Periodic Review

Metro Lake Union
Facility Site ID#: 2217
Cleanup Site ID#: 1275

1602 North Northlake Way
Seattle, Washington 98103

Washington State Department of Ecology
Northwest Region Office
Toxics Cleanup Program

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1.0 Introduction

This document is a review by the Washington State Department of Ecology (Ecology) of post-cleanup Site conditions and monitoring data to ensure that human health and the environment are being protected at the Metro Lake Union cleanup site (Site). Cleanup at this Site was implemented under the Model Toxics Control Act (MTCA) regulations, Chapter 173-340 Washington Administrative Code (WAC).

Soil cleanup activities at this Site were completed under a 1999 consent decree (CD; No. 99-2-086511-1SEA) and a 2007 prospective purchaser consent decree (PPCD; No. 07-2-23870-1SEA). Active groundwater remediation occurred between 1999 and 2010. Groundwater continues to be monitored according to a monitored natural attenuation remedy. The cleanup actions addressed concentrations of Site contaminants of concern (COCs) in soil and groundwater. These COCs include gasoline-, diesel-, and oil-range petroleum hydrocarbons and associated chemicals such as benzene, toluene, ethylbenzene, naphthalene, and carcinogenic polycyclic aromatic hydrocarbons (cPAHs); and metals, including arsenic, lead, cadmium, chromium, and mercury. Some COCs currently remain at the Site at concentrations which exceed the Site cleanup levels (CULs). The MTCA CULs for soil are established under WAC 173-340-740. The MTCA CULs for groundwater are established under WAC 173-340-720.

WAC 173-340-420(2) requires Ecology to conduct a periodic review of a site every five years under the following conditions:

1. Whenever Ecology conducts a cleanup action
2. Whenever Ecology approves a cleanup action under an order, agreed order or consent decree
3. Or, as resources permit, whenever Ecology issues a no further action opinion;
4. And one of the following conditions exists:
    (a) Institutional controls or financial assurance are required as part of the cleanup
    (b) Where the cleanup level is based on a practical quantitation limit
    (c) Where, in Ecology's judgment, modifications to the default equations or assumptions using site-specific information would significantly increase the concentration of hazardous substances remaining at the site after cleanup or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment.

When evaluating whether human health and the environment are being protected, the factors Ecology shall consider include [WAC 173-340-420(4)]:

(a) The effectiveness of ongoing or completed cleanup actions, including the effectiveness of engineered controls and institutional controls in limiting exposure to hazardous substances remaining at the Site;

(b) New scientific information for individual hazardous substances or mixtures present at the Site;

(c) New applicable state and federal laws for hazardous substances present at the Site;

(d) Current and projected Site and resource uses;

(e) The availability and practicability of more permanent remedies; and

(f) The availability of improved analytical techniques to evaluate compliance with cleanup levels.

Ecology shall publish a notice of all periodic reviews in the Site Register and provide an opportunity for public comment.

2.0 Summary of Site Conditions

2.1 Site Description and History

The Site is located along the north shore of Lake Union in a mixed-use neighborhood. The Site generally consists of three areas, including two tax parcels and the public right-of-way (ROW) between the two tax parcels. The two parcels are referred to as the North Yard (tax parcel 4083306985) and the South Yard (tax parcel 4088804670).

Starting in 1925, the Site was operated as a bulk petroleum fueling terminal by Standard Oil, which later became Chevron Products Company (Chevron). The South Yard formerly contained a warehouse, two docks, and a former railroad spur, and the North Yard formerly contained aboveground storage tanks (ASTs) for petroleum products, transfer piping, loading racks, and various small buildings. Piping extended under the South Yard docks to a pump vault near the warehouse, then underground to the North Yard tank farm. The South Yard and likely the ROW are located on fill that was placed to extend the shoreline, the majority of which was placed between approximately 1907 and 1919.

King County Department of Transportation Metro Transit Division (Metro) purchased the Site in 1982. From 1982 to 1992, Metro used the Site for diesel fueling operations. Metro reportedly decommissioned the fueling equipment in 1992. In 1999, Metro and Chevron entered into a CD (99-2-0865511-1SEA) with Ecology.

The potential for hazardous substances in the sediments in Lake Union, and any necessary cleanup, were specifically excluded from the CD. It is unknown whether sediments have been impacted by historical Site operations and releases.

In 2008, Ecology sent a letter to Metro and Chevron requesting a sediment Sampling and Analysis Plan to characterize nearshore sediment at the Metro Lake Union Site. Metro and Chevron responded that they did not believe that the potentially liable parties (PLPs) were responsible for the potential contamination in sediment, and that, “to the extent that sediment has been impacted, it is likely from two known contaminated sediment sites, Gas Works Park and Northlake Shipyard…” It is unclear how this issue was ultimately resolved; however,

documents from the Gas Works Park site show in-water areas next to the Metro Lake Union Site as part of the Western Study Area (City of Seattle 2010).

Metro currently owns the South Yard property, which is leased to the Center for Wooden Boats. In 2009, Metro sold the North Yard property to Touchstone NLU, LLC following negotiation of a PPCD. This 2007 PPCD required a limited cleanup of contaminated soils within the North Yard property line, while the 1999 CD requires cleanup of soils throughout the Site including outside of the North Yard property line and groundwater cleanup of the entire Site (North and South Yards).

In 2016, the Touchstone NLU section of the Site (North Yard) was given a No Further Action determination for soils within the North Yard. Ecology determined that the requirements of the 2007 PPCD had been satisfied and the PPCD was dismissed. The 1999 CD remains in effect for soils outside of the North Yard and groundwater throughout the Site.

In 2021, Ecology received official notice of conveyance of the property at 1621 N. 34th Street (North Yard), which was sold to an affiliate of BioMed Realty Acquisition Holdings LLC. According to the notice, a copy of the environmental covenant was provided to the purchaser of the property.

The area surrounding the Site is a mix of commercial, residential, and industrial land uses. To the northwest of the South Yard is a metal fabricating business and Northlake Shipyard, which is under a PPCD to conduct a cleanup action. To the southeast of the South Yard is a yard operated by the Seattle Police Department Harbor Patrol and Gas Works Park beyond. These properties are under an agreed order with Ecology. The properties surrounding the North Yard include a commercial business to the west, a building formerly occupied by the Essential Baking Company to the north, and residential buildings to the east. One block west of the Site is the North Transfer Station operated by Seattle Public Utilities. The transfer station is listed on the Confirmed and Suspected Contaminated Sites list for petroleum and halogenated organics.

2.2 Site Investigations

Several remedial investigations were conducted at the Site for Metro and Chevron from 1988 to 1998, with a supplemental investigation conducted in 2007 by SAIC. The Remedial Investigation/Feasibility Study (RI/FS) for the Site was completed in 1993 and the Site Cleanup Action Plan (CAP) was completed in 1998. Site investigations have identified petroleum hydrocarbons and related products and metals in soil and groundwater at the Site. A general outline of some of the Site investigations is below.

- April 1988: Three soil borings were advanced on the south side of the North Yard and one boring was advanced west of the South Yard warehouse. Gasoline-range hydrocarbons were reportedly detected in subsurface soil.
- April 1991: Wells were installed at the Site in the North and South Yards. Groundwater samples collected from these wells reportedly contained gasoline- and diesel-range hydrocarbons; benzene, toluene, ethylbenzene, and xylenes (BTEX); PAHs; and metals.

- 1992: Soil samples were collected from the surface, from test pits, and near a former underground storage tank (UST) excavation in the North Yard. Gasoline-, diesel-, and oil-range hydrocarbons were reportedly present in soil.
- 1993: The RI field work was conducted at the Site, including test pits, hand borings, soil borings, and installation of groundwater monitoring wells. The RI/FS characterized the nature and extent of COC in soil and groundwater resulting from previous Site activities, and evaluated cleanup alternatives.
    - Soil COCs identified during Site investigations include metals (arsenic, cadmium, chromium, lead, and mercury), polycyclic aromatic hydrocarbons (PAHs), benzene, and other petroleum hydrocarbons (gasoline-, diesel-, and oil-range hydrocarbons). Most of the metals-impacted soil was present in shallow soils located in the North Yard tank farm. Petroleum-impacted soil was primarily identified in deeper soils and groundwater throughout the Site.
    - Groundwater COCs identified during Site investigations include petroleum products, benzene, ethylbenzene, cPAHs, naphthalene, arsenic, and lead. These COCs exceeded the groundwater CULs set in the CAP. These CULs are discussed in Section 2.4.
- 1997: A supplemental environmental assessment was conducted to document soil and groundwater quality. Additional wells were installed.
- 1998: Air samples and additional soil samples were collected to augment previous investigations and to collect data to develop site-specific cleanup levels for soil and groundwater. Per the 1999 CD, “the age of the gasoline-range hydrocarbons found in soil at the Site greatly reduces the potential for exposure to humans through vapor migration. Vapor sampling of indoor and outdoor air at the Site confirmed this, showing air samples contained low to non-detectable levels of volatile organics. Therefore, vapor was eliminated as a media of concern.” Groundwater monitoring and an aquifer evaluation were also completed in 1998.

2.3 Cleanup Actions

The remedy selected in the 1998 CAP included two phases of remedial actions: Phase I and Phase II. Phase I included demolition of the existing ASTs, removal of underground piping and associated structures, and excavation and offsite disposal of shallow metals-impacted soils related to former sand blasting and painting activities. Phase I was completed in 2000. According to the PPCD, confirmation sampling indicated that all soils with concentrations of metals above Site CULs were removed.

The Phase II remedial actions included use of several remedial technologies to address petroleum hydrocarbons in soil and groundwater, including:

- Hydrogen peroxide injections to enhance bioremediation of petroleum hydrocarbons in soil and groundwater in the lower (southern) portion of the North Yard, ROWs, and the

South Yard. A pilot test was completed in 1999 and peroxide injections occurred from May 2000 through July 2001.

- From 1997 through 2010, light non-aqueous phase liquid (LNAPL) was removed from the North Yard through bailing, skimming, and sorbent socks.
- Enhanced Fluid Recovery was utilized to remove diesel- and oil-range petroleum hydrocarbons in the lower portion of the North Yard. This technology was only employed from August to September 2001 and was discontinued due to the high viscosity of the petroleum hydrocarbons.
- Biosparging was conducted from 2001 through 2007 and reportedly addressed groundwater from the North Yard, ROWs, and South Yard, and soils within the South Yard. Biosparging was determined to be unsuccessful in the North Yard.
- One isolated pocket of petroleum-impacted soil in the South Yard, near MW-8, was excavated and approximately 350 tons of soil were disposed offsite. The excavated soils were within the smear zone (approximately 8 to 15 feet below ground surface [bgs]). This work was completed between October 2003 and January 2004.
- In 2014 and 2015, North Yard soils within the property line were excavated for treatment and/or offsite disposal.
- Monitored natural attenuation for groundwater was employed at the lower half of the North Yard, ROWs, and South Yard from 1999 to present. The sampling frequency of wells at the Site was quarterly from 2000 to 2004, and approximately semiannual from 2010 to present (depending on the well).

On October 22, 2015, Ecology issued an email providing written notification that no further cleanup action is required to address the shallow soils collected from the South Yard in 1993 (Arcadis, 2022). These soils exceeded Site soil CULs.

In 2015, Ecology recommended closing the PPCD, stating that, “Touchstone has met the MTCA Method A CULs for soils for unrestrictive use throughout the North Edge Site.” The North Edge Site refers to the North Yard of the Site. Ecology also noted that soils under the CD, e.g. the entire Site, “…were successfully cleaned-up to MTCA industrial level” (Ecology, 2015b).

In 2016, Ecology provided written notification that no further action was necessary to satisfy the PPCD and closed out the PPCD. The PPCD CAP was intended to address contaminated soils at the North Yard but did not address or change the requirements for groundwater throughout the Site. As noted in the PPCD, soil contamination outside the boundary of the North Yard property and groundwater contamination throughout the Site remains the responsibility of King County and Chevron.

Ongoing compliance groundwater monitoring continues at the Site. A Revised Groundwater Compliance Monitoring Plan was submitted to Ecology in 2011, which reportedly specified that groundwater monitoring would continue annually until the North Yard remedial activities were completed. In 2014, it was reportedly agreed that the compliance monitoring schedule be set

to semiannual following remedial activities (Arcadis, 2014). To demonstrate compliance, groundwater concentrations must meet the Site CULs for five consecutive events (Ecology, 2014).

2.4 Cleanup Standards

The 1998 CAP set cleanup levels based on consideration of current and future land use, potential exposure pathways, COCs, and protection of human health and the environment. CULs as set in the 1998 CAP are listed in Table 1.

The soil CULs set in the 1998 CAP used the residual saturation level for total petroleum hydrocarbons, the MTCA Method A industrial soil CULs for metals, and the MTCA Method C industrial direct contact soil CULs for benzene and PAHs. The use of these CULs require the property to remain in industrial use and requires institutional controls (an environmental covenant) to ensure the future industrial use of the property.

The soil CULs for the 2007 remedial action at the North Yard were set at the MTCA Method A CULs for Unrestricted Land Use. These CULs were set in the 2007 CAP, which is Exhibit D of the 2007 PPCD. The CULs set for North Yard soils are more stringent than the soil CULs set in the 1998 CAP.

Groundwater CULs were set in the 1998 CAP to protect surface water in Lake Union, and are set at the MTCA Method B CUL for protection of surface water. Groundwater yield was determined to be insufficient to support a potable supply (not a source of future drinking water) based on aquifer testing under WAC 173-340-720(2). The groundwater CULs are listed in Table 1.

Table 1. Soil and Groundwater CULs

Constituent of Concern	1998 CAP Soil CUL	2007 CAP North Yard Soil CUL	1998 CAP Groundwater CUL
Benzene	4,530 mg/kg	0.03 mg/kg	43 µg/L
Toluene		7 mg/kg	48,500 µg/L
Ethylbenzene		6 mg/kg	6,910 µg/L
Xylenes		9 mg/kg	
Naphthalene	18 mg/kg	5 mg/kg	9,880 µg/L
Benzo(a)anthracene	18 mg/kg	0.1 mg/kg	0.0296 µg/L
Benzo(a)pyrene	18 mg/kg	0.1 mg/kg	0.0296 µg/L
Benzo(b)fluoranthene	18 mg/kg	0.1 mg/kg	0.0296 µg/L
Benzo(k)fluoranthene	18 mg/kg	0.1 mg/kg	0.0296 µg/L
Chrysene	18 mg/kg	0.1 mg/kg	0.0296 µg/L
Dibenzo(a,h)anthracene	18 mg/kg	0.1 mg/kg	0.0296 µg/L
Indeno(1,2,3-cd)pyrene	18 mg/kg	0.1 mg/kg	0.0296 µg/L
Fluoranthene	18 mg/kg		90.2
Arsenic	200 mg/kg		0.0982 µg/L
Lead	1,000 mg/kg		5 µg/L

Cadmium	10 mg/kg		
Chromium	500 mg/kg		
Mercury	1 mg/kg		
TPH-Gasoline	4,520 mg/kg	100 mg/kg	
TPH-Diesel	5,140 mg/kg	2,000 mg/kg	
TPH-Oil	5,780 mg/kg	2,000 mg/kg	

Note: The 1998 CAP does not specify whether metals CULs for groundwater are for total or dissolved concentrations. In general, MTCA groundwater CULs are for total metals; however, samples at this Site have historically been analyzed only for dissolved metals in groundwater. It is expected that total metals concentrations in groundwater would be slightly higher than dissolved concentrations; since dissolved arsenic concentrations are still present at concentrations greater than the groundwater CUL, it is not expected to change the outcome of this review. However, Ecology recommends analyzing groundwater samples for both total and dissolved arsenic.

Two conditional points of compliance (CPOCs) were set for groundwater; the CPOCs for the North and South Yards are the southern property boundary of each, respectively. For the North Yard, the compliance monitoring wells are wells MW-19, MW-20, and MW-21. For the South Yard, the compliance monitoring wells are wells MW-4, MW-7, MW-8A, MW-25, MW-26, AGI-2, MLU-1, and MLU-3. The 1998 CAP also specified that five consecutive quarters of concentrations below CULs were required in order to demonstrate that groundwater is in compliance with MTCA requirements, though the sampling frequency has changed over time.

CULs for soil in the North Yard are measured at the standard point of compliance, which is in soil throughout the Site (in this case, the North Yard). The 1998 CAP does not specifically note that the point of compliance for soil throughout the Site is the standard point of compliance. Based on an interpretation of WAC 173-340-740 in effect at the time (1999 edition), the selected remedy was interpreted to be a containment remedy, and soil remaining at concentrations greater than the CULs would use groundwater compliance as the indicator for when the Site was in compliance for soil in the South Yard and ROWs and for groundwater throughout the Site (Attorney General of Washington, 2015). As of 2016, and based on this interpretation, soils at the point of compliance (e.g. throughout the Site) have not met the requirements set out in the 1998 CAP and 2007 PPCD CAP since groundwater at the CPOC does not meet the requirements set out in the CAP. Based on historical soil samples collected in the ROW, concentrations of gasoline- and diesel-range organics may remain in soil at concentrations above the Site soil CUL, which is set at the residual saturation level. Naphthalene may also remain above the Site soil CUL in some areas of the ROW. Soil in these areas has not been sampled since 2014. However, under the 2015 interpretation of the remedy as a containment remedy, this soil does not require further active remediation to meet the requirements set out in the CAP (assuming groundwater meets cleanup standards within a reasonable restoration timeframe).

A restoration timeframe and contingency action plan for the current phase of the remedy (monitored natural attenuation) was not included in the CAP. The FS also did not include a restoration timeframe for the remedy that was ultimately selected for the Site.

2.5 Environmental and Restrictive Covenants

On November 26, 2002, a Restrictive Covenant was placed on the North Yard and South Yard properties (tax parcels 4083306985 and 4088804670, respectively) because the cleanup action at the Site would result in residual concentrations of contaminants of concern in soil and groundwater, and these concentrations would be above the CULs for unrestricted land use. The Restrictive Covenant recorded for the Site in 2002 imposed the following limitations:

1. No activities that interfere with the remedial actions required by the Consent Decree shall be undertaken on the Property without ECOLOGY approval.
2. No wells for the extraction of water shall be installed in the Property without ECOLOGY approval.
3. No development of the Property for uses other than industrial uses, as defined in Chapter 70.105D RCW, shall be undertaken without ECOLOGY approval.
4. With exceptions for landscaping and shallow underground utilities, no excavation of soils shall be permitted on the Property without ECOLOGY approval. Any excavation for such landscaping or underground utilities must ensure there is no increased exposure of the residual contaminants remaining in the Property after the Cleanup Action.
5. No title, easement, lease or other interest in the Property shall be conveyed or entered into without adequate provision for the terms of this Declaration of Restrictive Covenants.
6. Authorized representatives of ECOLOGY shall have the right to enter the Property at reasonable times with reasonable notice for the purposes of evaluating compliance with the terms of this Declaration of Restrictive Covenants.

On December 28, 2015, an Environmental Covenant was recorded for the North Yard (tax parcel 4083306985) which superseded and replaced the 2002 covenant for the subject tax parcel. The original 2002 covenant remains in effect for the rest of the Site. The Environmental Covenant recorded in 2015 for the North Yard imposed the following limitations:

1. Interference with Remedial Action. The Grantor shall not engage in any activity on the Property that may impact or interfere with the remedial action and any operation, maintenance, inspection or monitoring of that remedial action without prior written approval from Ecology.
2. Protection of Human Health and the Environment. The Grantor shall not engage in any activity on the Property that may threaten continued protection of human health or the environment without prior written approval from Ecology. This includes, but is not limited to, any activity that results in the release of residual contamination that was

contained as a part of the remedial action or that exacerbates or creates a new exposure to residual contamination remaining on the Property.

3. Continued Compliance Required. Grantor shall not convey any interest in any portion of the Property without providing for the continued adequate and complete operation, maintenance and monitoring of remedial actions and continued compliance with this Covenant.
4. Leases. Grantor shall restrict any lease for any portion of the Property to uses and activities consistent with this Covenant and notify all lessees of the restrictions on the use of the Property.
5. Preservation of Reference Monuments. Grantor shall make a good faith effort to preserve any reference monuments and boundary markers used to define the areal extent of coverage of this Covenant. Should a monument or marker be damaged or destroyed, Grantor shall have it replaced by a licensed professional surveyor within 30 days of discovery of the damage or destruction.
6. No Groundwater Extraction. The groundwater beneath the Property remains contaminated and shall not be extracted for any purpose other than temporary construction dewatering, investigation, monitoring or remediation. Drilling of a well for any water supply purpose is strictly prohibited. Groundwater extracted from the Property for any purpose shall be considered potentially contaminated.

Specifically, the 2015 Environmental Covenant for the North Yard does not restrict the property use to industrial, and the CULs for North Yard soils are for unrestricted land use.

On December 13, 2016, the 2015 Environmental Covenant for the North Yard was amended. This 2016 amendment maintained the same limitations on the North Yard as noted above for the 2015 Environmental Covenant. The difference between the 2015 and 2016 covenants appears to be the groundwater COCs.

On December 29, 2016, the 2016 Amended Environmental Covenant for the North Yard was re-recorded (amended) to include footnotes not present in the December 13, 2016 version of the covenant. The footnotes were regarding groundwater COCs.

Copies of the covenants are available on Ecology's website at:
https://apps.ecology.wa.gov/cleanupsearch/site/1275#site-documents.

3.0 Periodic Review

3.1 Effectiveness of completed cleanup actions

Current Site Conditions

Soils with COC concentrations higher than MTCA CULs are still present at the Site in the South Yard and ROWs. However, Ecology determined in 2015 and 2016 that no further action is necessary to remediate soils at the Site and that compliance for soils in the South Yard and ROWs will be evaluated based on compliance with groundwater CULs at the CPOC.

Based upon the Site visit conducted on September 22, 2022, the Site remedy continues to eliminate exposure to contaminated soils by ingestion and direct contact. The asphalt paving and other surface covering (gravel in the South Yard and grass/landscaping in the ROW) appeared in satisfactory condition. The depth of residual contamination is generally greater than 5 feet bgs in the South Yard, and greater than 10 feet bgs in the ROW.

Monitoring wells were generally in good condition; however, the surface conditions at well MW-22 appear to have changed since installation and a new surface housing is needed since in its current condition, the top of the well casing could be easily exposed or damaged. This well should be repaired by a licensed driller.

Wells MW-14 and MW-15 were not able to be located in the field during the site visit. Well MW-15 was sampled in January 2022, but well MW-14 has not been sampled since 2014. The location and condition of well MW-14 should be verified. All Site monitoring wells should be routinely located and inspected to confirm monument and well integrity.

Other than routine monitoring well maintenance, no other repair, maintenance, or contingency actions have been required.

The Site is still operating as a workshop for the Center for Wooden Boats (South Yard), street ROW, and commercial office building (North Yard). A photo log is available as Appendix 6.5.

Institutional Controls

Institutional controls in the form of a Restrictive Covenant were implemented for the North Yard and South Yard properties (tax parcels 4083306985 and 4088804670, respectively) in 2002. Amended Environmental Covenants were recorded for the North Yard in 2015 and 2016. The covenants remain active and discoverable through the King County Recorder's Office. There is no evidence a new instrument has been recorded that limits the effectiveness or applicability of the covenants.

The covenants prohibit activities that will result in the release of contaminants contained as part of the cleanup and prohibits any use of the properties that are inconsistent with the covenants (unless Ecology's approval is obtained in advance). The covenants serve to assure the long-term integrity of the remedy and that the contamination remaining is contained and controlled.

The City of Seattle did not sign the covenants or subordinate their interests by signing a subordination agreement. Therefore, the covenants doe not apply to the portion of the Site that is a public ROW. The remedy for the Site included institutional controls (activity and land use restrictions via covenants) and engineered controls (capping to prevent movement of or exposure to hazardous substances). Since the institutional controls do not apply to the ROW, this part of the remedy may not be protective of human health and the environment in the ROW.

However, the depth of residual contamination is generally greater than 10 feet bgs in the ROW, which is deeper than typical work conducted in streets, landscaping, and for utility work. Therefore, the risk of exposure to excavation workers in the ROW is considered relatively low.

Additionally, Ecology's Dig Clean Safety and Land Use Advisory system utilizes Washington 811 - Call Before You Dig data to send automated notifications when the identified work area is within or near a property with a covenant. These notifications are to inform workers and property owners of the covenant, with the goal of preventing release or exposure of contaminated materials to workers, the public, and the environment. The Dig Clean Safety and Land Use Advisory provides a link to the cleanup site's webpage, which includes electronically available documents. These notifications assist in notifying the City of Seattle and other workers excavating in the ROW of the potential risks of exposure to workers and/or releasing contaminants to the environment.

If the City of Seattle and other workers excavating in the ROW follow the terms and conditions in the covenants, it is likely that the remedy will remain protective of human health and the environment.

Groundwater Monitoring

Groundwater monitoring is ongoing at the Site as groundwater CULs have not been reached at the CPOCs. In 2022, dissolved arsenic was present in wells MW-7, AGI-2, MW-11, and MW-21 at concentrations above the Site CUL, and dissolved lead was detected above the Site CUL in well MLU-3. Benzene was also detected in groundwater at wells MW-7, AGI-2, MW-15, and MW-21 at concentrations above the laboratory reporting limit but below the Site CUL. The highest detected concentration in 2022 was in well MW-7 with 18.2 µg/L of benzene.

For CPOC wells, Table 2 below notes whether COCs have met the respective CUL for the 5 most recent sampling events (as of May 2022). Some wells upgradient of the CPOC wells were also sampled in January 2022 and generally met the CUL during the most recent event, with the exception of arsenic. It is not necessary for these wells to achieve the CUL since they are not CPOC wells. Arsenic is noted separately in Table 2 since the CUL for arsenic (0.0982 µg/L) is below the current practical quantitation limit (PQL).

To add context to the result summary below, arsenic concentrations are compared to both the Site CUL (from the 1998 CAP) and to 8 ug/L, which is the natural background concentration of arsenic in groundwater from Ecology's 2022 study on *Natural Background Groundwater Arsenic Concentrations in Washington State* (discussed in Section 3.2).

Table 2. Recent Groundwater Monitoring Results

Well	Area	Met CUL for Arsenic?	Met CUL for other COCs?
MW-19	North Yard CPOC	No, but below 8 µg/L during the previous 5 events.	Yes.
MW-20	North Yard CPOC	No, but below 8 µg/L during the previous 5 events.	Yes.
MW-21	North Yard CPOC	No. Highest detection during the last 5 events was 18 µg/L.	Yes.
MW-4	South Yard CPOC	No. Highest detection during the last 5 events 14.5 µg/L.	Yes.
MW-7	South Yard CPOC	No. Highest detection during the last 5 events 27.3 J µg/L.	Yes. However, benzene was detected at a concentration of 18.2 µg/L during January 2022, above the VI screening level for benzene.
MW-8A	South Yard CPOC	No, but below 8 µg/L during the previous 5 events.	Yes.
MW-25	South Yard CPOC	No, but below 8 µg/L during the previous 5 events.	Yes.
MW-26	South Yard CPOC	No, but below 8 µg/L during the previous 5 events.	Yes.
AGI-2	South Yard CPOC	No. Four out of the last five events also above 8 µg/L.	No. Benzene detection of 48 µg/L, above the CUL of 43 µg/L, during December 2019 event.
MLU-1	South Yard CPOC	No, but below 8 µg/L during the previous 5 events.	Yes.
MLU-3	South Yard CPOC	No, but below 8 µg/L during the previous 5 events.	No. Lead in groundwater (5.45 µg/L) above the CUL (5 µg/L) during the January 2022 event.

Remedial actions to address groundwater at the Site have been generally successful in reducing concentrations of petroleum-related compounds in groundwater. However, the remedial technologies employed at the Site did not directly address arsenic concentrations in groundwater.

It is unknown whether the COCs will meet cleanup standards within a reasonable restoration timeframe. A restoration timeframe and contingency action plan for the current phase of the remedy (monitored natural attenuation) was not included in the CAP. Active groundwater remediation ended in 2010.

Note: groundwater data have been collected at the Site through 2022; however, Ecology's Environmental Information Management System (EIM) only includes groundwater data through November 28, 2018. EIM should be updated to include recent groundwater data for the Site.

3.2 New scientific information for individual hazardous substances or mixtures present at the Site

Arsenic

In January 2022, Ecology published a study on *Natural Background Groundwater Arsenic Concentrations in Washington State* (Ecology, 2022a). A statistical analysis was conducted on groundwater arsenic data from public supply wells throughout the state. The study calculated a background threshold value for arsenic in groundwater in the Puget Sound Basin of 8 µg/L. The current MTCA Method A level is 5 µg/L; both of these concentrations are considered to be within the range of natural background of 5 to 15 µg/L (Ecology, 2022a).

Ecology's recommendations in the 2022 study included: "*Ecology should develop an implementation memo to provide guidance on how to use data from this study. This memo would be used to make site-specific decisions and demonstrate the appropriate use of background levels as targets for cleanup*."

In 2015, Metro/Chevron stated that they planned to propose a CD amendment to change the arsenic CUL for groundwater to the MTCA Method A CUL of 5 µg/L (Ecology, 2015b). However, Ecology has not received a request to make this change.

It would be appropriate in the future for Ecology to consider a request from the PLPs to change the groundwater CUL for arsenic to natural background as allowed in WAC 173-340-700. The Site's groundwater CUL for arsenic (from the 1998 CAP) is 0.0982 µg/L, which is far below natural background and below the current PQL.

Vapor Intrusion

In 1998, indoor and outdoor air samples were collected at the Site and vapor was eliminated as a medium of concern. However, the understanding of vapor intrusion has changed since 1998. An initial assessment of the VI pathway was conducted using Appendix B (Process for Initially Assessing the Potential for Petroleum Vapor Intrusion) of the Guidance for Evaluating Vapor

Intrusion in Washington State (Ecology 2022b). The following Table 3 provides a summary of recommended vertical separation distances between contamination and building basement floor, foundation, or crawl space surface.

Table 3. Recommended Vertical Separation Distances for Initial Assessment of Petroleum Vapor Intrusion (Table B-1 of Ecology 2022b)

Media	Benzene	TPH	Vertical Separation Distance (feet)
Soil (mg/kg)	≤10	≤100 (unweathered gasoline), or ≤250 (weathered gasoline, diesel)	6
Soil (mg/kg)	>10 (LNAPL)	>100 (unweathered gasoline), or >250 (weathered gasoline, diesel)	15
Groundwater (mg/L)	≤5	≤30	6
Groundwater (mg/L)	>5 (LNAPL)	>30 (LNAPL)	15

Soil samples within a 30-foot horizontal separation distance from the North Yard buildings (e.g. SB-1, SB-2, B-12, B-14, and B-23) contain gasoline-range organics and diesel-range organics at concentrations above the TPH screening levels for initial assessment of petroleum vapor intrusion (PVI) at a vertical separation distance of 6 feet. Since the building contains an underground garage, the vertical separation distance is not met and a Tier I or Tier II evaluation is appropriate for the Site. It is unknown whether the North Yard building was constructed with a vapor barrier. Concentrations of benzene in groundwater directly downgradient of the North Yard and in the vicinity of these soil samples are generally below the VI screening level for benzene of 2.4 ug/L.

Benzene and naphthalene are present in groundwater from well MW-7, which is within 30 feet of the building on the South Yard. In January 2022, MW-7 contained 18.2 µg/L of benzene and 137 µg/L of naphthalene. The concentration of benzene is less than 5 mg/L (5,000 µg/L), so based on the initial PVI assessment, a vertical separation distance of 6 feet is needed. During the last 5 monitoring events, groundwater at MW-7 has generally been between 12.2 and 14.1 feet bgs, which is greater than the recommended 6 foot vertical separation. Therefore, additional PVI assessment is not warranted for the South Yard.

3.3 New applicable state and federal laws for hazardous substances present at the Site

The cleanup at the Site was governed by Chapter 173-340 WAC [1999 ed.]. WAC 173-340-702(12) (c) [2001 ed.] provides that,

“A release cleaned up under the cleanup levels determined in (a) or (b) of this subsection shall not be subject to further cleanup action due solely to subsequent amendments to the provision in this chapter on cleanup levels, unless the department determines, on a case-by-case basis,

that the previous cleanup action is no longer sufficiently protective of human health and the environment."

Protection of Surface Water

The state water quality criteria were updated in 2016. Since groundwater at the Site discharges to Lake Union, and the groundwater CULs for the Site are based on protection of surface water, this pathway should be evaluated to ensure the remedy is protective of surface water. The following Table 4 provides a summary of screening levels (SLs) for groundwater that are considered protective of surface water. These SLs are for comparison purposes to assist in this evaluation.

Table 4. Groundwater SLs for Protection of Surface Water

Chemical	Groundwater SL for Surface Water (µg/L)	Basis for SL	Groundwater CUL (µg/L) from 1998 CAP
Benzene	0.44	State WQC-HH	43
Toluene	53	Implementation Memo 23	48,500
Ethylbenzene	12	Implementation Memo 23	6,910
Naphthalene	1,370	Equation 730-1	9,880
Benzo(a)anthracene	1.20E-03	CWA-HH	0.0296
Benzo(a)pyrene	1.20E-04	CWA-HH	0.0296
Benzo(b)fluoranthene	1.20E-03	CWA-HH	0.0296
Benzo(k)fluoranthene	0.012	CWA-HH	0.0296
Chrysene	0.12	CWA-HH	0.0296
Dibenz(a,h)anthracene	1.20E-04	CWA-HH	0.0296
Indeno(1,2,3-cd)pyrene	1.20E-03	CWA-HH	0.0296
Arsenic	0.018	CWA-HH	0.0982
Lead	2.52	WQC - aquatic life (state & CWA)	5

State WQC are in WAC 173-201A-240, Table 240
CWA WQC are in Section 304
CWA - Clean Water Act
HH - human health (consumption of water & fish)
WQC - water quality criteria
SL = screening level

The compliance monitoring wells at the Site that are located closest to Lake Union include MW-19, MW-20, MW-21, MW-8A, MW-25, MW-26, MW-4, and MLU-1. The 2022 monitoring data indicates that the concentrations of the COCs in these 8 wells are either below the SLs (from the table above) or are below the method detection limits (with the exception of arsenic, which is discussed in Section 3.2). Therefore, the remedy appears to be protective of surface water.

Cleanup Levels for Petroleum Hydrocarbons

CULs changed for petroleum hydrocarbon compounds as a result of modifications to MTCA in 2001. Ongoing groundwater sampling of petroleum-related compounds (e.g. BTEX) demonstrates that concentrations in groundwater are decreasing. However, while TPH were identified as COCs in soil, TPH were not identified as groundwater COCs in the CAP, potentially because groundwater CULs for these compounds may not have been promulgated at the time of the CAP. Groundwater compliance is used as the indicator for when the Site is in compliance for soil.

To confirm that concentrations of gasoline-, diesel-, and oil-range hydrocarbons are not present in groundwater at concentrations that could impact human health or the environment, groundwater samples should be analyzed for NWTPH-Gx and NWTPH-Dx (without silica gel) during the next monitoring event. The values in Ecology's *Implementation Memorandum No. 23: Concentrations of Gasoline and Diesel Range Organics Predicted to be Protective of Aquatic Receptors in Surface Waters* can be used for comparison purposes since no groundwater CULs for TPH were set in the CAP.

3.4 Current and projected Site and resource use

The South Yard of the Site is currently used for industrial purposes (woodworking/finishing associated with boat restoration/maintenance for the Center for Wooden Boats) and is not accessible to the public. The North Yard is currently used for commercial purposes (an office building with underground parking). The North Yard was formerly used as an industrial property, but soil at the property was cleaned up to MTCA Method A CULs for unrestricted land use prior to use as a commercial property. There are no projected future Site or resource use changes.

3.5 Availability and practicability of more permanent remedies

The remedy implemented in the North Yard included excavation and removal of impacted soil, which is considered a permanent remedy for soil. The remedy implemented for the South Yard and ROWs included containment of impacted soil. The remedy implemented for groundwater throughout the Site included enhanced biodegradation/natural attenuation of hazardous substances. While more permanent remedies may be available, they may not be practicable at this Site.

3.6 Availability of improved analytical techniques to evaluate compliance with cleanup levels

With the exception of arsenic, the analytical methods used at the time of the remedial action were capable of detection below selected Site CULs. For arsenic, the analytical methods used at the time of the remedial action had a similar PQL to current analytical methods; for groundwater, current methods are not capable of detection of concentrations at or below the Site CUL. Current methods are capable of detecting concentrations in the range of natural background.

4.0 Conclusions

- The Restrictive and Environmental Covenants for the North Yard and South Yard at the Site are in place and continue to be effective in protecting human health and the environment from exposure to hazardous substances and protecting the integrity of the cleanup action. However, the City of Seattle did not sign the covenants or sign a subordination agreement; therefore, the right of way (ROW) portion of the Site is not included in the covenants and does not have institutional controls. Since there are potential risks of exposure to excavation workers and/or releasing hazardous substances to the environment, the City of Seattle and other workers excavating in the ROW are recommended (but not required by the covenants) to follow the terms and conditions in the covenants in order for the remedy to be protective of human health and the environment. A health and safety plan is also recommended.
- Indoor and outdoor air samples were collected at the Site in 1998 and vapor was eliminated as a medium of concern. However, the understanding of vapor intrusion has changed since 1998. Given the concentrations of gasoline- and diesel-range organics remaining in soil within the lateral inclusion distance of the North Yard building, an updated vapor intrusion assessment is warranted to ensure the remedy is protective of building occupants.
- Groundwater cleanup levels (CULs) have not been met at the conditional point of compliance (CPOC) for one or more of the last five monitoring events for arsenic (most wells), benzene (well AGI-2), and lead (well MLU-3). The remedy is expected to be protective of human health and the environment once groundwater cleanup standards are met, but the cleanup is still in process.
    - Groundwater should continue to be monitored regularly by the PLPs until CULs are met at the CPOC.
    - It is unknown whether the contaminants of concern (COCs) will meet cleanup standards within a reasonable restoration timeframe, since a restoration timeframe and contingency action plan for the current phase of the remedy (monitored natural attenuation) was not included in the Cleanup Action Plan (CAP). Active groundwater remediation ended in 2010. Trend analysis should be

incorporated into future monitoring reports in order to evaluate the performance of the remedy over time. The PLPs should also estimate the restoration timeframe so it can be determined when/if contingency actions might be necessary (if the remedy is not performing as intended).

- TPH were identified as soil COCs, but not groundwater COCs, and groundwater CULs for TPH were not set in the CAP. However, compliance for soil is based on groundwater meeting cleanup standards. Therefore, at least one round of groundwater samples from CPOC wells should be analyzed for NWTPH-Dx without silica gel and NWTPH-Gx to confirm that these are not groundwater COCs and because groundwater concentrations are used as a compliance metric for the soil remedy.
- CULs for metals in groundwater under MTCA are generally for total metals concentrations, not dissolved. Groundwater samples should be analyzed for both total and dissolved to be able to compare the two results.
- EIM needs to be updated by the PLPs to include recent groundwater data.
- The Site's groundwater CUL for arsenic is 0.0982 µg/L, which is far below natural background and below the current PQL. It would be appropriate for Ecology to consider a request from the PLPs to increase the groundwater CUL for arsenic to natural background. If the PLPs decide to submit this request, they will need to document their rationale for their proposed natural background concentration.

- Well conditions at the Site should be reviewed by the PLPs at least annually and any issues should be repaired or the well replaced. At a minimum, the condition and location of well MW-14 should be verified during the next sampling event and the surface monument of well MW-22 must be repaired.
- Since the CD and PPCD excluded the characterization or cleanup of any potentially contaminated sediments, the selected remedy may not be protective of sediments.
- It is the property owner's responsibility to continue to inspect the Site to assure that the integrity of the remedy is maintained.

4.1 Next Review

The next review for the Site will be scheduled five years from the date of this periodic review. In the event that additional cleanup actions or institutional controls are required, the next periodic review will be scheduled five years from the completion of those activities.

5.0 References

Attorney General of Washington, Ecology Division. March 19, 2015. *Re: Response to November 6, 2014 Letter.*

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Associated Earth Sciences Incorporated. March 20, 2015. *Remedial Action Report, Metro Lake Union North Yard Property (North Edge Technology Center).*

City of Seattle. March 19, 2010. *Summary of Source Control Evaluation Results, Outfall A and Northeast Corner, Gas Works Sediment Area RI/FS.*

Ecology. October 14, 2014. *Re: Ecology Comments on Additional Soil Investigation Work Plan for KCDT Metro Transit Facilities North Site, former Chevron Bult Terminal #100-1327 Site, Consent Decree No. 99-2-08651-1SEA.*

Ecology. February 2015 (Ecology 2015a). *Metro Lake Union Facilities North Site Periodic Review Final Report.*

Ecology. June 30, 2015 (Ecology 2015b). *Ecology Recommends Closing Touchstone NLU PPCD.*

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Ecology. January 2022 (Ecology 2022a). *Natural Background Groundwater Arsenic Concentrations in Washington State.* Publication No. 14-09-044.

Ecology. March 2022 (Ecology 2022b). *Guidance for Evaluating Vapor Intrusion in Washington State.* Publication No. 09-09-047.

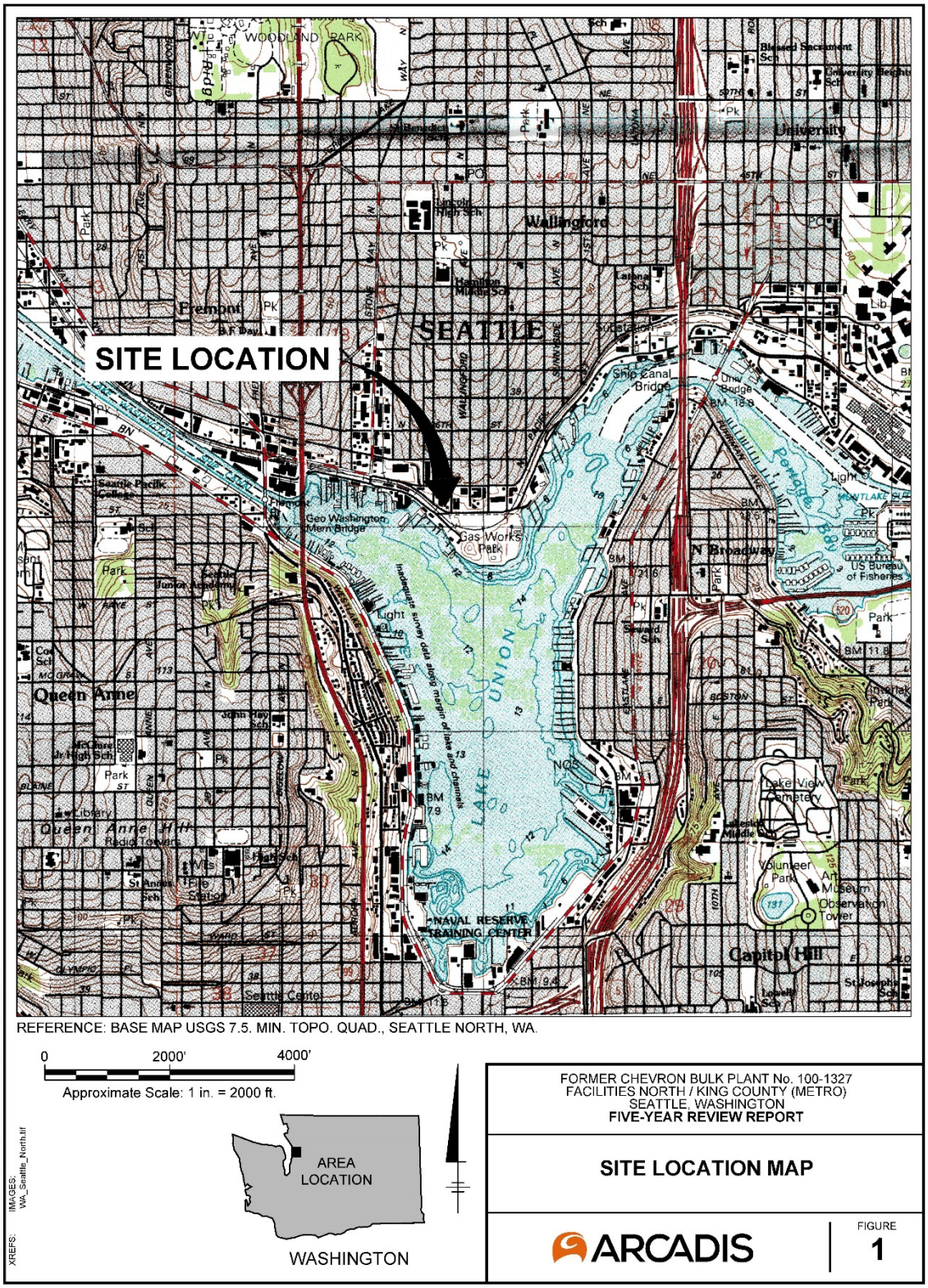
Higgins & Brancheau LLC. October 15, 2021. *Letter Re: NorthEdge, Seattle, WA – 1621 N. 34th Street, Seattle, Washington (the "Property") Metro Lake Union Site, Facility Site ID: 2217 Notice of Conveyance of Property.*

State of Washington King County Superior Court. July 23, 2007. *Prospective Purchaser Consent Decree No. 07-2-23870-1SEA.*

State of Washington King County Superior Court. April 6, 1999. *Consent Decree No. 99-2-08651-1SEA.*

6.0 Appendices

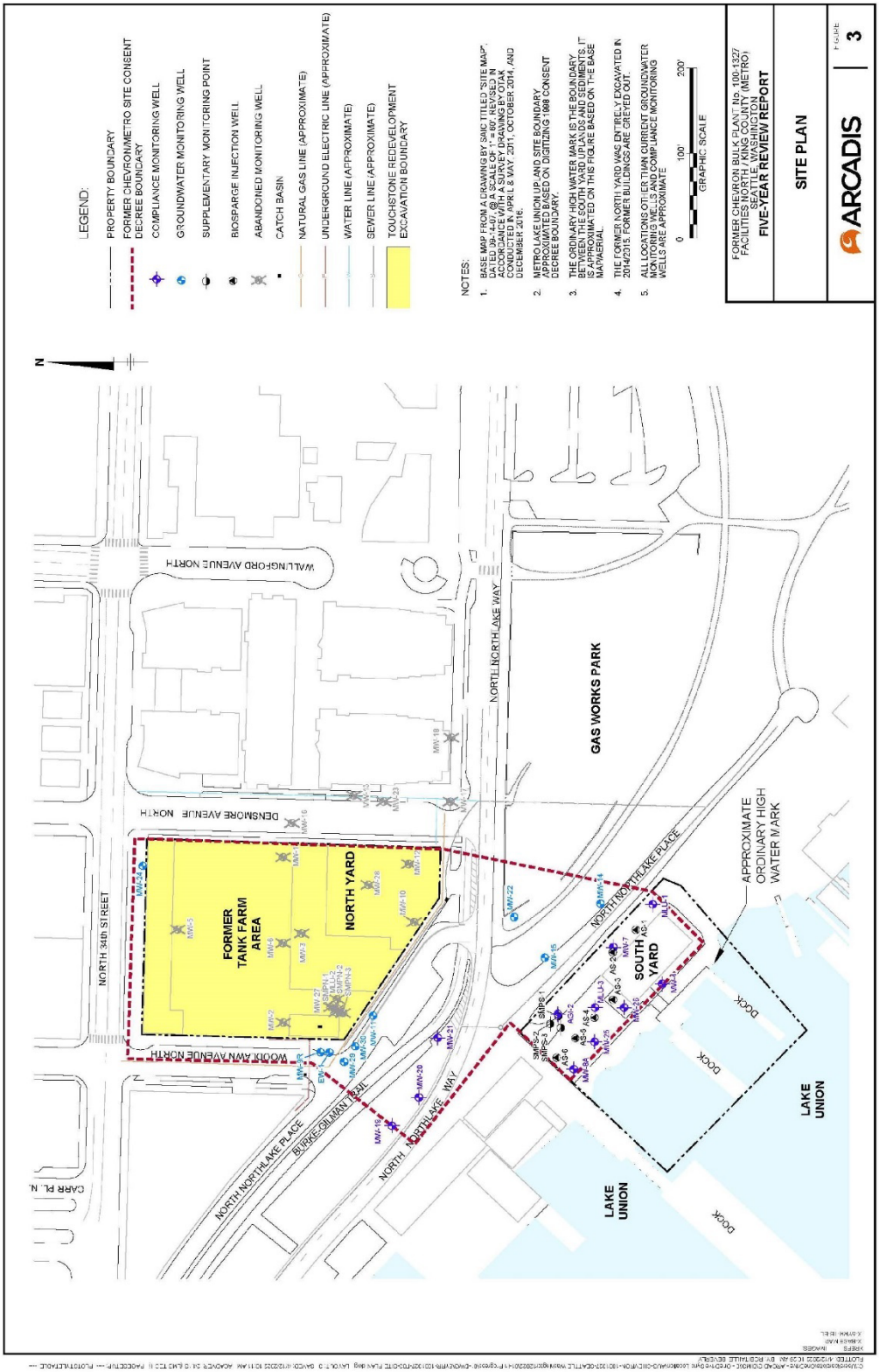
6.1 Vicinity Map



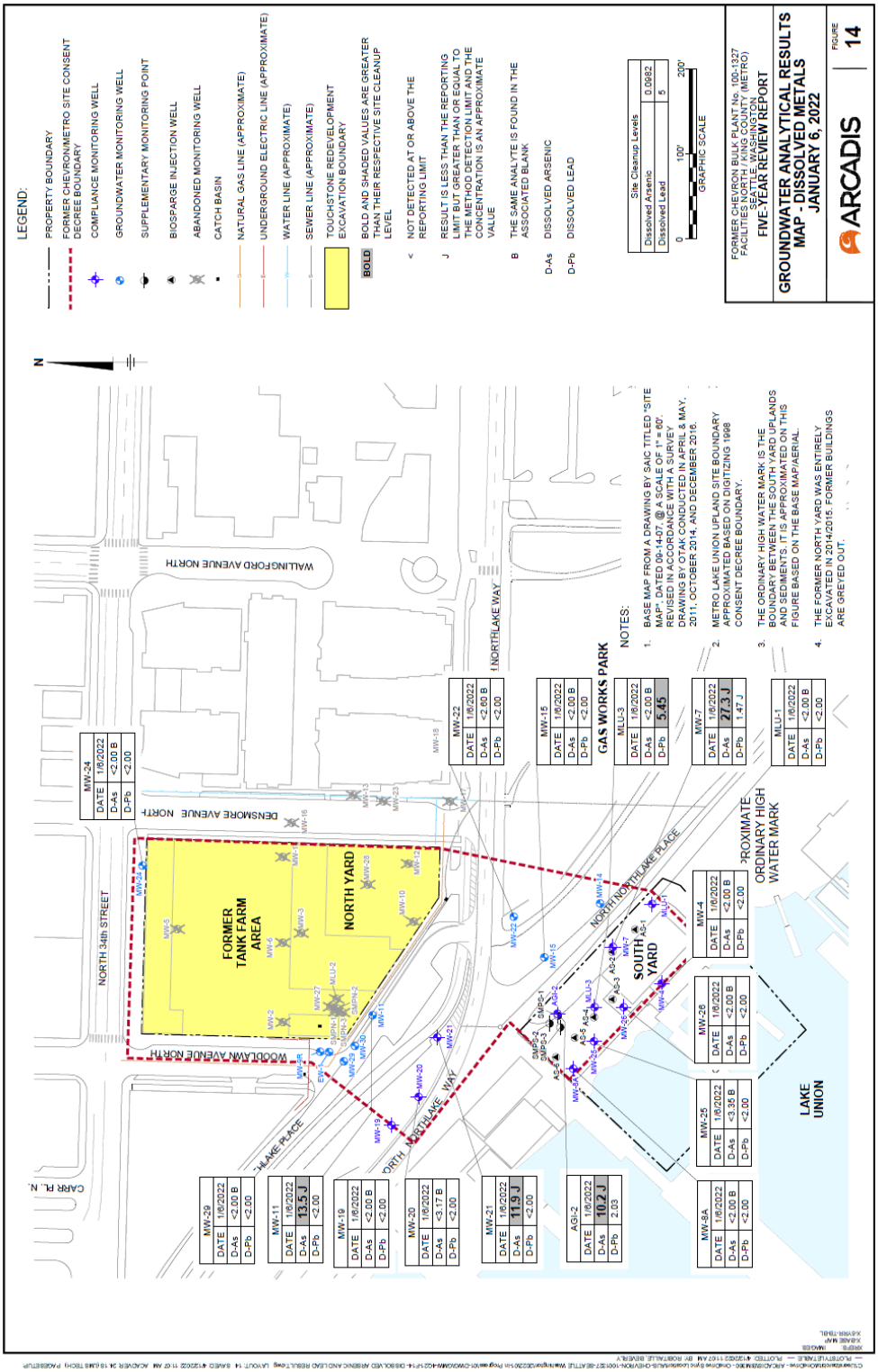
6.2 Site Plan


N
LEGEND:
PROPERTY BOUNDARY
FORMER CHEVRON/METRO SITE CONSENT DECREE BOUNDARY
NORTH YARD
SOUTH YARD
PUBLIC RIGHT OF WAY
0
100'
200'
GRAPHIC SCALE
FORMER CHEVRON BULK PLANT No. 100-1327
FACILITIES NORTH / KING COUNTY (METRO)
SEATTLE, WASHINGTON
FIVE-YEAR REVIEW REPORT
SITE AERIAL MAP
ARCADIS
FIGURE
2
WALLINGFORD AVENUE NORTH
DENSMORE AVENUE NORTH
NORTH NORTHLAKE WAY
GAS WORKS PARK
NORTH 34th STREET
FORMER TANK FARM AREA
NORTH YARD
WOODLAWN AVENUE NORTH
NORTH NORTHLAKE PLACE
SOUTH YARD
DOCK
DOCK
DOCK
LAKE UNION
NORTHLAKE WAY
BURKE-GILMAN TRAIL
NORTH NORTHLAKE PLACE
DARR PL. N.
LAKE UNION
Dock

6.3 Map of Monitoring Well Locations



6.4 Groundwater Analytical Results Map for Dissolved Metals



6.5 Photo log

Photo 1: Right-of-way area between North and South Yards with North Yard beyond.

Photo 2: South Yard from entrance gate.

Photo 3: North Yard buildings viewed from the South Yard.

Photo 4: South Yard building from the west.

Photo 5: MW-7 (red monument in the lower left corner) and the South Yard building.

Photo 6: Right-of-way area between the North and South Yards, facing the North Yard.

Photo 7: MW-22 within the right-of-way area.

Photo 8: South side of the North Yard buildings and right-of-way area.

Photo 9: Monitoring well and pavement within the right-of-way area.