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INTERIM REMOVAL ACTION WORK PLAN

DELTA WESTERN TERMINAL
DILLINGHAM, ALASKA

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May 27, 2020

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AST	aboveground storage tank
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
Delta Western	Delta Western, LLC
Delta Western Tank Farm site	the southern portion of the Site at 309 Main Street, designated by ADEC as Delta Western Tank Farm – Dillingham and assigned Hazard Identification No. 25770 and File No. 2540.38.017
Dillingham Auto	the former Dillingham Automotive Parts and Marine Store
Dillingham Auto site	the northern portion of the Site at 315 Main Street, designated by ADEC as Dillingham Auto and assigned Hazard Identification No. 23487 and File No. 2540.26.003
DRO	total petroleum hydrocarbons as diesel-range organics
EPA	U.S. Environmental Protection Agency
Farallon	Farallon Consulting, L.L.C.
GRO	total petroleum hydrocarbons as gasoline-range organics
Interim Action	interim removal action
µg/l	micrograms per liter
PAHs	polynuclear aromatic hydrocarbons
RRO	total petroleum hydrocarbons as residual-range organics
SCA	secondary containment area
Site	Delta Western, LLC Terminal in Dillingham, Alaska

TAH	total aromatic hydrocarbons
tank farm	the area of the Site where the ASTs identified as Tanks 1 through 11 are located
TAqH	total aqueous hydrocarbons
UST	underground storage tank
VOCs	volatile organic compounds
Work Plan	*Interim Removal Action Work Plan, Delta Western Terminal, Dillingham, Alaska* dated May 27, 2020 prepared by Farallon Consulting, L.L.C. (this document)

1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Interim Removal Action Work Plan (Work Plan) for Delta Western, LLC (Delta Western) to present the scope of work for an interim removal action (Interim Action) at the Delta Western Terminal in Dillingham, Alaska (herein referred to as the Site). A Site vicinity map is provided on Figure 1. A Site plan is provided on Figure 2.

The remedial action currently proposed for the Site is considered an Interim Action based on the necessity for performance of interim removal actions discussed in Section 330 of Chapter 75 of Title 18 of the Alaska Administrative Code (18 AAC 75.330) to prevent potential migration of hazardous substances at or from a site. Cleanup of the entire Site is not currently feasible as the Site includes an active fuel storage and distribution terminal, described in Section 2.1.2, Fueling Facilities. The terminal facility is currently operated by Bristol Alliance Fuels under lease to Delta Western.

The purpose of this Work Plan is to provide the scope of work for the Interim Action planned for the Site, and the details for the groundwater monitoring activities that will be implemented to monitor the performance of the Interim Action.

The Work Plan was prepared by Mr. Paul Grabau, Farallon Principal Hydrogeologist. Mr. Grabau is a qualified environmental professional as defined in 18 AAC 75.333[b].

The Site comprises two "sites" as identified by the Alaska Department of Environmental Conservation (ADEC):

- The northern portion of the Site at 315 Main Street, designated by ADEC as Dillingham Auto and assigned Hazard Identification No. 23487 and File No. 2540.26.003 (Dillingham Auto site); and
- The southern portion of the Site at 309 Main Street, designated by ADEC as Delta Western Tank Farm – Dillingham and assigned Hazard Identification No. 25770 and File No. 2540.38.017 (Delta Western Tank Farm site).

In accordance with the definition of a "site" under 18 AAC 75.990(115), the Site as referred to herein includes both the Dillingham Auto and Delta Western Tank Farm sites.

1.1 PURPOSE OF THE INTERIM ACTION

The purpose of the Interim Action is to mitigate potential impacts of groundwater migrating to the Nushagak River at the southern boundary of the Site by using an active remediation technology to reduce petroleum hydrocarbon concentrations in groundwater to less than surface water quality

standards for total aromatic hydrocarbons (TAH) and total aqueous hydrocarbon (TAqH) concentrations provided in 18 AAC 70.[1]

1.2 WORK PLAN ORGANIZATION

This Work Plan is organized into the following sections:

- **Section 2, Site Description and Background**, provides a description of the Site, discusses the environmental setting, and provides background information pertaining to the Interim Action.
- **Section 3, Interim Action Description and Implementation**, provides a description of the Interim Action and the methods that will be used for its implementation at the Site.
- **Section 4, Monitoring Well Installation and Soil Sampling**, describes the field procedures that will be followed for installation of new monitoring wells and collection of soil samples from the borings for the wells, and analysis.
- **Section 5, Groundwater Sampling**, describes the groundwater sampling methods and analyses that will be used to conduct Site-wide and performance groundwater activities, and presents the groundwater monitoring schedule.
- **Section 6, Management of Investigation-Derived Waste**, presents the procedures that will be used to manage investigation-derived waste.
- **Section 7, Reporting**, describes the information that will be provided in the 2020 Interim Removal Action Summary Report to be prepared following completion of the September 2020 performance groundwater monitoring event.
- **Section 8, References**, presents the documents cited in this Work Plan.

[1] ADEC surface water quality standards (18 AAC 70.020) of 10 micrograms per liter (µg/l) for TAH, and 15 µg/l for TAqH for marine or fresh water aquaculture water-supply designated uses.

2.0 SITE DESCRIPTION AND BACKGROUND

This section provides a description of the Site, discusses the environmental setting, and provides background information pertaining to the Interim Action.

2.1 SITE DESCRIPTION

2.1.1 Site Setting

The ADEC (no date) Contaminated Sites Program database lists a latitude of 59.028674 degrees north, a longitude of 158.466712 degrees west, and a horizontal datum of WGS84 for the Dillingham Auto site. The ADEC (no date) Contaminated Sites Program database lists a latitude of 59.037962 degrees north, a longitude of 158.467063 degrees west, and a horizontal datum of WGS84 for the Delta Western Tank Farm site. The Site is in the southeast quarter of the northwest quarter of Section 21, Township 13 South, Range 55 West of the Seward Meridian, Alaska.

Peter Pan Seafoods is west of the Site. The property east of Site is owned by the City of Dillingham and includes the City of Dillingham port office and storage facility (identified on previous site plans and figures as the Harbor Master office). Main Street is north of the Site. The Nushagak River is south of the Site (Figures 1 and 2).

2.1.2 Fueling Facilities

The Dillingham Auto site includes a portion of the Site office building and fuel service station, which currently are operated by Bristol Alliance Fuels under lease from Delta Western. The service station consists of a single dual-compartment aboveground storage tank (AST) “day tank” that holds 500 gallons of diesel fuel and 2,000 gallons of unleaded gasoline Two dual-hose dispensers are present on a single dispensing island. (Figure 2). Piping at the service station is a mixture of aboveground carbon steel and underground non-metallic pipes. Fuel is supplied to the service station by tanker trucks.

The former Dillingham Automotive Parts and Marine Store (Dillingham Auto) and fueling facility was located southeast of the current Delta Western office building and fueling facility, and included a single 3,000-gallon underground storage tank (UST) and a dispenser, which reportedly were removed by the former owner in 1991 (Shannon & Wilson, Inc. 2005). During the time Delta Western operated the former Dillingham Auto facility, fuel was dispensed from a 2,000-gallon AST with a single dispenser (R&M Engineering, Inc. 1997).

The Delta Western Terminal includes 11 ASTs, including associated active and former truck-loading racks north of the tanks, and a fuel dock. The Delta Western Terminal and associated infrastructure is currently operated by Bristol Alliance Fuels under lease from Delta Western.

The ASTs were installed between approximately 1946 and 1979 with capacities ranging from 500 to 12,360 barrels and currently are used for storage of diesel fuel, unleaded gasoline, aviation

gasoline and jet A fuel (Farallon 2017b). For the purpose of discussion herein, “tank farm” refers to the area of the Site where the ASTs are located (Figure 2).

The following discussion of the terminal fueling facilities at the Site is summarized from Enterprise Engineering, Inc. (2013). Fuel at the terminal is received by barge over the fuel dock pier. The fuel dock is approximately 200 feet long with five 4-inch-diameter fuel lines. The fuel dock piping is located on top of the pier deck and is regulated by the U.S. Coast Guard. The fuel dock piping passes through a concrete utilidor at the head of the dock before entering the tank farm. The fuel dock piping is either above ground or visible in the concrete utilidor, where it passes beneath the head of the dock. The pipelines from the fuel dock are cased through the tank farm secondary-containment dike. Piping in the tank farm is primarily 4-inch-diameter carbon steel pipe with short sections of 3- and 6-inch-diameter carbon steel pipe. All pipelines currently in use in the tank farm are above ground.

The three primary areas of secondary containment for the ASTs are (Figure 2):

- Containment Area 1 around Tank 11;
- Containment Area 2, for Tanks 1 through 9; and
- Containment Area 3, for Tank 10.

The three containment areas are collectively referred to as the secondary containment area (SCA). The SCA is lined with an impermeable reinforced chemical-resistant polyester geomembrane with thermally welded seams that was installed circa 1997. In 2014, the SCA was expanded on the eastern side of Containment Area 3 onto property leased from the City of Dillingham to increase the containment capacity for Containment Areas 2 and 3.

A pump house is present west-adjacent to the tank farm. Four centrifugal pumps are used to transfer fuel from the ASTs to the fuel dock and the truck-loading rack. Fuel can be transferred also by gravity. All piping in and adjacent to the pump house is above ground.

The truck-loading rack consists of five top-loading positions, one each for aviation gasoline, Jet A fuel, diesel fuel, unleaded gasoline, and heating oil. All piping leading to the truck-loading rack is above ground.

2.2 ENVIRONMENTAL SETTING

The Site is in Dillingham, Alaska at the northern end of Nushagak Bay, a large estuary that opens to Bristol Bay. Dillingham is near the confluence of the Wood and Nushagak Rivers. The Nushagak River is tidally influenced at Dillingham and drains to Nushagak Bay. The mean range of tidal elevation variability for the Snag Point tidal station in Dillingham for the period 1983 to 2001 was 16.58 feet (National Oceanic and Atmospheric Administration 2016). Average annual precipitation in Dillingham is approximately 26 inches.

Soil underlying the upper 20 feet of the Site consists of up to several feet of gravelly fill overlying well- to poorly graded sands, silty sands, silts, poorly to well-graded gravels with varying amounts of fines, and clay of varying plasticity. Deeper soil data can be inferred from well logs for water-supply Well Numbers 3 and 4 on the Peter Pan Seafoods property, approximately 155 and 165 feet west-northwest of the Site, respectively (Shannon & Wilson, Inc. 2010). The well log for Well Number 3 indicated that clay was encountered from 25 to 59 feet below ground surface (bgs), underlain by compacted silt to 98 feet bgs, clay with gravel to approximately 130 feet bgs, and gravel and rock to the total depth of the well of 140 feet bgs. The well log for Well Number 4 indicated that fine sand was encountered to 42 feet bgs, underlain by sand and gravel to 45 feet bgs, clay to 84 feet bgs, clay mixed with gravel to 93 feet bgs, and gravel and sand to the total depth of the well of 105 feet bgs.

The upper water-bearing zone at the Site is shallow, with measured depths to groundwater ranging from approximately 2 to 10 feet bgs. In the down-gradient portion of the Site, adjacent to the Nushagak River, the saturated silty sand and sand of the shallow water-bearing zone are underlain by silts and clays beginning at depths ranging from approximately 10 to 15 feet bgs. Highly plastic clay was encountered at correlative, although slightly lower, elevations in the borings for monitoring wells MW-17 and MW-18, which were installed in the intertidal area in 2016, south-adjacent to the seawall on the southern perimeter of the Site.

Groundwater flow direction at the Site is to the south, with a relatively steep hydraulic gradient that steepens near the southern boundary of the terminal property adjacent to the seawall. Tidal fluctuations appear to have little or no influence on groundwater levels in Site monitoring wells (Farallon 2017a and 2017b). The geometric mean of the average hydraulic conductivity values derived from falling and rising head (slug) aquifer tests conducted at the Site in 2017 (Farallon 2017b) was used to determine the mean hydraulic conductivity of 4.38×10^{-4} centimeters/second for the upper aquifer at the Site. Based on this mean hydraulic conductivity value, a groundwater seepage velocity of 154 feet per year was estimated (Farallon 2017b).

2.3 BACKGROUND INFORMATION

An understanding of Site conditions is critical to the evaluation and selection of an Interim Action for the Site. The subsurface conditions at the Site have been adequately characterized through the site characterization activities that have been completed to date. Site-specific considerations for evaluation of feasible remedial alternatives are discussed below.

2.3.1 Nature and Extent of Subsurface Petroleum Hydrocarbon Impacts in Soil and Groundwater

Depths to groundwater are relatively shallow at the Site which has contributed to a complex and relatively widespread distribution of petroleum hydrocarbons in soil and groundwater at the Site. Mean air and subsurface temperatures at the Site are relatively low, which tends to retard the natural attenuation process degrading petroleum hydrocarbons in the subsurface. This effect is illustrated by the relatively high concentrations of benzene that persist in both soil and groundwater. Benzene typically is the most-biodegradable of the BTEX (benzene, toluene,

ethylbenzene, and xylenes) constituents found in gasoline, and in older releases typically is detected at lower concentrations than the other BTEX constituents as a result of natural biodegradation processes.

Three general areas of elevated petroleum hydrocarbon concentrations in groundwater have been identified at the Site: the area of a former UST in the northern area of the Site; the area of a former truck-loading rack west of the current truck-loading rack; and the area west of the current pump house southwest of the tank farm. In general, concentrations of total petroleum hydrocarbons (TPH) as diesel-range organics (DRO) and as gasoline-range organics (GRO), and BTEX constituents in groundwater are highest on the southwestern portion of the Site.

ADEC noted in a letter to Delta Western regarding the Delta Western Tank Farm – Dillingham dated March 18, 2016, "groundwater quality immediately prior to emergence into the Nushagak River is regulated to the applicable 18 AAC 70 water quality standards of 10 µg/l total aromatic hydrocarbons and 15 µg/l total aqueous hydrocarbons." ADEC water-quality standards define TAH as the sum of BTEX constituent concentrations, and TAqH as the sum of concentrations of BTEX and polynuclear aromatic hydrocarbons (PAHs) listed in U.S. Environmental Protection Agency (EPA) Method 610.[2] Concentrations of TAH and TAqH have exceeded ADEC water-quality standards in groundwater samples collected from monitoring wells in the down-gradient area of the Site and from a flowing seep observed on the southwestern corner of the Site.

BTEX concentrations detected in groundwater samples collected from monitoring wells on the southern perimeter of the Site, proximate to the Nushagak River, generally have been orders of magnitude higher than PAH concentrations, Therefore, an Interim Action that reduces concentrations of BTEX constituents in groundwater to meet ADEC surface water-quality criteria for TAH[3] should meet TAqH criteria also. BTEX constituents are volatile organic compounds (VOCs), and amenable to treatment in groundwater using a variety of methods, including air stripping, air sparging, chemical oxidation, and enhanced natural attenuation.

2.3.2 Screening of Interim Action Alternatives

Site-specific factors were taken into consideration for screening of technically feasible and practicable remediation technologies for groundwater treatment at the Site. The Site is an active facility, currently operated by Bristol Alliance Fuels, and remedial actions will need to minimize disruptions to fueling operations during implementation.

Remedial technologies that rely on mechanized systems likely are impracticable at the Site due to seasonal freezing conditions that would require regular operation and maintenance to achieve

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[2] Acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene.

[3] Petroleum hydrocarbons, oils, and grease for marine water uses for growth and propagation of fish, shellfish, other aquatic life, and wildlife (18 AAC 70.020).

Interim Action goals. This constraint eliminates potential remedial technologies such as air sparging or pumping and treating groundwater that are commonly used to treat BTEX and other petroleum hydrocarbon-related compounds in groundwater at sites in more-favorable climates. The relatively remote location of the Site and the seasonally adverse climate were considerations in eliminating technologies that require frequent operation and maintenance, potential equipment repair and/or replacement, and/or frequent testing and replacement of treatment media.

The seawall at the Site consists of steel sheet piling, which forms part of the secondary containment wall south of the tank farm. Therefore, strong oxidizers injected to treat groundwater likely would be detrimental to the structural integrity of the sheet piling. Test pits excavated in 2013 to assess SCA integrity showed that the sheet pile seawall on the southern side of Tank 10 extended at least 15 feet bgs into the intertidal area.

A reactive barrier could be emplaced to bind BTEX and other petroleum hydrocarbons via sorption to reactive media such as activation carbon or by chemically transforming the contaminants into nontoxic by-products. Reactive barriers can be emplaced through trenching, soil-mixing methods using large-diameter augers, or via injection methods. Trenching and soil-mixing methods were eliminated from consideration due to stability concerns regarding the proximity to Tank 10, the likely presence of sheet pile tiebacks, and the need to mobilize relatively large excavation or drilling equipment into the SCA to implement these methods.

3.0 INTERIM ACTION DESCRIPTION AND IMPLEMENTATION

3.1 INTERIM ACTION DESCRIPTION

Based on consideration of the Site conditions discussed above, emplacement of a permeable reactive barrier that would extend across the southern perimeter of the Site was selected as the Interim Action to mitigate the potential discharge of dissolved-phase petroleum hydrocarbons in groundwater to the Nushagak River while allowing terminal operations to continue without significant interruption. The proposed barrier will extend from within the SCA south of Tank 10 to the western Site boundary (Figure 3).

Reactive barriers are a proven technology for treatment of groundwater. Recent technological developments have formulated liquid-activated carbon-based solutions using micron-sized carbon particles that can be effectively injected into the subsurface to form a reactive barrier rather than emplaced as a solid material in an excavated treatment trench or mixed into soil using augers.

Following review of several injectable liquid- and solid-activated carbon-based products, the injectable liquid-activated carbon-based product PetroFix, manufactured by Regenesis of San Clemente, California, was selected for the permeable barrier injections at the Site. PetroFix is composed of micron-sized particles of activated carbon suspended in water that binds organic contaminants as they pass through the aquifer matrix. PetroFix will be emplaced in the subsurface through dispersive flow via low-pressure injection using direct-push drilling methods, providing a thin-film coating of the aquifer matrix. Organic contaminants in groundwater partition directly into the carbon particles sorbed to the soil matrix in the saturated zone, thus removing contaminants from groundwater. Once the organic petroleum hydrocarbon contaminants have been bound, contaminant advection in the aqueous phase is eliminated, and partitioning into the vapor phase is reduced.

Once bound to the carbon, petroleum hydrocarbons are expected to biodegrade. Petroleum-degrading bacteria are ubiquitous in the subsurface, and have been documented by Regenesis to colonize the activated carbon material more prolifically than native soil. Degradation of sorbed contaminants is necessary to prolong the longer-term sorptive capacity of the injected material.

3.2 INTERIM ACTION IMPLEMENTATION

The barrier design proposed for the PetroFix injections developed by Regenesis assumes a total of 8,256 gallons of PetroFix injected into 48 direct-push injection points at 5-foot spacing (Figure 3). An estimated injection volume of 172 gallons per point (17 gallons per foot) was calculated by Regenesis based on a 10-foot vertical injection interval and assumptions regarding porosity/permeability provided by Farallon. The final injection point numbers and locations will be determined in the field based on logistical considerations.

The injections will be conducted by GeoTek Alaska, Inc. of Anchorage, Alaska using direct-push drilling methods with a rubber-tracked limited-access combination direct-push and hollow-stem

auger drill rig. The drill rig will be lifted over the SCA wall using an excavator or crane to access the area for injections inside the SCA. The drill rig will be moved into the SCA on drill mats or plywood to prevent damage to the SCA liner.

Approximately 480 pounds of an electron acceptor blend consisting of ammonium sulfate and sodium nitrate will be mixed into the PetroFix solution to promote biodegradation of petroleum hydrocarbons sorbed to the carbon substrate. The barrier is designed to last approximately 5 to 10 years without the addition of any supplemental electron acceptors. Natural attenuation parameters will be monitored as part of performance groundwater monitoring activities to evaluate the potential need for future biodegradation augmentation through introduction of additional electron acceptors via additional injection points or monitoring wells.

The target injection zone for the PetroFix solution is from the top of the silt or clay unit, which was encountered in borings previously drilled in the down-gradient area of the Site, to 1 to 2 feet above the high water table. The depths to the silt/clay unit and the water table will be determined from the stratigraphy encountered during installation of four new monitoring wells along the injection alignment, discussed in Section 4, Monitoring Well Installation and Soil Sampling. Based on the lithology encountered in previous borings in the southern portion of the Site, the depth to the silt/clay unit is anticipated to be 15 to 20 feet bgs along the injection point alignment.

Approval of the injections will be required by the EPA Region 10 Underground Injection Control Program. Once the scope of work has been approved by ADEC, Farallon will submit Inventory of Injection Well Form 7520-16 and pertinent project and product information, including safety data sheets for the PetroFix and the electron acceptor blend materials, to EPA for review as part of the permitting process.

Before the injection point and monitoring well borings are drilled, the boring locations will be cleared for subsurface utilities in consultation with Delta Western and/or Bristol Alliance Fuels personnel and using a private utility locating contractor equipped with groundwater penetrating radar and metal detecting equipment. The injection point and well locations will be adjusted as necessary based on the findings from the utility locating.

Installation of the injection borings and of three of the four new monitoring wells in the tank farm SCA will require a temporary waiver from ADEC of the secondary-containment requirements for aboveground oil storage tanks established in 18 AAC 75.075(a) to allow for breaching of the containment liner during the installation procedures. The waiver request will be submitted by Farallon following ADEC approval of this Work Plan. Following completion of the injection activities, the secondary containment liner will be sealed at each injection point and around the well monuments in the SCA by a qualified contractor to meet secondary-containment-liner specifications.

4.0 MONITORING WELL INSTALLATION AND SOIL SAMPLING

Four new monitoring wells are proposed to be installed along and down-gradient of the injection point alignment as performance groundwater monitoring locations to assess the effectiveness of the reactive barrier. Three of the proposed monitoring wells will be in the SCA, and one near the western extent of the injection point alignment (Figure 3). Existing monitoring well MW-16 will provide an additional monitoring point down-gradient of the injection point alignment west of the tank farm. The westernmost new monitoring well will be in the vicinity of the seep that has been observed in the southwestern area of the Site and sampled. Seep sampling for future monitoring events will be replaced by sampling the new monitoring well which should yield more representative samples than can be obtained from sampling the seep which requires digging a sump in the rock fill and waiting for the resulting suspended sediment to settle out. The monitoring wells will be installed prior to the PetroFix injections so stratigraphic information obtained from the borings for the wells can be used to refine the optimal injection depth interval along the reactive barrier alignment.

4.1 MONITORING WELL INSTALLATION

The final locations of the new monitoring wells will depend on logistical considerations such as access, and proximity to above- and below-ground structures or utilities. Before the borings are drilled, the boring locations will be cleared in consultation with Delta Western and/or Bristol Alliance Fuels personnel and using a private utility locating contractor. If the boring locations for the monitoring wells cannot be conclusively cleared of the presence of subsurface utilities, a hand auger will be used to clear the boring locations.

The monitoring wells will be installed by GeoTek Alaska, Inc. using the rubber-tracked limited-access combination direct-push and hollow-stem auger drill rig used for the injections. The monitoring well borings are anticipated to be drilled using direct-push methods but may be installed using hollow-stem-auger drilling methods, if needed, depending on drilling conditions. The drill rig will be lifted over the SCA wall using an excavator or crane to access the area in the SCA for the monitoring well installations. The drill rig will be moved into the SCA on drill mats or plywood to prevent damage to the SCA liner.

During advancement of the borings, lithology will be logged in accordance with the Unified Soil Classification System and ASTM International Standard D2488-06, *Standard Practice for Description and Identification of Soils.* Evidence of potential contamination such as elevated photoionization detector readings, unusual odor, discoloration, or sheen also will be noted.

The monitoring wells will be constructed of 2-inch-diameter Schedule 40 polyvinyl chloride casing with a 10-foot-long, 0.010- or 0.020-inch machine-slotted well screen using a pre-packed silica sand stainless steel mesh-wrapped filter pack. If feasible, silica sand will be emplaced around the screened interval. Hydrated granular or powdered bentonite will be emplaced above the filter pack. The monitoring wells will be installed to depths that allow the screened intervals to extend across the depth of groundwater encountered while drilling, with consideration for seasonal

variations noted during previous groundwater monitoring events. The monitoring wells inside the SCA will be completed using aboveground well monuments. The secondary containment liner will be sealed around the well monuments by a qualified contractor to meet secondary containment liner specifications in conjunction with the sealing of the Interim Action injection point liner perforations. The monitoring well outside of the SCA will be completed using a traffic-rated flush grade monument set in concrete.

The soil generated from the borings will be stored in labeled drums on the Site, outside the tank farm SCA, pending arrangements for disposal, discussed in Section 6.0, Management of Investigation-Derived Waste.

Each monitoring well will be developed using a surge block and a bailer to remove fine-grained material from the well and sand pack to optimize fluid flow from the formation to the well. Development water will be placed into a labeled drum(s), and characterized and handled as described in Section 6.0, Management of Investigation-Derived Waste.

The new monitoring wells will be surveyed and tied into the coordinate system and datum used for other Site monitoring wells, for use in constructing potentiometric surface elevation maps as part of the periodic groundwater monitoring events. The timing of the survey will depend on the availability of Southwest Alaska Surveying, who performed the past two surveys at the Site.

4.2 SOIL SAMPLING AND ANALYSIS

This section describes the collection of soil samples and analytical procedures during the installation of the new monitoring wells at the Site. Soil samples will be continuously collected from the borings for the monitoring wells using a 5-foot-long core barrel with disposable polyvinyl chloride liners. Soil samples will be screened for field evidence of petroleum hydrocarbon contamination with a photoionization detector calibrated using isobutylene span gas and ambient air as a zero gas. Other field-screening methods will include visual observation of staining or discoloration. Two soil samples from each boring will be retained for chemical analysis. One retained soil sample from each boring will be “worst case” for the boring, based on field evidence of petroleum hydrocarbon contamination, if present. At least one soil sample will be collected from the vadose zone, which is anticipated to be in the upper 8 to 10 feet bgs in the area of the new monitoring wells.

The soil samples will be analyzed for:

- GRO using Alaska Method AK 101;
- DRO using Alaska Method AK 102;
- Total petroleum hydrocarbons as residual-range organics (RRO) using Alaska Method AK 103; and
- BTEX using EPA Method 8021B.

One duplicate soil sample, blind to the analytical laboratory, will be collected and analyzed for GRO, DRO, RRO, and BTEX for quality assurance/quality control purposes.

5.0 GROUNDWATER SAMPLING

This section describes the sampling and analytical procedures for collection of groundwater samples at the Site and the anticipated near-term schedule for groundwater monitoring.

5.1 SITE-WIDE GROUNDWATER SAMPLING METHODS

Following completion of the new monitoring well installation and injection activities, a Site-wide groundwater monitoring event will be conducted. Groundwater samples will be collected from new monitoring wells and monitoring wells B1MW through B4MW, TW-2, MW-5R, MW-6 through MW-10, MW-11R, MW-12 through MW-16, and MW-19 through MW-26 (Figure 2). The sampling activities will be conducted by a qualified sampler as defined in 18 AAC 75.333, and in accordance with the ADEC (2019) *Field Sampling Guidance*.

Prior to sampling, the monitoring wells will be purged at groundwater extraction flow rates of 100 to 150 milliliters per minute. Groundwater samples will be collected using low-flow sampling methods and an electric submersible pump and a water-quality analyzer equipped with a flow-through cell to determine stabilization of water-quality parameters. During sampling, the pump intake will be placed approximately 1 foot below the groundwater surface in each monitoring well. If the well draws down to the level of the pump intake at the target groundwater extraction rates, the pump intake will be placed lower in the water column (e.g., 2 feet below the initial water surface).

The water-quality parameters temperature, specific conductivity, pH, dissolved-oxygen content, and oxidation-reduction potential will be recorded approximately every 3 minutes until stabilization is achieved. Groundwater samples will be collected when the water-quality parameters temperature, specific conductivity, and pH have stabilized. Stabilization for temperature and specific conductivity is defined as a relative percent difference of less than 3 percent for three consecutive measurements. Stabilization for pH is defined as a change less than 0.1 pH unit for three consecutive measurements.

Following purging, groundwater samples will be collected directly from the pump outlet tubing into laboratory-prepared sample containers. The samples will be placed on ice in a cooler and transported under standard chain-of-custody protocols to SGS North America Inc. in Anchorage, Alaska. SGS North America Inc. is an ADEC-approved laboratory assigned Contaminated Sites Laboratory Approval No. UST-005.

5.2 GROUNDWATER ANALYTICAL METHODS

The groundwater samples will be analyzed for:

- GRO using Alaska Method AK 101;
- DRO using Alaska Method AK 102;

- RRO using Alaska Method AK 103; and
- BTEX using EPA Method 8021B.

Groundwater samples collected from monitoring wells MW-10, MW-11R, MW-16, and MW-26 and the four new monitoring wells will also be analyzed for:

- VOCs using EPA Method 8260C;
- PAHs using EPA Method 8270D SIM; and
- Natural attenuation parameters:
    - Sulfate using EPA Method 300;
    - Total nitrate/nitrite-N using Standard Method 4500; and
    - Ferrous iron (II) and manganese (II) using colorimetric test kits.

BTEX constituent concentrations for groundwater samples from these monitoring wells will be summed to determine TAH concentrations; BTEX and select PAH[4] constituent concentrations will be summed to determine the TAqH concentration for comparison to 18 AAC 70 water-quality standards. The analytical results for groundwater samples from monitoring wells MW-10, MW-11R, and MW-26 will be compared to the results for groundwater samples from monitoring well MW-16 and the four new monitoring wells to assess the effectiveness of the reactive barrier in reducing dissolved-phase petroleum hydrocarbon concentrations in groundwater.

Three duplicate groundwater samples, blind to the analytical laboratory, will be collected and analyzed for GRO, DRO, RRO, and BTEX constituents for quality assurance/quality control purposes. The monitoring wells selected for duplicate sample collection will include one of the wells selected for VOC analysis and one of the wells selected for PAH analysis. A trip blank from each cooler will be analyzed for GRO and BTEX constituents.

5.3 PERFORMANCE SAMPLING METHODS

Performance groundwater monitoring events that involve sampling the monitoring wells immediately up-gradient and down-gradient of the injection alignment will be conducted between Site-wide monitoring events to monitor the effectiveness of the Interim Action. Monitoring wells MW-10, MW-11R, MW-16, MW-23, MW-24, MW-26 and the four new monitoring wells will be monitored and sampled for the performance monitoring events. The sampling and monitoring methods for the performance monitoring events will be the same as those for the Site-wide monitoring event described in Section 5.1, Site-Wide Groundwater Sampling Methods, and Section 5.2, Groundwater Analytical Methods. One set of duplicate groundwater samples, blind to

[4] Acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene.

the analytical laboratory, will be collected and analyzed for GRO, DRO, RRO, VOCs, and PAHs for quality assurance/quality control purposes during the performance groundwater monitoring event.

5.4 GROUNDWATER MONITORING SCHEDULE

The Site-wide groundwater monitoring event will be conducted immediately following completion of the injection and monitoring well installation activities. The first performance monitoring event will be conducted in September 2020 to assess the initial effectiveness of the Interim Action.

Groundwater monitoring events are anticipated to be conducted at the Site twice a year initially (2020 and 2021) to evaluate the performance of the Interim Action and whether the biodegradation supplements must be augmented to maintain the sorptive capacity of the permeable reactive barrier wall. The scope of work and frequency for groundwater monitoring beyond 2021 will be discussed with ADEC following review of the 2021 monitoring results. The monitoring events for 2020 and 2021 will consist of a Site-wide groundwater monitoring event each spring or early summer[5] followed by a performance monitoring event in late summer or fall. The exact timing of the groundwater monitoring events will depend on weather conditions and travel restrictions related to the Covid-19 pandemic but are anticipated to be conducted in late June each year for the Site-wide monitoring event, and in August or September for the performance monitoring event.

[5] Immediately following completion of injections in 2020

6.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Investigation-derived waste generated by the sampling activities is anticipated to include soil generated from the monitoring well installations, well development and purge water, and disposable personal protective clothing (e.g., nitrile gloves). Investigation-derived waste soil and water will be placed into separate labeled U.S. Department of Transportation–approved drums and temporarily stored on the Site pending receipt of laboratory analytical data for waste profiling. These drums will be placed inside or covered to prevent potential exposure to rainwater. It is anticipated that only a single drum each of waste soil and water will be generated during the monitoring well installation and sampling activities. Prior to mobilization to the Site, Farallon will contact selected waste disposal contractors regarding any additional sampling requirements for waste material. Disposable personal protective clothing and disposable sampling devices will be cleaned, placed into plastic garbage bags, and disposed of as nonhazardous solid waste.

Farallon will assist Delta Western in arranging for shipment of the waste to an authorized disposal facility once the profiling has been completed. Waste-related documentation will be maintained in the project file.

7.0 REPORTING

Following completion of the 2020 field activities, analytical and field-testing results will be reviewed and tabulated. The results from the sampling and monitoring activities will be documented in the 2020 Interim Removal Action Report. The report will include the following:

- A summary of the Interim Action injection activities;
- A summary of the monitoring well installation methods and activities;
- A summary of the 2020 groundwater sampling methods and activities;
- A summary of depth-to-groundwater measurements;
- Figures depicting monitoring well locations, groundwater elevation contours, and groundwater analytical results;
- Summary tables and a discussion of groundwater and soil sampling results;
- A discussion of waste handling and disposal activities; and
- Conclusions regarding the initial performance of the reactive barrier.

The 2020 Interim Removal Action Report will be provided to ADEC for review and comment within 45 days of receipt and quality assurance/quality control review of the analytical data from the September 2020 performance groundwater monitoring event.

8.0 REFERENCES

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FIGURES

INTERIM REMOVAL ACTION WORK PLAN
Delta Western Terminal
Dillingham, Alaska
Farallon PN: 1010-004

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FIGURE 1

SITE VICINITY MAP
DELTA WESTERN TERMINAL
DILLINGHAM, ALASKA

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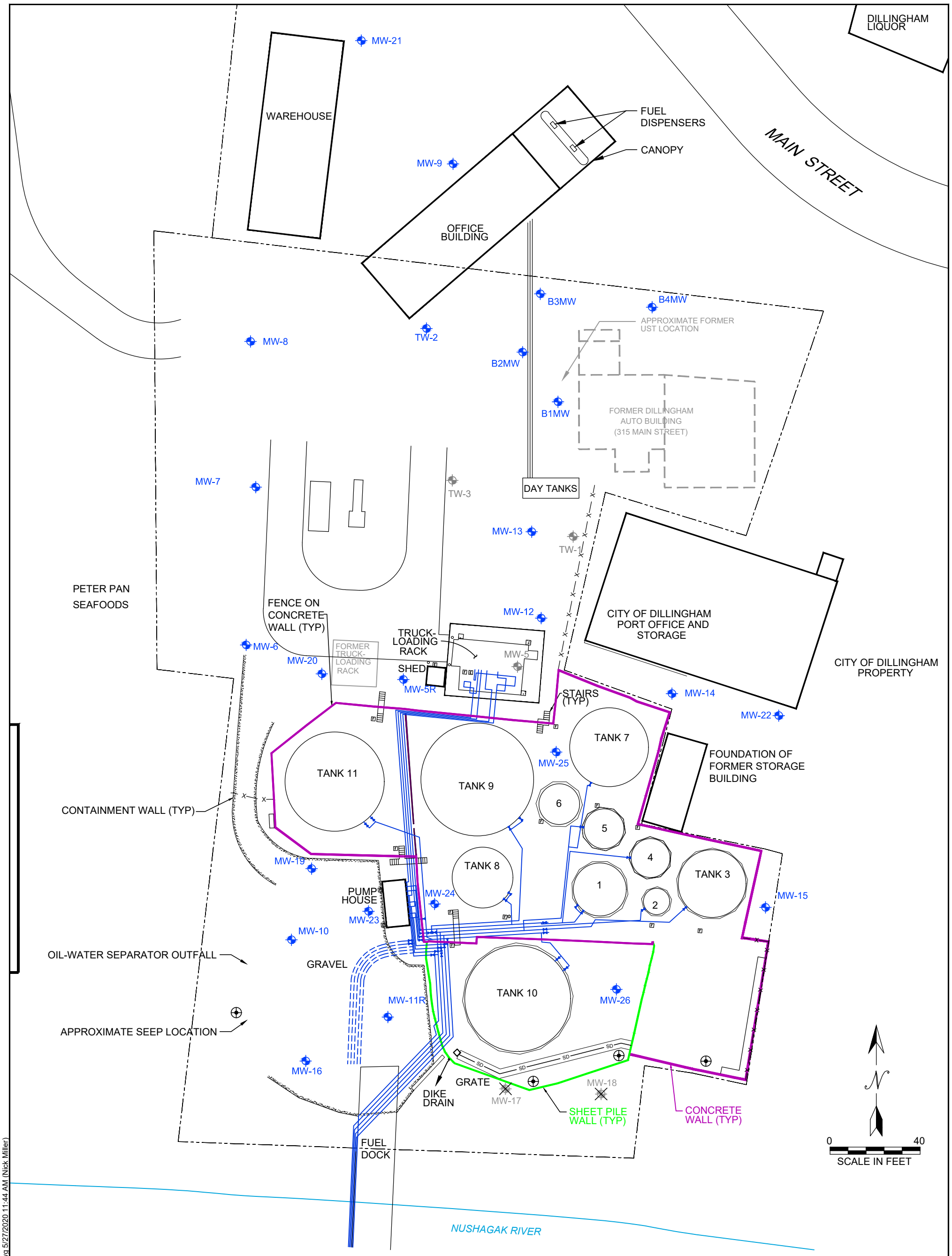

LEGEND

- PROPERTY BOUNDARY
- PRODUCT PIPING
- APPROXIMATE LOCATION OF SUSPECTED ABANDONED BURIED PIPELINES
- FENCE
- STORM DRAIN
- MW-18 MONITORING WELL
- MW-5 MONITORING WELL (DECOMMISSIONED)
- MW-17 MONITORING WELL (DESTROYED)

ALL LOCATIONS ARE APPROXIMATE

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FIGURE 2

SITE PLAN
DELTA WESTERN TERMINAL
DILLINGHAM, ALASKA

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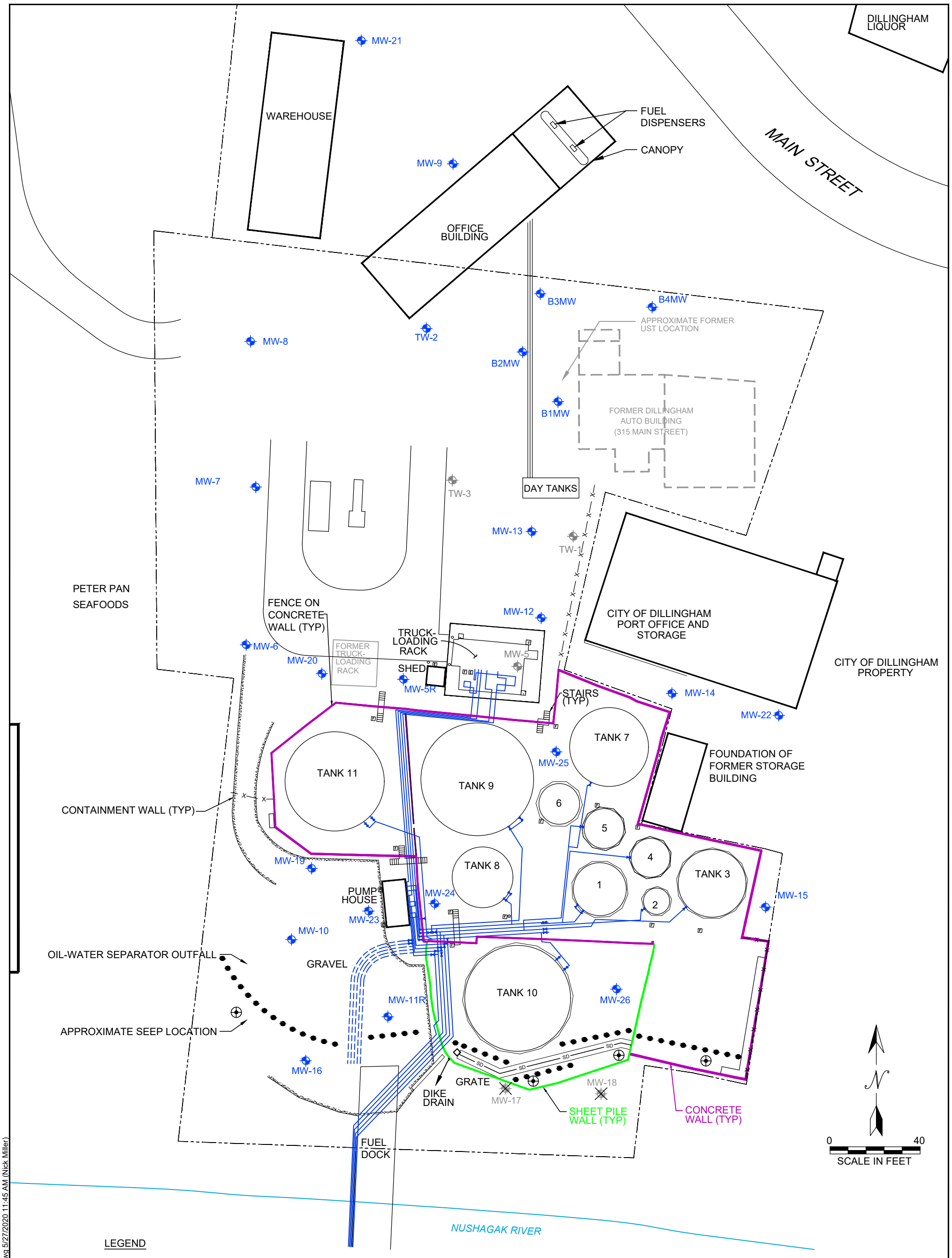

LEGEND

- PROPERTY BOUNDARY
- PRODUCT PIPING
- APPROXIMATE LOCATION OF SUSPECTED ABANDONED BURIED PIPELINES
- FENCE
- STORM DRAIN
- MW-18 MONITORING WELL
- MW-5 MONITORING WELL (DECOMMISSIONED)
- MW-17 MONITORING WELL (DESTROYED)
- PROPOSED INJECTION POINT
- PROPOSED MONITORING WELL

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FIGURE 3

SITE PLAN
SHOWING CONCEPTUAL INJECTION POINTS AND MONITORING WELLS
DELTA WESTERN TERMINAL
DILLINGHAM, ALASKA

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