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Engineering & Environmental Services

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Washington Department of Ecology
Northwest Regional Office Toxics Control Program
3190 – 160th Ave. SE
Bellevue, WA 98008-5452
Attn: Ms. Tamara Cardona

FINAL CONTINGENT ACTION ADDENDUM TO THE
FINAL INTERIM ACTION WORK PLAN
FORMER AMERICAN LINEN SUPPLY CO - DEXTER AVE SITE
AGREED ORDER NO. DE 14302

Dear Ms. Cardona:

PES Environmental, Inc. ("PES") has prepared this Final Contingent Action Addendum ("CAA") to the Final Interim Action Work Plan ("IAWP")[1] on behalf of BMR-Dexter LLC ("BMRD") for the Former American Linen Supply Co - Dexter Ave Site ("Site") located at 700 Dexter Avenue North, Seattle, Washington. The IAWP describes the cleanup actions that will be performed on and immediately adjacent to the Property to treat soil and groundwater contaminated by chlorinated volatile organic compounds ("CVOCs"), including tetrachloroethene ("PCE") and its daughter products, and petroleum hydrocarbons. The interim actions described in the IAWP are integrated into the property redevelopment (two 14-story office towers over three levels of subgrade parking), and are being performed prior to, during, and after the redevelopment construction. The IAWP described the approach for providing access to the area beneath the proposed development for performance monitoring and contingent source area treatment, which included the installation of monitoring and injection wells beneath the proposed building. As described in the IAWP, the CAA's purpose is to provide the contingent action design, including the number, location, and depth of proposed monitoring and injection wells, and describe the criteria to be used to determine when the contingent action (i.e., further injection of treatment agents) will be required.

This CAA was prepared consistent with the IAWP and in accordance with the requirements of Agreed Order No. DE 14302 ("AO") between the State of Washington Department of Ecology ("Ecology") and BMRD, and specifically to fulfill the requirements in AO Sections VI.G and VII.K. The interim action, including implementing as necessary the contingent actions described in this addendum, is being conducted concurrently with conducting a remedial investigation ("RI") and feasibility study ("FS") that are also requirements of the AO (Sections VII.A through VII.D).

For the purpose of this CAA, the word "Site" refers to an area where contamination released at the property located at 700 Dexter Avenue North has come to be located, consistent with the definition

[1] PES Environmental, Inc. 2018. *Final Interim Action Work Plan, American Linen Supply Co-Dexter Avenue Site, 700 Dexter Avenue North, Seattle, Washington.* August.

of "site" or "facility" in the Washington Model Toxics Control Act ("MTCA", Chapter 173-340 of the Washington Administrative Code ("WAC")). The word "Property" refers to the area within the 700 Dexter Avenue North property boundary.

BACKGROUND

This section provides a brief summary of the interim action, including the objectives and specific actions taken to meet them.

Summary of the Interim Action

As described in the IAWP, the interim action will accomplish the following four objectives:

1. Reducing the mass of CVOC and petroleum hydrocarbon contaminants remaining in saturated soil and groundwater on the Property.

2. Controlling migration of contaminants from the Property to provide long-term protection of downgradient human and environmental receptors.

3. Controlling migration of contaminants into the proposed redevelopment through installation of a vapor intrusion barrier system during building construction.

4. Providing for continued treatment of residual source area contamination, as necessary, after the Property development activities are completed.

The following paragraphs describe the interim action elements that are being implemented to achieve the above objectives, as described in detail in the IAWP. Briefly, the interim action reduces the mass of contamination that remains on the Property through a combination of (1) removal (through excavation) and (2) *in situ* treatment of contaminants in the saturated soil and groundwater beneath the excavation. The excavation will be completed as part of the planned building construction and will remove unsaturated and saturated soil to an elevation of 11.1 feet (approximately 29 to 39 feet below ground surface, depending on the location on the Property). An additional 0.5 to 9.5 feet of soil will be excavated from portions of the Property (down to elevations ranging from 1.6 feet to 10.6 feet) to facilitate construction of thickened portions of the foundation. Additional contaminant mass will be removed from groundwater that is extracted during the dewatering that will be conducted to facilitate soil excavation.

The use of *in situ* treatment beneath the development excavation will address contamination in the lower portion of the Intermediate A Zone, the Intermediate B Zone, and the upper portion of the Deep Zone.[2] The *in situ* technologies selected for the interim action include (1) *in situ* chemical oxidation ("ISCO") using modified Fenton's Reagent ("MFR") as the oxidant, and (2) enhanced reductive dechlorination ("ERD") using emulsified vegetable oil ("EVO") as the carbon substrate. These technologies will be implemented in a phased approach as follows:

[2] Section 7.2 of the IAWP discusses the hydrostratigraphy of the Property. Briefly, the Intermediate A and B Zones are dense to very dense, semi-confined to confined water-bearing zones in the glacial and interglacial soils generally found between elevations -45 and 20 feet. The Deep Zone is a deeper, very dense, confined water-bearing zone in the outwash deposits found below elevation -45 feet.

- Conduct three applications of ISCO using MFR to significantly reduce the mass of contamination (the first round of ISCO injections was completed on October 3, 2018); and
- After Ecology has reviewed and approved this CAA and the final MFR injection has had time to fully react, inject EVO and bioaugmentation cultures into the subsurface.

Control of contaminant migration from the Property will be accomplished by providing additional treatment through a perimeter *in situ* treatment system utilizing a series of 100 injection wells installed at 50 locations along 8th Avenue North and Roy Street on the downgradient perimeter of the Property.

Migration of contaminants into the proposed redevelopment structures will be prevented by installing a single membrane system that combines waterproofing and a contaminant vapor protection beneath and up the sides of the building. The waterproofing and vapor barrier system will prevent the migration of contaminated groundwater and/or contaminant vapors into the occupied portions of the buildings. Details of this system, including the design and installation procedures, are provided in the memorandum entitled "700 Dexter – Below Grade Waterproofing and Vapor Control" prepared by Morrison Hershfield and submitted to Ecology on October 18 to fulfill the requirements of the Vapor Intrusion Addendum required in the IAWP.

The final objective of the interim action, providing for continued treatment of residual source area contamination beneath the building, is the subject of this CAA and is described below.

Contingent Action Overview

The IAWP summarizes PES's evaluation of reasonable and feasible contingent actions for providing access beneath the proposed building to conduct performance monitoring and/or continued source area treatment. As part of this evaluation, PES assessed the building design to determine where penetrations of the building foundation are possible (and where they are not), and how wells installed through the foundation could be completed, sampled, and/or used for future treatment injections. PES concluded that installing monitoring and injection wells beneath the building is a viable and reasonable approach for providing ongoing treatment beneath the Property, and is consistent with the other approved interim action work elements. These injection wells can be used to inject additional EVO into the subsurface if and when the groundwater monitoring results indicate that additional treatment is necessary to meet the interim action and long-term cleanup objectives.

Implementing this approach will require the design and installation of both monitoring and injection wells beneath the building during its construction (it is not feasible to install these wells after the building is constructed). With this infrastructure in place, ongoing monitoring will generate data that can be compared to performance criteria to determine if and when additional EVO injections should occur. The injection and monitoring well network design, the monitoring plan, and performance criteria are described below.

INJECTION AND MONITORING WELL SYSTEM DESIGN

Constructing and utilizing injection wells inside the garage of the proposed building presents two main challenges: (1) where the wells can be located and (2) how the surface completions of the wells are constructed.

Factors Affecting Location of Wells

Foundation Structural Design Considerations

The foundation system for the project consists of a mat foundation under the entire project site. The minimum mat thickness is 2.5 feet, with significant portions of the mat varying from 0.5 to 10 feet thicker (i.e., 3 to 12.5 feet thick) in areas of high loads, such as below columns, structural steel braced frames, and shear walls. The lowest level of the basement is below the water table, so the mat foundation also resists the hydrostatic forces (uplift). Within the 2.5-foot sections of the mat, there are two layers of reinforcing bars ("rebar"), one near the top and one near the bottom, that typically consist of 1.5-inch-thick steel rebar installed in a grid 1-foot on center. Additional reinforcing is provided in the thicker sections.

According to the structural engineers for the building design (Magnusson Klemencic Associates), wells completed through this mat foundation create discontinuities within the structure that must be accounted for and carefully located in order not to compromise the integrity of the building's primary structure. Structural considerations for locating the wells through the mat foundation include:

- Locating well penetrations within the 2.5-foot-thick zones of the mat is generally acceptable, provided they are located a minimum of 7 feet clear of columns. Stresses within the mat are lower in these regions, and the reinforcing steel is spaced further apart;
- Wells cannot overlap with column, shear wall, and foundation wall locations; and
- Well penetrations cannot occur within the thickened areas of the mat foundation, as the discontinuity decreases the punching shear resistance of the mat foundation. These regions are also highly reinforced with large diameter and closely spaced steel reinforcing bars. Locating wells within these regions decreases the structural capacity of the foundation and may not be physically possible due to the density of the reinforcing.

Operational Constraints

In addition to the structural considerations summarized above, there are several areas where operational conditions limit where wells can be installed, including:

- The ramp from the second level parking down to the basement level, where the wells would be installed (i.e., wells installed under the ramp would not be accessible for treatment injections);
- The locations of the stormwater detention and fire water storage tanks. These tanks are generally full of water and are not suitable locations for injection wells;

- The location(s) of the garage ventilation equipment, vent shafts, and other mechanical rooms; and
- The elevator lobby and staircases.

The remaining portions of the bottom level of the garage are primarily parking and driveway areas that can accommodate installation of a well, and also provide future access to the wells for monitoring and/or injections.

The structural considerations and operational constraints summarized above were translated onto the building foundation plan to create a drawing that shows where it is possible and not possible to install injection or monitoring wells (Drawing 1). As shown on Drawing 1, areas that can accommodate installation of wells include "corridors" around the perimeter of the building, inside the exterior support columns, and around the main building core support areas in the central portions of the building. This arrangement provides good coverage across the full building footprint, including in four north-south oriented corridors perpendicular to the predominantly easterly groundwater flow direction.

Contaminant Distribution

In addition to showing where wells can be constructed due to structural and operational constraints, Drawing 1 also shows the location of the existing 157 injection wells completed at four different depth intervals that are being used to conduct three rounds of ISCO injections and one round of EVO injection prior to construction of the building. As described in detail in Section 9.4 of the IAWP, the existing injection wells are distributed to treat CVOCs in soil and groundwater in source areas where the PCE concentrations exceed 0.5 mg/kg, and specifically at the two primary areas of high CVOC concentrations present at the Property: near the former western boiler room (located in the southwestern portion of the Property), and near the former loading dock (located in the north-central portion of the Property). These two areas are discussed in detail in IAWP Section 7.3.5.

The four rounds of *in situ* treatment conducted prior to excavation will reduce the mass of contaminants present on the Property, and also reduce the CVOC concentrations in both soil and groundwater. For purposes of this addendum, the lateral extent of these pre-construction injection wells will be used to guide where the contingent action injection and monitoring wells should be located. Areas outside of the pre-construction injection well field generally have a much lower concentration of CVOCs in soil and groundwater. By treating the source areas identified in the IAWP, CVOC concentrations in these peripheral areas will also decline over time.

Factors Affecting Well Design

The factors that affect the design of the contingent action injection and monitoring wells, include the design of the foundation itself (e.g., thickness and rebar); the water table conditions present on the Property and, specifically, beneath the building foundation; and the waterproofing and vapor barrier system.

Foundation Design

The thickness of the mat foundation in the areas where injection and monitoring wells can be installed is 2.5 feet. Within this thickness, there will be two mats of rebar that generally consist of a 1-foot on center grid of 1.5-inch-diameter steel reinforcing bar. Either the design of the top of the well, including the monument, needs to fit within this mat foundation and its rebar, or the rebar spacing needs to be modified at the well locations.

Groundwater Elevations Beneath the Building

The elevation of the top of the mat foundation (i.e., the top of floor for the lowest parking level, referred to as P3) is 13.9 feet. Based on historical groundwater level monitoring conducted on and adjacent to the Property, groundwater elevations in the shallow and intermediate water-bearing zones typically range from 20 feet to 38 feet, depending on seasonal variability and the impacts of dewatering activities conducted in the South Lake Union area. This difference in the elevation of the top of mat foundation/P3 floor and the groundwater levels means the top of the P3 floor is approximately 6 feet to 24 feet below the surrounding groundwater elevation. Therefore, the static water level of a monitoring or injection well completed through P3 would extend approximately 6 to 24 feet above the top of P3.

The water table conditions summarized above need to be accounted for in the well design in two ways: (1) preventing water within the well from entering the garage when the well is not in use, and (2) preventing groundwater from migrating up the sides of the well casing through the waterproofing and foundation. Regarding the first item, there are two general approaches to addressing this issue. The first is to extend the well casing up to an elevation above the seasonal high groundwater elevation. The second is to install the wells in the bottom of the building garage, flush with the lowest parking level floor; because the top of these wells would be approximately 6 to 24 feet below the surrounding groundwater elevations (depending on the water bearing zone), the wells would require a water-tight well head with a flow control feature (e.g., valve or plug) to prevent water from entering the garage due to the higher surrounding groundwater elevations.

Completing the wells above the high water level would require extending the casings completely through the P3 parking level (lowest level), through the reinforced concrete slab of the first and second parking levels (P1 and P2), and into the first parking level (P1). Based on input from Magnusson Klemencic Associates, penetrations through these elevated slabs (P1 and P2) must be located a minimum of 5 feet clear of the column lines, as these are areas that are highly reinforced and have post-tensioning tendons embedded within the slab. The density of reinforcing, post-tensioning tendons and stud rails within the slab limits the physical ability to place a well sleeve within close proximity to the columns. Since the wells cannot be placed near columns, they would end up in active driveways and parking strips, where it is not clear that they could be protected while maintaining the parking structure's functionality. For these reasons, this approach to completing the wells was considered infeasible, and the approach of completing the wells in the P3 floor and using a valve to control/prevent flow into the garage was selected to address the water table conditions.

The second design consideration, migration of groundwater upwards around the well casing, will be addressed by employing appropriate well construction methods (well seal) and other barriers to groundwater flow integrated into the foundation design and construction. These well construction methods and relevant foundation design components are discussed below.

Waterproofing and Vapor Intrusion Barrier

Details of this system, including the design summary and installation procedures, are provided in the memorandum entitled "700 Dexter – Below Grade Waterproofing and Vapor Control" prepared by Morrison Hershfield and submitted to Ecology on October 18, 2018 to fulfill the requirements of the Vapor Intrusion Addendum required in the IAWP. As detailed in the memorandum, the waterproofing and contaminant vapor barrier system selected for this project consists of Cetco Coreflex 60, which consists of a 60-mil thick thermoplastic membrane integrally bonded to a hydrophilic "Active Polymer Core" ("APC"). The thermoplastic membrane serves as the primary waterproofing and contaminant vapor migration protection, and the APC, which swells when exposed to water, provides a secondary waterproofing barrier. The Cetco membrane will be installed beneath the entire building footprint and extend up the garage walls to provide a protective envelope preventing the intrusion of both contaminated groundwater and vapors into the building garage and the above structures.

With respect to the contingent action wells, it is critical that the wells are designed such that the integrity of the waterproofing and vapor barrier is maintained. The design will need to account for how the waterproofing barrier can be effectively sealed around each well penetration while withstanding the forces exerted by elevated groundwater levels outside the foundation.

Contingent Monitoring and Injection Well Locations and Design

Based on the information presented above, PES proposes to install 63 contingent action injection wells and 24 monitoring wells on the Property at the locations shown on Drawing 2 that also shows the final elevations of the excavation. In addition to these on-Property contingent injection wells, PES is proposing an area where potential future contingent injection wells adjacent to the Property along Dexter Avenue North can be installed (see discussion below).

On Property Injection Well Locations

A total of 21 contingent action wells will be installed in Treatment Zone A, 21 wells in Treatment Zone B, 13 wells in Treatment Zone C, and 8 wells in Treatment Zone D. Injection wells completed in the same treatment zone will be spaced approximately 20 feet from each other, and each injection well will be separated from other wells completed at different depths by approximately 5 feet. The 63 injection wells take advantage of the north-south-oriented corridors along the western, central, and eastern portions of the Property to create three transects of wells oriented perpendicular to groundwater flow. These transects will provide the capacity to treat upgradient of, within, and downgradient of the source areas identified in the IAWP, including the two primary areas of high CVOC concentrations on the Property near the former western boiler room and near the former loading dock.

- The western transect of 27 injection wells will provide the ability to inject EVO just upgradient of the former loading dock area located in the north-central portion of the Property, and also directly into the former western boiler room area located in the southwestern portion of the Property;
- The central transect of 24 injection wells will provide the ability to directly inject EVO into the middle of the former loading dock area and also in the area downgradient of the former western boiler room source area;
- The eastern transect of six injection wells will provide the ability to inject EVO into the area downgradient of the former loading dock area; and
- The six wells located in the southeast corner of the Property will provide the ability to inject EVO into this area.

Overall, this well configuration will provide a series of three lines of treatment/injection wells oriented perpendicular to groundwater flow that will provide the ability to continue treating soil and groundwater upgradient and downgradient of the source areas previously identified in the IAWP, should monitoring indicate that additional treatment is warranted. Figure 1 shows an east-west oriented cross section through the property showing this arrangement of injection wells. Upon completion of the perimeter injection wells described in the IAWP (shown on Drawing 2), groundwater treated by the contingent action injection wells will be further treated by a fourth transect of injection wells as the groundwater leaves the Property.

Dexter Avenue Contingency Injection Wells

Available soil and groundwater data in the southwest corner of the Property indicate that contamination may extend near the western Property line. The pre-construction portion of the interim action is treating this contamination through injection into the wells shown on Drawing 1. Furthermore, the western-most row of on-Property contingent action injection wells shown on Drawing 2 provides the ability to conduct additional treatment in this area as deemed necessary by ongoing monitoring (see below for discussion of monitoring program).

If monitoring of the combined effects of the pre-construction and on-Property contingent action injections suggests that additional contamination remains along or near the western Property line, it may be necessary to install additional injection wells just west of the Property in the area shown on Drawing 2. If wells on Dexter Avenue are deemed necessary, the specific number, location, and screened interval (i.e., treatment zone) will be determined at that time based on the available monitoring data and injection information. The decision to install the contingency injection wells will be coordinated with and approved by Ecology using the criteria and process described below.

Monitoring Well Locations

As shown in Drawing 2, the 24 monitoring wells (MW-165 through MW-188) are distributed throughout the Property in six groups of four wells, with each group including a well completed in each of the four treatment zones (i.e., Treatment Zones A, B, C, and D). The rationale for the well locations is as follows:

- The westernmost monitoring well group is located to provide data to assess the interim action's effectiveness at addressing contamination in the former western boiler room source area;
- The central monitoring well group is located both downgradient of the former western boiler room source area and near the former loading dock area; and
- The four monitoring well groups located on the southern and eastern sides of the Property are located downgradient of the overall treatment areas and will provide data to assess the on-Property interim action's overall performance and simultaneously provide data upgradient of the perimeter injection wells.

In addition to the 24 wells located on the Property, two additional monitoring wells will be located just north of the Property near existing deep monitoring well MW102. MW-189 will be screened in the Intermediate A zone, and MW-190 will be screened in the Intermediate B zone. These two wells will provide data to help define the northern extent of contamination off the Property, and monitor the long-term effectiveness of the on-Property treatment. As described below, these 24 wells located on the Property and two wells located north of the Property will be integrated into the overall interim action performance monitoring network.

Well Design

In general, the portion of the injection and monitoring wells completed below the building foundation will be very similar to the existing injection and monitoring wells installed as part of the IAWP (see Figure 52 from the IAWP, attached, for typical injection well detail). The below-slab portion of the injection wells will be constructed of 2-inch polyvinyl chloride ("PVC") casings with 15-foot-long screens completed in one of the four treatment zones defined in the IAWP (Treatment Zone A through Treatment Zone D). The table included on Drawing 2 shows the number of each type of injection well and the corresponding screened interval.

The 24 monitoring wells will be completed in a similar fashion, with the screened intervals set to correspond with the middle of each of the four treatment zones (see Figure 1). The table included on Figure 1 shows the number of each type of monitoring well and the corresponding screened interval. Contingent action wells will generally be installed using procedures specified in the Sampling and Analysis Plan included with the IAWP, except as described below to address issues specific to installing these wells in the bottom of the excavation below the water table. There are no monitoring wells proposed for the shallow zone, because this zone will be removed in its entirety during the planned excavation.

Wellhead Completion and Monument

The proposed completion details for the upper portions of both the injection and monitoring wells are shown on Figure 2. The major components of the wellhead design include:

- A transition from PVC to steel well casing approximately 2 to 3 feet below the minimum elevation of the excavation where the wells will be installed (approximately 10.6 feet). This will result in a stronger and more stable completion and offer more protection for the

wells during the time between well installation and completion of the mat foundation (see discussion below on well installation method);

- Sealing the casing with a minimum of 5 feet of bentonite chips directly beneath the temporary concrete slab installed to facilitate placement of the waterproofing (i.e., the "rat slab" shown at the bottom of the excavation). This bentonite seal will offer the primary means of preventing groundwater from migrating up through the foundation and into the building;
- Connecting the waterproofing and vapor barrier product to the well casing above the bentonite well seal. This connection will utilize a pre-molded penetration flashing that is welded to the main waterproofing later and will provide a secondary means of preventing upward groundwater migration;
- Once the casing rises into the elevation range of the mat foundation, the wellhead completion will consist of the following:
  - A reduction in the size of the casing from 2 inches to 1.5 inches. This will reduce the size of the flow control components, providing better access to these items for operation and maintenance;
  - A ball valve to provide the primary means of preventing upward flow of groundwater in the well due to hydrostatic pressures, and to provide flow control during potential future injections and monitoring; and
  - The top of the well will be completed with a cam-lock-type fitting that will be fitted with a water-tight cap. For the injection wells, this cap will be removed when injections are required, and the injection hose will be attached to the cam-lock fitting. For the monitoring wells, the cap will be removed and replaced with a fitting that will allow for sample tubing to be connected to the well for sampling purposes; and
- The wellhead will be set into a standard 12-inch diameter flush mount traffic-rated monument.

Well Installation Method

Installing the contingent action injection and monitoring wells will be conducted once the mass excavation of the Property has reached an elevation of approximately 11.5 feet. The general contractor will prepare a flat and level surface for the driller to work on, and wells will be installed at the locations and depths shown in Drawing 2 and detailed on Figure 2. The top of the casing and wellhead completion will set such that the top of the cam-lock cap at the top of the well is at an elevation of approximately 3 inches below the finish elevation of the mat foundation (at approximately elevation 13.6 feet).

After installation, the top 2 feet of the well will be sticking up above the ground. Temporary protection of the wells will be installed while the excavation contractor completes the excavations for the thickened portions of the foundation, and also to prepare the final working surface for the un-thickened portions of the foundation (including around the wells) at an elevation of approximately 10.6 feet (see Figure 2).

Once the excavation work is completed, construction of the foundation will commence. The first step will be pouring a 4-inch-thick non-structural concrete layer (also referred to as a "rat slab") to provide a solid flat working surface to install the waterproofing/vapor barrier system. Once the waterproofing/vapor barrier has been installed, including sealing around all the wells, a second 4-inch rat slab will be poured to protect the waterproofing/vapor barrier system and provide a working surface to begin setting rebar for the mat foundation. Once the upper level of the two rebar layers has been completed, the 12-inch well monument will be set at the appropriate elevation such that the top of the lid will match this finish elevation of the top of the foundation (i.e., the floor of the P3 level of the garage). Once all the well monuments have been inspected, the foundation will be poured, with the monuments being cast in place.

PERFORMANCE MONITORING APPROACH

This section describes the performance monitoring associated with the contingent action and how that monitoring will be integrated into the overall interim action monitoring program described in the IAWP. Based on the current construction schedule, the 24 on-Property monitoring wells (along with the 63 injection wells) will be installed between November 2019 and January 2020.

Monitoring Approach and Schedule

The interim action performance monitoring program is detailed in Section 11.9 of the IAWP and includes the monitoring well network and the four phases of performance groundwater monitoring that will be performed. The four phases of performance groundwater monitoring include a baseline event before injections occurred on the Property (completed in April and May 2018), monitoring after each round of injections in on-Property wells (ongoing), quarterly monitoring after the third ISCO injection round in select off-Property wells and wells to be installed pursuant to this CAA, and quarterly monitoring after perimeter well injection has occurred. The performance monitoring plan included in the IAWP anticipated the installation of additional monitoring wells on the Property as part of the CAA, and the proposed monitoring of these wells is described in Sections 11.9.2.3 and 11.9.2.4, and summarized in Table 18 of the IAWP.

Performance monitoring of the on-Property wells described in this CAA will be incorporated into the quarterly groundwater monitoring that will begin after the third round of ISCO injections (IAWP Section 11.9.2.3), and will continue until the initial EVO injection in the perimeter injection wells is conducted. Groundwater monitoring of the on-Property monitoring wells will then continue on a quarterly basis for another year after the perimeter well injections have been conducted (IAWP Section 11.9.2.4). Table 1 summarizes the monitoring approach for the on-Property monitoring wells.

Based on the current schedule for performing the next two rounds of ISCO injections, the post-ISCO monitoring will begin during the first quarter of 2019, and will continue until the initial EVO injection in the perimeter injection wells is conducted (approximately 3 months after the dewatering system is shut down in July 2020[3]). Assuming the on-Property monitoring wells are installed by January 2020, the following is a preliminary monitoring schedule for these wells:

[3] Construction milestones are subject to change. Dates presented in this CAA are based on the latest construction schedule and information available.

1. A baseline monitoring event will be conducted in approximately January 2020. After this sampling event, construction of the foundation and the lower levels of the garage will preclude access to these wells until sometime during the late second quarter of 2020;

2. Once access is re-established, the next sampling of the contingent action monitoring wells will be concurrent with the next post-ISCO quarterly monitoring event, likely either in the late second quarter or early third quarter of 2020;

3. Once the excavation dewatering system is shut down in July 2020, and groundwater levels and flow directions have returned to their pre-pumping conditions (anticipated to take approximately 3 months (i.e., in approximately October 2020)), a sampling event will be conducted to establish post-dewatering baseline conditions prior to injecting EVO into the perimeter injection wells;

4. Following this post-dewatering baseline sampling event, the initial EVO injection into the perimeter injection wells will be conducted (in late 2020). Approximately one month after completing the perimeter injections, the first of four quarterly monitoring events will be conducted to evaluate the initial effects of the interim action. These quarterly events will be conducted consistent with the procedures described in the IAWP and will include the on-Property monitoring wells in addition to the other performance monitoring wells defined in Table 1; and

5. After four quarters of monitoring (late 2021), the scope of additional interim action monitoring will be reassessed in consultation with Ecology based on both the IAWP performance monitoring data and data collected during RI. We anticipate integrating additional interim action monitoring into the long-term monitoring associated with the RI and/or the final cleanup action.

It is anticipated that the RI/FS process (including the cleanup action plan) will either be completed or nearing completion during the timeframe of this initial post-perimeter injection monitoring. If that is the case, the last stages of the interim action monitoring described above may be integrated into the overall cleanup action monitoring, if appropriate and approved by Ecology.

Monitoring Parameters

Groundwater samples collected from the on-Property monitoring wells will be analyzed for volatile organic compounds ("VOCs"), gasoline range organics ("GRO"), and geochemical parameters as detailed in Table 1. The Sampling and Analysis Plan ("SAP"; Appendix L of the IAWP) provides the sampling procedures and analytical methods, and the Quality Assurance Project Plan ("QAPP"; Appendix M of the IAWP) provides the quality assurance and quality control procedures used to evaluate the laboratory data.

CRITERIA FOR INITIATING CONTINGENT INJECTIONS

This section describes the data evaluation and assessment process that will be used to evaluate the performance monitoring results and determine if and when any contingent action injections should be conducted. The effects of the initial injection of EVO in early 2019 on the Property are

expected to last 2 to 5 years, so the earliest that a possible contingent action injection will occur is early 2021, and more likely in the 2022 to 2024 timeframe. As described above, installation of the contingent action injection wells and on-Property monitoring wells will be completed by January 2020. Monitoring during 2020 (post-ISCO monitoring) and 2021 (post-perimeter EVO injection monitoring), consistent with the interim action performance monitoring program and the longer-term monitoring, will provide the data used to determine whether a contingent action injection is required.

Treatment Performance Expectations

Section 11.10.1 of the IAWP includes the following expectation for the performance of the on-Property ISCO and EVO injections:

- Reduce PCE concentrations in the source areas by approximately 90 percent (i.e., an order of magnitude) within 18 months of the initial EVO injection, as measured by monitoring wells installed beneath the building consistent with the Ecology-approved Contingent Action Addendum.

In addition to this expectation presented in the IAWP, benchmarks will be used to assess the initial performance of the interim action now that the configuration of the on-Property injection and monitoring wells is known. To develop these benchmark values baseline groundwater concentrations were extrapolated for each of the future locations of the on-Property monitoring wells so that groundwater monitoring results can be evaluated relative to baseline conditions. Groundwater benchmark concentrations were then developed to set expectations as to the changes in CVOC c7oncentrations at the various monitoring well locations on the Property. The development of baseline data and benchmark values is described below.

Baseline Concentrations

Since the on-Property monitoring well network does not yet exist the baseline concentrations of CVOCs at the future locations of the on-Property monitoring wells were extrapolated using the data from the 2018 baseline monitoring event. The 2018 groundwater data were modeled using the Studio program described in the IAWP, and CVOC concentrations were identified at 2-foot intervals across the well screen of each of the proposed on-Property monitoring well locations. The resulting ranges of CVOC concentrations for each monitoring well are presented in Table 2. While there is uncertainty in these extrapolated concentrations, they provide a reasonable set of baseline concentrations that allow the selection of benchmark values. As monitoring data are generated from these on-Property wells, the baseline concentrations will be adjusted in consultation with Ecology.

Benchmark Concentrations

In order to provide guidance on how the treatment is proceeding, preliminary benchmarks have been established for all future on-Property monitoring wells (see Table 2). The specific method for calculating the benchmarks is described in the notes of Table 2. In general, the expectation is that PCE and trichloroethene (TCE) concentrations will decrease by an order of magnitude in both the source areas and in areas downgradient of the source areas on the Property. The development

of expectations for cis-1,2-dichloroethene (cDCE) and vinyl chloride (VC) concentrations is more complex since the reductive dechlorination of PCE and TCE will initially produce a transitory increase in cDCE and VC concentrations from the baseline concentrations. Over time, however, continued reductive dechlorination is expected to reduce the cDCE and VC concentrations below baseline conditions; but the exact timing of these processes is less predictable. Nonetheless, there is a general expectation that the concentrations of cDCE and VC will decrease by up to 50 percent over the initial 18 months following EVO injection.

These preliminary benchmarks are not a regulatory level or a remediation level, they are only a tool to assess the initial performance of the interim action. As with the baseline concentrations discussed above, the preliminary benchmarks also have uncertainty due to both the uncertainty in baseline concentrations and the rate at which the *in situ* reductive dechlorination process will occur. Therefore, as monitoring results become available from the on-Property monitoring wells, the preliminary benchmarks will be reassessed in consultation with Ecology.

Evaluating Interim Action Performance

Given the monitoring schedule outlined above and summarized in Table 1, two or three rounds of monitoring of the on-Property monitoring wells should be conducted by late 2020. The assessment of whether the on-Property component of the interim action is meeting expectations will be conducted on an ongoing basis, in consultation with Ecology, as monitoring data is received (i.e., quarterly) using a weight-of-evidence approach[4] that:

- Compares post-treatment monitoring results to the extrapolated 2018 baseline concentrations and preliminary benchmarks (see Table 2). The preliminary benchmarks will be used as follows:
    - If CVOC concentrations are below the benchmark concentration, then treatment is generally meeting expectations and contingent actions would not be recommended pending an evaluation of the other lines of evidence; and
    - If CVOC concentrations exceed the benchmark, then treatment is not meeting expectations and evaluation of other lines of evidence would be completed to determine whether a contingent action would be recommended.
- Evaluates trends in the CVOC concentrations over time, including assessing how concentrations are changing relative the preliminary benchmarks in Table 2.
- Evaluates the geochemical parameters to assess whether the conditions conducive to anaerobic biodegradation are present within the areas affected by the interim action. In the assessment, the geochemical data will be evaluated in conjunction with changes in CVOC concentrations. As discussed in IAWP (Section 11.10.4) the following changes may be

[4] U.S. Environmental Protection Agency. 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. Office of Research and Development. EPA/600/R-98/128. September.

observed near the injection wells and/or in the downgradient performance monitoring wells:

- Alkalinity and chloride increasing to above background concentrations;
- DO reducing to less than 0.5 mg/L;
- Ethene/ethane concentrations increasing to greater than 0.01 mg/L;
- Ferrous iron increasing greater than 1 mg/L;
- Nitrate reducing to less than 0.1 mg/L;
- ORP reducing to less than 50 millivolts;
- Sulfate reducing to less than 20 mg/L; and
- TOC concentrations increasing to greater than 20 mg/L.

This weight-of-evidence evaluation will be discussed with Ecology on an ongoing basis and summarized in the appropriate monthly progress report. The evaluation will include a recommendation on whether initiating a contingent injection is needed. A contingent injection event will not be recommended if the evaluation concludes that either (1) CVOC concentrations are below the preliminary benchmarks in Table 2, and the other lines of evidence support the conclusion that reductive dechlorination of CVOCs is occurring (based on the evaluation of the contaminant concentration trends and the geochemical parameter results, or (2) if benchmarks are exceeded, the trends in CVOC concentrations suggest that meeting the benchmark concentrations in a reasonable time is likely. If one of these two conditions is met, monitoring will proceed per the approved schedule, and the weight-of-evidence evaluation will be repeated after the next round of monitoring is completed. If an evaluation determines that the initial EVO injection is no longer effectively stimulating ERD (e.g., contaminant concentrations exceed benchmark concentrations and are not declining), initiating a contingent action injection beneath the building will be recommended. This weight-of evidence evaluation may determine that the whole Property either does or does not meet the treatment expectations, but it is also possible that it concludes that some areas or depth intervals on the Property are meeting the expectations while others are not. In the latter case, contingent action injections may only be recommended in certain wells and/or treatment zones. As noted above, the preliminary benchmarks will be reevaluated as monitoring data from the on-Property wells become available. The preliminary benchmarks will be modified as necessary and ultimately these benchmarks and the approach for evaluating the performance of the interim action will be integrated into the final Cleanup Action Plan for the Site after the RI/FS is completed.

Dexter Avenue Contingency Wells

A similar weight of evidence evaluation of monitoring results primarily from well clusters 2, 4, and 5 will determine the need to install additional injection wells on Dexter Avenue along the western Property boundary in the area shown on Drawing 2. The specific number, locations, and screened interval (i.e., treatment zone) will be determined at that time based on the available monitoring data and injection information. The decision to install the contingency injection wells will be coordinated with and approved by Ecology. This area has been designated in the development plans as an area where injection wells may be installed in the future.

CONTINGENT ACTION EVO INJECTION

If recommended by the evaluation of monitoring data, and in consultation with Ecology, a contingent action injection of EVO would be implemented generally following the procedures outlined in IAWP Section 11.4.2. This procedure would be modified as necessary based on information obtained during the initial pre-construction EVO injection, and on the geochemistry at the time of the contingent action injection (e.g., pH conditions).

REPORTING

Reporting related to the contingent action will be consistent with the reporting procedures provided in IAWP Section 12. The installation of the contingent action wells will be documented in the interim action implementation report prepared when the interim action is completed (i.e., after the post-perimeter well injection monitoring has been completed). Validated monitoring results will be submitted as they become available in the monthly progress reports, and the annual weight-of-evidence evaluation will be submitted to Ecology in a technical memorandum.

Please let John Moshy at BMRD or us know if you have any questions or require additional information regarding this addendum

Sincerely,

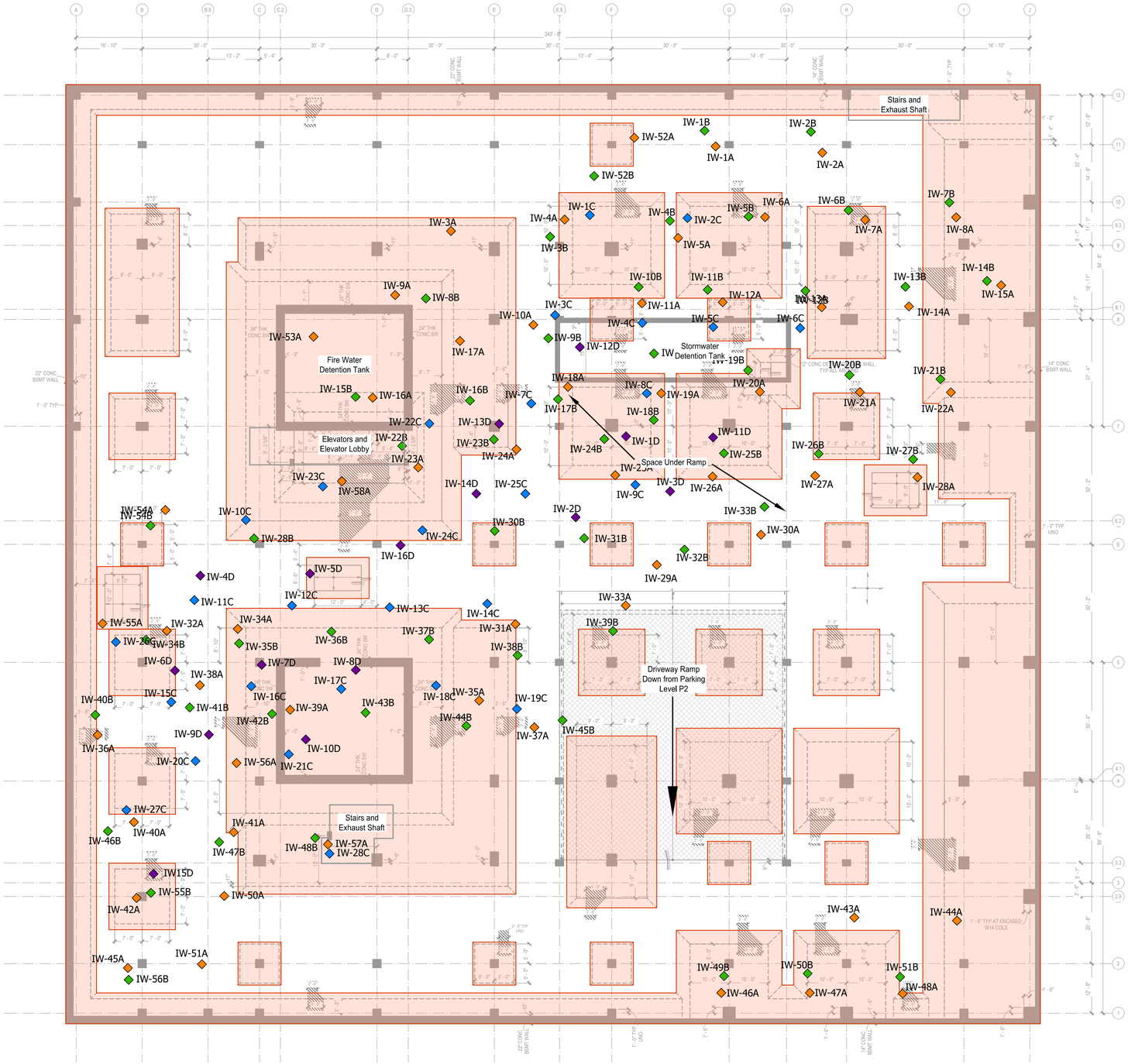
PES ENVIRONMENTAL, INC.

Daniel A. Balbiani, P.E.
Principal Engineer

Brian L. O'Neal, P.E.
Associate Engineer

Enclosures: Drawing 1 – Structural and Operations Constraints
Drawing 2 – Contingent Action Injection and Monitoring Well Locations
Figure 1 – Cross Section A-A'
Figure 2 – Contingent Action Well Details
Figure 52 from the approved IAWP
Table 1 – Interim Action Groundwater and Soil Vapor Monitoring
Table 2 – On-Property Performance Monitoring Expectations

cc: John Moshy, BMR-Dexter LLC



Explanation

Foundation No-Penetration Zone

- IW-1A — Existing Treatment Zone A Injection Well
- IW-13B — Existing Treatment Zone B Injection Well
- IW-6C — Existing Treatment Zone C Injection Well
- IW-11D — Existing Treatment Zone D Injection Well

N

0 15

SCALE IN FEET

Structural Drawings: Sheet S30/P.3 "Level P3/Foundation Plan" and A30/P.3 "Level P3" prepared by Magnussen Klemencic Associates

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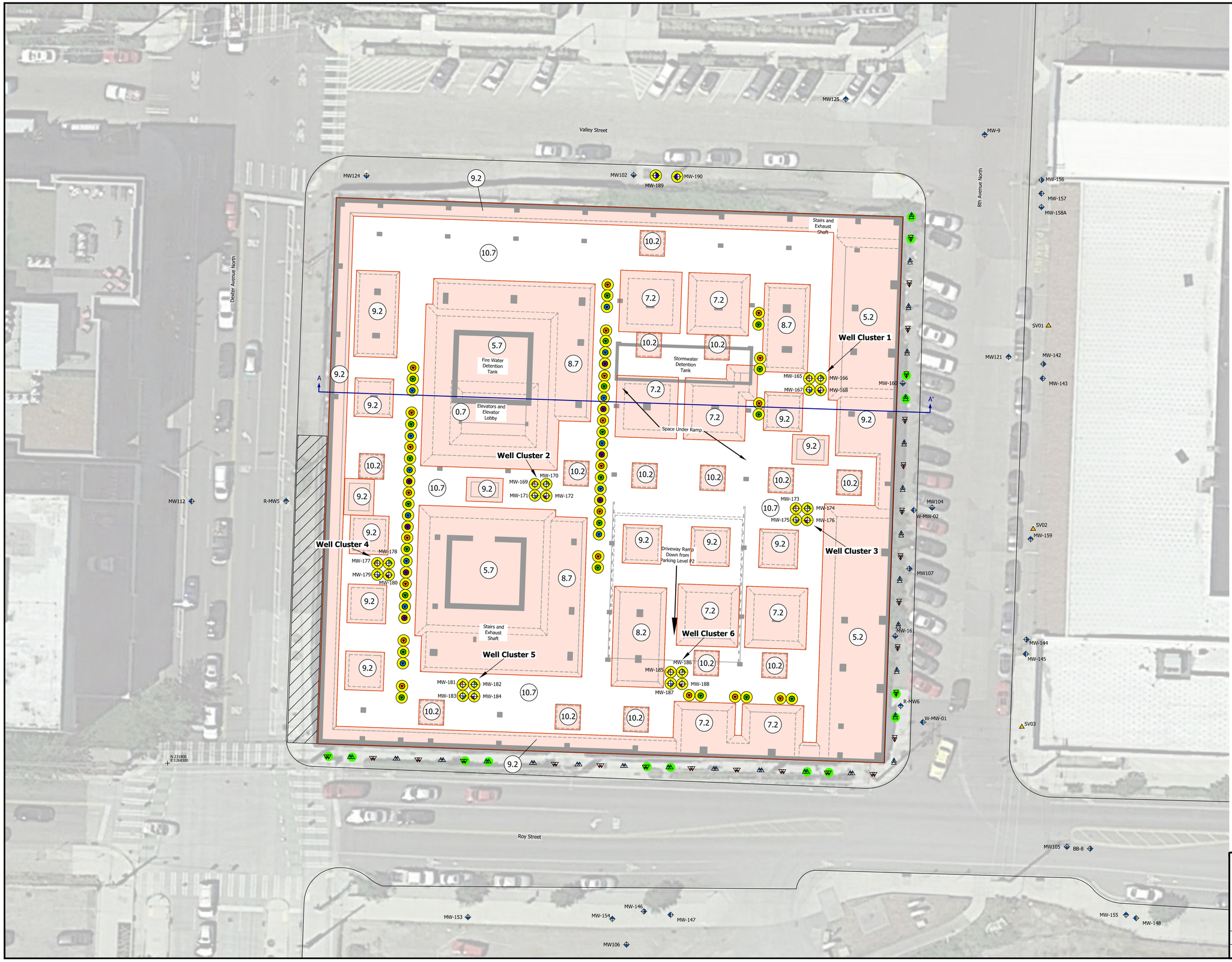
Structural and Operations Constraints
Contingent Action Addendum
Former American Linen Supply
700 Dexter Avenue North
Seattle, Washington

DRAWING 1

1413.001.02.403	141300102403_2632_D1_v4	BLO	2/19
DWG NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



	Screen Interval	Number of Wells
Injection Wells		
Treatment Zone A	-11 ft to +4 ft	21
Treatment Zone B	-25 ft to -10 ft	21
Treatment Zone C	-40 ft to -25 ft	13
Treatment Zone D	-55 ft to - 40 ft	8
Total Injection Wells		63
Monitoring Wells		
Intermediate A	-10 ft to 0 ft	1
Intermediate B	-30 ft to -20 ft	1
Treatment Zone A	-8 ft to +2 ft	6
Treatment Zone B	-22 ft to -12 ft	6
Treatment Zone C	-37 ft to -27 ft	6
Treatment Zone D	-52 ft to -42 ft	6
Total Monitoring Wells		26

Structural Drawings: Sheet S30/P.3 "Level P3/Foundation Plan" prepared by Magnussen Klemencic Associates

PES Environmental, Inc.
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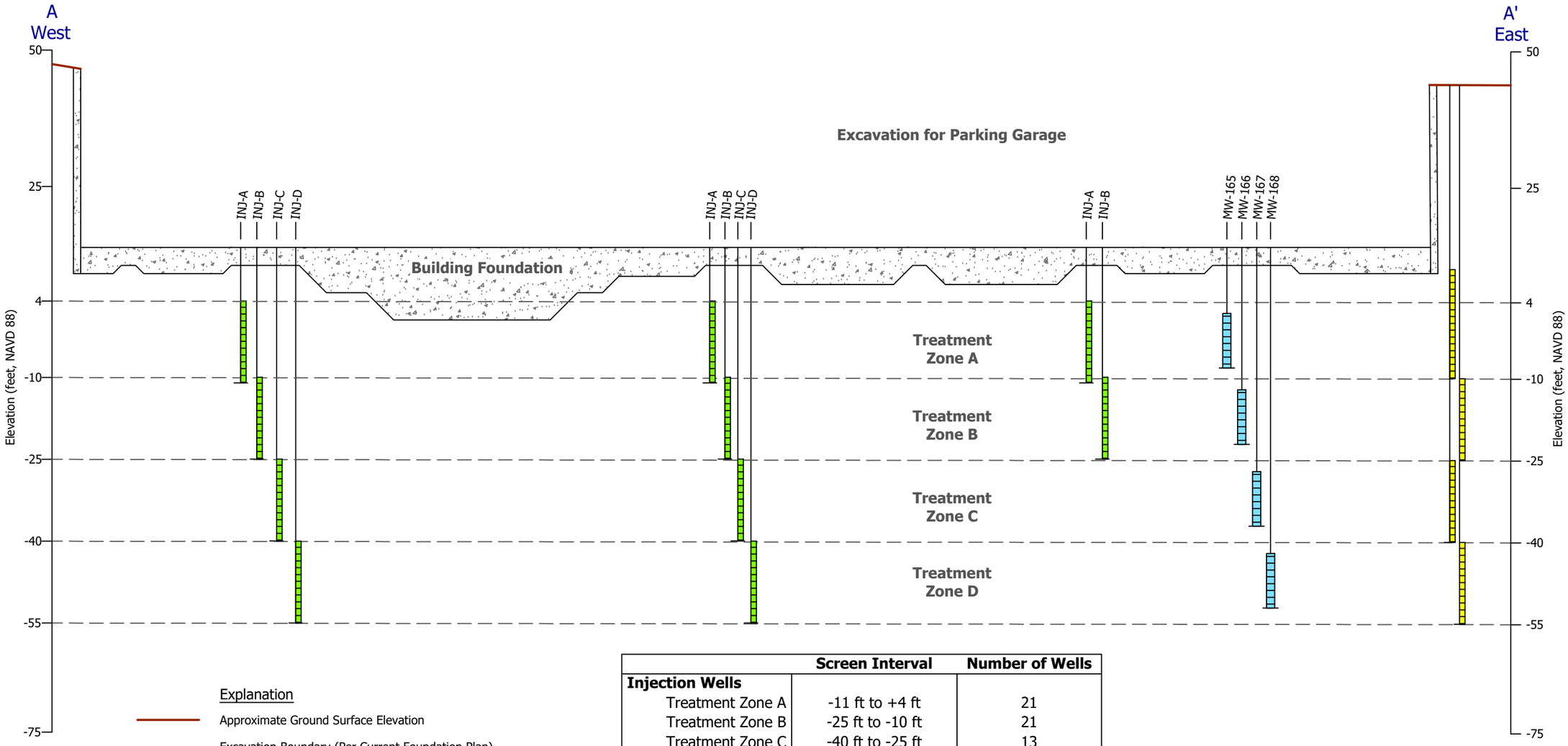
Contingent Action Injection and Monitoring Well Locations
Contingent Action Addendum
Former American Linen Supply
700 Dexter Avenue North
Seattle, Washington

DRAWING
2

1413.001.02.403	141300102403_2632_D2_v4	BLO	2/19
DWG NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

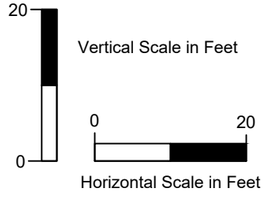


Explanation

- Approximate Ground Surface Elevation
- Excavation Boundary (Per Current Foundation Plan)
- Typical Injection Well with Screen Interval
- Perimeter Injection Well with Screen Interval
- Typical Monitoring Well with Screen Interval

Note: Injection and Monitoring Well locations shown seperated for clarity

	Screen Interval	Number of Wells
Injection Wells		
Treatment Zone A	-11 ft to +4 ft	21
Treatment Zone B	-25 ft to -10 ft	21
Treatment Zone C	-40 ft to -25 ft	13
Treatment Zone D	-55 ft to - 40 ft	8
	Total Injection Wells	63
Monitoring Wells		
Intermediate A	-10 ft to 0 ft	1
Intermediate B	-30 ft to -20 ft	1
Treatment Zone A	-8 ft to +2 ft	6
Treatment Zone B	-22 ft to -12 ft	6
Treatment Zone C	-37 ft to -27 ft	6
Treatment Zone D	-52 ft to -42 ft	6
	Total Monitoring Wells	26



Note: The original version of this figure includes color-designated features. A black and white copy of the figure may not accurately represent the information originally presented.

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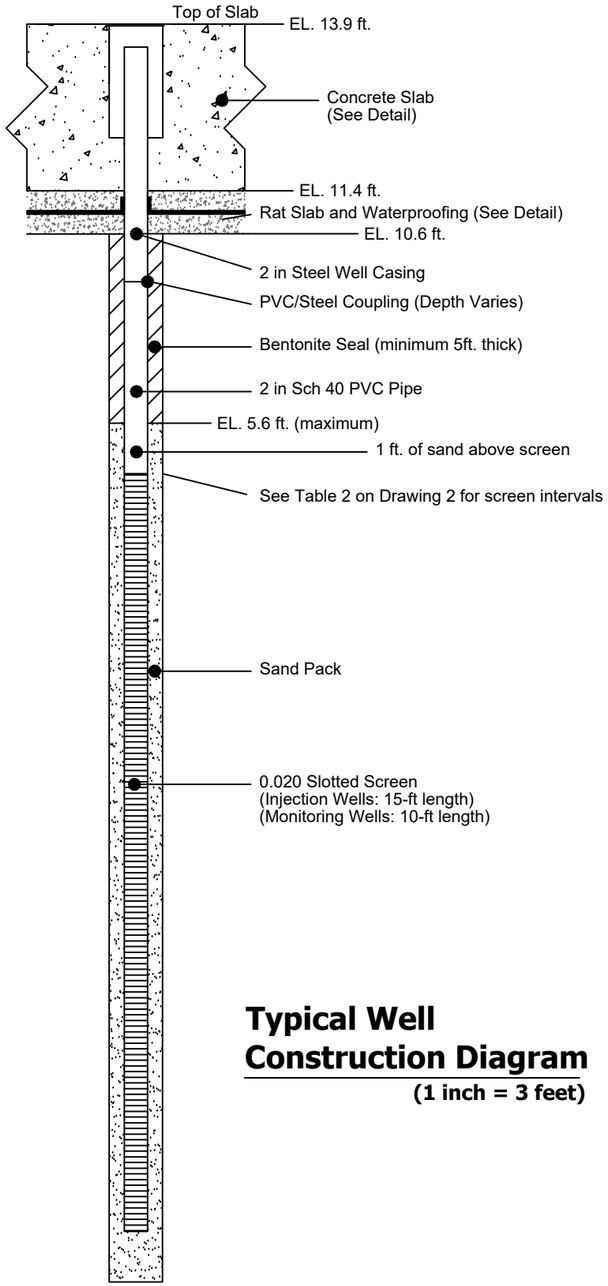
Cross Section A-A'
Contingent Action Addendum
Former American Linen Supply
700 Dexter Avenue North
Seattle, Washington

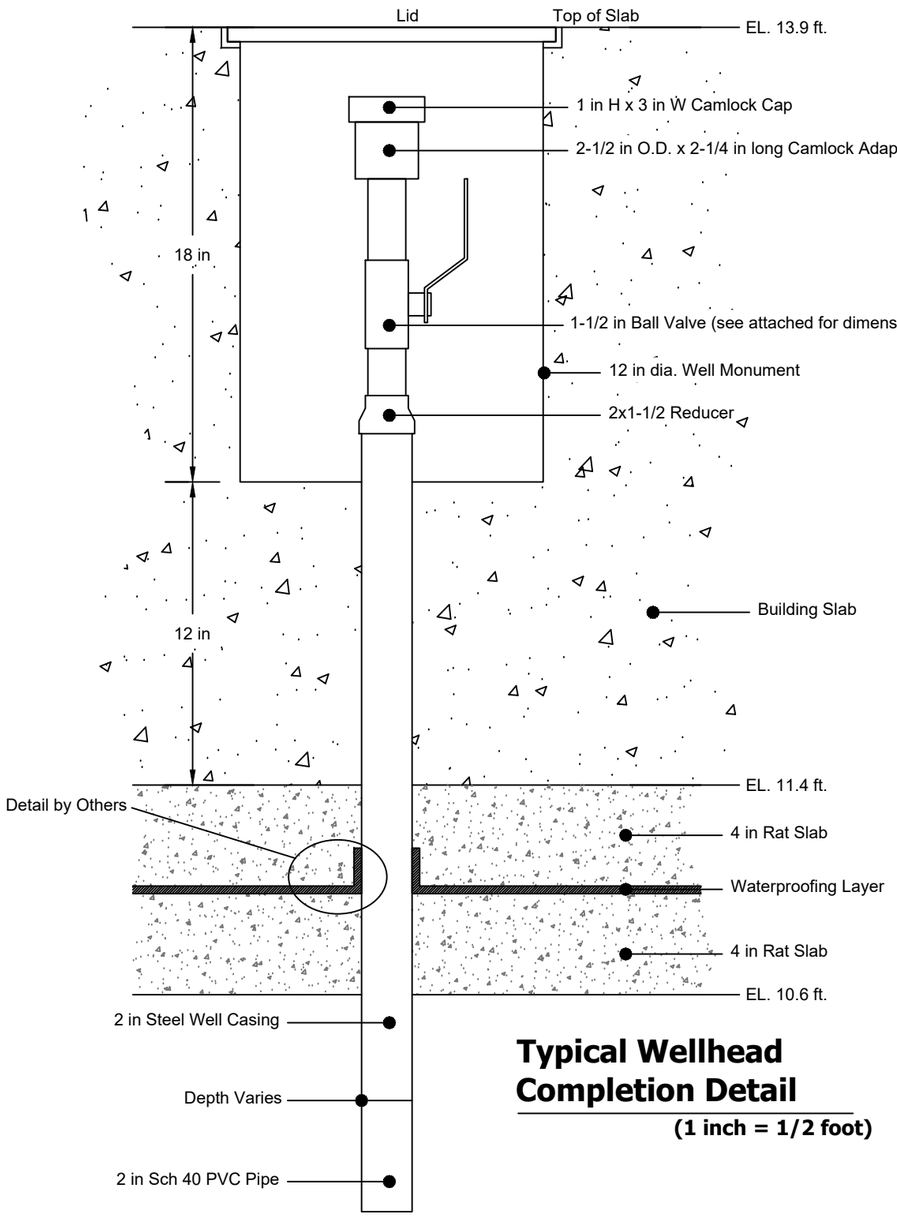
FIGURE
1

1413.001.02.403	141300102403_2632_1_v4	BLO	2/19
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



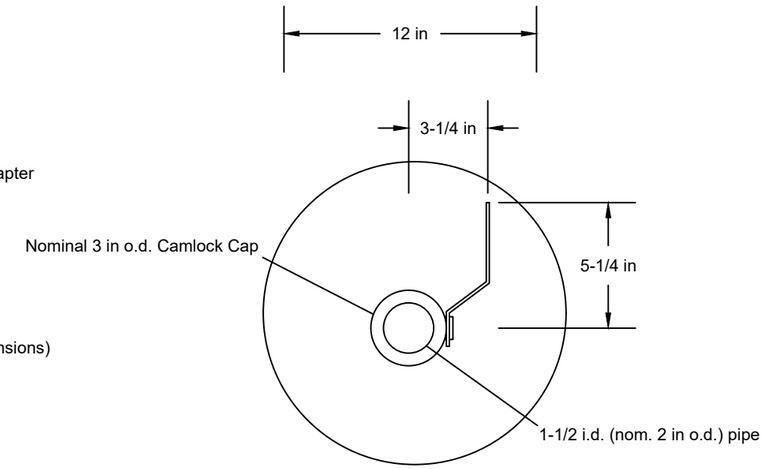
Typical Well Construction Diagram

(1 inch = 3 feet)



Typical Wellhead Completion Detail

(1 inch = 1/2 foot)



Monument Detail (Top)

(1 inch = 1/2 foot)

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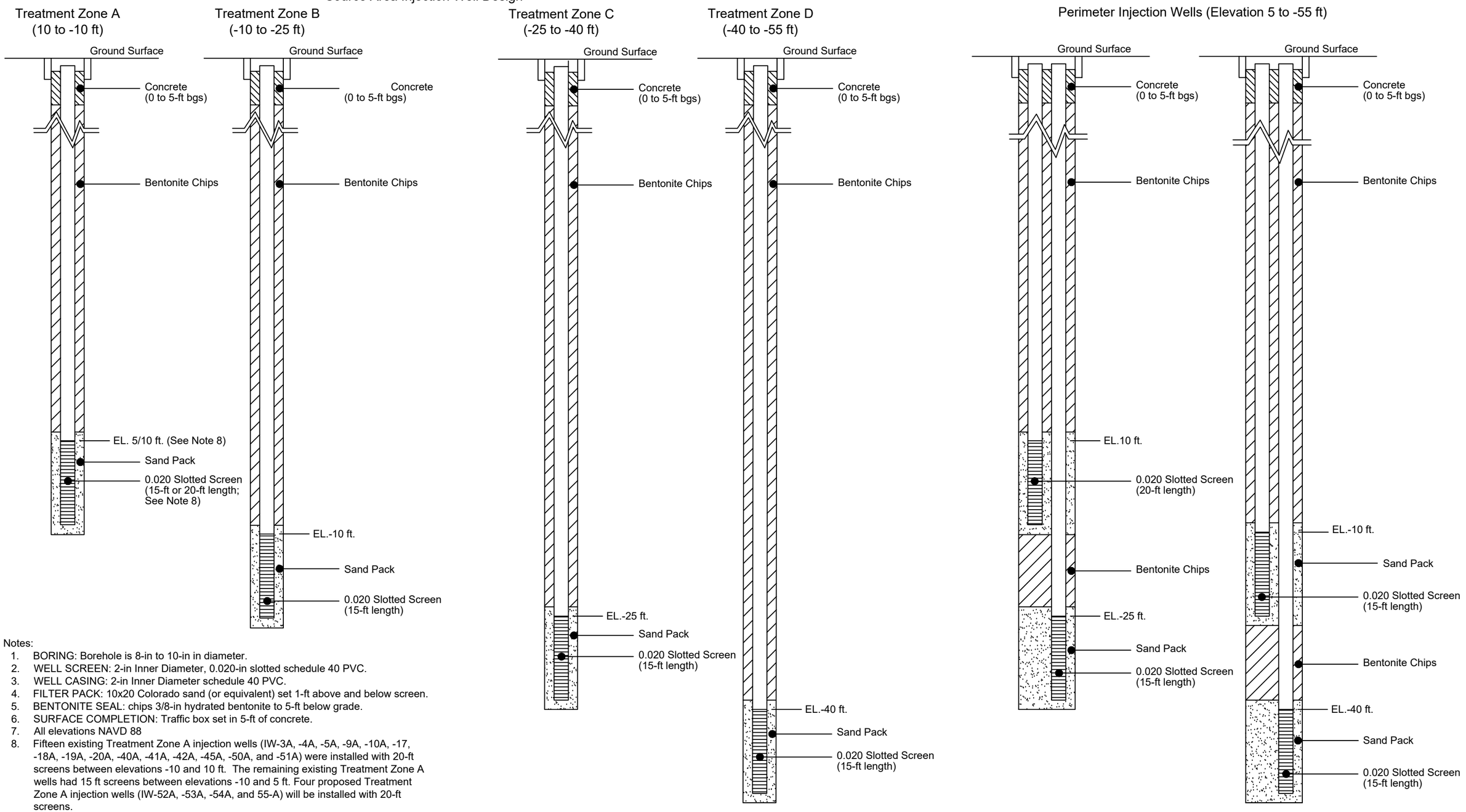
Contingent Action Well Details
Former American Linen Supply
700 Dexter Avenue North
Seattle, Washington

FIGURE
2

1413.001.02.403	141300102403_2632_2	*BLO*	2/19
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

Source Area Injection Well Design



Notes:

1. BORING: Borehole is 8-in to 10-in in diameter.
2. WELL SCREEN: 2-in Inner Diameter, 0.020-in slotted schedule 40 PVC.
3. WELL CASING: 2-in Inner Diameter schedule 40 PVC.
4. FILTER PACK: 10x20 Colorado sand (or equivalent) set 1-ft above and below screen.
5. BENTONITE SEAL: chips 3/8-in hydrated bentonite to 5-ft below grade.
6. SURFACE COMPLETION: Traffic box set in 5-ft of concrete.
7. All elevations NAVD 88
8. Fifteen existing Treatment Zone A injection wells (IW-3A, -4A, -5A, -9A, -10A, -17, -18A, -19A, -20A, -40A, -41A, -42A, -45A, -50A, and -51A) were installed with 20-ft screens between elevations -10 and 10 ft. The remaining existing Treatment Zone A wells had 15 ft screens between elevations -10 and 5 ft. Four proposed Treatment Zone A injection wells (IW-52A, -53A, -54A, and 55-A) will be installed with 20-ft screens.

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Injection Well Construction Schematics
Former American Linen Supply
700 Dexter Avenue North
Seattle, Washington

FIGURE
52

1413.001.02.404	141300102404_IAWP_52	*WRH*	8/18
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

Table 1

Interim Action Groundwater and Soil Vapor Monitoring
Former American Linen Supply
700 Dexter Avenue North, Seattle, Washington

Monitoring Well Number	Site Location	Screen Depth (ft bgs)	Monitoring Phase	
			Quarterly After ISCO Injection[a]	Quarterly After Perimeter Well Injection[b]
Shallow Monitoring Wells				
F13	Property	10-40	NA	NA
F5	Property	10-40	NA	NA
F9	Property	10-40	NA	NA
G12	Property	10-40	NA	NA
J15	Property	10-40	NA	NA
J5	Property	10-40	NA	NA
K8	Property	10-40	NA	NA
M15	Property	10-40	NA	NA
MW121	8th Ave N ROW	15-25	V, G	V, G
MW125	Valley Street ROW	15-30	V, G	V, G
MW-214	Valley Street ROW	7-17	–	–
MW-8	800 Aloha St Parcel	4.5-19	–	–
MW-9	8th Ave N ROW	7-22	V, G	V, G
N7	Property	10-40	NA	NA
R-MW2	Property	5-15	NA	NA
R-MW3	Property	7-17	NA	NA
R-MW5	Dexter Ave N ROW	15-30	V, G	V, G
R-MW6	8th Ave N ROW	12-22	V, G	V, G
SCL-MW101	Alley Between 8th & 9th Ave	5-15	–	–
SCL-MW105	Alley Between 8th & 9th Ave	20-30	–	–
SCS-2	Seattle City Light Parking Lot	11-21	–	–
SMW-3	Valley Street ROW	10-20	–	–
MW-154	Roy St ROW, near MW106	25-35	V, G	V, G
MW-155	Roy St ROW, near MW105	20-30	V, G	V, G
MW-159	8th Ave N ROW, near SV02	20-30	V, G	V, G
Intermediate A Monitoring Wells				
BB-8	Roy Street ROW	30-40	V, G, GC	V, G, GC
GEI-1	630 Westlake Ave N	26.8-36.8	–	–
MW107	8th Ave N ROW	35-45	V, G, GC	V, G, GC
MW108	Alley Between 8th & 9th Ave	40-50	V	V
MW109	Alley Between 8th & 9th Ave	35-45	V	V
MW110	Alley Between 8th & 9th Ave	35-45	V	V
MW115	9th Ave N ROW	35-45	V	V
MW116	9th Ave N ROW	35-45	V	V
MW119	9th Ave N ROW S of Roy St	35-45	V	V

Table 1

Interim Action Groundwater and Soil Vapor Monitoring
Former American Linen Supply
700 Dexter Avenue North, Seattle, Washington

Monitoring Well Number	Site Location	Screen Depth (ft bgs)	Monitoring Phase	
			Quarterly After ISCO Injection[a]	Quarterly After Perimeter Well Injection[b]
MW120	8th Ave N ROW	40-50	V, G, GC	V, G, GC
MW131	Property	44-54	NA	NA
MW-142	8th Ave N ROW	40-50	V, G, GC	V, G, GC
MW-144	8th Ave N ROW	40-50	V, G, GC	V, G, GC
MW-146	Roy Street ROW	40-50	V, G, GC	V, G, GC
MW-149	Property	35-45	NA	NA
MW-151	Property	35-45	NA	NA
MW-156	8th Ave N, near MW-9	40-50	V, G, GC	V, G, GC
MW-189	Valley St ROW, near MW102	48-58	V, G, GC	V, G, GC
Intermediate B Monitoring Wells				
MW111	Alley Between 8th & 9th Ave	70-80	V	V
MW112	Dexter Ave N ROW	75-85	V, G, GC	V, G, GC
MW126	Alley Between 8th & 9th Ave	85-95	V	V
MW130	Property	70-80	NA	NA
W-MW-01	8th Ave N ROW	70-80	V, G, GC	V, G, GC
W-MW-02	8th Ave N ROW	70-80	V, G, GC	V, G, GC
MW-132	Property	70-80	NA	NA
MW-134	Property	80-90	NA	NA
MW-135	Property	70-80	NA	NA
MW-136	Property	85-95	NA	NA
MW-139	Property	70-80	NA	NA
MW-143	8th Ave N ROW	70-80	V, G, GC	V, G, GC
MW-145	8th Ave N ROW	70-80	V, G, GC	V, G, GC
MW-147	Roy Street ROW	70-80	V, G, GC	V, G, GC
MW-148	Roy Street ROW	70-80	V, G, GC	V, G, GC
MW-150	Property	50-60	NA	NA
MW-152	Property	50-60	NA	NA
MW-157	8th Ave N, near MW-9	70-80	V, G, GC	V, G, GC
MW-190	Valley St ROW, near MW102	78-88	V, G, GC	V, G, GC
Deep Monitoring Wells				
FMW-129	SDOT property S of Roy St	84-89	V	V
FMW-131	630 Westlake Ave N	63-73	–	–
FMW-3D	625 Boren Ave N	59-69	–	–
GEI-2	630 Westlake Ave N	50.5-60.5	–	–
MW102	Valley Street ROW	115-125	V, G, GC	V, G, GC
MW103	Alley Between 8th & 9th Ave	103.5-113.5	V	V

Table 1

Interim Action Groundwater and Soil Vapor Monitoring
Former American Linen Supply
700 Dexter Avenue North, Seattle, Washington

Monitoring Well Number	Site Location	Screen Depth (ft bgs)	Monitoring Phase	
			Quarterly After ISCO Injection[a]	Quarterly After Perimeter Well Injection[b]
MW104	8th Ave N ROW	119-129	V, G, GC	V, G, GC
MW105	Roy Street ROW	130-140	V, G, GC	V, G, GC
MW106	West of Roy St	130-140	V, G, GC	V, G, GC
MW113	9th Ave N ROW	70-80	V, G, GC	V, G, GC
MW122	Alley Between 8th & 9th Ave	105-119	–	–
MW123	Westalke Ave N ROW	70-80	–	–
MW124	Valley Street ROW	110-120	–	–
MW128	Westlake Ave N ROW	60-70	–	–
MW-133	Property	129-139	NA	NA
MW-137	Property	105-115	NA	NA
MW-138	Dexter Ave N ROW	105-115	V, G, GC	V, G, GC
MW-141	Property	95-105	NA	NA
MW-153	Roy St ROW W of MW106	120-130	V, G, GC	V, G, GC
MW-158A	8th Ave N, near MW-9	90-100	V, G, GC	V, G, GC
MW-160	8th Ave N, N of MW104	120-130	V, G, GC	V, G, GC
MW-161	8th Ave N, S of MW107	120-130	V, G, GC	V, G, GC
Proposed on-Property Treatment Zone Monitoring Wells[c]				
MW-165	Property	12-22	V, G, GC	V, G, GC
MW-166	Property	26-36	V, G, GC	V, G, GC
MW-167	Property	41-51	V, G, GC	V, G, GC
MW-168	Property	56-66	V, G, GC	V, G, GC
MW-169	Property	12-22	V, G, GC	V, G, GC
MW-170	Property	26-36	V, G, GC	V, G, GC
MW-171	Property	41-51	V, G, GC	V, G, GC
MW-172	Property	56-66	V, G, GC	V, G, GC
MW-173	Property	12-22	V, G, GC	V, G, GC
MW-174	Property	26-36	V, G, GC	V, G, GC
MW-175	Property	41-51	V, G, GC	V, G, GC
MW-176	Property	56-66	V, G, GC	V, G, GC
MW-177	Property	12-22	V, G, GC	V, G, GC
MW-178	Property	26-36	V, G, GC	V, G, GC
MW-179	Property	41-51	V, G, GC	V, G, GC
MW-180	Property	56-66	V, G, GC	V, G, GC
MW-181	Property	12-22	V, G, GC	V, G, GC
MW-182	Property	26-36	V, G, GC	V, G, GC
MW-183	Property	41-51	V, G, GC	V, G, GC

Table 1

Interim Action Groundwater and Soil Vapor Monitoring
Former American Linen Supply
700 Dexter Avenue North, Seattle, Washington

Monitoring Well Number	Site Location	Screen Depth (ft bgs)	Monitoring Phase	
			Quarterly After ISCO Injection[a]	Quarterly After Perimeter Well Injection[b]
MW-184	Property	56-66	V, G, GC	V, G, GC
MW-185	Property	12-22	V, G, GC	V, G, GC
MW-186	Property	26-36	V, G, GC	V, G, GC
MW-187	Property	41-51	V, G, GC	V, G, GC
MW-188	Property	56-66	V, G, GC	V, G, GC
Perimeter Injection Wells[d]				
PRB-A1	Sidewalk adjacent to Property	35-50	V, G, GC	–
PRB-A5	Sidewalk adjacent to Property	35-50	V, G, GC	–
PRB-A12	Sidewalk adjacent to Property	35-50	V, G, GC	–
PRB-A14	Sidewalk adjacent to Property	35-50	V, G, GC	–
PRB-A17	Sidewalk adjacent to Property	35-50	V, G, GC	–
PRB-A21	Sidewalk adjacent to Property	35-50	V, G, GC	–
PRB-A24	Sidewalk adjacent to Property	35-50	V, G, GC	–
PRB-B1	Sidewalk adjacent to Property	50-65	V, G, GC	–
PRB-B4	Sidewalk adjacent to Property	50-65	V, G, GC	–
PRB-B11	Sidewalk adjacent to Property	50-65	V, G, GC	–
PRB-B13	Sidewalk adjacent to Property	50-65	V, G, GC	–
PRB-B16	Sidewalk adjacent to Property	50-65	V, G, GC	–
PRB-B20	Sidewalk adjacent to Property	50-65	V, G, GC	–
PRB-B24	Sidewalk adjacent to Property	50-65	V, G, GC	–
PRB-C1	Sidewalk adjacent to Property	65-80	V, G, GC	–
PRB-C5	Sidewalk adjacent to Property	65-80	V, G, GC	–
PRB-C12	Sidewalk adjacent to Property	65-80	V, G, GC	–
PRB-C14	Sidewalk adjacent to Property	65-80	V, G, GC	–
PRB-C17	Sidewalk adjacent to Property	65-80	V, G, GC	–
PRB-C21	Sidewalk adjacent to Property	65-80	V, G, GC	–
PRB-C24	Sidewalk adjacent to Property	65-80	V, G, GC	–
PRB-D1	Sidewalk adjacent to Property	80-95	V, G, GC	–
PRB-D4	Sidewalk adjacent to Property	80-95	V, G, GC	–
PRB-D11	Sidewalk adjacent to Property	80-95	V, G, GC	–
PRB-D13	Sidewalk adjacent to Property	80-95	V, G, GC	–
PRB-D16	Sidewalk adjacent to Property	80-95	V, G, GC	–
PRB-D20	Sidewalk adjacent to Property	80-95	V, G, GC	–
PRB-D24	Sidewalk adjacent to Property	80-95	V, G, GC	–

Table 1

Interim Action Groundwater and Soil Vapor Monitoring
Former American Linen Supply
700 Dexter Avenue North, Seattle, Washington

Monitoring Well Number	Site Location	Screen Depth (ft bgs)	Monitoring Phase	
			Quarterly After ISCO Injection[a]	Quarterly After Perimeter Well Injection[b]
Soil Vapor Probes				
SV01	8th Ave N, near MW121	11.75-12.25	V	V
SV02	8th Ave N, near MW-159	11.25-11.75	V	V
SV03	8th Ave N, south of MW-145	12.25-12.75	V	V

Notes:

[a] Six sampling rounds in 2019 and 2020 beginning after completion of the third on-Property ISCO injection; the final sampling round will include six sets of co-located nested perimeter injection wells that will be sampled to document baseline conditions in the perimeter injection well network after completion of dewatering and prior to injection in the perimeter wells, with the samples analyzed for VOCs, GRO, and geochemical parameters

[b] Four events beginning approximtely 3 months after perimeter well injection in late 2020; six sets of co-located nested perimeter injection wells will be visually monitored for the presence of EVO, with a sample collected for analysis of total organic carbon if EVO not observed in a well

[c] On-Property monitoring wells will be completed at the elevation of Parking Level P3 in the building garage (elevation 13.9 ft). The screen interval depths for the on-Property monitoring wells shown in the table are relative to the P3 floor.

[d] Select perimeter injection wells will be sampled in the last quarterly monitoring event prior to conducting the EVO injections into the perimeter injection wells. Screen depths are approximate and will be determined prior to installation based on surveyed ground surface elevation to cover appropriate treatment zone

ft bgs = feet below ground surface, depths approximate for planned explorations

V = samples analyzed for VOCs (EPA Method 8260 for groundwater, TO-15 for soil vapor)

G = samples analyzed for GRO (Method NWTPH-Gx)

GC = samples analyzed for geochemical parameters (alkalinity, chloride, dissolved gases (methane, ethane, and ethene), nitrate, sulfate, total metals (ferric iron, ferrous iron, and manganese), and total organic carbon), see SAP for lab methods

All sampled wells monitored for groundwater levels and field parameters (dissolved oxygen, pH, oxidation-reduction potential, specific conductance, and temperature) during sampling

– = well not sampled

NA = not applicable since well previously decommissioned or not yet installed

Table 2

On-Property Performance Monitoring Expectations
Former American Linen Supply
700 Dexter Avenue North, Seattle, Washington

Well Cluster	Monitoring Well	Treatment Zone	Compound	Baseline Concentration[1] (µg/L)			Preliminary Benchmark Concentration[2] (µg/L)
				Minimum	Maximum	Average	
1 Plume Wells[3]	MW-165	A	PCE:	5.8	6.9	6.4	NSC
			TCE:	0.2	7.4	3.8	NSC
			cDCE:	60	710	390	200
			VC:	63	290	180	90
	MW-166	B	PCE:	3.8	4.8	4.3	NSC
			TCE:	160	510	340	34
			cDCE:	3,900	7,600	5,800	2,900
			VC:	830	1,200	1,000	500
	MW-167	C	PCE:	2.2	5.8	4.0	NSC
			TCE:	4.4	180	92	9.2
			cDCE:	84	2,800	1,400	700
			VC:	120	700	410	210
	MW-168	D	PCE:	0.8	1.0	0.9	NSC
			TCE:	0.5	1.0	0.8	NSC
			cDCE:	10	18	14	7.0
			VC:	22	68	45	23
2 Source Area Wells[4]	MW-169	A	PCE:	0.3	10	5.2	NSC
			TCE:	0.1	2.8	1.5	NSC
			cDCE:	27	700	360	180
			VC:	23	430	230	120
	MW-170	B	PCE:	37	250	140	14
			TCE:	9.4	66	38	3.8
			cDCE:	3,600	9,700	6,700	3,400
			VC:	1,700	3,500	2,600	1,300
	MW-171	C	PCE:	190	470	330	33
			TCE:	75	210	140	14
			cDCE:	840	1,800	1,300	650
			VC:	36	180	110	55
	MW-172	D	PCE:	1,500	4,400	3,000	300
			TCE:	500	1,400	950	100
			cDCE:	1,600	2,600	2,100	1,100
			VC:	67	180	120	60

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On-Property Performance Monitoring Expectations
Former American Linen Supply
700 Dexter Avenue North, Seattle, Washington

Well Cluster	Monitoring Well	Treatment Zone	Compound	Baseline Concentration[1] (µg/L)			Preliminary Benchmark Concentration[2] (µg/L)
				Minimum	Maximum	Average	
3 Plume Wells	MW-173	A	PCE:	4.1	110	57	5.7
			TCE:	0.2	1.5	0.9	NSC
			cDCE:	3.6	48	26	13
			VC:	2.2	24	13	6.5
	MW-174	B	PCE:	0.8	2.6	1.7	NSC
			TCE:	2.6	7.4	5.0	NSC
			cDCE:	110	240	180	90
			VC:	52	84	68	34
	MW-175	C	PCE:	0.5	0.6	0.6	NSC
			TCE:	4.0	6.4	5.2	NSC
			cDCE:	81	160	120	60
			VC:	10	34	22	11
	MW-176	D	PCE:	0.8	3.3	2.1	NSC
			TCE:	3.2	8.2	5.7	NSC
			cDCE:	60	100	80	40
			VC:	7.0	7.5	7.3	NSC
4 Source Area Wells	MW-177	A	PCE:	6.0	990	500	50
			TCE:	1.5	170	86	8.6
			cDCE:	150	4,600	2,400	1,200
			VC:	31	590	310	160
	MW-178	B	PCE:	5,000	18,000	12,000	1,200
			TCE:	1,100	3,100	2,100	210
			cDCE:	22,000	49,000	36,000	18,000
			VC:	2,100	4,600	3,400	1,700
	MW-179	C	PCE:	470	990	730	73
			TCE:	200	350	280	28
			cDCE:	12,000	22,000	17,000	8,500
			VC:	2,100	3,000	2,600	1,300
	MW-180	D	PCE:	400	420	410	41
			TCE:	89	160	120	12
			cDCE:	240	1,900	1,100	550
			VC:	7.1	110	59	30

Table 2

On-Property Performance Monitoring Expectations
Former American Linen Supply
700 Dexter Avenue North, Seattle, Washington

Well Cluster	Monitoring Well	Treatment Zone	Compound	Baseline Concentration[1] (µg/L)			Preliminary Benchmark Concentration[2] (µg/L)
				Minimum	Maximum	Average	
5 Plume Wells	MW-181	A	PCE:	21	49	35	3.5
			TCE:	20	38	29	2.9
			cDCE:	570	1,200	890	450
			VC:	59	280	170	85
	MW-182	B	PCE:	4.8	9.1	7.0	NSC
			TCE:	3.4	8.5	6.0	NSC
			cDCE:	740	1,200	970	490
			VC:	360	520	440	220
	MW-183	C	PCE:	2.8	4.9	4.0	NSC
			TCE:	0.6	2.2	1.0	NSC
			cDCE:	14	190	100	50
			VC:	16	140	80	40
	MW-184	D	PCE:	1.3	2.0	1.7	NSC
			TCE:	0.5	0.5	0.5	NSC
			cDCE:	10	11	11	5.5
			VC:	9.6	14	12	6.0
6 Plume Wells	MW-185	A	PCE:	0.1	0.2	0.2	NSC
			TCE:	0.1	0.3	0.2	NSC
			cDCE:	16	36	26	13
			VC:	57	66	62	31
	MW-186	B	PCE:	0.1	0.4	0.3	NSC
			TCE:	0.2	0.7	0.5	NSC
			cDCE:	35	66	51	26
			VC:	12	50	31	16
	MW-187	C	PCE:	0.0	0.0	0.0	NSC
			TCE:	0.0	0.1	0.1	NSC
			cDCE:	0.4	9.1	4.8	NSC
			VC:	0.1	2.4	1.3	NSC
	MW-188	D	PCE:	0.0	0.1	0.1	NSC
			TCE:	0.0	0.1	0.1	NSC
			cDCE:	0.4	1.1	0.8	NSC
			VC:	0.1	0.3	0.2	NSC

Table 2

On-Property Performance Monitoring Expectations
Former American Linen Supply
700 Dexter Avenue North, Seattle, Washington

Well Cluster	Monitoring Well	Treatment Zone	Compound	Baseline Concentration[1] (µg/L)			Preliminary Benchmark Concentration[2] (µg/L)
				Minimum	Maximum	Average	

Notes:

1 - Baseline concentrations at proposed on-Property monitoring well locations established by modeling the April/May 2018 baseline groundwater monitoring data, then extrapolating the concentrations of PCE, TCE, cDCE, and VC across the screened interval. Concentrations rounded to two significant figures.

2 - Preliminary benchmark concentrations are established to provide a guideline for what may be observed in specific wells approximately 18 months following the initial injection of EVO. The benchmarks are set using the following assumptions and all values are rounded to two signficant figures:

(a) For PCE and TCE, it assumed that a 90 percent reduction of the average baseline concentration will be achieved.

(b) For cDCE and VC, it is assumed that a 50 percent reduction of the average baseline concentration will be achieved.

(c) Where the maximum estimated baseline concentration for a specific compound in a well is 10 µg/L or less, the preliminary benchmark is listged as "NSC" for no significant change, inidcating that these low concentrations are not anticipate to appreciably change over the initial 18 month timeframe.

3 - "Plume Wells" (wells in clusters 1, 3, 5, and 6) are located downgradient of the primary source areas and are generally characterized by lower concentrations of PCE and TCE and, depending on the location and depth of a specific well, variable concentrations of cDCE and VC.

4 - "Source Area Wells" (wells in clusters 2 and 4) are located in the primary source areas and are generally characterized by moderate to high concentrations of all PCE, TCE, cDCE, and VC.

PCE = perchloroethylene (tetrachloroethene)
TCE = trichloroethylene
cDCE = cis-1,2-dichloroethene
VC = Vinyl Chloride
µg/L = micrograms per liter