents of potential concern (COPCs) for the Block 38 West Site (see Table 1).

The COPCs identified for soil at the Block 38 West Site included:

- Total petroleum hydrocarbons (TPH) as gasoline-range organics (GRO);
- TPH as diesel-range organics and oil-range organics (Total DRO+ORO);
- Benzene;
- Naphthalene;
- 1-Methylnaphthalene;
- 2-Methylnaphthalene;
- Benzo(a)pyrene;
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs); and
- Metals as barium and mercury.

The COPCs identified for groundwater at the Block 38 West Site included:

- GRO;
- Total DRO+ORO;
- Benzene;
- Naphthalene;
- 1-Methylnaphthalene; and
- Metals as barium and mercury.

Other hazardous substances were detected in groundwater at the Block 38 West Property boundary and in soil within the east-adjacent Block 38 alley at concentrations that exceed screening levels protective of human health and the environment but are not considered CPOCS for the Block 38 West Site. Those substances include chlorinated volatile organic compounds (CVOCs) and arsenic, cadmium, and lead and are associated with other listed contaminated sites. These are further discussed in Section 3.5.5.

### 3.5.2 COPC Sources

Based on the results from the RI and the interim actions completed by Farallon and others, the following historical operations and/or features were confirmed as sources of soil and/or groundwater contamination at the Block 38 West Site:

- Historical placement of impacted fill soil;

- Impacted fill soil located within wood debris associated with the former lumber mill operations on Block 38;
- Former timber pilings associated with historical buildings;
- Oil encountered in a sanitary sewer line at the southeastern portion of the Block 38 West Property (efforts to evaluate the sanitary sewer line indicated no specific point of release or former feature to which the sanitary sewer line was connected);
- A coal fill layer ranging in thickness from 4 to 6 inches encountered across the east-central and northern portions of the Block 38 West Property and in the southern and central portions of the alley at approximate elevation 20 feet NAVD88;
- Localized impacts associated with bunker fuel oil USTs encountered in the northwestern portion of the Block 38 West Property; and
- Localized impacts associated with a former railroad trestle and former timber pilings within the alley.

### 3.5.3 Soil

Prior to interim actions, the majority of COPCs detected at concentrations exceeding applicable screening levels were encountered from approximate elevations of 23 to 15 feet NAVD88 (approximately 2.5 to 20 feet bgs compared to surrounding surface elevations), extending deeper to elevation 10 feet NAVD88 in localized areas and within the fill soil and/or organic debris material across the Block 38 West Property. The independent interim action conducted in conjunction with the redevelopment of the Block 38 West Property removed the fill soil, wood debris, and soil with COPCs detected at concentrations exceeding applicable screening levels from within the limits of the Block 38 West Property and to the maximum extent practicable in the adjacent alley. The new building required mass excavation across the entire Block 38 West Property to approximate elevation -6.5 feet NAVD88 or approximately 30 to 35 feet below existing grade (Figures 4 and 5).

The alley interim action removed soil containing detectable concentrations of COPCs to an approximate elevation of 17.5 to 15 feet NAVD88 (Figure 6). The construction excavation activities within the alley extended to a depth of approximately 5 feet bgs or an elevation of 25 to 18 feet NAVD88 (north to south) in order to place structural backfill to support the new concrete road surface and access utilities.

Following the interim actions and development of the Block 38 West Property, soil containing total DRO+ORO and cPAHs at concentrations greater than the cleanup levels identified in Section 4.2 remains in localized areas at the Block 38 West Site. Total DRO+ORO and cPAHs remain within the alley and in the Westlake Avenue North right-of-way near the northwestern boundary of the Block 38 West Property as shown on Figures 7 and 8. Exceedances of cPAHs in soil also extend beyond the alley into the Mercer Street right-of-way to the north. These remaining contaminants are present in soil at depths ranging from approximately 5 to 15 feet bgs.

### **3.5.4 Groundwater**

Previous subsurface investigations documented localized petroleum hydrocarbon and naphthalene impacts to the Shallow and/or Intermediate Water-Bearing Zones at the Block 38 West Property. The nature and extent of groundwater impacts were evaluated following the interim actions to support the evaluation of cleanup alternatives for the Block 38 West Site. Groundwater quality in the Shallow Water-Bearing Zone was evaluated by monitoring a network of seven groundwater monitoring wells (FMW-154, FMW-155, FMW-156, FMW-158, FMW-160, FMW-161, and FMW-163) in the rights-of-way surrounding the Block 38 West Property (Figure 3). Groundwater quality in the Intermediate Water-Bearing Zone was evaluated by a monitoring network of 11 groundwater monitoring wells (FMW-150 through FMW-153, FMW-157, FMW-159, FMW-162, FMW-164, and OW-1 through OW-3) within the building foundation and in the rights-of-way surrounding the Block 38 West Property (Figure 3).

As documented in the RI/FFS, COPCs for the Block 38 West Site are no longer present at concentrations exceeding respective cleanup levels in the Shallow Water-Bearing Zone or Intermediate Water-Bearing Zone at the Block 38 West Site.

### **3.5.5 Contaminants from Other Sites**

CVOCs are impacting groundwater in the Deep Outwash Aquifer near the northwest corner of the Block 38 West Property. These impacts are attributed to chlorinated solvent releases from historical laundry and dry-cleaning operations on the American Linen Supply Co Dexter Ave cleanup site (Cleanup Site ID 12004), originating approximately 1,000 feet northwest of Block 38 West at 700 Dexter Avenue North (PES 2022). The chlorinated solvent contamination migrated through the groundwater and has come to be located at the Block 38 West Property. The American Linen Site, and the associated CVOC plume is being addressed under a separate agreed order with Ecology (Agreed Order No. DE 14302) and includes ongoing remedial investigation and feasibility study activities as well as ongoing interim cleanup actions. The data collected on the Block 38 West Property indicate that no releases of CVOCs occurred as a result of previous operations on the Block 38 West Property and that the concentrations detected in the Deep Outwash Aquifer are not commingled with any COPCs identified for the Block 38 West Site.

Prior to the Block 38 West interim actions, arsenic was impacting shallow soil in a small, localized area within the alley, and cadmium and lead were impacting shallow soil along the eastern side of the alley. These metals were co-located with elevated levels of cPAHs and are attributed to environmental releases on the Rosen Property cleanup site (Cleanup Site ID 5123), also known as the Interurban Exchange 2 site, located east of the alley on the Block 38 East Property (GeoEngineers 2008). An independent interim action was conducted on the northern and central portions of the Block 38 East Property in 2008, which resulted in removal of the contaminated soil from that property. Compliance sampling from the west sidewall of the 2008 interim action excavation confirmed that cadmium, lead, and cPAHs remained in shallow soil along the Block 38 East Property boundary. Ecology issued a property-specific No Further Action determination for the Rosen Property cleanup site in 2009 under the Voluntary Cleanup Program. The arsenic, cadmium, and a portion of the lead impacts in the alley were

subsequently removed as a result of the Block 38 alley interim action conducted in 2021 under the Block 38 West AO. Lead remains in shallow soil along the eastern side of the alley at elevated concentrations. The data collected on the Block 38 West Property indicate that no releases of arsenic, cadmium, or lead occurred as a result of operations on the Block 38 West Property.

Based on the determinations that the above contaminants currently constitute separate sites pursuant to MTCA and have been or will be remediated under separate legal agreement(s), the CVOCs and metals are not included as COPCs at the Block 38 West Site.

## 4.0 Cleanup Standards

Cleanup standards apply to a release of hazardous substances at a Site and include 1) cleanup levels for hazardous substances present at the Site; 2) the location where these cleanup levels must be met (i.e., point of compliance); and 3) other regulatory requirements that apply to the Site because of the type of action and/or location of the Site (i.e., applicable state and federal laws). Cleanup standards are identified for each hazardous substance at a Site and the specific areas or pathways where humans and the environment can become exposed to these substances.

In accordance with WAC 173-340-700, this section provides the cleanup standards for the Block 38 West Site.

### 4.1 Constituents of Concern

Based on the results of the RI and evaluation of conditions following the interim actions, only soil remains impacted with hazardous substances at concentrations exceeding screening levels protective of human health and the environment. Those hazardous substances comprise the final constituents of concern (COCs) for the Block 38 West Site and include:

- Total DRO+ORO; and
- Total cPAHs by Toxicity Equivalent Calculation (TEC).

The results of the RI concluded that groundwater is no longer a medium of concern, and therefore, no COCs are identified for groundwater.

Additionally, based on the information and determinations discussed in Section 3.5.5, the CVOC impacts remaining in deeper groundwater and the lead impacts remaining in shallow soil will be addressed under separate legal agreements and are not retained as COCs for the Block 38 West Site.

### 4.2 Cleanup Levels

Cleanup levels for the Block 38 West Site have been developed in accordance with WAC 173-340-700 through 173-340-760 to be protective of human health and the environment and likely vulnerable populations and/or overburdened communities as identified in Section 2.6. The cleanup levels for the COCs in soil identified above are based on MTCA Method B cleanup levels protective of direct contact. MTCA Method A cleanup levels can be used as a surrogate for Method B for compounds, such as total petroleum hydrocarbons, that do not have established Method B cleanup levels. Based on the residual soil contamination present at the Block 38 West Site and the current engineering controls in place, it is unlikely that any human receptors, including those that are part of a vulnerable population or overburdened community, are at risk unless the existing engineering controls are breached or removed.

The cleanup levels for the COCs in soil at the Block 38 West Site are:

- Total DRO+ORO: 2,000 milligrams per kilogram (mg/kg) (based on MTCA Method A, unrestricted land uses); and
- Total cPAHs TEC: 0.19 mg/kg (based on MTCA Method B, direct contact).

### 4.3 Points of Compliance

The points of compliance are the locations at which cleanup levels for the COCs must be attained to meet the requirements of MTCA in accordance with WAC 173-340-740(6). For soil cleanup levels based on protection of direct contact exposures, the point of compliance for soil is throughout the Block 38 West Site from the ground surface to 15 feet bgs in accordance with WAC 173-340-740(6)(d).

### 4.4 Applicable or Relevant and Appropriate Requirements

The following section identifies ARARs for the selected cleanup action including both action-specific requirements and location specific requirements.

#### 4.4.1 Applicable Local, State, and Federal Laws

Pursuant to MTCA, the cleanup action would be exempt from the procedural requirements of Chapter 70A.305.090 of the Revised Code of Washington, and of any laws requiring or authorizing state or local government permits or approvals. However, the cleanup action must still comply with the substantive requirements of such permits or approvals in accordance with WAC 173-340-520. The cleanup action must also comply with any applicable federal regulations and obtain any required federal permits as necessary. These requirements are often categorized as location-specific, action-specific, or chemical-specific.

The cleanup action complies with all applicable local, state, and federal laws that are presented in Table 2. Location-specific requirements will be met through compliance with all applicable state, federal, and local regulations in place for the specific location of the Block 38 West Property. Action-specific requirements have been met through implementation of construction activities and compliance with all construction-related requirements during performance of the interim actions. Chemical-specific requirements will be met through compliance with applicable MTCA cleanup levels.

#### 4.4.2 Permitting and Substantive Requirements

The following section describes the permitting and substantive requirements applicable to the interim actions performed at the Block 38 West Site.

##### 4.4.2.1 State Environmental Policy Act

SEPA (WAC 197-11) and the SEPA procedures (WAC 173-802) provide the framework for state agencies to evaluate the environmental consequences of a project and ensure appropriate measures are taken to mitigate environmental impacts. SEPA was applicable to the interim actions and the redevelopment project on the Block 38 West Property.



Block 38 is in the South Lake Union neighborhood of downtown Seattle, for which an Environmental Impact Statement (EIS) was previously prepared. The EIS, which was prepared by the City of Seattle and finalized in 2012, evaluated general environmental impacts and mitigation strategies for development projects within the South Lake Union neighborhood (City of Seattle 2012). City Investors IX prepared and submitted an addendum to the South Lake Union EIS in April 2019 that provided a site-specific analysis of environmental impacts and associated mitigation measures for the Block 38 West Property redevelopment project. The City of Seattle (2019) determined that the project will not have a significant adverse impact on the environment.

#### **4.4.2.2 City of Seattle Master Use Permit**

City Investors IX obtained a Master Use Permit from the City of Seattle for the Block 38 West Property redevelopment project on the Block 38 West Property, which also included the alley improvements.

#### **4.4.2.3 City of Seattle Grading and Shoring Permits**

City Investors IX obtained a grading permit from the City of Seattle. Substantive requirements of a grading permit included erosion control, which was addressed by implementation of best management practices in accordance with a project-specific temporary erosion and sediment control plan.

#### **4.4.2.4 Construction Stormwater General Permit**

City Investors IX received coverage under the Construction Stormwater General Permit (CSWGP) No. WAR307944 from Ecology on July 30, 2019. The CSWGP was associated with the construction dewatering activities associated with the redevelopment of the Block 38 West Property.

#### **4.4.2.5 King County Industrial Waste Program Discharge Authorization**

City Investors IX received authorization to discharge water generated by construction dewatering at the Block 38 West Site to the sanitary sewer system via the Issuance of Revised Wastewater Discharge Authorization No. 4493-02 from King County Industrial Waste Program dated August 29, 2019.

#### **4.4.2.6 Historical and Cultural Resource Protection**

As required by state law, appropriate measures were taken to evaluate the potential presence of historical, archaeological, or cultural resources. City Investors IX prepared a Cultural Resources Assessment, which was submitted to the Washington State Department of Archaeology and Historic Preservation (DAHP). DAHP concurred with the findings of the Cultural Resources Assessment requiring archeological monitoring during excavations with potential to intersect native soil. In addition, City Investors IX prepared a Monitoring and Inadvertent Discovery Plan for the Block 38 West Property redevelopment project. Monitoring conducted by the archeologist over the course of the Property cleanup and redevelopment did not yield any cultural resources of significance.

## 5.0 Cleanup Action Selection

This section presents the cleanup action requirements and goals for the Block 38 West Site, summarizes the selected cleanup action, and explains how the selected action meets the MTCA requirements for cleanup actions in WAC 173-340-360.

### 5.1 Cleanup Action Requirements and Goals

As specified in WAC 173-340-360(3)(a), a cleanup action must satisfy the following general requirements,:

- Protect human health and the environment, including likely vulnerable populations and overburdened communities;
- Comply with cleanup standards;
- Comply with applicable state and federal laws;
- Prevent or minimize present and future releases and migration of hazardous substances in the environment;
- Provide resilience to climate change impacts that have a high likelihood of occurring and severely compromising its long-term effectiveness;
- Provide for compliance monitoring;
- Not rely primarily on dilution and dispersion unless the incremental costs of any active remedial measures over the costs of dilution and dispersion grossly exceed the incremental degree of benefits;
- Provide for a reasonable restoration time frame; and
- Use permanent solutions to the maximum extent practicable.

In addition to the general requirements listed above, cleanup actions must meet action-specific requirements and media-specific requirements outlined in WAC 173-340-360(3)(b) and WAC 173-340-360(3)(c), respectively, and consider public concerns and tribal rights and interests as specified in WAC 173-340-360(3)(d).

Specific cleanup action goals were also identified for the Block 38 West Site in accordance with WAC 173-340-351(6)(a), and include the following:

- Achieve cleanup standards using a permanent solution as defined in WAC 173-340-200 that meets MTCA requirements and expectations for cleanup actions per WAC 173-340-360 and WAC 173-340-370;
- Eliminate the direct contact exposure pathway for COCs in soil; and

- Protect human health and the environment, including vulnerable populations and overburdened communities located near the Block 38 West Site.

The selected cleanup action will meet all of these goals.

## 5.2 Selected Cleanup Action

The selected cleanup action consists of the following elements:

- Complete removal and offsite disposal of affected soil and groundwater by mass excavation to an elevation of -6.5 feet NAVD88 on the Block 38 West Property (completed as a result of the independent interim action);
- Removal and offsite disposal of affected soil to the maximum extent practicable in the alley area to an elevation of 25 to 18 feet NAVD88 (completed as a result of the alley interim action);
- Compliance monitoring (completed during and following the interim actions);
- Installation of a protective cap over remaining soil contamination, consisting of new pavement within the alley and surrounding the new building (completed as a result of the interim actions); and
- Implementation of institutional controls to protect and maintain the cap and prevent direct contact with remaining contamination (not yet completed).

Based on the completed interim actions to date, only implementation of institutional controls remains. This component is further discussed in Section 6.1.2.

### 5.2.1 Considerations Related to Other Sites

The RI confirmed the presence of CVOCs in groundwater within the Deep Outwash Aquifer along the northwestern boundary of the Block 38 West Property at concentrations exceeding screening levels protective of human health and the environment. As noted in Section 3.5.5, those compounds are associated with the American Linen Site and associated CVOC plume, which is under an Agreed Order with Ecology as a part of the formalized cleanup process. As such, cleanup of the American Linen CVOC plume is not within the scope of this CAP.

To prevent potential vapor intrusion exposures associated with the CVOCs present in groundwater at the Block 38 West Property boundary, an Ecology-reviewed, contaminant-resistant vapor barrier was installed on the newly constructed building. The vapor barrier specifications are provided in Appendix B.

## 5.3 Explanation for Selected Cleanup Action

The selected cleanup action for the Block 38 West Site satisfies the MTCA general requirements in WAC 173-340-360(3)(a) and meets additional requirements specified in 173-340-360(3)(b), WAC 173-340-360(3)(c), and WAC 173-340-360(3)(d), and expectations specified in WAC 173-

340-370. The selected cleanup action will satisfy the following general requirements, as noted above in Section 5.1 and specifically in WAC 173-340-360(3)(a).

- **Protect human health and the environment.** The selected cleanup action, source removal and engineering and institutional controls, will protect human health and the environment, including vulnerable populations and overburdened communities identified in the vicinity of the Block 38 West Site, by permanently reducing the volume of hazardous substances in soil and eliminating the potential exposure pathway to residual soil contamination at the Block 38 West Site. As discussed above in Section 2.5, the vulnerable populations and overburdened communities in the vicinity of the Block 38 West Site are not more susceptible for exposure to contamination at this Site compared to the general population, and that interim actions completed to date have mitigated potential exposure to environmental harms.
- **Comply with cleanup standards.** Excavation, removal, and offsite disposal of soil containing hazardous substances resulted in the achievement of applicable MTCA cleanup levels (including soil cleanup levels for the identified COCs) in soil at the Block 38 West Property and to the maximum extent practicable in the northwestern portion and alley area of the Block 38 West Site. These actions have also resulted in the reduction of hazardous substances in Site groundwater such that all concentrations have achieved compliance with applicable MTCA cleanup levels and groundwater is no longer a medium of concern.
- **Comply with applicable state and federal laws.** Interim actions completed to date complied with applicable state and federal laws, as defined in WAC 173-340-710, and met requirements of other local, state, and federal laws related to environmental protection, health and safety, transportation, and disposal. The future cleanup action elements will also comply with all relevant and applicable local, state, and federal laws.
- **Prevent or minimize present and future releases and migration of hazardous substances in the environment.** Existing engineering controls will contain and eliminate the potential direct contact exposure pathway for the COCs remaining in shallow soil at the Site.
- **Provide resilience to climate change.** Based on the evaluation above in Section 2.8, the location of the Block 38 West Site in a highly developed area in Seattle, projected local and regional climatological characteristics are not anticipated to affect the migration of hazardous substances or the resilience of cleanup action alternatives at the Block 38 West Site.
- **Provide for compliance monitoring.** Compliance monitoring was performed consistent with WAC 173-340-410 during the interim actions that have already occurred. Implementation of institutional controls will ensure that engineering controls are maintained and allow for long-term compliance monitoring as needed.

- **Provide for a reasonable restoration time frame.** Cleanup of the Block 38 West Property is complete and cleanup of the adjacent alley and rights-of-way at the Block 38 West Site are complete to the maximum extent practicable as a result of the interim actions. The restoration time frame is considered reasonable and consistent with WAC 173-340-360(4)(c) and, based on the RI data, has proven to be effective in the long term by restoring groundwater quality and eliminating the potential exposure pathways to residual soil contamination.
- **Use permanent solutions to the maximum extent practicable.** The selected cleanup action is a permanent solution and has achieved applicable cleanup levels at the points of compliance for hazardous substances throughout the majority of the Site in the short term. The completed source removal and ongoing engineering and institutional controls will protect human health and the environment by permanently reducing the volume of hazardous substances in soil and eliminating the potential exposure pathway to residual soil contamination at the Block 38 West Site.
- **Consider public concerns and tribal rights and interests.** The interim actions were reviewed during the SEPA process for the independent interim action and a public comment period for the alley area interim action. Public concerns were taken into consideration with regard to limiting impacts to rush hour traffic and creating through access in the alley to improve access to below grade parking garages from Republican Street. Tribal rights and interests were considered during the development and implementation of the Monitoring and Inadvertent Discovery Plan for the interim actions and RI activities. Affected tribes were notified in advance of the work.

The selected cleanup action will meet action-specific requirements applicable under WAC 173-340-360(3)(b) to allow for use of institutional controls, provide financial assurances, and allow for periodic reviews of annual cap inspections. The primary elements of the selected cleanup action were implemented in conjunction with redevelopment and were highly implementable.

## 6.0 Cleanup Action Plan

This section presents a description of the selected cleanup action for the Site, the restoration time frame, implementation schedule, public participation, and compliance monitoring requirements.

### 6.1 Description of Cleanup Action

As noted in Section 5.2, the selected cleanup action for the Block 38 West Site includes a combination of elements, predominantly excavation and offsite disposal of contaminated soil from the Block 38 West Property and the adjacent alley. The other elements include installation and maintenance of a protective cap and implementing institutional controls to contain remaining soil contamination and prevent direct contact exposures. Compliance monitoring was completed during the interim actions and the RI and is further discussed in Section 7.0.

#### 6.1.1 Summary of Completed Cleanup Actions

The complete removal of affected soil and groundwater by mass excavation within the Block 38 West Property boundaries and removal of affected soil to the maximum extent practicable in the alley area were completed as interim actions during redevelopment of the Block 38 West Property. Interim actions completed are summarized in Sections 3.2 and 3.3 and described in detail in the 2023 IAR and 2024 Alley IAR.

#### 6.1.2 Remaining Cleanup Action Elements

Due to the interim actions completed at the Block 38 West Site, the only remaining element of the selected cleanup action is the implementation of institutional controls. This will consist of implementing an environmental covenant that meets the requirements of WAC 173-340-440 (8), (9), and (10) and RCW 64.70 (Uniform Environmental Covenants Act). The Environmental Covenant will be prepared in cooperation with Ecology and consistent with the Toxics Cleanup Program Procedure 440A (Establishing Environmental Covenants under the Model Toxics Control Act).

The purpose of the covenant is to impose certain restrictions on the activities and uses of the Block 38 West Property and surrounding right-of-way to protect human health, the environment, and the integrity of the interim actions completed to date at the Block 38 West Site. The covenant will remain in place until concentrations of total DRO+ORO and cPAHs decrease to levels less than the cleanup levels. It is expected that inspections and maintenance of the protective cap will be conducted on an annual basis as part of the covenant, using an Ecology-approved inspection checklist.

### 6.2 Restoration Time Frame

The selected cleanup action provides for a reasonable restoration time frame in accordance with WAC 173-340-360(4)(c). The potential risks posed by the Block 38 West Site to human health and the environment, including likely vulnerable populations and overburdened communities, are summarized in Section 5.3. Given that the majority of the selected cleanup

action has already been implemented and resulted in complete removal of hazardous substances at the Block 38 West Site to the maximum extent practicable, it is not practicable for an alternate active remedial measure to achieve a shorter restoration time frame than the selected cleanup action.

Institutional controls remaining to be implemented at the Block 38 West Site in the form of an environmental covenant are considered effective and reliable in preventing disturbance of remaining residual soil contamination or engineering controls. Inspection of the engineering controls (i.e., the protective cap) as summarized in the CMP (Appendix A) will ensure that the integrity of engineering controls is maintained and that they remain effective and reliable.

The only element of the selected cleanup action remaining to be completed is implementation of institutional controls in the form of an environmental covenant. It is expected that an environmental covenant will be recorded for the Block 38 West Site within 12 months.

### **6.3 Implementation Schedule**

The majority of the selected cleanup action has already been completed at the Block 38 West Property. Institutional controls in the form of an environmental covenant remain as the only element of the selected cleanup action yet to be implemented. It is expected that the environmental covenant will be recorded within 12 months. The initial monitoring period will be 5 years, at which time Ecology will conduct an initial 5-year review of the cleanup.

## 7.0 Compliance Monitoring

Compliance monitoring is required to ensure the protectiveness of the cleanup action performed in accordance with WAC 173-340-410.

### 7.1 Summary of Past Compliance Monitoring

Past compliance monitoring performed at the Block 38 West Site included collection of soil performance and compliance samples during the interim actions and four quarterly groundwater monitoring performed during the RI. Performance samples that meet cleanup levels may be used as compliance samples where appropriate.

#### 7.1.1 Soil Compliance Monitoring

Performance soil samples were collected during previous investigations, UST decommissioning, and the excavation and offsite disposal of contaminated soil performed on the Block 38 West Property and within the east adjacent alley. Performance soil sampling points were used as confirmation soil sampling points where analytical results for performance soil samples confirmed that cleanup levels were attained before or at the final limits of the excavation.

As documented in the RI/FFS, analytical results of performance soil sampling indicates that soil containing total DRO+ORO and cPAHs at concentrations exceeding cleanup levels remains in localized areas within the alley area, a limited portion of the Mercer Street right-of-way, and near the northwestern boundary of the Block 38 West Property (Figures 4 through 8). Confirmation samples collected on the Block 38 West Property indicate all soil with detectable concentrations of COCs have been removed.

#### 7.1.2 Groundwater Compliance Monitoring

Groundwater compliance monitoring included four consecutive quarterly groundwater monitoring events conducted at the Block 38 West Site in May, August, and November 2023, and February 2024. The monitoring well network for compliance monitoring consisted of:

- Seven monitoring wells screened in the Shallow Water-Bearing Zone (FMW-154, FMW-155, FMW-156, FMW-158, FMW-160, FWM-161, and FMW-163);
- Eleven monitoring wells screened in the Intermediate Water-Bearing Zone (FMW-150 through FMW-153, FMW-157, FMW-159, FMW-162, FMW-164, OW-1 through OW-3, and OW-5); and
- Three monitoring wells screened in the Deep Outwash Aquifer (FMW-137, FMW-138, and FMW-165).

As documented in the RI/FFS, compliance monitoring analytical results indicate that no hazardous substances are present in groundwater associated with the Block 38 West Site.



## 7.2 Proposed Compliance Monitoring

Proposed compliance monitoring pending completion of final remedial elements at the Block 38 West Site includes visual inspection of the impervious surfaces capping remaining soil contamination as detailed in the CMP (Appendix A). Visual inspections will be performed to ensure the integrity of the protective cap is maintained.

## 7.3 Contingency Actions

Contingency actions may be required if additional risk reduction measures are determined to be necessary based on observations made during future compliance monitoring, or otherwise. Contingency actions may include repair of protective caps preventing exposure to remaining contaminated soil or potentially removal of remaining contamination in the event of utility upgrades or future redevelopment.

## 8.0 References

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# Figures





REFERENCE: 7.5 MINUTE USGS QUADRANGLE SEATTLE NORTH, WASHINGTON, DATED 1983



0 2,000  
SCALE IN FEET



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Washington  
Issaquah | Bellingham | Seattle

Oregon  
Portland | Baker City

California  
Oakland | Irvine

**FIGURE 1**  
**VICINITY MAP**  
**BLOCK 38 WEST PROPERTY**  
**SEATTLE, WASHINGTON**

FARALLON PN: 397-019

Drawn By: Imurock

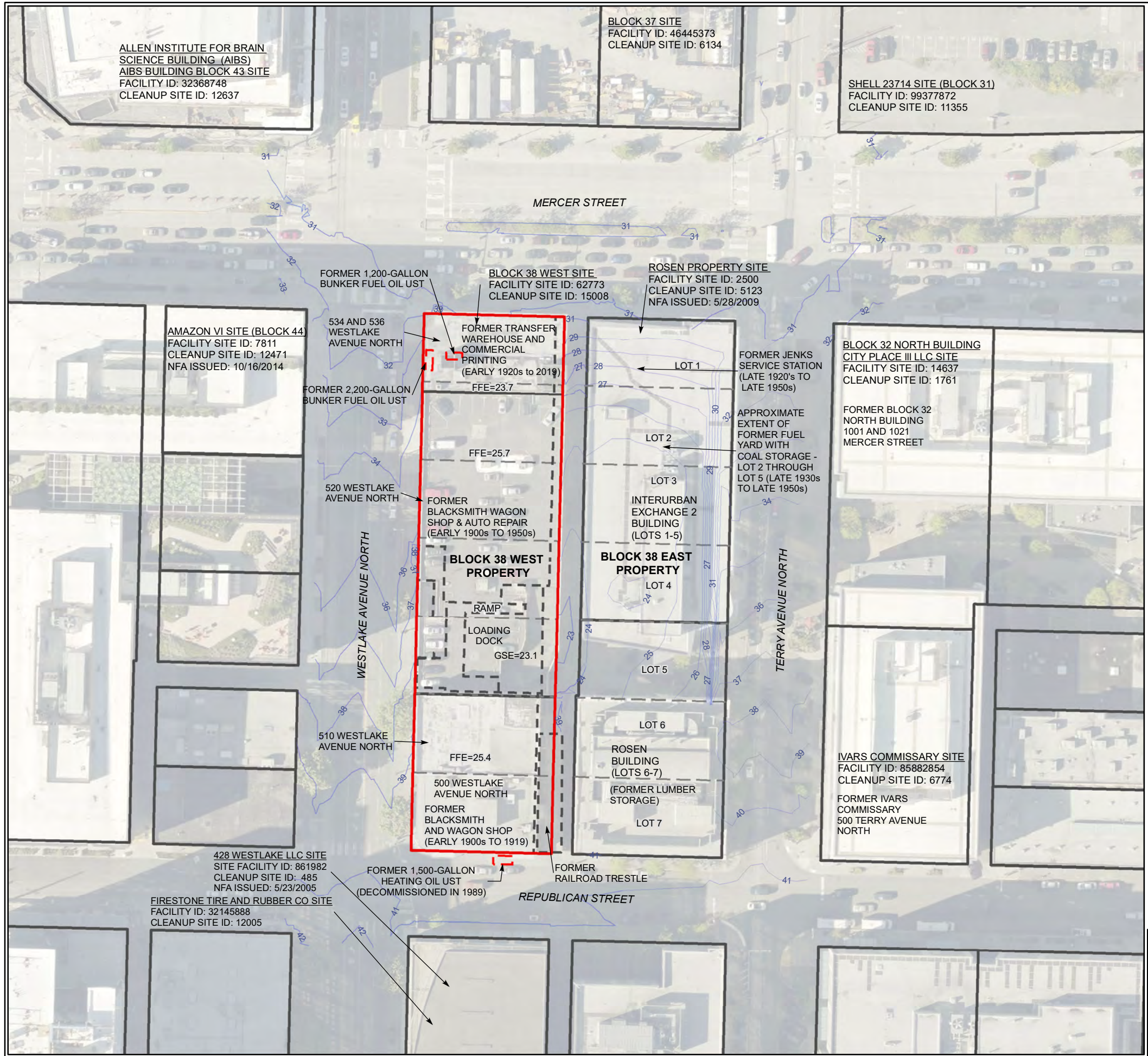
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Date: 7/8/2024

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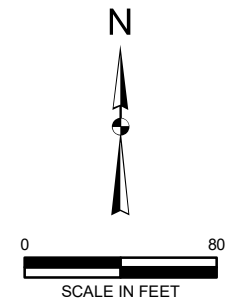


**LEGEND**

- PILE
- - - BUILDING FEATURES (BUILDINGS ON BLOCK 38 WEST PROPERTY DEMOLISHED IN 2019)
- · - LOT LINE
- 30— GROUND SURFACE ELEVATION CONTOUR
- ▭ PROPERTY BOUNDARY
- ▭ KING COUNTY PARCEL BOUNDARY


NOTES:  
 LOADING DOCK HIGHER THAN GSE  
 ELEVATION SOURCE: BUSH, ROED, & HITCHINGS, INC. (2014)  
 ELEVATION DATA PRESENTED IN FEET ABOVE MEAN SEA LEVEL IN THE NORTH AMERICAN VERTICAL DATUM OF 1988

FFE = APPROXIMATE FINISH FLOOR ELEVATIONS OF GROUND FLOOR OF FORMER BUILDING  
 GSE = APPROXIMATE GROUND SURFACE ELEVATION OF FORMER LOADING DOCK AREA  
 UST = UNDERGROUND STORAGE TANK

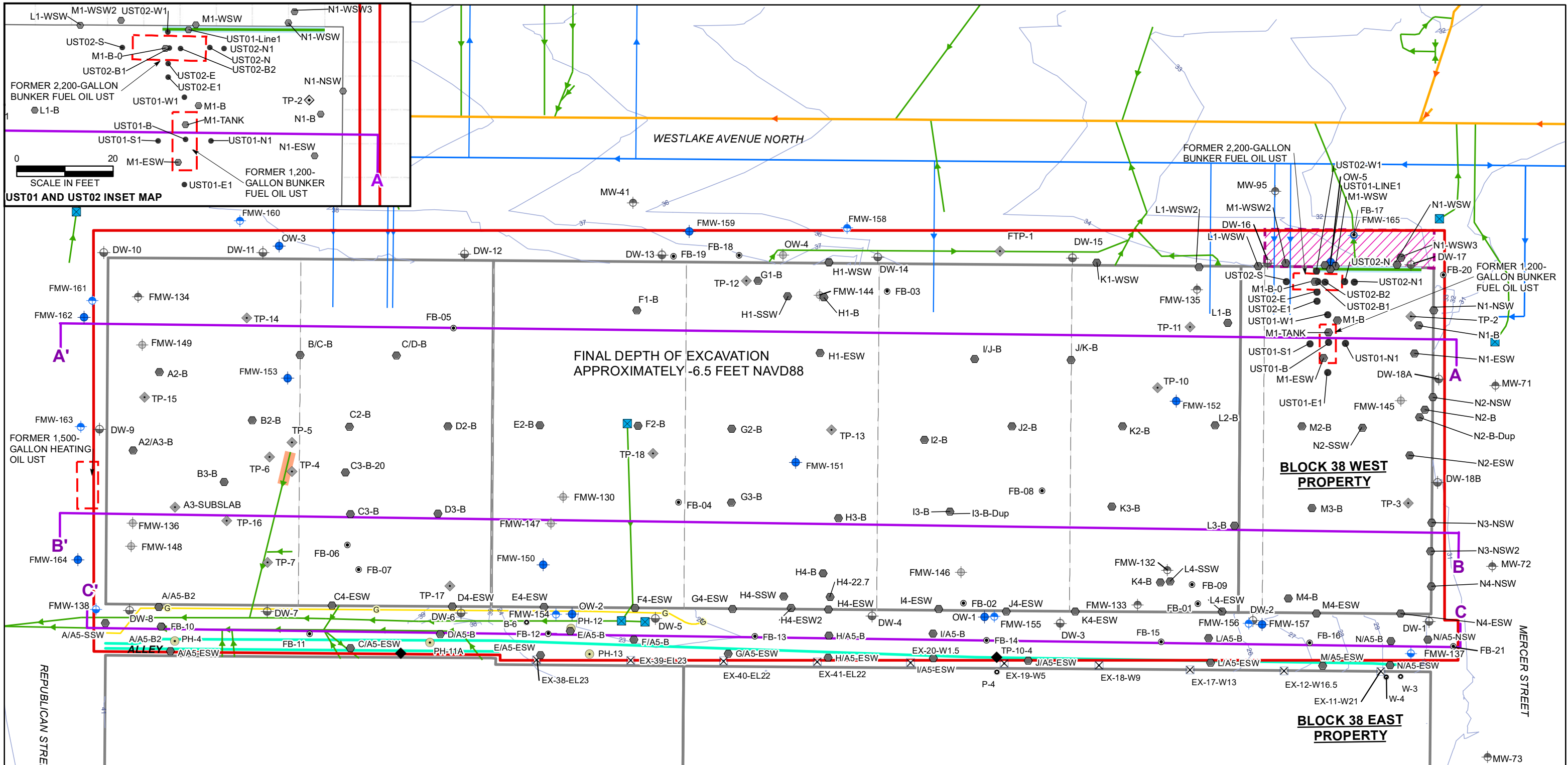


**DRAFT**

ALL LOCATIONS ARE APPROXIMATE. FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

 <b>FARALLON</b> CONSULTING Your Challenges. Our Priority.   farallonconsulting.com	Washington Issaquah   Bellingham   Seattle	<p><b>FIGURE 2</b>          SITE PLAN WITH          HISTORICAL FEATURES          BLOCK 38 WEST SITE          SEATTLE, WASHINGTON</p> <p>FARALLON PN: 397-019</p>
	Oregon Portland   Baker City California Oakland   Irvine	
Drawn By: jjonas Checked By: SS Date: 12/23/2023 Document Path: O:\Projects\397 VULCAN\019_Block38MapFiles\017D_R1-WP_2021-11\Figure-02_HistFeats.mxd		Disc Reference:





- LEGEND**
- SHALLOW WATER-BEARING ZONE MONITORING WELL
  - ⊕ DEWATERING WELL
  - ⊕ DEEP OUTWASH AQUIFER WELL
  - ⊕ DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
  - ⊕ INTERMEDIATE WATER-BEARING ZONE MONITORING WELL / OBSERVATION WELL
  - ⊕ DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
  - BORING (FARALLON)
  - BORING (GEOENGINEERS)
  - ⊗ EXCAVATION BORING (FARALLON)
  - ◆ TEST PIT (GEOENGINEERS)
  - POT HOLE (FARALLON)
  - UST SAMPLE LOCATION (FARALLON)
  - EXCAVATION SAMPLE LOCATION (FARALLON)
  - ◆ TEST PIT (FARALLON)

- PIPING DISCOVERED IN SIDEWALL [BELIEVED TO BE ASSOCIATED WITH DISCOVERED USTs]
- MTCA SITE BOUNDARY
- FORMER UNDERGROUND STORAGE TANKS (USTs)
- MECHANICAL EQUIPMENT AREA DECOMMISSIONED AND FILLED WITH CDF
- KING COUNTY PARCELS
- LOT LINE
- LINE OF CROSS SECTION

- ⊕ CATCH BASIN
- APPROXIMATE SECTION OF THE SIDE SEWER WHERE OILY SUBSTANCE OBSERVED
- COMBINED SEWER LATERAL
- WATER LINE
- COMBINED MAIN
- FIBER OPTIC LINE
- NEW GAS LINE

NOTES:  
 1. ALL LOCATIONS ARE APPROXIMATE.  
 2. FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.  
 3. CDF = CONTROLLED DENSITY FILL  
 4. MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION  
 5. ELEVATION DATA PRESENTED IN FEET ABOVE MEAN SEA LEVEL IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) ELEVATION SOURCE: BUSH, ROED, & HITCHINGS, INC. (2014)

DRAFT

Washington  
Issaquah | Bellingham | Seattle

Oregon  
Portland | Baker City

California  
Oakland | Irvine

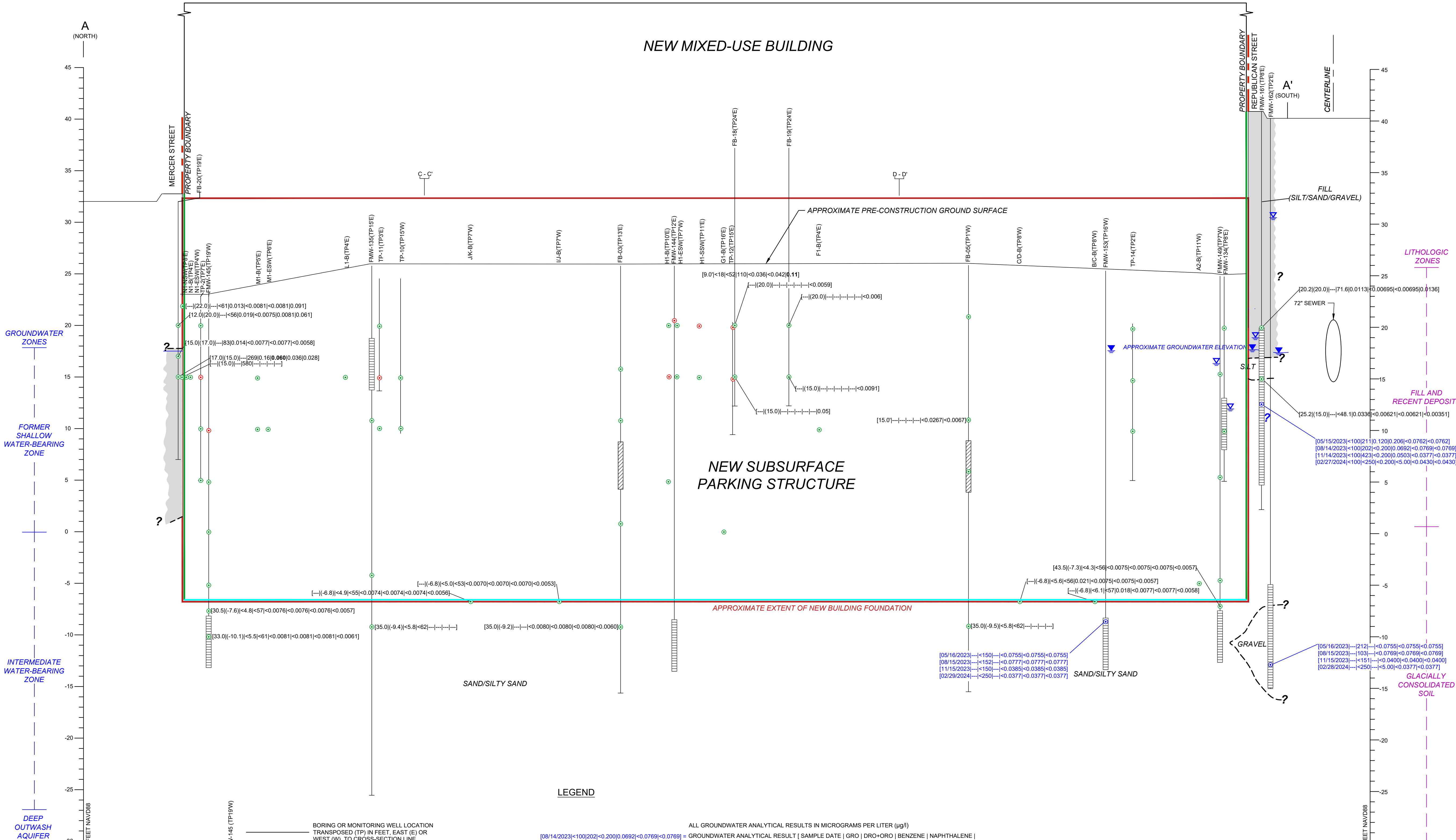
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FIGURE 3

SITE PLAN WITH SAMPLE LOCATIONS  
BLOCK 38 WEST SITE  
SEATTLE, WASHINGTON

FARALLON PN: 397-019

NEW MIXED-USE BUILDING



GROUNDWATER ZONES

FORMER SHALLOW WATER-BEARING ZONE

INTERMEDIATE WATER-BEARING ZONE

DEEP OUTWASH AQUIFER ?

LITHOLOGIC ZONES

FILL AND RECENT DEPOSITS

GLACIALLY CONSOLIDATED SOIL

LEGEND

- BORING OR MONITORING WELL LOCATION TRANPOSED (TP) IN FEET, EAST (E) OR WEST (W), TO CROSS-SECTION LINE
  - INDICATES CONCENTRATIONS OF ONE OR MORE HAZARDOUS SUBSTANCES EXCEEDED THE APPLICABLE MTCA CLEANUP LEVELS
  - INDICATES CONCENTRATIONS OF HAZARDOUS SUBSTANCES ANALYZED DID NOT EXCEED THE APPLICABLE MTCA CLEANUP LEVELS
  - APPROXIMATE GROUNDWATER ELEVATION
  - STRATIGRAPHIC CONTACT
  - BLANK CASING OR BORING
  - STATIC GROUNDWATER ELEVATION (MOST RECENT)
  - GROUNDWATER ELEVATION AT TIME OF DRILLING
  - TEMPORARY SCREEN INTERVAL
  - GROUNDWATER SAMPLE LOCATION
  - WELL SCREEN INTERVAL
- ALL GROUNDWATER ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/l)
- GROUNDWATER ANALYTICAL RESULT [ SAMPLE DATE | GRO | DRO+ORO | BENZENE | NAPHTHALENE ]
- 1-METHYLNAPHTHALENE | 2-METHYLNAPHTHALENE
- \*\* = DENOTES SAMPLE IS RECONNAISSANCE GROUNDWATER GRAB SAMPLE
- ++ = GRO REPORTED AT A CONCENTRATION OF 1,100 µg/l; HOWEVER, RE-EVALUATION BY THE ANALYTICAL LABORATORY INDICATED THAT THE REPORTED CONCENTRATION OF GRO WAS ATTRIBUTED TO A SINGLE PEAK ON THE CHROMATOGRAM, WHICH WAS IN THE RANGE OF NAPHTHALENE.
- ALL SOIL ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)
- SOIL ANALYTICAL RESULTS [ DEPTH | ELEVATION IN FEET NAVD88 | GRO | DRO+ORO | NAPHTHALENE | 1-METHYLNAPHTHALENE | 2-METHYLNAPHTHALENE | cPAH TEC ]
- GRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE-RANGE ORGANICS
- DRO = TPH AS DIESEL-RANGE ORGANICS
- ORO = TPH AS OIL-RANGE ORGANICS
- DRO+ORO = SUM OF DRO AND ORO
- cPAH TEC = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS TOXIC EQUIVALENT CONCENTRATION
- BOLD** = DENOTES CONCENTRATIONS THAT EXCEED APPLICABLE CLEANUP LEVELS
- = SAMPLE NOT ANALYZED OR NOT APPLICABLE
- < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED
- NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988
- COPC = CONSTITUENT OF POTENTIAL CONCERN
- MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION
- APPROXIMATE AREA OF WOOD DEBRIS/ORGANICS LAYER
- VERTICAL VAPOR/GROUNDWATER BARRIER SYSTEM
- SUB-SLAB VAPOR BARRIER SYSTEM

ANALYTE	SOIL (mg/kg)	
	VADOSE	SATURATED
GRO	30	30
DRO+ORO	2,000	2,000
NAPHTHALENE	1,600	1,600
1-METHYLNAPHTHALENE	34	34
2-METHYLNAPHTHALENE	320	320
cPAH TEC	0.19	0.19

ANALYTE	GROUNDWATER (µg/L)	
	GRO	CLEANUP LEVEL
DRO+ORO	800	800
BENZENE	2.4	2.4
NAPHTHALENE	8.9	8.9
1-METHYLNAPHTHALENE	1.5	1.5
2-METHYLNAPHTHALENE	32	32

SOIL CLEANUP LEVELS FOR NAPHTHALENE, 1-METHYLNAPHTHALENE, 2-METHYLNAPHTHALENE, WERE UPDATED BASED ON THE DIRECT CONTACT PATHWAY SINCE THE LEACHING PATHWAY IS NO LONGER COMPLETE FOLLOWING INTERIM ACTIONS.

DATA IS ONLY SHOWN FOR PERFORMANCE AND COMPLIANCE SAMPLES THAT REMAIN IN PLACE. NO SOIL DATA STRINGS ARE SHOWN FOR SAMPLES THAT WERE REMOVED.

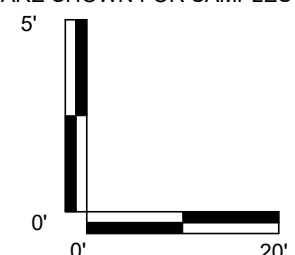


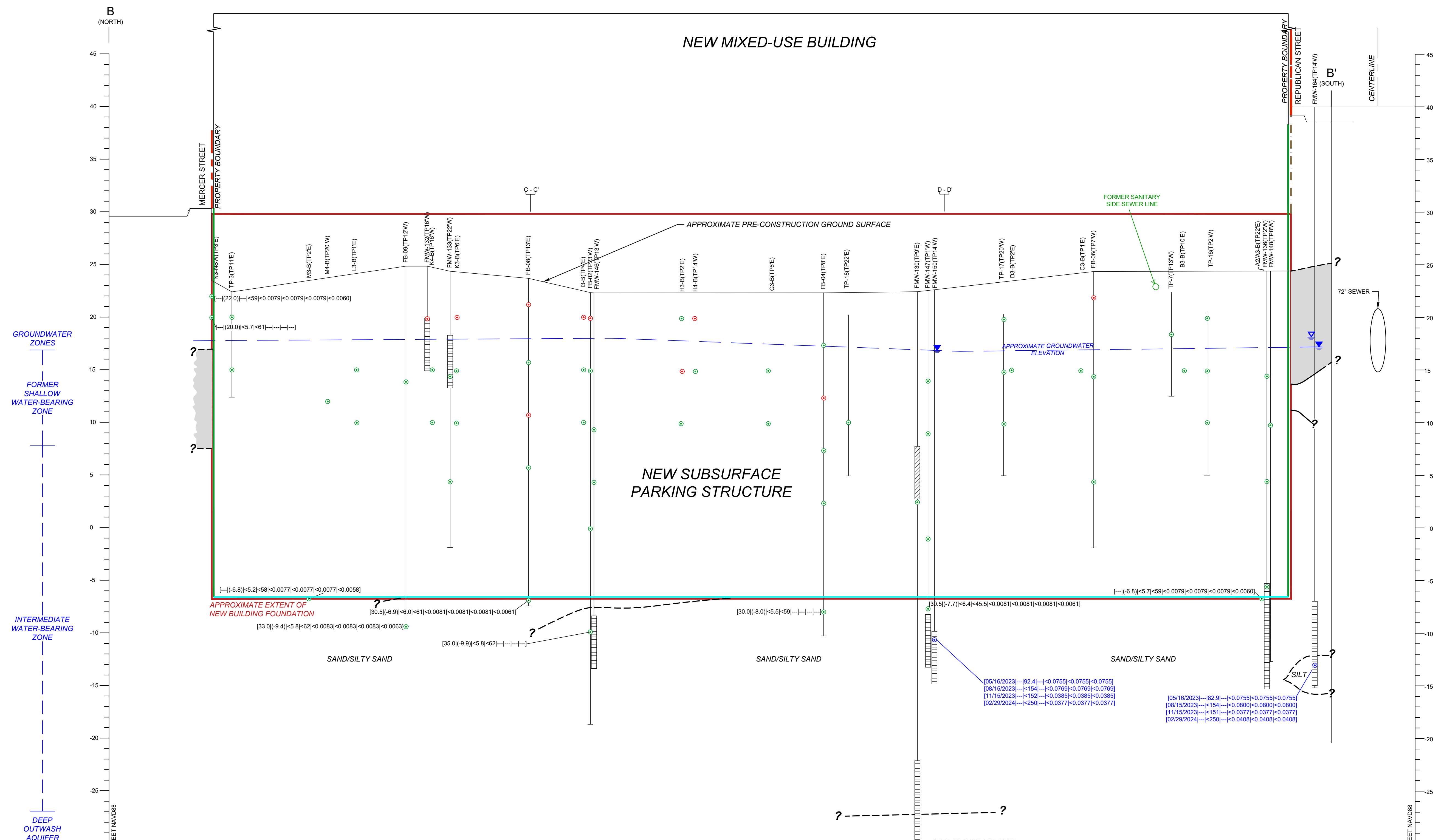
FIGURE 4  
POST INTERIM ACTION  
CROSS SECTION A-A'  
BLOCK 38 WEST SITE  
SEATTLE, WASHINGTON

FARALLON PN-397-019

Drawn By: RB Checked By: GP Date: 8/2/2024

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**LEGEND**

TP-3 (TP-11E) BORING OR MONITORING WELL LOCATION TRANSPROSED (TP) IN FEET, EAST (E) OR WEST (W), TO CROSS-SECTION LINE  
 INDICATES CONCENTRATIONS OF ONE OR MORE HAZARDOUS SUBSTANCES EXCEEDED THE APPLICABLE MTCA CLEANUP LEVELS  
 INDICATES CONCENTRATIONS OF HAZARDOUS SUBSTANCES ANALYZED DID NOT EXCEED THE APPLICABLE MTCA CLEANUP LEVELS  
 APPROXIMATE GROUNDWATER ELEVATION  
 STRATIGRAPHIC CONTACT  
 BLANK CASING OR BORING  
 STATIC GROUNDWATER ELEVATION (MOST RECENT)  
 GROUNDWATER ELEVATION AT TIME OF DRILLING  
 TEMPORARY SCREEN INTERVAL  
 GROUNDWATER SAMPLE LOCATION  
 WELL SCREEN INTERVAL

ALL GROUNDWATER ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/l)  
 [08/15/2023]--[58.9]--[<0.07 69]--[<0.0769]--[<0.0769] = GROUNDWATER ANALYTICAL RESULT | SAMPLE DATE | GRO | DRO+ORO | BENZENE | NAPHTHALENE | 1-METHYLNAPHTHALENE | 2-METHYLNAPHTHALENE |  
 \*\* = DENOTES SAMPLE IS RECONNAISSANCE GROUNDWATER GRAB SAMPLE  
 ++ = GRO REPORTED AT A CONCENTRATION OF 1.100 µg/l. HOWEVER, RE-EVALUATION BY THE ANALYTICAL LABORATORY INDICATED THAT THE REPORTED CONCENTRATION OF GRO WAS ATTRIBUTED TO A SINGLE PEAK ON THE CHROMATOGRAM, WHICH WAS IN THE RANGE OF NAPHTHALENE.  
 ALL SOIL ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)  
 -- = SOIL ANALYTICAL RESULTS | DEPTH | (ELEVATION IN FEET NAVD88) | GRO | DRO+ORO | NAPHTHALENE | 1-METHYLNAPHTHALENE | 2-METHYLNAPHTHALENE | cPAH TEC  
 GRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE-RANGE ORGANICS  
 DRO = TPH AS DIESEL-RANGE ORGANICS  
 ORO = TPH AS OIL-RANGE ORGANICS  
 DRO+ORO = SUM OF DRO AND ORO  
 cPAH TEC = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS TOXIC EQUIVALENT CONCENTRATION  
**BOLD** = DENOTES CONCENTRATIONS THAT EXCEED APPLICABLE CLEANUP LEVELS  
 - - = SAMPLE NOT ANALYZED OR NOT APPLICABLE  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988  
 COPC = CONSTITUENT OF POTENTIAL CONCERN  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION  
 APPROXIMATE AREA OF WOOD DEBRIS/ORGANICS LAYER  
 VERTICAL VAPOR/GROUNDWATER BARRIER SYSTEM  
 SUB-SLAB VAPOR BARRIER SYSTEM  
 ESTIMATED EXTENT OF COAL/CHARCOAL LAYER

ANALYTE	SOIL (mg/kg)		CLEANUP LEVEL	
	VADOSE	SATURATED	VADOSE	SATURATED
GRO	30	30		
DRO+ORO	2,000	2,000		
NAPHTHALENE	1,600	1,600		
1-METHYLNAPHTHALENE	34	34		
2-METHYLNAPHTHALENE	320	320		
cPAH TEC	0.19	0.19		

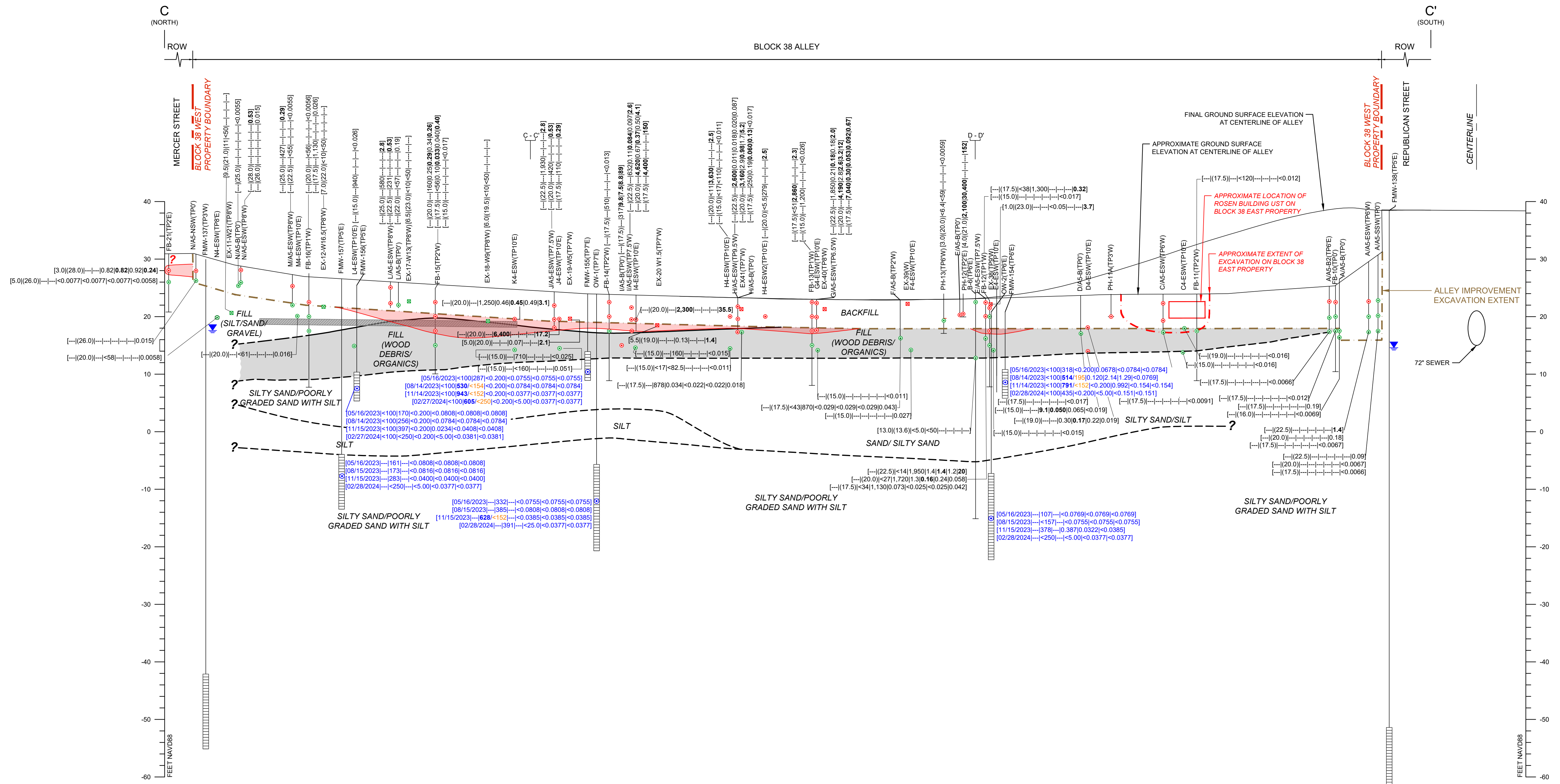
ANALYTE	GROUNDWATER (µg/L)		CLEANUP LEVEL	
	VADOSE	SATURATED	VADOSE	SATURATED
DRO+ORO			500	
BENZENE			2.4	
NAPHTHALENE			8.9	
1-METHYLNAPHTHALENE			1.5	
2-METHYLNAPHTHALENE			32	

SOIL CLEANUP LEVELS FOR NAPHTHALENE, 1-METHYLNAPHTHALENE, 2-METHYLNAPHTHALENE, WERE UPDATED BASED ON THE DIRECT CONTACT PATHWAY SINCE THE LEACHING PATHWAY IS NO LONGER COMPLETE FOLLOWING INTERIM ACTIONS.  
 DATA IS ONLY SHOWN FOR PERFORMANCE AND COMPLIANCE SAMPLES THAT REMAIN IN PLACE. NO SOIL DATA STRINGS ARE SHOWN FOR SAMPLES THAT WERE REMOVED.

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 Oregon Portland | Baker City  
 California Oakland | Irvine  
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**FIGURE 5**  
 POST INTERIM ACTION CROSS SECTION B-B'  
 BLOCK 38 WEST SITE  
 SEATTLE, WASHINGTON  
 FARALLON PN:397-019



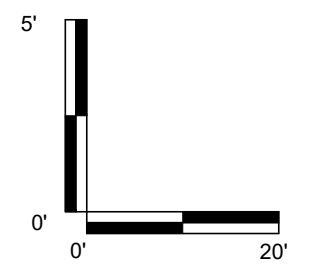
**LEGEND**

- BORING OR MONITORING WELL LOCATION  
 TRANSPOSED (TP) IN FEET, EAST (E) OR WEST (W), TO CROSS-SECTION LINE.
  - INDICATES CONCENTRATIONS OF ONE OR MORE HAZARDOUS SUBSTANCES EXCEEDED THE APPLICABLE MTCA CLEANUP LEVELS
  - INDICATES CONCENTRATIONS OF HAZARDOUS SUBSTANCES ANALYZED DID NOT EXCEED THE APPLICABLE MTCA CLEANUP LEVELS
  - EXCAVATION AREA EXTENT
  - APPROXIMATE GROUNDWATER ELEVATION
  - STRATIGRAPHIC CONTACT
  - BLANK CASING OR BORING
  - STATIC GROUNDWATER ELEVATION (MOST RECENT)
  - GROUNDWATER SAMPLE LOCATION
  - WELL SCREEN INTERVAL
  - APPROXIMATE AREA OF WOOD DEBRIS/ORGANICS LAYER
  - ESTIMATED EXTENT OF SOIL EXCEEDING MTCA SCREENING LEVELS
  - ESTIMATED EXTENT OF COAL/CHARCOAL LAYER
  - EXCAVATION BORING (FARALLON)
  - EXCAVATION SAMPLE (FARALLON)
- ALL GROUNDWATER ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/L)  
 GROUNDWATER ANALYTICAL RESULT | SAMPLE DATE | GRO | DRO+ORO | DRO+ORO WITH SILICA GEL CLEANUP WHEN AVAILABLE |  
 BENZENE | NAPHTHALENE | 1-METHYLNAPHTHALENE | 2-METHYLNAPHTHALENE |  
 ALL SOIL ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)  
 SOIL ANALYTICAL RESULT:  
 [DEPTH] | (ELEVATION IN FEET NAVD88) | GRO | DRO+ORO | NAPHTHALENE | 1-METHYLNAPHTHALENE | 2-METHYLNAPHTHALENE | cPAH TEC |  
 GRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE-RANGE ORGANICS  
 DRO = TPH AS DIESEL-RANGE ORGANICS  
 ORO = TPH AS OIL-RANGE ORGANICS  
 DRO+ORO = SUM OF DRO AND ORO  
 cPAH TEC = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS TOXIC EQUIVALENT CONCENTRATION  
**BOLD** = DENOTES CONCENTRATIONS THAT EXCEED APPLICABLE CLEANUP LEVELS  
 - = SAMPLE NOT ANALYZED FOR CONSTITUENT  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION

SOIL (mg/kg)			GROUNDWATER (µg/L)	
ANALYTE	CLEANUP LEVEL		GRO	CLEANUP LEVEL
	VADOSE	SATURATED		
GRO	30	30		800
DRO+ORO	2,000	2,000		500
NAPHTHALENE	1,600	1,600		2.4
1-METHYLNAPHTHALENE	34	34		8.9
2-METHYLNAPHTHALENE	320	320		1.5
cPAH TEC	0.19	0.19		32

SOIL CLEANUP LEVELS FOR NAPHTHALENE, 1-METHYLNAPHTHALENE, 2-METHYLNAPHTHALENE, WERE BASED ON THE DIRECT CONTACT PATHWAY SINCE THE LEACHING PATHWAY IS NO LONGER COMPLETE FOLLOWING INTERIM ACTIONS.

DATA IS ONLY SHOWN FOR PERFORMANCE AND COMPLIANCE SAMPLES THAT REMAIN IN PLACE. NO SOIL DATA STRINGS ARE SHOWN FOR SAMPLES THAT WERE REMOVED.



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**FIGURE 6**  
 POST INTERIM ACTION  
 CROSS SECTION C-C'  
 BLOCK 38 ALLEY  
 SEATTLE, WASHINGTON  
 FARALLON PN-397-019

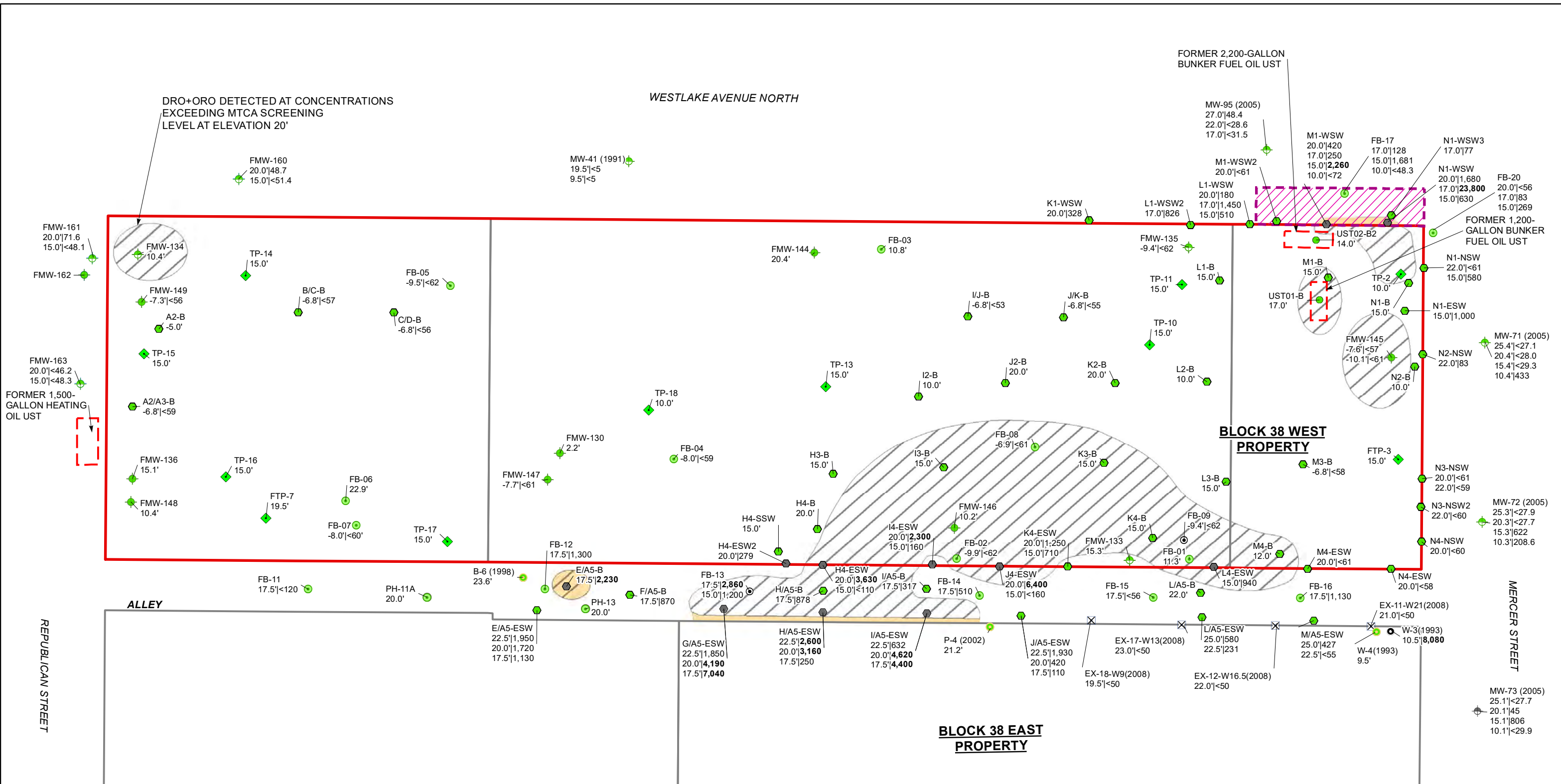
**DRAFT**



DRO+ORO DETECTED AT CONCENTRATIONS EXCEEDING MTCA SCREENING LEVEL AT ELEVATION 20'

WESTLAKE AVENUE NORTH

FORMER 2,200-GALLON BUNKER FUEL OIL UST



**LEGEND**

- SHALLOW WATER-BEARING ZONE MONITORING WELL
- INTERMEDIATE WATER-BEARING ZONE MONITORING WELL / OBSERVATION WELL
- DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- BORING (FARALLON)
- BORING (GEOENGINEERS)
- EXCAVATION SAMPLE (GEOENGINEERS)
- POT HOLE (FARALLON)
- UST SAMPLE LOCATION (FARALLON)
- EXCAVATION SAMPLE LOCATION (FARALLON)
- TEST PIT (FARALLON)

- DENOTES SAMPLE LOCATION AND ELEVATION IN FEET NAVD88 WHERE DRO+ORO RESULTS ARE LESS THAN THE CLEANUP LEVEL
- ESTIMATED EXTENT OF SOIL EXCEEDING THE CLEANUP LEVEL REMAINING IN PLACE POST INTERIM ACTIONS OR INACCESSIBLE DUE TO EXISTING UTILITY BANK
- ESTIMATED EXTENT OF SOIL EXCEEDING THE SCREENING LEVEL THAT WAS EXCAVATED AND REMOVED BY INTERIM ACTIONS
- MECHANICAL EQUIPMENT AREA DECOMMISSIONED AND FILLED WITH CDF
- PROPERTY BOUNDARY
- FORMER UNDERGROUND STORAGE TANKS (USTs)

KING COUNTY PARCEL BOUNDARY

NOTES:  
 DATA SHOWN ARE FOR SAMPLES COLLECTED BETWEEN 2014 THROUGH 2023 UNLESS OTHERWISE NOTED. DATA IS ONLY SHOWN FOR PERFORMANCE AND COMPLIANCE SAMPLES THAT REMAIN IN PLACE. NO SOIL DATA STRINGS ARE SHOWN FOR SAMPLES THAT WERE REMOVED.  
 FOR SOIL SAMPLES:  
 ELEVATION IN FEET NAVD88 | DRO+ORO ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)  
**BOLD** = DENOTES CONCENTRATIONS THAT EXCEED THE SOIL CLEANUP LEVEL OF 2,000 mg/kg  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
 CDF = CONTROLLED DENSITY FILL  
 DRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS DIESEL-RANGE ORGANICS  
 ORO = TPH AS OIL-RANGE ORGANICS  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988

ALL LOCATIONS ARE APPROXIMATE. FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

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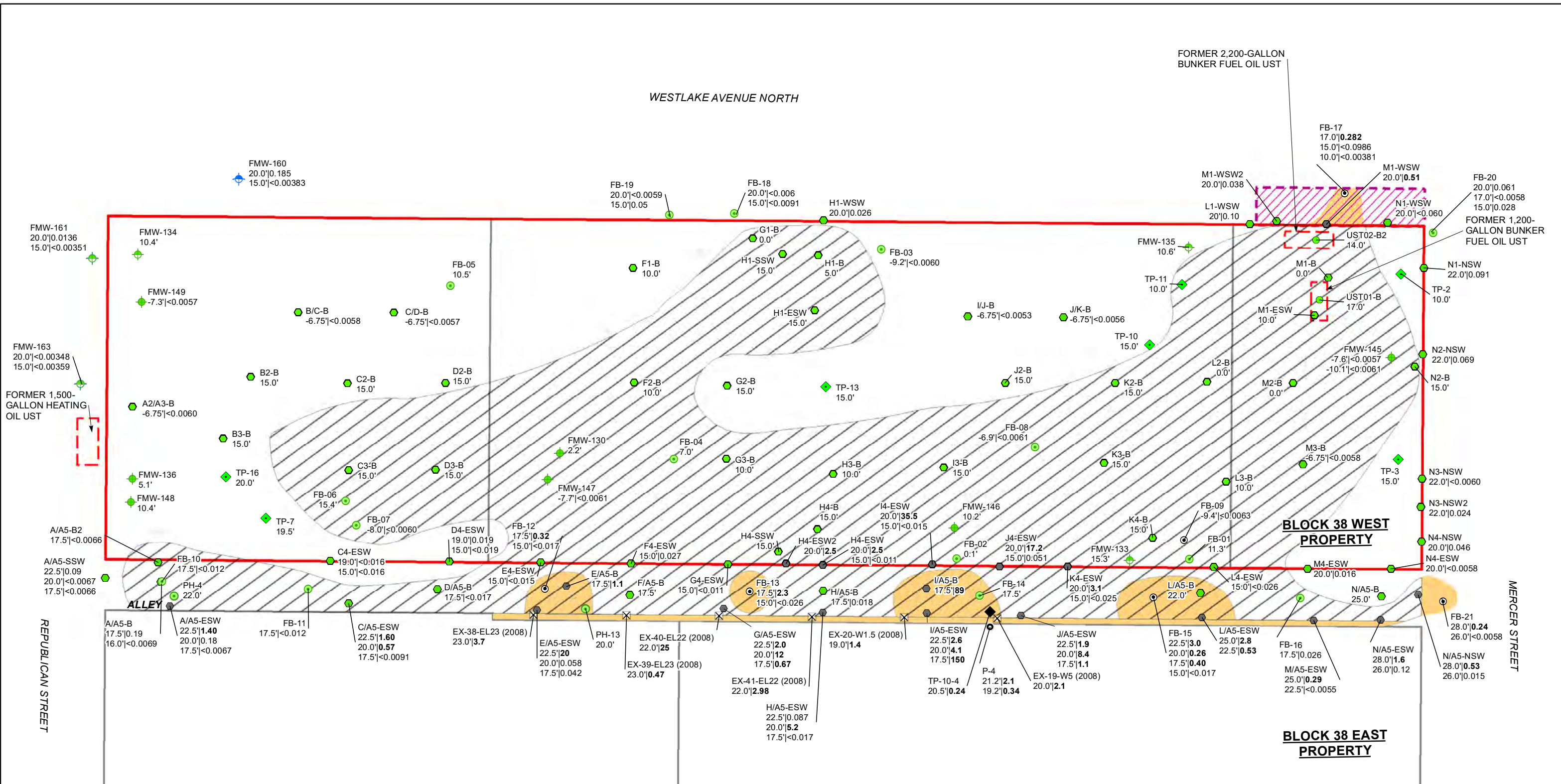
Drawn By: j.jones      Checked By: JW      Date: 8/2/2024      Disc Reference: Q:\Projects\397\_VULCAN\019\_Block38\Mapfiles\17F\_2024\Figure-07\_PIA\_Soil-DRO+ORO.mxd

**DRAFT**

SCALE IN FEET

**FIGURE 7**  
 POST INTERIM ACTION  
 SOIL ANALYTICAL RESULTS  
 FOR DRO + ORO  
 BLOCK 38 WEST SITE  
 SEATTLE, WASHINGTON  
 FARALLON PN: 397-019





- LEGEND**
- SHALLOW WATER-BEARING ZONE MONITORING WELL
  - DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
  - DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
  - BORING (FARALLON)
  - BORING (GEOENGINEERS)
  - EXCAVATION SAMPLE (GEOENGINEERS)
  - TEST PIT (GEOENGINEERS)
  - POTHOLE (FARALLON)
  - UST SAMPLE LOCATION (FARALLON)
  - EXCAVATION SAMPLE LOCATION (FARALLON)
  - TEST PIT (FARALLON)
  - DENOTES SAMPLE LOCATION AND ELEVATION IN FEET NAVD88 WHERE cPAHs RESULTS ARE LESS THAN THE CLEANUP LEVEL
  - ESTIMATED EXTENT OF SOIL EXCEEDING THE CLEANUP LEVEL REMAINING IN PLACE POST INTERIM ACTIONS OR INACCESSIBLE DUE TO EXISTING UTILITY BANK
  - ESTIMATED EXTENT OF SOIL EXCEEDING THE SCREENING LEVEL THAT WAS EXCAVATED AND REMOVED BY INTERIM ACTIONS
  - MECHANICAL EQUIPMENT AREA DECOMMISSIONED AND FILLED WITH CDF
  - PROPERTY BOUNDARY
  - FORMER UNDERGROUND STORAGE TANKS (USTs)
  - KING COUNTY PARCEL BOUNDARY

NOTES:  
 DATA SHOWN ARE FOR SAMPLES COLLECTED BETWEEN 2014 THROUGH 2023 UNLESS OTHERWISE NOTED. DATA IS ONLY SHOWN FOR PERFORMANCE AND COMPLIANCE SAMPLES THAT REMAIN IN PLACE. NO SOIL DATA STRINGS ARE SHOWN FOR SAMPLES THAT WERE REMOVED.

FOR SOIL SAMPLES:  
 DEPTH AND CONCENTRATIONS REPORTED AS:  
 ELEVATION IN FEET NAVD88 | cPAH TEC  
 ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)

**BOLD** = DENOTES ELEVATION AND CONCENTRATIONS THAT EXCEED THE CLEANUP LEVEL OF 0.19 mg/kg  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED FOR TOTAL TOXIC EQUIVALENT CONCENTRATION OF BENZO(A)PYRENE (mg/kg)

CDF = CONTROLLED DENSITY FILL  
 cPAHs = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS  
 TEC = TOXIC EQUIVALENT CONCENTRATION OF BENZO(A)PYRENE FOR cPAH MIXTURE  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988

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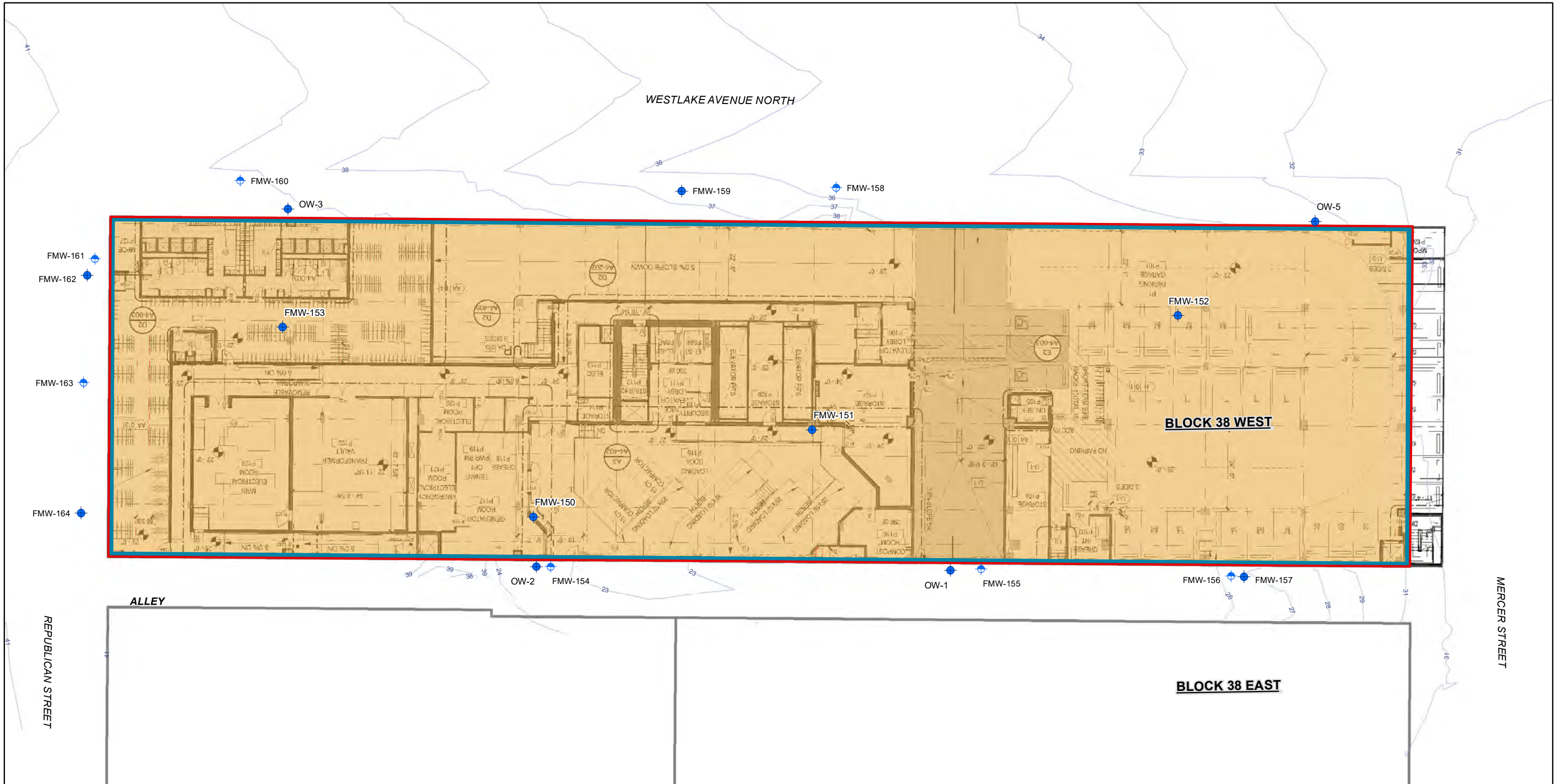
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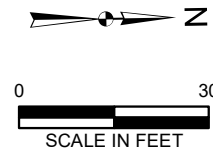
**FIGURE 8**  
 POST INTERIM ACTION  
 SOIL ANALYTICAL RESULTS  
 FOR cPAH TEC  
 BLOCK 38 WEST SITE  
 SEATTLE, WASHINGTON  
 FARALLON PN: 397-019





**LEGEND**

-  SHALLOW WATER-BEARING ZONE MONITORING WELL
-  INTERMEDIATE WATER-BEARING ZONE MONITORING WELL / OBSERVATION WELL
-  VERTICAL EXTENT OF VAPOR BARRIER INSTALLED, FROM BASE TO TOP OF SHORING WALL; HYCRETE WATERPROOF CONCRETE EXTENDS TO ELEVATION 20.0 FEET NAVD88
-  HORIZONTAL EXTENT OF VAPOR BARRIER INSTALLED ACROSS FOUNDATION; BARRIER PLACED ON TOP OF RAT SLAB FOUNDATION PRIOR TO POURING THE MAT SLAB FOUNDATION WITH TOP 12-INCHES CONSISTING OF HYCRETE WATERPROOF CONCRETE
-  ELEVATION CONTOUR
-  PROPERTY BOUNDARY
-  KING COUNTY PARCEL BOUNDARY



DRAFT



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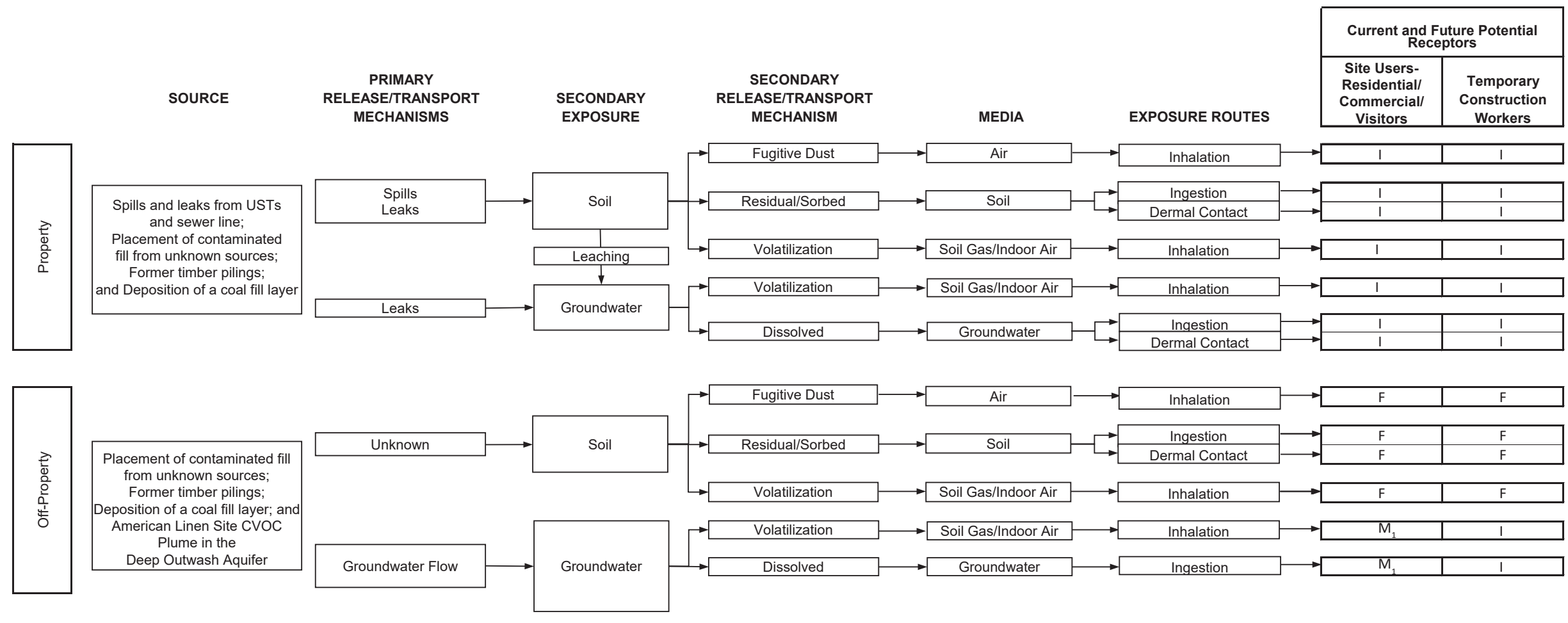
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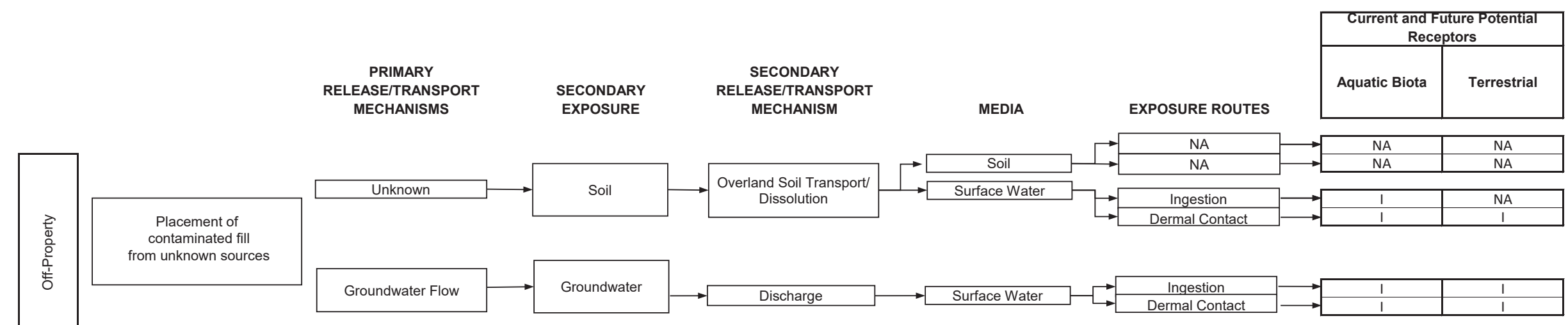
**FIGURE 9**  
EXTENT OF VAPOR BARRIER  
BLOCK 38 WEST SITE  
SEATTLE, WASHINGTON

**NOTES:**  
 1. ALL LOCATIONS ARE APPROXIMATE.  
 2. FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.  
 3. ELEVATION DATA PRESENTED IN FEET ABOVE MEAN SEA LEVEL IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) ELEVATION SOURCE: BUSH, ROED, & HITCHINGS, INC. (2014)

HUMAN HEALTH RISK CONCEPTUAL SITE MODEL



ECOLOGICAL RISK CONCEPTUAL SITE MODEL



I = Incomplete Pathway  
 C = Complete Current Pathway  
 M = Complete pathway currently on Property mitigated by presence of vapor barrier and concrete floor  
 M<sub>1</sub> = Pathway is incomplete based on the COCs for the Block 38 West Site. However the pathway is potentially complete based on the presence of the American Linen Site CVOC Plume adjacent to the Block 38 West Site.  
 F = Currently Incomplete, Potentially Complete Pathway in Future  
 NA = not applicable

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**FIGURE 10**

**EXPOSURE PATHWAY ANALYSIS**  
**BLOCK 38 WEST SITE**  
**SEATTLE, WASHINGTON**

FARALLON PN: 397-019

# Tables

**Table 1  
Post Interim Action Cleanup Levels  
Block 38 West Site  
Seattle, Washington**

Chemical	Soil Screening Levels												Groundwater Screening Levels								Chemical Retained as COC (based on Soil or Groundwater)		
	Method B Direct Contact	Protection of Groundwater				Adjustment Factors		FFS Soil Cleanup Level (mg/kg)		Maximum Concentration Detected at Site Vadose   Saturated (mg/kg)	Retained as Soil COC for RI Work Plan	Retained as Soil COC for FFS (post Interim Action)	Groundwater		Protection of Indoor Air	Adjustment Factors		Groundwater Screening Level (µg/L)	Maximum Concentration Detected at Site (µg/L)	Retained as Groundwater COC for RI Work Plan		Retained as Groundwater COC for FFS (post Interim Action)	
		Vadose Zone		Saturated Zone		Natural Background (mg/kg)	Practical Quantitation Limits (mg/kg)	Vadose Zone	Saturated Zone				Level (µg/L)	Basis		Level (µg/L)	Natural Background (µg/L)						Practical Quantitation Limits (µg/L)
		Level (mg/kg)	Basis	Level (mg/kg)	Basis																		
<b>Petroleum Hydrocarbons</b>																							
TPH, diesel- and oil-range organics	---	2,000	Method A#	2,000	Method A#	---	75	2,000	2,000	30,400   23,800	Yes	Yes	500	Method A	---	---	500	500	3,300	Yes	No	Yes	
TPH, gasoline-range organics, benzene present	1,500*	30	Method A#	30	Method A#	---	5	30	30	2,100   83	Yes	No	800	Method A	---	---	100	800	2,100 <sup>1</sup>	Yes	No	No	
TPH, gasoline-range organics, no detectable benzene	1,500*	100	Method A#	100	Method A#	---	5	100	100	2,100   83	Yes	No	1,000	Method A	---	---	100	1,000	2,100 <sup>1</sup>	Yes	No	No	
<b>Volatile Organic Compounds</b>																							
Acetone	72,000	29	Leach	2.1	Leach	---	0.005	29	2.1	Not Analyzed	---	---	7,200	Method B	---	---	5.0	7,200	7.4	No	No	No	
Benzene	18	0.027	Leach	0.0017	Leach	---	0.001	0.027	0.0017	0.12   0.0033	Yes	No	5.0	MCL	2.4	---	0.20	2.4	5.1 <sup>2</sup>	Yes	No	No	
Chloroform	32	0.074	Leach	0.0048	Leach	---	0.001	0.074	0.0048	Not Analyzed	---	---	14	Method B/Adjusted MCL	1.2	---	0.20	1.2	2.7	No <sup>3</sup>	No <sup>3</sup>	No <sup>3</sup>	
cis-1,2-Dichloroethene	160	0.078	Leach	0.0052	Leach	---	0.001	0.078	0.0052	Not Detected <sup>6</sup>	No	No	16	Method B	180	---	0.20	16	1.3	No	No	No <sup>3</sup>	
Ethylbenzene	8,000	5.9	Leach	0.34	Leach	---	0.001	5.9	0.34	0.13   0.0075	No	No	700	MCL	2,800	---	0.20	700	2.2	No	No	No	
Tetrachloroethene	480	0.05	Leach	0.0028	Leach	---	0.001	0.05	0.0028	0.0041   ND	No	No	5.0	MCL	25	---	0.20	5.0	Not Detected	No	No	No	
Toluene	6,400	4.5	Leach	0.27	Leach	---	0.005	4.5	0.27	0.49   0.018	No	No	640	Method B/Adjusted MCL	15,000	---	1.0	640	7.5	No	No	No	
1,1,1-Trichloroethane	160,000	1.5	Leach	0.084	Leach	---	0.001	1.5	0.084	Not Analyzed	---	---	200	MCL	5,400	---	0.20	200	0.26	No	No	No	
Xylenes	16,000	14	Leach	0.83	Leach	---	0.003	14	0.83	0.94   0.048	No	No	1,600	Method B/Adjusted MCL	320	---	0.60	320	6.7	No	No	No	
<b>Polycyclic Aromatic Hydrocarbons (PAHs)</b>																							
Naphthalene	1,600	4.5	Leach	0.24	Leach	---	0.0067	1,600 <sup>9</sup>	1,600 <sup>9</sup>	22   9.8	Yes	No	160	Method B	8.9**	---	0.10	8.9**	650	Yes	No	No	
1-Methylnaphthalene	34	0.082	Leach	0.0042	Leach	---	0.0067	34 <sup>9</sup>	34 <sup>9</sup>	14   7.5	Yes	No	1.5	Method B	---	---	0.10	1.5	10	Yes	No	No	
2-Methylnaphthalene	320	1.7	Leach	0.088	Leach	---	0.0067	320 <sup>9</sup>	320 <sup>9</sup>	15   8.8	Yes	No	32	Method B	---	---	0.10	32	13	No	No	No	
Acenaphthene	4,800	49	Leach	2.5	Leach	---	0.0067	49	2.5	1.5   0.049	No	No	480	Method B	---	---	0.10	480	8.3	No	No	No	
Acenaphthylene	---	---	---	---	---	---	0.0067	---	---	0.45   0.045	No	No	---	---	---	---	0.10	---	0.12	No	No	No	
Anthracene	24,000	1,100	Leach	57	Leach	---	0.0067	1,100	57	3.3   0.29	No	No	2,400	Method B	---	---	0.10	2,400	Not Detected	No	No	No	
Benzo(g,h,i)Perylene	---	---	---	---	---	---	0.0067	---	---	8.5   0.21	No	No	---	---	---	---	0.010	---	Not Detected	No	No	No	
Fluoranthene	3,200	630	Leach	32	Leach	---	0.0067	630	32	18   0.97	No	No	640	Method B	---	---	0.10	640	Not Detected	No	No	No	
Fluorene	3,200	51	Leach	2.6	Leach	---	0.0067	51	2.6	1.3   0.22	No	No	320	Method B	---	---	0.10	320	1.6	No	No	No	
Phenanthrene	---	---	---	---	---	---	0.0067	---	---	18   1.0	No	No	---	---	---	---	0.10	---	0.48	No	No	No	
Pyrene	2,400	330	Leach	16	Leach	---	0.0067	330	16	27   1.1	No	No	240	Method B	---	---	0.10	240	Not Detected	No	No	No	
<b>Carcinogenic PAHs</b>																							
Benzo(a)Pyrene	0.19	3.9	Leach	0.19	Leach	---	0.0067	0.19	0.19	120   120	Yes	Yes	0.2	MCL	---	---	0.010	0.2	0.023	No	No	Yes	
Benzo(a)Anthracene	cPAH TEC	cPAH TEC	Leach	cPAH TEC	Leach	---	0.0067	cPAH TEC	cPAH TEC	110   91	Yes	Yes	cPAH TEC	cPAH TEC	---	---	0.010	cPAH TEC	0.043	No	No	Yes	
Benzo(b)Fluoranthene	cPAH TEC	cPAH TEC	Leach	cPAH TEC	Leach	---	0.0067	cPAH TEC	cPAH TEC	100   120	Yes	Yes	cPAH TEC	cPAH TEC	---	---	0.010	cPAH TEC	0.031	No	No	Yes	
Benzo(j,k)Fluoranthene	cPAH TEC	cPAH TEC	Leach	cPAH TEC	Leach	---	0.0067	cPAH TEC	cPAH TEC	31   24	Yes	Yes	cPAH TEC	cPAH TEC	---	---	0.010	cPAH TEC	Not Detected	No	No	Yes	
Chrysene	cPAH TEC	cPAH TEC	Leach	cPAH TEC	Leach	---	0.0067	cPAH TEC	cPAH TEC	110   110	Yes	Yes	cPAH TEC	cPAH TEC	---	---	0.010	cPAH TEC	0.036	No	No	Yes	
Dibenzo(a,h)Anthracene	cPAH TEC	cPAH TEC	Leach	cPAH TEC	Leach	---	0.0067	cPAH TEC	cPAH TEC	9.9   9.1	Yes	Yes	cPAH TEC	cPAH TEC	---	---	0.010	cPAH TEC	Not Detected	No	No	Yes	
Indeno(1,2,3-cd)Pyrene	cPAH TEC	cPAH TEC	Leach	cPAH TEC	Leach	---	0.0067	cPAH TEC	cPAH TEC	63   69	Yes	Yes	cPAH TEC	cPAH TEC	---	---	0.010	cPAH TEC	0.014	No	No	Yes	
cPAH TEC	0.19	3.9	Leach	0.19	Leach	---	NA	0.19	0.19	152   150	Yes	Yes	0.2	MCL	---	---	NA	0.2	0.033	No	No	Yes	



**Table 1  
Post Interim Action Cleanup Levels  
Block 38 West Site  
Seattle, Washington**

Chemical	Soil Screening Levels												Groundwater Screening Levels								Chemical Retained as COC (based on Soil or Groundwater)		
	Method B Direct Contact	Protection of Groundwater				Adjustment Factors		FFS Soil Cleanup Level (mg/kg)		Maximum Concentration Detected at Site Vadose   Saturated (mg/kg)	Retained as Soil COPC for RI Work Plan	Retained as Soil COC for FFS (post Interim Action)	Groundwater		Protection of Indoor Air	Adjustment Factors		Groundwater Screening Level (µg/L)	Maximum Concentration Detected at Site (µg/L)	Retained as Groundwater COPC for RI Work Plan		Retained as Groundwater COC for FFS (post Interim Action)	
		Vadose Zone		Saturated Zone		Natural Background (mg/kg)	Practical Quantitation Limits (mg/kg)	Vadose Zone	Saturated Zone				Level (µg/L)	Basis		Level (µg/L)	Natural Background (µg/L)						Practical Quantitation Limits (µg/L)
		Level (mg/kg)	Basis	Level (mg/kg)	Basis																		
<b>Metals</b>																							
Arsenic	0.67	4.7	Leach	0.23	Leach	7.3	5	7.3	7.3	13   ND	No <sup>3</sup>	No <sup>3</sup>	0.58	Method B/Adjusted MCL	---	8.0 <sup>5</sup>	3.3	8.0	Not Analyzed	No <sup>3</sup>	No <sup>3</sup>	No <sup>3</sup>	
Barium	16,000	1,600	Leach	83	Leach	---	2.5	16,000 <sup>9</sup>	16,000 <sup>9</sup>	490   290	Yes	No	2,000	MCL	---	---	28	2,000	Not Analyzed	Yes	No	No	
Cadmium	80	0.69	Leach	0.035	Leach	0.77 <sup>4</sup>	0.50	0.77 <sup>4</sup>	0.77 <sup>4</sup>	2.4   ND	No <sup>3</sup>	No <sup>3</sup>	5.0	MCL	---	---	4.4	5.0	Not Analyzed	No <sup>3</sup>	No <sup>3</sup>	No <sup>3</sup>	
Chromium <sup>7</sup>	120,000	480,000	Leach	24,000	Leach	48	0.50	120,000	24,000	48   100	No	No	100	MCL	---	---	2.0	100	Not Analyzed	No	No	No	
Lead	250 <sup>8</sup>	3,000	Leach	150	Leach	16.83	5.0	250	150	21,000   240	No <sup>3</sup>	No <sup>3</sup>	15	MCL	---	---	1.1	15	Not Analyzed	No <sup>3</sup>	No <sup>3</sup>	No <sup>3</sup>	
Mercury	---	2.1	Leach	0.1	Leach	0.07	0.25	2.1	2.1 <sup>9</sup>	ND   1.2	Yes	No	2.0	MCL	1.1	---	0.50	1.1	Not Analyzed	Yes	No	No	

**NOTES:**

- Shading represents most stringent screening level, natural background concentration, or practical quantitation limit for vadose zone soil.
  - Shading represents most stringent screening level, natural background concentration, or practical quantitation limit for saturated zone soil.
  - Shading indicates the chemical or specific matrix is not a COPC for the FFS after completion of the Remedial Investigation.
  - Shading indicates a change from information provided in the RI Work Plan screening level table (Table 13).
- denotes no screening level established for this parameter.

- COC = contaminant of concern
- COPC = contaminant of potential concern
- FFS = Focused Feasibility Study
- µg/L = micrograms per liter
- mg/kg = milligrams per kilogram
- NA = not applicable
- ND = not detected
- TPH = total petroleum hydrocarbons

cPAH TEC = Carcinogenic polycyclic aromatic hydrocarbon toxic equivalent concentration (cPAH TEC) calculated following the total toxicity equivalency method in Section 708(8) of Chapter 173-340 of the Washington Administrative Code.

Leach = Washington State Cleanup Levels and Risk Calculations (CLARC) under Washington State Model Toxics Control Act Cleanup Regulation (MTCA), default soil concentrations protective of groundwater from CLARC Master spreadsheet, <https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC>

MCL = Federal Maximum Contaminant Level (MCL), 40 Code of Federal Regulations (CFR) Part 141.

Method A = MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses, Table 740-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised 2013.

Method B = Washington State CLARC under Washington State MTCA, Standard Method B Formula Values from CLARC Master spreadsheet, <https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC>

<sup>1</sup> Result was derived from a reconnaissance groundwater sample. Analysis of reconnaissance groundwater samples can result in potentially biased data due to turbidity of the sample and greater presence of suspended solids that hazardous substances can sorb onto. This detection in groundwater was flagged by the laboratory because the sample chromatogram was not similar to a typical gas.

<sup>2</sup> Result was derived from a reconnaissance groundwater sample. Analysis of reconnaissance groundwater samples can result in potentially biased data due to turbidity of the sample and greater presence of suspended solids that hazardous substances can sorb onto.

<sup>3</sup> Section 6.4 of the Agency Review Draft-Remedial Investigation Work Plan provides additional information as to why the COPC was not retained for further evaluation for the Block 38 West Site. Arsenic, cadmium and lead are not retained as COPCs for Block 38 West based on historical data indicating that the source is likely associated with the adjacent Rosen Property Site.

<sup>4</sup> Arsenic and cadmium screening levels adjusted for natural background concentrations provided in *Natural Background Soil Metals Concentrations in Washington State*, Washington State Department of Ecology, Publication #94-115, October 1994.

<sup>5</sup> Puget Sound Lowland natural background concentration from *Natural Background Groundwater Arsenic Concentrations in Washington State, Study Results*, Washington State Department of Ecology, Publication No. 14-09-044, dated January 2022.

<sup>6</sup> Reporting limits for cis-1,2-dichloroethene in soil ranged from 0.00074 mg/kg to 0.0044 mg/kg.

<sup>7</sup> Values based on trivalent chromium risk-based values for soil SLs (120,000 mg/kg for direct contact, 480,000 mg/kg vadose leaching, 24,000 saturated leaching) since there is no known source of hexavalent chromium used on the Block 38 West Property. Background levels are based on total chromium. Total chromium groundwater screening level of 100 µg/L based on the MCL.

<sup>8</sup> Value based on Method A as a surrogate for Method B as no Method B direct contact value for soil has been established.

<sup>9</sup> Ecology approved the use of the direct contact soil screening level for this chemical.

\* Source of this value is the generic TPH cleanup level from *Model Remedies for Sites with Petroleum Contaminated Soils*, Washington State Department of Ecology, Publication No. 15-09-043, Revised: December 2017.

\*\* MTCA Method B vapor intrusion groundwater screening level for naphthalene is applicable for the Shallow Water-Bearing Zone and the Method B screening level for drinking water is applicable for the deeper Intermediate Water-Bearing Zone.

# Method A is used as a surrogate for Method B because no Method B vadose or saturated leaching value has been established for TPH gasoline-, diesel- and oil-range mixtures.

**Table 2**  
**Applicable or Relevant and Appropriate Requirements**  
**Block 38 West Site**  
**Seattle, Washington**

*Public Review Draft*

<b>Standard, Requirement, or Limitation<sup>1</sup></b>	<b>Applicability</b>
<b>Location-Specific ARARs<sup>2</sup></b>	
State Environmental Policy Act (RCW 43.21C; WAC 197-11 and WAC 173-802)	SEPA review is required for MTCA cleanup actions; Ecology will be the lead agency for this effort.
Native American Graves Protection and Repatriation Act (25 USC 3001 through 3013; 43 CFR 10) Washington's Indian Graves and Records Law (RCW 27.44)	These statutes prohibit the destruction or removal of Native American cultural items and require written notification of inadvertent discovery to the appropriate agencies and Native American tribe. These programs are applicable to the cleanup action if cultural items are found. The activities must cease in the area of the discovery; a reasonable effort must be made to protect the items discovered; and notice must be provided.
Archaeological Resources Protection Act(16 USC 470aa et seq.; 43 CFR 7)	This program sets forth requirements that are triggered when archaeological resources are discovered. These requirements only apply if archaeological items are discovered during implementation of the selected remedy.
National Historic Preservation Act (16 USC 470 et seq.; 36 CFR parts 60, 63, and 800)	This program sets forth a national policy of historic preservation and provides a process that must be followed to ensure that impacts of actions on archaeological, historic, and other cultural resources are protected.

**Table 2**  
**Applicable or Relevant and Appropriate Requirements**  
**Block 38 West Site**  
**Seattle, Washington**

*Public Review Draft*

<b>Standard, Requirement, or Limitation<sup>1</sup></b>	<b>Applicability</b>
<b>Location-Specific ARARs<sup>2</sup> (cont.)</b>	
<p>U.S. Archaeological and Historic Preservation Act [16 USC § 469, 470 et seq.; 36 CFR Parts 65 and 800]            Washington Archaeological Sites and Resources [RCW 27.44, 27.48, and 27.53; Chapter 25-48 WAC]</p>	<p>Actions must be taken to preserve and recover significant artifacts, preserve historic and archaeological properties and resources, and minimize harm to national landmarks. There are no known historic or archaeological sites in the vicinity of the Site, but these regulations were followed through implementation of an archaeological Monitoring and Inadvertent Discovery Plan during the interim action construction work.</p>
<p>Seattle Clarification of SEPA Historic Preservation Policy for Potential Archaeologically Significant Sites and Requirements for Archaeological Assessments (Director's Rule 2-98; SMC Chapter 25.05.675 H)</p>	<p>Provides guidance for the identification, protection, and treatment of archaeological sites on the City of Seattle's shorelines. The archaeological significance of a project site must be assessed for any proposed project involving excavation within 200 feet of the U.S. Government Meander line which approximates the historical shoreline. The Site is within 200 feet of the historical shoreline of Lake Union.</p>
<p>State Environmental Policy Act (RCW 43.21C, WAC 197-11 and WAC 173-802)</p>	<p>Establishes the state's policy for protection and preservation of the natural environment. Applies to cleanup actions conducted under MTCA. A SEPA review is required for local permitting pursuant to MTCA and was completed for the interim actions.</p>

**Table 2**  
**Applicable or Relevant and Appropriate Requirements**  
**Block 38 West Site**  
**Seattle, Washington**

<b>Standard, Requirement, or Limitation<sup>1</sup></b>	<b>Applicability</b>
<b>Action-Specific ARARs<sup>3</sup></b>	
<p>Resource Conservation and Recovery Act (42 USC 6921-6949a; 40 CFR Part 268, Subtitles C and D)</p>	<p>Establishes requirements for the identification, handling, and disposal of hazardous and nonhazardous waste. These regulations establish guidelines and criteria from which states develop solid waste regulations. Subtitle C of RCRA pertains to the management of hazardous waste. These requirements are applicable for the interim actions completed and final cleanup action since it involved off-Site disposal of impacted soil, groundwater, treatment media, and/or wastewater designated as hazardous waste.</p> <p>Subtitle D of RCRA establishes a framework for management of nonhazardous solid waste. These requirements are applicable for the interim actions completed and final cleanup action since it involved off-Site disposal of impacted soil and/or groundwater designated as nonhazardous waste.</p>
<p>Dangerous Waste Regulations (RCW 70A.300; WAC 173-303)</p>	<p>Establishes regulations that are the state equivalent of RCRA requirements for determining whether a solid waste is a state dangerous waste. This regulation also provides requirements for the management of dangerous wastes. These requirements are applicable for the interim actions completed and final cleanup action since it involved off-Site disposal of impacted soil, groundwater, treatment media, and/or wastewater designated as hazardous waste.</p>
<p>Solid Waste Disposal Act (42 USC Sec. 6901-6992; 40 CFR 257-258)  Federal Land Disposal Requirements (40 CFR 268)</p>	<p>Protects health and the environment and promotes conservation of valuable material and energy resources. The Solid Waste Disposal Act establishes a framework for regulation of solid waste disposal. Federal land disposal requirements promulgated under the authority of the Solid Waste Disposal Act set minimum safety requirements for landfills including limitations on storage and land disposal for hazardous substances.</p>

**Table 2**  
**Applicable or Relevant and Appropriate Requirements**  
**Block 38 West Site**  
**Seattle, Washington**

<b>Standard, Requirement, or Limitation<sup>1</sup></b>	<b>Applicability</b>
<b>Action-Specific ARARs<sup>3</sup> (cont.)</b>	
Department of Transportation Hazardous Materials Regulations (49 CFR 172)	Regulates the safe and secure transportation of hazardous materials, including documentation and handling requirements for shipping. These requirements are applicable for the interim actions completed and final cleanup action since it involved off-Site disposal of impacted soil, groundwater, treatment media, and/or wastewater designated as hazardous waste.
Washington Minimum Functional Standards for Solid Waste Handling (WAC 173-304)	Sets minimum functional standards for the proper handling of all solid waste materials originating from residences, commercial, agricultural, and industrial operations, as well as other sources.
Washington Solid Waste Handling Standards (RCW 70A.205 and WAC 173-351 and 173-304)	Establishes minimum standards for handling and disposal of solid waste. Solid waste includes wastes that are likely to be generated as a result of site remediation, including contaminated soils, construction and demolition wastes, and garbage.
Noise Control Act of 1974 (RCW 70A.20, WAC 173-60, SMC Chapter 25.08)	Establishes maximum noise levels. Construction activities during the interim actions were limited to normal business hours to minimize noise impacts. If future construction work is necessary at the Site to address remaining contamination beneath the cap, those activities will also be limited to normal working hours, to the extent possible, to minimize noise impacts.
Accreditation of Environmental Laboratories (RCW 43.21A.230 and WAC 173-50)	Requires persons or organizations submitting analytical data under the purview of Ecology, Department of Health, and other entities, to use environmental laboratories which are accredited.
City of Seattle Traffic Code (SMC 11.1)	The City of Seattle code regulates construction use and permitting in the right-of-way. Guidelines for grading activities, applicable since the interim actions completed and final cleanup action involved an excavation and filling volume greater than 500 cubic yards.
City of Seattle Construction Codes for Grading (SMC 22.170)	Required for the excavation or addition of material within an Environmentally Critical Area, movement of more than 500 cubic yards of material, and in-place modification of the ground (soil remediation).

**Table 2**  
**Applicable or Relevant and Appropriate Requirements**  
**Block 38 West Site**  
**Seattle, Washington**

<b>Standard, Requirement, or Limitation<sup>1</sup></b>	<b>Applicability</b>
<b>Action-Specific ARARs<sup>3</sup> (cont.)</b>	
City of Seattle Construction Codes for Demolition (Seattle Building Code Chapter 33)	Regulates the demolition of any structures within an Environmentally Critical Area or greater than 120 square feet in size.
National Electrical Code (NFPA 70) and the Seattle Electric Code Supplement for Class 1 Division 2 Environments.	Establishes restrictions and guidelines for temporary and/or permanent electrical installations.
King County Industrial Waste Program	The King County Industrial Waste Program monitors discharge of liquid waste to the wastewater (sanitary sewer) system. Any discharges during construction to the wastewater system must be approved by King County prior to discharge. The King County Industrial Waste Program monitors volume and water quality of liquid waste discharged to the system. Guidelines for erosion control and construction stormwater management. These regulations are applicable since the completed interim actions and final cleanup action involved construction requiring dewatering and stormwater management.
U.S. Federal Water Pollution Control Act--NPDES [CWA; 33 USC § 1342, Section 402] and Implementing Regulations Washington Waste Discharge General Permit Program [RCW 90.48; Chapter 173-226 WAC]	The NPDES program establishes requirements for point source discharges, including stormwater runoff. These requirements are applicable to the final cleanup action since the interim actions involved point source discharge of stormwater during construction or following cleanup.

**Table 2**  
**Applicable or Relevant and Appropriate Requirements**  
**Block 38 West Site**  
**Seattle, Washington**

<b>Standard, Requirement, or Limitation<sup>1</sup></b>	<b>Applicability</b>
<b>Action-Specific ARARs<sup>3</sup> (cont.)</b>	
Federal, State, and Local Air Quality Protection Programs State Implementation of Ambient Air Quality Standards Regional Standards for Fugitive Dust Emissions Toxic Air Pollutants	Regulations promulgated under the federal Clean Air Act (42 USC 7401) and the Washington State Clean Air Act (RCW 70A.15) govern the release of airborne contaminants from point and non-point sources. Local air pollution control authorities such as PSCAA have also set forth regulations for implementing these air quality requirements. PSCAA requires notification prior to demolition of any building with asbestos-containing material. Both PSCAA (under Regulation III) and WAC 173-460 establish ambient source impact levels for arsenic.
Clean Air Act and Implementing Regulations [RCW 70A.15; Chapter 173-400 WAC]	These regulations require the owner or operator of a source of fugitive dust to take reasonable precautions to prevent fugitive dust from becoming airborne and to maintain and operate the source to minimize emissions primarily during construction. These regulations are applicable for interim actions completed and the final cleanup action due to active construction.
Regional Emission Standards for Toxic Air Pollutants [PSCAA Regulations I and III]	A source of toxic air contaminant requires a notice of construction. This is applicable for interim actions completed and the final cleanup action due to active construction and construction dewatering treatment system.
U.S. OSHA [29 CFR Parts 1904, 1910, and 1926] WISHA [RCW 49.17; Title 296 WAC]	Site worker and visitor health and safety requirements established by OSHA/WISHA were met during implementation of the interim actions completed and are applicable to the final cleanup action.
Minimum Standards for Construction and Maintenance of Wells [RCW 18.104; Chapter 173-160 WAC]	Washington State has developed minimum standards for constructing water and monitoring wells, and for the decommissioning of wells. These regulations are applicable since the final cleanup action involved drilling or decommissioning wells.

**Table 2**  
**Applicable or Relevant and Appropriate Requirements**  
**Block 38 West Site**  
**Seattle, Washington**

<b>Standard, Requirement, or Limitation<sup>1</sup></b>	<b>Applicability</b>
<b>Chemical-Specific ARARs<sup>4</sup></b>	
Model Toxics Control Act (RCW 70A.305 and WAC 173-340)	Establishes Washington administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances have come to be located.
Drinking Water Standards—State MCLs (WAC 246-290-310)	Establishes standards for contaminant levels in drinking water for water system purveyors.
Water Quality Standards for Groundwaters of the State of Washington (WAC 173-200)	Implements the Water Pollution Control Act and the Water Resources Act of 1971 (90.54 RCW).
National Recommended Water Quality Standards (40 CFR 131) Washington Maximum Contaminant Levels (WAC 246-290-310)	These water quality standards define the water quality goals of the water body by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. States adopt water quality standards from 40 CFR 131 to protect public health or welfare, enhance the quality of water, and serve the purposes of the CWA. Washington water quality standards (MCLs) are presented in WAC 246-290-310.
MTCA [RCW 70A.305; Chapter 173- 340-740 WAC]	The MTCA soil cleanup levels are applicable.
MTCA [RCW 70A.305; Chapter 173- 340-720 WAC]	The MTCA groundwater cleanup levels are applicable.



**Table 2**  
**Applicable or Relevant and Appropriate Requirements**  
**Block 38 West Site**  
**Seattle, Washington**

**Public Review Draft**

**NOTES:**

<sup>1</sup> Projects conducted under an agreed order or consent decree are exempt from the procedural requirements of most state and local permits (RCW 70A.305.090); however, the remedial actions must still comply with the substantive requirements of the exempt permits.

<sup>2</sup> Location-specific ARARs are requirements that are applicable to the specific area where the Site is located, and can restrict the performance of activities, including cleanup actions, solely because they occur in specific locations.

<sup>3</sup> Action-specific ARARs are requirements that are applicable to certain types of activities that occur or technologies that are used during the implementation of cleanup actions.

<sup>4</sup> Chemical-specific ARARs are applicable to the types of contaminants present at the Site. The cleanup of contaminated media at the Site must meet the CULs developed under MTCA; these CULs are considered chemical-specific ARARs.

**ABBREVIATIONS:**

CFR = Code of Federal Regulations

CWA = Clean Water Act

Ecology = Washington State Department of Ecology

MCL = Maximum Contaminant Level

MTCA = Model Toxics Control Act Cleanup Regulation

NFPA = National Fire Protection Association

NPDES = National Pollutant Discharge Elimination System

OSHA = Occupational Safety and Health Act

PSCAA = Puget Sound Clean Air Agency

RCRA = Resource Conservation and Recovery Act

RCW = Revised Code of Washington

SEPA = State Environmental Policy Act

SMC = Seattle Municipal Code

USC = U.S. Code

WAC = Washington Administrative Code

WISHA = Washington Industrial Safety and Health Act

# Appendix A. Draft Compliance Monitoring Plan

October 28, 2024

Tena Seeds, P.E.  
Toxics Cleanup Program, NWRO  
15700 Dayton Avenue North  
Shoreline, Washington 98133

**RE: COMPLIANCE MONITORING PLAN  
BLOCK 38 WEST SITE  
500 THROUGH 536 WESTLAKE AVENUE NORTH  
SEATTLE, WASHINGTON  
FARALLON PN: 397-019**

Dear Tena Seeds:

Farallon Consulting, L.L.C. (Farallon) has prepared this Compliance Monitoring Plan (CMP) for City Investors IX L.L.C. (City Investors IX) to provide procedures and locations for compliance monitoring for the property located at 500 through 536 Westlake Avenue North in Seattle Washington (herein referred to as the Block 38 West Property) (Figure 1).

The Block 38 West Site, as defined under Agreed Order No. DE 17963 (AO) between the Washington State Department of Ecology (Ecology) and City Investors IX, is where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, placed, or otherwise come to be located. The Site is generally located at 500 through 536 Westlake Avenue North in Seattle, Washington. The Block 38 West Property comprises the western half of the block bounded by Mercer Street to the north, Westlake Avenue North to the west, Republican Street to the south, and a north-south-trending alley (City of Seattle public right-of-way) that bisects the block to the east. The eastern half of the same block is referred to as the Block 38 East Property; the whole block comprising the Block 38 West and Block 38 East Properties and the alley is referred to as Block 38.

## **BACKGROUND**

A comprehensive remedial investigation (RI) has been performed under the AO for the Block 38 West Site that included multiple phases of characterization between 1994 and 2024. These RI activities were performed to assess the Block 38 West Site for constituents of potential concern (COPCs) in soil and groundwater associated with historical operations at the Block 38 West Property. The results of the RI, and identification of the selected cleanup action were published



in the Public Review Draft RI/Focused Feasibility Study Report (RI/FFS Report) prepared by Farallon in August 2024 under the AO.<sup>1</sup>

Cleanup of the Block 38 West Site was performed through interim actions from October 2019 through July 2021 in conjunction with redevelopment of the Block 38 West Property as described in the RI/FFS Report and Draft Cleanup Action Plan (DCAP).<sup>2</sup>

## CONSTITUENTS OF CONCERN

As described in the DCAP, groundwater was eliminated as a medium of concern during the RI. The confirmed constituents of concern (COCs) for soil at the Block 38 West Site are:

- Total petroleum hydrocarbons (TPH) in the form of diesel range organics (DRO) and oil range organics (ORO); and
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs).

Based on the results from the RI and performance monitoring as part of the interim actions, isolated areas of total DRO+ORO and cPAHs remain in shallow soil at concentrations exceeding proposed cleanup levels for the Block 38 West Site.

## SELECTED CLEANUP ACTION

The selected cleanup action for the Block 38 West Site consists of the following elements:

- Complete removal of affected soil and groundwater by mass excavation to an elevation of -6.5 feet NAVD88 on the Block 38 West Property;
- Removal of affected soil to the maximum extent practicable in the alley area to an elevation of 25 to 18 feet NAVD88;
- Installation of a protective cap over remaining soil contamination, consisting of new pavement within the alley and surrounding the new building; and
- Implementation of institutional controls to protect and maintain the cap and prevent direct contact with remaining contamination.

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<sup>1</sup> Farallon Consulting, L.L.C. (Farallon). 2024. *Public Review Draft Remedial Investigation/Focused Feasibility Study, Block 38 West Site, 500 through 536 Westlake Avenue North, Seattle, Washington. Agreed Order No. DE 17963, Facility Site Identification No. 62773, Cleanup Site Identification No. 15008.* Prepared for City Investors IX LLC. August 20.

<sup>2</sup> Washington State Department of Ecology. 2024. *Public Review Draft Cleanup Action Plan, Block 38 West Site, 500 through 536 Westlake Avenue North, Seattle, Washington. Agreed Order No. DE 17963, Facility Site Identification No. 62773, Cleanup Site Identification No. 15008.* October 28.



The majority of the cleanup action was performed concurrent with redevelopment of the Block 38 West Property between 2019 and 2021. Implementation of institutional controls and long-term compliance monitoring are all that remain.

### **CAP MONITORING**

To ensure the integrity of the cleanup action, periodic monitoring of the asphalt and/or concrete pavement overlying areas of remaining soil contamination in the alley and in the Westlake Avenue North right-of-way near the northwest corner of the Block 38 West Property will be conducted for an initial period of 5 years, to be re-evaluated at the 5-year review conducted by Ecology. This section summarizes the periodic monitoring activities. The areas of remaining soil contamination subject to periodic monitoring of the overlying asphalt and/or concrete pavement cap are depicted on Figures 2 and 3.

### **MONITORING FREQUENCY**

Monitoring will be conducted annually for at least 5 years, beginning immediately after recording of the environmental covenant, until the first 5-year periodic review by Ecology, which is anticipated to be in 2030.

### **REPORTING**

A 5-Year Periodic Monitoring Report will be submitted to Ecology prior to the 5-year periodic review. Following the 5-year periodic review, periodic monitoring will continue annually unless written approval of a reduction in frequency is received from Ecology. Inspections will be conducted by an Operations and Maintenance Professional (O&M Professional) under the direction of the Facility Manager or Owner's Consultant.

### **INSPECTION PROCEDURES**

The inspection will consist of a walking survey of the exterior portion of the Block 38 West Site and within the alley separating Block 38 West and Block 38 East. The inspection will be documented on the Periodic Monitoring Form (Attachment A). If any of the following features are present, that feature will be noted on the Periodic Monitoring Form and in photographs:

- Cracking or ruts;
- Intersecting cracks;
- Spalling of surface;
- Buckling;



- Vegetation in cracks;
- Erosion damage; and
- Excessive or uneven settlement.

The Periodic Monitoring Form may include sketches and photographs to further document the inspection and will include a summary of repairs recommended and implemented, if any.

If the O&M Professional is of the opinion that the cap is not performing as intended, appropriate repairs will be recommended and documented. Upon approval by the Facility Manager or Owner's Consultant, repairs will be implemented by personnel and/or subcontractor(s) qualified to make the repairs as determined by the Facility Manager or Owner's Consultant.

For the asphalt and/or concrete-paved locations surrounding the newly constructed building, areas with numerous intersecting cracks, alligatored areas, or buckling will be regarded as deterioration requiring maintenance. Cracks will be repaired and conform to current Washington State Department of Transportation Standard Specifications 5-03.3. Alligatored areas greater than 100 square feet will be removed and replaced with 3 inches of new asphalt; areas smaller than 100 square feet may be repaired as cracks. Buckling of the asphalt and/or concrete cap with cracks will be regarded as requiring maintenance and that section of asphalt and/or concrete will be removed and replaced.

Inspection observations will be documented on the Periodic Monitoring Form (Attachment A). If a breach in the integrity of the asphalt and/or concrete cap is identified, the Facility Manager or Owner's Consultant will notify Ecology and promptly initiate repairs



## CLOSING

Farallon appreciates the opportunity to provide environmental consulting services for this project. Please contact Suzy Stumpf at (425) 295-0800 if you have questions or need additional information.

Sincerely,

**Farallon Consulting, L.L.C.**

Glenn McKenney, L.G.  
Project Geologist

Suzy Stumpf, P.E.  
Principal Engineer

Attachments: Figure 1, *Vicinity Map*  
Figure 2, *Post Interim Action Soil Analytical Results for DRO + ORO*  
Figure 3, *Post Interim Action Soil Analytical Results for cPAH TEC*  
Attachment A, *Periodic Monitoring Form*

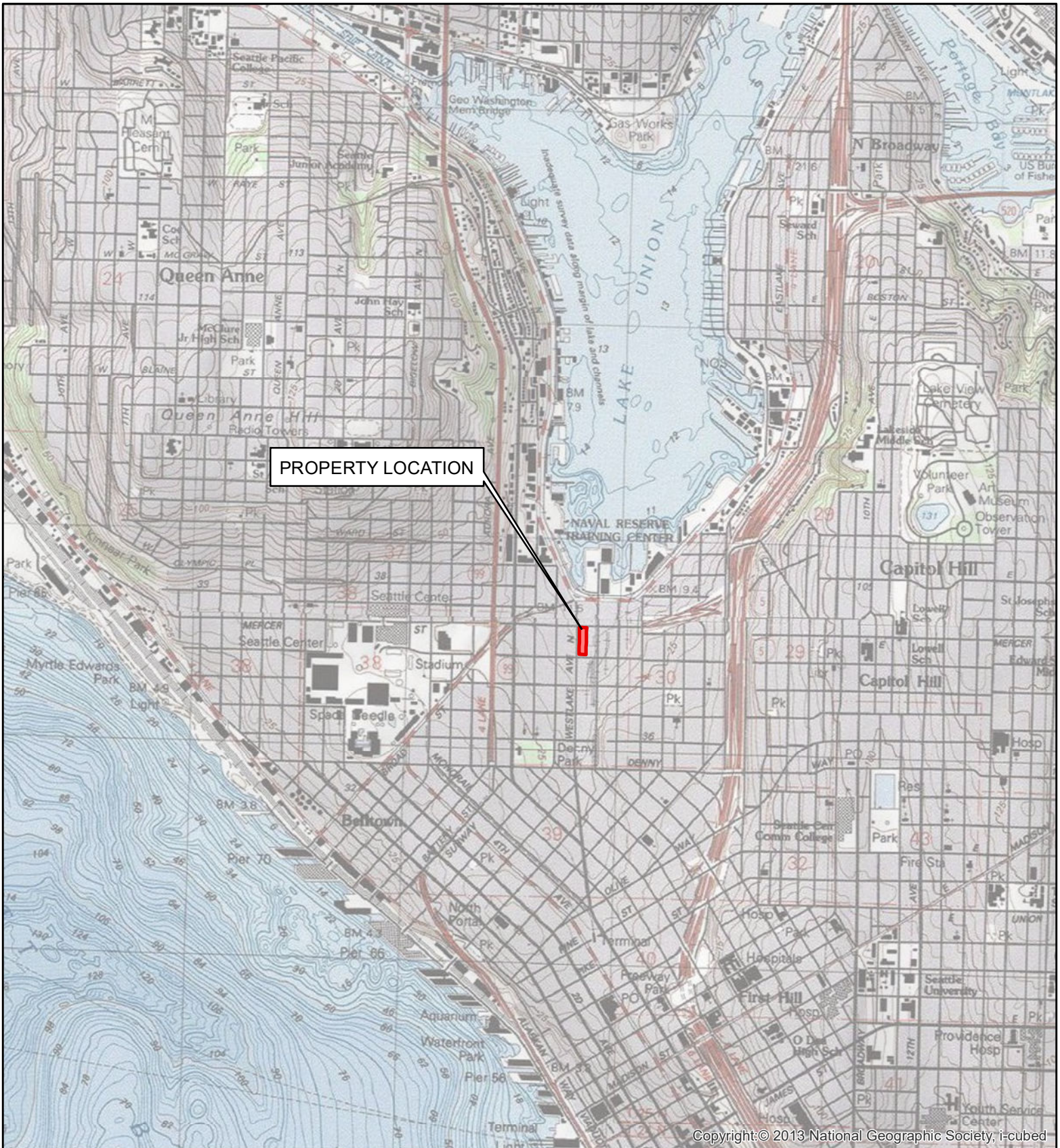
GM/SS:ca

**FIGURES**

COMPLIANCE MONITORING PLAN  
Block 38 West Site  
500 through 536 Westlake Avenue North  
Seattle, Washington

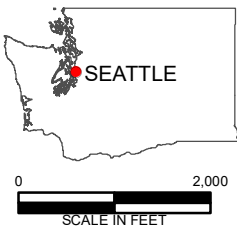
Farallon PN: 397-019





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REFERENCE: 7.5 MINUTE USGS QUADRANGLE SEATTLE NORTH, WASHINGTON, DATED 1983



Washington  
Issaquah | Bellingham | Seattle  
  
Oregon  
Portland | Baker City  
  
California  
Oakland | Irvine

**FIGURE 1**  
**VICINITY MAP**  
**BLOCK 38 WEST PROPERTY**  
**SEATTLE, WASHINGTON**

FARALLON PN: 397-019

Drawn By: Imurock

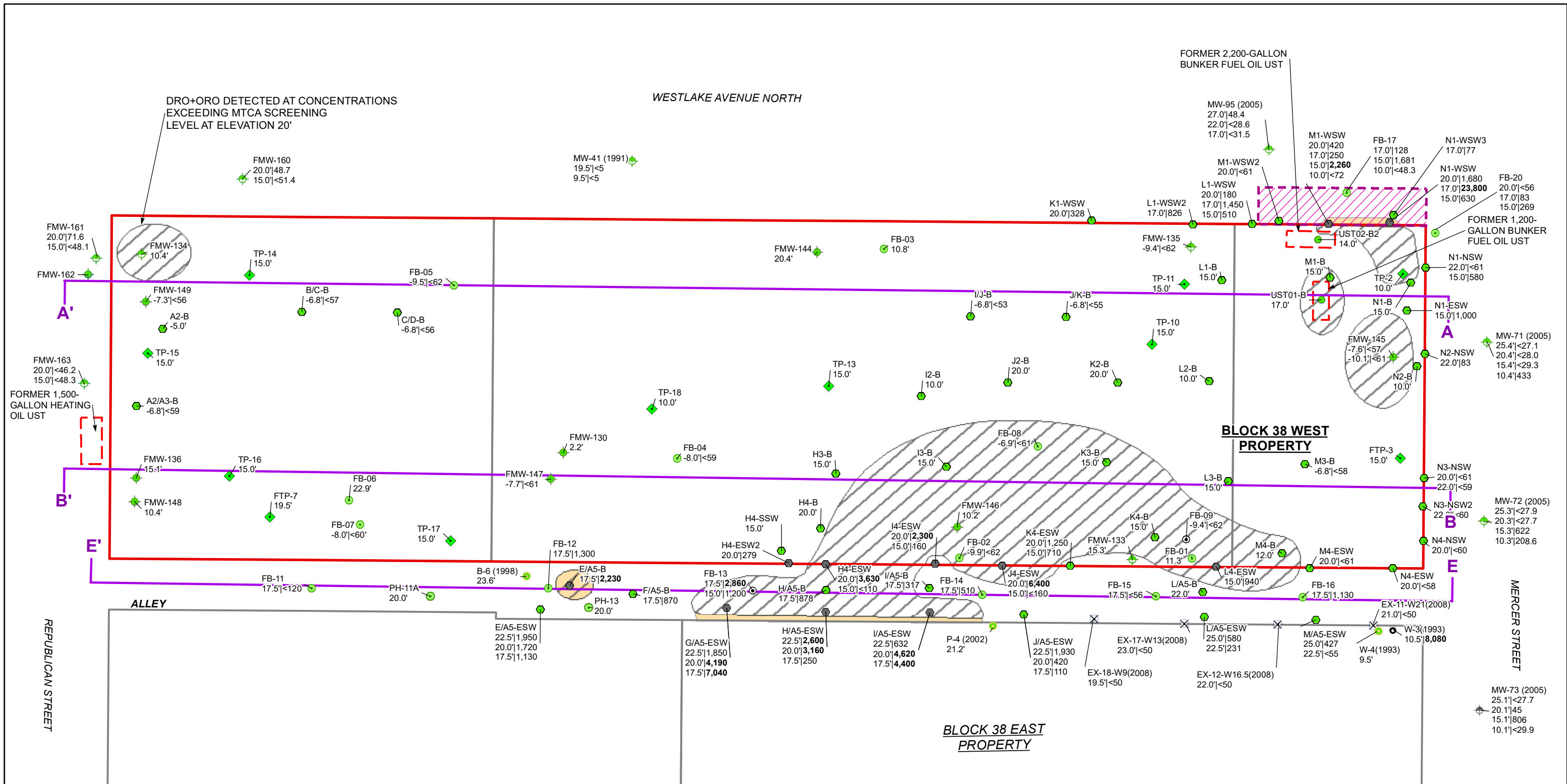
Checked By: JW

Date: 7/8/2024

Disc Reference:

Document Path: Q:\Projects\397 VULCAN\019\_Block38\Mapfiles\004\_Reporting\Figure-01\_SiteVicinity.mxd





**LEGEND**

- SHALLOW WATER-BEARING ZONE MONITORING WELL
- INTERMEDIATE WATER-BEARING ZONE MONITORING WELL / OBSERVATION WELL
- DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- BORING (FARALLON)
- BORING (GEOENGINEERS)
- EXCAVATION SAMPLE (GEOENGINEERS)
- POT HOLE (FARALLON)
- UST SAMPLE LOCATION (FARALLON)
- EXCAVATION SAMPLE LOCATION (FARALLON)
- TEST PIT (FARALLON)

- DENOTES SAMPLE LOCATION AND ELEVATION IN FEET NAVD88 WHERE DRO+ORO RESULTS ARE LESS THAN THE PROPOSED CLEANUP LEVEL
- LINE OF CROSS SECTION
- ESTIMATED EXTENT OF SOIL EXCEEDING THE PROPOSED CLEANUP LEVEL REMAINING IN PLACE POST INTERIM ACTIONS OR INACCESSIBLE DUE TO EXISTING UTILITY BANK
- ESTIMATED EXTENT OF SOIL EXCEEDING THE SCREENING LEVEL THAT WAS EXCAVATED AND REMOVED BY INTERIM ACTIONS
- MECHANICAL EQUIPMENT AREA DECOMMISSIONED AND FILLED WITH CDF
- PROPERTY BOUNDARY
- FORMER UNDERGROUND STORAGE TANKS (USTs)

KING COUNTY PARCEL BOUNDARY

**NOTES:**  
 DATA SHOWN ARE FOR SAMPLES COLLECTED BETWEEN 2014 THROUGH 2023 UNLESS OTHERWISE NOTED. DATA IS ONLY SHOWN FOR PERFORMANCE AND COMPLIANCE SAMPLES THAT REMAIN IN PLACE. NO SOIL DATA STRINGS ARE SHOWN FOR SAMPLES THAT WERE REMOVED.  
 FOR SOIL SAMPLES:  
 ELEVATION IN FEET NAVD88 | DRO+ORO ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)  
**BOLD** = DENOTES CONCENTRATIONS THAT EXCEED THE SOIL PROPOSED CLEANUP LEVEL OF 2,000 mg/kg  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
 CDF = CONTROLLED DENSITY FILL  
 DRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS DIESEL-RANGE ORGANICS  
 ORO = TPH AS OIL-RANGE ORGANICS  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988

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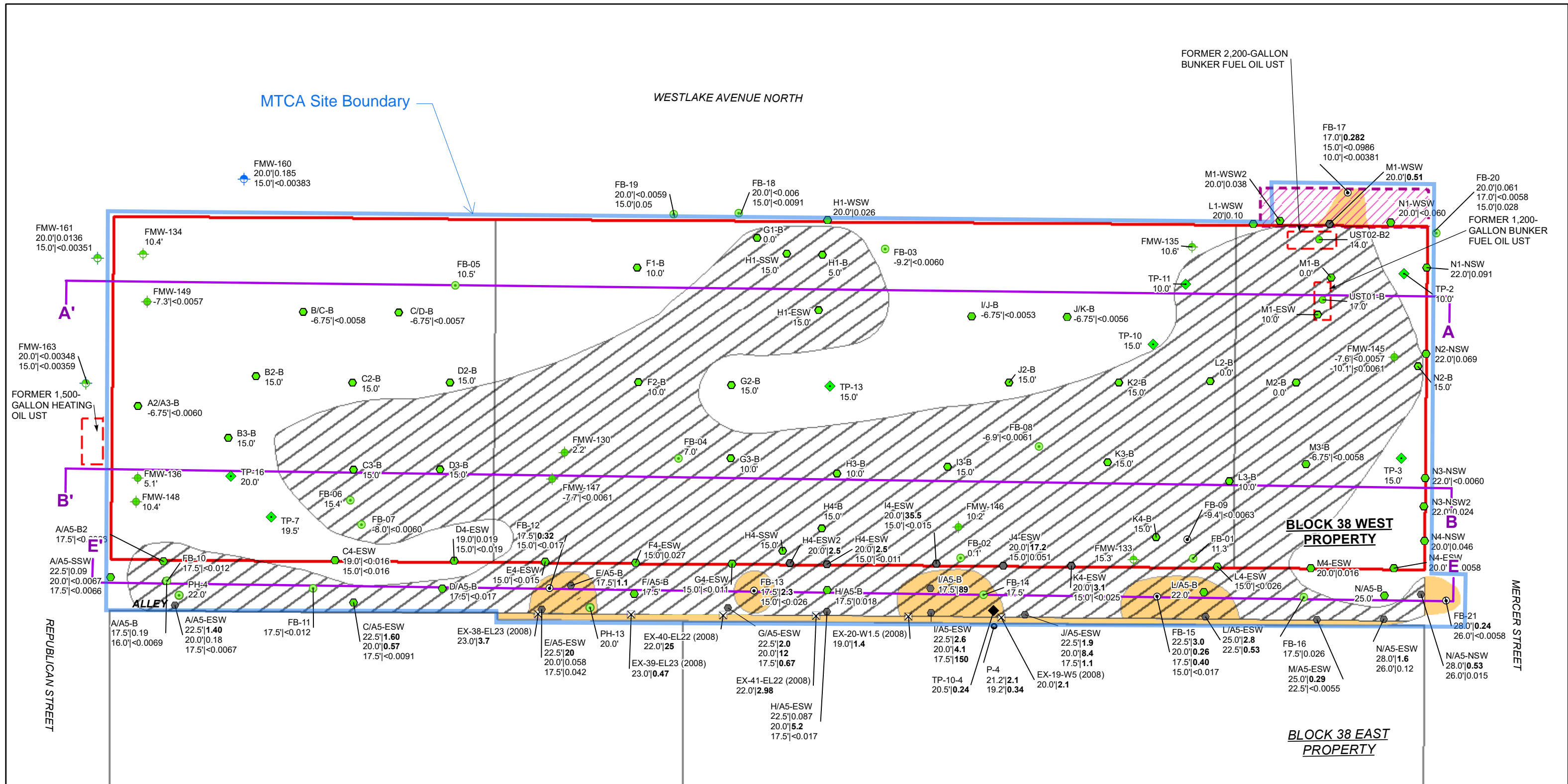
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**FIGURE 2**  
 POST INTERIM ACTION  
 SOIL ANALYTICAL RESULTS  
 FOR DRO + ORO  
 BLOCK 38 WEST SITE  
 SEATTLE, WASHINGTON  
 FARALLON PN: 397-019

**DRAFT**

Date: 10/18/2024  
 Disc Reference: Q:\Projects\397 VULCAN\019\_Block38Mapfiles\17H\_DCAPI\Figure-02\_PIA\_Soil-DRO+ORO.mxd



- LEGEND**
- SHALLOW WATER-BEARING ZONE MONITORING WELL
  - DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
  - DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
  - BORING (FARALLON)
  - BORING (GEOENGINEERS)
  - EXCAVATION SAMPLE (GEOENGINEERS)
  - TEST PIT (GEOENGINEERS)
  - POT HOLE (FARALLON)
  - UST SAMPLE LOCATION (FARALLON)
  - EXCAVATION SAMPLE LOCATION (FARALLON)
  - TEST PIT (FARALLON)

- DENOTES SAMPLE LOCATION AND ELEVATION IN FEET NAVD88 WHERE cPAHs RESULTS ARE LESS THAN THE PROPOSED CLEANUP LEVEL
- LINE OF CROSS SECTION
- ESTIMATED EXTENT OF SOIL EXCEEDING THE PROPOSED CLEANUP LEVEL REMAINING IN PLACE POST INTERIM ACTIONS OR INACCESSIBLE DUE TO EXISTING UTILITY BANK
- ESTIMATED EXTENT OF SOIL EXCEEDING THE SCREENING LEVEL THAT WAS EXCAVATED AND REMOVED BY INTERIM ACTIONS
- MECHANICAL EQUIPMENT AREA DECOMMISSIONED AND FILLED WITH CDF
- PROPERTY BOUNDARY
- FORMER UNDERGROUND STORAGE TANKS (USTs)
- KING COUNTY PARCEL BOUNDARY

**NOTES:**  
 DATA SHOWN ARE FOR SAMPLES COLLECTED BETWEEN 2014 THROUGH 2023 UNLESS OTHERWISE NOTED. DATA IS ONLY SHOWN FOR PERFORMANCE AND COMPLIANCE SAMPLES THAT REMAIN IN PLACE. NO SOIL DATA STRINGS ARE SHOWN FOR SAMPLES THAT WERE REMOVED.

FOR SOIL SAMPLES:  
 DEPTH AND CONCENTRATIONS REPORTED AS:  
 ELEVATION IN FEET NAVD88 | cPAH TEC  
 ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)

**BOLD** = DENOTES ELEVATION AND CONCENTRATIONS THAT EXCEED THE PROPOSED CLEANUP LEVEL OF 0.19 mg/kg  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED FOR TOTAL TOXIC EQUIVALENT CONCENTRATION OF BENZO(A)PYRENE (mg/kg)

CDF = CONTROLLED DENSITY FILL  
 cPAHs = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS  
 TEC = TOXIC EQUIVALENT CONCENTRATION OF BENZO(A)PYRENE FOR cPAH MIXTURE  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988



ALL LOCATIONS ARE APPROXIMATE. FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

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**FIGURE 3**  
 POST INTERIM ACTION  
 SOIL ANALYTICAL RESULTS  
 FOR cPAH TEC  
 BLOCK 38 WEST SITE  
 SEATTLE, WASHINGTON  
 FARALLON PN: 397-019

Drawn By: chartman      Checked By: SS      Date: 10/18/2024      Disc Reference: Q:\Projects\397 VULCAN\019\_Block38\Mapfiles\17H\_DCAP\Figure-03\_Soil-cPAHs.mxd

**ATTACHMENT A  
PERIODIC MONITORING FORM**

COMPLIANCE MONITORING PLAN  
Block 38 West Site  
500 through 536 Westlake Avenue North  
Seattle, Washington

Farallon PN: 397-019



**PERIODIC MONITORING FORM**

Preparer's Name: \_\_\_\_\_ Date/Time Prepared: \_\_\_\_\_  
Site Name: \_\_\_\_\_ Farallon PN: \_\_\_\_\_

**Site Information**

Owner's Consultant/  
Facility Manager: \_\_\_\_\_ Interviewed:  Yes  No  
Mailing Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_  
Phone No.: \_\_\_\_\_ Email: \_\_\_\_\_

**Current Land Use** (Check appropriate boxes)

- Residential  Commercial (office)  Commercial (warehouse)  Strip Mall  Industrial
- Other, Describe: \_\_\_\_\_

**Cap Material** (Check all appropriate boxes that apply)

- Earthen/Soil  Asphalt  Concrete  Other, Describe: \_\_\_\_\_

**Inspection Scope:**

To ensure the integrity of the completed remedial actions, periodic monitoring of the asphalt/concrete-paved areas outside the footprint of the newly constructed building and within the alley separating Block 38 West and Block 38 East will be conducted for the foreseeable future. The inspection will consist of a walking survey of the exterior portion of the Property in areas where COCs exceeded the preliminary screening levels for direct contact and/or the protection of terrestrial receptors.

**Visual Inspection**

Using the attached checklist, inspect the asphalt/concrete-paved areas outside the footprint of the newly constructed building and within the alley separating Block 38 West and Block 38 East. Summarize the results of the visual inspection below:

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### Site Inspection Sketch

In the area below, provide an appropriate sketch(s) indicating areas inspected and locations of problem areas with recommended repairs. Include additional pages and photographs of areas as appropriate.

### General Comments

Provide any other information that may be of importance in understanding the recommendations for annual cap maintenance activities for the Site.

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### VISUAL INSPECTION CHECKLIST

#### ASPHALTIC OR CONCRETE CAPPED AREAS

Open cracks and/or ruts	None _____	Repair Needed _____
Differential settlement	None _____	Repair Needed _____
Spalling of surface	None _____	Repair Needed _____
Buckling	None _____	Repair Needed _____
Vegetation in cracks	None _____	Repair Needed _____

Recommended Repair Type/Location:

## Appendix B. Vapor Barrier Specifications





# DRAGO® WRAP VAPOR INTRUSION BARRIER

## SUMMARY OF PERMEATION AND ATTENUATION TESTING

### BACKGROUND

From October 2015 through August 2018, Drago Wrap Vapor Intrusion Barrier was subjected to a series of diffusion and sorption tests to obtain the film's diffusion, partitioning, and permeation characteristics. This testing was designed and overseen by an expert in the permeation of volatile organic compounds (VOCs) at a prominent university. The results of this testing, combined with further modeling and analysis, have been used to empirically determine the attenuation efficacy of Drago Wrap against various hydrocarbons and chlorinated solvents. The purpose of this document is to briefly discuss the theory behind diffusive vapor intrusion (VI); summarize and explain the robust testing protocol utilized; and relay the results of the testing and analysis.

### CHEMICALS TESTED

Drago Wrap has been tested with regard to permeation of the following chemicals: Trichloroethylene (TCE); Perchloroethylene (PCE); the BTEX family: Benzene, Toluene, Ethylbenzene, Xylene; Dichloromethane; 1,4 Dichlorobenzene; Methyl tert-butyl ether (MTBE) and Naphthalene. This list was chosen based on a survey of the most often found chemicals on brownfield projects.

### THEORY

The practical purpose behind obtaining permeation, diffusion, and partitioning coefficients is to apply them to the equations governing mass flux per Fick's laws during design of VI mitigation systems. The following briefly explains the theory and physics behind Fick's First Law.

The diffusion coefficient,  $D_g$  (units expressed in  $[m^2/s]$ ), is the parameter defining the membrane's resistance to the diffusive mass flux  $[g/m^2s]$  transported within the membrane as governed by Fick's First Law:

$$f = -D_g \frac{dc_g}{dz} \quad (\text{Eq. 1})$$

due to a concentration gradient  $dc_g/dz$   $[g/m^4]$  in the membrane layer. If the contaminant source is an aqueous solution adjacent to the membrane, the concentration of the contaminant in the membrane can be related to that in the fluid (at equilibrium) by the partitioning coefficient,  $S_{gf}$  (where  $S_{gf}$  is analogous to a Henry's coefficient). It is given by Equation 2 and depends on the solubility of the contaminant in the material:

$$S_{gf} = \frac{c_g}{c_f} \quad (\text{Eq. 2})$$

where  $c_f$  is the concentration of the contaminant in the fluid, adjacent to and in equilibrium with, the concentration,  $c_g$ , in the membrane.

Thus, the mass flux ( $f$ ) from the fluid on one side of the membrane to the fluid on the other side (at steady state) is given by:

$$f = S_{gf} D_g \frac{dc_g}{dz} = \frac{P_g}{l} \Delta C \quad (\text{Eq. 3})$$

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# DRAGO® WRAP VAPOR INTRUSION BARRIER

## SUMMARY OF PERMEATION AND ATTENUATION TESTING

where  $l$  is the thickness of the film/membrane, and  $\Delta C$  is the difference in concentration between the two sides of the film/membrane at steady state, and the product of the two parameters ( $S_{gf} D_g$ ) is called the permeation coefficient,  $P_g$  ( $m^2/s$ ):

$$P_g = S_{gf} D_g \quad (\text{Eq. 4})$$

It can be gleaned from Equations 1-4 that the diffusion coefficient,  $D_g$ , is not enough to characterize the film's mass transfer properties for contaminants moving from below the membrane to above it. Diffusive mass transfer through an intact geomembrane is a 3-step process: partitioning into the geomembrane; diffusion through the geomembrane; and partitioning out of the geomembrane. Both  $D_g$  and  $S_{gf}$  (or simply  $P_g$ ) must be known in order to effectively utilize Fick's steady state mass transfer equations. Therefore, to allow for full and complete analysis, Drago Wrap's permeation was fully characterized with all three values (permeation, diffusion, and partitioning coefficients) for each chemical tested. Those values are contained in Table 2. It is also imperative to understand the differences in methodologies between lab and site-specific field-testing setups. If such differences exist, the addition of the phase transition coefficient between water and air, Henry's coefficient (H), may also be required in the analysis. A deeper discussion on accounting for these differences is beyond the scope of this summary. Please contact the Stego Industries' Technical Department for additional assistance.

### TESTING METHODOLOGY

Two types of tests and subsequent modeling have been employed in characterizing Drago Wrap's relevant characteristics: diffusion testing, sorption testing, and the finite layer modeling and analysis program, POLLUTE v7 (Rowe and Booker 2004).

The diffusion testing setup used stainless steel double-compartment cells (Figure 1), such that source and receptor volumes were separated by the Drago Wrap membrane. The cell was screwed together, with the membrane secured using two Viton rings (Figure 2) to prevent the loss of contaminant at the connection between each compartment and the membrane. Both the source and receptor were filled with double deionized (DDI) water, and a septum was inserted into the sampling ports to prevent losses. A stock solution of contaminants was added to the source compartment to form a dilute aqueous solution with a known concentration. Before assembly, and after disassembly, the mass of the membrane was recorded.

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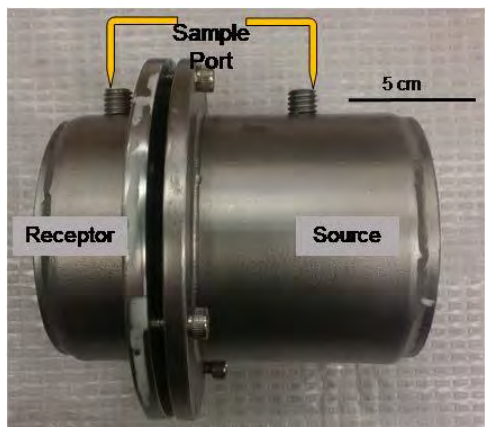


Figure 1: Double Compartment Cell

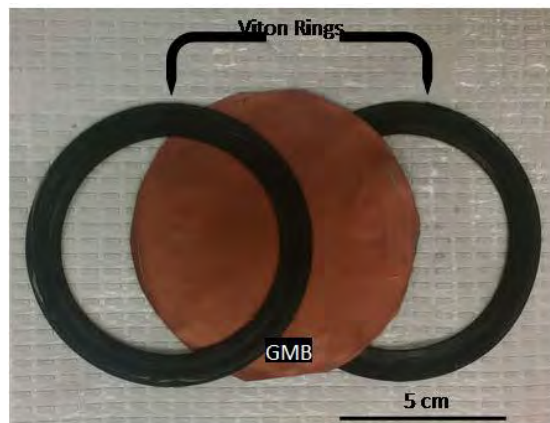


Figure 2: Membrane and Viton Rings

Sorption testing was also performed to directly measure the partitioning coefficients for each chemical. The sorption testing was conducted using 20-ml vials where a specimen was placed in double deionized water. The mass of the specimen was recorded beforehand. The vials were filled with double deionized water so that there was no airspace in the vial. Known masses of contaminants were added and 50  $\mu$ l samples were taken daily from the vials for analysis and replaced with double deionized water until equilibrium was reached. The chemical analysis of these specimens was performed in the same manner as chemical analysis of the diffusion tests. This analysis is described in Appendix B.

The results from the diffusion and sorption tests were transduced and analyzed using the finite layer modeling and analysis program, POLLUTE v7, to create the results seen in Table 2.

In addition to whole-film testing, the discrete layers that make up Drago Wrap were tested to determine their respective permeation, diffusion and partitioning coefficients. The results obtained from the mathematical modeling of these tests do not necessarily equate to the values obtained from whole-film permeation testing. In other words, the full membrane benefits from a synergistic effect: the whole is greater than the sum of its parts. Due to its unique design, the testing demonstrated a very important feature to Drago Wrap: its ability to degrade chlorinated solvents like TCE. The results show about a 50-day half-life for TCE when the membrane is installed in its intended orientation. The results in Table 2 come from the most conservative approach to analyzing the results and do not consider these synergies.

## RESULTS

As described earlier, the values displayed in Table 2 result from a conservative approach to the analysis of data generated from several phases and years of testing, and subsequent numerical modeling. The preferred methodology for obtaining accurate results requires an aqueous-to-aqueous testing scenario. Table 2 depicts these results. There exist scenarios where mass flux design with Drago Wrap requires additional consideration of phase-change analysis beyond what is offered in Table 2. Please contact the Stego Industries' Technical Department for assistance should the need arise.

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# DRAGO® WRAP VAPOR INTRUSION BARRIER

## SUMMARY OF PERMEATION AND ATTENUATION TESTING

**Table 1 – Descriptions of the Tested Chemicals**

Chemical	Abbreviation	Family	Use
Benzene	Btex	Aromatic Hydrocarbon	Gasoline byproduct
Toluene	bTex	Aromatic Hydrocarbon	Gasoline byproduct
Ethylbenzene	btEx	Aromatic Hydrocarbon	Gasoline byproduct
M&P-Xylenes	bteX	Aromatic Hydrocarbon	Gasoline byproduct
O-Xylene	bteX	Aromatic Hydrocarbon	Gasoline byproduct
Trichloroethylene	TCE	Chlorinated Hydrocarbon	Dry Cleaning and Solvent
Tetrachloroethylene	PCE	Chlorinated Hydrocarbon	Dry Cleaning and Solvent
Methyl tert-butyl ether	MTBE	Oxygenate	Octane-increasing additive to fuel
Dichloromethane	DCM	Chlorinated Hydrocarbon	Paint Stripper, Decaffeinate, Aerosol propellant
Naphthalene	Naphthalene	Polycyclic Aromatic Hydrocarbon	Fumigant, Pyrotechnics, Wetting Agent
1,4-Dichlorobenzene	1,4-DCB	Chlorinated Hydrocarbon	Pesticide, Disinfectant, Deodorant

**Table 2 – Aqueous Coefficients**

Chemical	Diffusion, $D_g$ [ $\times 10^{-15} \text{ m}^2/\text{s}$ ]	Partitioning, $S_{gf}$ [-]	Permeation, $P_g$ [ $\times 10^{-13} \text{ m}^2/\text{s}$ ]
Benzene	2.6	171	4.5
Toluene	1.5	339	5.1
Ethylbenzene	0.41	764	3.1
M&P-Xylenes	0.4	743	2.9
O-Xylene	0.4	670	2.7
TCE	3.9	251	9.8
PCE	1.1	610	6.6
MTBE	1	1	0.01
DCM	0.95	475	4.5
Naphthalene	0.014	1710	0.25
1,4-DCB	0.94	760	7.1

## CONCLUSION

Drago Wrap has proven to be a superior barrier to standard geomembranes like HDPE (by a factor of about 10 to 200 – See Appendix A) for all contaminants where comparisons could be made to HDPE and has remarkably low values for BTEX, TCE; PCE; MTBE; Naphthalene; DCM; and 1,4 DCB with permeation coefficients of the order of magnitude of  $10^{-13}$  –  $10^{-14} \text{ m}^2/\text{s}$ . In addition, the testing has shown that chlorinated solvents experience degradation while permeating through the membrane with a half-life of 50 days for TCE when the film is correctly oriented relative to the contaminant source.

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# DRAGO® WRAP VAPOR INTRUSION BARRIER

## SUMMARY OF PERMEATION AND ATTENUATION TESTING

### APPENDIX A – COMPARISON TO HDPE (WHERE AVAILABLE)

	Permeation Coefficients- 20-mil Drago Wrap			Permeation Coefficients – 80-mil HDPE <sup>1</sup>			Ratio ( $P_{g\text{Drago}}/P_{g\text{HDPE}}$ )
	$D_g$ ( $m^2/s$ )	$S_{gf}$ (-)	$P_g$ ( $m^2/s$ )	$D_g$ ( $m^2/s$ )	$S_{gf}$ (-)	$P_g$ ( $m^2/s$ )	
Benzene	$2.6 \times 10^{-15}$	171	$4.5 \times 10^{-13}$	$3.5 \times 10^{-13}$	30	$1.05 \times 10^{-11}$	23
Toluene	$1.5 \times 10^{-15}$	339	$5.1 \times 10^{-13}$	$3.0 \times 10^{-13}$	100	$3.0 \times 10^{-11}$	60
Ethylbenzene	$4.1 \times 10^{-16}$	764	$3.0 \times 10^{-13}$	$1.8 \times 10^{-13}$	285	$5.1 \times 10^{-11}$	170
<i>m&amp;p</i> -Xylenes	$4.0 \times 10^{-16}$	743	$2.9 \times 10^{-13}$	$1.7 \times 10^{-13}$	347	$5.9 \times 10^{-11}$	200
<i>o</i> -Xylene	$4.0 \times 10^{-16}$	670	$2.7 \times 10^{-13}$	$1.5 \times 10^{-13}$	240	$3.6 \times 10^{-11}$	130
TCE	$3.9 \times 10^{-15}$	251	$9.8 \times 10^{-13}$	$4.0 \times 10^{-13}$	85	$3.4 \times 10^{-11}$	35
PCE	$1.1 \times 10^{-15}$	610	$6.6 \times 10^{-13}$	-	-	-	-
MTBE	$1.0 \times 10^{-15}$	1	$1.0 \times 10^{-15}$	-	-	-	-
DCM	$9.5 \times 10^{-16}$	475	$4.5 \times 10^{-13}$	$6.5 \times 10^{-13}$	6	$3.9 \times 10^{-12}$	9
Naphthalene	$1.4 \times 10^{-17}$	1710	$2.5 \times 10^{-14}$	-	-	-	-
1,4-DCB	$9.4 \times 10^{-16}$	760	$7.1 \times 10^{-13}$	-	-	-	-

<sup>1</sup>Sangam & Rowe (2001)

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# DRAGO® WRAP VAPOR INTRUSION BARRIER

## SUMMARY OF PERMEATION AND ATTENUATION TESTING

### APPENDIX B– CHEMICAL ANALYSIS

The cells were sampled at regular time intervals. During each sampling event, 10 ul to 100 ul was removed from the cell, and that volume was replaced with DDI water so there was no airspace in the cell.

The samples were added to a vial containing 0.4 ml of methanol, 0.01 ml internal standard, and water was added so the total fluid volume in the vial was 1.6 ml. A Solid Phase Micro Extraction (SPME) fiber was inserted into vial headspace and the volatile compounds sorbed onto the fiber. This fiber was analyzed using gas chromatography (GC), and results compared to a certified laboratory standard calibration curve for the contaminant in question. Two types of detectors were used (depending on the cell in question); namely, a mass selective detector and a flame ionization detector. A quality assurance certified lab standard (from a different source to the calibration standards) was assessed during each sampling event.

All laboratory testing was conducted in a Canadian Association for Laboratory Accreditation (CALA) lab and followed CALA methods. This means that rigorous quality assurance practices were followed during chemical analysis. CALA frequently reviews the methods used and the accreditation is renewed every two years.

### REFERENCES

Rowe, R. K., and Booker, J. R. (2004). "POLLUTE V.7 - 1D Pollutant Migration through a Non-homogenous Soil." GAEA Environmental Engineering Ltd.

Sangam, H. P., and Rowe, R. K. (2001). "Migration of dilute aqueous organic pollutants through HDPE geomembranes." Geotextiles and Geomembranes, 19(6), 329–357.

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# DRAGO® WRAP VAPOR INTRUSION BARRIER

## RESISTANCE TO DEGRADATION – ADDITIONAL CONSIDERATIONS

Drago Wrap Vapor Intrusion Barrier, and the technologies that underlie this game-changing vapor intrusion protection product, has undergone extensive testing to determine its ability to attenuate VOCs and other relevant material properties. These tests exposed Drago Wrap to a host of deleterious chemicals that may exist at or below a project site, including various petroleum distillates, chlorinated solvents, etc. The results of these tests are positive and telling; they show that Drago Wrap is extremely impermeable to a wide range of chemical vapors and, more importantly for our current considerations, maintains such impermeability over the course of years of exposure to these deleterious compounds.

While the results of such testing speak extensively to Drago Wrap's ability to resist degradation in extreme exposure conditions, we wished to pursue multiple exposure scenarios to further increase the confidence project team members should have in Drago Wrap as a critical component of the vapor intrusion systems they utilize on their projects. The following pages detail these measures. The conclusions indicate that there were no significant changes in mass or volume of Drago Wrap when exposed to direct contact with soils contaminated with benzene, toluene, ethylbenzene, xylene (collectively known as BTEX), trichloroethylene (TCE), perchloroethylene (PCE, or tetrachloroethylene), cis-1,2-dichloroethylene (C-DCE), trans-1,2-dichloroethylene (T-DCE), and sulfates. Additionally, we tested the post-exposure samples to determine their tensile strength (ASTM E882) and permeance to water vapor (F1249), and we observed that Drago Wrap maintains its ability to meet each corresponding performance threshold for high-performance water vapor barriers: for D882, Drago Wrap remains a Class A Vapor Barrier per ASTM E1745; for F1249, Drago Wrap maintains a permeance well below 0.01 perms.

If additional questions remain regarding any aspect of Drago Wrap, please be sure to contact the Stego Technical Department. We are happy to help and look forward to the opportunity to provide an effective and economical solution to your barrier needs.

Regards,

Dan Marks CSI CDT LEED Green Associate  
Technical Director | Stego Industries, LLC  
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# DRAGO® WRAP VAPOR INTRUSION BARRIER TESTING SIMULATED HYDROCARBON (BTEX) CONDITION

## SETUP

To simulate a hydrocarbon contaminated brownfield site, a senior chemist at a research and testing lab prepared contaminated water to contain 1,000 ppb of each benzene, toluene, ethylbenzene, and xylene (BTEX). Two liters of this mixture were placed in a chamber, 49 cm x 23.5 cm wide by 27 cm tall. ASTM C778 standard 20-30 sand was added to the vessel until it was 5 cm above the original water line. At this level, the sand was damp with no free-standing water. Drago Wrap samples were placed on top of the damp sand, and the entire surface of the membrane were weighted down with sand-filled plastic bags to ensure full contact of the Drago Wrap with the damp sand. The test vessel was covered and sealed. After 30 days of exposure under ambient laboratory conditions (21-25°C), the samples were removed for evaluation.

Simply stated:

We took relatively large amounts of often-seen hydrocarbons resulting from fuel spills and old service station sites and put them into a water table just 2 inches below a sample of Drago Wrap. This can be considered an extreme situation in that water tables are not typically that close to the slab and vapor barrier membrane. After a 30-day exposure, the mass and volume changes were analyzed, and we subsequently tested the material for its water vapor permeance rating and tensile strength.

## RESULTS

### Mass and Volume

The chemist conducted mass and volume measurements before and after exposure. The following comes directly from her report: *"All of the test coupons exhibited slight changes in mass and volume, no matter what their exposure conditions were. Statistical analysis by the two-tailed t-test showed that the changes for the BTEX-exposed coupons were not significantly different from the changes for the control-exposed coupons."*

Conclusion: In other words, Drago Wrap mass and volume were not significantly affected by the BTEX exposure.

### Tensile Strength

Samples were sent by the lab to our in-house lab and tested per ASTM E882 in both the machine and transverse directions. After the 30-day extreme BTEX solvent exposure, the results were 50.2 lbf/in and 49.6 lbf/in for machine and transverse directions respectively. These results were not significantly different than the water-exposed control samples (48.7 lbf/in, 48.5 lbf/in) or the unexposed samples (48.5 lbf/in, 46.8 lbf/in). For another point of comparison, consider that to be labeled as Class A per ASTM E1745, new-material tensile need only test at 45 lbf/in.

Conclusion: BTEX exposure has little to no effect on Drago Wrap's physical integrity in below-slab applications.

### Water Vapor Permeance

The testing lab then sent exposed and control samples to our in-house lab where they were subsequently tested per ASTM F1249. The results were very positive. The permeance of the sample exposed to the BTEX solution (0.00733 perms) increased minimally compared to the control (0.00614 perms), both staying well below the threshold of 0.01 perms.

Conclusion: BTEX exposure had minimal effect on Drago Wrap's ability to retard water vapor.





# DRAGO® WRAP VAPOR INTRUSION BARRIER TESTING SIMULATED CHLORINATED SOLVENT CONDITION

## SETUP

To simulate a dry-cleaning brownfield site, a senior chemist at a research and testing lab prepared contaminated water to contain 3,600 ppb perchloroethylene (PCE), 12,500 PPB trichloroethylene (TCE), 16,200 PPB CIS-1,2-dichloroethylene (C-DCE), AND 1,700 PPB trans-1,2-dichloroethylene (T-DCE). Two liters of this mixture were placed in a chamber, 49 cm x 23.5 cm wide and 27 cm tall. ASTM C778 standard 20-30 sand was added to the vessel until it was 5 cm above the original water line. At this level, the sand was damp with no free-standing water. Drago Wrap samples were placed on top of the damp sand, and the entire surface of the vapor barrier was weighted down with sand-filled plastic bags to ensure full contact of the Drago Wrap with the damp sand. The test vessel was covered and sealed. After 30 days of exposure under ambient laboratory conditions (21-25°C), the samples were removed for evaluation.

Simply stated:

We took an actual soils report from an old dry cleaning site and recreated the conditions, roughly. In the actual scenario the water table was 20 feet below the vapor barrier. In our setup, we created a contaminated water table just 2 inches below Drago Wrap. After a 30-day exposure, the mass and volume changes were analyzed, and we subsequently tested the material for its water vapor permeance rating and tensile strength.

## RESULTS

### Mass and Volume

The chemist conducted mass and volume measurements before and after exposure. The following comes directly from her report: *"All of the test coupons exhibited slight changes in mass and volume, no matter what their exposure conditions were. Statistical analysis by the two-tailed t-test showed that the changes for the chlorinated solvent-exposed coupons were not significantly different from the changes for the control-exposed coupons."*

Conclusion: Drago Wrap's mass and volume were not significantly affected by the chlorinated solvent exposure.

### Tensile Strength

Samples were sent by the lab to our in-house lab and tested per ASTM E882 in both the machine and transverse directions. After the 30-day extreme chlorinated solvent exposure, the results were 51.2 lbf/in and 49.7 lbf/in for machine and transverse directions respectively. These results were not significantly different than the water-exposed control samples (48.7 lbf/in, 48.5 lbf/in) or the unexposed samples (48.5 lbf/in, 46.8 lbf/in). For another point of comparison, consider that to be labeled as Class A per ASTM E1745, new-material tensile need only test at 45 lbf/in.

Conclusion: Chlorinated solvent exposure has little to no effect on Drago Wrap's physical integrity in below-slab applications.

### Water Vapor Permeance

The testing lab then sent exposed and control samples to our in-house lab where they were subsequently tested per ASTM F1249. The results were very positive. The permeance of the sample exposed to the BTEX solution (0.00713 perms) increased minimally compared to the control (0.00614 perms), both staying well below the threshold of 0.01 perms.

Conclusion: Chlorinated solvent exposure had minimal effect on Drago Wrap's ability to retard water vapor.



# DRAGO® WRAP VAPOR INTRUSION BARRIER TESTING

## SIMULATED SULFATE EXPOSURE CONDITION

### SETUP

To simulate the worst possible sulfate exposure, a senior chemist at a research and testing lab prepared water contaminated with 10,000 PPM of SO<sub>4</sub> (sulfate.) This sulfate concentration was chosen because it was rated as “very severe” (the highest or worst classification) by UC Berkeley professors conducting research for the Caltrans Long Life Pavement Rehabilitation Strategy (LLPRS) Program. The Chemist took this worst-case scenario concentration and soaked samples of Drago Wrap in it for 28 days. Upon removal, the samples were analyzed for changes in mass and volume, and subsequently the exposed product was tested to determine its tensile strength and water vapor permeance rate.

### RESULTS

#### Mass & Volume

The chemist conducted mass and volume measurements before and after exposure. The following comes directly from her report: *“All of the test coupons exhibited slight changes in mass and volume, no matter what their exposure conditions were. Statistical analysis by the two-tailed t-test showed that the changes for the sulfate-exposed coupons were not significantly different from the changes for the control-exposed coupons.”*

Conclusion: In other words, Drago Wrap’s mass and volume were not significantly affected by the sulfate exposure.

#### Tensile

Samples were sent by the lab to our in-house lab and tested per ASTM E882 in both the machine and transverse directions. After the 28-day extreme sulfate exposure, the results were 49.6 lbf/in and 52.3 lbf/in for machine and transverse directions respectively. These results were not significantly different than the water-exposed control samples (48.7 lbf/in, 50.8 lbf/in) or the unexposed samples (48.5 lbf/in, 46.8 lbf/in). For another point of comparison, consider that to be labeled as Class A per ASTM E1745, new-material tensile need only test at 45 lbf/in.

Conclusion: Sulfate exposure has little to no effect on Drago Wrap’s physical integrity in below-slab applications.

#### Water Vapor Permeance

The testing lab then sent exposed and control samples to our in-house lab where they were subsequently tested per ASTM F1249. The results were very positive. The permeance of the sample exposed to the sulfate solution (0.00734 perms) increased minimally compared to the control (0.00698 perms), both staying well below the threshold of 0.01 perms.

Conclusion: Sulfate exposure had no significant effect on Drago Wrap’s ability to retard water vapor.



# DRAGO® WRAP VAPOR INTRUSION BARRIER

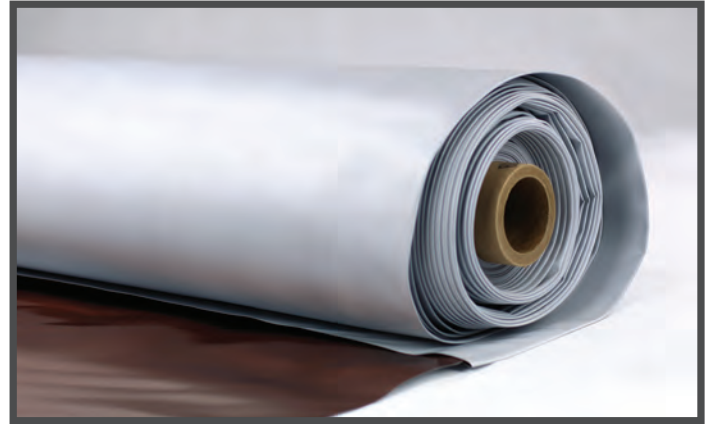
A STEGO TECHNOLOGY, LLC INNOVATION | VAPOR RETARDERS 07 26 00, 03 30 00 | VERSION: 2/22/2019

## 1. PRODUCT NAME

**DRAGO WRAP VAPOR INTRUSION BARRIER**

## 2. MANUFACTURER

c/o Stego® Industries, LLC\*  
216 Avenida Fabricante, Suite 101  
San Clemente, CA 92672  
Sales, Technical Assistance  
Ph: (877) 464-7834  
Fx: (949) 257-4113  
www.stegoindustries.com



## 3. PRODUCT DESCRIPTION

**USES:** Drago Wrap is specifically engineered to attenuate volatile organic compounds (VOCs) and serve as a below-slab moisture vapor barrier.

**COMPOSITION:** Drago Wrap is a multi-layered plastic extrusion that combines uniquely designed materials with only high grade, prime, virgin resins.

**ENVIRONMENTAL FACTORS:** Drago Wrap can be used in systems for the control of various VOCs including hydrocarbons, chlorinated solvents, radon, methane, soil poisons, and sulfates.

## 4. TECHNICAL DATA

**TABLE 4.1: PHYSICAL PROPERTIES OF DRAGO WRAP VAPOR INTRUSION BARRIER**

PROPERTY	TEST	RESULTS
Under Slab Vapor Retarders	ASTM E1745 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs	ASTM E1745 Compliant
Water Vapor Permeance	ASTM F1249 – Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor	0.0069 perms
Push-Through Puncture	ASTM D4833 – Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products	183.9 Newtons
Tensile Strength	ASTM D882 – Test Method for Tensile Properties of Thin Plastic Sheeting	53.5 lbf/in
Permeance After Conditioning (ASTM E1745 Sections 7.1.2 - 7.1.5)	ASTM E154 Section 8, F1249 – Permeance after wetting, drying, and soaking ASTM E154 Section 11, F1249 – Permeance after heat conditioning ASTM E154 Section 12, F1249 – Permeance after low temperature conditioning ASTM E154 Section 13, F1249 – Permeance after soil organism exposure	0.0073 perms 0.0070 perms 0.0062 perms 0.0081 perms
Hydrocarbon Attenuation Factors	Contact Stego Industries' Technical Department	
Chlorinated Solvent Attenuation Factors	Contact Stego Industries' Technical Department	
Methane Transmission Rate	ASTM D1434 – Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting	7.0 GTR** (mL(STP)/m <sup>2</sup> *day)
Radon Diffusion Coefficient	K124/02/95	9.8 x 10 <sup>-14</sup> m <sup>2</sup> /second
Thickness		20 mil
Roll Dimensions		14' x 105' or 1,470 ft <sup>2</sup>
Roll Weight		150 lb

Note: perm unit = grains/(ft<sup>2</sup>\*hr\*in-Hg) \*\* GTR = Gas Transmission Rate

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# DRAGO® WRAP VAPOR INTRUSION BARRIER

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## 5. INSTALLATION

**UNDER SLAB:** Unroll Drago Wrap over a tamped aggregate, sand, or earth base. Overlap all seams a minimum of 12 inches and tape using Drago® Tape. All penetrations must be sealed using a combination of Drago Wrap and Drago Accessories.

Review Drago Wrap's complete installation instructions prior to installation.

## 6. AVAILABILITY & COST

Drago Wrap is available nationally through our network of building supply distributors. For current cost information, contact your local Drago distributor or Stego Industries' Sales Representative.

## 7. WARRANTY

Stego Industries, LLC believes to the best of its knowledge, that specifications and recommendations herein are accurate and reliable. However, since site conditions are not within its control, Stego Industries does not guarantee results from the use of the information provided and disclaims all liability from any loss or damage. Stego Technology, LLC does offer a limited warranty on Drago Wrap. Please see [www.stegoindustries.com/legal](http://www.stegoindustries.com/legal).

## 8. MAINTENANCE

Store Drago Wrap in a dry and temperate area.

## 9. TECHNICAL SERVICES

Technical advice, custom CAD drawings, and additional information can be obtained by contacting Stego Industries or by visiting the website.

**Contact Number:** (877) 464-7834

**Website:** [www.stegoindustries.com](http://www.stegoindustries.com)

## 10. FILING SYSTEMS

- [www.stegoindustries.com](http://www.stegoindustries.com)

(877) 464-7834 | [www.stegoindustries.com](http://www.stegoindustries.com)

DATA SHEETS ARE SUBJECT TO CHANGE. FOR MOST CURRENT VERSION, VISIT [WWW.STEGOINDUSTRIES.COM](http://WWW.STEGOINDUSTRIES.COM)





# DRAGO® WRAP LIMITED WARRANTY ISSUER: STEGO TECHNOLOGY, LLC (“Stego Tech”)



Applicable Date: January 1, 2018 | Revision Date: October 30, 2018 | Version Number: 2.0

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This Drago Wrap Limited Warranty (“the Warranty”) commences on the Effective Date and applies to Drago Wrap Vapor Intrusion Barrier (for the purposes of this Warranty “Drago Wrap”).

Stego Tech recommends installation of Drago Wrap per ASTM E1643, its published installation instructions, and in accordance with all site-specific recommendations of the project’s design team. Drago Wrap is specifically engineered to be installed in conjunction with its proprietary accessories, including Drago® Tape, DragoTack™ Tape, Drago® Sealant, and Drago® Sealant Form. Additionally, to avoid puncturing Drago Wrap and comply with ASTM E1643, Stego Tech recommends utilizing the Beast® Screed system of vapor barrier-safe accessories.

## WARRANTY TERMS AND CONDITIONS

### 1 DRAGO WRAP WARRANTY

Stego Tech recognizes the most current version of ASTM E1745 (at the time of the material purchase) as the governing standard specification for under-slab vapor retarders. Subject to the limitations set forth below, for the Life of the Building™ Stego Tech warrants that Drago Wrap:

- (a) meets all of the requirements for its designated ASTM E1745 classification;
- (b) has been tested in accordance with each of the following ASTM test methods:
  - i. ASTM E1745 – *Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs*
  - ii. ASTM F1249 – *Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor*
  - iii. ASTM D1709 – *Test Methods for Impact Resistance of Plastic Film by Free-Falling Dart Method*
  - iv. ASTM D882 – *Test Method for Tensile Properties of Thin Plastic Sheeting*
  - v. ASTM E154 – *Sections 8, 11, 12, 13 – Permeance After Conditioning*<sup>1</sup>
  - vi. ASTM D1434 – *Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting*
  - vii. ASTM D4833 – *Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products*
- (c) will be free from Manufacturing Composition Defects;
- (d) eligible for input on project-specific installation best practices by a Stego Tech-authorized representative during the preconstruction phase upon reasonable notice, in-person or remotely; and
- (e) eligible for Site Review by a Stego Tech-authorized representative, in-person or digitally, for input on installation prior to concrete placement upon reasonable notice.
- (f) will meet or exceed its published product literature for **a period not less than two (2) years from the Date of Installation.**

This Warranty is the sole Warranty given by Stego Tech or its Affiliates as to Drago Wrap. All installations or uses of Drago Wrap automatically activate this Warranty. If you do not wish to be bound by the terms of this Warranty, please return the Drago Wrap for a full Refund. Otherwise, all installations will be presumed to have agreed to the terms herein.

### 2 NOTICE AND CLAIMS

Any Claim pursuant to this Warranty must be Certified and must be made within sixty (60) days of the date discovered or the date it should reasonably have been discovered in order for Stego Tech to evaluate the Claim and replace the Drago Wrap. Claims may be made at any time during the Life of the Building. Such replacement (or at Stego Tech’s option, Refund of the verified purchase price) shall be your sole and exclusive remedy for any such Claim.

<sup>1</sup> Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

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# DRAGO® WRAP LIMITED WARRANTY

## ISSUER: STEGO TECHNOLOGY, LLC (“Stego Tech”)



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### 3 WARRANTY AND CONDITIONS TO COVERAGE

This Warranty excludes any defect or damage caused by: (a) faulty or improper installation of the Drago Wrap, including the failure to comply with published specification and installation recommendations in effect at the time of installation; (b) improper use, storage or site conditions (e.g noncompliance with the terms of the Drago Wrap Material Safety Data Sheet); (c) any below-concrete slab or similar activity, and any other maintenance, repair, alteration or new installation to the Building that occurs after the completion of the original installation that impacts the Drago Wrap; (d) damage caused by non-Stego Tech materials; (e) factors beyond the reasonable control of Stego Tech or its Affiliates, including, but not limited to, natural disasters such as lightning, floods, windstorms, seismic disturbances, hurricanes, tornadoes, or impact of foreign objects or other violent storms or casualty; (f) damage resulting from any form of misuse, abuse or negligence; (g) structural defects or failures in the Building to which the Drago Wrap is installed.

**Your sole remedy under this Warranty is, at Stego Tech’s option: (a) Refund of the purchase price paid; or (b) replacement of so much of the Drago Wrap as Stego Tech deems necessary.**

### 4 WARRANTY EXCLUSIONS

Except where prohibited by law, this Warranty and the remedies expressly stated herein are the exclusive warranties and remedies provided to you with respect to the Drago Wrap and supersede any prior, contrary or additional representations, whether oral or written. No representative, distributor, dealer or any other person is authorized to make, or makes any warranty, representation, condition or promise with respect to the Drago Wrap. **ALL OTHER WARRANTIES ARE DISCLAIMED AND EXCLUDED – WHETHER EXPRESS, IMPLIED, OR STATUTORY – INCLUDING ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY IMPLIED WARRANTIES OTHERWISE ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE.**

In no event shall Stego Tech or its Affiliates be liable for any incidental, special, indirect, consequential damages, including but not limited to lost income or loss of use. This exclusion applies regardless of whether such damages are sought for breach of warranty, breach of contract, negligence, or strict liability in tort or any other legal or equitable theory.

### 5 SEVERANCE

If any provision in this Warranty is found to be invalid or unenforceable, then the remainder shall have full force and effect, and the invalid provision shall be modified or partially enforced to the maximum extent permitted by law to effectuate the purpose of the Warranty.

### 6 DISPUTE RESOLUTION

It is the intention of the parties to use their reasonable best efforts to informally resolve, where possible, any dispute, claim, demand or controversy arising out of the performance of this Warranty by mutual negotiation and cooperation. In the event that the parties are unable to informally resolve a dispute, the Parties agree that such disputes shall be completely and finally settled by submission to arbitration before a single arbitrator under the Judicial Arbitration and Mediation Services (JAMS) Arbitration Rules then in effect. Good faith mediation shall be a condition precedent to initiating arbitration. Unless the parties agree otherwise, the arbitration shall take place in Orange County, California, U.S.A. The award of the arbitrator shall be in writing, shall be final and binding upon the parties, shall not be appealed from or contested in any court and may, in appropriate circumstances, include injunctive relief. Judgment on such award may be entered in any court of appropriate jurisdiction, or application may be made to that court for a judicial acceptance of the award and an order of enforcement, as the party seeking to enforce that award may elect. The prevailing party shall be entitled to recover its attorney fees and costs. This Agreement shall be governed in all respects by the laws of the State of California without regard to the conflict of law provisions thereof. Neither party will consolidate, or seek class treatment for any action unless previously agreed to in writing by all parties.

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*Note - legal notice on last page.*





# DRAGO® WRAP LIMITED WARRANTY ISSUER: STEGO TECHNOLOGY, LLC (“Stego Tech”)



Applicable Date: January 1, 2018 | Revision Date: October 30, 2018 | Version Number: 2.0

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## DEFINITIONS

“**Affiliates**” means Stego Tech affiliated entities, partners, joint venturers, suppliers, vendors, subcontractors, representatives, and agents.

“**Applicable Date**” means the Limited Warranty applies to material sold on or after January 1, 2018.

“**Building**” means the building above which Drago Wrap was installed, as verified by Stego Tech.

“**Certified**” means that you have investigated whether a breach of this Warranty occurred and obtained and provided a qualified inspector report confirming evidence exists of such a Defect. Stego Tech reserves the right to independently verify any Claims.

“**Claim**” means a claim for relief under the Warranty.

“**Date of Installation**” means the date Drago Wrap was installed, as verified by Stego Tech.

“**Effective Date**” means date of first sale as verified.

“**Life of the Building**” means the duration of which the building originally installed atop of the Drago Wrap is in good and working condition.

“**Manufacturing Composition Defect**” means any condition of the Drago Wrap that does not meet the material’s intended design and is disclosed to Stego Tech during the Life of the Building.

“**Refund**” means Stego Tech providing a monetary return in the amount verified to be the cost of the Drago Wrap subject to the Claim.

“**Site Review**” means a review of representative portions of the Drago Wrap installation (digitally or in-person, when possible, and as determined by Stego Tech authorized representative) prior to concrete placement to help ensure compliance with governing installation standard, ASTM E1643, Stego Tech’s installation instructions, and/or, if applicable, the design team’s recommendations (e.g. contract documents). Site Reviews are not a full site inspection.

“**Stego Tech**” means Stego Technology, LLC, a California limited liability company with its principal place of business located at 216 Avenida Fabricante, #101, San Clemente, California 92672. Stego Industries, LLC is the exclusive representative of Drago Wrap and accessory products, owned by Stego Technology, LLC, a wholly independent company.

“**Warranty**” means this Drago Wrap Limited Warranty.







Revision Date: July 30, 2018 | Date of Issue: June 1, 2017 | Version Number: 2.0

## SECTION 1: IDENTIFICATION

### Product Identifier

**Product Name:** Drago Wrap

### Intended Use of the Product

Vapor Intrusion Barrier

### Company Name, Address, and Telephone of the Responsible Party

Stego Technology, LLC or C/O Stego® Industries, LLC\*  
216 Avenida Fabricante #101  
San Clemente, CA 92672

### Emergency Telephone Number

**Emergency Number:** 1 (800) 424-9300 (24 Hrs.) CHEMTREC

**Main Contact Number:** (877) 464-7834

## SECTION 2: HAZARDS IDENTIFICATION

**Classification:** This product is not classified as hazardous in accordance with 29 C.F.R. § 1910.1200.

**Signal word:** None.

**Pictogram(s):** None.

**Hazard statement(s):** None.

**Precautionary statement(s):** None.

**Hazards not otherwise classified:** Polymer film can burn if exposed to excessive temperatures beyond the normal use of the product.

## SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS Number	% by WT.
Copper	Proprietary*	<10%*

The selections marked with an '\*' are proprietary and considered to be Trade Secrets. This is the reason that they are listed as such, or provided as a range.

## SECTION 4: FIRST AID MEASURES

The following first aid recommendations are based on an assumption that appropriate personal and industrial hygiene practices are followed.

**Inhalation:** Not a respirable film. If exposed to fumes from combustion, move subject to fresh air; if breathing is difficult, give oxygen and get medical attention; if victim has stopped breathing, give artificial respiration and get medical attention.

**Eye Contact:** Not a probable route of exposure. If exposed to fumes from overheating or from combustion, move subject to fresh air. Flush with plenty of water; if irritation continues, get medical attention.

**Skin Contact:** No treatment necessary. For thermal burns, cool molten materials with water and get medical attention.

**Ingestion:** Not a probable route of exposure.

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## SECTION 5: FIRE-FIGHTING MEASURES

**Unusual Hazards:** Polymer film can burn if exposed to excessive temperature beyond the normal use of the product.

**Extinguishing Agents:** Use extinguishing media appropriate for surrounding fire: carbon dioxide, foam, dry chemical, and water fog.

**Personal Protective:** Equipment unnecessary unless resin is burned, which is not an intended use of the product. If resin is burning, wear self-contained breathing apparatus (pressure-demand MSHAINIOSH approved or equivalent) and full protective gear.

**Note:** See Section 10 for hazardous combustion and thermal decomposition information.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

**Personal Protection:** None necessary.

**Procedures:** None necessary.

## SECTION 7: HANDLING AND STORAGE

**Storage Conditions:** Cool, dry storage recommended. Indoor storage recommended.

Avoid storing films in areas containing aromatic hydrocarbons, halogenated compounds, chlorinated compounds, oxidative agents, solvents or other known polyethylene solubilizers, prodegradants, as they may impact the product performance and/or service life.

**Handling Procedures:** Avoid direct sunlight. Avoiding direct UV exposure of product. Avoid contact with incompatible materials.

**Installation Temperature Range:** Below 110°F (ambient). Please also see technical and safety data sheets for accessory products installation/application temperature ranges.

**In-Service Temperature Range:** Below 85°F (soil and slab temperature, beginning 28 days following slab placement). Please also see technical and safety data sheets for accessory products installation/application temperature ranges.

**Exposure to Ultraviolet Radiation/Weather Events:** The amount of time between when Stego Wrap is installed and when concrete is placed or other complete protection from sunlight and weather events is provided should be minimized while not exceeding 7 days.

Please review the remainder of the SDS and this wrap's technical data sheet for storage and additional information. If any of the conditions cited above pose a problem for the typical installation of Drago Wrap, please contact Stego Industries for additional information and solutions.

## SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Ingredient	OSHA PEL	ACGIH TWA
Copper	0.1 mg/m <sup>3</sup> (Cu fume)	0.2 mg/m <sup>3</sup> (Cu fume)

**Respiratory Protection:** None required during handling. Local exhaust to remove fumes from heat sealing and hot wire cutting areas of packaging or bag converting for worker comfort.

**Eye Protection:** None necessary.

**Hand Protection:** None necessary.

**Engineering Controls (Ventilation):** Use local exhaust ventilation when routinely heat sealing this product. Recommended ventilation is with a minimum capture velocity of 100 ft/min. (30 m/min.) at the point of vapor evolution. Refer to the current edition of *Industrial Ventilation: A Manual of Recommended Practice* published by the American Conference of Governmental Industrial Hygienists for information on the design, installation, use, and maintenance of exhaust systems.

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**SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES** *Continued...*

**General Physical Form:** Solid plastic film.

**INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES**

<b>Appearance</b>	Plastic film
<b>Color:</b>	Copper and Gray
<b>State:</b>	Solid
<b>Odor Characteristics:</b>	None
<b>Odor Threshold:</b>	None
<b>pH:</b>	Not Applicable
<b>Melting Point/Freezing Point:</b>	Not Applicable
<b>Initial Boiling Point and Boiling Point Range:</b>	Not Applicable
<b>Flash Point:</b>	Not Applicable
<b>Evaporation Rate:</b>	Not Applicable
<b>Flammability (solid, gas):</b>	Not Applicable
<b>Upper flammability:</b>	Not Applicable
<b>Lower Flammability:</b>	Not Applicable
<b>Vapor Pressure:</b>	Not Applicable
<b>Vapor Density:</b>	Not Applicable
<b>Relative Density:</b>	Not Applicable
<b>Solubility:</b>	Not Applicable
<b>Partition Coefficient: n-octanol/water:</b>	Not Applicable
<b>Auto ignition-temperature:</b>	Not Applicable
<b>Decomposition temperature:</b>	>325°C (617°F)
<b>Viscosity:</b>	Not Applicable

**SECTION 10: STABILITY AND REACTIVITY**

**Instability:** This material is considered stable. Thermal decomposition is dependent on time and temperature.

**HAZARDOUS DECOMPOSITION PRODUCTS**

Substance	Condition
Hydrocarbons	Combustion by-product
Carbon Monoxide	Combustion by-product
Carbon Dioxide	Combustion by-product
Copper Fume	Combustion by-product

**Hazardous Polymerization:** Product will not undergo hazardous polymerization. Product does not decompose at ambient temperatures.

**Incompatibility:** Lead azide and lead stiphante commonly used in high explosive detonators react violently with copper.

**Reactivity:** Reacts and binds with polar gases such as Hydrogen sulfide (H<sub>2</sub>S), Ozone (O<sub>3</sub>), Carbonyl sulfide (COS), Sulfur Dioxide (SO<sub>2</sub>), Hydrogen chloride (HCl), Formic Acid, Acetic Acid.

**Hazardous Decomposition:** Under recommended usage conditions, hazardous decomposition products are not expected. Hazardous decomposition products may occur as a result of oxidation, heating, or reaction with another material.

*Continued...*

*Note - legal notice on page 5*



Revision Date: July 30, 2018 | Date of Issue: June 1, 2017 | Version Number: 2.0

## SECTION 11: TOXICOLOGICAL INFORMATION

This product, when used under reasonable conditions and in accordance with the directions for use, should not present a health hazard. However, use or processing of the product in a manner not in accordance with the product's directions for use may affect the performance of the product and may present potential health and safety hazards.

**Acute Data:** No Toxicity data are available for this material.

### PRIMARY ROUTES OF EXPOSURE

**Skin Contact:** Only if burned.

**Eye Contact:** Only if burned.

**Respiratory Contact:** Only if burned.

### ACUTE EFFECTS OF EXPOSURE

**Ingestion:** Not a probable route of exposure.

**Inhalation:** No inhalation risk unless product is heated to point of burning, which in normal applications does not occur. Fumes from combustion are unlikely to be produced during heat shrinking. Local ventilation should be used for comfort. Testing data shows copper/polymer particulate count at approximately 0.007mg/m<sup>3</sup>, which is well below OSHA PEL of 0.1 mg/m<sup>3</sup>.

**Eye Contact:** No eye exposure risk during all product usage except during heating if plastic is heated to point of combustion, which does not occur during the intended use of the product. Fumes from combustion, which have a low toxicity, may be produced during hot wire cutting or heat sealing. Fumes are unlikely to be produced during heat shrinking when used as directed.

**Skin Contact:** Not irritating when used as directed. Hot polymer created during heat shrinking, wire cutting, or heat sealing, may produce thermal burns.

**Chronic Effects of Exposure:** None known when used as directed.

**Carcinogenicity:** None known when used as directed.

## SECTION 12: ECOLOGICAL INFORMATION

This material is insoluble in water and not expected to present any environmental problems in normal application, however areas containing aromatic hydrocarbons, halogenated compounds, chlorinated compounds, pH extremities, oxidative agents, solvents or other known polyethylene solubilizers, prodegradants, etc. may impact the product performance and/or service life.

## SECTION 13: DISPOSAL CONSIDERATIONS

**Procedure:** Reclaim if feasible. If product can't be reclaimed, no special requirements are necessary; dispose of as ordinary solid waste. Pick up film for good "housekeeping" and to prevent a slipping hazard. Incineration or landfill in compliance with federal, state and local regulations. *Since regulations vary, consult applicable regulations or authorities before disposal.*

## SECTION 14: TRANSPORT INFORMATION

**US DOT Hazard Class:** Not regulated.

*Continued...*

*Note - legal notice on page 5*



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## SECTION 15: REGULATORY INFORMATION

**Workplace Classification:** This product is not considered hazardous under the OSHA Hazard Communication Standard (29 C.F.R. § 1910.1200).

**CERCLA Information (40 C.F.R. 302.4):** Because of the form in which copper is contained within the resin, releases of this material to air, land, or water are not reportable to the National Response Center under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

**Waste Classification:** When this product becomes a waste, it is classified as a non-hazardous waste under criteria of the Resource Conservation and Recovery Act (40 C.F.R. 261).

## SECTION 16: OTHER INFORMATION

### HAZARD RATING

Health: 0 | Flammability: 1 | Reactivity: 0 | Special Hazards: None

Scale: 4 = Extreme | 3 = High | 2 = Moderate | 1 = Slight | 0 = Insignificant

National Fire Protection Association (NFPA) hazard ratings are designed for use by emergency response personnel to address the hazards that are presented by short-term, acute exposure to a material under conditions of fire, spill, or similar emergencies. Hazard ratings are primarily based on the inherent physical and toxic properties of the material, but also include the toxic properties of combustion or decomposition products that are known to be generated in significant quantities.

*Rating are based on internal supplier's guidelines, and they are intended for internal use only.*

### ABBREVIATIONS

ACGIH = American Conference of Governmental Industrial Hygienists

OSHA = Occupational Safety and Health Administration

TLV = Threshold Limit Value

PEL = Permissible Exposure Limit

TWA = Time Weighted Average

STEL = Short-Term Exposure Limit

**Disclaimer:** The information contained herein relates only to the specific material identified. Stego Technology, LLC believes that such information is accurate and reliable as of the date of this material safety data sheet, but no representation, guarantee or warranty, expressed or implied, is made as to the accuracy, reliability, or completeness of the information. Stego Technology, LLC urges persons receiving this information to make their own determination as to the information's suitability and completeness for their particular application.

**Please read the product statements for all Drago® products by navigating here:**

**<http://www.stegoindustries.com/legal>**



DRAGO® WRAP  
VAPOR INTRUSION BARRIER

INSTALLATION  
INSTRUCTIONS

Engineered protection to create a *healthy* built environment.



# DRAGO® WRAP VAPOR INTRUSION BARRIER INSTALLATION INSTRUCTIONS



P2 of 4

**IMPORTANT:** Please read these installation instructions completely, prior to beginning any Drago Wrap installation. The following installation instructions are generally based on ASTM E1643 – *Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs*. There are specific instructions in this document that go beyond what is stated in ASTM E1643 to take into account vapor intrusion mitigation. If project specifications call for compliance with ASTM E1643, then be sure to review the specific installation sections outlined in the standard along with the techniques referenced in these instructions.

## UNDER-SLAB INSTRUCTIONS:

1. Drago Wrap has been engineered to be installed over a tamped aggregate, sand, or earth base. It is not typically necessary to have a cushion layer or sand base, as Drago Wrap is tough enough to withstand rugged construction environments.

**NOTE: Drago Wrap must be installed with the gray facing the subgrade.**

Fig.1: UNDER-SLAB INSTALLATION



2. Unroll Drago Wrap over the area where the slab is to be placed. Drago Wrap should completely cover the concrete placement area. All joints/seams should be overlapped a minimum of 12 inches and taped using Drago® Tape. (Fig. 1). If additional protection is needed, install DragoTack™ Tape in between the overlapped seam in combination with Drago Tape on top of the seam.

**NOTE: The area of adhesion should be free from dust, dirt, moisture, and frost to allow maximum adhesion of the pressure-sensitive tape. Ensure that all seams are taped with applied pressure to allow for maximum and continuous adhesion of the pressure-sensitive Drago Tape. Adhesives should be installed above 40°F. In temperatures below 40°F, take extra care to remove moisture/frost from the area of adhesion.**

3. ASTM E1643 requires sealing the perimeter of the slab. Extend vapor retarder over footings and seal to foundation wall or grade beam at an elevation consistent with the top of the slab or terminate at impediments such as waterstops or dowels. Consult the structural and environmental engineer of record before proceeding.

### SEAL TO PERIMETER WALL OR FOOTING WITH DRAGOTACK TAPE: (Fig. 2a and 2b)

Fig.2a: SEAL TO PERIMETER WALL

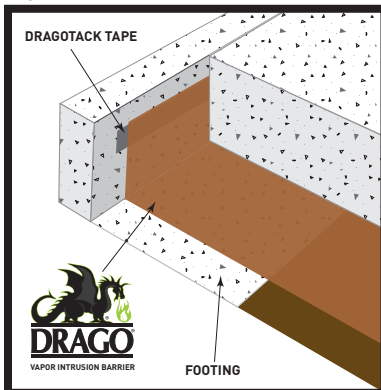
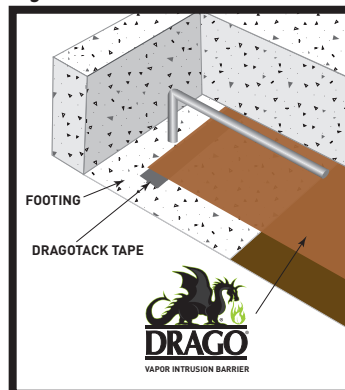


Fig. 2b: SEAL TO FOOTING



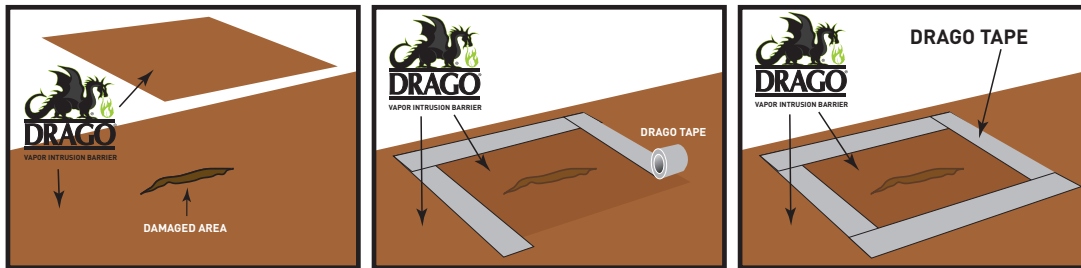
- a. Make sure area of adhesion is free of dust, dirt, debris, moisture, and frost to allow maximum adhesion.
- b. Remove release liner on one side and stick to desired surface.
- c. When ready to apply Drago Wrap, remove the exposed release liner and press firmly against DragoTack Tape to secure.
- d. If a mechanical seal is needed, fasten a termination bar over the top of the Drago Wrap inline with the DragoTack Tape.

**NOTE: If sealing to the footing, the footing should receive a hand float finish to allow for maximum adhesion.**



4. In the event that Drago Wrap is damaged during or after installation, repairs must be made. Cut a piece of Drago Wrap to a size and shape that covers any damage by a minimum of 6 inches in all directions. Clean all adhesion areas of dust, dirt, moisture, and frost. Tape down all edges using Drago Tape. (Fig. 3)

Fig. 3: SEALING DAMAGED AREAS

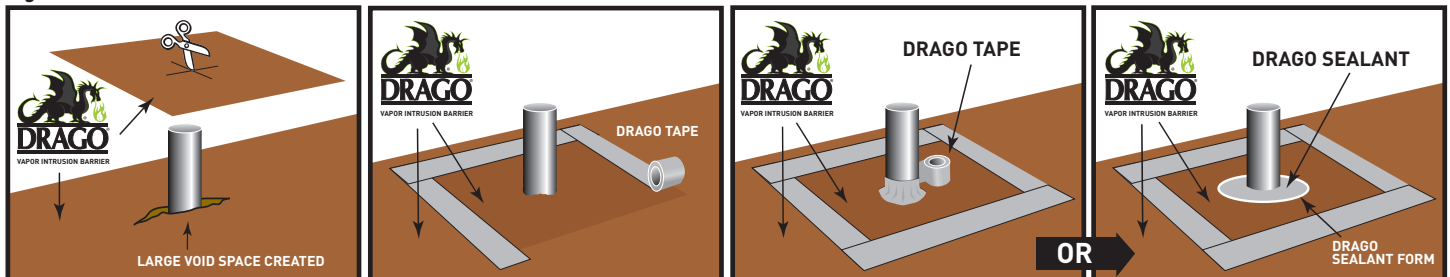


5. **IMPORTANT: ALL PENETRATIONS MUST BE SEALED.** All pipe, ducting, rebar, and block outs should be sealed using Drago Wrap, Drago Tape, and/or Drago® Sealant and Drago® Sealant Form. (Fig. 4a). Drago accessories should be sealed directly to the penetrations.

Fig. 4a: PIPE PENETRATION SEALING



Fig. 4b: DETAIL PATCH FOR PIPE PENETRATION SEALING



**DETAIL PATCH FOR PIPE PENETRATION SEALING: (Fig. 4b)**

- Install Drago Wrap around pipe penetrations by slitting/cutting material as needed. Try to minimize void space created.
- If Drago Wrap is close to pipe and void space is minimized, proceed to step d.
- If void space exists, then
  - Cut a detail patch to a size and shape that creates a 6-inch overlap on all edges around the void space at the base of the pipe.
  - Cut an "X" slightly smaller than the size of the pipe diameter in the center of the detail patch and slide tightly over pipe.
  - Tape the edges of the detail patch using Drago Tape.
- Seal around the base of the pipe using Drago Tape and/or Drago Sealant and Drago Sealant Form.
  - If Drago Sealant is used to seal around pipe, make sure Drago Wrap is flush with the base of the penetration prior to pouring Drago Sealant.

# DRAGO® WRAP VAPOR INTRUSION BARRIER INSTALLATION INSTRUCTIONS



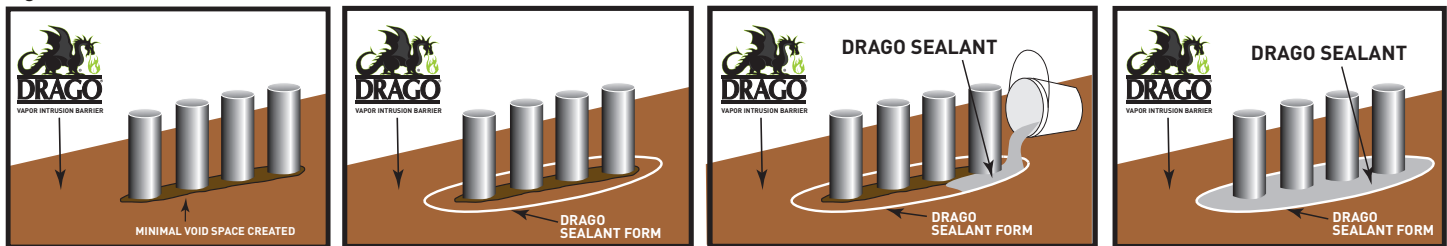
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## MULTIPLE PIPE PENETRATION SEALING: (Fig. 5)

**NOTE:** Multiple pipe penetrations in close proximity may be most efficiently sealed using Drago Wrap, Drago Sealant, and Drago Sealant Form for ease of installation.

- a. Cut a hole in Drago Wrap such that the membrane fits over and around the base of the pipes as closely as possible, ensuring that it is flush with the base of the penetrations.
- b. Install Drago Sealant Form continuously around the entire perimeter of the group of penetrations and at least 1 inch beyond the terminating edge of Drago Wrap.
- c. Pour Drago Sealant inside of Drago Sealant Form to create a seal around the penetrations.
- d. If the void space between Drago Wrap and the penetrations is not minimized and/or the base course allows for too much drainage of sealant, a second coat of Drago Sealant may need to be poured after the first application has cured.

Fig. 5: MULTIPLE PIPE PENETRATION SEALING



## BEAST® CONCRETE ACCESSORIES - VAPOR BARRIER SAFE

Stego Industries\* recommends the use of BEAST vapor barrier-safe concrete accessories, to help eliminate the use of non-permanent penetrations in Drago Wrap installations.



BEAST® SCREED

*Improve efficiency and maintain concrete floor levelness with the BEAST SCREED SYSTEM!*



BEAST® HOOK

*Locate it and lock it down!*



BEAST® FORM STAKE

*The Stego barrier-safe forming system that prevents punctures in the vapor barrier.*

**IMPORTANT:** AN INSTALLATION COMPLETED PER THESE INSTRUCTIONS SHOULD CREATE A MONOLITHIC MEMBRANE BETWEEN ALL INTERIOR INTRUSION PATHWAYS AND VAPOR SOURCES BELOW THE SLAB AS WELL AS AT THE SLAB PERIMETER. THE UNDERLYING SUBBASE SHOULD NOT BE VISIBLE IN ANY AREA WHERE CONCRETE WILL BE PLACED. IF REQUIRED BY THE DESIGN ENGINEER, ADDITIONAL INSTALLATION VALIDATION CAN BE DONE THROUGH SMOKE TESTING.

**NOTE:** While Drago Wrap installation instructions are based on ASTM E1643 - *Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs*, these instructions are meant to be used as a guide, and do not take into account specific job site situations. Consult local building codes and regulations along with the building owner or owner's representative before proceeding. If you have any questions regarding the above-mentioned installation instructions or products, please call us at 877-464-7834 for technical assistance. While Stego Industries' employees and representatives may provide technical assistance regarding the utility of a specific installation practice or Stego product, they are not authorized to make final design decisions.



**DATA SHEET**

# Hycrete Endure WP

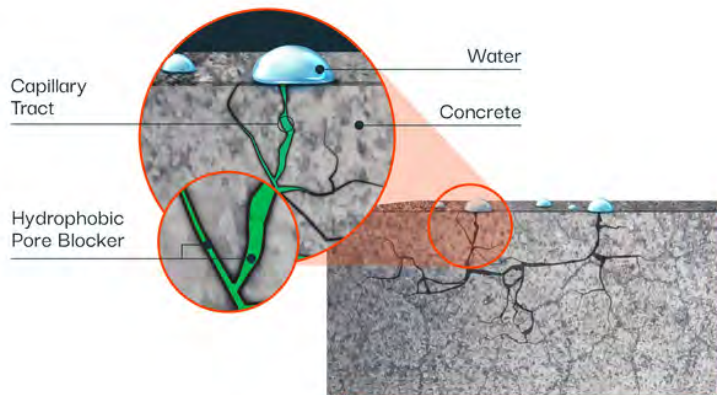
**For Maximum Waterproofing Protection in Concrete Mixes**

**PRODUCT DESCRIPTION**

**Hycrete Endure WP** (formerly W1000), Hycrete’s patented flagship concrete waterproofing admixture, dramatically reduces water ingress through concrete. Ordinary concrete absorbs water and dissolved salts through its network of pores, leading to water infiltration and corrosion of steel reinforcement. Hycrete Endure WP reduces absorption to 1% or lower and forms a protective coating around steel reinforcement. Less water and fewer chlorides are able to penetrate the concrete and the reinforcement has enhanced protection from corrosion. Hycrete Endure WP delivers consistent and reliable performance and is easy to use. Hycrete Endure WP is an environmentally responsible, Cradle to Cradle™ certified product. Using Hycrete Endure WP allows owners and builders to have the comfort of knowing their investment /project remains secure against one of nature’s most damaging elements ...water.

**USES AND APPLICATIONS**

- Included in Hycrete360; see separate data sheet for Hycrete360.
- Extra protection for walls and slabs
- Above and below grade construction
- Water containment reservoirs
- Sewage and water treatment plants
- Secondary containment structures
- Underground vaults
- Tilt-up panel walls
- Pre-cast components
- Architectural water features and fountains
- Bridges, dams and highway infrastructure
- Aquatic centers, marinas and zoos
- Swimming pools

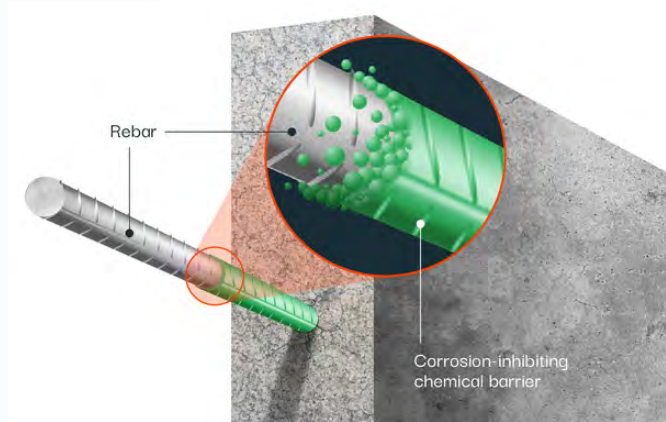


**KEY BENEFITS**

- Maximum waterproofing protection in concrete: less than 1% water absorption
- Corrosion protection; protective coating formed around steel reinforcement
- Neutral concrete set time performance, even in high fly ash and GGBS (slag) mixes
- Resists hydrostatic pressure
- Can heal cracks up to 0.4mm
- Consistent performance and verifiable dosage
- Easy to use; no additional labor required
- Safe to use

**PRODUCT FEATURES**

- Cradle to Cradle™ certified by MBDC
  - NSF/ANSI 61 - approved for use in potable water tanks
  - Compatible with standard admixture metering equipment
  - ISO 14021 compliant - recycled content in accordance with Type II environmental labeling; applicable for LEED Materials and Resources Credit
- 4.1/4.2 - Recycled Content

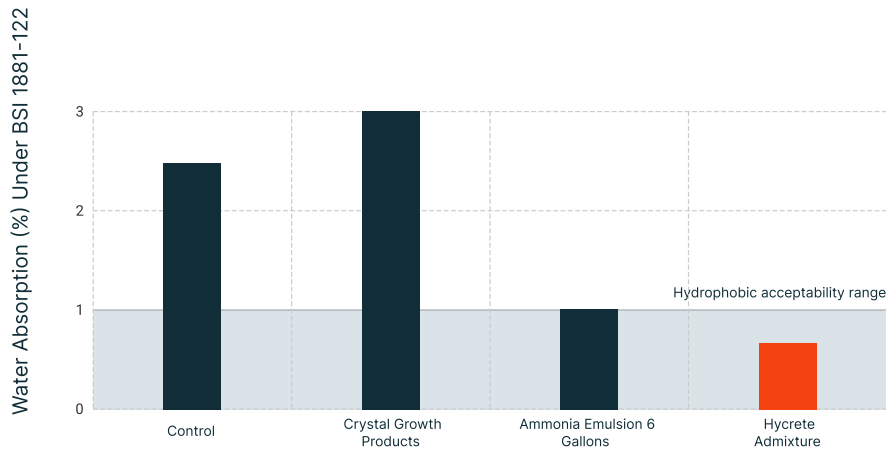


**PRODUCT PERFORMANCE\***

Water absorption	BSI 1881-122	Less than 1% absorption
Permeability/hydrostatic pressure	DIN 1048 BS EN 12390-8	Passes DIN 1048; up to 70% reduction in permeability
Crack healing	ASTM C597	Concrete with Hycrete fosters faster and 100% complete healing compared to untreated control
Set time	ASTM C403	Set neutral
Drying shrinkage	ASTM C157	Neutral to the control
Slump	ASTM C143	Neutral
Workability	N/A	Excellent
Effect on concrete color	N/A	None
Compressive strength	ASTM C39	Water/cement ratios may need to be lowered to account for possible, minor strength decreases associated with some materials. Perform trial mixes.
Potable water	NSF/ANSI 61	Approved for use in potable water tanks 50,000 gallons or greater and pipes 84" in diameter and greater
Adhesion	ASTM C1583, ASTM C1072, ASTM D3359	Neutral; no adverse effect on bond with concrete

\*All benefits and results are based on actual test results. Results may vary according to concrete mix designs, Hycrete Endure WP dosage, or other factors.

**WATERPROOFING PERFORMANCE**



South Carolina independent Lab Testing: 40/60 Structural Mix, 0.40 W/C 611  
 Type I-II Cement Polycarboxylate Superplasticizer



## GENERAL PROPERTIES AND CHARACTERISTICS

<b>Physical characteristics:</b> Form: Liquid Specific gravity: 1.05 Chloride content: Nil pH: 8.5	<b>Compatibility:</b> <ul style="list-style-type: none"> <li>• Most concrete admixtures</li> <li>• Most Portland cements or replacements including fly ash and GGBS (slag)</li> <li>• Shotcrete mixes and application</li> <li>• Most surface-applied sealants and external membrane protection systems</li> </ul>
<b>Recommended dosage:</b> 1.0 U.S. gallon per cubic yard of concrete (5.0 liters per cubic meter)	
<b>Usage guidelines:</b> <ul style="list-style-type: none"> <li>• Superplasticizer at the manufacturer’s recommended rate and appropriate for the placement requirements of the project.</li> <li>• Cementitious Content: The cementitious content of concrete containing Hydrophobic Concrete Admixture will not be less than 550 lbs/yd<sup>3</sup> (325 kg/m<sup>3</sup>) with up to 15% fly ash or 50% slag maximum.</li> <li>• Water-Cement Ratio: 0.42 maximum. Water content of Hydrophobic Concrete Admixture and other admixtures to be included in the water-to cementitious ratio.</li> </ul>	
<b>Packaging:</b> 1 gallon bottles; 5 gallon pails; 55 gallon drums; 275 gallon totes; bulk tanker delivery	
<b>Storage and handling:</b> Store above 32°F (0°C) and below 120 °F (48 °C). Slight flocculation can occur over time due to pH reductions. Such flocculation does not affect product performance	

### Notes

- For air-entrained concrete mixes speak to your local Hycrete Rep for proper mix design.
- User should perform trial mixes prior to placement and make necessary adjustments to the mix design as needed.
- If considering dosages other than recommended dosage contact Technical Services before use.

### Safety

- Hycrete Endure WP (formerly W1000) is a water-based material and should not be swallowed or come into contact with skin or eyes. Wear suitable protective gloves and goggles. If material comes in contact with the skin, wash immediately with soap and water. In case of contact with eyes, rinse immediately with sufficient water and seek medical support. If swallowed, seek immediate medical attention. For further information please consult the Material Safety Data Sheet.

### Related Documents

- Hycrete Mixing Instructions
- Hycrete Material Safety Data Sheet – Hycrete Endure WP
- For air-entrained concrete mixes speak to your local Hycrete Rep for proper mix design.



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Hycrete warrants that its products are free from manufacturing defects and, when applied in accordance with the current specification and application instructions, will perform as so stated in its product literature.

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