FINAL CLEANUP ACTION PLAN

Vancouver Annex Terminal
5420 NW Fruit Valley Road
Vancouver, Washington

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Acronyms

ARARs	Applicable Relevant and Appropriate Requirements
ASTs	above ground storage tanks
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylenes
COCs	constituents of concern
CAP	Cleanup Action Plan
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
mg/kg	milligrams per kilogram
MTBE	Methyl tert-butyl ether
TPHd	total petroleum hydrocarbons in the diesel carbon range
TPHg	total petroleum hydrocarbons in the gasoline carbon range
TPHo	total petroleum hydrocarbons as oil
ug/L	micrograms per liter
MTCA	Model Toxics Control Act
PAHs	polycyclic aromatic hydrocarbons
POC	point of compliance
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RAA	Recent Alluvial Aquifer
PAA	Pleistocene Alluvial Aquifer
SGA	Sand and Gravel Aquifer
SRI/FS	Supplemental Remedial Investigation/Feasibility Study
UST	underground storage tank
WAC	Washington Administrative Code

1 Introduction

This cleanup action plan (CAP) describes the cleanup action selected by the Washington State Department of Ecology (Ecology) for the NuStar Terminals Operations Partnership L.P. (NuStar) Annex Terminal located at 5420 NW Fruit Valley Road, Vancouver, Washington (herein referred to as the Site; a location map is provided on Figure 1). The Site is located on an approximately 31-acre facility owned by NuStar (the Facility); Figure 2 illustrates the extent of the Site and the Facility. The Facility has been operated as a truck loading terminal by various owners since 1953.

The CAP has been prepared to meet the requirements of Agreed Order No. DE 08-TC-S DE5250 (Agreed Order) between the Washington State Department of Ecology (Ecology) and NuStar, executed on November 6, 2008. Ecology has determined that the cleanup action described here complies with the Model Toxics Control Act (MTCA), Chapter 70.105D Revised Code of Washington (RCW), and the MTCA Cleanup Regulation, Chapter 173-340 Washington Administrative Code (WAC). This determination is based on the Supplemental Remedial Investigation and Feasibility Study (SRI/FS) Report, Vancouver Annex Terminal, prepared by Cascadia Associates, LLC (Cascadia) on behalf of NuStar, and approved by Ecology (SRI/FS; Cascadia, 2020), and other relevant documents in the administrative record.

1.1 Purpose

A CAP is a required part of the site cleanup process under Chapter 173-340 WAC, MTCA Cleanup Regulations. The purpose of the CAP is to identify the proposed cleanup action for the Site and to provide an explanatory document for public review. More specifically, the CAP:

- Describes the Site;
- Summarizes current site conditions;
- Summarizes the cleanup action alternatives considered in the remedy selection process;
- Describes the selected cleanup action for the Site and the rationale for selecting this alternative;
- Identifies site-specific cleanup levels and points of compliance for each hazardous substance and medium of concern for the proposed cleanup action;
- Identifies applicable state and federal laws for the proposed cleanup action;
- Identifies residual contamination remaining on the Site after cleanup and restrictions on future uses and activities at the Site to ensure continued protection of human health and the environment;
- Discusses compliance monitoring requirements; and

- Presents the schedule for implementing the CAP.

Ecology has made a preliminary determination that the cleanup described in this CAP will comply with the requirements for selection of a remedy under WAC 173-340-360.

1.2 Previous Studies

The CAP was developed using information presented in the SRI/FS for the Site (Cascadia, 2020), which was reviewed and approved by Ecology. The Supplemental Remedial Investigation (SRI) consisted of multiple investigations conducted between 2014 and 2020. Prior to the SRI, two preliminary investigations and an initial remedial investigation were conducted at the Facility between 2001 and 2012.

In total, more than 90 soil borings have been installed at the Site, facilitating the collection and analysis of 115 soil samples and 108 grab groundwater samples. In addition, 13 monitoring wells have been installed and have been routinely monitored for the past 10 years. A brief summary of these investigations is provided below; more detail on the scope and results of these investigations can be found in the SRI/FS (Cascadia, 2020).

Preliminary Environmental Site Assessment – 2002. In April 2002, petroleum-impacted soils were encountered during the decommissioning of an underground gasoline-vapor recovery tank associated with a vapor recovery unit. Test pits were advanced to delineate the extent of the impacted soils, and approximately 60 to 100 cubic yards of soil were excavated based on the results of the test pitting. Soil and groundwater samples were collected from borings installed around the excavation area, which identified the presence of fuel constituents in soil and groundwater beyond the excavation. Further assessment was conducted to delineate the extent of the fuel-related constituents in soil and groundwater, and four monitoring wells were installed to allow for continued groundwater quality monitoring.

Phase I and II Environmental Site Assessment—2003. A comprehensive Phase II Environmental Site Assessment was conducted in 2003 in support of due diligence efforts during a property transfer from then-owner Cenex to NuStar. Results of the Phase I Environmental Site Assessment indicated several potential areas of concern:

- fuel storage in above ground storage tanks (ASTs);
- stormwater pond used to collect non-contact stormwater;
- slop tank used to store oily wastes prior to recycling or disposal;
- current and former truck loading racks used to transfer fuel;
- the vapor recovery unit and former underground storage tank (UST);
- an oil water separator located adjacent to the vapor recovery unit;

- and a former pesticide/herbicide handling and storage areas in the southeastern portion of the associated with a previous owner's site usage in the 1990s.

SECOR conducted a Phase II Facility-wide environmental investigation to assess each area of potential concern and concluded that significant areas of concern associated with fuel-related constituents in soil or groundwater were not identified outside of the former UST/VRU and truck loading rack areas). Pesticides, herbicides, triazines, and nitrates in soil and groundwater samples collected from the former pesticide/herbicide handling area in the southeastern part of the Facility were either not detected or were below concentrations of concern (Ash Creek, 2010). Lead results from groundwater sampling of the monitoring wells were slightly elevated and inconsistent with previous analysis of lead in groundwater at the Site. Results of the 2003 investigation indicated that additional investigations were needed to assess and monitor the former UST/vapor recovery unit area, the truck loading rack, and lead in groundwater. Locations of the former UST/vapor recovery unit area, truck loading rack, soil borings, and groundwater monitoring wells are shown on Figure 2.

Site Investigations—2006 to 2008. Several investigations of the former UST/vapor recovery unit and truck rack areas, and groundwater monitoring of the four on-site monitoring wells were conducted between 2006 and 2008 to assess the conditions at the Facility. The investigations included sampling of off-site wells, direct-push groundwater assessment of deeper groundwater at the Facility, and a year-long quarterly groundwater monitoring program. Results indicated that the fuel-related constituents were limited to shallow groundwater in the former UST/vapor recovery unit area, off-site groundwater was not impacted, lead concentrations in groundwater were non-detect, and fuel-related constituents in shallow groundwater were decreasing rapidly with time (Ash Creek, 2010). Locations of the borings installed during the 2006 to 2008 investigations are shown on Figure 2.

Supplemental Remedial Investigation—2014 to 2020. Prior to approving the initial remedial investigation, Ecology requested further assessment of the western half of the Facility to investigate the occurrence of petroleum hydrocarbons identified in several borings during the 2003 Facility-wide investigation. Results of these investigations indicated the presence of fuel-related constituents in soil and groundwater in two isolated areas in the western area: the first area is located in the southwest, south of the overflow storm pond at the Facility, and the second is located in a bermed AST east of the Fire System Water Reservoir. The two additional source areas identified in these investigations are referred to as the MW-5 and MW-6 areas; locations of the two areas are shown on Figure 2.

Groundwater Monitoring—2014 to 2020.

Comprehensive groundwater monitoring events were conducted periodically throughout the SRI. The monitoring well network currently consists of 11 shallow wells and two deeper wells across the Site installed and constructed as follows:

- Shallow wells MW-1 through MW-4 screened from 10 to 25 feet below ground surface (bgs), were installed in the former UST/vapor recovery unit and truck loading rack areas in 2003.
- Shallow wells MW-5 and MW-6, screened from 10 to 25 feet bgs, were installed in the western portion of the Site in 2014.
- Shallow wells MW-7 through MW-10, screened from 10 to 25 feet bgs, were installed in the western portion of the Site in 2016.
- Deeper wells MW-5D and MW-8D, screened from 35 to 45 feet bgs, were installed in the western portion of the Site in 2016.
- Shallow well MW-11, screened from 10 to 25 feet bgs, was installed in 2019 to monitor groundwater conditions in the vapor recovery unit Area.

Twelve comprehensive monitoring events were conducted at the Facility in the period from 2014 to 2020. Monitoring included gauging depth to groundwater and collecting groundwater samples from each well. Groundwater samples were analyzed for total petroleum hydrocarbons as gasoline, diesel, and oil (TPHg, TPHd, TPHo), benzene, toluene, ethylbenzene, and xylenes (BTEX), and methyl tert-butyl ether (MTBE). Naphthalene was added to the analytical program in 2019. Results from the continued groundwater monitoring confirmed that the TPH and related constituents are confined to the two localized areas in the western tank farm—one area around MW-5 and the second around MW-6—and a small area around well MW-11 in the vapor recovery unit Area.

The final draft of the SRI/FS was submitted to Ecology in October 2020. The SRI/FS provides the technical basis for the cleanup actions to be conducted at the Site.

2 Site Description

The Facility is a single parcel (Clark County Tax Lot No. 147360) of approximately 31 acres and is roughly rectangular, with dimensions of approximately 800 by 1,800 feet (Figure 2). The Facility is located in a mixed industrial-agricultural area and currently includes a tank farm consisting of seven large ASTs contained in four containment areas; a covered truck loading rack; smaller ASTs containing fuel additives; a 42,000-gallon transmix AST; and several buildings used for equipment storage and offices. The large ASTs are used to store jet fuel and range in capacity size from 1,680,000 to 4,599,378 gallons. The vapor recovery unit and adjacent oil water separator are located within a pipeline area between the south and north tank farm containments. The Facility is connected to the municipal sanitary sewer and water supply systems. The lined Fire System Water Reservoir is located in the northwestern portion of the Facility and an unlined overflow Storm Pond is located immediately south of the Fire System Water Reservoir (Figure 2). The Facility is fully fenced with a gated entry restricting access.

This section presents a discussion of the Site history, a summary of the conceptual site model describing the contamination found at the Site and the associated environmental concerns, and the cleanup standards.

2.1 Site History

Support Terminals Operating Partnership, L.P. (STOP) purchased the Facility from Cenex Harvest States Cooperative (Cenex) in 2003. In March 2008, STOP changed its name to NuStar.

The property was developed in 1957 as a truck loading terminal. It is unclear from the records whether the Facility was developed by Cenex. Historically, chemicals and other products stored at the Facility included liquid fertilizers and refined petroleum products such as gasoline, diesel and kerosene, de-natured alcohol, and petroleum product additives. A transmix tank is located in the western portion of the Facility (Figure 2) and this is typically where waste (such as from tank-bottom cleanouts or the oil water separator) would be stored prior to off-site disposal or recycling. There is no indication that materials from tank-bottom cleanouts were buried at the Facility.

Prior to or during Cenex's ownership, American Cyanamid conducted agricultural research—including the testing of herbicides and pesticides—in the southeastern portion of the Facility (Figure 2).

2.2 Conceptual Site Model

The information presented in this section is based on the conceptual site model that was provided in the SRI/FS (Cascadia, 2020), which should be referenced for additional details.

The Site and surrounding area is dominated by three primary geologic units: Recent Alluvial deposits, the Pleistocene Alluvial deposits, and the Troutdale Formation. The Recent Alluvial deposits are the upper unit with deposits approximately 55 to 70 feet thick and consist of fine-grained silt and sand. The Recent Alluvial deposits underlying the western portion of the Site consist of clayey silt, silt with some fine sand, and sandy silt to depths of approximately 28 to 35 feet bgs. In some areas, localized, thin laterally discontinuous sand layers are observed in the silt. Below 28 to 35 feet bgs, the Recent Alluvial deposits consist of layers of fine- to medium-grained sand to a depth of at least 65 feet bgs. On the eastern portion of the Facility, the base of the silt layer is generally shallower, with fine- to medium-grained sand encountered at approximately 10 feet bgs near the vapor recovery unit.

The underlying Pleistocene Alluvial deposits are approximately 95 to 115 feet thick in the vicinity of the Site and consist of coarse-grained sand and gravel. The Troutdale Formation underlies the Pleistocene Alluvial deposits and can be in excess of 1,000 feet thick in the Site vicinity. It is made up of cemented sandy gravels and semi-consolidated sands, silts, and clays.

The regional aquifers—Recent Alluvial Aquifer (RAA), Pleistocene Alluvial Aquifer (PAA), and the aquifers of the Troutdale Formation, including the Sand and Gravel Aquifer (SGA)—follow the regional geology. The RAA is unconfined and receives recharge directly from the land surface and/or surface water features. The PAA directly underlies the RAA and is a productive aquifer with high well yields (several thousand gallons per minute [gpm] without significant drawdown). The groundwater flow system is highly influenced by nearby local surface water bodies, including the Columbia River, Vancouver Lake, Vancouver Lake Flushing Channel, and Lake River. Clark Public Utilities, a community drinking water provider, installed a domestic supply wellfield approximately 500 feet north of the Site and extracts water from the SGA from depths of approximately 500 to 600 feet bgs. Clark Public Utilities has plans to initiate pumping from the shallower PAA in the future.

First encountered groundwater is found in the sandy silt of the RAA. In the western portion of the Facility, depth to first encountered groundwater has ranged from approximately 8 to 22 feet bgs; in the eastern portion of the Facility, near the former and current Truck Loading Rack, depth to groundwater has ranged from approximately 20 to 32 feet bgs. Shallow groundwater flow at the Facility has remained, under static conditions, relatively flat with a slight gradient predominantly to the southeast.

Based on the SRI/FS, the contaminants of concern (COCs) for the cleanup action are fuel-related constituents, specifically: TPHg, TPHd, BTEX, and naphthalene. There are four localized areas of soil and/or groundwater impacts that define the Site. The nature and extent of contamination in each of these areas are summarized as follows:

- **Truck Loading Rack Area**. Soil is impacted by TPHg and TPHd in a localized area approximately 40 feet by 90 feet in extent located west of the truck loading rack. Vertically, the TPH are limited to the depth interval between 6 and 16 feet bgs. Comparison of soil data collected from this area in 2002 to data collected in 2019 indicate that petroleum hydrocarbon concentrations have attenuated significantly with time. Seasonally high groundwater is encountered at approximately 22 feet bgs; therefore, soil containing petroleum hydrocarbons is at least 6 feet above the water table. Groundwater is not impacted in this area and the residual hydrocarbons in soil are not leachable.

- **Overflow Storm Pond**. TPHg is found in a limited area (estimated to be 25 feet in diameter or less) in shallow soil between 3 and 6 feet bgs in the overflow Storm Pond. Comparison of soil data collected from this area in 2002 to data collected in 2019 indicate that petroleum hydrocarbon concentrations have attenuated significantly with time. Groundwater is not impacted in this area and the limited residual hydrocarbons in the soil are not leachable nor accessible. Due to its limited size and location directly adjacent to the MW-6 Area, cleanup of this area has been evaluated in conjunction with and included into the MW-6 Area.

- **Vapor Recovery Unit Area**. Shallow groundwater contains TPHg, benzene, ethylbenzene, xylenes, and naphthalene in an approximately 50- by 50-foot area near the vapor recovery unit.

- **MW-5 Area**. TPHg and TPHd are present in shallow groundwater in an approximate 100- by 200-foot area and in vadose zone soil below a depth of 7 feet in an approximate 50- by 75-foot area. The vertical extent of impacted groundwater is primarily confined to the silty layer within the RAA. Ethylbenzene and xylenes are also found in this area, although the extent of these constituents is more limited than TPH. Benzene and toluene are not found in this area

- **MW-6 Area**. TPHg and TPHd are present in shallow groundwater in an oblong area extending approximately 125 feet by 225 feet. BTEX is also present in this area, but is more limited in extent. The vertical extent of the COCs is limited to the silty layer within the RAA and does not extend below 40 feet bgs. Soil between 3 and 21 feet contains COCs in a localized area around boring B-18, the location of which is shown on Figure 3. Vadose zone soil between 10 and 20 feet bgs also contain COCs in a localized area around well MW-6.

Based on current and potential future use scenarios, the potential for risk at the Site to human receptors is via the potential future transport of COCs into a drinking water aquifer should the Clark Public Utilities wellfield initiate pumping from the PAA. A Terrestrial Ecological Evaluation did not identify risk to terrestrial ecological receptors (plants and animals).

3 Cleanup Standards

The cleanup standards required under MTCA consist of cleanup levels for hazardous substances present at the Site and the location where cleanup levels must be met (point of compliance). Media exceeding a cleanup level are addressed through a cleanup remedy that prevents exposure to the contaminated media. The cleanup standards for the Site are presented in this section.

3.1 Contaminated Media and Points of Compliance

This section presents the contaminated media and points of compliance for the cleanup action.

3.1.1 Soil

The soil point of compliance (POC) is the location or locations where the soil cleanup levels must be attained for the Site to be in compliance with the cleanup standards. The standard POC for direct contact with soil is 15 feet, based on a reasonable maximum depth of excavation and assumed placement of excavated soils at the surface where excavation occurs. The conditional POC for direct contact with soil is 6 feet when an institutional control is established to prevent soil excavation.

Soil in isolated areas generally below 7 to 12 feet contain COCs, primarily TPH. One area near boring B-18 in the southwest portion of the site contains a limited area of soil that contains TPHg, TPHd, and BTEX from a depth of 3 feet to 21 feet bgs. These petroleum hydrocarbons are weathered with few volatile compounds remaining but may have the potential to leach petroleum hydrocarbons to groundwater at concentrations of potential concern. Therefore, soil cleanup levels are based on protecting groundwater via a soil leaching pathway and established based on the highest beneficial use of groundwater. Based on WAC 173-340-720(1)(a), the highest potential beneficial use of groundwater is assumed to be drinking water unless it can be otherwise demonstrated.

3.1.2 Groundwater

The groundwater POC is the point, or points, where the groundwater cleanup levels must be attained for the Site to comply with the cleanup standards. The standard POC for groundwater under MTCA is throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest most depth that could potentially be affected by the Site (WAC 173-340-720(8)(b)). Where it can be demonstrated that it is not practicable to meet the cleanup level throughout the Site within a reasonable restoration timeframe, Ecology may approve a conditional POC that is as close as practicable to the source and does not exceed the property boundary.

The maximum beneficial use of groundwater beneath and downgradient of the Site is drinking water; therefore, the groundwater cleanup levels are based on cleanup levels protective of potable groundwater.

3.2 Cleanup Levels

Cleanup levels are the concentration at which a substance does not threaten human health or the environment. The cleanup levels for the Site were developed during the SRI/FS and have been approved by Ecology as the final cleanup levels. The soil and groundwater cleanup levels are the most stringent of the cleanup levels protective of human health through the direct contact and ingestion pathways and those that are protective of ecological receptors. The soil cleanup levels for the Site are shown on Table 1 and groundwater cleanup levels are presented on Table 2.

4 Cleanup Action Alternatives and Analysis

4.1 Alternatives Evaluated

Remedial alternatives were evaluated for the areas of the Site where both soil and groundwater contain COCs (the MW-5, MW-6, and vapor recovery unit areas) separately from the area where COCs are limited to soil (truck loading rack).

MW-5, MW-6, and vapor recovery unit Areas. Six remedial alternatives were developed and evaluated in the SRI/FS (Cascadia, 2020) to address contamination at the Site. The alternatives combined a range of potentially applicable technologies, consisting of landfill capping, source removal, institutional controls and long-term monitoring. The alternatives consisted of the following:

- **Alternative 1 – No Action**. The no action alternative assumes that no actions are taken to treat, remove, or monitor COCs in soil and groundwater at the Site. This alternative provides a baseline against which to evaluate the other alternatives.
- **Alternative 2 – Monitored Natural Attenuation.** Monitored Natural Attenuation consists of institutional controls to prevent the groundwater from being accessed and long-term groundwater quality monitoring. The application of institutional controls provides notification regarding the presence of contaminated materials, regulates the disturbance/management of these materials, and prohibits the creation of preferential pathways for contaminant migration. The principal assumption of Alternative 2 is that reductions of COCs within the shallow water bearing zone (silt unit) will occur through natural processes such as biodegradation, diffusion, dispersion, hydrolysis, and sorption.
- **Alternative 3 – Hydraulic Containment.** Alternative 3 provides for the hydraulic control and containment of COCs in groundwater by installing groundwater extraction wells throughout the defined extent of TPH in shallow groundwater, extracting COC-containing groundwater, treating the groundwater via a coalescing plate separator and granulated carbon adsorption, and discharging treated groundwater to the municipal sanitary sewer system under permit with the publicly owned treatment works.
- **Alternative 4 – Plume Stabilization and Enhanced Bioremediation**. Alternative 4 includes the direct injection of liquid activated carbon and biostimulants throughout residual source areas to minimize migration of the dissolved phase hydrocarbons and promote biodegradation.
- **Alternative 5 – Removal of Accessible Petroleum Containing Soil and Groundwater Recirculation**. Alternative 5 includes removal of readily accessible petroleum hydrocarbon containing soil, hydraulic containment of the dissolved phase plumes via groundwater extraction, and reinjection/recirculation of treated/amended water inside the plumes to stimulate bioremediation.

- **Alternative 6 – Removal of Petroleum Containing Soil and Enhanced Bioremediation.** Alternative 6 includes the removal of all accessible petroleum-containing soil and the placement of oxygen releasing compounds in the completed excavations to enhance aerobic biodegradation of residual contamination.

The six alternatives were evaluated against the MTCA threshold criteria and other requirements, including disproportionate cost analysis procedures (WAC 173-340-360). With the exception of Alternative 1, no action, all of the alternatives meet the MTCA threshold criteria. Based on the results of the disproportionate cost ana11

lysis, Alternatives 3, 5 and 6 had the highest beneficial scores. However, Alternative 5 and 6 have the higher benefit to cost ratio, and Alternative 5 is a more proven technology. Therefore, under MTCA, Alternative 5 is identified as the alternative that is permanent to the maximum extent practicable.

Truck Loading Rack. Three cleanup alternatives were developed to address the subsurface soil containing petroleum hydrocarbons in the truck loading rack area. The cleanup alternatives developed consisted of:

- No Action (retained for comparison purposes)
- Institutional Controls—Deed Restrictions and Soil Management Plan
- Excavation with Off-Site Disposal

With the exception of the no-action alternative, the alternatives meet the MTCA threshold criteria. However, the third alternative, excavation with off-site disposal, would be significantly more expensive, and, based on the results of the disproportionate cost analysis of the three options, the second alternative is selected for the truck loading rack area.

4.2 Rationale for the Selected Cleanup Action

The contamination at the Site requiring remedial action consists of three localized areas where subsurface soil and shallow groundwater contain TPHg, TPHd, BTEX and/or naphthalene, and one area where soil between depths of 6 and 13 feet contain TPH. The selected cleanup action in the groundwater impacted areas consists of: removal of readily accessible petroleum hydrocarbon-containing soil and extraction; treatment and recirculation of treated groundwater in the MW-5 and MW-6 areas; and, injection of liquid activated carbon in the vapor recovery unit area. The selected cleanup actions in the truck loading rack area are institutional controls, including deed restrictions and a soil management plan.

The selected cleanup action in the MW-5, MW-6, and vapor recovery unit areas meets the threshold requirements set forth in MTCA and identified in WAC 173-340-360(2)(a), as follows:

- **Protect human health and the environment.** This alternative protects human health and the environment by controlling the migration of COCs and reducing residual contaminant levels through targeted removal actions, pumping and treating COCs in groundwater, and treating residual contamination *in situ* through groundwater recirculation and enhanced bioremediation.
- **Comply with cleanup standards.** The alternative complies with the cleanup standards by reducing the COC concentration throughout the Site groundwater to below cleanup levels (using a combination of removal actions and *in-situ* treatment).
- **Comply with applicable state and federal laws.** The cleanup action was specifically developed to comply with MTCA. The cleanup action is anticipated to comply with all other potential applicable, relevant, and appropriate requirements ([ARARs]; see Section 5.2) because the required engineering design and agency review processes will include steps to ensure compliance. The means of compliance with ARARs will be documented in the engineering design documents and other preconstruction documentation that will be prepared during the design phase.
- **Provide for compliance monitoring.** The alternative includes compliance monitoring to verify that cleanup levels have been achieved.

The selected cleanup action in the truck loading rack area meets the threshold requirements set forth in MTCA and identified in WAC 173-340-360(2)(a), as follows:

- **Protect human health and the environment.** This alternative protects human health and the environment by limiting and managing access to contaminated soil while natural attenuation reduces concentrations to acceptable levels.
- **Comply with cleanup standards.** The alternative complies with the cleanup standards by reducing the COC concentration through monitored natural attenuation.
- **Comply with applicable state and federal laws.** The cleanup action was specifically developed to comply with MTCA. The cleanup action is anticipated to comply with all other potential ARARs (see Section 5.2) because the required institutional controls and agency review processes will include steps to ensure compliance. The means of compliance with ARARs will be documented in the institutional control documents, including the soil management plan.
- **Provide for compliance monitoring**. The alternative includes compliance monitoring to verify that cleanup levels have been achieved.

The Site cleanup action has a reasonable restoration timeframe, uses permanent solutions to the maximum extent practicable, and was provided for public review during the SRI/FS public comment period. The selected Site cleanup action meets the MTCA threshold requirements and selection criteria per WAC 173-340-360.

5 Description of the Cleanup Action

The selected remedial alternative for implementation during the cleanup action was developed through evaluation of the Site conditions and applicable remedial technologies in the SRI/FS. This section describes the selected remedial alternative.

5.1 Cleanup Action Components

The cleanup action includes the following components:

- **Removal of Vadose Zone Soil**. Petroleum-containing soil will be removed from the vadose zone down to 12 feet in two areas where shallower soil impacts were observed in the MW-5 and MW-6 Areas. The areal extent of each excavation is approximately 50 by 75 feet; the excavation will be backfilled with gravel to approximately 2 feet below grade. The upper 2 feet will be capped with a low permeability clay fill cap. An injection gallery will be constructed within each excavated area during the backfill process to allow injection of treated, amended water.
- **Groundwater Extraction, Treatment, and Recirculation.** Groundwater in the MW-5 and MW-6 Areas will be extracted from the edges of the plumes, treated, amended, and re-injected in the interior of the plumes to form a groundwater recirculation system. Extraction will be achieved through the installation of an estimated nineteen 35-feet-deep groundwater extraction wells. The groundwater will be treated using a coalescing plate separator and granulated carbon adsorption, or equivalent treatment system. Treated groundwater will be amended with biostimulants and reinjected via injection galleries for infiltration. These in-ground discharges of treated/amended water will be permitted and monitored in accordance with the state's Underground Injection Control program. The groundwater extraction points will then pull this amended water through the impacted zone, forming a recirculation treatment cell. The continuous recirculation of oxygen/nutrient-rich water through the impacted zones is designed to actively enhance the biodegradation of residual COCs in soil and groundwater.
- **Injection of Liquid Activated Carbon.** Several direct injections of liquid micron-scale carbon adsorbents and biostimulants will be conducted throughout the silt zone surrounding MW-11 within the vapor recovery unit Area. An estimated 6-foot by 6-foot injection grid will be used in this area and reagents will be slowly injected at multiple depth intervals through direct-push injection points equipped with a surface seal to preclude daylighting. A compliance well will be installed downgradient of MW-11 to enhance the current groundwater monitoring system in this area.
- **Soil Management Plan for Truck Loading Rack Area Soil.** A Soil Management Plan will be prepared that provides required management and monitoring for the residual hydrocarbons in subsurface soil in the truck loading rack area.

- **Institutional Controls for Truck Loading Rack Area.** Institutional controls will include a deed restriction to prevent future, unrestricted development or any other activities that could create exposure pathways for direct contact with the contaminated soil in the truck rack area that is not conducted in accordance with the approved Soil Management Plan. The institutional controls are required until concentrations of COCs in soil in the Truck Rack Area are demonstrated to have attenuated to below Site Cleanup Levels.
- **Monitoring Plan.** A Monitoring Plan will be prepared that will include the following elements to monitor compliance:
  - Semi-annual groundwater monitoring to include gauging of water levels to assess groundwater gradients, and sampling of Site monitoring wells and chemical analysis of the samples to assess COC concentration trends with time;
  - Periodic inspection of Site conditions; and
  - Annual reporting of groundwater monitoring and site inspection results, and any actions taken in accordance with the Soil Management Plan.
- **Five Year Reviews**. Ecology will review the status of the Cleanup Action at least every five years to assess whether it is on track and/or whether additional cleanup elements are needed to achieve cleanup levels within a reasonable timeframe.

The conceptual elements of the cleanup action are depicted on Figure 3. The detailed locations and specifications will be defined in future design and specification documents.

5.2 Applicable, Relevant, and Appropriate Requirements (ARARs)

The MTCA rules (WAC-173-340-710) require that cleanup actions comply with applicable state and federal laws, which are defined as "legally applicable requirements and those requirements that the department determines…are relevant and appropriate requirements" (i.e., ARARs). A cleanup action performed under MTCA authority (e.g., an Agreed Order) is exempt from the procedural requirements of certain state and local environmental laws, although the cleanup action must still comply with the substantive requirements of applicable federal, state, and local laws.

"Legally applicable" requirements include cleanup standards or environmental protection requirements under state or federal laws that specifically address a hazardous substance or cleanup action for a site. "Relevant and appropriate" requirements include cleanup standards or environmental requirements (e.g., cleanup standards, standards of control, environmental criteria, environmental limits, etc.) under state and federal law that, while not legally applicable to the cleanup action, address problems or situations that are considered sufficiently similar to those encountered at the Site. The ARARs applicable for the Site are as follows:

- **Safe Drinking Water Act (42 USC Section 300f).** The Safe Drinking Water Act sets a framework for the Underground Injection Control program to control the injection of wastes into groundwater. EPA and individual states implement the Underground Injection Control program, which sets standards for safe waste injection practices and bans certain types of injection altogether.
- **Resource Conservation and Recovery Act**. The Resource Conservation and Recovery Act is the principal federal law in the United States governing the disposal of solid waste and hazardous waste. Resource Conservation and Recovery Act handles many regulatory functions of hazardous and non-hazardous waste. In the State of Washington, Resource Conservation and Recovery Act is implemented by Ecology under the Dangerous Waste Regulations (WAC 173-303).
- **State Environmental Policy Act (43.21C Revised Code of Washington [RCW]; WAC 197-11)**. The State Environmental Policy Act was created to ensure that state and local government officials consider potential environmental impacts when making decisions. These decisions may be related to issuing permits for private projects, constructing public facilities, or adopting regulations, policies, or plans. The State Environmental Policy Act process begins when an application for a permit is submitted to a state or local government agency, or when an agency proposes to take an action such as the implementation of a remedial action. One agency is identified as the "lead agency" under the State Environmental Policy Act Rules (WAC 197-11-924-938) and is responsible for conducting the environmental review for a proposal and documenting that review in the appropriate State Environmental Policy Act documents.
- **Washington Solid Waste Management—Reduction and Recycling Act (Chapter 70.95 RCW; Chapter 173-350 WAC).** This act establishes a state-wide program for solid waste handling, recovery, and/or recycling to prevent land, air, and water pollution and conserve the natural and economic resources of the state.
- **Underground Injection Control Program (Chapter 173-218 WAC).** The program was designed to protect groundwater quality by preventing groundwater contamination through regulating the discharge of fluids into Underground Injection Control wells. The program satisfies the intent and requirements of Washington State Water Pollution Control Act (Chapter 90.48 RCW) as well as Part C of the Safe Drinking Water Act .
- **State of Washington Water Pollution Control Law (Chapter 90.48 RCW).** This legislation defines Ecology's authority and obligations for the wastewater discharge permit program. The Facility's stormwater discharges to ground must comply with State Waste Discharge Permit Number ST 6255 (Permit). The Permit is effective May 1, 2020 and expires on April 30, 2025. The cleanup action would need to be consistent with the substantive requirements of the Permit, which include effluent limits for authorized discharges to ground, groundwater quality monitoring, and a

best management practice that precludes any discharge in excess of the hydraulic capacity of the evaporative/infiltration ponds, so that the surge pond overflows.

- **Water Resources Act (Chapter 90.54 RCW).** This act establishes fundamental policies for the utilization and management of the waters of the State of Washington. If construction-generated dewatering water or stormwater from the cleanup action is treated for discharge to water of the State of Washington, such discharge would need to comply with the requirements of the Facility's stormwater Permit and/or a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit.

5.3 Restoration Timeframe

The estimated time for COC concentrations in groundwater to achieve cleanup levels is 7 to 10 years and soil mitigation will be achieved once the removal actions are completed, the Soil Management Plan has been approved by Ecology, and deed restrictions have been recorded with the appropriate entities, all of which are anticipated to be completed within one year following execution of the Agreed Order for Site Cleanup between NuStar and Ecology. This is considered a reasonable restoration timeframe in accordance with the factors listed in WAC 173-340-360(4)(b).

5.4 Compliance Monitoring and Reporting

Compliance monitoring and reporting will be implemented in accordance with WAC 173-340-410 to ensure the protectiveness of the cleanup actions. The following sections generally describe the monitoring requirements. In addition to compliance monitoring, confirmation sampling of soil and groundwater will be conducted when cleanup is complete to demonstrate the applicable goals have been obtained.

5.4.1 Groundwater

The goal of groundwater monitoring is to evaluate groundwater quality over time and ensure that there are no risks to human health or the environment at the point of compliance. The COC concentrations in groundwater downgradient of the Site currently meet the cleanup levels. Once the cleanup action is implemented, the COC concentrations at the Site are anticipated to be at or below groundwater cleanup levels in 7 to 10 years. Groundwater monitoring will be conducted to observe these changes over time.

Groundwater monitoring will include semiannual water level measurement; sample collection from Site monitoring wells MW-5 through MW12, MW5d, and MW-8d; and laboratory analysis. Measured water levels will be analyzed to determine the groundwater surface elevation and direction and rate of groundwater flow. Groundwater samples will be collected using low-flow techniques while monitoring for pH, temperature, and conductivity using calibrated field equipment, handled using standard chain-of-custody procedures, and analyzed by an accredited laboratory for TPHg, TPHd, BTEX, and naphthalene.

Concentrations of TPHg, TPHd, BTEX, and naphthalene will be evaluated for statistically significant trends following unified guidance provided by the EPA (EPA, 2009). These trends will be used to determine compliance with cleanup levels.

An Operations Maintenance and Monitoring Plan (OM&MP) to monitor compliance will be prepared in accordance with WAC 173-340-410 and will include a Sampling and Analysis Plan and contingency plan. The Sampling and Analysis Plan will identify the data analysis and evaluation procedures to be used to demonstrate and confirm compliance and to determine when the cleanup action has met the cleanup goals. The contingency plan will propose one or more reliable statistical methods or other equivalent analysis techniques to demonstrate and confirm compliance, and the conditions under which the methods would be used at the facility, including actions to be taken if post system monitoring indicates an exceedance of cleanup levels. Groundwater monitoring and interpretation will be documented annually and submitted to the Ecology Site Manager. Results of laboratory analyses will be posted to Ecology's Environmental Information Management database. Groundwater monitoring and reporting will be conducted for at least two years following shutdown of the groundwater recirculation system.

5.4.2 Truck Loading Rack Reporting

The vertical and lateral extent of soil currently containing petroleum hydrocarbons above soil cleanup levels will be described in the Soil Management Plan and will become the designated soil management area. Any activities conducted within the designated soil management area that trigger the elements of the Soil Management Plan will be documented and reported annually. These activities include, but may not be limited to, digging, accessing, and/or removing soil from within the designated soil management area.

5.5 Schedule for Implementation

The implementation of the cleanup action occurs after a public participation comment period on a draft CAP. Construction of the remedy is expected in 2023 and 2024.

5.6 Institutional Controls

Institutional controls are measures taken to limit or prohibit activities that may interfere with the integrity of a cleanup action or that may result in exposure to hazardous substances at a site (WAC 173-340-440). An environmental covenant, in the form of a deed restriction, will be developed for the Property. The environmental covenant will prevent disturbance of the contaminated soil in the truck loading rack area without prior notification of Ecology and require implementation of a Soil Management Plan.

5.7 Periodic Review

In accordance with WAC 173-340-420, at a site where a cleanup action requires multiple years to achieve and/or an institutional control, Ecology will conduct a review of this Site

every five years to ensure the continued protection of human health and the environment. Since groundwater cleanup is anticipated to take 7 to 10 years and institutional controls will be required for the truck loading rack area, periodic reviews will occur at the Site to assess the effectiveness of the cleanup action.

References

Cascadia Associates, LLC, 2020, Supplemental Remedial Investigation and Feasibility Study Report, Vancouver Terminal Annex, Vancouver, Washington, October 23, 2020.

Washington State Department of Ecology (Ecology), 2013, Model Toxics Control Act Regulation and Statute, Chapter 173-340 of the Washington Administrative Code (WAC 173-340), and Chapter 70.105D of the Revised Code of Washington (RCW 70.105D), Publication No. 94-06, Revised 2013.

United States Environmental Protection Agency (EPA), 2009, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, Publication EPA 530-R-09-007, March 2009.

TABLES

Table 1
Soil Constituents of Concern and Site Cleanup Levels
NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

Constituent of Concern	Soil Cleanup Level (mg/kg)[1]
TPHg	30
TPHd	2,000
Napthalene	5
Benzene	0.03
Ethylbenzene	6
Toluene	7
Xylenes	9

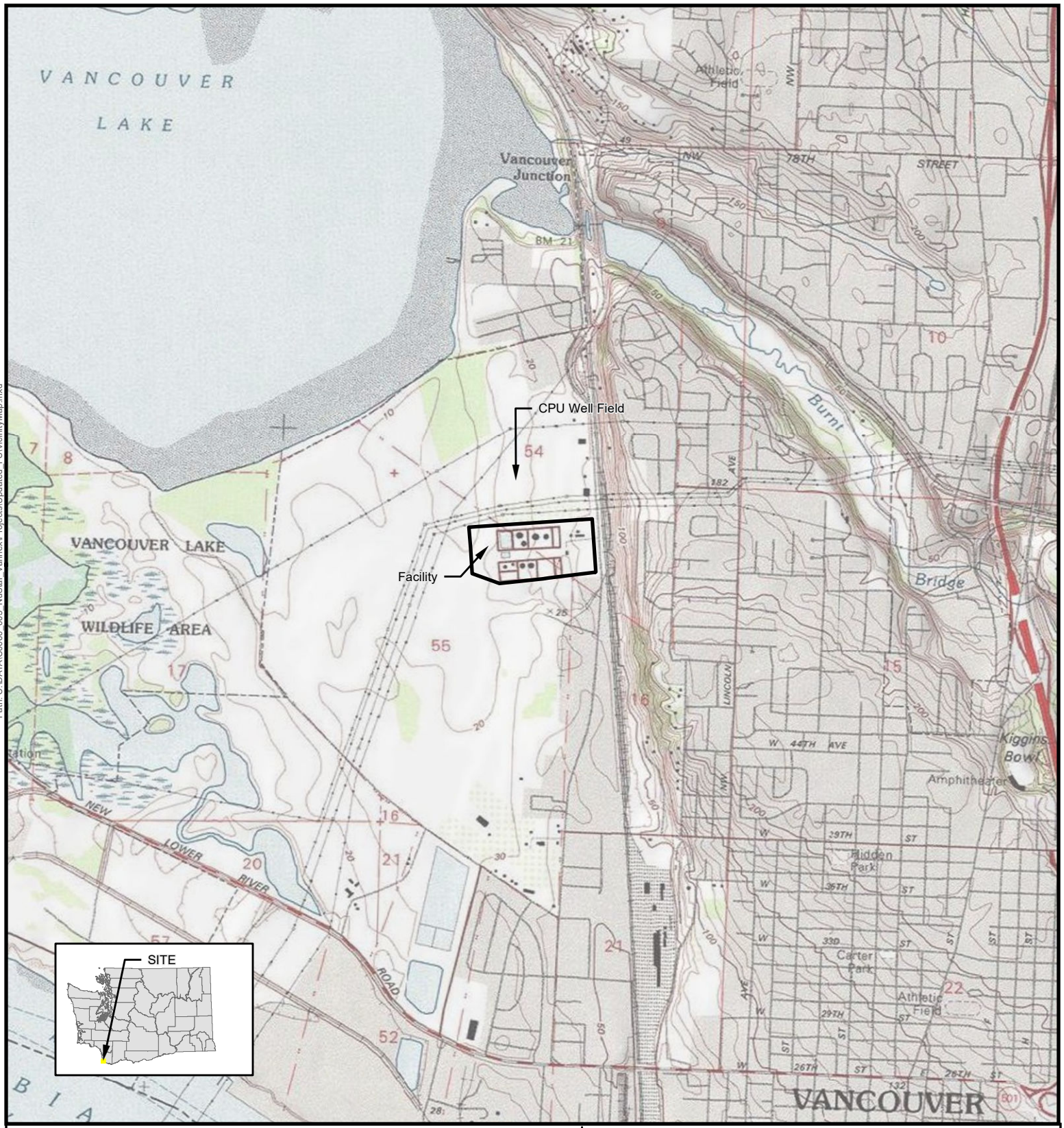
[1] Model Toxics Control Act Cleanup Regulation (MTCA), WAC 173-340, Method A values for soil with unrestricted land use.
TPHg = Total Petroleum Hydrocarbons in gasoline hydrocarbon range
TPHd = Total Petroleum Hydrocarbons in diesel hydrocarbon range
mg/kg = milligrams per kilogram

Table 2
Groundwater Constituents of Concern and Site Cleanup Levels
NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

Constituent of Concern	Groundwater Cleanup Level (ug/L)[1]
TPHg	800
TPHd	500
Naphthalene	160
Benzene	5
Ethylbenzene	700
Toluene	1,000
Xylenes	1,000

[1] Model Toxics Control Act Cleanup Regulation (MTCA), WAC 173-340, Method A values for groundwater based on potential drinking water beneficial use.
TPHg = Total Petroleum Hydrocarbons in gasoline hydrocarbon range
TPHd = Total Petroleum Hydrocarbons in diesel hydrocarbon range
ug/L = micrograms per liter

FIGURES



Source: USGS Map obtained from Esri ArcGIS Online

Facility Boundary

0 1,000 2,000
Feet

Facility Location Map

NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Figure

1

Path: C:\DATA\C0060_005_NuStar_Vannex\Projects\Updated_FS\VicinityMap.mxd
Print Date: 4/27/2020
Approved By:
Produced By: ErikStrandhagen
Project:

Source:
Aerial from Mapbox.

Facility Boundary

MTCA Site Boundaries

0 100 200
Feet

Aerial View of Site and Site Vicinity

NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

GeoEngineers

Project Number 019001-008

February 2022

Figure 2

Document Path: P:\19\19001008\GIS\MXD\Cleanup Action Plan\Aerial View, Site, Vicinity.mxd

Notes:
Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007).

Locations of roads and containments are approximate.

Source:
Aerial from Mapbox.

- Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep Monitoring Well Locations)
- Historical Temporary Well Location (Approximate)
- GP-1 Historical Direct-Push Boring Location (2002/2003)
- HA-1 Historical Hand Auger Location (2002/2003)
- GP-1 Sample Location (2008)
- DP-1 Sample Location (2009)
- SB-8R Soil Boring Location (September 2014)
- B-1 Soil Boring Location (October 2015)
- B-1 Soil Boring Location (February 2019)
- B-29 Soil Boring Location (February 2020)
- Facility Boundary

0 25 50 100 Feet

Facility Site Plan

Final Cleanup Action Plan
NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-001-006	Figure
January 2021		3

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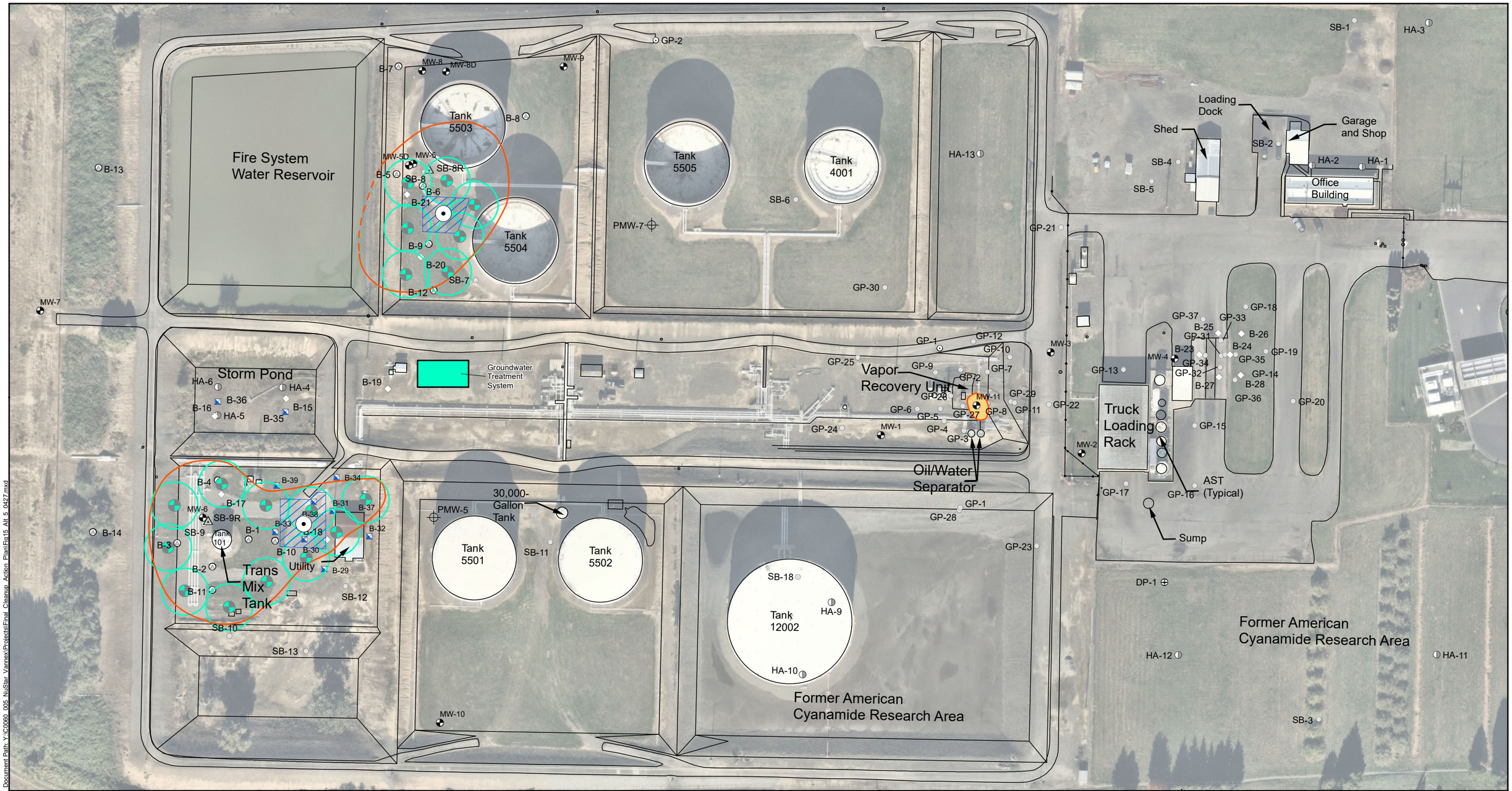

Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep)

Historical Temporary Well Location (Approximate)

Historical Direct-Push Boring Location (2002/2003)

Historical Hand Auger Location (2002/2003)

Sample Location (2008)

Sample Location (2009)

Soil Boring Location (September 2014)

Soil Boring Location (October 2015)

Soil Boring Location (February 2019)

Soil Boring Location (February 2020)

Shallow Groundwater Extraction Well and Estimated Radius of Drawdown

Extent of TPH in Groundwater Greater Than MTCA Method A Cleanup Levels (Dashed Where Inferred)

Excavate Soil to 12 feet

Direct Injection

Recirculation Gallery

0 25 50 100 Feet

Notes:
Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007). Locations of roads and containments are approximate.
Source: Aerial from Mapbox.

Alternative 5
Removal of Readily Accessible Soil; Hydraulic Recirculation and Enhanced Bioremediation
Feasibility Study Report
NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number 0060-001-006

January 2021

Figure 4

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