SUBMITTED TO:
PACCAR Inc

BY:
Shannon & Wilson, Inc.
400 N. 24th Street, Suite 100
Seattle, WA 98103

(206) 632-8020
www.shannonwilson.com

ENGINEERING DESIGN REPORT

Groundwater Injections

8801 EAST MARGINAL WAY S., TUKWILA, WASHINGTON
AGREED ORDER NO. 6069

SHANNON & WILSON

June 30, 2021

Shannon & Wilson No: 21-1-12567-027

Submitted To: PACCAR Inc

Subject: ENGINEERING DESIGN REPORT, GROUNDWATER INJECTIONS, 8801 EAST MARGINAL WAY S., TUKWILA, WASHINGTON
AGREED ORDER NO. 6069

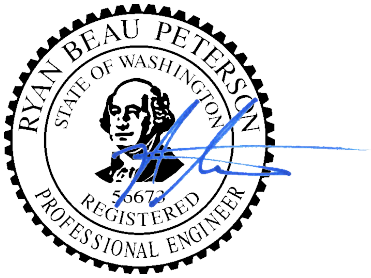
Shannon & Wilson prepared this report and participated in this project as a consultant to PACCAR Inc. This report presents the Engineering Design Report for injection of treatment compounds in groundwater at 8801 East Marginal Way S, Tukwila, Washington.

This report is one of multiple documents that fulfills the Final Engineering Design Report requirements discussed in Task 2C of AO No. 6069.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or we may be of further service, please contact us.

Sincerely,

SHANNON & WILSON



Ryan Peterson, PE
Environmental Engineer

Scott Gaulke
Digitally signed by Scott Gaulke
Date: 2021.06.30 16:22:09 -07'00'

Scott W. Gaulke, LHG, PE
Vice President

RBP:SWG:MJS/rbp

EXECUTIVE SUMMARY

The property located at 8801 East Marginal Way S in Tukwila, Washington (8801 property) occupies 24.30 acres on the east bank of the Lower Duwamish Waterway, as shown in Figure 1. Contaminated soil and groundwater are present at the 8801 property due to historical sources on and off the 8801 property.

This Engineering Design Report (EDR) provides the specifications necessary to implement a subset of the remedial actions described in the Final Feasibility Study, Final Interim Action Work Plan, and the Addendum to the Feasibility Study and Interim Action Work Plan (Addendum). The Final Interim Action Work Plan and the Addendum together constitute the Interim Action Work Plan for the 8801 property.

This EDR is intended to address the plume of groundwater contaminated with halogenated volatile organic compounds (HVOCs) in the west portion of the 8801 property and soil and groundwater contaminated with gasoline-range hydrocarbons in the Northwest Treatment Area of the 8801 property (see Figure 2). The HVOC plume extends into the Northwest Treatment Area. The primary chemicals of concern (COCs) in the HVOC plume are trichloroethylene (TCE) and degradation products (vinyl chloride [VC]).

Other remedial actions to be completed to address the HVOC plume and Northwest Treatment Area are discussed in separate EDRs and include extension and modification of the existing air sparging/soil vapor extraction system, targeted excavation of soil impacted by TCE and gasoline-range hydrocarbons, and construction of a sub-slab depressurization system in the proposed warehouse on the 8801 property. These separate remedial activities may occur before or after the first groundwater injection event. Whichever sequence occurs, the timing of the remedial activities are not expected to adversely impact the injection action described in this report.

The remedial actions described in this EDR includes enhancing biological degradation of COCs in the HVOC plume and Northwest Treatment Area. A carbon source, consisting of oleic acids and lactates/polylactates, will be injected into the subsurface and will be consumed by bacteria. The carbon sources and HVOCs will be co-metabolized (dechlorinated) by the bacteria.

Groundwater injections in the Northwest Treatment Area will occur adjacent and upgradient to soil with gasoline-range hydrocarbons detected in excess of the cleanup level. In the Northwest Treatment Area, the bulk of the soil with exceedances of gasoline-range hydrocarbons will be excavated (Excavation Area 8 in Figure 3). This excavation is

described in a separate EDR. The compound will be injected upgradient of the Area 8 excavation and will migrate to the area of gasoline-impacted soil. The injected compounds will promote growth of the microbial community that will likely metabolize any residual petroleum hydrocarbons in groundwater. Since the groundwater is estimated to migrate at approximately 40 feet per year, the injected compounds placed upgradient of the impacted soil are not anticipated to have migrated to Excavation Area 8 prior to excavation. The excavation of Area 8 subsequent to the upgradient injection of the compounds is not anticipated to impact either remedial action.

The plume area for treatment consists of approximately 150,000 square feet. The injection event will consist of injecting fluids in available areas in the eastern portion of the HVOC plume and in the western portion of the Northwest Treatment Area. The number of events, frequency of events, and number of injection locations may be altered depending on in situ conditions, site development, and progress toward achieving remediation levels.

Compliance monitoring will include monitoring injection equipment parameters, groundwater levels, contaminant concentrations downgradient of the injection area, and other measures. The Compliance Monitoring Plan contains additional details of requirements and was submitted as a separate document.

As part of the 8801 property redevelopment, which is separate from the remedial actions, the area within 100 feet of the western boundary of the 8801 property, also known as the 100-foot river buffer, will be landscaped to comply with the City of Tukwila shoreline requirements. Consequently, this EDR includes activities that facilitate the integration of the remedial actions with the landscaping.

The preceding summary is provided for introductory use only. We recommend a thorough reading of the complete report

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Appendices

ACRONYMS

3DME	3-D Microemulsion®
AO	Agreed Order
AS	air sparging
BDI	Bio-Dechlor INOCULUM® Plus
bgs	below ground surface
CMP	Compliance Monitoring Plan
COC	chemical of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CULs	cleanup levels
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
ERD	enhanced reductive dechlorination
HSP	Health and Safety Plan
HVOC	halogenated volatile organic compound
IAWP	Interim Action Work Plan
LDW	Lower Duwamish Waterway
mg/L	milligrams per liter
MSL	mean sea level
MTCA	Model Toxics Control Act
PCB	polychlorinated biphenyl
POC	point of compliance
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RL	remediation level
SAP	Sampling and Analysis Plan
SEPA	State Environmental Policy Act
SVE	soil vapor extraction
TCE	trichloroethene
TEQ	toxicity equivalent quotient
VC	vinyl chloride
WAC	Washington Administrative Code

1 INTRODUCTION

The upland portion of the property located at 8801 East Marginal Way S in Tukwila, Washington (8801 property) (Figure 1) and the adjoining sediments in the Lower Duwamish Waterway (LDW) together constitute the 8801 site. The 8801 site is subject to two separate Agreed Orders (AOs): AO No. 6069, which applies to the 8801 property, and AO No. 3599, which applies to the adjoining LDW sediments. This report is one of multiple documents that fulfills the Final Engineering Design Report requirements discussed in Task 2C of AO No. 6069.

This EDR provides the specifications necessary to implement a subset of the remedial actions that were selected for the 8801 property in the Final Feasibility Study, Final Interim Action Work Plan, and Addendum to the Feasibility Study and Interim Action Work Plan (Addendum) (Shannon & Wilson, 2020a, 2020b, and 2020c). The Final Interim Action Work Plan and the Addendum together constitute the Interim Action Work Plan (IAWP) for the 8801 property. This subset of remedial actions includes in situ remediation by injection of compounds into the plume of groundwater contaminated with halogenated volatile organic compounds (HVOCs) in the west portion of the 8801 property and injection of compounds in the Northwest Treatment Area. Compliance monitoring for the remedial actions described in this EDR are discussed in the Compliance Monitoring Plan (CMP) (Shannon & Wilson, 2021a). The Sampling and Analysis Plan (SAP) is an appendix of the CMP.

2 SITE DESCRIPTION

This section presents an overview of the 8801 property location, history, geology, and hydrogeology. Additional information is provided in the Final Feasibility Study and Final Interim Action Work Plan (Shannon & Wilson, 2020a and 2020b).

2.1 Physical Description and Use

The 8801 property occupies 24.30 acres on the east bank of the LDW and is relatively flat, with a ground surface elevation of approximately 20 feet above mean sea level (MSL).

The property owner, CenterPoint 8801 Marginal LLC, plans to redevelop the 8801 property by constructing an approximately 414,400-square foot warehouse for industrial use and trailer storage on the property. The redevelopment is slated to commence in 2021. The redevelopment plans include demolition of the existing buildings, except part of the smaller warehouse on the west end of the 8801 property that houses the aboveground infrastructure

for the existing air sparging (AS)/soil vapor extraction (SVE) system. This building is referred to as the "Small Warehouse" and the portion of the Small Warehouse that will not be demolished is referred to as the "Equipment Room." Additionally, several aboveground structures and belowground pipes in the Northwest Treatment Area that are used for stormwater and sewer systems will remain in place or will be renovated.

After demolition of the Small Warehouse is complete, various remedial actions will be implemented, including excavation and removal of contaminated soil from several hotspots and installation of a clay cap and drainage layer within the 100-foot river buffer located along the western edge of the 8801 property. Much of the remainder of the 8801 property will be covered with an asphalt/concrete parking lot and the foundation of the new warehouse. The features of the proposed development are shown in Appendix A.

2.2 Geology

The 8801 property is currently paved. Fill material underlies paved surfaces and is up to 10 feet thick in some locations. Fill material includes gravelly structural fill beneath buildings and paved areas, poorly graded sand to silty sand fill deposits, and gravelly backfill materials in excavations. Fill material at the 8801 property is underlain by a layer of fine-grained material, including silt, sandy silt, and silty sand that extends to a depth of 5 to 15 feet below ground surface (bgs). A poorly graded sand layer, which typically contains less than 10% silt, is generally present beneath the fine-grained layer beginning from 10 to 15 feet bgs down to 30 to 50 feet bgs, although at some locations it is present immediately beneath the pavement surface or the fill material. A layer of fine-grained materials, consisting mainly of silt and silty sand, is typically present beneath the poorly graded sand layer at depths of approximately 30 to 50 feet bgs. This fine-grained silty material acts as a confining layer to groundwater flow on the western portion of the 8801 property. The lower fine-grained layer is typically underlain by poorly graded sand to the maximum depth explored at the 8801 property (60 feet bgs).

2.3 Hydrogeology

Results of groundwater monitoring at the 8801 property indicate that the shallow aquifer is typically 8 to 10 feet bgs. The hydraulic gradient in the shallow aquifer is generally toward the west. Groundwater velocity is estimated to be 40 feet per year.

Results of tidal influence analyses indicate that the maximum tidal fluctuation at the LDW 8801 site along the western boundary of the 8801 property ranges from -3.03 feet MSL to +1.85 feet MSL in the southern portion of the 8801 property where riprap demarcates the 8801 property boundary. Farther north, where the sheet piling bulkhead demarcates the

8801 property boundary, the maximum tidal fluctuation ranges between -1.80 feet MSL and +1.32 feet MSL.

2.4 Background for the Halogenated Volatile Organic Compound (HVOC) Groundwater Plume

A plume of groundwater contaminated with HVOCs extends from the northern boundary of the 8801 property, downgradient (south and west), to the western boundary of the 8801 property (Figure 2). A portion of the HVOC plume extends under the north adjoining property. The primary COCs identified in the HVOC plume are TCE and VC. Calculations undertaken using the BIOCHLOR model, as discussed in the Final Feasibility Study, demonstrate that HVOCs are naturally degrading at the 8801 property. VC is predominantly present due to degradation of TCE.

The HVOC plume is intercepted by the existing AS/SVE system at about 130 to 200 feet from the western boundary of the 8801 property. The AS/SVE system is designed as a polishing step to further remove HVOCs from the groundwater prior to groundwater reaching the western boundary of the 8801 property. The AS system is designed to inject pressurized air below the ground surface into the saturated zone, causing contaminants to volatilize and promote in situ aerobic degradation. Vapors are extracted from the subsurface via negative pressure created by the SVE system.

2.5 Pilot Injection Study at the Halogenated Volatile Organic Compound (HVOC) Groundwater Plume

A pilot injection study, designed to promote enhanced reductive dechlorination (ERD) of the HVOC plume, was conducted on the 8801 property during July 2019 (Shannon & Wilson, 2020d). The pilot injection study was undertaken to acquire data that was critical for (a) design and (b) assessment of baseline conditions necessary for the implementation of a successful remedial action. The pilot injection study consisted of injection of the following products at 44 injection sites (shown in Figure 2) within the HVOC plume:

- Regenesis 3D Microemulsion™ (3DME) substrate diluted with water. 3DME provides an organic substrate.
- Regenesis Bio-Dechlor INOCULUM® Plus (BDI). BDI provides the live microbial consortium.
- Anaerobic water, or water with a dissolved oxygen concentration below 0.2 milligram per liter (mg/L), was used to prime and flush the lines prior to and following injection of the BDI.

Groundwater samples collected two months after the pilot injection event indicated that ERD was occurring (Shannon & Wilson, 2020d). At MW-48A, the groundwater monitoring well closest to the injection points, the concentration of TCE declined, while the concentration of VC increased.

Groundwater samples collected 18 months after the pilot injection event provided additional evidence of meaningful changes in the concentrations of contaminants, degradation products, and geochemical and biochemical indicators (Shannon & Wilson, 2021b). Based on the laboratory data, reductive dechlorination using the compounds injected during the pilot was improved above baseline levels and appeared to be continuing to reduce the concentrations of HVOCs.

After 18 months, at MW-48A (in the pilot injection area), whilst dechlorination was still occurring, the rate appeared to have slowed potentially due to the decrease in pH that may be suppressing microbial activity. The optimal pH range for growth of the BDI microbes is 6 to 8 and industry data suggests that at a pH below 5.5, growth may stall. The measured pH at the pilot injection area decreased from 6.33 to 6.82 measured during the baseline groundwater monitoring prior to the pilot study to 5.6 to 5.62 as measured at 18 months after the pilot injection.

Based on the pilot study data, there also appears to be back diffusion from soil as shown by slightly increasing TCE concentrations. This opinion is based on the most recent analytical results (February 2021) from within the treatment area (MW-48A), where we anticipate the effects of the injection compounds to be more mature when compared to downgradient monitoring points (MW-28A and MW-47A).

Based on the pilot study results, the injected compounds will continue to beneficially impact groundwater for one to two years as they move away from the injection area, resulting in ERD occurring in an increasing larger area.

The full-scale injection that is described in this EDR will include re-injection in the pilot study area. Fermentation activities generated by the injected material and microbes during the pilot study appear to be have resulted in decline in the pH at MW-48A and downgradient. Therefore, a buffering compound (calcium carbonate) will be added to the injection solution during the full-scale injection. The buffer material will raise the aquifer pH to the favorable range for microbial growth.

2.6 Background for the Northwest Treatment Area

The Northwest Treatment Area of the 8801 property is shown in Figure 3. The Northwest Treatment Area consists of approximately 13,000 square feet of paved surface with several

structures and underground utilities. A sheet pile wall separates this portion of the 8801 property from the LDW. The hydraulic gradient in the shallow aquifer is generally toward the west but may have a northerly and southerly component closer to the sheet pile wall.

The majority of the Northwest Treatment Area is within the HVOC plume. In addition to VC contaminants associated with the HVOC plume, gasoline-range hydrocarbons have been detected in saturated soil and groundwater in the Northwest Treatment Area. Concentrations of gasoline-range hydrocarbons in saturated soil that exceed the cleanup levels (CULs) have been detected at depths up to approximately 10 feet bgs.

In-situ chemical oxidation (ISCO) was previously selected as a remedial action for the Northwest Treatment Area due to logistical challenges associated with the existing structures adjacent to the zone of contamination. That approach, which is discussed in the Final Feasibility Study and the IAWP, consisted of periodic injections of an oxidizing compound within the area impacted by gasoline-range hydrocarbons. ISCO compounds typically take effect for a short duration and within a small radius of influence from the injection site. It was anticipated that the injections would occur over three years.

During subsequent preparation of redevelopment plans for the 8801 property (separate from the remedial actions), the restoration plan for the 100-foot river buffer was revised to accommodate the City of Tukwila shoreline requirements. The current restoration plan for the 100-foot river buffer includes demolition of the Small Warehouse in the Northwest Area except for the Equipment Room, excavation and removal of contaminated soil from several hotspots, backfilling the excavations, grading, installation of a clay cap and drainage layer, and landscaping (Appendix A).

The remedial actions for the Northwest Treatment Area were revised to limit disturbance of the 100-foot river buffer following restoration activities. Soil with concentrations of gasoline-range hydrocarbons exceeding the CULs will be excavated after the Small Warehouse is removed (Excavation Area 8 shown in Figure 3), as described in a separate EDR. A carbon source will be injected as described in this EDR after the targeted hotspot excavation. The carbon source will enhance biological degradation of COCs (HVOCs) in the Northwest Treatment Area. A carbon source, consisting of oleic acids and lactates/polylactates, will be injected into the subsurface and will be consumed by bacteria. The carbon source and HVOCs will be co-metabolized (dechlorinated) by bacteria. The injected carbon source will promote growth of the microbial community that will likely metabolize any residual gasoline-range hydrocarbons in groundwater.

The injection fluids are designed to migrate with groundwater and will disperse across the Northwest Treatment Area from the injection locations east of the 100-foot river buffer. Permanent injection wells will be used for periodic injection events.

Because the injection fluids will be delivered east of and below the 100-foot river buffer, the chemicals will not come in contact with landscaping planted in the 100-foot river buffer. Accordingly, the injected chemicals are not expected to affect the ability of landscaping in the 100-foot river buffer to grow or thrive.

3 CLEANUP STANDARDS AND REMEDIATION LEVELS

Cleanup standards consist of CULs and points of compliance (POCs) where the CULs must be attained. A remediation level (RL) consists of a concentration of a COC above which a cleanup action component will be required as part of a cleanup action. The cleanup standards and RLs described in this section apply to the remedial actions described in this EDR and other remedial actions described in the IAWP.

3.1 Cleanup Levels

The CULs are provided in the IAWP and an excerpt is included in Appendix E, Table E-1. The starting point for establishing the CULs was the Washington State Department of Ecology (Ecology) preliminary CULs, which are based on various exposure pathways, including soil partitioning to groundwater and entering surface water, and are protective of sediment, surface water, and consumption of fish. The CULs are based on applicable state and federal or relevant and appropriate requirements. The values were then adjusted for practical quantitation limits achievable by analytical laboratories and for natural background concentrations of COCs, as appropriate.

3.2 Remediation Levels

RLs are the concentration that, once reached at the designated location, will achieve CULs at the POCs. The RLs for TCE and VC are higher than the CULs because the BIOCHLOR model indicates that HVOCs will naturally degrade such that concentrations will be protective of surface water (i.e., concentrations of TCE and VC will be below CULs) by the time the groundwater reaches the western boundary of the 8801 property. The RLs for TCE and VC are provided in the IAWP and an excerpt is included in Appendix E, Table E-2 of this report.

3.3 Point of Compliance for Groundwater CULs and RLs

The Model Toxics Control Act (MTCA) defines the POC as the point or points at which CULs must be attained. The POC for groundwater is a "conditional" POC set at the western boundary of the 8801 property due to the inability to achieve the total carcinogenic polycyclic aromatic hydrocarbon toxicity equivalent quotient and total polychlorinated biphenyl aroclor CULs in groundwater throughout the 8801 site. The rationale for establishing a conditional POC for groundwater is described further in the Final Feasibility Study and the IAWP.

4 REMEDY OVERVIEW

The remedial actions described in this EDR consist of enhanced biological degradation in the HVOC plume and Northwest Treatment Area. This remedy protects human health and the environment, employs reliable and proven technologies, and can be completed within a reasonable timeframe. The objective of this remedy is to reduce the concentration of COCs in the main part of the HVOC plume to RLs and reduce the concentration of VC and gasoline-range hydrocarbons to CULs in the Northwest Treatment Area.

The remedial actions include the following components:

- Injection of organic substrate, dechlorinating microbes, and anaerobic water at approximately locations in the eastern portion of the HVOC plume and western portion of the Northwest Treatment Area (including two permanent injection wells). The initial injection areas are shown in Figures 2 and 3. After construction of the 414,000 square feet warehouse, additional injection points will be outside the footprint of the building based on the geochemistry and concentrations in the groundwater. In the Northwest Treatment Area, groundwater flow will disperse the remediation chemicals to the west to areas with restricted access due to infrastructure.
- Compliance monitoring will include monitoring injection equipment parameters, groundwater levels, contaminant concentrations downgradient of the injection area, and other parameters. The CMP contains additional details of monitoring activities and was submitted as a separate document.

The remedial actions described in this EDR are anticipated are anticipated to commence in 2021.

5 DESIGN AND IMPLEMENTATION

The purpose of this section is to provide a detailed description of the engineering design to implement this remedial action.

5.1 Objective

The objective of the remedial actions described in this EDR is to reduce concentrations of COCs in groundwater in the HVOC plume to RLs and reduce the concentrations of COCs in groundwater in the Northwest Treatment Area to CULs. Once these remedial actions are completed, it is anticipated that natural degradation of COCs will continue and concentrations will be less than applicable CULs at the conditional POC.

5.2 Potentially Applicable or Relevant and Appropriate Requirements

The activities described in this EDR consist of remedial action that will occur under the terms of an AO entered into with Ecology. As such, this remedial action is exempt from the procedural requirements of Chapters 70A.15, 70A.205, 70A.305, 77.55, 90.48, and 90.58 Revised Code of Washington (RCW) and the procedural requirements of any laws requiring or authorizing local government permits or approvals. This remedial action must nonetheless comply with the substantive provisions of state and local laws and regulations.

Potentially applicable or potentially relevant and appropriate requirements that might apply to this remedial action include:

- The State Environmental Policy Act (SEPA) as authorized by RCW 43.21C and Washington Administrative Code (WAC) 197-11. A SEPA checklist for the IAWP, which includes the remedial action described in this report, has been completed, a determination of non-significance issued, and the document provided for public review.
- Occupational Safety and Health Act and Washington Industrial Safety and Health Act regulations (29 Code of Federal Regulations 1910.120; WAC 296-843). Details to address this are provided in the Health and Safety Plan (HSP) attached to the CMP.
- Washington Industrial Safety and Health Act, Chapter 49.17 RCW, Safety Standards for Construction Work (WAC 296-155). Details to address this are provided in the HSP attached to the CMP.
- Underground Utilities, RCW 19.122.010, General Protection Requirements (WAC 296-155-655).
- City of Tukwila zoning, building, and construction regulations (e.g., grading, stormwater, and shoreline requirements).

- Requirements for decommissioning of groundwater monitoring wells (WAC 173-160). A licensed driller will submit a notice of intent to Ecology's Water Resources Program prior to decommissioning the monitoring wells as detailed in the CMP.
- Resource Conservation and Recovery Act (RCRA) regulations for waste generation, hauling, and disposal (WAC 173-303; WAC 173-350).
- Solid Waste Management Chapter 43.21 RCW, Minimum Functional Standards for Solid Waste Handling (WAC 173-304) for waste handling.
- Underground Injection Control Program (WAC 173-218). Ecology requires any material that is injected into the subsurface be registered with Ecology's Water Quality Program as an injection control registration. All wells must be registered, and approval must be received prior to beginning injections. Injections may only occur in the specified wells, timeframe, and for the material specified.

5.3 Pre-Mobilization Coordination

Pre-mobilization coordination activities will include, but are not limited to, the following:

- Addressing any overlapping health and safety issues with the project team.
- Communicating the project schedule with the project team.
- Notifying Ecology about the anticipated field schedule at least five working days prior to the scheduled start of the remedial actions.
- Communicating and coordinating with Boeing personnel for access to the north adjoining property.
- Communicating with the laboratory about the laboratory requirements included in the SAP.
- Communicating with the off-site waste disposal facility regarding the acceptance of solid waste generated on the 8801 property.
- Coordinating with the appropriate wastewater facility regarding acceptance of any stormwater or groundwater discharged to that facility.

5.4 Site Preparation

The following tasks will be completed prior to commencing injection activities.

- The existing warehouse building near the center of the 8801 property and the Small Warehouse near the northwest portion of the 8801 property will be demolished except for the Equipment Room (Appendix A). These activities may not be completed before the first injection event.
- Utility location will be undertaken using a private company. The stormwater lines in proximity to the proposed injection area will be traced to ensure any preferential

routeways are known. The locations of the known stormwater lines and utility access holes are provided in Figure 4.

- Two permanent injection wells will be installed in the Northwest Treatment Area after the first injection event. The wells will be located immediately east of the 100-foot river buffer (Figure 3) and will be screened at 5 to 20 feet bgs. The injection wells will be decommissioned when they are no longer required to implement the remedy.
- Groundwater monitoring wells within the injection areas may be decommissioned and replaced as new monitoring wells as outlined in the CMP. Wells that may potentially be within the radius of the injection activities will be protected. Packers will be placed in those monitoring wells for the duration of injection activities. Packers will not be installed in monitoring wells if the wells are outside of the radius of influence of the injection points. The packers will be removed upon completion of injection work in wells within the radius of influence.
- Packers will be placed in nearby stormwater lines to prevent any injection fluids that may seep into stormwater pipes from migrating through the stormwater system to the stormwater outfalls. The locations of stormwater packers are provided in Figure 4. Upon completion of the nearby injection work, the stormwater lines will be flushed with water and the resultant liquids removed by vacuum pump prior to the packers being removed from the stormwater systems.
  - A packer will be placed to the east of storm drain manhole SDMH-E to prevent stormwater from entering the area where potential seepage of injection fluids may occur into the injection pipe.
  - A packer will be placed to the east of storm drain manhole SDMH-B. The packer will prevent injection fluid from traveling downstream to the stormwater treatment system. This access hole will be monitored during injection activities for signs of leakage around the packer.
  - Two packers will be placed in the stormwater sewer location on the north adjoining property. Packers will be placed upgradient (at manhole MH 70) and downgradient (at manhole MH 75) from the injection area. The packer locations are shown in Figure 4 and Appendix F which is a map showing the north adjoining property's drainage system.

A bypass line will be run between the point of stormwater line closure to a point beyond the downline packer location. The bypass line will be connected to a pump and is designed to prevent stormwater from accumulating and potential flooding behind the first packer.

5.5 Injection Fluids

The remedial action includes injection of fluids designed to enhance biological degradation of COCs. A carbon source will be injected to the subsurface and will be consumed by microbes for the co-metabolism of the HVOCs in saturated soil and groundwater. The carbon source will promote growth of the microbial community that will likely metabolize

any residual gasoline-range hydrocarbons in groundwater in the Northwest Treatment Area.

Based on results of the pilot injection study, the selected remediation compounds have shown to be effective at promoting the degradation of HVOCs in groundwater at the 8801 property. Based on post-pilot injection groundwater monitoring, the selected remediation compounds have shown to continue to degrade contaminants beyond 18 months following injection, and biochemical parameters suggest that degradation will continue for the expected timeframe of 2 to 4 years after initial injection (the 2 to 4 year timeframe is based on the manufacturer's data). Based on the efficiency of the pilot study, the methods, equipment, and materials that were implement in the pilot study are selected for the full-scale remedial injection, except for several minor items that are noted in Section 2.5 and in this section.

The carbon source selected for this remedial action is a solution of Regenesis' 3DME, a patented molecular structure consisting of oleic acids and lactates/polylactates (product spec sheet provided as Appendix B). 3DME was chosen because of its ability to initially adsorb to surrounding soils, then slowly desorb into the aquifer. This time-released dosage into the groundwater is anticipated to occur over two to four years. In addition, 3DME is more soluble than blended emulsified vegetable oil products, which fail to distribute beyond the limits of pumping. Furthermore, the remediation process using 3DME does not generate heat, which could adversely affect existing infrastructure. 3DME has been successfully applied at the 8801 property and at other sites in the vicinity of the 8801 site. The 3DME solution will be mixed in a large frac tank using hydrant water. While the 3DME solution is being mixed, hydrant water will also be treated with sodium bisulfate so the carbon source is delivered to the subsurface with anaerobic water; creating ideal conditions for subsequent microbial fermentation.

Fermentation of the 3DME provides an electron donor source. The electron donor can then be used by bacteria that respirate HVOCs to grow and reproduce. Initially, bacteria will consume any dissolved oxygen, nitrates, iron, or sulfates in the subsurface for respiration. After these compounds are consumed, the HVOCs will be used by the bacteria as a food source. The respiration of bacteria will dehalogenate TCE down the normal degradation pathway: TCE will degrade to dichloroethylene, dichloroethylene will degrade to VC, and VC will degrade to ethane and ethene.

To enhance the ERD, bioaugmentation, the addition of dechlorinating bacteria, will be conducted at the 8801 property. Bioaugmentation will be performed by injecting Regenesis' BDI, an enriched, natural microbial consortium containing species of *Dehalococcoides sp.*, which are capable of completely dechlorinating contaminants during in situ anaerobic

bioremediation processes (product spec sheet provided as Appendix C). BDI has been successfully applied at other sites in the vicinity of the 8801 site, as well as other sites in Washington.

Based on the results of the pilot injection, the pH of the groundwater appears to have lowered during the pilot study and is lower than the favorable range for microbial growth. During the remedial injection, the pH of the groundwater will be raised to the preferred range. VitaCal® precipitated calcium carbonate will be dissolved in the 3DME solution to raise the pH of groundwater. Calcium carbonate is a common substance found in limestone and is used as an additive in many food products. A safety data sheet for VitaCal® precipitated calcium carbonate is provided as Appendix D.

Anaerobic water will be used for priming and flushing the injection lines before and after injection of BDI. The anerobic water will contain less than 0.2 mg/L of dissolved oxygen. Anaerobic water will be created by treating approximately 275 gallons of hydrant water with approximately 1/3 cup of sodium bisulfate. The dissolved oxygen concentration of the anaerobic water will be monitored using a hand-held water quality meter (calibrated daily).

Because the remediation chemicals will be delivered east of and below the clay cap of the 100-foot river buffer, the injected chemicals will not come in contact with landscaping planted in the 100-foot river buffer during injection. The injected chemicals are not expected to affect the ability of landscaping in the 100-foot river buffer to grow or thrive.

5.6 Injection Locations and Equipment

The approximate injection locations for the initial event are shown in Figures 2 and 3. The injection locations (also referred to as temporary injection locations) are points at which the remediation compounds will be injected via a push probe. The cavity created by the push probe will be immediately backfilled following completion of the injection event. After construction activities associated with CenterPoint have been completed, two permanent injection wells will be installed at the Northwest Treatment Area in an area with restricted access and where it is possible that multiple injection events will be required.

The 8801 property is fenced and has a locked gate that restricts public access. The injection areas consist of a relatively flat surface that is paved with concrete and/or asphalt. Based on the pilot injection study conducted in July 2019, the injection locations were spaced approximately 30 feet apart with an estimated radius of influence of 20 feet laterally and 30 feet down gradient. The design assumes that each injection radius of influence overlaps, ensuring full contact with the soil throughout the injection areas. Based on groundwater and soil sampling and analysis, the target area will be from 5 to 20 feet bgs. In areas of concrete, the surface will be cored.

At each temporary injection location, except for the permanent injection wells, a star bit direct-push probe will be pushed to 20 feet bgs, and a 5-foot slotted tool will be exposed. At the two permanent injection wells, packers will be used to isolate the injection interval. The injections will take place at three depth intervals at each location: 20 to 15 feet bgs, 15 to 10 feet bgs, and 10 to 5 feet bgs. The injections will occur starting at the deepest depth interval and proceeding shallower. A profile view of typical proposed injection locations is provided as Figure 5.

Once temporary injections are completed, the injection locations will be backfilled with hydrated bentonite and the surface will be patched to match the existing grade using concrete or asphalt in accordance with WAC 173-160.

As previously discussed, two permanent injection wells will be installed in the Northwest Treatment Area. The wells will be screened at 5 to 20 feet bgs. At the time of the first injection event, if the final pavement is not constructed at the location of the two permanent injection wells, remediation compounds will be injected at the location of the wells using a star bit direct-push probe using the methods described above. The permanent injection wells will be installed when the final pavement is constructed. The wells will be decommissioned when no longer required for the remedy.

5.7 Injection Sequence and Schedule

Injection of remediation chemicals is typically employed by injecting fluids at several locations simultaneously. Up to ten points with the same depth interval will be injected simultaneously. The injection sequence and parameters were developed based on the results of the pilot injection study, recommendations by the remediation compound vendor (Regenesis), and experience at similar sites.

The following list provides the anticipated injection sequence and volumes at each injection location.

1. 37.5-gallon prime of anaerobic water
2. 1834 gallons of 5% (by volume) 3DME solution
3. 572 gallons of 5% (by weight) precipitated calcium carbonate solution
4. 0.8 liters of BDI
5. 37.5-gallon flush of anaerobic water.

It is anticipated that the initial injection event, consisting of injection at each point, will take approximately one month to complete.

5.8 Contingencies

Groundwater monitoring will be undertaken to assess the performance of the remedial action. The number of events, frequency of events, and number of injection locations may be altered, depending on in situ conditions and progress toward achieving RLs and CULs.

Groundwater monitoring procedures are discussed in Section 5.2.4 and 5.2.8 of the CMP (Shannon & Wilson, 2021a) and will consist of quarterly monitoring and evaluation of remedial performance. The RAOs are to protect current and future worker exposure to soil contaminants, occupants of future building to vapor contaminants, and the surface water and sediments of the LDW from migration of contaminants in groundwater. The work is also designed to achieve remediation of the halogenated VOC groundwater plume in a reasonable timeframe. The groundwater data will be used to establish whether additional remedial actions are required and to assess the restoration timeline.

Within the halogenated VOC groundwater plume, the reagents have a designed lifespan of approximately two to four years and will impact groundwater both near and downgradient of the injection point. Triggers to consider for additional action or consideration of other alternatives in the halogenated VOC plume are:

- If the maximum concentration of TCE has not declined by up to 80 to 90% within three years and the geochemistry demonstrates that dechlorination is still occurring, re-injection of the ERD compounds or other stimulate compounds will be considered.
- If vinyl chloride increases are greater than those predicted from the mass conversion of the remaining TCE or the concentrations stall, alternative injection substrates may be considered. These could include, but are not limited to, permanganate, peroxide, persulfate, calcium carbonate, or additional pH control.

Cleanup of VC and lighter petroleum hydrocarbons in the Northwest Treatment Area will be undertaken as discussed in Sections 5.1 and 5.6 of this EDR. Triggers to consider for additional action or consideration of other alternatives in the Northwest Treatment Area are:

- If VC concentrations exceed the CULs at MW-7A (upgradient) and MW-44A (within the injection area) after three injection periods (if three injections are undertaken as they may not all be required), consideration of other options, such as alternative injection compounds, will be discussed with Ecology.
- If hydrocarbon concentrations exceed the CULs at MW-44A after three injection periods (if three injections are undertaken as they may not all be required), consideration of other options, such as alternative injection compounds, will be discussed with Ecology.

5.9 Construction Procedures and Controls

This section describes the construction procedures and controls that will be implemented, as necessary, in conjunction with the remedial actions described in previous sections.

5.9.1 Site Control

A perimeter fence is already in place around the 8801 property to limit public access. If necessary, a perimeter fence will be placed around the injection areas or the areas will be cordoned off with cones and tape. The contractor will control fencing access points during construction.

5.9.2 Spill Control

The contractors will use best management practices to prevent spills of oil, fuel, injection fluids, and other products containing hazardous substances, and will have spill kits available at the 8801 property to respond to any spills. Any release to the environment will be remedied to Ecology's satisfaction by the contractor responsible for the spill.

5.9.3 Waste Disposal

The injection probes will be decontaminated between injection locations. Decontamination water will be collected, characterized, and transferred to a qualified off-site treatment or disposal facility. Excavated soil will be characterized for COCs and transferred to a qualified disposal facility. The soil is anticipated to be disposed of at a RCRA Subtitle D facility.

5.10 Remedial Action Completion Report

After the remedial actions described in this EDR are completed, a Remedial Action Completion Report documenting the remedial actions will be produced. The Remedial Action Report may also document remedial actions described in other EDRs.

6 COMPLIANCE MONITORING

This section discusses the compliance monitoring that will be undertaken to demonstrate compliance with MTCA. The CMP with additional detail for performance and compliance monitoring has been submitted separately (Shannon & Wilson, 2021a).

Three types of compliance monitoring are identified for remedial actions performed under MTCA (WAC 173-340-410): Protection, Performance, and Compliance Monitoring. The

definition of each is presented below (WAC 173-340-410 [1]) with project-specific action to be undertaken:

- Protection Monitoring – To confirm that human health and the environment are adequately protected during implementation of remedial actions. Protection monitoring for the remedial actions described in this EDR will include:
  - Erecting a barrier, consisting of caution tape, around the locations being injected, the pressurized lines, the injection equipment truck, and reagent storage tanks.
  - Wearing of appropriate personal protective equipment, including, but not limited to, safety eyeglasses, hardhat, face shield (if specified), high-visibility vest, safety boots, and chemical-resistant gloves.
  - Groundwater level monitoring: Prior to, during, and after each injection event, the depth to groundwater will be measured with dedicated transducers at monitoring wells (if present) immediately beyond the downgradient extent of the injection to determine if the injection event has affected groundwater elevations located between the injection areas and the western boundary of the 8801 property. The tidal cycle will also be noted to determine the effect of tide on the groundwater elevation readings.
- Performance Monitoring – To evaluate whether remedial actions have attained cleanup standards and other performance standards. Performance monitoring for the remedial actions described in this EDR will include:
  - Waste characterization for off-site treatment or disposal.
  - Monitoring the injection systems' input and output parameters to ensure the systems are functioning as designed and allow modifications to increase the systems' effectiveness, and monitoring the systems' effects on groundwater quality. The pressure and flowrate of each injection line will also be monitored.
  - Groundwater samples will be collected from groundwater monitoring wells located downgradient of the remediated areas following completion of the soil excavation and groundwater treatment. The locations of the proposed performance wells and selected analyses are provided in the CMP.
- Confirmation Monitoring – To confirm the long-term effectiveness of remedial actions once cleanup standards and other performance standards have been attained. Confirmation monitoring for the remedial actions described in this EDR will include:
  - Groundwater sampling from groundwater monitoring wells along the western boundary of the 8801 property to determine if CULs have been achieved. The locations of the proposed confirmation wells and selected analyses are provided in the CMP.

7 LIMITATIONS

Shannon & Wilson has reviewed historical records and conducted subsurface explorations of the 8801 site. We have examined and relied on documents referenced in the report and made assumptions for the design and operation of equipment. We have not conducted an independent examination of all facts contained in referenced materials and statements. We have assumed that these documents are genuine and that the information provided in these documents and statements is true and accurate. We have no knowledge or indication to the contrary unless otherwise stated in the body of the report.

The data presented in this report are based on limited research and sampling at the 8801 site; other areas of contamination that were not identified during investigations could be present at the 8801 site. Conditions referenced in this report may change over time.

8 REFERENCES

Shannon & Wilson, 2020a, Final feasibility study, 8801 East Marginal Way S, Tukwila, Wash.: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., 21-1-12567-021, for PACCAR Inc, Bellevue, Wash., July 27, available https://apps.ecology.wa.gov/gsp/DocViewer.ashx?did=93568.

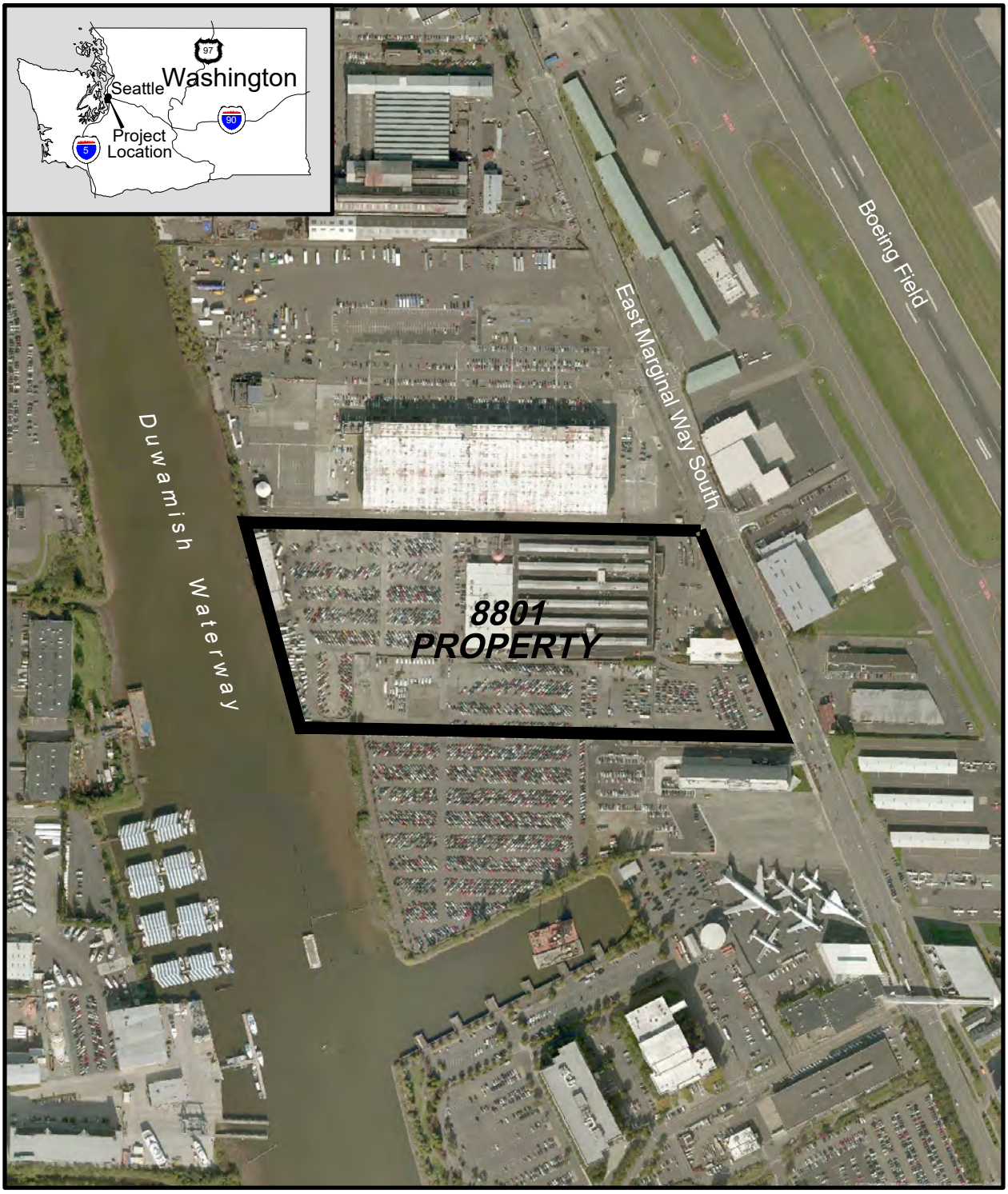
Shannon & Wilson, 2020b, Final interim action work plan, 8801 East Marginal Way S, Tukwila, Wash.: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., 21-1-12567-021, for PACCAR Inc, Bellevue, Wash., July 27, available https://apps.ecology.wa.gov/gsp/DocViewer.ashx?did=93570.

Shannon & Wilson, 2020c, Final feasibility study and interim action work plan addendum, 8801 East Marginal Way S, Tukwila, Wash.: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., 21-1-12567-023, for PACCAR Inc, Bellevue, Wash., December 11.

Shannon & Wilson, 2020d, Pilot injection field activities and groundwater results, 8801 East Marginal Way, Tukwila, Wash.: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., 103485-001, for PACCAR Inc, Bellevue, Wash., March 20.

Shannon & Wilson, 2021a, Compliance monitoring plan, 8801 East Marginal Way S., Tukwila, Wash.: Report prepared by Shannon & Wilson, Seattle, Wash., 21-1-12567-024, for PACCAR Inc, Bellevue, Wash., March 15.

Shannon & Wilson, 2021b, Post-pilot injection monitoring results, 8801 East Marginal Way S., Tukwila, Wash.: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., 103485-003, for PACCAR Inc, Bellevue, Wash., April 29.



0 500 1,000

Approximate Scale in Feet

Engineering Design Report
Groundwater Injections

VICINITY MAP

June 2021 21-1-12567-027

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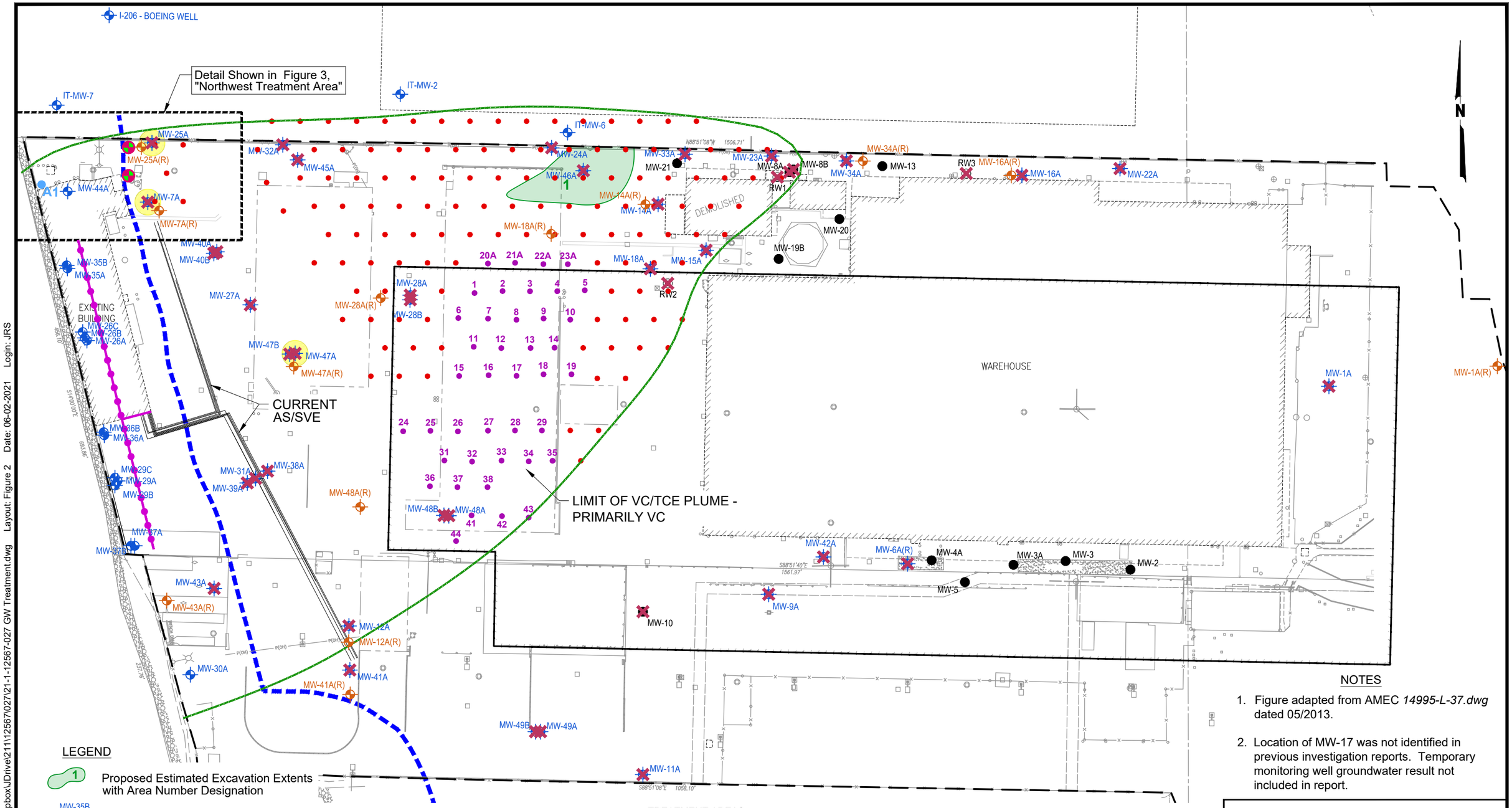
FIG. 1

Filename: C:\Users\jrs\CAD Group Dropbox\JDrive\211\12567\027\21-1-12567-027 Vicinity Map.dwg Date: 06-02-2021 Login: JRS



LEGEND

- 1 — Proposed Estimated Excavation Extents with Area Number Designation
- MW-35B — Monitoring Well
  - A - Screen Installed in Zone A Aquifer
  - B - Screen Installed in Zone B Aquifer
  - C - Screen Installed in Zone C Aquifer
- RW3 — Recovery Well
- MW-21 — Well Removed or Covered
- Wells to be Decommissioned
- MW-48A(R) — Replacement Well Tentative Location
- Groundwater Level Monitoring Well
- Permanent Injection Well Approximate Position
- 100' River Buffer
- Conceptual Building Footprint

TREATMENT AREAS

- Proposed Injection Location
- 26 — July 2019 Pilot Injection Location
- Northwest Treatment Area
- AS/SVE System Extension

NOTES

1. Figure adapted from AMEC *14995-L-37.dwg* dated 05/2013.
2. Location of MW-17 was not identified in previous investigation reports. Temporary monitoring well groundwater result not included in report.

Engineering Design Report
Groundwater Injections

PROPOSED INJECTION LOCATIONS

June 2021 21-1-12567-027

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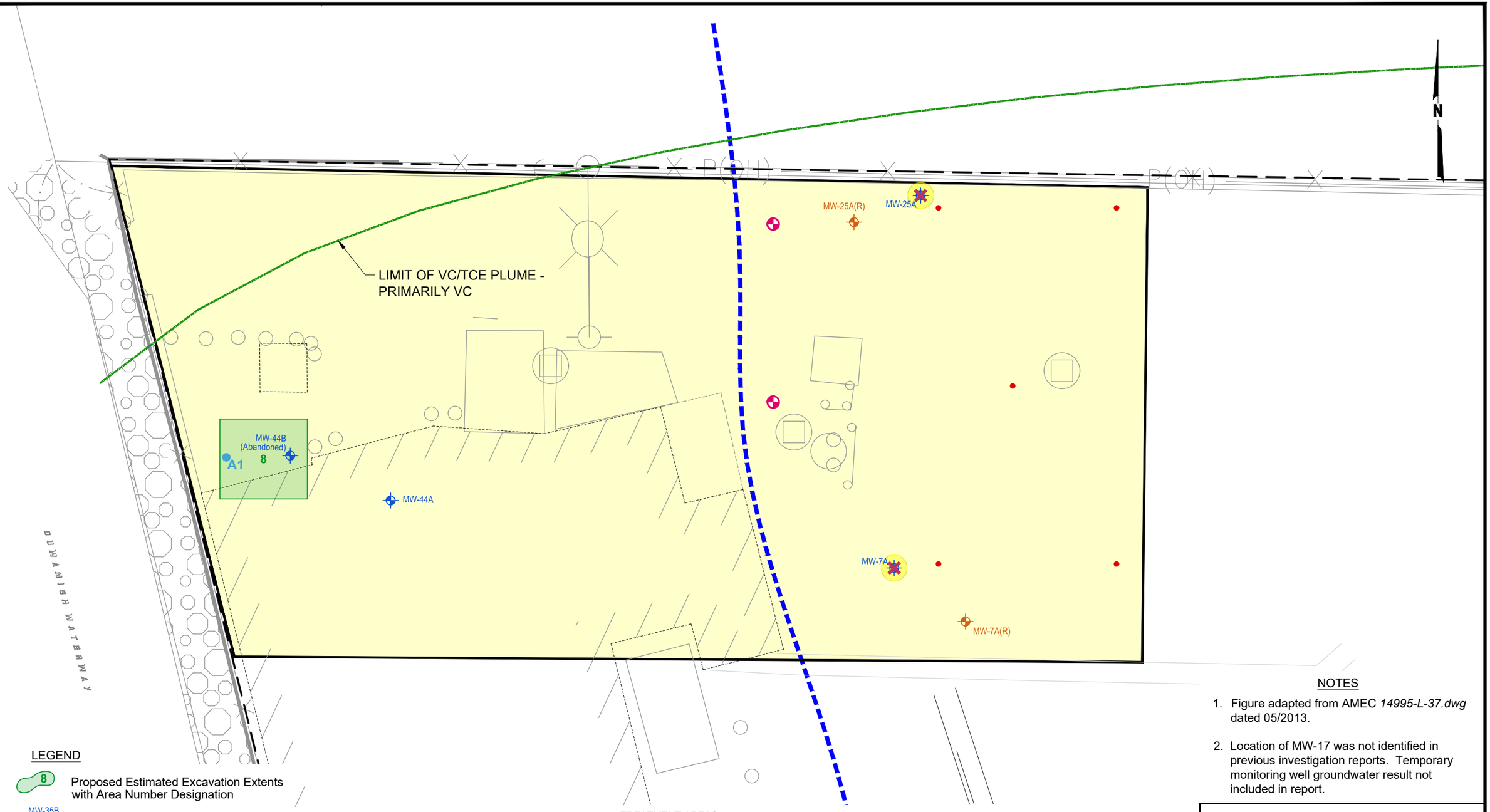
FIG. 2

Filename: C:\Users\jrs\CAD Group Dropbox\JDrive\21\12567\027\21-1-12567-027 GW Treatment.dwg Layout: Figure 2 Date: 06-02-2021 Login: JRS



NOTES

1. Figure adapted from AMEC *14995-L-37.dwg* dated 05/2013.
2. Location of MW-17 was not identified in previous investigation reports. Temporary monitoring well groundwater result not included in report.

Engineering Design Report
Groundwater Injections

NORTHWEST TREATMENT AREA

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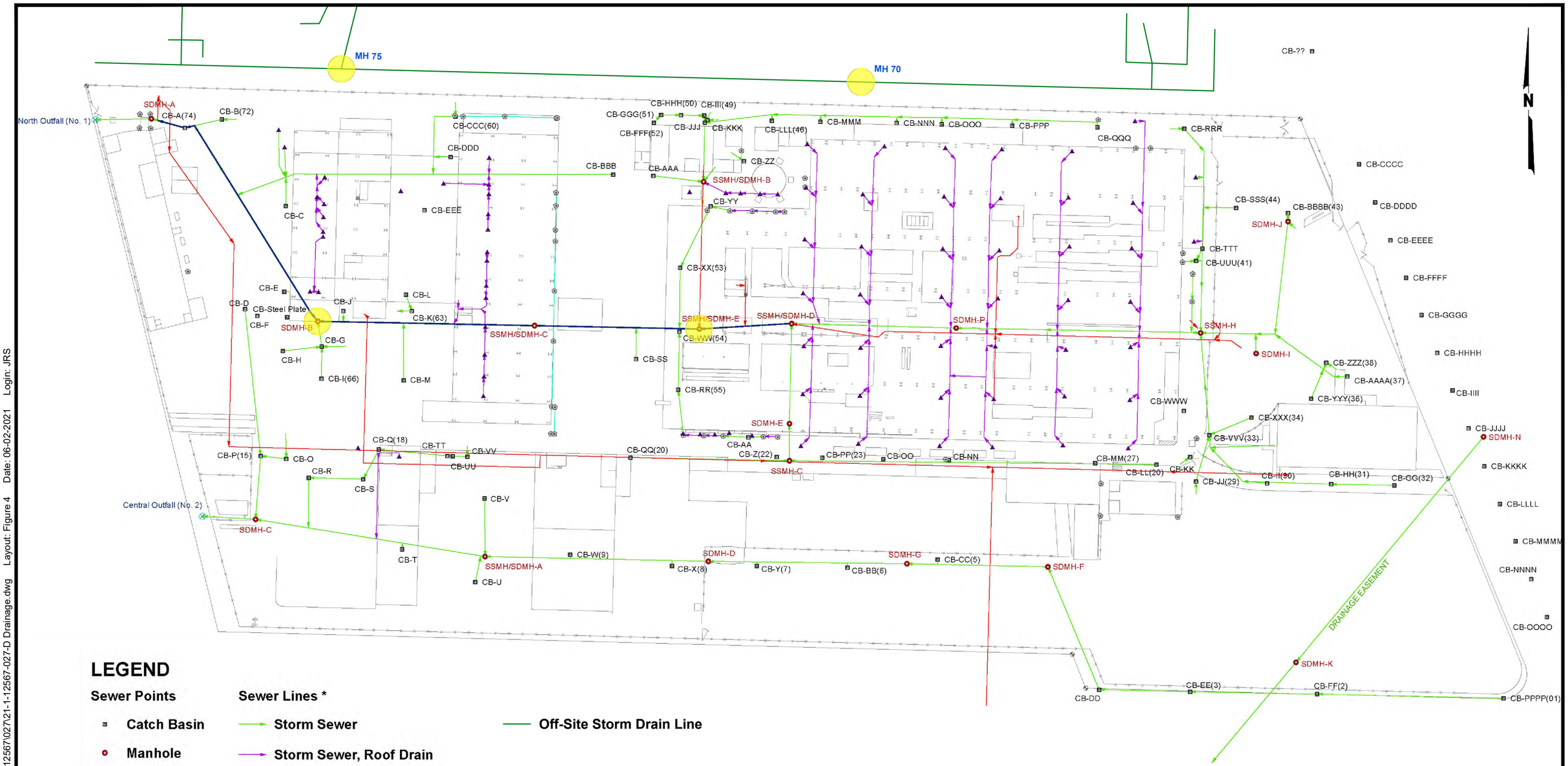
FIG. 3

Filename: C:\Users\jrs\CAD Group Dropbox\JDrive\21\12567\027\21-1-12567-027 NW Treatment Area.dwg Layout: Figure 3 Date: 06-02-2021 Login: JRS



LEGEND

Sewer Points

- Catch Basin
- Manhole
- Outfall
- Roof Drain
- Storm Drain

Sewer Lines *

- Storm Sewer
- Storm Sewer, Roof Drain
- Sanitary Sewer
- Combined Storm-Sanitary Sewer
- Trench Drain

Off-Site Storm Drain Line

Packer Installed at Utility Access Hole

NOTES

1. Surveyed locations of catch basins, manholes, and storm drains from Barghausen Consulting Engineers, Inc figure dated 11/16/04 - "ALTA / ASCM LAND TITLE SURVEY"
2. Loation and connection of sewer lines from Kenworth Truck Company figure dated 01/31/99 - "Sewer and Drainage Map" and from some limited survey information.
3. All Locations are approximate.

0 120 240

Scale in Feet

Engineering Design Report
Groundwater Injections

SITE STORMWATER AND SANITARY DRAINAGE LAYOUT

June 2021 21-1-12567-027

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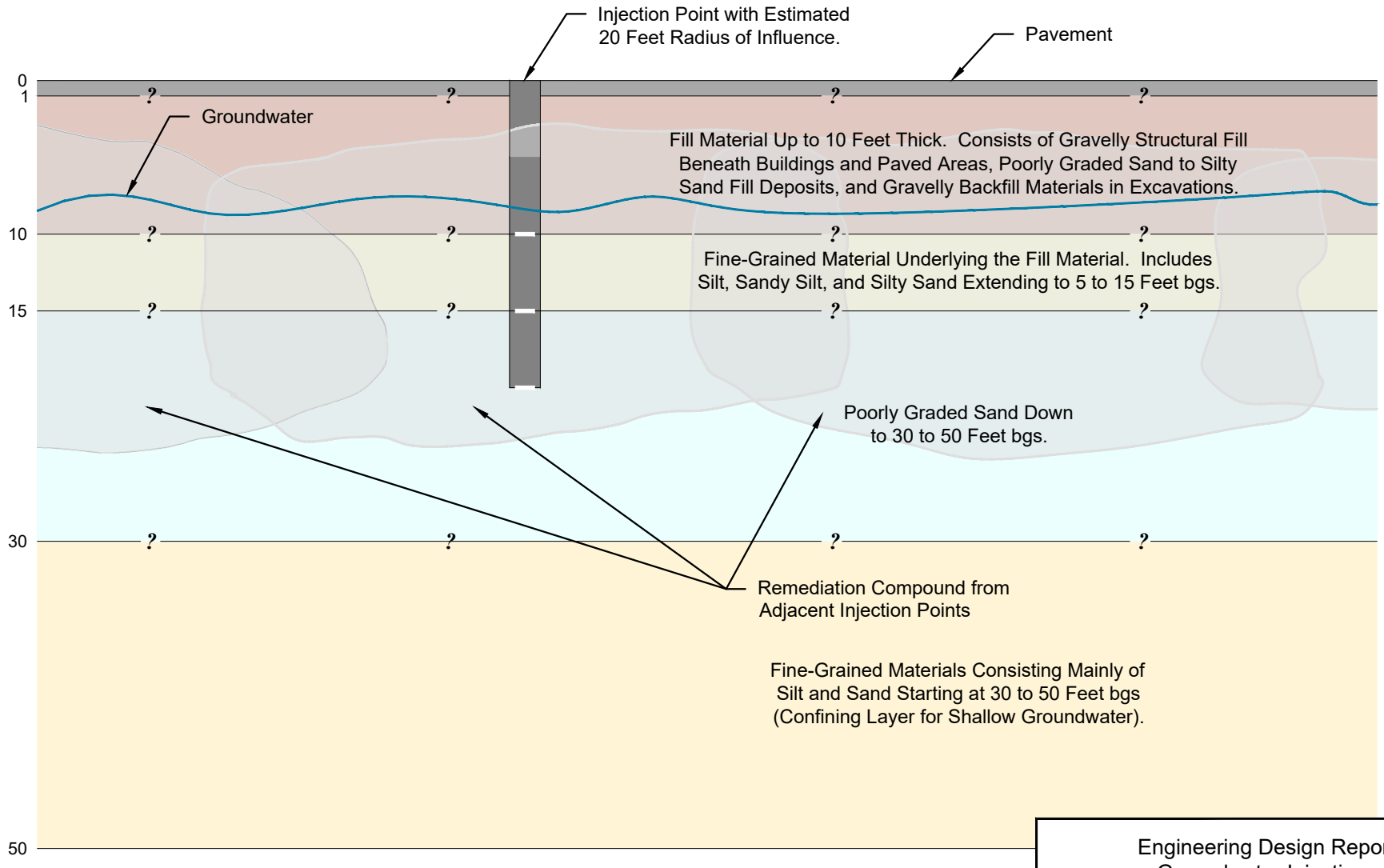
FIG. 4

Filename: C:\Users\jrs\CAD Group Dropbox\JDrive\21\12567\027\21-1-12567-027-D Drainage.dwg Layout: Figure 4 Date: 06-02-2021 Login: JRS



NOTE

Lithilogy is simplified and is shown for context. Actual conditions may vary.

Engineering Design Report
Groundwater Injections

SIMPLIFIED PROFILE VIEW OF INJECTION LOCATION

June 2021 21-1-12567-027

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FIG. 5

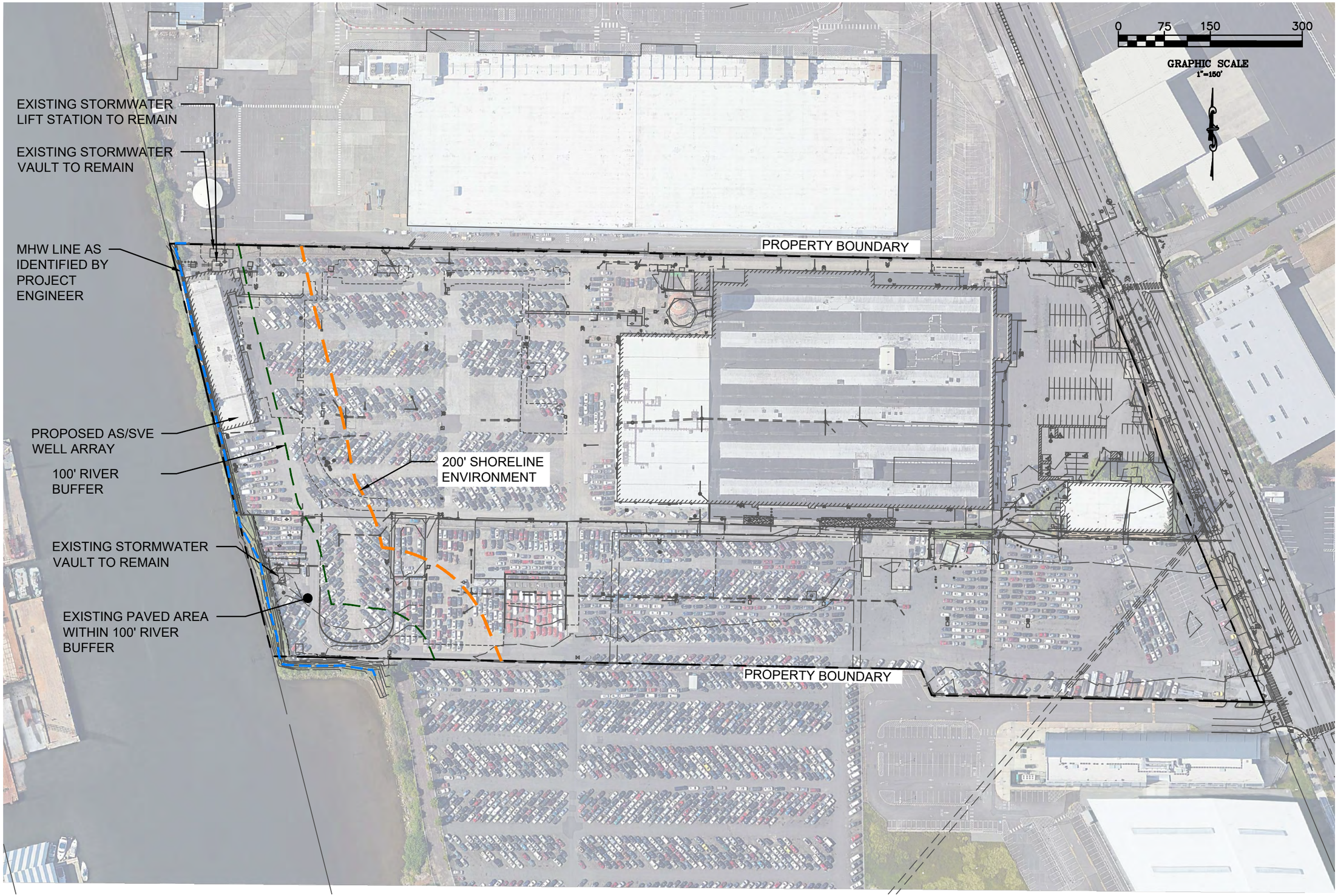
FIG. 5

APPENDIX A: CENTERPOINT PROPOSED RIVER BUFFER PLANS

Appendix A

CenterPoint Proposed River Buffer Plans

CENTERPOINT TUKWILA - EXISTING CONDITIONS



SOURCES:

BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH
KENT, WA 98032
(425)251-6222
(425)251-8782 FAX
CIVIL ENGINEERING, LAND PLANNING, SURVEYING, ENVIRONMENTAL SERVICES

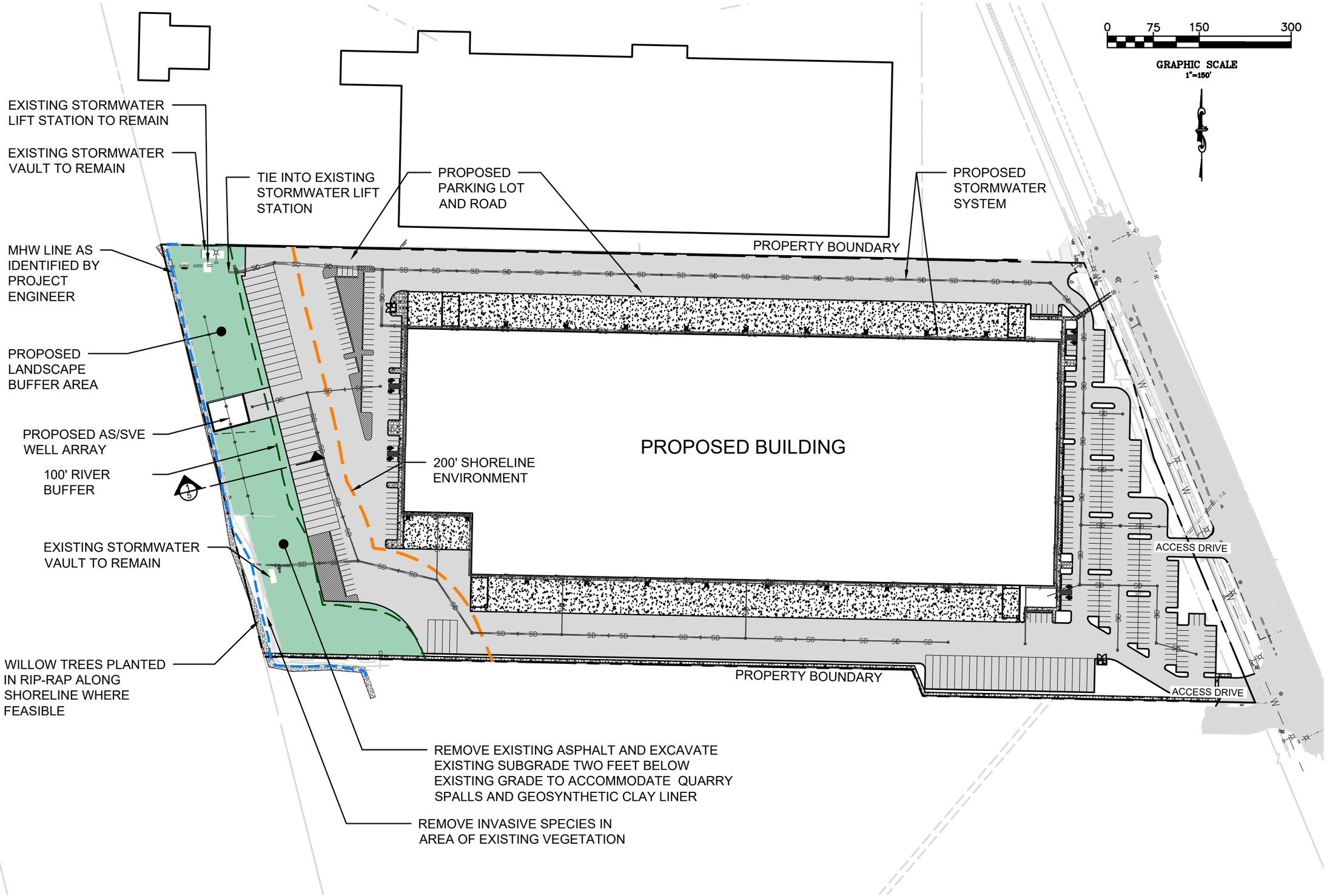
Soundview Consultants LLC
Environmental Assessment • Planning • Land Use Solutions
2907 HARBORVIEW DRIVE, SUITE D
GIG HARBOR, WASHINGTON 98335
P. 253.514.8952
F. 253.514.8954
WWW.SOUNDVIEWCONSULTANTS.COM

CENTERPOINT TUKWILA
8801 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98108

THE SE¼ OF SECTION 33, TOWNSHIP 24N, RANGE 04E, W.M.

DATE:	10/29/2020
JOB:	1853.0001
BY:	MW
SCALE:	AS SHOWN
SHEET	1 OF 7

CENTERPOINT TUKWILA - PROPOSED PROJECT



SOURCES:

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8801 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98108
THE SE¼ OF SECTION 33, TOWNSHIP 24N, RANGE 04E, W.M.

DATE:	10/29/2020
JOB:	1853.0001
BY:	MW
SCALE:	AS SHOWN
SHEET	2 OF 7

CENTERPOINT TUKWILA - PLANTING PLAN VIEWPORTS 1 & 2

VIEWPORT 1

0 15 30 60

GRAPHIC SCALE
1"= 30'

VIEWPORT 2

SCALE: 1"=30'

NOTE:

- SEE SHEET 4 FOR PLANT LIST AND SYMBOLS AND SHEET 5 FOR FULL PLANT SCHEDULE WITH QUANTITIES.
- LANDSCAPING WILL INCORPORATE CONTINUED ACCESS FOR AS/SVE SYSTEM.

SOURCES:
BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH
KENT, WA 98032
(425)251-6222
(425)251-8782 FAX
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2907 HARBORVIEW DRIVE, SUITE D
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P. 253.514.8952
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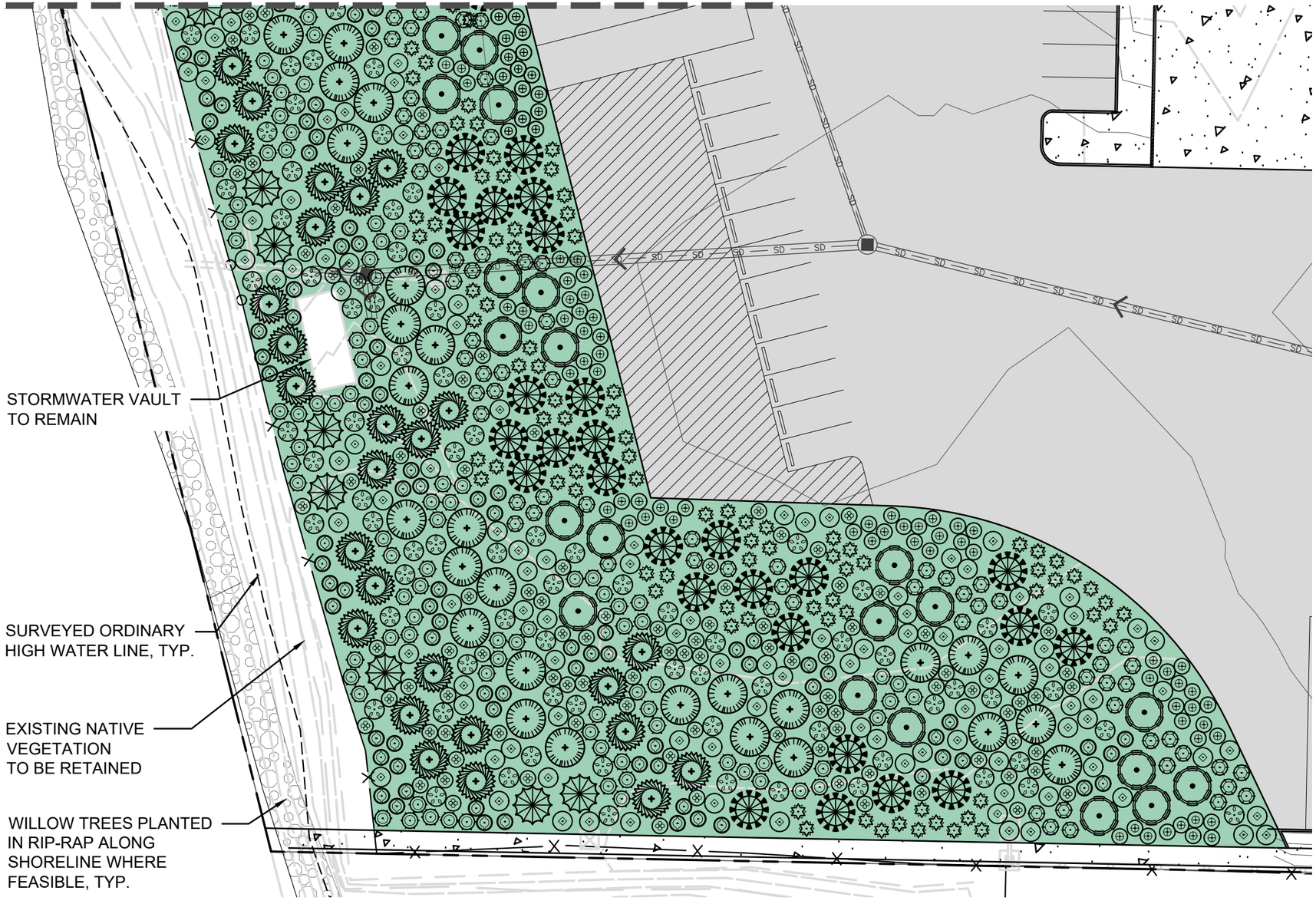
CENTERPOINT TUKWILA
8801 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98108
THE SE ¼ OF SECTION 33, TOWNSHIP 24N, RANGE 04E, W.M.

DATE:	10/29/2020
JOB:	1853.0001
BY:	MW
SCALE:	AS SHOWN
SHEET	3 OF 7

CENTERPOINT TUKWILA - PLANTING PLAN VIEWPORT 3



VIEWPORT 3

0 15 30 60

GRAPHIC SCALE
1"= 30'

PLANT LIST

TREES

SCIENTIFIC NAME
PICEA SITCHENSIS
PINUS CONTORTA
PRUNUS EMARGINATA
PSEUDOTSUGA MENZIESII
SALIX LASIANDRA
THUJA PLICATA

SHRUBS

SCIENTIFIC NAME
LONICERA INVOLUCRATA
MAHONIA AQUIFOLIUM
RIBES SANGUINEUM
ROSA GYMNOCARPA
ROSA NUTKANA
RUBUS PARVIFLORUS
SAMBUCUS RACEMOSA
SYMPHORICARPOS ALBUS

GROUNDCOVERS

DRY SOIL SEED MIX
(76,347 SF)

NOTE: SEE SHEET 5 FOR FULL PLANT SCHEDULE WITH QUANTITIES.

SOURCES:

BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH
KENT, WA 98032
(425)251-6222
(425)251-8782 FAX
CIVIL ENGINEERING, LAND PLANNING, SURVEYING, ENVIRONMENTAL SERVICES

Soundview Consultants LLC
Environmental Assessment • Planning • Land Use Solutions
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GIG HARBOR, WASHINGTON 98335
P. 253.514.8952
F. 253.514.8954
WWW.SOUNDVIEWCONSULTANTS.COM

CENTERPOINT TUKWILA
8801 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98108

THE SE¼ OF SECTION 33, TOWNSHIP 24N, RANGE 04E, W.M.

DATE:	10/29/2020
JOB:	1853.0001
BY:	MW
SCALE:	AS SHOWN
SHEET	4 OF 7

PLANT SCHEDULE

			50% trees, 50% shrubs, 100% coverage				
Plant Name							
Scientific	**Common**	**Plant Status**	**Shoreline Buffer Area Plant Quantities**	**Spacing**	**Size**	**Condition**	**Planting Area**
Trees		Area:	74,087				
Picea sitchensis	Sitka spruce	FAC	75	**10 - 12 ft**	**6 - 8 ft**	**Container**	**Moist**
Pinus contorta	Shore pine	FAC	75	**10 - 12 ft**	**6 - 8 ft**	**Container**	**Dry/Moist**
Prunus emarginata	Bitter cherry	FACU	46	**10 - 12 ft**	**6 - 8 ft**	**Container**	**Dry**
Pseudotsuga menziesii	Douglas fir	FACU	55	**10 - 12 ft**	**6 - 8 ft**	**Container**	**Dry**
*Salix lasiandra**	Pacific willow*	FACW	140	**10 - 12 ft**	**3 - 4 ft**	**Stakes***	**Riverbank***
Thuja plicata	Western red cedar	FAC	46	**10 - 12 ft**	**6 - 8 ft**	**Container**	**Dry/Moist**
	Total		**437**			*** Plant 2 stakes per symbol**	
Shrubs/Herbaceous Plants							
Lonicera involucrata	Black twinberry	FAC	210	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Moist/Wet**
Mahonia aquifolium	Tall Oregon grape	FACU	210	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry**
Ribes sanguineum	Red-flowering currant	FACU	230	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry**
Rosa gymnocarpa	Bald hip rose	FACU	230	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry/Moist**
Rosa nutkana	Nootka rose	FAC	180	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry/Moist**
Rubus parviflorus	Thimbleberry	FACU	210	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry**
Sambucus racemosa	Red elderberry	FACU	210	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry**
Symphoricarpos albus	Snowberry	FACU	230	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry**
	Total		**1,710**				
Dry Soil Seed Mix 30 lbs/acre (all disturbed buffer areas)			**% by wt.**				
Agrostis exarata	Spike bentgrass	FACW	10				
Deschampsia cespitosa	Tufted hairgrass	FACW	10				
Deschampsia danthonioides	Annual hairgrass	FACW	10				
Deschampsia elongata	Slender hairgrass	FAC	10				
Elymus glaucus	Blue wildrye	FACU	25				
Hordeum brachyantherum	Meadow barley	FACW	25				
Lupinus polyphyllus	Streamside lupine	FAC	10				
Total			**100**				

1 - Scientific names and species identification taken from Flora of the Pacific Northwest, 2nd Edition (Hitchcock and Cronquist, Ed. by Giblin, Ledger, Zika, and Olmstead, 2018).

2 - Over-sized or container plants are suitable for replacement pending project biologist's approval.

3 - Final plans are subject to regulatory approval.

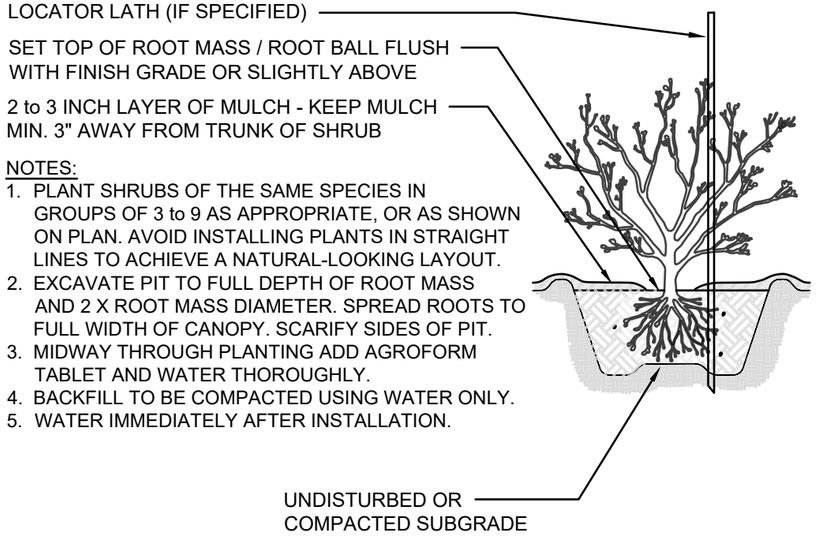
4 - All disturbed buffer areas to receive Dry Soil Seed Mix.

5 - Planting density adjustments in some locations may be appropriate based on retention of existing native vegetation and density of invasive species.

* - Plant two Pacific willow stakes per symbol.

SHRUB PLANTING DETAIL

NOT TO SCALE

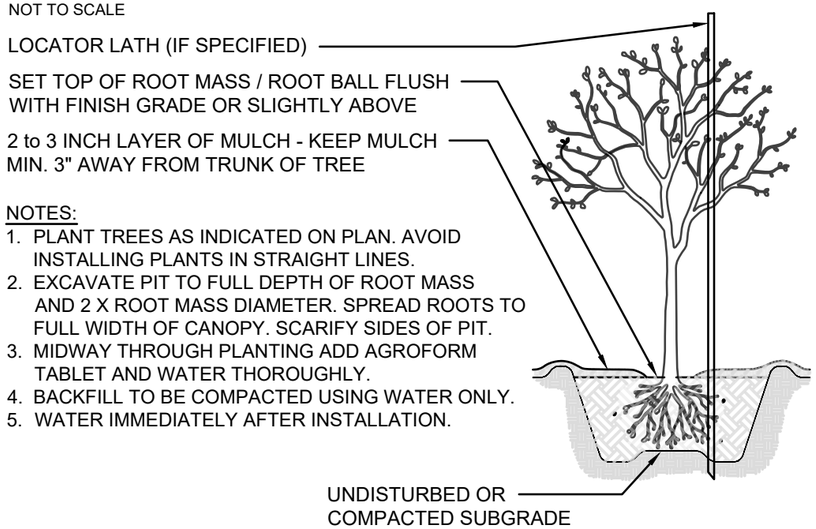


NOTES:

1. PLANT SHRUBS OF THE SAME SPECIES IN GROUPS OF 3 to 9 AS APPROPRIATE, OR AS SHOWN ON PLAN. AVOID INSTALLING PLANTS IN STRAIGHT LINES TO ACHIEVE A NATURAL-LOOKING LAYOUT.
2. EXCAVATE PIT TO FULL DEPTH OF ROOT MASS AND 2 X ROOT MASS DIAMETER. SPREAD ROOTS TO FULL WIDTH OF CANOPY. SCARIFY SIDES OF PIT.
3. MIDWAY THROUGH PLANTING ADD AGROFORM TABLET AND WATER THOROUGHLY.
4. BACKFILL TO BE COMPACTED USING WATER ONLY.
5. WATER IMMEDIATELY AFTER INSTALLATION.

TREE PLANTING DETAIL

NOT TO SCALE



NOTES:

1. PLANT TREES AS INDICATED ON PLAN. AVOID INSTALLING PLANTS IN STRAIGHT LINES.
2. EXCAVATE PIT TO FULL DEPTH OF ROOT MASS AND 2 X ROOT MASS DIAMETER. SPREAD ROOTS TO FULL WIDTH OF CANOPY. SCARIFY SIDES OF PIT.
3. MIDWAY THROUGH PLANTING ADD AGROFORM TABLET AND WATER THOROUGHLY.
4. BACKFILL TO BE COMPACTED USING WATER ONLY.
5. WATER IMMEDIATELY AFTER INSTALLATION.

SOURCES:
BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH
KENT, WA 98032
(425)251-6222
(425)251-8782 FAX
CIVIL ENGINEERING, LAND PLANNING, SURVEYING, ENVIRONMENTAL SERVICES

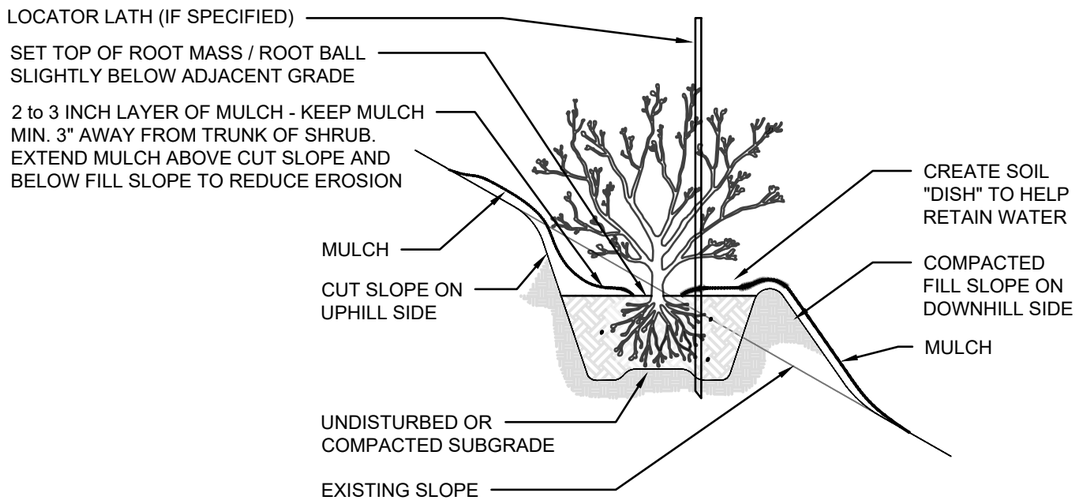
Soundview Consultants LLC
Environmental Assessment • Planning • Land Use Solutions
2907 HARBORVIEW DRIVE, SUITE D
GIG HARBOR, WASHINGTON 98335
P. 253.514.8952
F. 253.514.8954
WWW.SOUNDVIEWCONSULTANTS.COM

CENTERPOINT TUKWILA
8801 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98108
THE SE¼ OF SECTION 33, TOWNSHIP 24N, RANGE 04E, W.M.

DATE: 10/29/2020
JOB: 1853.0001
BY: MW
SCALE: AS SHOWN
SHEET 5 OF 7

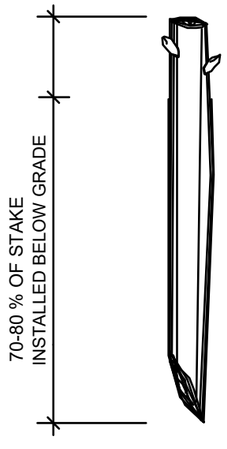
TREE AND SHRUB PLANTING ON STEEP SLOPE

NOT TO SCALE



LIVE STAKE PLANTING DETAIL

NOT TO SCALE



STORAGE OF LIVE STAKES

ALL WOODY PLANT CUTTINGS COLLECTED MORE THAN 12 HR PRIOR TO INSTALLATION, MUST BE CAREFULLY BOUND, SECURED, AND STORED OUT OF DIRECT SUNLIGHT AND SUBMERGED IN CLEAN FRESH WATER FOR A PERIOD OF UP TO TWO WEEKS.

OUTDOOR TEMPERATURES MUST BE LESS THAN 50 DEGREES F AND TEMPERATURE INDOORS AND IN STORAGE CONTAINERS MUST BE BETWEEN 34 AND 50 DEGREES F.

IF THE LIVE STAKES CANNOT BE INSTALLED DURING THE DORMANT SEASON, CUT DURING THE DORMANT SEASON AND HOLD IN COLD STORAGE AT TEMPERATURES BETWEEN 33 AND 39 DEGREES F FOR UP TO 2 MONTHS.

NOTES:

1. LIVE STAKES TO BE 1 TO 2 INCH DIAMETER 24 TO 32 INCHES LENGTH.
2. USE 1/2 INCH DIAMETER REBAR OR ROCK BAR TO MAKE PILOT HOLE.
3. INSTALL LIVE STAKES TAPER END DOWN WITH BUDS POINTED UP.
4. MINIMUM TWO BUDS ABOVE GRADE.
5. SET LIVE STAKES WITH DEAD-BLOW HAMMER.
6. WATER IMMEDIATELY AFTER INSTALLATION.

SOURCES:
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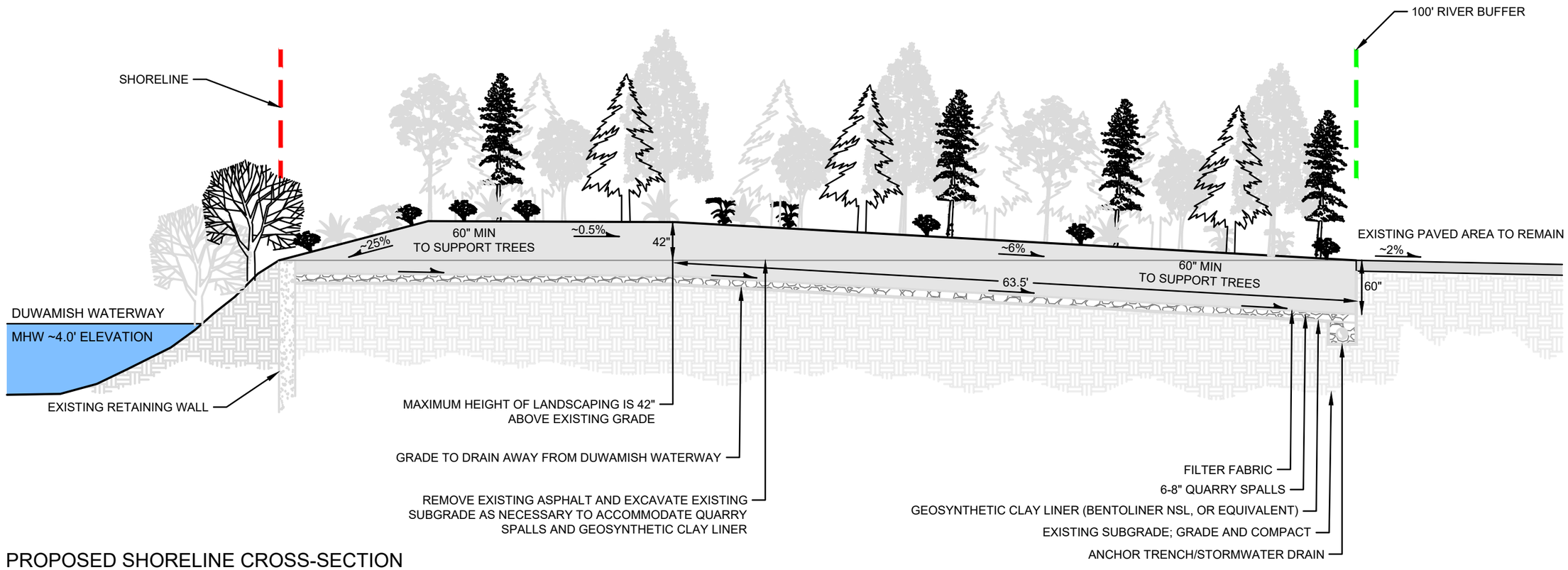
SCALE: AS SHOWN
SHEET 6 OF 7

CENTERPOINT TUKWILA - PROPOSED SHORELINE CROSS-SECTION



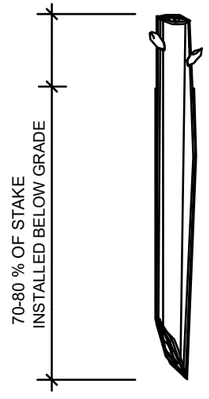
PROPOSED SHORELINE CROSS-SECTION

10 0 10

SCALE IN FEET

LIVE STAKE PLANTING DETAIL

NOT TO SCALE



STORAGE OF LIVE STAKES

ALL WOODY PLANT CUTTINGS COLLECTED MORE THAN 12 HR PRIOR TO INSTALLATION, MUST BE CAREFULLY BOUND, SECURED, AND STORED OUT OF DIRECT SUNLIGHT AND SUBMERGED IN CLEAN FRESH WATER FOR A PERIOD OF UP TO TWO WEEKS.

OUTDOOR TEMPERATURES MUST BE LESS THAN 50 DEGREES F AND TEMPERATURE INDOORS AND IN STORAGE CONTAINERS MUST BE BETWEEN 34 AND 50 DEGREES F.

IF THE LIVE STAKES CANNOT BE INSTALLED DURING THE DORMANT SEASON, CUT DURING THE DORMANT SEASON AND HOLD IN COLD STORAGE AT TEMPERATURES BETWEEN 33 AND 39 DEGREES F FOR UP TO 2 MONTHS.

NOTES:

1. LIVE STAKES TO BE 1 TO 2 INCH DIAMETER 24 TO 32 INCHES LENGTH.
2. USE 1/2 INCH DIAMETER REBAR OR ROCK BAR TO MAKE PILOT HOLE.
3. INSTALL LIVE STAKES TAPER END DOWN WITH BUDS POINTED UP.
4. MINIMUM TWO BUDS ABOVE GRADE.
5. SET LIVE STAKES WITH DEAD-BLOW HAMMER.
6. WATER IMMEDIATELY AFTER INSTALLATION.

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JOB:	1853.0001
BY:	MW
SCALE:	AS SHOWN
SHEET	7 OF 7

APPENDIX B: 3DME SPEC SHEET

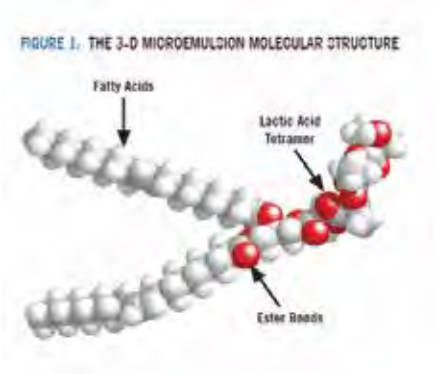
Appendix B

3DME Spec Sheet

3-D Microemulsion® Factory Emulsified Technical Description

3-D Microemulsion (3DME®) is comprised of a patented molecular structure containing oleic acids (i.e., oil component) and lactates/polylactates, which are molecularly bound to one another (figure 1). The 3DME molecule contains both a soluble (hydrophilic) and in-soluble (lipophilic) region. These two regions of the molecule are designed to be balanced in size and relative strength. The balanced hydrophilic/lipophilic regions of 3DME result in an electron donor with physical properties allowing it to initially adsorb to the aquifer material in the area of application, then slowly redistribute via very small 3DME "bundles" called micelles. These 3DME micelles spontaneously form within sections of the aquifer where concentrations of 3DME reach several hundred parts per million. The micelles' small size and mobility allow it to move with groundwater flow through the aquifer matrix, passing easily through the pore throats in between soil grains resulting in the further redistribution of 3DME within the aquifer. This allows for advective distribution of the oleic acids which are otherwise insoluble and unable to distribute in this manner, allowing for increased persistence of the lactate/polylactates component due to their initial attachment to the oleic acids.

Example of 3-D Microemulsion



Due to its patented molecular structure, 3DME offers far greater transport when compared to blended emulsified vegetable oil (EVO) products, which fail to distribute beyond the limits of pumping. 3DME also provides greater persistence when compared to soluble substrates such as lactates or simple sugars. The 3DME molecular structures capitalize on the best features of the two electron-donor types while at the same time, minimize their limitations. 3DME is delivered to the site as a ready-to-apply emulsion that is simply diluted with water to generate a large volume of a 3DME colloidal suspension.

Suspension of 3DME generated by this mixing range from micelles on the order of .02 microns to .05 microns in diameter, to "swollen" micelles, (termed "microemulsions") which are on the order of .05 to 5 microns in diameter. Once injected into the subsurface in high volumes, the colloidal suspension mixes and dilutes in existing pore waters. The micelles/microemulsions on the injection front will then begin to sorb onto the surfaces of soils as a result of zeta potential attraction and organic matter within the soils themselves. As the sorption continues, the 3DME will "coat" pore surfaces developing a layer of molecules and in some cases a bilayer. This sorption process continues as the micelles/microemulsion moves outward and disassociates into their hydrophilic/hydrophobic components. The specialized chemistry of 3DME results in a staged release of electron donors: free lactate (immediate); polylactate esters (mid-range) and free fatty acids & fatty acid esters (long-term). Material longevity of three years or greater has been seen at most sites as determined from biogeochemical analyses.

For a list of treatable contaminants with the use of 3DME, view the Range of Treatable Contaminants Guide

Chemical Composition

- Hydrogen Release Compound Partitioning Electron Donor – CAS #823190-10-9
- Sodium Lactate – CAS# 72-17-3
- Water – CAS# – 7732-18-5

3-D Microemulsion® Factory Emulsified Technical Description

Properties

- Density – Approximately 1.0 grams per cubic centimeter (relative to water)
- pH – Neutral (approximately 6.5 to 7.5 standard units)
- Solubility – Soluble in Water
- Appearance – White emulsion
- Odor – Not detectable
- Vapor Pressure – None
- Non-hazardous

Storage and Handling Guidelines

Storage
Store in original tightly closed container
Store in a cool, dry, well-ventilated place
Store away from incompatible materials
Recommended storage containers: plastic lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass

Handling
Avoid contact with eyes, skin, and clothing
Provide adequate ventilation
Wear appropriate personal protective equipment
Observe good industrial hygiene practices

Applications

- 3DME is diluted with water prior to application. Resulting emulsion has viscosity similar to water.
- Easily injects into formation through direct push injection points, injection wells or other injection delivery systems.

Application instructions for this product are contained here 3DME FE Application Instructions.

Health and Safety

Material is food grade and relatively safe to handle. We recommend avoiding contact with eyes and prolonged contact with skin. OSHA Level D personal protection equipment including vinyl or rubber gloves, and eye protection are recommended when handling this product. Please review the Material Safety Data Sheet for additional storage, usage, and handling requirements here: SDS-3DME FE.

REGENESIS

www.regenesis.com
1011 Calle Sombra, San Clemente CA 92673
949.366.8000

APPENDIX C: BDI SPEC SHEET

Appendix C

BDI Spec Sheet

BDI PLUS® Technical Description

Bio-Dechlor INOCULUM Plus (BDI PLUS®) is an enriched natural consortium containing species of Dehalococcoides sp. (DHC). BDI PLUS has been shown to simulate the rapid and complete dechlorination of chlorinated solvents such as tetrachloroethene (PCE), trichloroethene (TCE), dichloroethene (DCE) and vinyl chloride (VC) to non-toxic end products, ethene, carbon dioxide and water.

The culture also contains microbes capable of dehalogenating halomethanes (e.g., carbon tetrachloride and chloroform) and haloethanes (e.g., 1,1,1-TCA and 1,1-DCA) as well as mixtures of these contaminants.

Species of Dehalococcoides sp. (DHC)

For a list of treatable contaminants with the use of BDI PLUS, view the Range of Treatable Contaminants Guide

Chemical Composition

- Non-hazardous, naturally-occurring, non-altered anaerobic microbes and enzymes in a water-based medium.

Properties

- Appearance – Murky, yellow to grey water
- Odor – Musty
- pH 6.0 to 8.0
- Density – Approximately 1.0 grams per cubic centimeter (0.9 to 1.1 g/cc)
- Solubility – Soluble in Water
- Vapor Pressure – None
- Non-hazardous

Storage and Handling Guidelines

Storage
Store in original tightly closed container
Store away from incompatible materials
Recommended storage containers: plastic lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass
Store in a cool, dry area at 4-5°C (39 - 41°F)
Material may be stored for up to 3 weeks at 2-4°C without aeration

Handling
Avoid prolonged exposure
Observe good industrial hygiene practices
Wear appropriate personal protective equipment

BDI PLUS® Technical Description

Applications

- BDI PLUS is delivered to the site in liquid form and is designed to be injected directly into the saturated zone requiring treatment.
- Most often diluted with de-oxygenated water prior to injection into either hydraulic push injection points or properly constructed injection wells.
- The typical dilution rate of the injected culture is 10 gallons of deoxygenated water to 1 liter of standard BDI PLUS culture.

Application instructions for this product are contained here BDI PLUS Application Instructions.

Health and Safety

Material is non-hazardous and relatively safe to handle; however avoid contact with eyes and prolonged contact with skin. OSHA Level D personal protection equipment including: vinyl or rubber gloves and safety goggles or a splash shield are recommended when handling this product. An eyewash station is recommended. Please review the Material Safety Data Sheet for additional storage, usage, and handling requirements here: BDI PLUS SDS.

REGENESIS

www.regenesis.com
1011 Calle Sombra, San Clemente CA 92673
949.366.8000

APPENDIX D: VITACAL® PCC SAFETY DATA SHEET

Appendix D

VitaCal® PCC Safety Data Sheet

SAFETY DATA SHEET

1. Identification

Product identifier	**VitaCal® PCC Food Codex Grade Calcium Carbonate**
Other means of identification	None.
Recommended use	For all direct and indirect food contact applications of calcium carbonate by 21 CFR 184.1191 and related global regulations.
Recommended restrictions	None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer:	Mississippi Lime Company
Address:	16147 US Highway 61 Ste Genevieve, MO 63670
24 Hour Emergency Contact Number:	(800) 437-5463

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
OSHA defined hazards	Not classified.

Label elements

Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Calcium carbonate, synthetic	471-34-1	98.5

Composition comments All concentrations are in percent by weight. Components not listed are either non-health-hazardous or are below reportable limits.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Do not rub eyes. Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Dusts may irritate the respiratory tract, skin and eyes.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.

General information Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media Use extinguishing agent suitable for type of surrounding fire.

Unsuitable extinguishing media None known.

Specific hazards arising from the chemical During fire, gases hazardous to health may be formed. Calcium carbonate ignites on contact with fluorine.

Special protective equipment and precautions for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions Use water spray to cool unopened containers.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards This product is not flammable or combustible.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Wear appropriate protective equipment and clothing during clean-up. Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up Avoid the generation of dusts during clean-up. Collect dust using a vacuum cleaner equipped with HEPA filter. Stop the flow of material, if this is without risk.

Large Spills: Wet down with water and dike for later disposal. Shovel the material into waste container. Following product recovery, flush area with water.

Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal. For waste disposal, see section 13 of the SDS.

Environmental precautions Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling Minimize dust generation and accumulation. Provide appropriate exhaust ventilation at places where dust is formed. Avoid prolonged exposure. Practice good housekeeping.

Conditions for safe storage, including any incompatibilities Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value	Form
Calcium carbonate, synthetic (CAS 471-34-1)	TWA	5 mg/m3	Respirable.
		10 mg/m3	Total

Biological limit values No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. If engineering measures are not sufficient to maintain concentrations of dust particulates below the Occupational Exposure Limit (OEL), suitable respiratory protection must be worn. If material is ground, cut, or used in any operation which may generate dusts, use appropriate local exhaust ventilation to keep exposures below the recommended exposure limits.

Individual protection measures, such as personal protective equipment

Eye/face protection Unvented, tight fitting goggles should be worn in dusty areas.

Skin protection

Hand protection Wear appropriate chemical resistant gloves.

Skin protection

Other Wear suitable protective clothing.

Respiratory protection Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits.

Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Solid.
Form	Powder.
Color	White.
Odor	None.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	2442.2 °F (1339 °C)
Initial boiling point and boiling range	Not available.
Flash point	Does not flash.
Evaporation rate	Not available.
Flammability (solid, gas)	Does not burn.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Insoluble.
Solubility (solvents)	None.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	None.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with incompatible materials. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air).
Incompatible materials	Ignites on contact with fluorine. It is incompatible with acids, alum, ammonium salts and mercury + hydrogen.
Hazardous decomposition products	Thermal decomposition can produce calcium oxide.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Dust may irritate respiratory system. Prolonged inhalation may be harmful.

Skin contact Dust or powder may irritate the skin.

Eye contact Dust may irritate the eyes.

Ingestion Expected to be a low ingestion hazard.

Symptoms related to the physical, chemical and toxicological characteristics Dusts may irritate the respiratory tract, skin and eyes.

Information on toxicological effects

Acute toxicity Not expected to be acutely toxic.

Components	Species	Test Results
Calcium carbonate, synthetic (CAS 471-34-1)		
Acute		
Oral		
LD50	Rat	6450 mg/kg

Skin corrosion/irritation Prolonged skin contact may cause temporary irritation.

Serious eye damage/eye irritation Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization Not a respiratory sensitizer.

Skin sensitization This product is not expected to cause skin sensitization.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity Not classifiable as to carcinogenicity to humans.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

NTP Report on Carcinogens

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not regulated.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard Not classified.

Chronic effects Excessive consumption may cause hypercalcemia (excess calcium in the blood), alkalosis (abnormal alkalinity in blood and tissues), and renal (kidney) impairment. It may also produce the "milk-alkali syndrome," characterized by neurological symptoms such as irritability, lethargy, stupor and coma depending on amount ingested and length of time.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components		Species	Test Results
Calcium carbonate, synthetic (CAS 471-34-1)			
Aquatic			
Acute			
Fish	LC50	Western mosquitofish (Gambusia affinis)	> 56000 mg/l, 96 Hours

Persistence and degradability Not applicable to inorganic substances.

Bioaccumulative potential No data available.

Mobility in soil The product is insoluble in water.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable.

15. Regulatory information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 26-October-2017

Revision date -

Version # 01

HMIS® ratings Health: 1
Flammability: 0
Physical hazard: 0

Disclaimer Mississippi Lime Company cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

APPENDIX E: EXCEPTS FROM INTERIM ACTION WORK PLAN (IAWP)

Appendix E

Excerpts from Interim Action Work Plan (IAWP)

Excepts are from Shannon & Wilson, 2020, Final Interim Action Work Plan, 8801 East Marginal Way S., Tukwila, Washington, Agreed Order 6069: Report prepared by Shannon & Wilson, Seattle, Wash., project 21-1-12567-021, for PACCAR, Bellevue, Wash., July 27.

CONTENTS

Table 1 - Cleanup Levels

Analyte	Soil – Protection of Sediment or Surface Water[a] (mg/kg)	Soil - Background (mg/kg)	Human Health – MTCA Method A or B[b] (mg/kg)	Practical Quantitation Limit (mg/kg)	Soil – Protective of Vapor[c] (mg/kg)	Groundwater[a] (µg/L)	Groundwater – Protective of Indoor Air[b] (µg/L)	Practical Quantitation Limit (µg/L)	MTCA Method B Indoor Air[b] (µg/m^3)
Arsenic	—	7.3	—	—	—	8	—	—	—
Bis(2-ethylhexyl)phthalate	0.005/0.1	—	—	0.12	—	0.046	—	0.2	—
Cadmium	5.1	—	—	—	—	—	—	—	—
Chromium	2,600	—	—	—	—	—	—	—	—
Copper	—	36	—	—	—	8	—	—	—
Dichloroethane, 1,1-	—	—	—	—	—	—	11	—	1.56
Diesel-range hydrocarbons	—	—	—	—	—	500[d]	—	—	—
Dioxin/furan TEQ	—	0.0000052	—	—	—	—	—	—	—
Gasoline-range hydrocarbons	—	—	100	—	250	1,000[d]	—	—	1,400
Lead	—	—	250	—	—	—	—	—	—
Oil-range hydrocarbons	—	—	2,000	—	—	500[d]	—	—	—
Tetrachloroethene	0.0016	—	—	—	—	2.9	—	—	9.62
Total cPAHs TEQ	0.0000022	—	—	0.005	—	0.000016	—	0.01	—
Total PCB aroclors	0.0000022	—	—	0.002	—	0.000007	—	0.01	—
Trichloroethene	0.00027/0.0044	—	—	0.001	—	0.7	—	—	0.37
Vinyl chloride (chloroethylene)	0.000055 /0.001	—	—	0.001	—	0.18	—	—	0.28

NOTES:

a. Washington State Department of Ecology's (Ecology's) Lower Duwamish Waterway (LDW) Preliminary Cleanup Levels (PCUL) Work Book (Ecology, 2018). Soil values are based on protection of sediment or surface water via leaching from saturated/unsaturated soil into non-potable groundwater or from bank spall at locations close to water (cadmium and chromium). The first value is saturated soil and the second value is unsaturated soil.

b. Model Toxics Control Act (MTCA) Method A or B levels from the CLARC database (March 2019).

c. Ecology Implementation Memo 14: Updated process for initially assessing the potential for petroleum vapor intrusion. March 2016.

d. A1 boring area is the one area with gasoline impacted groundwater and the adjacent well MW-44A is the only location with diesel and oil impacted groundwater in 2019.

Bold = Selected proposed cleanup level for chemical in the media.

— = Not a selected cleanup level and/or chemical of concern for this media; cPAHs = carcinogenic polycyclic aromatic hydrocarbons; mg/kg = milligrams per kilogram; PCB = polychlorinated biphenyl; TEQ = toxicity equivalency quotient; µg/L = micrograms per liter; $\mu g/m^3$ = micrograms per meter cubed

Appendix E, Table E-2

Table 4 - Proposed Halogenated Volatile Organic Compounds Groundwater Remediation Levels

Area	Trichloroethene (µg/l)	Vinyl Chloride (µg/l)
Plume at MW-14A/G0	5	1
Plume east of existing AS/SVE	1	0.5

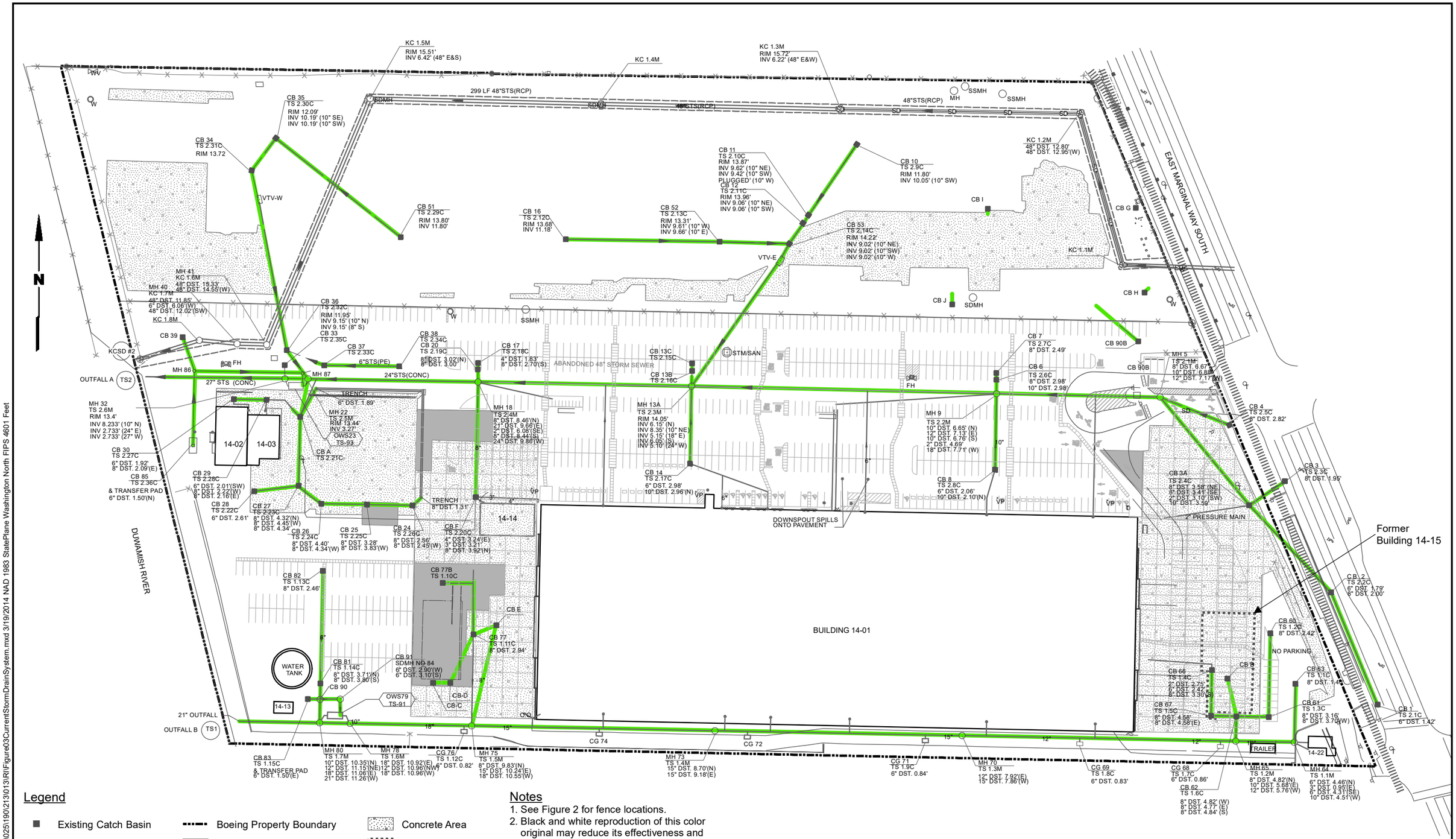
NOTES:

AS/SVE = air sparing/soil vapor extraction; µg/l = micrograms per liter

APPENDIX F: NORTH ADJOINING PROPERTY DRAINAGE MAP

Appendix F

North Adjoining Property Drainage Map



Legend

- Existing Catch Basin
- Existing Storm Drain Line
- Boeing Property Boundary
- New Concrete (Replaced 2011)
- Concrete Area
- Former Building

Notes

1. See Figure 2 for fence locations.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: Boeing 2012

0 120 240

Scale in Feet

LANDAU ASSOCIATES

Boeing Isaacson-Thompson Site Tukwila, Washington	**Current Storm Drain System**	Figure 3

G:\Projects\025\190\213\013\R\Figure03CurrentStormDrainSystem.mxd 3/19/2014 NAD 1983 StatePlane Washington North FIPS 4601 Feet