

## Appendix C Substantive Compliance Documentation

## Jamie Stevens

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**From:** Seeds, Tena (ECY) <TSEE461@ECY.WA.GOV>  
**Sent:** Wednesday, June 23, 2021 8:44 AM  
**To:** Jamie Stevens  
**Cc:** Kim Hempel (khempel@pioneerees.com); Mike Ciserella (mike@cantera-group.com); Doug Ciserella (doug@cantera-group.com); Grant Hainsworth  
**Subject:** RE: Project 6807625-GR - Confirmation for Department of Ecology

Thank you. I feel comfortable having the City's confirmation that the substantive requirements of both permits are met. If you can confirm that the team is in agreement with the last round of comments on the EDR (with the CAA-6 sample issue already addressed) and that nothing else needs to be resolved, please proceed with finalizing the EDR and move forward with the work. Let me know and I'll prepare a conditional approval letter.

Tena

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**From:** Jamie Stevens <jamie.stevens@creteconsulting.com>  
**Sent:** Wednesday, June 23, 2021 8:23 AM  
**To:** Seeds, Tena (ECY) <TSEE461@ECY.WA.GOV>  
**Cc:** Kim Hempel (khempel@pioneerees.com) <khempel@pioneerees.com>; Mike Ciserella (mike@cantera-group.com) <mike@cantera-group.com>; Doug Ciserella (doug@cantera-group.com) <doug@cantera-group.com>; Grant Hainsworth <grant.hainsworth@creteconsulting.com>  
**Subject:** FW: Project 6807625-GR - Confirmation for Department of Ecology

**THIS EMAIL ORIGINATED FROM OUTSIDE THE WASHINGTON STATE EMAIL SYSTEM - Take caution not to open attachments or links unless you know the sender AND were expecting the attachment or the link**

Tena – the City of Seattle issued a similar statement for the waterfront parcel, Permit 6807625-GR, stating substantive requirements have been met.

See below.

Jamie Stevens  
206.799.2744

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**From:** Craig Belcher [<mailto:craig@cba-llc.com>]  
**Sent:** Wednesday, June 23, 2021 7:34 AM  
**To:** Kim Hempel; Mike Ciserella  
**Cc:** Doug Ciserella; Jamie Stevens; Grant Hainsworth  
**Subject:** FW: Project 6819513-CN - 2737 W Commodore Way - Confirmation for Department of Ecology

Please see below.

Thanks,  
Craig

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**From:** Sandberg, Andrew <[Andrew.Sandberg@seattle.gov](mailto:Andrew.Sandberg@seattle.gov)>  
**Sent:** Wednesday, June 23, 2021 7:32 AM  
**To:** Craig Belcher <[craig@cba-llc.com](mailto:craig@cba-llc.com)>  
**Subject:** RE: Project 6819513-CN - 2737 W Commodore Way - Confirmation for Department of Ecology

Hi Craig,

The substantive requirements have been met for permit 6807625-GR . The contractor disclosure information is pending approval, as well as remaining fees and then the permit will be issued.

Thanks

Andy

**CAUTION: External Email**

Hi Andy,

Would it be possible to get the same type of confirmation for project 6807625-GR? This is the grading permit for the project. All the reviews have been approved and is in prep for issuance.

Thanks,  
Craig

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**From:** Sandberg, Andrew <[Andrew.Sandberg@seattle.gov](mailto:Andrew.Sandberg@seattle.gov)>  
**Sent:** Tuesday, June 22, 2021 1:13 PM  
**To:** Craig Belcher <[craig@cba-llc.com](mailto:craig@cba-llc.com)>  
**Subject:** RE: Project 6819513-CN - 2737 W Commodore Way - Confirmation for Department of Ecology

Hi Craig,

The substantive requirements have been met for permit 6819513-CN. There are a few procedural documents pending awaiting ECA approval before permit is issued.

Thank you

Andy

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**From:** Craig Belcher <[craig@cba-llc.com](mailto:craig@cba-llc.com)>  
**Sent:** Tuesday, June 22, 2021 11:48 AM  
**To:** Sandberg, Andrew <[Andrew.Sandberg@seattle.gov](mailto:Andrew.Sandberg@seattle.gov)>  
**Subject:** RE: Project 6819513-CN - 2737 W Commodore Way - Confirmation for Department of Ecology

**CAUTION: External Email**

Thanks Andy,

Basically, DOE has said they would be good just to get an email reply saying that the substantive requirements of the project have been met. If you could do that, we can forward that on to DOE. My understanding is that there is a package that DOE is working on finalizing in the next few days. If we could get the confirmation included in that, it would be a huge help.

Thanks,  
Craig

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**From:** Sandberg, Andrew <[Andrew.Sandberg@seattle.gov](mailto:Andrew.Sandberg@seattle.gov)>  
**Sent:** Tuesday, June 22, 2021 11:38 AM

**To:** Craig Belcher <[craig@cba-llc.com](mailto:craig@cba-llc.com)>

**Subject:** RE: Project 6819513-CN - 2737 W Commodore Way - Confirmation for Department of Ecology

Hi Craig,

Sounds like the code requirements have been approved for the project. What sort of confirmation do you need? Is there a timeline for this confirmation from DOE?

Thanks!

Andy

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**From:** Craig Belcher <[craig@cba-llc.com](mailto:craig@cba-llc.com)>

**Sent:** Tuesday, June 22, 2021 8:32 AM

**To:** Sandberg, Andrew <[Andrew.Sandberg@seattle.gov](mailto:Andrew.Sandberg@seattle.gov)>

**Subject:** Project 6819513-CN - 2737 W Commodore Way - Confirmation for Department of Ecology

**CAUTION: External Email**

Hi Andy,

I wanted to follow up on project 6819513-CN. This is the shoring and grading permit for the cleanup project at 2737 W Commodore Way, the one that is being done under a consent decree with the Department of Ecology that you helped me out on a little bit ago. As part of the consent decree with the Department of Ecology, the project team is coordinating with DOE. As part of the coordination, DOE is asking for some information regarding the permits I was hoping you could confirm.

Currently, all the plan reviews have been approved, with the exception of the Geotech review. For the Geotech review the only items that are left are the insurance requirements and the potential landslide covenant. The landslide covenant has been signed and recorded and the final insurance documents have been submitted to the City's Risk Management group. With this in mind, would you be able to confirm that the project has met the substantive requirements for the city for the work under these permits? DOE is looking for something from the city that shows the overall technical aspects, instead of the procedural aspects, have been completed. A simple confirmation that the substantive requirements have been completed would work for DOE.

Thanks,  
Craig

**CRAIG BELCHER**

**PERMIT CONSULTANTS NW** | C: 206.295.0613

COMMERCIAL AND RESIDENTIAL PERMIT CONSULTING/COORDINATING



**King County**

**Wastewater Treatment Division**

Industrial Waste Program

Department of Natural Resources and Parks

201 South Jackson Street, Suite 513  
Seattle, WA 98104-3855

**206-477-5300** Fax 206-263-3001

TTY Relay: 711

March 25, 2021

SENT VIA EMAIL ONLY  
ELECTRONIC READ RECEIPT REQUESTED

Mike Ciserella  
TOC Seattle Terminal 1, LLC  
2753 West 31<sup>st</sup> Street  
Chicago, IL 60608

Issuance of new Wastewater Discharge Authorization No. 1145-01 to TOC Seattle Terminal 1, LLC

Dear Mr. Mike Ciserella:

The King County Industrial Waste Program (KCIW) has reviewed your application to discharge industrial wastewater to the sewer system from the TOC Seattle Terminal 1, LLC facility located at 2737 West Commodore Way, Seattle, Washington, and has issued the enclosed Minor Discharge Authorization. The enclosed Discharge Authorization No. 1145-01 supersedes and cancels Discharge Authorization No. 4427-01, effective April 1, 2021.

This discharge authorization permits your facility to discharge limited amounts of industrial wastewater into King County's sewer system in accordance with the effluent limitations and other requirements and conditions set forth in the document and the regulations outlined in King County Code 28.84.060 (enclosed). As long as you maintain compliance with regulations and do not change the nature and volume of your discharge, KCIW will not require you to apply for an industrial wastewater discharge permit, a type of approval that would result in additional requirements, oversight, and increased fees.

If you propose to increase the volume of your discharge or change the type or quantities of substances discharged, you must contact KCIW at least 60 days before making these changes.

King County Code 28.84 authorizes a fee for each Minor Discharge Authorization issued by the King County Department of Natural Resources and Parks. The current fee for issuance of a new Minor Discharge Authorization is \$2000. King County will send you an invoice for this amount.

Mike Ciserella  
March 25, 2021  
Page 2

If you have any questions about this discharge authorization or your wastewater discharge, please call me at 206-477-5465 or email me at [dave.haberman@kingcounty.gov](mailto:dave.haberman@kingcounty.gov). To learn more about King County's industrial wastewater regulations, visit our program's website at: [www.kingcounty.gov/industrialwaste](http://www.kingcounty.gov/industrialwaste).

Thanks in advance for supporting our mission to protect workers, the local and regional sanitary sewer system, our treatment plant infrastructure, and the environment.

Sincerely,

DocuSigned by:  
  
39F3ABE315B446E...  
Dave Haberman  
Compliance Investigator

Enclosures

e-cc: Mike Ciserella, TOC Seattle Terminal 1, LLC, [mike@cantear-group.com](mailto:mike@cantear-group.com)  
Julie Howell, Seattle Public Utilities, [julie.howell@seattle.gov](mailto:julie.howell@seattle.gov)



## King County

### MINOR DISCHARGE AUTHORIZATION

King County Industrial Waste Program  
201 S. Jackson Street, Suite 513  
Seattle, WA 98104-3855

**NUMBER 1145-01**

for

### **TOC Seattle Terminal 1, LLC**

**Facility address:** 2737 West Commodore Way, Seattle, Washington  
**Mailing address:** 2753 West 31<sup>st</sup> Street, Chicago, IL 60608  
**Phone:** 206-447-6267      **Emergency (24-hour) phone:** 425-754-4016  
**Industry type:** Groundwater Remediation – Petroleum/Organics  
**SIC code:** 4226    **EPA Id. No.:** WAD009591207  
**Discharge to:** West Point

\*Note: This authorization is valid only for the specific discharges shown below:

**Discharge process:** Wastewater generated by Groundwater Remediation - Petroleum operation

**Pretreatment process:** Groundwater treated via solids settling, filtration and granular activated carbon prior to discharge

**Effective date:** April 1, 2021  
**Expiration date:** December 1, 2021

#### **DESCRIPTION OF SAMPLE SITES AND DISCHARGE VOLUMES**

Sample Site No.	Description	Maximum Volume (gallons per day)	
		Industrial	Total
A4257	Final Discharge Sump	8,500	8,500

Permission is hereby granted to discharge industrial wastewater from the above-identified facility into the King County sewer system in accordance with the effluent limitations and monitoring requirements set forth in this authorization.

If the industrial user wishes to continue to discharge after the expiration date, an application must be filed for re-issuance of this discharge authorization at least 90 days prior to the expiration date. For information concerning this King County Discharge Authorization, please call Industrial Waste Compliance Investigator Dave Haberman at 206-477-5465.

#### **24-HOUR EMERGENCY NOTIFICATION**

**West Point Treatment Plant: 206-263-3801**  
**Washington State Department of Ecology: 425-649-7000**

**I. SPECIAL CONDITIONS**

- A. Discharge to the sanitary sewer shall not begin until KCIW has conducted a preoperative inspection of the pretreatment facilities and has sent written notification (email is sufficient) to the permittee that discharges may begin.



## II. SELF-MONITORING REQUIREMENTS

A. The following self-monitoring requirements shall be met for this discharge authorization:

Sample Site No.	Parameter	Sample Type	Frequency
A4257	Benzene	Grab	Monthly
	Ethylbenzene	Grab	Monthly
	Toluene	Grab	Monthly
	Total Xylenes	Grab	Monthly
	Pentachlorophenol	Grab	Monthly
	1,1,2-Trichloroethylene (TCE)	Grab	Monthly
	Vinyl Chloride	Grab	Monthly
	Nonpolar FOG	3 Grabs <sup>B</sup>	Monthly
	pH	Grab	Monthly
	Total Monthly Flow	Meter reading	Continuous
	Maximum Daily discharge	Meter reading	Continuous
	Settleable solids	Grab (by Imhoff cone)	Only if operating criteria are exceeded
	Hydrogen sulfide	Meter reading	Only if operating criteria are exceeded
	Explosivity	Meter reading	Only if operating criteria are exceeded

B. The three nonpolar fats, oils, and grease (FOG) grab samples shall be of equal volume, collected at least five minutes apart, and analyzed separately. When using U.S. Environmental Protection Agency approved protocols specified in 40 CFR Part 136, the individual grab samples may be composited (at the laboratory) prior to analysis. The result of the composite sample or the average of the concentrations of the three grab samples may be reported as total FOG unless the value is 100 mg/L or greater, in which case the concentration of nonpolar FOG must be reported.

C. The settleable solids field test by Imhoff cone must be performed as follows:

1. Fill Imhoff cone to one-liter mark with well-mixed sample
2. Allow 45 minutes to settle
3. Gently stir sides of cone with a rod or by spinning; settle 15 minutes longer
4. Record volume of settleable matter in the cone as mL/L

D. If a violation of any discharge limits or operating criteria is detected in monitoring, you shall notify KCIW immediately upon receipt of analytical data.

E. A self-monitoring report shall be filed with KCIW no later than the 15th day of the time period following the sample collection (i.e., the 15th day of the following month for monthly, weekly, daily samples; the 15th day of the following quarter for quarterly samples). If no discharge takes place during any monitoring period, it shall be noted on the report.

- F. All self-monitoring data submitted to KCIW, which required a laboratory analysis, must have been performed by a laboratory accredited by the Washington State Department of Ecology for each parameter tested, using procedures approved by 40 CFR 136. This does not apply to field measurements performed by the industrial user such as pH, temperature, flow, atmospheric hydrogen sulfide, total dissolved sulfides, total settleable solids by Imhoff cone, or process control information.
- G. All sampling data collected by the permittee at the point of compliance and analyzed using procedures approved by 40 CFR 136 or approved alternatives shall be submitted to KCIW whether required as part of this authorization or done voluntarily by the permittee.
- H. Self-monitoring reports shall be signed by an authorized representative of the industrial user. The authorized representative of the industrial user is defined as:
1. The president, secretary, treasurer, or a vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation
  2. The manager of one or more manufacturing, production, or operating facilities, but only if the manager:
    - a. Is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiate and direct other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations
    - b. Can ensure that the necessary systems are established, or actions taken to gather complete and accurate information for control mechanism requirements and knowledgeable of King County reporting requirements
    - c. Has been assigned or delegated the authority to sign documents, in accordance with corporate procedures
  3. A general partner or proprietor if the industrial user is a partnership or proprietorship, respectively
  4. A director or highest official appointed or designated to oversee the operation and performance of the industry if the industrial user is a government agency
  5. The individuals described in one through four above may designate an authorized representative if:
    - a. The authorization is submitted to King County in writing.
    - b. The authorization specifies the individual or position responsible for the overall operation of the facility from which the discharge originates or having overall responsibility for environmental matters for the company or agency.

### **III. GENERAL DISCHARGE LIMITATIONS**

#### **A. Operating Criteria**

There shall be no odor of solvent, gasoline, or hydrogen sulfide (rotten egg odor), oil sheen, unusual color, or visible turbidity. The discharge must remain translucent. If any of the discharge limits are exceeded, you must stop discharging and notify KCIW at 206-477-5300.

#### **B. Corrosive Substances**

##### Limits

Instantaneous minimum:      pH 5.0 (s.u.)

Daily minimum:                pH 5.5 (s.u.)

Maximum:                        pH 12.0 (s.u.)

*s.u. = standard units*

The instantaneous minimum pH limit is violated whenever any single grab sample or any instantaneous recording is less than pH 5.0.

The daily minimum pH limit is violated whenever any continuous recording of 15 minutes or longer remains below pH 5.5 or when each pH value of four consecutive grab samples collected at 15-minute intervals or longer within a 24-hour period remains below pH 5.5.

Discharges of caustic solutions greater than pH 12.0 are prohibited unless King County provides prior written authorization. For these situations, the authorized caustic solution discharges above pH 12.0 must be less than pH 12.5 and must not contain an equivalent weight of sodium hydroxide (NaOH) that exceeds a daily loading rate of 21 pounds/day. The authorized discharge of caustic solutions greater than pH 12.0 shall be subject to special conditions to protect worker safety and the POTW.

#### **C. Fats, Oils, and Grease**

##### FOG Accumulations and Obstructions

Discharges of FOG shall not result in significant accumulations which, either alone or in combination with other wastes, are capable of obstructing flow or interfering with the operations or performance of the POTW.

##### Nonpolar FOG (mineral/petroleum origin)

Nonpolar FOG limit: 100 mg/L

The limit for nonpolar FOG is violated when either:

- the arithmetic mean of the concentration from the individual analyses of three grab samples, taken no more frequently than 5-minute intervals, exceeds the limitation, or

- the concentration of a single composite sample of three grab samples, taken no more frequently than 5-minute intervals, exceeds the limitation.

Industrial users that violate the nonpolar FOG limit may be required to complete, for King County review and approval, a FOG control plan.

#### Polar FOG (Animal and Vegetable Origin)

Industrial users that have the potential to discharge polar FOG shall minimize free-floating polar FOG. Industrial users must minimize the use of emulsifying agents, such as cleaners or detergents, to only the quantity needed to maintain industrial activities at their facility and to not impact the POTW.

Industrial users may not add emulsifying agents prior to or within FOG-removal devices, exclusively for the purposes of emulsifying free-floating FOG.

Industrial users that discharge free-floating polar FOG will be required to complete, for King County review and approval, a FOG control plan.

King County has the authority to include aqueous concentration-based discharge limits for polar FOG or total FOG (i.e., the sum of polar and nonpolar FOG) in permits and discharge authorizations issued to industrial users that primarily discharge FOG of animal or vegetable origin. The concentration-based limits shall be based on what can be achieved through implementation of a treatment technology that the Wastewater Treatment Division Director determines represents all known, available, and reasonable methods of prevention, control, and treatment.

#### D. Flammable or Explosive Materials

No person shall discharge any pollutant, as defined in 40 CFR 403.5, that creates a fire or explosion hazard in any sewer or treatment works, including, but not limited to, waste streams with a closed cup flashpoint of less than 140° Fahrenheit or 60° Centigrade using the test methods specified in 40 CFR 261.21.

At no time shall two successive readings on an explosion hazard meter, at the point of discharge into the system (or at any point in the system), be more than 5% nor any single reading be more than 10% of the lower explosive limit (LEL) of the meter.

Pollutants subject to this prohibition include, but are not limited to, gasoline, kerosene, naphtha, benzene, toluene, xylene, ethers, alcohols, ketones, aldehydes, peroxides, chlorates, perchlorates, bromates, carbides, hydrides, and sulfides, and any other substances that King County, the fire department, Washington State, or the U.S. Environmental Protection Agency has notified the user are a fire hazard or a hazard to the system.

E. Compound Screening Levels and Reporting Requirements

Compound	CAS Number	Wastewater Screening Level (mg/L)
Pentachlorophenol	87-86-5	0.0053
1,1,2-Trichloroethylene (TCE)	79-01-6	0.5
Vinyl Chloride	75-01-4	0.012
Benzene	71-43-2	0.070
Ethylbenzene	100-41-4	1.7
Toluene	108-88-3	1.4
Total Xylenes	1330-20-7	2.2

For each exceedance of the screening levels, the permittee shall:

1. Notify KCIW within 24 hours of learning of the exceedance
2. Collect a sample and submit new data to KCIW within 14 days of becoming aware of the exceedance (or the next time discharge occurs if greater than 14 days)
3. Submit a written report within 14 days of learning of the exceedance (*14-Day Report*). The report should explain the cause of the exceedance and corrective actions taken to respond to the exceedance and ensure ongoing compliance

F. Heavy Metals/Cyanide

The industrial user shall not discharge wastes, which exceed the following limitations:

Heavy Metals & Cyanide	Instantaneous Maximum ppm (mg/L) <sup>1</sup>	Daily Average ppm (mg/L) <sup>2</sup>
Arsenic	4.0	1.0
Cadmium	0.6	0.5
Chromium	5.0	2.75
Copper	8.0	3.0
Lead	4.0	2.0
Mercury	0.2	0.1
Nickel	5.0	2.5
Silver	3.0	1.0
Zinc	10.0	5.0
Cyanide	3.0	2.0

<sup>1</sup> The instantaneous maximum is violated whenever the concentration of any sample, including a grab within a series used to calculate daily average concentrations, exceeds the limitation.

<sup>2</sup> The daily average limit is violated: a) for a continuous flow system when a composite sample consisting of four or more consecutive samples collected during a 24-hour period over intervals of 15 minutes or greater exceeds the limitation, or b) for a batch system when any sample exceeds the limitation. A

composite sample is defined as at least four grab samples of equal volume taken throughout the processing day from a well-mixed final effluent chamber and analyzed as a single sample.

#### G. High Temperature

The industrial user shall not discharge material with a temperature in excess of 65° C (150° F).

#### H. Hydrogen Sulfide

The following are atmospheric hydrogen sulfide limits as measured at a monitoring location designated by King County:

- Short-Term Limit: 15.0 parts per million volume (ppmv) as a 15-minute average
- 8-Hour Limit: 10.0 ppmv as an 8-hour average
- Weekly Limit: 3.0 ppmv as a 7-day average

More stringent weekly atmospheric hydrogen sulfide limits may be developed and imposed on a case-by-case basis depending on nuisance conditions or risks to workers and sewer infrastructure.

Aqueous soluble sulfide limits may be established on a case-by-case basis depending on the volume of discharge and conditions in the receiving sewer, including oxygen content, pH, and existing sulfide concentrations.

#### I. Organic Compounds

No person shall discharge any organic pollutants that result in the presence of toxic gases, vapors, or fumes within a public or private sewer or treatment works in a quantity that may cause acute worker health and safety problems. Organic pollutants subject to this restriction include, but are not limited to, the following:

- Any organic compound listed in the “Total Toxic Organics (TTO)” definition provided in 40 CFR Section 433.11(e) and 40 CFR Section 413.02(i)
- Acetone, 2-butanone (MEK), 4-methyl-2-pentanone (MIBK), xylenes

Industrial users are required to implement source control strategies and best management practices to minimize the concentration of any of the aforementioned organic pollutants.

#### J. Settleable Solids

Settleable solids concentrations: 7.0 ml/L

#### **IV. GENERAL CONDITIONS**

- A. All requirements of King County Code pertaining to the discharge of wastes into the municipal sewer system are hereby made a condition of this discharge authorization.
- B. All pretreatment systems used to bring the permittee's discharge into compliance with King County's discharge limitations and all compliance monitoring equipment shall be maintained continuously in satisfactory and effective operations by the permittee at the permittee's expense and shall be subject to periodic inspections by authorized KCIW personnel. These systems shall be attended at all times during discharge to the King County sewerage system. In the event that such equipment fails, the permittee must notify KCIW immediately and take spill prevention precautions.
- C. The industrial discharger shall implement measures to prevent accidental spills or discharges of prohibited substances to the municipal sewer system. Such measures include, but are not limited to, secondary containment of chemicals and wastes, elimination of connections to the municipal sewer system, and spill response equipment.
- D. Any facility changes, which will result in a change in the character or volume of the pollutants discharged to the municipal sewer system, must be reported to your KCIW representative. Any facility changes that will cause the violation of the effluent limitations specified herein will not be allowed.
- E. In the event the permittee is unable to comply with any of the conditions of this discharge authorization because of breakdown of equipment or facilities, an accident caused by human error, negligence, or any other cause, such as an act of nature the company shall:
1. Take immediate action to stop, contain, and clean up the unauthorized discharges and correct the problem.
  2. Immediately notify KCIW and, if after 5 p.m. weekdays and on weekends, call the emergency King County treatment plant phone number on Page 1 so steps can be taken to prevent damage to the sewer system.
  3. For discharge violations, collect a sample and submit new data to KCIW within 14 days of becoming aware of the violation.
  4. Submit a written report within 14 days of the event (*14-Day Report*) describing the breakdown, the actual quantity and quality of resulting waste discharged, corrective action taken, and the steps taken to prevent recurrence.
- F. Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this discharge authorization or the resulting liability for failure to comply.
- G. The permittee shall, at all reasonable times, allow authorized representatives of KCIW to enter that portion of the premises where an effluent source or disposal system is located or in which any records are required to be kept under the terms and conditions of this authorization.
- H. Nothing in this discharge authorization shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations including discharge into waters of the state. Any such discharge is subject to regulation and enforcement action by the Washington State Department of Ecology.

King County Minor Discharge Authorization Number 1145-01

Effective Date: April 1, 2021

Expiration Date: December 1, 2021

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- I. This discharge authorization does not authorize discharge after its expiration date. If the permittee wishes to continue to discharge after the expiration date, an application must be filed for reissuance of this discharge authorization at least 90 days prior to the expiration date. If the permittee submits its reapplication in the time specified herein, the permittee shall be deemed to have an effective wastewater discharge authorization until KCIW issues or denies the new wastewater discharge authorization. If the permittee fails to file its reapplication in the time period specified herein, the permittee will be deemed to be discharging without authorization.

DocuSigned by:

*Dave Haberman*

39F3ABE315B446E...

3/25/2021

Compliance Investigator: \_\_\_\_\_ Date: \_\_\_\_\_

Dave Haberman





# Industrial Waste Program Monthly Self-Monitoring Report

King County

Send to: King County Industrial Waste Program  
 201 S. Jackson Street, Suite 513  
 Seattle, WA 98104-3855  
 Phone 206-477-5300 / FAX 206-263-3001  
 Email: [info.kciw@kingcounty.gov](mailto:info.kciw@kingcounty.gov)

Company Name: TOC Seattle Terminal 1, LLC

Sample Site No. A4257

Permit/DA No.: 1145-01

Please Specify Month & Year: Month: 20

This form is available at: [www.kingcounty.gov/industrialwaste](http://www.kingcounty.gov/industrialwaste)

All units are mg/L unless otherwise noted.

Sample Date	pH		Benzene (µg/L) LIMIT (70)	Ethylbenzene (µg/L) LIMIT (1700)	Toluene (µg/L) LIMIT (1400)	Total Xylenes (µg/L) LIMIT (2200)	NP Fats, Oils, & Grease (Avg./ 3 grabs) (mg/L) LIMIT (100)	Daily Flow (gals/day) LIMIT 8,500
	Min LIMIT (5.0)	Max LIMIT (12.0)						
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4								
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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further certify that all data requiring a laboratory analysis were analyzed by a Washington State Department of Ecology accredited laboratory for each parameter tested.

Signature of Principal Executive or Authorized Agent

Date

Monthly Min pH

& Date

Monthly Max pH

& Date

& Date

**PLEASE CIRCLE ALL VIOLATIONS**

**Due Date:** Monthly report is due by the 15th each month.



# Industrial Waste Program Monthly Self-Monitoring Report

King County

PAGE 2 of 2

Send to: King County Industrial Waste Program  
 201 S. Jackson Street, Suite 513  
 Seattle, WA 98104-3855  
 Phone 206-477-5300 / FAX 206-263-3001  
 Email: [info.kciw@kingcounty.gov](mailto:info.kciw@kingcounty.gov)

Company Name: TOC Seattle Terminal 1, LLC

Sample Site No. A4257

Permit/DA No.: 1145-01

Please Specify Month & Year: Month: 20

This form is available at: [www.kingcounty.gov/industrialwaste](http://www.kingcounty.gov/industrialwaste)

All units are mg/L unless otherwise noted.

Sample Date	Pentachlorophenol CAS 87-86-5 LIMIT (0.0053)	Vinyl Chloride CAS 75-01-4 LIMIT (0.012)	1,1,2- Trichloroethylene (TCE) CAS 79-01-6 LIMIT (0.5)	Additional Notes
1				
2				
3				
4				
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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further certify that all data requiring a laboratory analysis were analyzed by a Washington State Department of Ecology accredited laboratory for each parameter tested.

Signature of Principal Executive or Authorized Agent

Date

**PLEASE CIRCLE ALL VIOLATIONS**

**Due Date:** Monthly report is due by the 15th each month.



STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000

711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

June 10, 2021

Mike Ciserella  
TOC Seattle Terminal 1 LLC  
2753 W 31<sup>st</sup> St  
Chicago, IL 60608-5126

**RE: Coverage under the Construction Stormwater General Permit**

**Permit number:** WAR310049  
**Site Name:** former Time Oil Bulk Terminal Facility  
**Location:** 2737 W Commodore Way #2805  
Seattle, WA County: King  
**Disturbed Acres:** 3.5

Dear Mike Ciserella:

The Washington State Department of Ecology (Ecology) received your Notice of Intent for coverage under Ecology's Construction Stormwater General Permit (CSWGP). This is your permit coverage letter. Your permit coverage is effective June 10, 2021.

Retain this letter as an official record of permit coverage for your site. You may keep your records in electronic format if you can easily access them from your construction site. You can get the CSWGP, permit forms, and other information at [www.ecology.wa.gov/eCoverage-packet](http://www.ecology.wa.gov/eCoverage-packet). Contact your Permit Administrator, listed below, if you want a copy of the CSWGP mailed to you. Please read the permit and contact Ecology if you have any questions.

**Electronic Discharge Monitoring Reports (WQWebDMR)**

This permit requires you to submit monthly discharge monitoring reports (DMRs) for the full duration of permit coverage (from the first full month of coverage to termination). DMRs must be submitted electronically using Ecology's secure online system, WQWebDMR. To sign up for WQWebDMR go to [www.ecology.wa.gov/programs/wq/permits/paris/webdmr.html](http://www.ecology.wa.gov/programs/wq/permits/paris/webdmr.html). If you have questions, contact the portal staff at (360) 407-7097 (Olympia area), or (800) 633-6193/option 3, or email [WQWebPortal@ecy.wa.gov](mailto:WQWebPortal@ecy.wa.gov).

Mike Ciserella  
June 10, 2021  
Page 2

### **Appeal Process**

You have a right to appeal coverage under the general permit to the Pollution Control Hearing Board (PCHB). Appeals must be filed within 30 days of the date of receipt of this letter. Any appeal is limited to the general permit's applicability or non-applicability to a specific discharger. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2). For more information regarding your right to appeal, go to <https://apps.ecology.wa.gov/publications/summarypages/1710007.html> to view Ecology's Focus Sheet: *Appeal of General Permit Coverage*.

### **Ecology Field Inspector Assistance**

If you have questions regarding stormwater management at your construction site, please contact your Regional Inspector, Maria Zeman of Ecology's Northwest Regional Office in Bellevue at [Maria.Zeman@ecy.wa.gov](mailto:Maria.Zeman@ecy.wa.gov), or at 425-649-7100.

### **Questions or Additional Information**

Ecology is here to help. Please review our web page at [www.ecology.wa.gov/constructionstormwaterpermit](http://www.ecology.wa.gov/constructionstormwaterpermit). If you have questions about the Construction Stormwater General Permit, please contact your Permit Administrator, Josh Klimek at [josh.klimek@ecy.wa.gov](mailto:josh.klimek@ecy.wa.gov) or (360) 407-7451.

Sincerely,



Jeff Killelea, Acting Manager  
Program Development Services Section  
Water Quality Program

Construction Stormwater General Permit (CSWGP)

# Stormwater Pollution Prevention Plan (SWPPP)

for  
Former Time Oil Bulk Terminal

Prepared for:  
**Department of Ecology**  
*Toxics Cleanup Program and Water Quality Program –  
NorthWest Region*

Permittee / Owner	Developer	Operator / Contractor
TOC Seattle Terminal 1, LLC	TBD	Crete Consulting Inc.

2737-2805 West Commodore Way in Seattle

### Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
TBD	Crete Consulting Inc.	TBD

### SWPPP Prepared By

Name	Organization	Contact Phone Number
Jamie Stevens	Crete Consulting Inc.	206-799-2744

### SWPPP Preparation Date

June 2, 2021

### Project Construction Dates

Activity / Phase	Start Date	End Date
Cleanup	05/01/2021	12/31/2021

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Appendix A	King County Metro Sewer Discharge Permit
Appendix B	Site Plans
Appendix C	Construction BMPs & City of Seattle Checklists and Correspondence
Appendix D	General Permit - PLACEHOLDER
Appendix E	Site Inspection Forms

## List of Acronyms and Abbreviations

<b>Acronym / Abbreviation</b>	<b>Explanation</b>
<b>303(d)</b>	Section of the Clean Water Act pertaining to Impaired Waterbodies
<b>BMP(s)</b>	Best Management Practice(s)
<b>CESCL</b>	Certified Erosion and Sediment Control Lead
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>CSWGP</b>	Construction Stormwater General Permit
<b>DMR</b>	Discharge Monitoring Report
<b>DO</b>	Dissolved Oxygen
<b>Ecology</b>	Washington State Department of Ecology
<b>EPA</b>	United States Environmental Protection Agency
<b>ERTS</b>	Environmental Report Tracking System
<b>ESC</b>	Erosion and Sediment Control
<b>NPDES</b>	National Pollutant Discharge Elimination System
<b>NTU</b>	Nephelometric Turbidity Units
<b>NWRO</b>	Northwest Regional Office of the Department of Ecology
<b>pH</b>	Power of Hydrogen
<b>RCW</b>	Revised Code of Washington
<b>SPCC</b>	Spill Prevention, Control, and Countermeasure
<b>su</b>	Standard Units
<b>SWMMWW</b>	Stormwater Management Manual for Western Washington
<b>SWPPP</b>	Stormwater Pollution Prevention Plan
<b>TESC</b>	Temporary Erosion and Sediment Control
<b>TMDL</b>	Total Maximum Daily Load
<b>WAC</b>	Washington Administrative Code



# 1 Project Information

Project/Site Name: Former Time Oil Bulk Terminal  
Street/Location: 2737-2805 West Commodore Way  
City: Seattle State:WA Zip code:98199  
Receiving waterbody: Salmon Bay (no discharge to Salmon Bay)

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared as part of the NPDES stormwater permit requirements for the Former Time Oil Bulk Terminal construction project to meet City of Seattle and Department of Ecology requirements. All construction work will be completed with Ecology oversight under a Prospective Purchaser Consent Decree (PPCD) entered in King County Cause No. 20-2-15215-3 SEA (as amended) between Ecology and TOC Seattle Terminal 1, LLC (TOCST) for the Time Oil Bulk Terminal PPA Site and Washington Administrative Code (WAC) 173-340-400.

This SWPPP was prepared using the Ecology SWPPP Template downloaded from the Ecology website on March 1, 2021. This SWPPP was prepared based on the requirements set forth in the Construction Stormwater General Permit, Stormwater Management Manual for Western Washington (SWMMWW 2019).

The Property generally consists of four separate parcels (commonly identified as the Bulk Terminal parcel, ASKO Hydraulic parcel [ASKO parcel], East Waterfront parcel, and West Waterfront parcel) that were acquired by TOCST in November 2020. These parcels are collectively termed the Property for purposes of this SWPPP.

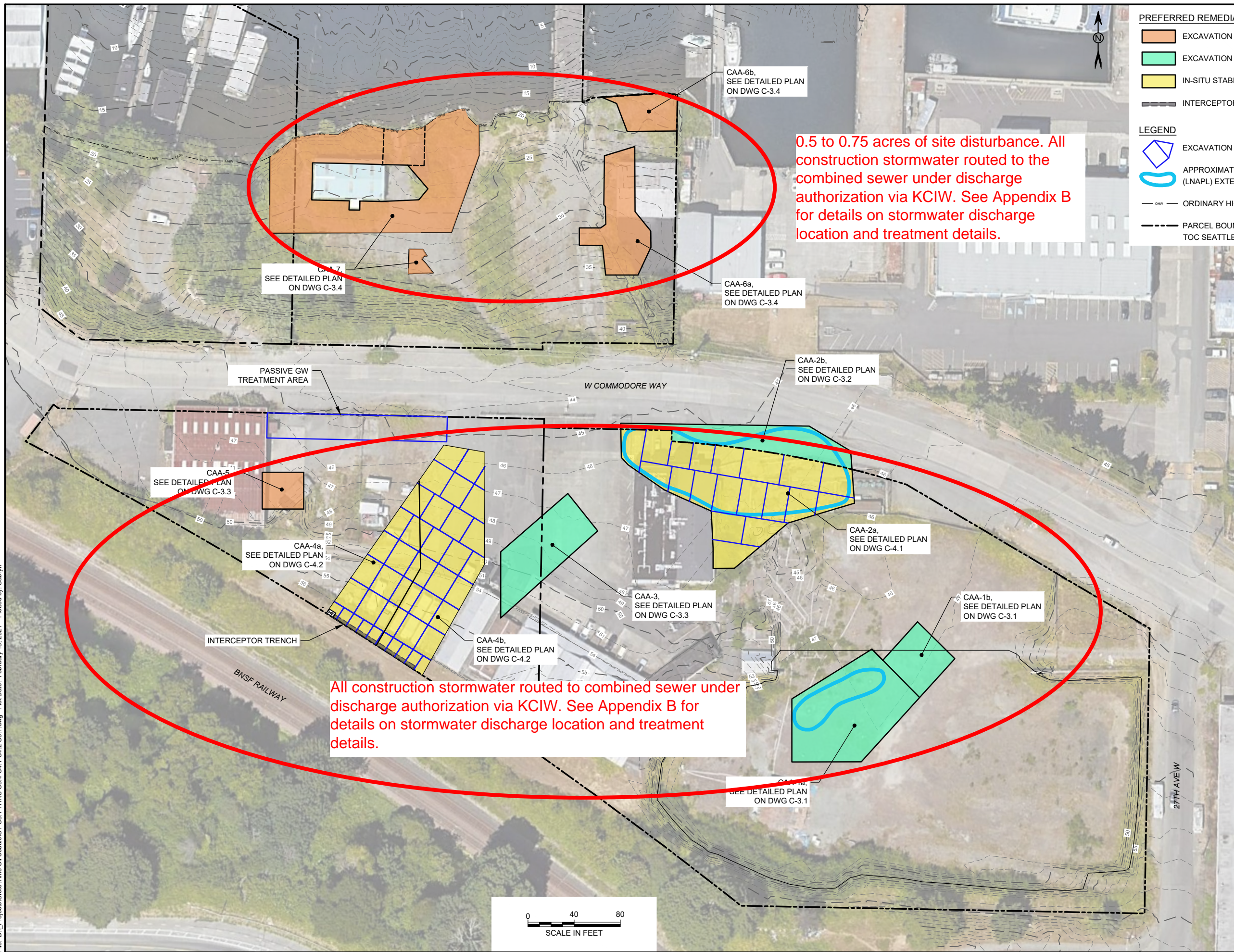
The purpose of this SWPPP is to describe the proposed construction activities and all temporary and permanent erosion and sediment control (TESC) measures, pollution prevention measures, inspection/monitoring activities, and recordkeeping that will be implemented during the proposed construction project. The objectives of the SWPPP are to:

- Implement Best Management Practices (BMPs) to prevent erosion and sedimentation, and to identify, reduce, eliminate or prevent stormwater contamination and water pollution from construction activity.
- Prevent violations of surface water quality, ground water quality, or sediment management standards.

## 1.1 Existing Conditions

The Property encompasses a total of 10.42 acres, with 5.67 acres south of W. Commodore Way and 4.75 acres north of the roadway and along the Salmon Bay shoreline. W. Commodore Way runs between the Bulk Terminal and ASKO parcels to the south and the East Waterfront and West Waterfront parcels to the north (Figure 1).

File: D:\Projects\Crete\Time Oil Seattle\C1-C3.1 THRU C3.4-C4.1-C4.2-C5.1.dwg Plot Date: February 18, 2021 Plotted by: Cabryn



**PREFERRED REMEDIAL ALTERNATIVE**

- EXCAVATION TO CLEANUP LEVEL (CUL)
- EXCAVATION TO REMEDIATION LEVEL (REL)
- IN-SITU STABILIZATION / SOLIDIFICATION
- INTERCEPTOR TRENCH

**LEGEND**

- EXCAVATION MIXING GRID CELLS
- APPROXIMATE LIGHT NON-AQUEOUS-PHASE LIQUID (LNAPL) EXTENT
- ORDINARY HIGH WATER
- PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

**0.5 to 0.75 acres of site disturbance. All construction stormwater routed to the combined sewer under discharge authorization via KCIW. See Appendix B for details on stormwater discharge location and treatment details.**

**All construction stormwater routed to combined sewer under discharge authorization via KCIW. See Appendix B for details on stormwater discharge location and treatment details.**



By	Description	Date	Rev

<p><b>Client</b></p> <p><b>CRETE CONSULTING, INC.</b>          108 S. Washington Street, Suite 300          Seattle, Washington 98104          (206) 491-7554          www.creteconsulting.com</p>	
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<p><b>Scale</b> As Noted</p> <p><small>SCALE WARNING Drawing is not to scale, if scale bar doesn't measure one inch</small></p> <p><b>Designer</b> M. Byers  <b>Drafter</b> C. Taylor  <b>Checker</b> X  <b>Reviewer</b> X</p>	
--	--

<p><b>Time Oil Bulk Terminal Remediation Design Seattle, Washington</b></p> <p><b>Remediation Areas</b></p>	
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<p><b>DRAFT</b></p>	
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<p><b>Drawing No.</b></p> <p style="text-align: center;"><b>C-1</b></p>	
<p><b>Sheet 13 of 23</b></p>	

The Property is composed of four King County tax parcels as noted: Bulk Terminal parcel (No. 1125039050); ASKO parcel (No. 4237900405); East Waterfront parcel (No. 1125039120); and West Waterfront parcel (No. 1125039081):

- The 4.10-acre Bulk Terminal parcel on the south side of W. Commodore Way at 2737 W. Commodore Way is bounded to the east by W. Fort Street and beyond by a multi-tenant warehouse building. An active BNSF mainline borders the Bulk Terminal parcel on the south.
- The 1.57-acre ASKO parcel located on the south side of W. Commodore Way at 2805 W. Commodore way is bounded to the west by a multi-tenant warehouse building and beyond by 31st Avenue West. The BNSF mainline also borders this parcel on the south.
- The 3.17-acre East Waterfront parcel located on the north side of W. Commodore Way at 2750 W. Commodore Way is bounded to the east by the Port of Seattle Maritime Industrial Center. Its northern boundary is within Salmon Bay.
- The 1.58-acre West Waterfront parcel north of W. Commodore Way at 2800 W. Commodore Way is bounded to the west by the Lockhaven Apartments and Marina.

Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas) are listed below:

- Total acreage: 10.42 acres
- Disturbed acreage: 3.5 acres
- Groundwater: The top of the saturated zone for the Shallow WBZ, effectively the water table, ranges from less than 5 feet below ground surface (bgs) at the Salmon Bay shoreline to nearly 30 feet bgs at the upper south end of the Property. Most of the work will be above the water table. Select areas will include soil excavation approximately 5 feet below the water table. The maximum soil excavation depth is 15 feet bgs.
- Existing structures: All Buildings will be removed prior to the start of the construction activities covered in this SWPPP. Building foundations which overlap with construction activities, will be removed with construction activities covered in this SWPPP (these areas are included in the total disturbed acreage value above). 0.6 acres of building slabs will remain after the cleanup action as these are areas that are outside of the excavation or treatment areas.
- Landscape topography: There are no landscaped areas within the working limits; there are intermittent discontinuous areas of blackberry growth which have grown up from lack of maintenance. There is one area of trees on the waterfront parcel that is approximately 0.25 acres in size.
- Drainage patterns: Surface water on the Bulk Terminal and ASKO parcels currently flows to onsite low areas for infiltration or discharge to the combined sewer via catch basins. Water north of West Commodore Way is infiltrated or sheet flows to Salmon Bay.
- Existing Vegetation: The property has had heavy industrial use since first site development (1940's). The East Waterfront parcel has approximately 0.5 acres of vegetated area, growing up along the edges of pavement, roads, and buildings.
- Critical Areas There are identified steep slopes on the property, these are outside of the construction areas.

The surface water body, Salmon Bay has a 303(d) listing for pH, lead, Aldrin, and bacteria.

Table 1 includes a list of suspected and/or known contaminants associated with the construction activity. No construction contaminated water will be discharged to Salmon Bay.

**Table 1 – Summary of Site Pollutant Constituents**

<b>Constituent (Pollutant)</b>	<b>Location</b>	<b>Depth</b>	<b>Concentration (soil/groundwater)</b>
<b>ASKO and Bulk Terminal</b>			
Arsenic	soil	subsurface	>7.3 mg/kg/>5 ug/L
Benzene	soil/groundwater	subsurface	>0.02 mg/kg/>0.44 ug/L
Gasoline-range organics	soil/groundwater	subsurface	>30 mg/kg/>800 ug/L
Diesel-range organics+ Oil-range organics	soil/groundwater	subsurface	>1,600 mg/kg/> 500 ug/L
Trichloroethene	soil/groundwater	subsurface	>0.02 mg/kg/>0.5 ug/L
Vinyl Chloride	groundwater	subsurface	>0.2 ug/L
Pentachlorophenol	soil/groundwater	subsurface	0.05 mg/kg/>0.2 ug/L
<b>Waterfront Parcels</b>			
Arsenic	soil/groundwater	Surface to subsurface	>7.3 mg/kg/>5 ug/L
Benzene	soil/groundwater	subsurface	>0.02 mg/kg/>0.44 ug/L
Gasoline-range organics	soil/groundwater	subsurface	>30 mg/kg/>800 ug/L
Diesel-range organics+ Oil-range organics	soil/groundwater	subsurface	>1,600 mg/kg/> 500 ug/L

## 1.2 Proposed Construction Activities

Construction activities are planned to address contaminated portions of the property (contamination is from historical operations and past uses associated with former owners).

The property will be completed in two phases, Phase 1 construction activities will include site preparation, grading, paving, TESC installation, demolition of slabs, and environmental cleanup. Those activities are included in this SWPPP. Details of the proposed construction activities are provided in the Engineering Design Report, which is currently under review by Ecology (CRETE 2021). Phase 2 construction activities will include site redevelopment including the construction of new buildings, parking lots, landscape features, new sanitary, electric, gas and storm drain utilities. Permitting for Phase 2 is being prepared separately from Phase 1.

During Phase 1 construction activities, all contaminated/potentially contaminated stormwater will be discharged to the sanitary sewer under the discharge criteria of the King County Sewer discharge permit (Discharge Authorization No. 1145-01, provided in Appendix A), or disposed off-site at an appropriate disposal facility.

To address the historical contaminants, the property owners and Ecology Toxics Cleanup Program have developed the following approach to site cleanup:

- **East Waterfront parcel.** Select soil excavation for total petroleum hydrocarbons (TPH) and metals.

- **Bulk Terminal parcel.** Select soil excavation and In situ solidification and stabilization (ISS) for TPH and benzene, and light non-aqueous phase liquid removal or encapsulation. Phase 2 construction, which will include site development, will include a cap which will isolate all site soils. Capping is expected to include a combination of pavement, constructed landscape areas, and buildings.
- **ASKO parcel.** Minor select soil excavation coupled with ISS for chlorinated volatile organic compounds (cVOCs), TPH, benzene, and arsenic. This parcel also includes an interceptor trench with a permeable reactive barrier and a downgradient passive in situ groundwater treatment zone to treat cVOCs in groundwater. Phase 2 construction, which will include site development, will include a cap which will isolate all site soils. Capping is expected to include a combination of pavement, constructed landscape areas, and buildings.

Prior to the start of the cleanup work all site buildings will be demolished and utilities serving the buildings will be capped and terminated. All building foundations and slabs will remain following demolition.

For the waterfront parcel, three areas will have soil excavated and removed. The areas will be backfilled with clean import material and stabilized prior to site development. The site will be developed under a separate permit submittal. All stormwater collected in construction work areas during the cleanup work will be collected, stored in a tank, and transferred to the Bulk Terminal/ASKO parcel for treatment and discharge through the King County Industrial Waste Program (Discharge Authorization No. 1145-01, provided in Appendix A), or transported off-site to an appropriate disposal facility. The contractor will determine the details of stormwater collection, transport, and disposal in the pre-construction submittals and this SWPPP will be updated to reflect those means and methods. This will include details on how stormwater will be collected and routed to prevent discharge to Salmon Bay. No contaminated stormwater/dewatering water will be discharged to waters of the State. Construction water storage area locations are shown on drawing G-9, included in Appendix B. Excavated areas will remain pervious between the cleanup phase and the development phase. The current schedule includes completion of the construction work for the waterfront parcel during the dry season.

For the upland parcels (i.e., Bulk Terminal and ASKO parcels), areas will have soil excavated and removed (approximately 20,500 SF affected) and two areas will have ISS treatment (approximately 91,000 SF). Excavated areas will be backfilled with clean import material and stabilized prior to site development. All storm drains within the excavation or ISS treatment areas will be removed (shown on drawing G-10 provided in Appendix B). All other storm drains within the work areas shall be plugged and protected during construction. All stormwater collected in construction work areas during the cleanup work (including any dewatering) will be collected and transported off-site to an appropriate disposal facility, or treated to meet Department of Ecology, City and KCWTD standards, and discharged to the County combined sewer main in W. Commodore Way, through the King County Industrial Waste Program (Discharge Authorization No. 1145-01, provided in Appendix A). The City of Seattle side sewer permit is in process. The King County Sewer discharge point is shown on drawing G-7B provided in Appendix B. No contaminated stormwater/dewatering water will be discharged to waters of the State. Excavated areas will remain pervious between the cleanup phase and the

development phase. Final site stormwater controls will be designed during site redevelopment included in a future separate permit submittal.

### **1.2.1 Description of site drainage including flow from and onto adjacent properties**

Surface water south of West Commodore Way (on the Bulk Terminal and ASKO parcels) currently flows to onsite low areas for infiltration or discharge to the combined sewer via catch basins. Water north of West Commodore Way is infiltrated or sheet flows to Salmon Bay. During construction no contaminated stormwater/dewatering water will be discharged to waters of the State. Surface water is not discharged to Salmon Bay. Site plans are included in Appendix B.

### **1.2.2 Description of final stabilization**

Following soil excavation and ground disturbance activities all areas will be stabilized crushed rock/ballast rock (or similar). Best management practices will be employed to maintain surface gravel to control soil erosion until redevelopment occurs.

### **1.2.3 Contaminated Site Information**

Collected stormwater, water from excavations and stockpile areas, and water from equipment/personnel decontamination will be consumed in the in-situ solidification and stabilization process, transported off-site to an appropriate disposal facility, or discharged to the sanitary sewer under the treatment and discharge requirements of a King County Sewer Discharge Authorization (Discharge Authorization No. 1145-01, provided in Appendix A). Discharge samples will be collected in accordance with the permit to confirm compliance with discharge limits.

For the East Waterfront parcel, there will be no stormwater discharged to Salmon Bay from active cleanup areas during remedial activities.

The site has known contamination from historical operations that has been documented in extensive site investigations and mapping conducted under Ecology Toxics Cleanup Program oversight. Though the extent of contamination is well known it is possible that unforeseen contamination may be uncovered during site work. In the event of an inadvertent discovery of new contamination (i.e. black mottled soils, petroleum odor, sheen on standing water, buried drums or debris, etc.)-the suspect material will be treated as contaminated. If contamination does not pose a threat to the environment (i.e. it is not an active spill or leak) the area will be contained and the Ecology Toxics Cleanup Program manager will be notified and a plan will be developed with Toxics Cleanup Program ~~on how~~ to address the additional contamination.

If there is an imminent threat to the environment from a spill or leak, all project work in that area will stop immediately, the Ecology Toxics Cleanup Program manager will be notified, and a plan will be developed with the Toxics Cleanup Program to address the contamination. The spill or release will be documented through Ecology's Environmental Report Tracking System (ERTS) by calling 1-800-OILS-911.

If there is an unintended **discharge** to Salmon Bay, all project work in that area will stop immediately and the discharge will be reported to Ecology's Northwest regional ERTS at 206-594-0000 ([nwroerts@ecy.wa.gov](mailto:nwroerts@ecy.wa.gov)), Ecology Water Quality Program will be notified, and the Ecology Toxics Cleanup Program manager will be notified.

## 2 Construction Stormwater Best Management Practices (BMPs)

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e. hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.

### 2.1 The 13 Elements

BMPs and the City of Seattle Checklist for project construction BMP's are included in Appendix C.

#### 2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits

To protect adjacent properties and to reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. The BMPs relevant to marking the clearing limits that will be applied for this project include:

- High Visibility Plastic or Metal Fence (BMP C103)

No alternate BMPs are proposed for construction.

Installation Schedules: These BMPs will be installed prior to the start of any soil disturbance work; work is currently scheduled to start on June 1, 2021 and may extend through 12/31/2021.

Inspection and Maintenance plan: Site inspection will occur in all areas disturbed by construction activities. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve the quality of stormwater discharges. Inspections will occur based on the details provided in Section 4.

Responsible Staff: A Certified Erosion and Sediment Control Lead will complete the inspections. Staff TBD.

#### 2.1.2 Element 2: Establish Construction Access

Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads, and wheel washing, street sweeping, and street cleaning shall be employed as necessary to prevent sediment from entering state waters. Tracking of sediment is not allowed



onto roadways. If sediment is tracked into road, the road shall be thoroughly and immediately cleaned by shoveling or pickup sweeping.

Construction access or activities occurring on unpaved areas will be minimized, yet where necessary, access points will be stabilized to minimize the tracking of sediment onto public roads, and wheel washing, street sweeping, and street cleaning will be employed to prevent sediment from entering state waters. All wash wastewater will be controlled on site. The specific BMPs related to establishing construction access that will be used as necessary on this project include.

All wash wastewater shall be controlled on site. The specific BMPs related to establishing construction access that may be used on this project include:

- Stabilized Construction Entrance (BMP C105)
- Wheel Wash (BMP C106) (this BMP will be used if non dedicated site vehicle wheels come into contact with contaminated soils), approximate location is shown on Drawing G-8, included in Appendix B.
- Construction Road/Parking Area Stabilization (BMP C107)

No alternate BMPs are proposed for construction.

Installation Schedules: These BMPs will be installed prior to the start of any soil disturbance work; work is currently scheduled to start on June 1, 2021 and may extend through 12/31/2021.

Inspection and Maintenance plan: Site inspection will occur in all areas disturbed by construction activities. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve the quality of stormwater discharges. Inspections will occur based on the details provided in Section 4.

Responsible Staff: A Certified Erosion and Sediment Control Lead will complete the inspections. Staff TBD.

### **2.1.3 Element 3: Control Flow Rates**

In general, discharge rates of stormwater from the site will be controlled where increases in impervious area or soil compaction during construction could lead to downstream erosion. The erosion and flow rates will not exceed the flow capacities of the installed sediment controls.

No alternate BMPs are proposed for construction.

Will you construct stormwater retention and/or detention facilities?

Yes No X

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?

Yes No X

## **2.1.4 Element 4: Install Sediment Controls**

All stormwater that is determined to be contaminated will be discharged to the sanitary sewer under the discharge criteria of the King County Sewer discharge permit (Discharge Authorization No. 1145-01, provided in Appendix A), or disposed off-site at an appropriate disposal facility.

The specific BMPs to be used for controlling sediment on this project include:

- Silt Fence (BMP C233), plastic will be along the Waterfront Parcel.
- Storm Drain Inlet Protection (BMP C220)
- Interceptor Triangular Silt Dike (BMP C208) along the Waterfront Parcel, shown on Drawing G-9 (Appendix B)
- Portable Water Storage Tanks (e.g., Baker Tank) for Sedimentation.

In addition, sediment will be removed from paved areas in and adjacent to construction work areas manually or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize washoff of sediments from adjacent streets during runoff events.

Special care will be required along the Waterfront parcel. A silt dike shall be used to ensure no construction contaminated water will be discharged to Salmon Bay.

Installation Schedules: These BMPs will be installed prior to the start of any soil disturbance work; work is currently scheduled to start on June 1, 2021 and may extend through 12/31/2021.

Inspection and Maintenance plan: All BMPs shall be installed and inspected by a Certified Erosion and Sediment Control Lead to determine that BMPs are sufficient to prevent discharge to Salmon Bay prior to ground disturbance activities. Additional BMPs may be required along the waterfront parcel during ground disturbance activities adjacent to the Ordinary High Water Mark, these will be determined by the Certified Erosion and Sediment Control Lead with coordination from the Ecology construction inspector. Site inspection will occur in all areas disturbed by construction activities. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve the quality of stormwater discharges. Inspections will occur based on the details provided in Section 4.

Responsible Staff: A Certified Erosion and Sediment Control Lead will complete the inspections. Staff TBD.

## **2.1.5 Element 5: Stabilize Soils**

Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used on this project include:

- Dust Control (BMP C140)

- Early application of gravel base on areas to be paved
- Use of a Low permeability liners (for temporary conditions)

The project site is located west of the Cascade Mountain Crest. As such, no soils shall remain exposed and unworked for more than 7 days during the dry season (May 17 to September 30) and 2 days during the wet season (October 1 to April 30). Regardless of the time of year, all soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on weather forecasts.

In general, cut and fill slopes will be stabilized as soon as possible and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

**West of the Cascade Mountains Crest**

<b>Season</b>	<b>Dates</b>	<b>Number of Days Soils Can be Left Exposed</b>
During the Dry Season	May 17 – September 30	7 days
During the Wet Season	October 1 – April 30	2 days

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

**Anticipated project dates:**                      **Start date:    June 1, 2021**  
**End date:        December 31, 2021**

Will you construct during the wet season?  
X Yes                      No

Installation Schedules: These BMPs will be installed prior to the start of any soil disturbance work; work is currently scheduled to start on June 1, 2021 and may extend through 12/31/2021.

Inspection and Maintenance plan: Site inspection will occur in all areas disturbed by construction activities. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve the quality of stormwater discharges. Inspections will occur based on the details provided in Section 4.

Responsible Staff: A Certified Erosion and Sediment Control Lead will complete the inspections. Staff TBD.

**2.1.6 Element 6: Protect Slopes**

All cut and fill slopes will be designed, constructed, and protected in a manner than minimizes erosion. The following specific BMPs may be used as necessary to protect slopes for this project:

- Interceptor Dike and Swale (BMP C200)
- Interceptor Triangular Silt Dike (BMP C208)

To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (Appendix D – will be added, placeholder), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

Will steep slopes be present at the site during construction?  
Yes X                      No

Installation Schedules: These BMPs will be installed prior to the start of any soil disturbance work; work is currently scheduled to start on June 1, 2021 and may extend through 12/31/2021.

Inspection and Maintenance plan: Site inspection will occur in all areas disturbed by construction activities. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve the quality of stormwater discharges. Inspections will occur based on the details provided in Section 4.

Responsible Staff: A Certified Erosion and Sediment Control Lead will complete the inspections. Staff TBD.

## **2.1.7 Element 7: Protect Drain Inlets**

All storm drain inlets and culverts made operable during construction will be protected to prevent unfiltered or untreated water from entering the drainage conveyance system. However, the first priority is to keep all access roads clean of sediment and keep street runoff separate from entering storm drains until treatment can be provided. Storm Drain Inlet Protection (BMP C220) will be implemented for all storm drain inlets that could potentially be impacted by sediment-laden runoff on and near the project site. The following inlet protection measures that may be used on this project include:

- Drop Inlet Protection
  - ▶ Excavated Drop Inlet Protection
  - ▶ Block and Gravel Drop Inlet Protection
  - ▶ Gravel and Wire Drop Inlet Protection
  - ▶ Catch Basin Filters
- Culvert Inlet Sediment Trap
- BMP C220: Inlet Protection

All other storm drains within the work areas shall be plugged and protected during construction. Work areas will depend on the contractor equipment and staging areas. Drawing G-10 (Appendix B) shows all site catch basin that require removal or protection. All catch basins that require protection that are within a work area shall also be plugged to prevent discharge.

If the BMP options listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D – will be added, placeholder), or if no BMPs are listed above but deemed necessary during construction, the Certified Erosion and Sediment Control Lead will implement one or more of the alternative BMP inlet protection options listed in Appendix C.

Installation Schedules: These BMPs will be installed prior to the start of any soil disturbance work; work is currently scheduled to start on June 1, 2021 and may extend through 12/31/2021.

Inspection and Maintenance plan: Site inspection will occur in all areas disturbed by construction activities. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve

the quality of stormwater discharges. Inspections will occur based on the details provided in Section 4.

Responsible Staff: A Certified Erosion and Sediment Control Lead will complete the inspections. Staff TBD.

### **2.1.8 Element 8: Stabilize Channels and Outlets**

Construction will not require temporary conveyance channels or outlets to Salmon Bay, streams or slopes. BMPs for stabilization channels and outlets are not anticipated for use on this project.

### **2.1.9 Element 9: Control Pollutants**

Known past industrial operations and releases on the Bulk Terminal, ASKO, and East Waterfront parcels caused or contributed to the contamination at the Property. These sources are detailed in the Cleanup Action Plan (Ecology 2020). Sources of contamination include leaks and spills from:

- Petroleum storage and handling on the Bulk Terminal, ASKO, and East Waterfront parcels, including operation of USTs and ASTs; transfer of petroleum to barrels; and transportation of petroleum via loading racks, a barrel incline, and the underground pipeline utilidor
- Mixing diesel with penta in an AST on the Bulk Terminal parcel
- Machine shop and steam cleaning operations on the ASKO parcel
- Vehicle maintenance on the eastern portion of the East Waterfront parcel
- Icicle Seafood maintenance operations on the East Waterfront parcel including sandblasting and vehicle maintenance
- BNSF railroad product loading and off-loading operations

As a result of these releases, the primary contaminants at the Property consist of petroleum products (gasoline, diesel, oil), benzene, penta, chlorinated solvents (trichloroethene [TCE] and vinyl chloride [VC]), and heavy metals. Leaks and spills of the contaminants referenced above have migrated downward through the soil to groundwater, creating contaminant plumes. Because the releases were from surface or near surface sources and because of existing hydrogeologic conditions, most of the petroleum contaminated soil is within 20 to 25 feet of ground surface, and most of the TCE-contaminated soil is within 30 to 40 feet of ground surface. The metals contamination, by contrast, is generally close to the surface.

All stormwater collected in construction work areas during the cleanup work (including any dewatering) will be collected and transported off-site to an appropriate disposal facility, or treated to meet Department of Ecology, City and KCWTD standards, and discharged to the County combined sewer main in W. Commodore Way, through the King County Industrial Waste Program (Discharge Authorization No. 1145-01, provided in Appendix A). The King County Sewer discharge point is shown on drawing G-7B provided in Appendix B. No contaminated stormwater/dewatering water will be discharged to waters of the State.

All pollutants, including waste materials and debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well-organized, and free of debris. If required, BMPs to be implemented to control specific sources of pollutants are discussed below.

Vehicles, construction equipment, and/or petroleum product storage/dispensing:

- All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.
- On-site fueling tanks and petroleum product storage containers shall include secondary containment.
- Spill prevention measures, such as drip pans, will be used when conducting maintenance and repair of vehicles or equipment.
- In order to perform emergency repairs on site, temporary plastic will be placed beneath and, if raining, over the vehicle.
- Contaminated surfaces shall be cleaned immediately following any discharge or spill incident.

Chemical storage:

- Any chemicals stored in the construction areas will conform to the appropriate source control BMPs listed in Volume IV of the Ecology stormwater manual. In Western WA, all chemicals shall have cover, containment, and protection provided on site, per BMP C153 for Material Delivery, Storage and Containment in SWMMWW 2019

Solid Waste:

- Solid waste will be stored in secure, clearly marked containers.

Other:

- Other BMPs will be administered as necessary to address any additional pollutant sources on site.

Demolition:

- Dust released from demolished sidewalks, buildings, or structures will be controlled using Dust Control measures (BMP C140).
- Storm drain inlets vulnerable to stormwater discharge carrying dust, soil, or debris will be protected using Storm Drain Inlet Protection (BMP C220 as described above for Element 7).
- Process water and slurry resulting from sawcutting and surfacing operations will be prevented from entering the waters of the State by implementing Sawcutting and Surfacing Pollution Prevention measures (BMP C152).

Concrete and grout:

- Process water and slurry resulting from concrete work will be prevented from entering the waters of the State by implementing Concrete Handling measures (BMP C151).

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?

Yes X No

Vehicles, construction equipment, and/or petroleum product storage/dispensing:

- All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.
- On-site fueling tanks and petroleum product storage containers will include secondary containment.
- Spill prevention measures, such as drip pans, will be used when conducting maintenance and repair of vehicles or equipment.
- Contaminated surfaces will be cleaned immediately following any discharge or spill incident.

Will wheel wash or tire bath system BMPs be used during construction?

Yes X      No

Only for trucks that come into contact with contaminated soils. Wheel wash water will be disposed of at an off-site disposal facility (not through the onsite sanitary sewer sewer).

Wheel Wash (BMP C106)

Installation Schedules: These BMPs will be installed prior to the start of any soil disturbance work; work is currently scheduled to start on June 1, 2021 and may extend through 12/31/2021.

Inspection and Maintenance plan: Site inspection will occur in all areas disturbed by construction activities. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve the quality of stormwater discharges. Inspections will occur based on the details provided in Section 4.

Responsible Staff: A Certified Erosion and Sediment Control Lead will complete the inspections. Staff TBD.

Will pH-modifying sources be present on-site?

Yes X      No

**Table 2 – pH-Modifying Sources**

	None
x	Bulk cement
	Cement kiln dust
	Fly ash
	Other cementitious materials
	New concrete washing or curing waters
x	Waste streams generated from concrete grinding and sawing
	Exposed aggregate processes



	Dewatering concrete vaults
	Concrete pumping and mixer washout waters
	Recycled concrete
	Other (i.e. calcium lignosulfate) [please describe]

Concrete and grout:

- Process water and slurry resulting from concrete work will be prevented from entering the waters of the State by implementing Concrete Handling measures (BMP C151).

### 2.1.10 Element 10: Control Dewatering

Dewatering is anticipated to be performed during select deep excavation activities, which include only 2 likely areas, and is anticipated to be contaminated. All stormwater collected in construction work areas during the cleanup work (including any dewatering) will be collected and transported off-site to an appropriate disposal facility, or treated to meet Department of Ecology, City and KCWTD standards, and discharged to the County combined sewer main in W. Commodore Way, through the King County Industrial Waste Program (Discharge Authorization No. 1145-01, provided in Appendix A).

**Table 3 – Dewatering BMPs**

	Infiltration
x	Transport off-site in a vehicle (vacuum truck for legal disposal)
	Ecology-approved on-site chemical treatment or other suitable treatment technologies
x	Sanitary or combined sewer discharge with local sewer district approval (last resort)
	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

Installation Schedules: These BMPs will be installed prior to the start of any soil disturbance work; work is currently scheduled to start on June 1, 2021 and may extend through 12/31/2021.

Inspection and Maintenance plan: Site inspection will occur in all areas disturbed by construction activities. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve the quality of stormwater discharges. Inspections will occur based on the details provided in Section 4.

Responsible Staff: A Certified Erosion and Sediment Control Lead will complete the inspections. Staff TBD.

### 2.1.11 Element 11: Maintain BMPs

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW* or *Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

## 2.1.12 Element 12: Manage the Project

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
  - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
  - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the King Discharge Authorization No. 1145-01, provided in Appendix A. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
  - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

**Table 4 – Management**

x	Design the project to fit the existing topography, soils, and drainage patterns
x	Emphasize erosion control rather than sediment control
x	Minimize the extent and duration of the area exposed
	Keep runoff velocities low
x	Retain sediment on-site

x	Thoroughly monitor site and maintain all ESC measures
x	Schedule major earthwork during the dry season
	Other (please describe)

### **2.1.13 Element 13: Protect Low Impact Development (LID) BMPs**

The project does not include any LID.

### 3 Pollution Prevention Team

Table 5 – Team Information

<b>Title</b>	<b>Name(s)</b>	<b>Phone Number</b>
<b>Certified Erosion and Sediment Control Lead (CESCL)</b>	TBD	TBD
<b>Resident Engineer</b>	TBD	TBD
<b>Emergency Ecology Contact</b>	Emergency Spills Hotline	1-800-645-7911
<b>Emergency Permittee/ Owner Contact</b>	Jamie Stevens/CRETE Consulting	206-799-2744
<b>Non-Emergency Owner Contact</b>	Kim Hempel	773-435-3725
<b>Monitoring Personnel</b>	TBD	TBD
<b>Ecology Regional Office</b>	Northwest Region Tena Seeds	206-594-0089 (office) 425-457-3143 (cell)

## 4 Monitoring and Sampling Requirements

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

File a blank form under Appendix E.

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

The receiving waterbody, **Salmon Bay**, is impaired for: **pH**. All stormwater and dewatering discharges from the site are subject to an **effluent limit** of **8.5 su for pH**. All site stormwater will be discharged through the sanitary sewer through a King County Sewer Discharge Authorization (Discharge Authorization No. 1145-01, provided in Appendix A). Discharge samples will be collected in accordance with the permit to confirm compliance with discharge limits. No water will be discharged from the site to Salmon Bay.

### 4.1 Site Inspection

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

The King County Sewer discharge point is shown on drawing G-7B provided in Appendix B (Discharge Authorization No. 1145-01 is provided in Appendix A).

### 4.2 Stormwater Quality Sampling

### 4.3 Turbidity Sampling

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.

All site stormwater will be discharged through the sanitary sewer through a King Count industrial Waste Discharge permit (application is included; this will be updated when the permit is issued). No water will be discharged from the site to Salmon Bay.

Method for sampling turbidity:

**Table 6 – Turbidity Sampling Method**

	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
x	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU or the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU or the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.  
<https://www.ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue>
  - Central Region (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490
  - Eastern Region (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400
  - Northwest Region (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000
  - Southwest Region (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
  - Turbidity is 25 NTU (or lower).
  - Transparency is 33 cm (or greater).
  - Compliance with the water quality limit for turbidity is achieved.
    - 1 - 5 NTU over background turbidity, if background is less than 50 NTU

- 1% - 10% over background turbidity, if background is 50 NTU or greater
- The discharge stops or is eliminated.

## 4.4 pH Sampling

All site stormwater will be discharged through the sanitary sewer through a King Count industrial Waste Discharge permit (application is included; this will be updated when the permit is issued). No water will be discharged from the site to Salmon Bay.

pH monitoring is required for “Significant concrete work” (i.e. greater than 1000 cubic yards poured concrete or recycled concrete over the life of the project). The use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO<sub>2</sub>) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO<sub>2</sub> sparging or dry ice.

Method for sampling pH:

**Table 7 – pH Sampling Method**

x	pH meter
x	pH test kit
	Wide range pH indicator paper

# 5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies

## 303(d) Listed Waterbodies

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

Yes X      No

List the impairment(s):

Salmon Bay is identified for pH, lead, Aldrin, and bacteria.

The receiving waterbody, **Salmon Bay**, is impaired for: **pH**. All stormwater and dewatering discharges from the site are subject to an **effluent limit** of **8.5 su** for pH.

If yes, discharges must comply with applicable effluent limitations in S8.C and S8.D of the CSWGP.

Water will not be discharged to Salmon Bay. Construction water from site activities will be discharged to the sanitary sewer through a King County Discharge authorization (Discharge Authorization No. 1145-01, provided in Appendix A), or transported off-site to an appropriate disposal facility.



# 6 Reporting and Record Keeping

## 6.1 Record Keeping

### 6.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

### 6.1.2 Records Retention

Records will be retained during the life of the project and for a minimum of five (5) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

### 6.1.3 Updating the SWPPP

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

## 6.2 Reporting

### 6.2.1 Discharge Monitoring Reports

**Cumulative soil disturbance is one (1) acre or larger; therefore,** Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting “No Discharge”. The DMR due date is fifteen (15) days following the end of each calendar month.

DMRs will be reported online through Ecology’s WQWebDMR System.

### 6.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Specific information to be included in the noncompliance report is found in Special Condition S5.F.3 of the CSWGP.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- Central Region at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- Eastern Region at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- Northwest Region at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- Southwest Region at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number

3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO<sub>2</sub> sparging is planned for adjustment of high pH water.

**Appendix A King County Metro Sewer Discharge Permit**

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**King County**

**Wastewater Treatment Division**

Industrial Waste Program

Department of Natural Resources and Parks

201 South Jackson Street, Suite 513  
Seattle, WA 98104-3855

**206-477-5300** Fax 206-263-3001

TTY Relay: 711

March 25, 2021

SENT VIA EMAIL ONLY  
ELECTRONIC READ RECEIPT REQUESTED

Mike Ciserella  
TOC Seattle Terminal 1, LLC  
2753 West 31<sup>st</sup> Street  
Chicago, IL 60608

Issuance of new Wastewater Discharge Authorization No. 1145-01 to TOC Seattle Terminal 1, LLC

Dear Mr. Mike Ciserella:

The King County Industrial Waste Program (KCIW) has reviewed your application to discharge industrial wastewater to the sewer system from the TOC Seattle Terminal 1, LLC facility located at 2737 West Commodore Way, Seattle, Washington, and has issued the enclosed Minor Discharge Authorization. The enclosed Discharge Authorization No. 1145-01 supersedes and cancels Discharge Authorization No. 4427-01, effective April 1, 2021.

This discharge authorization permits your facility to discharge limited amounts of industrial wastewater into King County's sewer system in accordance with the effluent limitations and other requirements and conditions set forth in the document and the regulations outlined in King County Code 28.84.060 (enclosed). As long as you maintain compliance with regulations and do not change the nature and volume of your discharge, KCIW will not require you to apply for an industrial wastewater discharge permit, a type of approval that would result in additional requirements, oversight, and increased fees.

If you propose to increase the volume of your discharge or change the type or quantities of substances discharged, you must contact KCIW at least 60 days before making these changes.

King County Code 28.84 authorizes a fee for each Minor Discharge Authorization issued by the King County Department of Natural Resources and Parks. The current fee for issuance of a new Minor Discharge Authorization is \$2000. King County will send you an invoice for this amount.

Mike Ciserella  
March 25, 2021  
Page 2

If you have any questions about this discharge authorization or your wastewater discharge, please call me at 206-477-5465 or email me at [dave.haberman@kingcounty.gov](mailto:dave.haberman@kingcounty.gov). To learn more about King County's industrial wastewater regulations, visit our program's website at: [www.kingcounty.gov/industrialwaste](http://www.kingcounty.gov/industrialwaste).

Thanks in advance for supporting our mission to protect workers, the local and regional sanitary sewer system, our treatment plant infrastructure, and the environment.

Sincerely,

DocuSigned by:  
  
39F3ABE315B446E...  
Dave Haberman  
Compliance Investigator

Enclosures

e-cc: Mike Ciserella, TOC Seattle Terminal 1, LLC, [mike@cantear-group.com](mailto:mike@cantear-group.com)  
Julie Howell, Seattle Public Utilities, [julie.howell@seattle.gov](mailto:julie.howell@seattle.gov)



## King County

### MINOR DISCHARGE AUTHORIZATION

King County Industrial Waste Program  
201 S. Jackson Street, Suite 513  
Seattle, WA 98104-3855

**NUMBER 1145-01**

for

### **TOC Seattle Terminal 1, LLC**

**Facility address:** 2737 West Commodore Way, Seattle, Washington  
**Mailing address:** 2753 West 31<sup>st</sup> Street, Chicago, IL 60608  
**Phone:** 206-447-6267      **Emergency (24-hour) phone:** 425-754-4016  
**Industry type:** Groundwater Remediation – Petroleum/Organics  
**SIC code:** 4226    **EPA Id. No.:** WAD009591207  
**Discharge to:** West Point

\*Note: This authorization is valid only for the specific discharges shown below:

**Discharge process:** Wastewater generated by Groundwater Remediation - Petroleum operation

**Pretreatment process:** Groundwater treated via solids settling, filtration and granular activated carbon prior to discharge

**Effective date:** April 1, 2021  
**Expiration date:** December 1, 2021

#### **DESCRIPTION OF SAMPLE SITES AND DISCHARGE VOLUMES**

Sample Site No.	Description	Maximum Volume (gallons per day)	
		Industrial	Total
A4257	Final Discharge Sump	8,500	8,500

Permission is hereby granted to discharge industrial wastewater from the above-identified facility into the King County sewer system in accordance with the effluent limitations and monitoring requirements set forth in this authorization.

If the industrial user wishes to continue to discharge after the expiration date, an application must be filed for re-issuance of this discharge authorization at least 90 days prior to the expiration date. For information concerning this King County Discharge Authorization, please call Industrial Waste Compliance Investigator Dave Haberman at 206-477-5465.

**24-HOUR EMERGENCY NOTIFICATION**  
**West Point Treatment Plant: 206-263-3801**  
**Washington State Department of Ecology: 425-649-7000**

**I. SPECIAL CONDITIONS**

- A. Discharge to the sanitary sewer shall not begin until KCIW has conducted a preoperative inspection of the pretreatment facilities and has sent written notification (email is sufficient) to the permittee that discharges may begin.



**II. SELF-MONITORING REQUIREMENTS**

A. The following self-monitoring requirements shall be met for this discharge authorization:

Sample Site No.	Parameter	Sample Type	Frequency
A4257	Benzene	Grab	Monthly
	Ethylbenzene	Grab	Monthly
	Toluene	Grab	Monthly
	Total Xylenes	Grab	Monthly
	Pentachlorophenol	Grab	Monthly
	1,1,2-Trichloroethylene (TCE)	Grab	Monthly
	Vinyl Chloride	Grab	Monthly
	Nonpolar FOG	3 Grabs <sup>B</sup>	Monthly
	pH	Grab	Monthly
	Total Monthly Flow	Meter reading	Continuous
	Maximum Daily discharge	Meter reading	Continuous
	Settleable solids	Grab (by Imhoff cone)	Only if operating criteria are exceeded
	Hydrogen sulfide	Meter reading	Only if operating criteria are exceeded
	Explosivity	Meter reading	Only if operating criteria are exceeded

B. The three nonpolar fats, oils, and grease (FOG) grab samples shall be of equal volume, collected at least five minutes apart, and analyzed separately. When using U.S. Environmental Protection Agency approved protocols specified in 40 CFR Part 136, the individual grab samples may be composited (at the laboratory) prior to analysis. The result of the composite sample or the average of the concentrations of the three grab samples may be reported as total FOG unless the value is 100 mg/L or greater, in which case the concentration of nonpolar FOG must be reported.

C. The settleable solids field test by Imhoff cone must be performed as follows:

1. Fill Imhoff cone to one-liter mark with well-mixed sample
2. Allow 45 minutes to settle
3. Gently stir sides of cone with a rod or by spinning; settle 15 minutes longer
4. Record volume of settleable matter in the cone as mL/L

D. If a violation of any discharge limits or operating criteria is detected in monitoring, you shall notify KCIW immediately upon receipt of analytical data.

E. A self-monitoring report shall be filed with KCIW no later than the 15th day of the time period following the sample collection (i.e., the 15th day of the following month for monthly, weekly, daily samples; the 15th day of the following quarter for quarterly samples). If no discharge takes place during any monitoring period, it shall be noted on the report.

- F. All self-monitoring data submitted to KCIW, which required a laboratory analysis, must have been performed by a laboratory accredited by the Washington State Department of Ecology for each parameter tested, using procedures approved by 40 CFR 136. This does not apply to field measurements performed by the industrial user such as pH, temperature, flow, atmospheric hydrogen sulfide, total dissolved sulfides, total settleable solids by Imhoff cone, or process control information.
- G. All sampling data collected by the permittee at the point of compliance and analyzed using procedures approved by 40 CFR 136 or approved alternatives shall be submitted to KCIW whether required as part of this authorization or done voluntarily by the permittee.
- H. Self-monitoring reports shall be signed by an authorized representative of the industrial user. The authorized representative of the industrial user is defined as:
1. The president, secretary, treasurer, or a vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation
  2. The manager of one or more manufacturing, production, or operating facilities, but only if the manager:
    - a. Is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiate and direct other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations
    - b. Can ensure that the necessary systems are established, or actions taken to gather complete and accurate information for control mechanism requirements and knowledgeable of King County reporting requirements
    - c. Has been assigned or delegated the authority to sign documents, in accordance with corporate procedures
  3. A general partner or proprietor if the industrial user is a partnership or proprietorship, respectively
  4. A director or highest official appointed or designated to oversee the operation and performance of the industry if the industrial user is a government agency
  5. The individuals described in one through four above may designate an authorized representative if:
    - a. The authorization is submitted to King County in writing.
    - b. The authorization specifies the individual or position responsible for the overall operation of the facility from which the discharge originates or having overall responsibility for environmental matters for the company or agency.

### **III. GENERAL DISCHARGE LIMITATIONS**

#### **A. Operating Criteria**

There shall be no odor of solvent, gasoline, or hydrogen sulfide (rotten egg odor), oil sheen, unusual color, or visible turbidity. The discharge must remain translucent. If any of the discharge limits are exceeded, you must stop discharging and notify KCIW at 206-477-5300.

#### **B. Corrosive Substances**

##### Limits

Instantaneous minimum:      pH 5.0 (s.u.)

Daily minimum:                 pH 5.5 (s.u.)

Maximum:                         pH 12.0 (s.u.)

*s.u. = standard units*

The instantaneous minimum pH limit is violated whenever any single grab sample or any instantaneous recording is less than pH 5.0.

The daily minimum pH limit is violated whenever any continuous recording of 15 minutes or longer remains below pH 5.5 or when each pH value of four consecutive grab samples collected at 15-minute intervals or longer within a 24-hour period remains below pH 5.5.

Discharges of caustic solutions greater than pH 12.0 are prohibited unless King County provides prior written authorization. For these situations, the authorized caustic solution discharges above pH 12.0 must be less than pH 12.5 and must not contain an equivalent weight of sodium hydroxide (NaOH) that exceeds a daily loading rate of 21 pounds/day. The authorized discharge of caustic solutions greater than pH 12.0 shall be subject to special conditions to protect worker safety and the POTW.

#### **C. Fats, Oils, and Grease**

##### FOG Accumulations and Obstructions

Discharges of FOG shall not result in significant accumulations which, either alone or in combination with other wastes, are capable of obstructing flow or interfering with the operations or performance of the POTW.

##### Nonpolar FOG (mineral/petroleum origin)

Nonpolar FOG limit: 100 mg/L

The limit for nonpolar FOG is violated when either:

- the arithmetic mean of the concentration from the individual analyses of three grab samples, taken no more frequently than 5-minute intervals, exceeds the limitation, or

- the concentration of a single composite sample of three grab samples, taken no more frequently than 5-minute intervals, exceeds the limitation.

Industrial users that violate the nonpolar FOG limit may be required to complete, for King County review and approval, a FOG control plan.

#### Polar FOG (Animal and Vegetable Origin)

Industrial users that have the potential to discharge polar FOG shall minimize free-floating polar FOG. Industrial users must minimize the use of emulsifying agents, such as cleaners or detergents, to only the quantity needed to maintain industrial activities at their facility and to not impact the POTW.

Industrial users may not add emulsifying agents prior to or within FOG-removal devices, exclusively for the purposes of emulsifying free-floating FOG.

Industrial users that discharge free-floating polar FOG will be required to complete, for King County review and approval, a FOG control plan.

King County has the authority to include aqueous concentration-based discharge limits for polar FOG or total FOG (i.e., the sum of polar and nonpolar FOG) in permits and discharge authorizations issued to industrial users that primarily discharge FOG of animal or vegetable origin. The concentration-based limits shall be based on what can be achieved through implementation of a treatment technology that the Wastewater Treatment Division Director determines represents all known, available, and reasonable methods of prevention, control, and treatment.

#### D. Flammable or Explosive Materials

No person shall discharge any pollutant, as defined in 40 CFR 403.5, that creates a fire or explosion hazard in any sewer or treatment works, including, but not limited to, waste streams with a closed cup flashpoint of less than 140° Fahrenheit or 60° Centigrade using the test methods specified in 40 CFR 261.21.

At no time shall two successive readings on an explosion hazard meter, at the point of discharge into the system (or at any point in the system), be more than 5% nor any single reading be more than 10% of the lower explosive limit (LEL) of the meter.

Pollutants subject to this prohibition include, but are not limited to, gasoline, kerosene, naphtha, benzene, toluene, xylene, ethers, alcohols, ketones, aldehydes, peroxides, chlorates, perchlorates, bromates, carbides, hydrides, and sulfides, and any other substances that King County, the fire department, Washington State, or the U.S. Environmental Protection Agency has notified the user are a fire hazard or a hazard to the system.

E. Compound Screening Levels and Reporting Requirements

Compound	CAS Number	Wastewater Screening Level (mg/L)
Pentachlorophenol	87-86-5	0.0053
1,1,2-Trichloroethylene (TCE)	79-01-6	0.5
Vinyl Chloride	75-01-4	0.012
Benzene	71-43-2	0.070
Ethylbenzene	100-41-4	1.7
Toluene	108-88-3	1.4
Total Xylenes	1330-20-7	2.2

For each exceedance of the screening levels, the permittee shall:

1. Notify KCIW within 24 hours of learning of the exceedance
2. Collect a sample and submit new data to KCIW within 14 days of becoming aware of the exceedance (or the next time discharge occurs if greater than 14 days)
3. Submit a written report within 14 days of learning of the exceedance (*14-Day Report*). The report should explain the cause of the exceedance and corrective actions taken to respond to the exceedance and ensure ongoing compliance

F. Heavy Metals/Cyanide

The industrial user shall not discharge wastes, which exceed the following limitations:

Heavy Metals & Cyanide	Instantaneous Maximum ppm (mg/L) <sup>1</sup>	Daily Average ppm (mg/L) <sup>2</sup>
Arsenic	4.0	1.0
Cadmium	0.6	0.5
Chromium	5.0	2.75
Copper	8.0	3.0
Lead	4.0	2.0
Mercury	0.2	0.1
Nickel	5.0	2.5
Silver	3.0	1.0
Zinc	10.0	5.0
Cyanide	3.0	2.0

<sup>1</sup> The instantaneous maximum is violated whenever the concentration of any sample, including a grab within a series used to calculate daily average concentrations, exceeds the limitation.

<sup>2</sup> The daily average limit is violated: a) for a continuous flow system when a composite sample consisting of four or more consecutive samples collected during a 24-hour period over intervals of 15 minutes or greater exceeds the limitation, or b) for a batch system when any sample exceeds the limitation. A

composite sample is defined as at least four grab samples of equal volume taken throughout the processing day from a well-mixed final effluent chamber and analyzed as a single sample.

#### G. High Temperature

The industrial user shall not discharge material with a temperature in excess of 65° C (150° F).

#### H. Hydrogen Sulfide

The following are atmospheric hydrogen sulfide limits as measured at a monitoring location designated by King County:

- Short-Term Limit: 15.0 parts per million volume (ppmv) as a 15-minute average
- 8-Hour Limit: 10.0 ppmv as an 8-hour average
- Weekly Limit: 3.0 ppmv as a 7-day average

More stringent weekly atmospheric hydrogen sulfide limits may be developed and imposed on a case-by-case basis depending on nuisance conditions or risks to workers and sewer infrastructure.

Aqueous soluble sulfide limits may be established on a case-by-case basis depending on the volume of discharge and conditions in the receiving sewer, including oxygen content, pH, and existing sulfide concentrations.

#### I. Organic Compounds

No person shall discharge any organic pollutants that result in the presence of toxic gases, vapors, or fumes within a public or private sewer or treatment works in a quantity that may cause acute worker health and safety problems. Organic pollutants subject to this restriction include, but are not limited to, the following:

- Any organic compound listed in the “Total Toxic Organics (TTO)” definition provided in 40 CFR Section 433.11(e) and 40 CFR Section 413.02(i)
- Acetone, 2-butanone (MEK), 4-methyl-2-pentanone (MIBK), xylenes

Industrial users are required to implement source control strategies and best management practices to minimize the concentration of any of the aforementioned organic pollutants.

#### J. Settleable Solids

Settleable solids concentrations: 7.0 ml/L

#### **IV. GENERAL CONDITIONS**

- A. All requirements of King County Code pertaining to the discharge of wastes into the municipal sewer system are hereby made a condition of this discharge authorization.
- B. All pretreatment systems used to bring the permittee's discharge into compliance with King County's discharge limitations and all compliance monitoring equipment shall be maintained continuously in satisfactory and effective operations by the permittee at the permittee's expense and shall be subject to periodic inspections by authorized KCIW personnel. These systems shall be attended at all times during discharge to the King County sewerage system. In the event that such equipment fails, the permittee must notify KCIW immediately and take spill prevention precautions.
- C. The industrial discharger shall implement measures to prevent accidental spills or discharges of prohibited substances to the municipal sewer system. Such measures include, but are not limited to, secondary containment of chemicals and wastes, elimination of connections to the municipal sewer system, and spill response equipment.
- D. Any facility changes, which will result in a change in the character or volume of the pollutants discharged to the municipal sewer system, must be reported to your KCIW representative. Any facility changes that will cause the violation of the effluent limitations specified herein will not be allowed.
- E. In the event the permittee is unable to comply with any of the conditions of this discharge authorization because of breakdown of equipment or facilities, an accident caused by human error, negligence, or any other cause, such as an act of nature the company shall:
  - 1. Take immediate action to stop, contain, and clean up the unauthorized discharges and correct the problem.
  - 2. Immediately notify KCIW and, if after 5 p.m. weekdays and on weekends, call the emergency King County treatment plant phone number on Page 1 so steps can be taken to prevent damage to the sewer system.
  - 3. For discharge violations, collect a sample and submit new data to KCIW within 14 days of becoming aware of the violation.
  - 4. Submit a written report within 14 days of the event (*14-Day Report*) describing the breakdown, the actual quantity and quality of resulting waste discharged, corrective action taken, and the steps taken to prevent recurrence.
- F. Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this discharge authorization or the resulting liability for failure to comply.
- G. The permittee shall, at all reasonable times, allow authorized representatives of KCIW to enter that portion of the premises where an effluent source or disposal system is located or in which any records are required to be kept under the terms and conditions of this authorization.
- H. Nothing in this discharge authorization shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations including discharge into waters of the state. Any such discharge is subject to regulation and enforcement action by the Washington State Department of Ecology.

King County Minor Discharge Authorization Number 1145-01

Effective Date: April 1, 2021

Expiration Date: December 1, 2021

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- I. This discharge authorization does not authorize discharge after its expiration date. If the permittee wishes to continue to discharge after the expiration date, an application must be filed for reissuance of this discharge authorization at least 90 days prior to the expiration date. If the permittee submits its reapplication in the time specified herein, the permittee shall be deemed to have an effective wastewater discharge authorization until KCIW issues or denies the new wastewater discharge authorization. If the permittee fails to file its reapplication in the time period specified herein, the permittee will be deemed to be discharging without authorization.

DocuSigned by:

*Dave Haberman*

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3/25/2021

Compliance Investigator: \_\_\_\_\_ Date: \_\_\_\_\_

Dave Haberman





**King County**

# Industrial Waste Program Monthly Self-Monitoring Report

Send to: King County Industrial Waste Program  
 201 S. Jackson Street, Suite 513  
 Seattle, WA 98104-3855  
 Phone 206-477-5300 / FAX 206-263-3001  
 Email: [info.kciw@kingcounty.gov](mailto:info.kciw@kingcounty.gov)

Company Name: TOC Seattle Terminal 1, LLC

Sample Site No. A4257

Permit/DA No.: 1145-01

Please Specify Month & Year: Month: 20

This form is available at: [www.kingcounty.gov/industrialwaste](http://www.kingcounty.gov/industrialwaste)

All units are mg/L unless otherwise noted.

Sample Date	pH		Benzene (µg/L) LIMIT (70)	Ethylbenzene (µg/L) LIMIT (1700)	Toluene (µg/L) LIMIT (1400)	Total Xylenes (µg/L) LIMIT (2200)	NP Fats, Oils, & Grease (Avg./ 3 grabs) (mg/L) LIMIT (100)	Daily Flow (gals/day) LIMIT 8,500
	Min LIMIT (5.0)	Max LIMIT (12.0)						
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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further certify that all data requiring a laboratory analysis were analyzed by a Washington State Department of Ecology accredited laboratory for each parameter tested.

Signature of Principal Executive or Authorized Agent \_\_\_\_\_ Date \_\_\_\_\_

Monthly Min pH \_\_\_\_\_  
 Monthly Max pH \_\_\_\_\_

& Date \_\_\_\_\_  
 & Date \_\_\_\_\_ & Date \_\_\_\_\_

**PLEASE CIRCLE ALL VIOLATIONS**

**Due Date:** Monthly report is due by the 15th each month.



# Industrial Waste Program Monthly Self-Monitoring Report

King County

PAGE 2 of 2

Send to: King County Industrial Waste Program  
 201 S. Jackson Street, Suite 513  
 Seattle, WA 98104-3855  
 Phone 206-477-5300 / FAX 206-263-3001  
 Email: [info.kciw@kingcounty.gov](mailto:info.kciw@kingcounty.gov)

Company Name: TOC Seattle Terminal 1, LLC

Sample Site No. A4257

Permit/DA No.: 1145-01

Please Specify Month & Year: Month: 20

This form is available at: [www.kingcounty.gov/industrialwaste](http://www.kingcounty.gov/industrialwaste)

All units are mg/L unless otherwise noted.

Sample Date	Pentachlorophenol CAS 87-86-5 LIMIT (0.0053)	Vinyl Chloride CAS 75-01-4 LIMIT (0.012)	1,1,2- Trichloroethylene (TCE) CAS 79-01-6 LIMIT (0.5)	Additional Notes
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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further certify that all data requiring a laboratory analysis were analyzed by a Washington State Department of Ecology accredited laboratory for each parameter tested.

Signature of Principal Executive or Authorized Agent \_\_\_\_\_ Date \_\_\_\_\_

**PLEASE CIRCLE ALL VIOLATIONS**

**Due Date:** Monthly report is due by the 15th each month.

## Application Checklist

Before submitting your application, use this checklist to make sure you have included all the necessary information and documentation.

### Checklist for Individual Authorization Application

Application Component and Page Number	Completed
Signature of authorized representative or owner (page 3)	<input checked="" type="checkbox"/>
Signed signature delegation if authorized representative or owner is delegating signature authority (page 4)	<input checked="" type="checkbox"/>
Project Information (page 5)	<input checked="" type="checkbox"/>
Detailed project information (pages 6 and 7)	<input checked="" type="checkbox"/>
Exhibit A, Site Plan (page 8)	<input checked="" type="checkbox"/>
Exhibit B, Wastewater Treatment System Description (page 8)	<input checked="" type="checkbox"/>
Exhibit C, Dewatering Schedule (required for sites requesting discharge approval for longer than six months) (page 8)	<input checked="" type="checkbox"/>
Exhibit D, Description of Contamination (required for sites with known groundwater or sediment contamination) (page 8)	<input checked="" type="checkbox"/>




## Required Signature

**NOTE: A construction site owner must sign this page and/or the reverse page to delegate signature authority.**

King County Code 28.82.050 requires a signature from an “authorized representative” on all wastewater applications and reports. An authorized representative is responsible for the accuracy of the information provided. For construction projects, it is the site owner. The authorized representative may be one of the following:

- A. The president, secretary, treasurer, or a vice-president of the corporation in charge of a principal business function or any other person who performs similar policy or decision-making functions
- B. The manager of one or more manufacturing, production, or operating facilities, but only if the manager:
  - 1. Is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiate and direct other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations;
  - 2. Can ensure that the necessary systems are established or actions taken to gather complete and accurate information for control mechanism requirements and knowledgeable of King County reporting requirements; and;
  - 3. Has been assigned or delegated the authority to sign documents, in accordance with corporate procedures
- C. A general partner or proprietor for a partnership or proprietorship
- D. A director or highest official appointed or designated to oversee the operation and performance of the industry if the industrial user is a government agency
- E. An individual and/ or position—delegated in writing by one of the first four (A–D above)—who is responsible for the overall operation of the facility from which the discharge originates or has overall responsibility for environmental matters for the company or agency.

**Use the form on reverse to delegate signature authority.**

<i>I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.</i>	
Mike Ciserella	2753 West 31st Street
Name	Street Address
Manager	Chicago, IL 60608
Title	City, State, and Zip
TOC SEattle Terminal 1, LLC	mike@cantera-group.com
Company Name	Email
773-722-9200 X 501	
Phone	Signature
(773) 991-2687	2/24/21
Cell Phone (optional )	Date



### Delegation of Signature Authority Form

This form is only required if the authorized representative wishes to delegate signature authority. Use additional copies of this page to delegate to additional people or positions.

#### Person Delegating Signature Authority

By signing below, I certify that I am authorizing the following person(s) and/or position(s) to receive signature authority. I am an authorized representative for the company named in this application because I meet the following definition listed on the reverse page:

A                       B                       C                       D

Mike Ciserella	2753 West 31 <sup>st</sup> Street
Name	Street Address
Manager	Chicago, IL 60608
Title	City, State, and Zip
TOC SEattle Terminal 1, LLC	mike@cantera-group.com
Company Name	Email
773-722-9200 X 501	
Phone	Signature
(773) 991-2687	2/24/21
Cell Phone (optional)	Date

#### Person(s) and/or Position(s) Receiving Signature Authority

<p>1. Kim Hempel</p> <p>Name or Position</p> <p>Project Manager</p> <p>Title</p> <p>Pioneer Engineering &amp; Environmental Services, LLC</p> <p>Company Name</p> <p>773-722-9200 x 209                      2753 West 31st Street</p> <p>Phone                                      Street Address</p> <p>khempel@pioneerees.com                      Chicago, IL 60608</p> <p>Email                                      City, State, and Zip Code</p> <p></p> <p>Signature</p>	<p>2.</p> <p>Name or Position</p> <p>Title</p> <p>Company Name</p> <p>Phone                                      Street Address</p> <p>Email                                      City, State, and Zip Code</p> <p>Signature</p>
<p>3.</p> <p>Name or Position</p> <p>Title</p> <p>Company Name</p> <p>Phone                                      Street Address</p> <p>Email                                      City, State, and Zip Code</p> <p>Signature</p>	<p>4.</p> <p>Name or Position</p> <p>Title</p> <p>Company Name</p> <p>Phone                                      Street Address</p> <p>Email                                      City, State, and Zip Code</p> <p>Signature</p>

## Project Information

Applicant/Project Name	TOC Seattle Terminal 1, LLC		
Project Location (Address, City, and Zip Code)	2737 W. Commodore Way Seattle, WA 98199		
NOTE: The site owner will be issued the discharge approval; the contractor or consultant will be sent a copy.			
	<b>Site/Project Owner (Must be authorized or delegated signatory)</b>		<b>Contractor/Consultant</b>
Name	Mike Ciserella		Grant Hainsworth
Title			
Company	TOC Seattle Terminal 1, LLC		Crete Consulting Inc.
Mailing address	2753 West 31st Street		108 S. Washington St. #300
City/state/zip code	Chicago, IL 60608		Seattle, WA 98104
Office telephone no.	773-722-9200 X 501		
Cellphone no.			253-797-6323
Fax no.			
Email address	mike@cantera-group.com		grant.hainsworth@creteconsulting.com
Primary person to be contacted about this application if not listed above (name, address, telephone, email)	Tyrone Clager - tyrone.clager@clearwaterservices.com - 425-754-4016		
NOTE: Use attachments, if necessary, to provide the following information.			
Detailed description of project construction	This property is currently covered under Major Discharge Authorization No. 4427-01. The industrial wastewater generating activities outlined under that Authorization have ceased and the property owners are seeking to redevelop the site. This application is seeking coverage for remediation and site prep activities that are necessary before property redevelopment can proceed. Scheduled activities include building demolition and remediation, including soil excavations, in situ soil solidification/stabilization, and surface stabilization. Note that building demolition activities will only remove structures to grade level, and pavement/footings will be left in place until remediation begins in June; therefore, demolition will not disturb the subsurface.		
Start date of dewatering	April 1, 2021	End date of dewatering	March 31, 2026
Site size	10.42 acres		
Environmental permits issued for the site that are relevant to this project (for example: NPDES, Ecology Notice of Intent)	King County IWP DA No. 4427-01; Ecology PPCD No. 20-2-15215-3 SEA, Facility Site ID#75486194		

## Detailed Project Information

Follow these instructions to complete the table below:

- **Process or activity generating wastewater.** Enter a brief process number and name for each process and activity (for example: 1. well dewatering, 2. wheel wash, 3. equipment cleaning, 4. concrete curing, 5. jet grouting, 6. contaminated stormwater runoff).
- **Substances and/or pollutants in wastewater.** List all substances in the wastewater (such as sediment/solids, caustic and/or acidic, oil and grease, other contaminants if groundwater or soil is contaminated).
- **Type of pretreatment.** For each waste stream, identify the type of wastewater pretreatment you will provide (such as filtration, chemical precipitation, settling, pH neutralization, electrocoagulation, chitosan). King County policy requires that at a minimum, an appropriately sized settling tank (weir tank preferred) must be installed to provide gravity separation.
- **Frequency of discharge.** Indicate the frequency of discharge. Enter "continuous" if you will discharge continuously to the sewer as the wastewater is generated or "batch" if you will store wastewater and discharge it to the sewer in batches.
- **Discharge point.** Enter the manhole or side sewer location approved by the local city or sewer agency for temporary connection to the sewer.
- **Daily quantity discharged.** Calculate the projected daily maximum discharge volume for each process or activity and then the total for all processes and activities.

Process or Activity Number	Process or Activity that Generates Wastewater	Substances and/or Pollutants in Wastewater	Type of Pretreatment	Frequency of Discharge (continuous or batch)	Discharge Point if known (manhole, side sewer location)	Maximum Daily Quantity Discharged (gallons)
1	Remedial excavation dewatering	petroleum hydrocarbons	filtration/adsorption	continuous	TBD	7,500
2	In situ solidification	elevated pH	neutralization	continuous	TBD	<b>1,000</b>
3	construction/demolition activities	sediment	sedimentation / infiltration	on site infiltration	TBD	15,437
<b>Total maximum daily discharge volume</b>						23,937

### Water Quantity Balance Calculations

For each process or activity listed in the table above, thoroughly document the information, methods, and assumptions used to calculate your site's water quantity balance. Use a storm event of 2 inches per 24 hours to calculate the maximum daily stormwater runoff volume. Add attachments if you need more space.

Surface Discharge: Runoff Calculations assume a 2-inch storm event. Calculations based on the Western Washington Hydrology Model outlined in the SWMM Vol. 3. Runoff Curve Number assumed to be 80 based on existing surface characteristics. Runoff basin of 5.67 acres only assumes Bulk Terminal & ASKO portions of the site and excludes waterfront portion.

$$Q_d = (P - 0.2S)^2 / P + 0.8S$$

$$P = 2$$

$$S = (1000/CN) - 10 \Rightarrow (1000/80) - 10 = 2.5$$

$$\text{Runoff Depth } Q_d = (2 - 0.2(2.5))^2 / (2 + 0.8(2.5)) = 0.75 \text{ inches}$$

Total volume of runoff is found by multiplying  $Q_d$  by the area.



**Industrial Waste Program  
Individual Authorization Application for Construction Dewatering**

---

Total Volume = 3630 (cu.ft/ac.in) X 0.75 in X 5.67 ac => 15,437 gallons

Excavation Dewatering: Engineer's estimate is 7,500 gpd max

ISS process: Incidental, less than 1000 gpd max

Total Estimated gpd max of 23,937



## Detailed Project Information (continued)

If your project will discharge greater than 25,000 gpd during November through April, explain in detail why discharge to surface water is not feasible.

Discharge of greater than 25,000 gpd during November through April is not anticipated. The southern portion of the site has no access to a surface water outfall and discharge to the sanitary sewer is the only option.

Is there known groundwater or soil contamination on site?

Yes

If yes, provide a summary of the contamination, site history, and sources of contamination. Submit Exhibit D (see page 8).  
See Exhibit D

Does this site have a Temporary Erosion and Sediment Control (TESC) Plan that outlines best management practices (BMPs)?

Yes If yes, the plan must be available onsite for reference throughout the project.

No If no, please explain:

Contact the local sewer agency (city or sewer district) to receive instructions on discharge conditions. ([www.kingcounty.gov/environment/wtd/About/SewerAgencies.aspx](http://www.kingcounty.gov/environment/wtd/About/SewerAgencies.aspx)) and complete the following:

Name and telephone number of the local city or sewer district personnel you contacted.

Julie Howell - [julie.howell@seattle.gov](mailto:julie.howell@seattle.gov)

Maximum discharge rate (gpm) specified by the local city or sewer district contact.

TBD

Sewer account number or billing method that the local city or sewer district will use to assess sewer fees.

## Exhibits

### Exhibits A and B are required for all applications.

- A. Site Plan.** Attach a site plan that shows the location of activities or processes generating wastewater, settling ponds/tanks or other wastewater treatment system components, wastewater conveyance lines, temporary points of discharge (approved by the local city or sewer district), groundwater and/or sediment sampling locations, streets, and public sewer and storm drainage facilities.
- B. Wastewater Treatment System.** Attach a description of the proposed wastewater treatment system, including the following:
- Diagrams, specification sheets, and basic design data for system components (for example, pumps, tanks, mixers).
  - Schematic flow diagram of the treatment process that shows system piping, tanks, and control features.
  - Maximum flow rate for the system.

NOTE: KCIW may require an engineering justification and/or other evidence demonstrating that discharge from the site will meet applicable permit effluent limitations.

*Minimum Standards for Rectangular Sedimentation Tank Design* is available here:

[http://www.kingcounty.gov/environment/wastewater/IndustrialWaste/GettingDischargeApproval/Construction/Sedimentation\\_tank\\_s.aspx](http://www.kingcounty.gov/environment/wastewater/IndustrialWaste/GettingDischargeApproval/Construction/Sedimentation_tank_s.aspx).

### Exhibit C is required for approval of projects that will discharge longer than six months:

- C. Dewatering Schedule.** Attach a wastewater discharge schedule indicating when each activity or process is expected to generate wastewater for the duration of the project. For each process and discharge period, specify the projected maximum daily discharge volume. (See example below.)

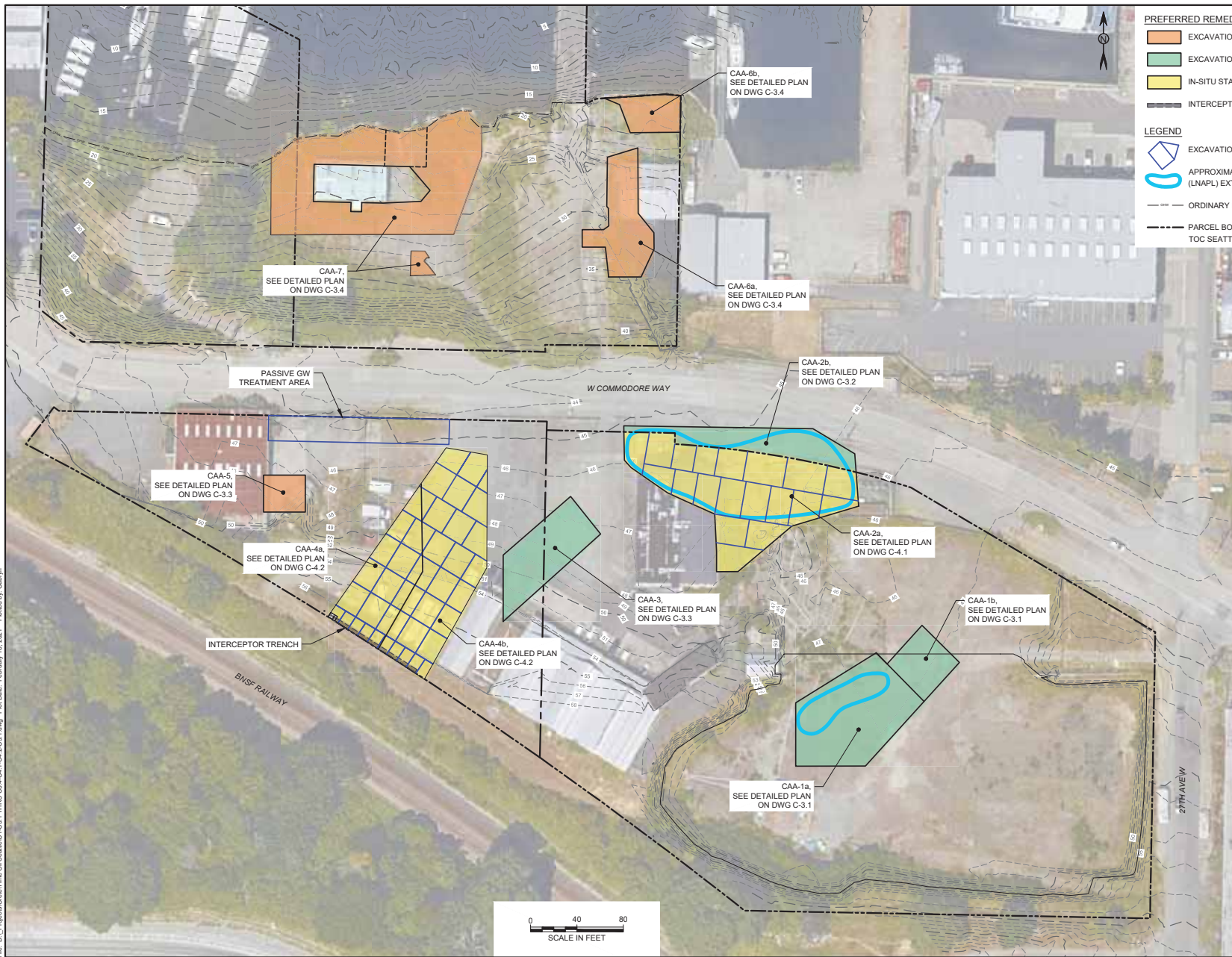
NOTE: The chart below is included as an example only. You may create a similar table or use a different format, provided it includes the requested information.

Project Name:	E X A M P L E														O N L Y		
	Start Date					Project Timeline										End Date	
	week 1	week 2	week 3	week 4	week 5	week 6	week 7	week 8	week 9	week 10	week 11	week 12	week 13	week 14	week 15		
Process 1 - drill slurry decant						max 1,000 gpd											
Process 2 - wheel wash	max 500 gpd																
Process 3 - Excavation dewatering						max 8,500 gpd								max 25,000 gpd			
Process 4 - Contaminated Stormwater						max 45,000 gpd											

### Exhibit D is required for sites with known groundwater or sediment contamination:

- D. Description of contamination sources and chemical characteristics.** Attach a summary (preferably in table format) of all available groundwater and/or sediment quality data. Indicate groundwater and/or sediment sample locations on the site plan (Exhibit A).

File: D:\\_Projects\Crete\Time Oil Spill\DWG\C-1 THRU C-4\C-1.CAD, 2/25/17.dwg Plot Date: February 16, 2021 Plotted by: Calynn



**PREFERRED REMEDIAL ALTERNATIVE**

- EXCAVATION TO CLEANUP LEVEL (CUL)
- EXCAVATION TO REMEDIATION LEVEL (REL)
- IN-SITU STABILIZATION / SOLIDIFICATION
- INTERCEPTOR TRENCH

**LEGEND**

- EXCAVATION MIXING GRID CELLS
- APPROXIMATE LIGHT NON-AQUEOUS-PHASE LIQUID (LNAPL) EXTENT
- ORDINARY HIGH WATER
- PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

Rev	Date	Description

Client

**CRETE CONSULTANTS**  
 108 S. Washington Street, Suite 300  
 Seattle, Washington 98104  
 (206) 491-7554  
 www.creteconsulting.com

Scale: As Noted

**SCALE WARNING**  
 Drawing is NOT to scale. If scale bar doesn't measure one inch

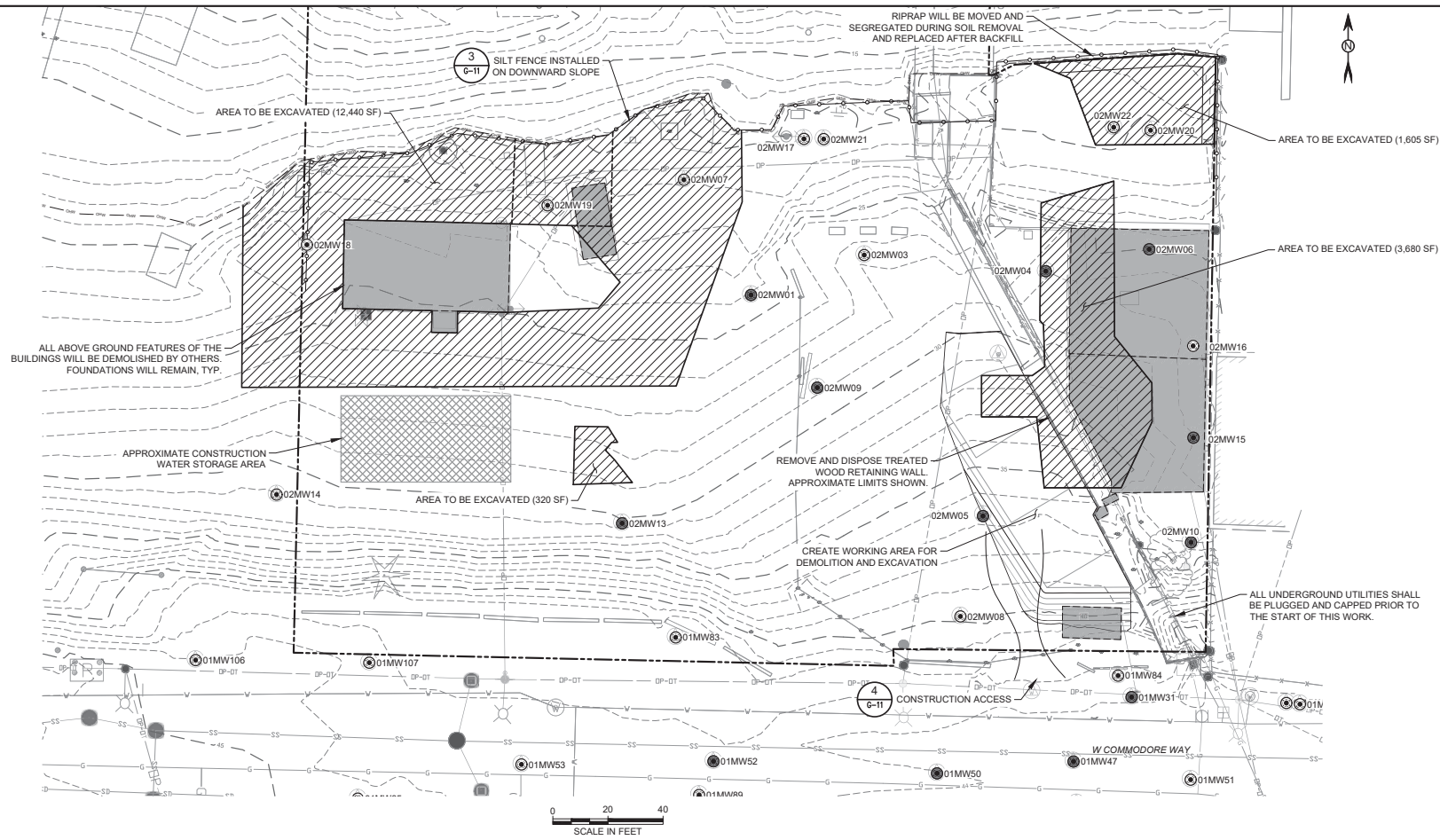
Designer	M. Byers
Drafter	C. Taylor
Checker	X
Reviewer	X

**Time Oil Bulk Terminal  
 Remediation Design  
 Seattle, Washington  
 Remediation Areas**

Drawing No. **C-1**  
 Sheet 13 of 23

**DRAFT**

File: D:\\_Projects\Crete\Time Oil Seattle\CI.C3.1.THRU\CI.LCA.1.CA.2.C5.1.dwg Plot Date: February 16, 2021 P:\NW by Calynn



**LEGEND**

- EXCAVATION / TREATMENT AREA
- ABOVE GROUND FEATURE TO BE DEMOLISHED (UNDER SEPARATE PERMIT)
- CONSTRUCTION WATER STORAGE AREA
- MONITORING WELL TO BE PROTECTED
- MONITORING WELL TO BE DECOMMISSIONED
- TEMPORARY SILT DIKE
- ORDINARY HIGH WATER
- PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

**NOTES**

1. DEMOLITION OF UPLAND STRUCTURES IS PERMITTED UNDER SEPARATE PERMIT AND WILL OCCUR BY OTHERS PRIOR TO THE START OF THIS WORK. DEMOLITION WILL INCLUDE ALL ABOVE GRADE STRUCTURES AND ACTIVE UTILITIES ASSOCIATED WITH THE BUILDINGS. SELECTIVE DEMOLITION WILL BE REQUIRED TO REMOVE ASPHALT AND CONCRETE ABOVE WORK AREAS AND WILL BE COMPLETED BY THE REMEDIATION CONTRACTOR.
2. ALL CONTACT STORMWATER WILL BE COLLECTED DURING SITE CONSTRUCTION AND WILL BE DISCHARGED IN ACCORDANCE WITH PERMITS AND AS APPROVED BY THE ENGINEER.

Rev	Date	Description	By

Client

108 S. Washington Street, Suite 300  
Seattle, Washington 98104  
(206) 491-7554  
www.creteconsultants.com

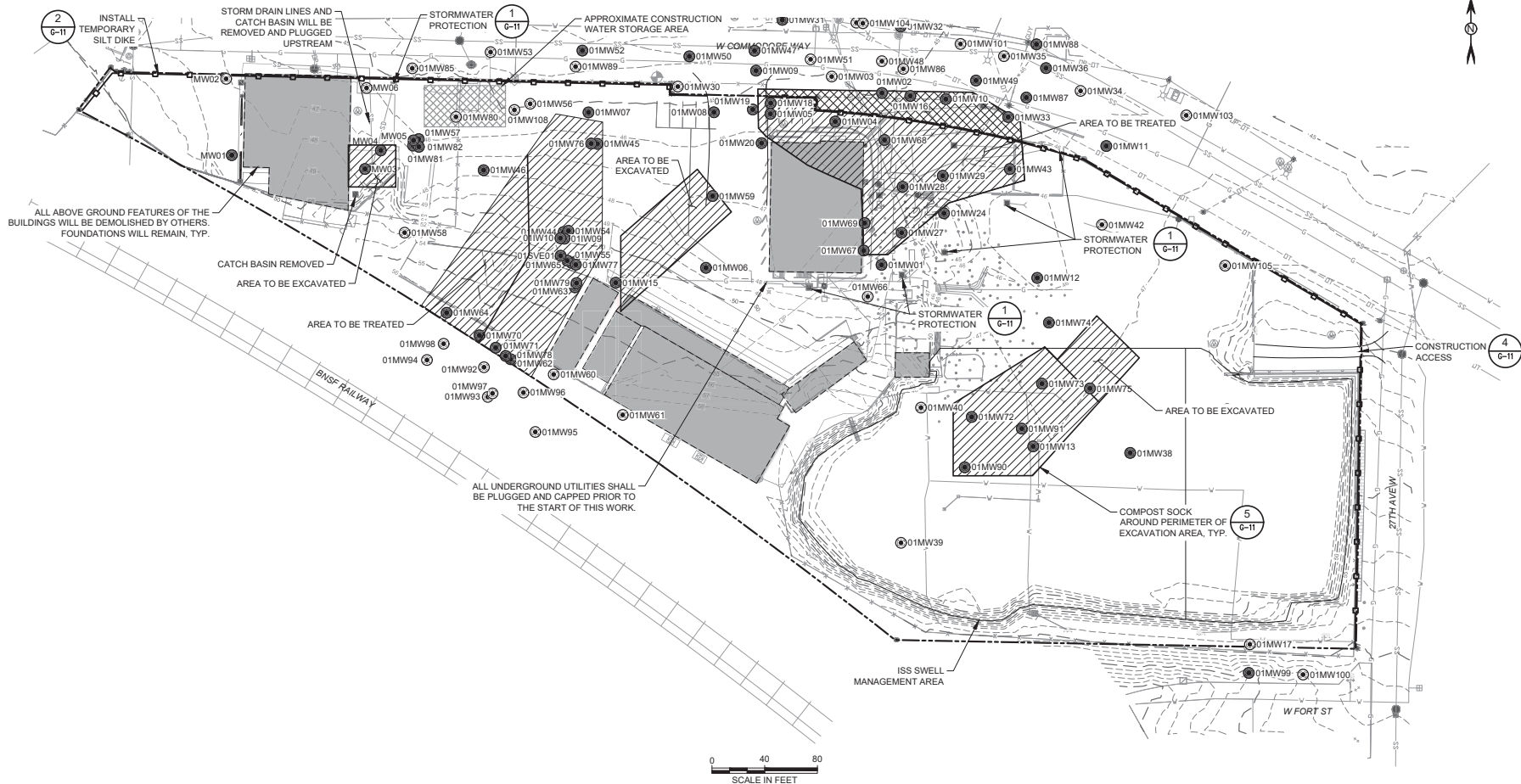
Scale	As Noted
SCALE WARNING Drawing is not to scale. If scale bar doesn't measure one inch	
Designer	M. Byers
Drafter	C. Taylor
Checker	X
Reviewer	X

Time Oil Bulk Terminal Remediation Design Seattle, Washington  
**Demo and TESC Plan**  
(1 of 2)

Drawing No.	<b>G-9</b>
Sheet	10 of 23

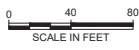
**DRAFT**

File: D:\Projects\Crete\Time Oil Seattle\1.C3.1.THRU\C3.LCA.1.C3.1.dwg Plot Date: February 18, 2021 Plotted by: Calynn



**LEGEND**

	EXCAVATION / TREATMENT AREA
	ABOVE GROUND FEATURE TO BE DEMOLISHED (UNDER SEPARATE PERMIT)
	CONSTRUCTION WATER STORAGE AREA
	MONITORING WELL TO BE PROTECTED
	MONITORING WELL TO BE DECOMMISSIONED
	TEMPORARY SILT DIKE
	PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES



- NOTES**
- DEMOLITION OF UPLAND STRUCTURES IS PERMITTED UNDER SEPARATE PERMIT AND WILL OCCUR BY OTHERS PRIOR TO THE START OF THIS WORK. DEMOLITION WILL INCLUDE ALL ABOVE GRADE STRUCTURES AND ACTIVE UTILITIES ASSOCIATED WITH THE BUILDINGS. SELECTIVE DEMOLITION WILL BE REQUIRED TO REMOVE ASPHALT AND CONCRETE ABOVE WORK AREAS AND WILL BE COMPLETED BY THE REMEDIATION CONTRACTOR.
  - ALL CONTACT STORMWATER WILL BE COLLECTED DURING SITE CONSTRUCTION AND WILL BE DISCHARGED IN ACCORDANCE WITH PERMITS AND AS APPROVED BY THE ENGINEER.

**DRAFT**

Rev	Date	Description	By

Client

**CRETE CONSULTANTS**  
 108 S. Washington Street, Suite 300  
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 (206) 491-7554  
 www.creteconsulting.com

Scale: As Noted

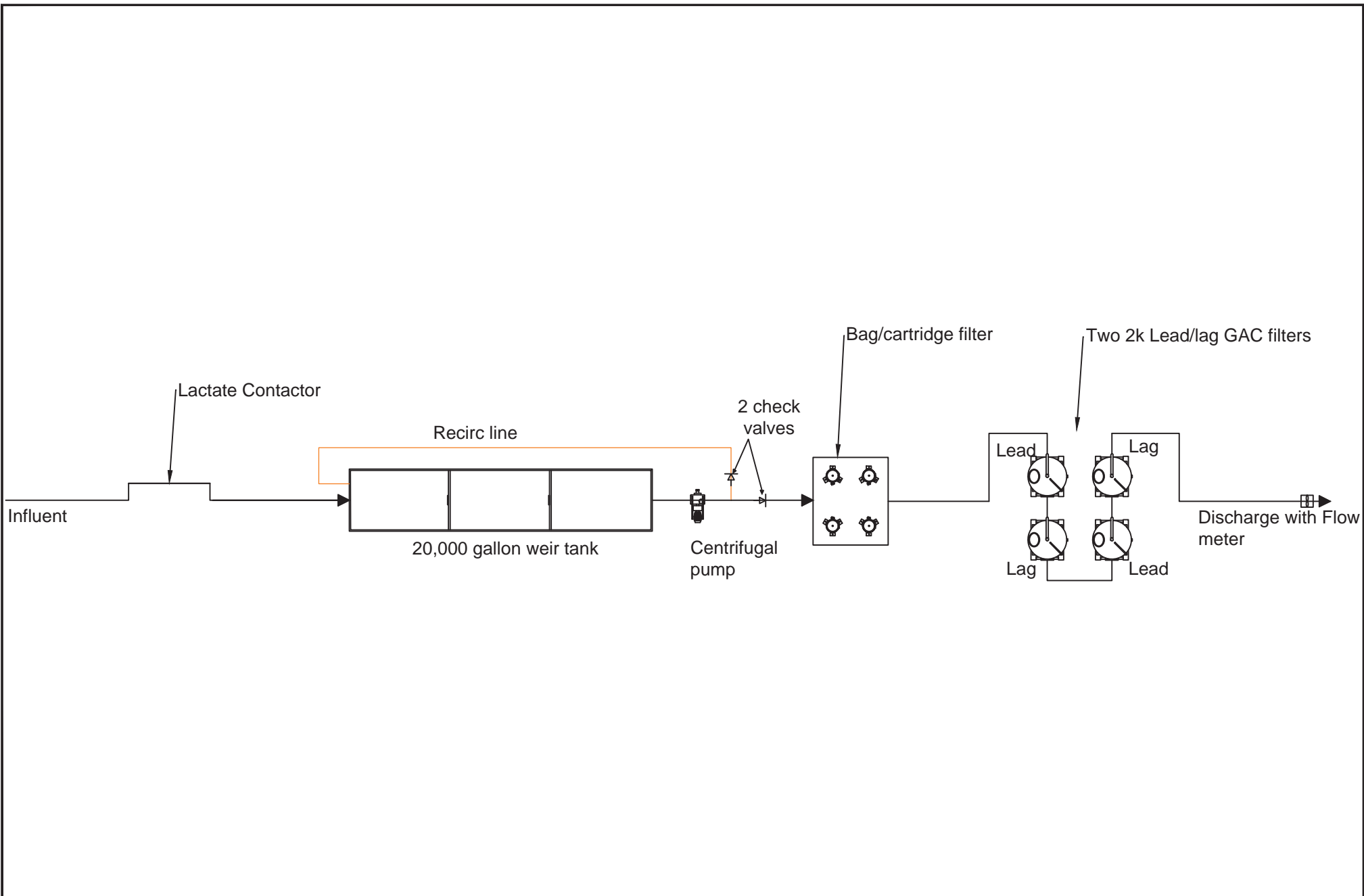
SCALE WARNING  
 Drawing is not to scale. If scale bar doesn't measure one inch

Designer: M. Byers  
 Drafter: C. Taylor  
 Checker: X  
 Reviewer: X

Time Oil Bulk Terminal Remediation Design Seattle, Washington  
**Demo and TESC Plan**  
 (2 of 2)

Drawing No. **G-10**

Sheet 11 of 23



THESE FABRICATION DESIGNS ARE PROPRIETARY AND CONFIDENTIAL. NO PART OF THESE DESIGNS MAY BE DISCLOSED IN ANY MANNER TO A THIRD PARTY WITHOUT PRIOR WRITTEN CONSENT OF CLEAR WATER SERVICES, LLC.

TOC SEATTLE TERMINAL 1  
 PROJECT NO: 20PIO1  
 100GPM - REMEDIATION DEWATERING  
 PROCESS FLOW DIAGRAM

DATE: 2/25/2021    DESIGNER: CWS    FILE NAME: 20PIO1 - TOC Seattle Terminal 1

SHEET  
**1**  
 1 OF 1



Easy-to-clean, smooth-wall interior



## 18,000 Gallon Open-Top Weir Tank

Capacity: 18,060 gal (430 bbl)  
Height: 13'  
Width: 8'  
Length: 43' 6"  
Tare Weight: 30,000 lbs

*All sizes are approximate*

At Adler Tank Rentals, we are committed to providing safe and reliable containment solutions for all types of applications where performance matters.

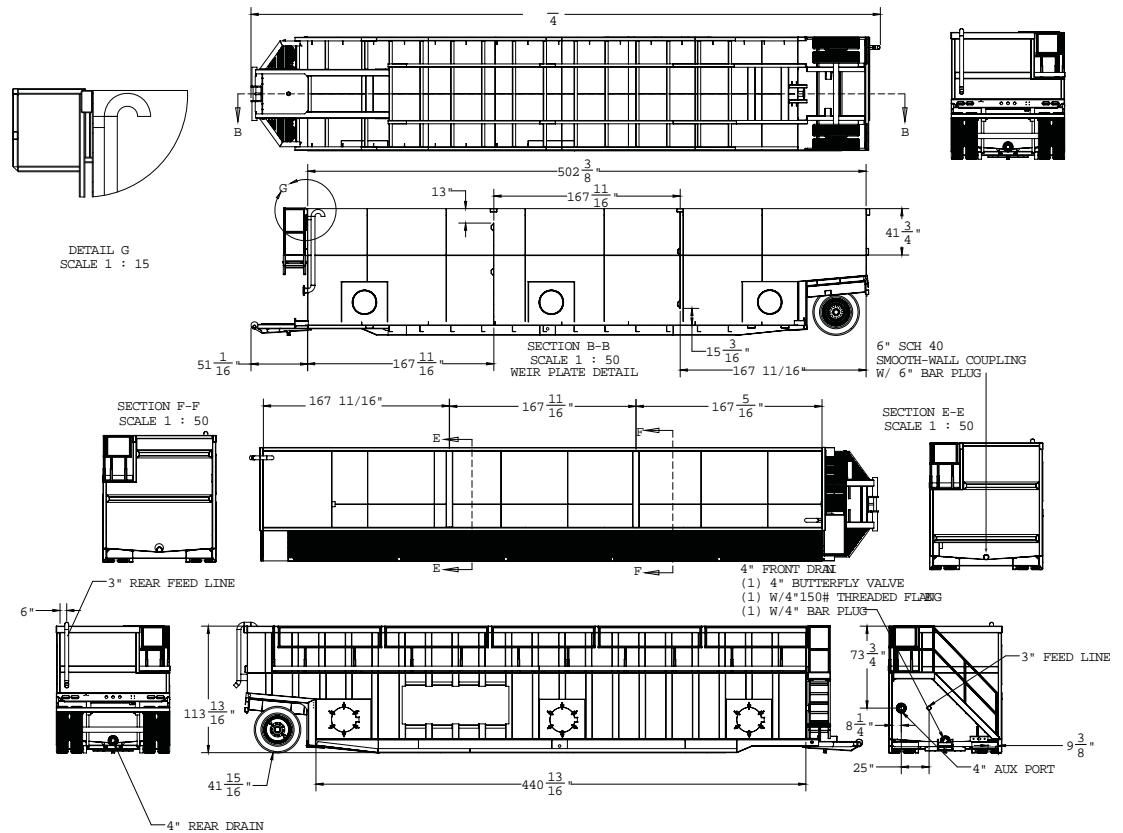
Designed with internal weirs to promote faster separation of oils and particulate contaminants from stored groundwater, the 18,000 Gallon Open-Top Weir Tank can efficiently accommodate flows of up to 100 GPM or more in either pump-through or batch-treatment capacities.



### Mechanical Features

- 3" fill line
- Three (3) standard 22" side-hinged manways
- Multiple 4" valved fill/drain ports, including floor-level valves for low point drain out
- Sloped and V bottom for quicker drain out and easier cleaning
- Easy-to-clean design with smooth-wall interior, no corrugations and no internal rods
- Front-mounted ladderwell for top access
- Fixed rear axle for increased maneuverability
- Nose rail cut-out for easy access when installing hose and fittings on the front/bottom of tank
- Internal baffles, or weirs (over and under), to accelerate settling of unwanted solids and fine sediments; may also be used in the separation of unwanted floating materials
- Can be used in a pump-through or batch-treatment capacity
- Flows of up to 100 GPM achievable depending on circumstances; may also be modified to achieve higher flows while maintaining efficiency
- One (1) front and one (1) rear 4" valved fill/drain port

# 18,000 Gallon Open-Top Weir Tank



## Safety Features

- Non-slip step materials on ladderwells and catwalks
- "Safety yellow" rails and catwalks for high visibility
- Safe operation reminder decals
- Built-in stair and walkway

## Options

- Weirs
- Audible alarms, strobes and level gauges (digital and mechanical)
- Interior-bare steel or lined

## Comprehensive Service

Adler Tank Rentals provides containment solutions for hazardous and non-hazardous liquids and solids. We offer 24-hour emergency service, expert planning assistance, transportation, repair and cleaning services. All of our rental equipment is serviced by experienced Adler technicians and tested to exceed even the most stringent industry standards.





# Standard Centrifugal SC32C75



## PERFORMANCE

### End Suction Standard Centrifugal Pump

Bare shaft, frame mounted, heavy duty pump

Size	3" x 2" 76 x 50 mm
Flow, Max	240 USgpm 60 m <sup>3</sup> /hr 20 l/s
Head, Max	250 feet 80 meters
Flow at BEP	190 USgpm 40 m <sup>3</sup> /hr 10 l/s
Efficiency at BEP	67%
PE <sub>1</sub> Number	Close Coupled, 1.00
Solids Handling, Max	0.5" 13 mm
Operating Speed, Max	3550 rpm
Suction Connection	3" (76 mm) 150 ANSI Flanges
Delivery Connection	2" (50 mm) 150 ANSI Flanges
Bearing Lubrication	Oil STD Grease optional
Fasteners	Imperial

### High Flow, Heavy Duty Pump

The SC32C75 is a high flow, ruggedized pump designed to run over a broad range of performance and deliver outstanding suction lift. The rugged construction and modular design provide proven reliability and flexibility in the most demanding applications.

## OPTIONAL PRIMING SYSTEM

Priming System	Mechanically driven diaphragm-style vacuum pump
Air Removal Capability	50 CFM
Priming Chamber	Single chamber with positive sealing air separation PosiValve™ with stainless steel float ball & linkage
Discharge Check Valve	Swing style; ductile iron with nitrile disc

## SPECIFICATIONS

Mechanical Seal	Single seal w/ tungsten carbide vs. silicon carbide seal faces, Viton® elastomers, 300 series stainless steel hardware and spring (run dry option available)
Pump End Bearing	Single Row Ball
Drive End Bearing	Double Row Angular Contact
Shaft	17-4 PH Stainless Steel

## MATERIALS OF CONSTRUCTION

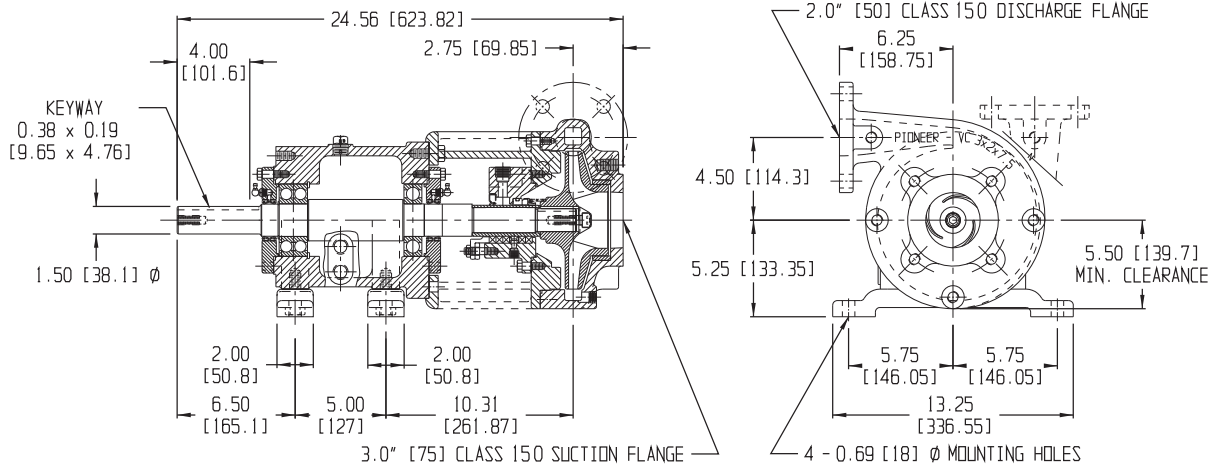
Material	Standard Construction	CD4MCu Duplex Stainless
Impeller	Stainless Steel ASTM A744 CA6NM	ASTM A744 CD4MCu
Volute	Ductile Iron ASTM A536 65-45-12	ASTM A744 CD4MCu
Wear Ring	ASTM A48 Class 40 Gray Iron	ASTM A743 316 Stainless
Suction Cover	Ductile Iron ASTM A536 65-45-12	ASTM A744 CD4MCu
Brac-plate	Ductile Iron ASTM A536 65-45-12	ASTM A744 CD4MCu

## APPLICATIONS

Oil & Gas	Petrochemical
Construction	Rental
Industrial	Agriculture
Mining	Irrigation

PosiValve™ Patent #6,783,730

## MECHANICAL DIMENSIONS



## PERFORMANCE CURVE

Model: SC32C75

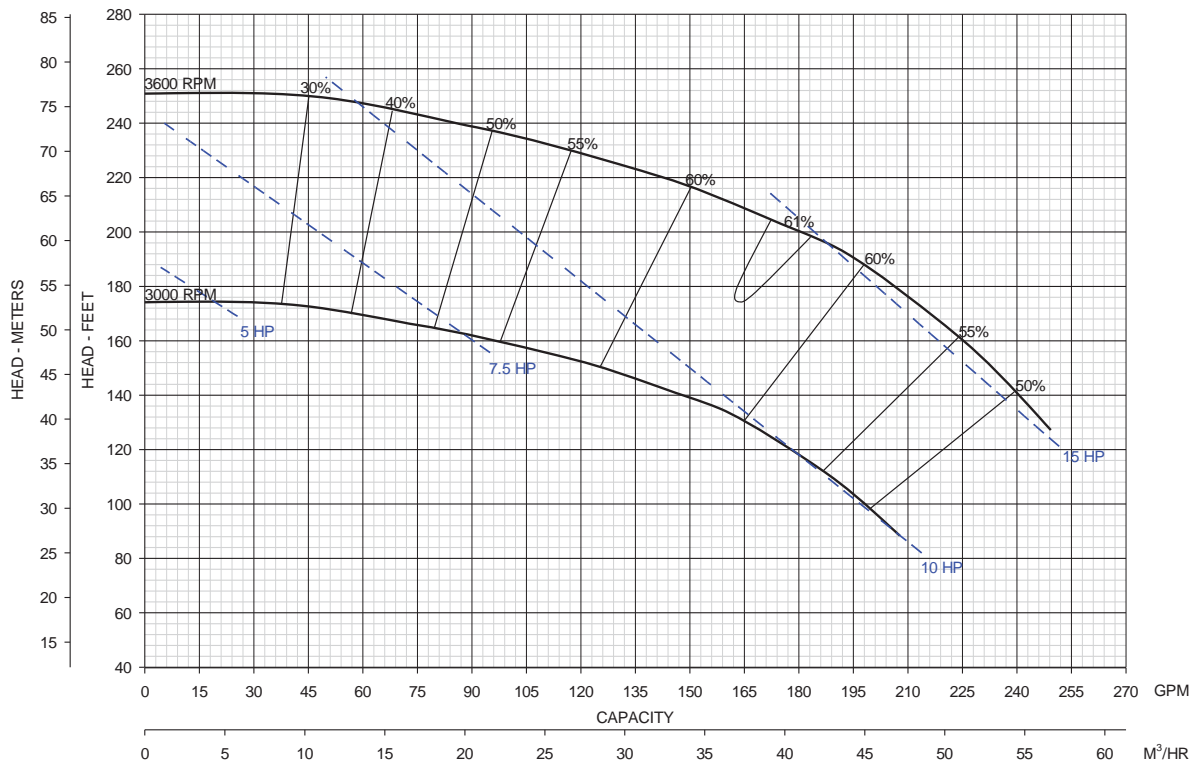
Impeller Dia: 7.5"

Speed: 3550 rpm

Solids Size: 0.5"

Curve #A1614HQ

PE<sub>CL</sub>: 1.00



## DUOLINE™ Multi-Bag Filter Housing System



### *Duplex units for continuous filtration processes*

DUOLINE units with FLOWLINE housings

Eaton's DUOLINE multi-bag filter housing systems are duplex units for continuous filtration processes where the system flow cannot be shut down for filter bag change-outs.

This multi-bag filter housing system consists of two single bag filter housings fitted together at the inlet and outlet by a butterfly valve or ball valve assembly. The dual housing system allows the filtration process to run continuously even during filter bag change-outs. Units come standard with filter bag size 02 stainless steel restrainer baskets.

#### Features

- Can be equipped with the most advanced TOPLINE™ single bag filter housing, the SIDELINE™ single bag filter housing for a greater range of applications or the economical FLOWLINE™ single bag filter housing for coarse particle filtration
- System arrangement assures continuous flow rates. One unit can be taken off-line in sequence for filter bag change-outs without having to take the other filter unit off-line

- Swing bolt cover for quick, easy filter bag change-outs. The TOPLINE single bag filter housing features a domed cover. FLOWLINE and SIDELINE single bag filter housings covers' feature an integrated ergonomic handle
- TOPLINE and SIDELINE models feature extended five year warranties and are designed in accordance with Section VIII, Division 1 of the ASME Code
- Smooth, bead-blasted finish makes it easy to completely clean the interior

#### Options

- Housings and fittings available in stainless steel or carbon steel for high corrosion resistance
- Available without valves, with butterfly valves or with ball valve assemblies
- Buna-N® O-rings for the cover are standard. EPDM, Viton®, PTFE encapsulated Viton or silicone rubber seals and gaskets are available
- Linkage assembly available. A quick turn of the linkage handle diverts the flow from one single bag filter housing to the other, guaranteeing a synchronized changeover

Viton® is a registered trademark of E. I. du Pont de Nemours and company.

# EATON

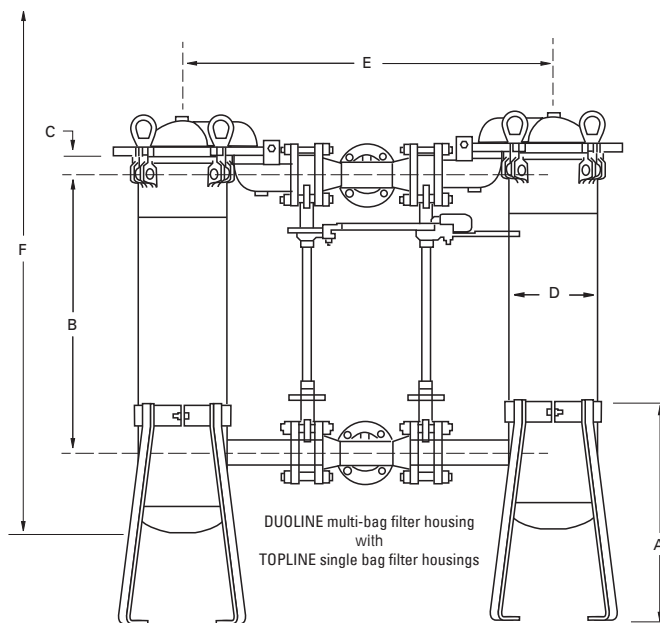
Powering Business Worldwide

# DUOLINE Multi-Bag Filter Housing System

## Applications

- Coarse filtration > 500 µm ✓
- Medium filtration > 10 µm
- Fine filtration < 10 µm

- Pre-filtration ✓
- Safety filtration ✓
- High volume
- Batch filtration
- Circuit filtration ✓
- Continuous filtration ✓
- Solvents, paints
- Fats and oils ✓
- Catalyst, activated carbon
- Acids, bases ✓
- Petrochemicals ✓
- Water, waste water ✓
- Chemical industry ✓
- Pharmaceuticals
- Metal cleaning
- Automotive
- Electronics
- Food and beverage
- Paint and lacquer ✓
- Water treatment ✓
- Galvanic industry



Dimensions - inch (mm)

Models	A	B	C	D	E	F
F3AVTB0222 (TOPLINE)	19.25 (489)	24.50 (622)	1.93 (49)	8.62 (219)	37.50 (952)	64.00 (1625)
F3AVTB0322 (TOPLINE)	19.25 (489)	24.50 (622)	1.93 (49)	8.62 (219)	37.50 (952)	64.00 (1625)
F3AVSB00222 (SIDELINE)	19.25 (489)	27.50 (698)	3.15 (80)	8.62 (219)	30.62 (777)	70.00 (1778)
F3AVSB00322 (SIDELINE)	19.25 (489)	27.50 (698)	3.15 (80)	8.62 (219)	33.12 (841)	70.00 (1778)
F3AVFB00422 (FLOWLINE)	19.25 (489)	28.44 (722)	3.34 (85)	7.68 (195)	26.75 (679)	69.00 (1752)
F3AVFB00442 (FLOWLINE)	19.25 (489)	28.44 (722)	3.34 (85)	7.68 (195)	26.75 (679)	69.00 (1752)
F3AVFB00443 (FLOWLINE)	19.25 (489)	28.44 (722)	3.44 (87)	7.68 (195)	31.75 (806)	69.00 (1752)
F3AVFB01073 (FLOWLINE)	19.25 (489)	28.44 (722)	3.44 (87)	7.68 (195)	31.75 (806)	69.00 (1752)

Dimensions for reference only and approximate. Exact dimensions for installation purposes available on request.

## Technical data

Models	No. of filter bags	Size	Flow rate <sup>1</sup> GPM (m <sup>3</sup> /h)	Max. pressure psi (bar)	Max. temp. °F (°C)	Housing volume gal (l)	Housing weight lb (kg)	I/O connections
F3AVTB0222 (TOPLINE)	2	2	115 (26)	150 (10)	250 (160)	16 (60.5)	240 (109)	2"
F3AVTB0322 (TOPLINE)	2	2	115 (26)	150 (10)	250 (160)	16 (60.5)	240 (109)	2"
F3AVSB00222 (SIDELINE)	2	2	115 (26)	150 (10)	250 (160)	16 (60.5)	300 (134)	2"
F3AVSB00322 (SIDELINE)	2	2	176 (40)	150 (10)	250 (160)	17 (64.35)	330 (149.7)	3"
F3AVFB00422 (FLOWLINE)	2	2	115 (26)	150 (10)	250 (160)	15 (56.78)	200 (90.7)	2"
F3AVFB00442 (FLOWLINE)	2	2	115 (26)	150 (10)	250 (160)	15 (56.78)	200 (90.7)	2"
F3AVFB00443 (FLOWLINE)	2	2	176 (40)	150 (10)	250 (160)	15 (56.78)	200 (90.7)	3"
F3AVFB01073 (FLOWLINE)	2	2	176 (40)	150 (10)	250 (160)	15 (56.78)	200 (90.7)	3"

<sup>1</sup> Maximum theoretical flow based on water viscosity, filter bag specific.

**North America**  
44 Apple Street  
Tinton Falls, NJ 07724  
Toll Free: 800 656-3344  
(North America only)  
Tel: +1 732 212-4700

**Europe/Africa/Middle East**  
Auf der Heide 2  
53947 Nettersheim, Germany  
Tel: +49 2486 809-0

**Internormen Product Line**  
Friedensstraße 41  
68804 Altluisheim, Germany  
Tel: +49 6205 2094-0

**Begerow Product Line**  
An den Nahewiesen 24  
55450 Langenlonsheim, Germany  
Tel: +49 6704 204-0

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Changning District, 200335  
Shanghai, P.R. China  
Tel: +86 21 5200-0099

**Singapore**  
4 Loyang Lane #04-01/02  
Singapore 508914  
Tel: +65 6825-1668

**Brazil**  
Av. Julia Gaioli, 474 – Bonsucesso  
07251-500 – Guarulhos, Brazil  
Tel: +55 11 2465-8822

For more information, please  
email us at [filtration@eaton.com](mailto:filtration@eaton.com)  
or visit [www.eaton.com/filtration](http://www.eaton.com/filtration)

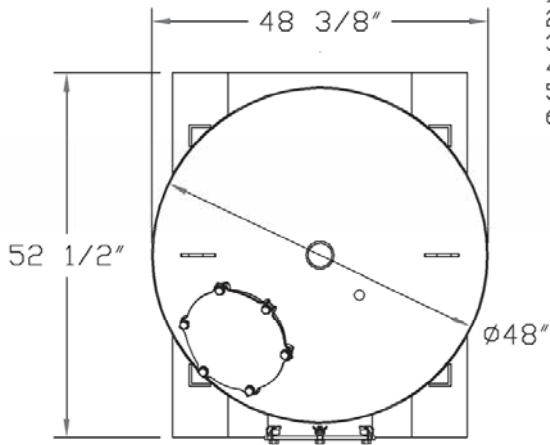
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EF-FBH-17  
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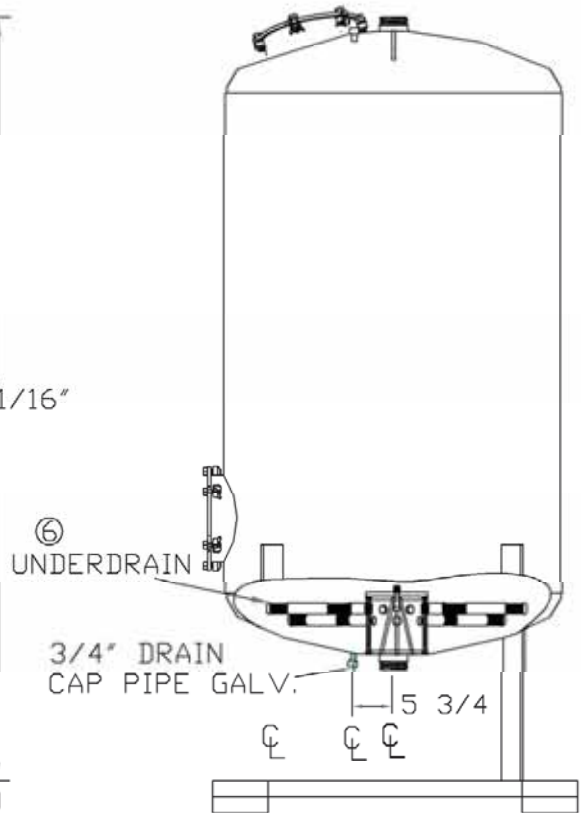
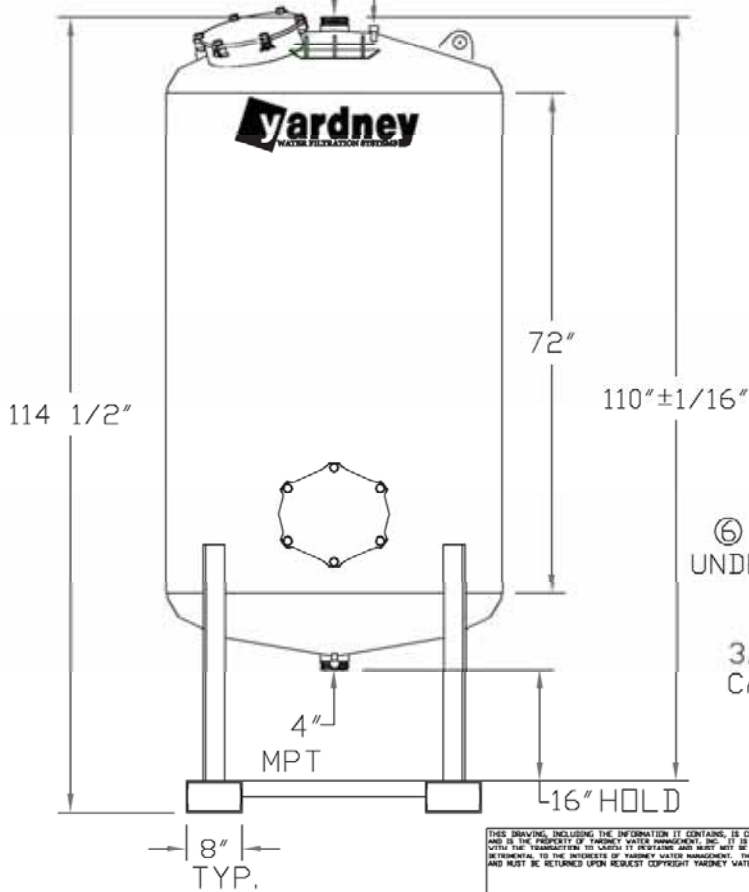
# 4872 TANK w/LIFTING LUGS

NOTES: (UNLESS OTHERWISE STATED)

1. REMOVE ALL BURRS & SHARP EDGES.
2. SEAM WELD ALL JOINTS, OUTSIDE ONLY.
3. GROOVES TO BE STANDARD VICTAULIC TYPE.
4. UNIT MUST BE WATER TIGHT.
5. FUSE COAT ALL INTERIOR SURFACES.
6. UNDERDRAIN ASSY 48" CB TRIPOD PVC HUB CROSSFLOW.



4" MPT  
3/4" FPT CAP PIPE GALV.



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DO NOT SCALE DWG.



APPROVALS				DATE	<b>4872 TANK SKID MOUNTED</b> SIZE D DRAWING NO 9750000707 REV. A SCALE NONE MUST CLEAR WATER COMPLIANCE
DRAWN BY				6/2/14	
CHECKED BY					
APPROVED BY					
A REPLACED TOP & BOT SPUDS & ADDED 3/4" DRAIN		BY	DATE	APP	
REVISIONS		BY	DATE	APP	

### DESCRIPTION

The Badger Meter ModMAG® M2000 is the result of years of research and field use of electromagnetic flow meter technology. Based on Faraday's law of induction, these meters can measure water, wastewater, water-based fluids and other liquids that meet minimum electrical conductivity.

Designed, developed and manufactured under strict quality standards, this meter features sophisticated, processor-based signal conversion with accuracies of  $\pm 0.20\%$  of rate  $\pm 1$  mm/s. The wide selection of liner and electrode materials helps provide maximum compatibility and minimum maintenance over a long operating period.

The meter is best suited for bidirectional flow measurement of fluids with a conductivity  $> 5 \mu\text{S/cm}$  ( $> 20 \mu\text{S/cm}$  for demineralized water). The meter has high accuracy, is easy to use, and can be chosen for a wide variety of applications. The backlit, four-line display shows all actual flow measuring data, daily and complete information, including alarm messages. The standard transmitter has 4 programmable digital outputs, one digital input, power output and different interfaces. Integrated system self checkup makes putting into operation and service easier. For service purpose, the meter configuration can be kept or transferred to another metre without a new parametering via the optional back-up parameter function.

### APPLICATION

The M2000 transmitter can be integrally mounted to the sensor or can be remote-mounted, if necessary and has many advantages over other conventional technologies. The meter targets a variety of applications and is well suited for the diverse water and wastewater treatment industry. The M2000 meter can accurately measure fluid flow—whether the fluid is water or a highly corrosive liquid, very viscous, contains a moderate amount of solids, or requires special handling. Today, electromagnetic meters are successfully used in industries including building automation, oil and gas, food and beverage, pharmaceutical, water and wastewater, and chemical.



### FEATURES

- Available in sizes 0.25...78 in. (6...2000 mm)
- Accuracy of  $\pm 0.2\%$  of rate  $\pm 1$  mm/s
- Flow Range 0.03...12 m/s
- Pulsed DC magnetic field for zero point stability
- Integral and remote signal converter availability
- Power Supply of 85...265V AC / 9...36V DC
- Corrosion resistant liners for long life
- Measurement largely independent of flow profile
- User friendly programming procedure
- Empty pipe detection
- Power loss totalization
- Digital signal processor (32-bit)
- Non-volatile programming memory
- LCD display
- Rotating cover
- IP67 Housing
- Calibrated in state-of-the-art facilities
- ModBus®, HART, Profibus DP, M-Bus
- Integrated data logger
- Verifications device.
- NSF listed
- CSA certified

## ELECTRODES

When looking from the end of the meter into the inside bore, the two measuring electrodes are positioned at three o'clock and nine o'clock. M2000 electromagnetic meters have an "empty pipe detection" feature. This is accomplished with a third electrode positioned in the meter at twelve o'clock.

If this electrode is not covered by fluid for a minimum five-second duration, the meter displays an "empty pipe detection" condition, sends out an error message, if desired, and stops measuring to maintain accuracy. When the electrode again becomes covered with fluid, the error message disappears and the meter resumes measuring.

As an option to using grounding rings, a grounding electrode (fourth electrode) can be built into the meter during manufacturing to assure proper grounding. The position of this electrode is at six o'clock.

## OPERATION

The flow meter is a stainless steel tube lined with a non-conductive material. Outside the tube, two DC powered electromagnetic coils are positioned opposing each other. Perpendicular to these coils, two electrodes are inserted into the flow tube. Energized coils create a magnetic field across the whole diameter of the pipe.

As a conductive fluid flows through the magnetic field, a voltage is induced across the electrodes. This voltage is proportional to the average flow velocity of the fluid and is measured by the two electrodes. The M2000 transmitter receives the sensor's analog signal, amplifies that signal and converts it into digital information. At the processor level, the signal is analyzed through a series of sophisticated software algorithms. After separating the signal from electrical noise, it is converted into both analog and digital signals that are used to display rate of flow and totalization.

With no moving parts in the flow stream, there is no pressure lost. Also, accuracy is not affected by temperature, pressure, viscosity or density and there is practically no maintenance required.

## SPECIFICATIONS

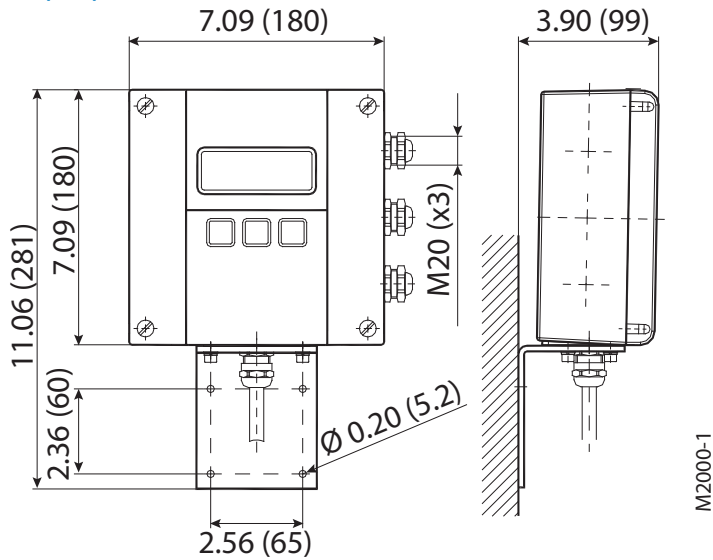
**NOTE:** DN represents nominal diameter in mm.

### Transmitter Specifications

<b>Flow Range</b>	0.10...39.4 ft/s (0.03...12 m/s)
<b>Accuracy</b>	± 0.20% of rate ± 1 mm/s
<b>Repeatability</b>	± 0.1%
<b>Power Supply</b>	<b>AC Power Supply:</b> 85...265V AC; Typical Power: 20W A or 15W; Maximum Power: 26V A or 20W <b>Optional DC Power Supply:</b> 10...36V DC; Typical Power: 10W; Maximum Power: 14W
<b>Analog Output</b>	4...20 mA, 0...20 mA, 0...10 mA, 2...10 mA (programmable and scalable) Voltage sourced 24V DC isolated. Maximum loop resistance < 800 ohms.
<b>Digital Output</b>	Four total, configurable 24V DC sourcing active output (up to 2), 100 mA total, 50 mA each; sinking open collector output (up to four), 30V DC max, 100 mA each; AC solid-state relay (up to 2), 48V AC, 500 mA max
<b>Digital Input</b>	Max 30V DC (programmable – positive zero return, external totalizer reset or preset batch start)
<b>Frequency Output</b>	Scalable up to 10 kHz, open collector up to 1 kHz, solid-state relay
<b>Misc Output</b>	High/low flow alarm (0...100% of flow), error alarm, empty pipe alarm, flow direction, preset batch alarm, 24V DC supply, ADE
<b>Communication</b>	RS232 Modbus RTU; RS485 Modbus RTU, HART, Profibus DP require separate daughterboards
<b>Pulse Width</b>	Scalable up to 10 kHz, passive open collector up to 10 kHz, active switched 24V DC. Up to two outputs (forward and reverse). Pulse width programmable from 1...1000 ms or 50% duty cycle.
<b>Processing</b>	32-bit DSP
<b>Empty Pipe Detection</b>	Field tunable for optimum performance based on specific application
<b>Excitation Frequency</b>	1 Hz, 3.75 Hz, 7.5 Hz or 15 Hz (factory optimized to pipe diameter)
<b>Noise Dampening</b>	Programmable 0...30 seconds
<b>Low Flow Cut-Off</b>	Programmable 0...10% of maximum flow
<b>Galvanic Separation</b>	250V
<b>Fluid Conductivity</b>	Minimum 5.0 µS/cm (minimum 20 µS/cm for demineralized water)
<b>Fluid Temperature</b>	<b>With Remote Transmitter:</b> PFA, PTFE & Halar 302° F (150° C) <b>With Meter-Mounted Transmitter:</b> Rubber 178° F, (80° C), PFA, PTFE & Halar 212° F (100° C)
<b>Ambient Temperature</b>	-4...140° F (-20...60° C)
<b>Relative Humidity</b>	Up to 90 percent non-condensing
<b>Flow Direction</b>	Unidirectional or bidirectional two separate totalizers (programmable)
<b>Totalization</b>	Programmable/resettable
<b>Units of Measure</b>	Ounce, pound, liter, US gallon, imperial gallon, barrel, hectoliter, mega gallon, cubic meter, cubic feet, acre feet
<b>Display</b>	4 x 20 character display with backlight
<b>Programming</b>	Three-button, external manual or remote

<b>Transmitter Housing</b>	Cast aluminum, powder-coated paint		
<b>Mounting</b>	Meter mount or remote wall mount (bracket supplied)		
<b>Locations</b>	Indoor and outdoor		
<b>Meter Enclosure Classification</b>	<b>Standard:</b> NEMA 4X (IP67); <b>Optional:</b> Submersible NEMA 6P ((IP68) depth of 2 m for 72 hr), remote transmitter required		
<b>Junction Box Enclosure Protection</b>	For remote transmitter option: powder-coated die-cast aluminum, NEMA 4 (IP67)		
<b>Cable Entries</b>	M20 cable glands (3)		
<b>Optional Stainless Steel Grounding Rings</b>	<b>Meter Size</b>	<b>Thickness of one ring</b>	<b>Thickness of one ring (DIN Flanges)</b>
	Up through 10 in.	0.135 in. (3.429 mm)	0.12 in. (3 mm)
	12...78 in.	0.187 in. (4.750 mm)	0.12 in. (3 mm)
<b>NSF Listed</b>	Models with hard rubber liner, 4 in. size and larger; PTFE liner, all sizes		
<b>Token Features</b>	Data Logging (Blue token); Store/Restore (Red token); Firmware Upgrade (Black token)		

**M2000 Transmitter Dimensions**  
in. (mm)





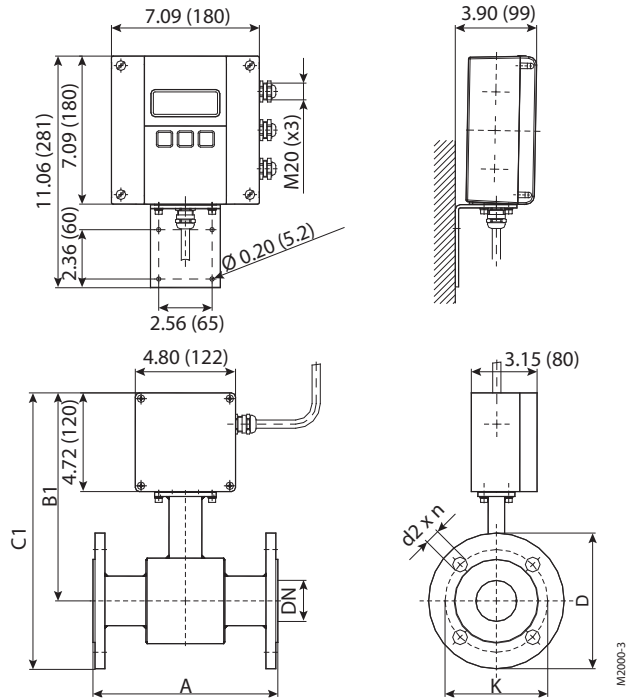
## Sensor Type II Specifications

The electromagnetic sensor type II is not only available in a number of different flange process connections (DIN, ANSI, JIS, AWWA, etc.) but also in a number of liners like hard rubber, PTFE, PFA, or Halar. The sensor is configurable with up to 4 electrodes for measuring, empty pipe and grounding electrodes. Available in sizes from DN 6 TO DN 2000 and nominal pressures up to PN 100, the sensor type II is best suited for a variety of applications in the industry and the water/waste water industry.

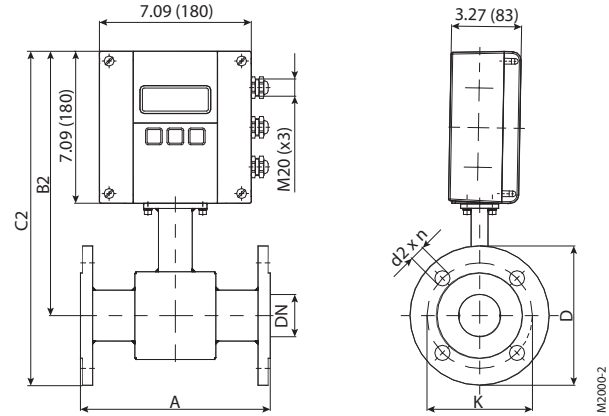
<b>Size</b>	1/4...78 in. (DN 6...2000)	
<b>Flanges</b>	<b>Standard:</b> ANSI B16.5, AWWA, ISO 1092-1, JIS and more in carbon steel; <b>Optional:</b> 304 or 316 stainless steel	
<b>Nominal Pressure</b>	up to 1450 psi (100 bar)	
<b>Pressure Rating</b>	Line sizes 1/4...24 in: In accordance with ASME B16.5 Class 150 or Flange Rating Class 300 Line sizes 26...72 in: AWWA C-207 Class D or Class E Flange Rating	
<b>Protection Class</b>	NEMA 4X (IP67), optional NEMA 6P (IP68)	
<b>Minimum Conductivity</b>	5 µS/cm (20 µS/cm for demineralized water)	
<b>Liner Material</b>	Hard/soft rubber	1...78 in. (DN 25...2000) 32...176° F (0...80° C)
	PTFE	1/2...24 in. (DN 15...600) -40...302° F (-40...150° C)
	Halar (ECTFE)	12 in. (DN 300) and larger -40...302° F (-40...150° C)
	PFA	1/4...3/8 in. (DN 6...10) —
<b>Electrodes Materials</b>	Hastelloy C (standard), Tantal Platinum / Gold plated, Platinum / Rhodium	
<b>Housing</b>	<b>Standard:</b> Carbon steel welded; <b>Optional:</b> 316 or 304 stainless steel	
<b>Electrode Materials</b>	<b>Standard:</b> Hastelloy C22; <b>Optional:</b> 316 stainless steel, gold/platinum plated, tantalum, platinum/rhodium	
<b>Lay Length</b>	1/4...3/4 in. (DN 6...20)	6.7 in. (170 mm)
	1...2 in. (DN 25...50)	8.9 in. (225 mm)
	2-1/2...4 in. (DN 65...100)	11.0 in. (280 mm)
	5...8 in. (DN 125...200)	15.8 in. (400 mm)
	10...14 in. (DN 250...350)	19.7 in. (500 mm)
	16...28 in. (DN 400...700)	23.6 in. (600 mm)
	30...40 in. (DN 750...1000)	31.5 in. (800 mm)
	48...56 in. (DN 1200...1400)	39.4 in. (1000 mm)
	64 in. (DN 1600)	63.0 in. (1600 mm)
	72 in. (DN 1800)	70.9 in. (1800 mm)
78 in. (DN 2000)	78.7 in. (2000 mm)	

### Sensor Type II Dimensions

#### Remote Version in. (mm)



#### Mounted Version in. (mm)



Size		A Std*	A ISO**	B1	B2	C1	C2	with ANSI-flanges			with DIN-flanges		
in.	DN	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	$\varnothing D$ in. (mm)	$\varnothing K$ in. (mm)	$\varnothing d2 \times n$ in. (mm)	$\varnothing D$ in. (mm)	$\varnothing K$ in. (mm)	$\varnothing d2 \times n$ in. (mm)
1/4	6	6.7 (170)	—	8.98 (228)	11.34 (288)	11.4 (288)	14.0 (356)	3.50 (88.9)	2.37 (60.3)	0.63 × 0.16 (15.9 × 4)	3.54 (90)	2.36 (60)	0.55 × 0.16 (14 × 4)
5/16	8	6.7 (170)	—	8.98 (228)	11.34 (288)	11.4 (288)	14.0 (356)	3.50 (88.9)	2.37 (60.3)	0.63 × 0.16 (15.9 × 4)	3.54 (90)	2.36 (60)	0.55 × 0.16 (14 × 4)
3/8	10	6.7 (170)	—	8.98 (228)	11.34 (288)	11.4 (288)	14.0 (356)	3.50 (88.9)	2.37 (60.3)	0.63 × 0.16 (15.9 × 4)	3.54 (90)	2.36 (60)	0.55 × 0.16 (14 × 4)
1/2	15	6.7 (170)	7.87 (200)	9.37 (238)	11.73 (298)	11.4 (288)	14.0 (356)	3.50 (88.9)	2.37 (60.3)	0.63 × 0.16 (15.9 × 4)	3.74 (95)	2.56 (65)	0.55 × 0.16 (14 × 4)
3/4	20	6.7 (170)	7.87 (200)	9.37 (238)	11.73 (298)	11.5 (293)	14.2 (361)	3.87 (98.4)	2.75 (69.8)	0.63 × 0.16 (15.9 × 4)	4.13 (105)	2.95 (75)	0.55 × 0.16 (14 × 4)
1	25	8.9 (225)	7.87 (200)	9.37 (238)	11.73 (298)	11.7 (298)	14.4 (366)	4.25 (107.9)	3.13 (79.4)	0.63 × 0.16 (15.9 × 4)	4.53 (115)	3.35 (85)	0.55 × 0.16 (14 × 4)
1 1/4	32	8.9 (225)	7.87 (200)	9.96 (253)	12.32 (313)	12.5 (318)	15.2 (386)	4.63 (117.5)	3.50 (88.9)	0.63 × 0.16 (15.9 × 4)	5.51 (140)	3.94 (100)	0.71 × 0.16 (18 × 4)
1 1/2	40	8.9 (225)	7.87 (200)	9.96 (253)	12.32 (313)	12.7 (322)	15.4 (390)	5.00 (127)	3.87 (98.4)	0.63 × 0.16 (15.9 × 4)	5.91 (150)	4.33 (110)	0.71 × 0.16 (18 × 4)
2	50	8.9 (225)	7.87 (200)	9.96 (253)	12.32 (313)	13.2 (335)	15.9 (403)	6.00 (152.4)	4.75 (120.6)	0.75 × 0.16 (19 × 4)	6.50 (165)	4.92 (125)	0.71 × 0.16 (18 × 4)
2 1/2	65	11.0 (280)	7.87 (200)	10.67 (271)	13.05 (331)	14.4 (366)	17.1 (434)	7.00 (177.8)	5.50 (139.7)	0.75 × 0.16 (19 × 4)	7.28 (185)	5.71 (145)	0.71 × 0.16 (18 × 4)
3	80	11.0 (280)	7.87 (200)	10.67 (271)	13.05 (331)	14.7 (372)	17.3 (440)	7.50 (190.5)	6.00 (152.4)	0.75 × 0.16 (19 × 4)	7.87 (200)	6.30 (160)	0.71 × 0.31 (18 × 8)
4	100	11.0 (280)	9.84 (250)	10.94 (278)	13.31 (338)	15.7 (398)	18.4 (466)	9.00 (228.6)	7.50 (190.5)	0.75 × 0.31 (19 × 8)	8.66 (220)	7.09 (180)	0.71 × 0.31 (18 × 8)
5	125	15.8 (400)	9.84 (250)	11.73 (298)	14.09 (358)	16.9 (430)	19.6 (498)	10.00 (254)	8.50 (215.9)	0.85 × 0.31 (22.2 × 8)	9.84 (250)	8.27 (210)	0.71 × 0.31 (18 × 8)
6	150	15.8 (400)	11.81 (300)	12.20 (310)	14.57 (370)	17.9 (456)	20.6 (524)	11.00 (279.4)	9.50 (241.3)	0.85 × 0.31 (22.2 × 8)	11.22 (285)	9.45 (240)	0.87 × 0.31 (22 × 8)
8	200	15.8 (400)	13.78 (350)	13.31 (338)	15.67 (398)	20.4 (518)	22.5 (572)	13.50 (342.9)	11.75 (298.4)	0.85 × 0.31 (22.2 × 8)	13.39 (340)	11.61 (295)	0.87 × 0.47 (22 × 12)
10	250	19.7 (500)	17.72 (450)	14.25 (362)	16.61 (422)	24.1 (613)	26.8 (681)	16.00 (406.4)	14.25 (361.9)	1.00 × 0.47 (25.4 × 12)	15.55 (395)	13.78 (350)	0.87 × 0.47 (22 × 12)

Size		A Std* in. (mm)	A ISO** in. (mm)	B1 in. (mm)	B2 in. (mm)	C1 in. (mm)	C2 in. (mm)	with ANSI-flanges			with DIN-flanges		
in.	DN							Ø D in. (mm)	Ø K in. (mm)	Ø d2xn in. (mm)	Ø D in. (mm)	Ø K in. (mm)	Ø d2xn in. (mm)
12	300	19.7 (500)	19.69 (500)	16.73 (425)	19.09 (485)	26.2 (666)	28.9 (734)	19.00 (482.6)	17.00 (431.8)	1.00 × 0.47 (25.4 × 12)	17.52 (445)	15.75 (400)	0.87 × 0.47 (22 × 12)
14	350	19.7 (500)	21.65 (550)	17.72 (450)	20.08 (510)	28.2 (716)	30.8 (782)	21.00 (533.4)	18.75 (476.2)	1.13 × 0.47 (28.6 × 12)	19.88 (505)	18.11 (460)	0.87 × 0.63 (22 × 16)
16	400	23.6 (600)	23.62 (600)	18.70 (475)	21.06 (535)	31.0 (788)	33.7 (856)	23.50 (596.9)	21.25 (539.7)	1.13 × 0.63 (28.6 × 16)	22.24 (565)	20.28 (515)	1.02 × 0.63 (26 × 16)
18	450	23.6 (600)	—	19.69 (500)	22.05 (560)	32.4 (822)	35.0 (890)	25.00 (635.0)	22.75 (577.8)	1.25 × 0.63 31.7 × 16	24.21 (615)	22.24 (565)	1.02 × 0.79 (26 × 20)
20	500	23.6 (600)	—	20.67 (525)	23.03 (585)	35.5 (901)	38.2 (969)	27.50 (698.5)	25.00 (635.0)	1.25 × 0.79 (31.7 × 20)	26.38 (670)	24.41 (620)	1.02 × 0.79 (26 × 20)
22	550	23.6 (600)	—	21.65 (550)	24.02 (610)	36.9 (937)	39.6 (1005)	29.50 (749.3)	27.25 (692.1)	1.37 × 0.79 (34.9 × 20)	—	—	—
24	600	23.6 (600)	—	23.15 (588)	25.51 (648)	39.5 (1003)	42.2 (1071)	32.00 (812.8)	29.50 (749.3)	1.37 × 0.79 (34.9 × 20)	30.71 (780)	28.54 (725)	1.18 × 0.79 (30 × 20)
26	650	23.6 (600)	—	24.13 (613)	26.50 (673)	—	—	32.25 (869.9)	31.75 (806.4)	1.37 × 0.94 (34.9 × 24)	—	—	—
28	700	23.6 (600)	—	24.61 (625)	26.97 (685)	44.0 (1118)	46.2 (1173)	36.50 (927.1)	34.00 (863.6)	1.38 × 1.10 (35.1 × 28)	35.24 (895)	33.07 (840)	1.18 × 0.94 (30 × 24)
30	750	31.5 (800)	—	25.59 (650)	27.95 (710)	45.7 (1161)	48.3 (1228)	38.75 (984.2)	36.00 (914.4)	1.37 × 1.10 (34.9 × 28)	—	—	—
32	800	31.5 (800)	—	26.89 (683)	29.25 (743)	49.5 (1257)	52.2 (1325)	41.75 (1060.5)	38.50 (977.9)	1.63 × 1.10 (41.3 × 28)	39.96 (1015)	37.40 (950)	1.30 × 0.94 (33 × 24)
34	850	31.5 (800)	—	27.87 (708)	30.24 (768)	—	—	43.75 (1111.2)	40.50 (1028.7)	1.63 × 1.26 (41.3 × 32)	—	—	—
36	900	31.5 (800)	—	28.54 (725)	30.91 (785)	54.1 (1374)	55.3 (1405)	46.00 (1168.4)	42.75 (1085.8)	1.63 × 1.26 (41.3 × 32)	43.90 (1115)	41.34 (1050)	1.30 × 1.10 (33 × 28)
38	950	31.5 (800)	—	29.53 (750)	31.89 (810)	—	—	48.75 (1238.3)	45.25 (1149.4)	1.63 × 1.26 (41.3 × 32)	—	—	—
40	1000	31.5 (800)	—	31.10 (790)	33.46 (850)	57.4 (1457)	60.0 (1525)	53.00 (1346.2)	49.50 (1257.3)	1.63 × 1.42 (41.3 × 36)	48.43 (1230)	45.67 (1160)	1.42 × 1.10 (36 × 28)
42	1050	39.4 (1000)	—	—	—	63.4 (1610)	66.0 (1675)	—	—	—	—	—	—
48	1200	39.4 (1000)	—	35.43 (900)	37.80 (960)	67.2 (1707)	69.9 (1775)	59.51 (1511.5)	56.00 (1422.4)	1.63 × 1.73 (41.3 × 44)	57.28 (1455)	54.33 (1380)	1.54 × 1.26 (39 × 32)
54	1350	39.4 (1000)	—	38.39 (975)	40.75 (1035)	73.0 (1927)	75.4 (1915)	66.25 (1682.8)	62.75 (1593.9)	1.88 × 1.73 (47.8 × 44)	—	—	—
56	1400	39.4 (1000)	—	39.37 (1000)	41.73 (1060)	—	—	—	—	—	65.94 (1675)	62.60 (1590)	1.65 × 1.42 (42 × 36)
Standard													
with ANSI-flanges		1/4...56 in. (DN 6 - 1400)				pressure rate 150 psi (10 bar)							
with DIN flanges		1/4...8 in. (DN 6 – 200)				pressure rate 230 psi (16 bar)							
		10...56 in. (DN 250 – 1400)				pressure rate 150 psi (10 bar)							
* Standard		**ISO 20456											

## IMPORTANT

Flange Sizes ≤ 24 in., Standard: ANSI B16.5 Class 150 RF forged carbon steel; Optional: 300 lb forged carbon steel, 316 or 304 stainless steel

Flange Sizes > 24 in., Standard: AWWA Class D Flanges RF forged carbon steel

## Weight and Flow Range

Size		Estimated Weight with M2000	Flow Range	
in.	DN		lb (kg)	US Metric
1/4	6	8 (3.5)	0.0134...5.4 GPM	0.051...20.4 l/min
5/16	8	8 (3.5)	0.0239...9.6 GPM	0.09...36.2 l/min
3/8	10	8 (3.5)	0.0373...14.9 GPM	0.141...57 l/min
1/2	15	10 (4.5)	0.084...33.6 GPM	0.318...127 l/min
3/4	20	10 (4.5)	0.149...60 GPM	0.57...226 l/min
1	25	11 (5)	0.233...93 GPM	0.88...353 l/min
1-1/4	32	13 (6)	0.382...153 GPM	1.45...579 l/min
1-1/2	40	15.5 (7)	0.6...239 GPM	2.26...905 l/min
2	50	19 (8.5)	0.93...373 GPM	3.53...1,414 l/min
2-1/2	65	27.5 (12.5)	1.58...631 GPM	0.358...143 m <sup>3</sup> /h
3	80	31 (14)	2.39...956 GPM	0.54...217 m <sup>3</sup> /h
4	100	42 (19)	3.73...1,494 GPM	0.85...339 m <sup>3</sup> /h
5	125	53 (24)	5.8...2,334 GPM	1.33...530 m <sup>3</sup> /h
6	150	60.5 (27.5)	8.4...3,361 GPM	1.91...763 m <sup>3</sup> /h
8	200	87 (39.5)	14.9...5,975 GPM	3.39...1,357 m <sup>3</sup> /h
10	250	129 (58.5)	23.3...9,336 GPM	5.3...2,121 m <sup>3</sup> /h
12	300	204 (92.5)	33.6...13,444 GPM	7.6...3,054 m <sup>3</sup> /h
14	350	262 (119)	45.7...18,299 GPM	10.4...4,156 m <sup>3</sup> /h
16	400	344 (156)	60...23,901 GPM	13.6...5,429 m <sup>3</sup> /h
18	450	397 (180)	76...30,250 GPM	17.2...6,870 m <sup>3</sup> /h
20	500	470 (213)	93...37,345 GPM	21.2...8,482 m <sup>3</sup> /h
22	550	549 (249)	113...45,188 GPM	25.7...10,263 m <sup>3</sup> /h
24	600	617 (280)	134...53,777 GPM	30.5...12,214 m <sup>3</sup> /h
28	700	—	183...73,197 GPM	41.6...16,625 m <sup>3</sup> /h
30	750	930 (422)	210...84,027 GPM	47.7...19,085 m <sup>3</sup> /h
32	800	1171 (531)	239...95,604 GPM	54.3...21,714 m <sup>3</sup> /h
36	900	1378 (625)	302...120,999 GPM	69...27,482 m <sup>3</sup> /h
40	1000	—	373...149,381 GPM	85...33,928 m <sup>3</sup> /h
48	1200	1788 (811)	538...215,109 GPM	122...48,857 m <sup>3</sup> /h
56	1400	—	732...292,787 GPM	166...66,499 m <sup>3</sup> /h
60	1500	2112 (958)	840...336,108 GPM	191...76,338 m <sup>3</sup> /h
64	1600	2339 (1061)	956...382,416 GPM	217...86,856 m <sup>3</sup> /h
72	1800	3219 (1460)	1210...483,996 GPM	275...109,927 m <sup>3</sup> /h
78	2000	4101 (1860)	1494...597,525 GPM	339...135,713 m <sup>3</sup> /h

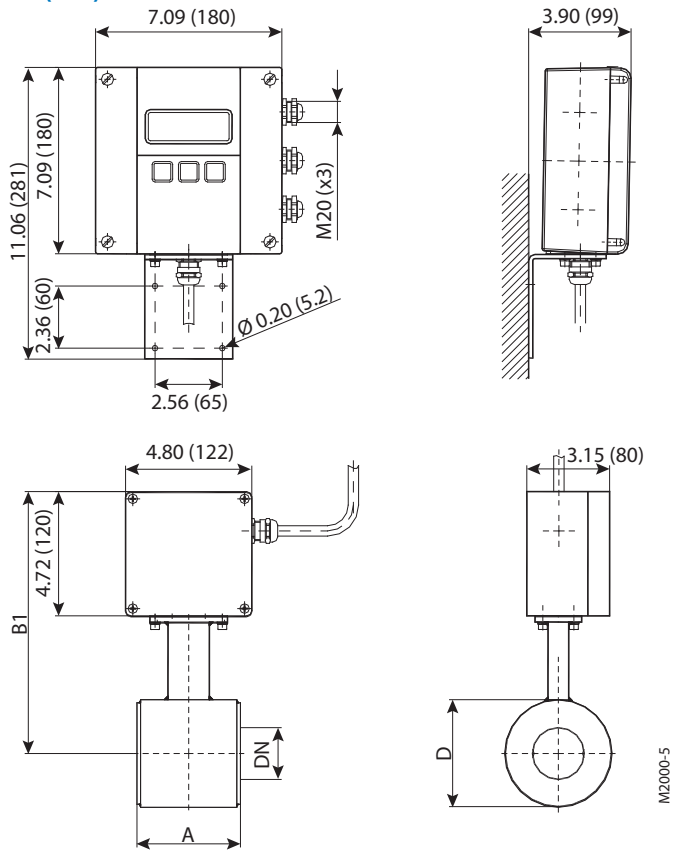
### Sensor Type III Specifications

Thanks to its very short lay length, the sensor type III is often the right alternative to a lot of applications. Delivered with a PTFE liner, the sensor type III has a standard nominal pressure of PN 40.

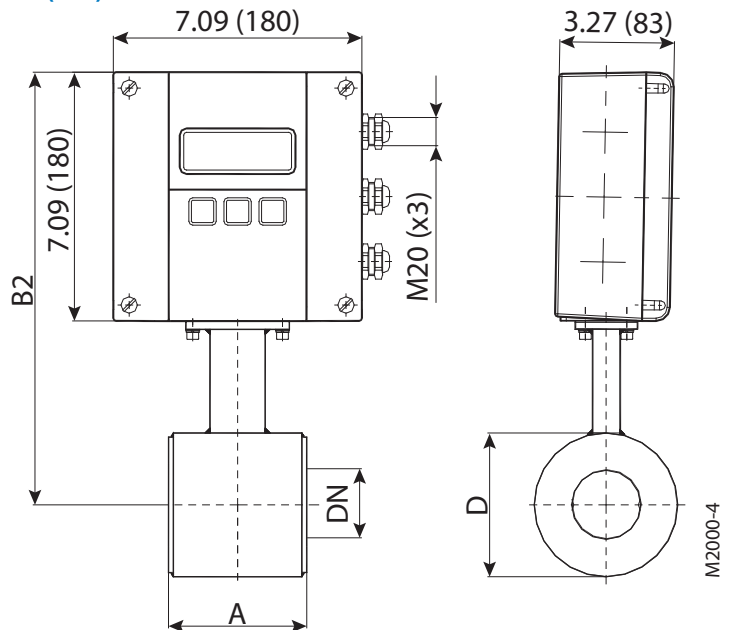
Size	1...4 in. (DN 25...100)	
Process Connection	Wafer connection (in-between flange mounting)	
Nominal Pressure	580 psi (40 bar)	
Protection Class	NEMA 4X (IP67), optional NEMA 6P (IP68)	
Minimum Conductivity	5 µS/cm (20 µS/cm for demineralized water)	
Liner Materials	PTFE	
Electrode Material	Hastelloy C (Standard), Tantal, Platinum / Gold Plated, Platinum / Rhodium	
Housing	Carbon Steel / optional stainless steel	
Lay Length	1...2 in. (DN 25...50)	4 in. (100 mm)
	2-1/2...4 in. (DN 65...100)	6 in. (150 mm)

### Sensor Type III Dimensions

#### Remote Version in. (mm)



#### Mounted Version in. (mm)



in.	DN	A	B1	B2	D
1	25	3.94 (100)	9.37 (238)	7.24 (184)	2.91 (74)
1-1/4	32	3.94 (100)	9.57 (243)	7.44 (189)	3.31 (84)
1-1/2	40	3.94 (100)	9.76 (248)	7.64 (194)	3.70 (94)
2	50	3.94 (100)	9.96 (253)	7.83 (199)	4.09 (104)
2-1/2	65	5.91 (150)	10.47 (266)	8.35 (212)	5.08 (129)
3	80	5.91 (150)	10.67 (271)	8.54 (217)	5.51 (140)
4	100	5.91 (150)	10.98 (279)	8.86 (225)	6.14 (156)

580 psi (40 bar)

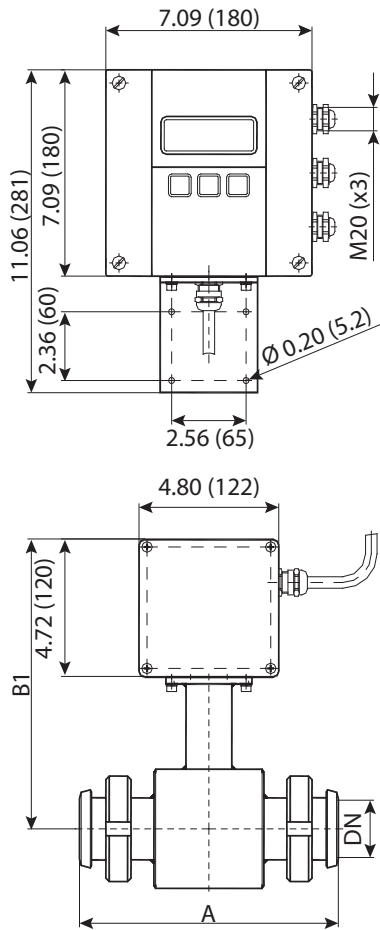
## Sensor Type Food Specifications

The sanitary sensor was developed for the flow measurement of liquid food. This model is available with Tri-Clamp® BS4825/ISO2852, DIN11851, and more process connections and also with any special connections (customer specified). The sanitary sensor is delivered in a stainless steel housing and with PTFE/PFA lining.

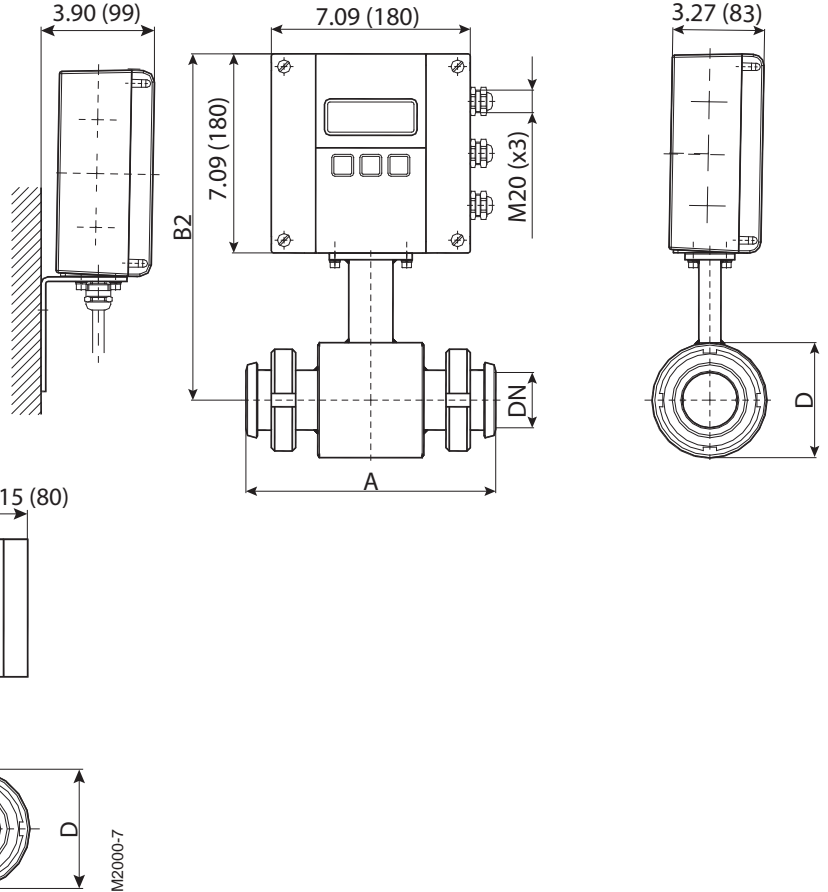
Size	3/8...4 in. (DN 10...100)		
Process Connection	Tri-Clamp BS4825/ISO2852, DIN 11851, customer specified, and more		
Nominal Pressure	145/230 psi (10/16 bar)		
Protection Class	NEMA 4X (IP67), optional NEMA 6P (IP68)		
Minimum Conductivity	5 µS/cm (20 µS/cm for demineralized water)		
Liner Materials	PTFE/PFA	-40...302° F (-40...150° C)	
Electrode Material	Standard: Hastelloy C Optional: Tantal, Platinum / Gold plated, Platinum / Rhodium		
Housing	Standard: Carbon Steel Optional: Stainless Steel		
Lay Length	Tri-Clamp Connection	3/8...2 in. (DN 10...50)	6 in. (145 mm)
		2-1/2...4 in. (DN 65...100)	8 in. (200 mm)
	DIN 11851 Connection	3/8...3/4 in. (DN 10...20)	7 in. (175 mm)
		1...2 in. (DN 25...50)	9 in. (225 mm)
		2-1/2...4 in. (DN 65...100)	11 in. (280 mm)

### Type Food DIN 11851 Dimensions

#### Remote Version in. (mm)



#### Mounted Version in. mm

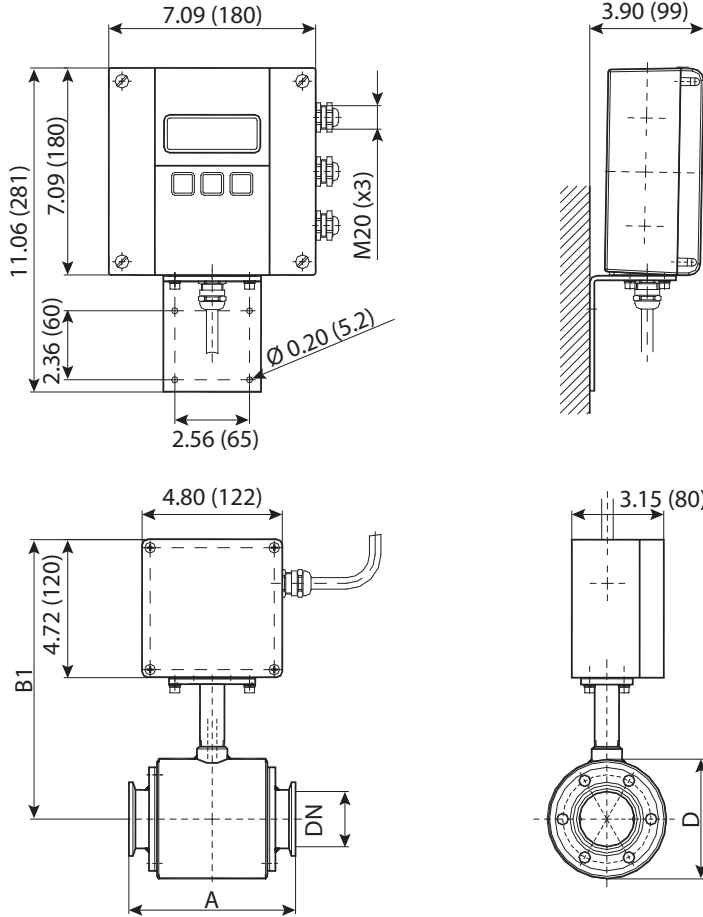


in.	DN	A	B1	B2	D
3/8	10	6.69 (170)	9.37 (238)	7.24 (184)	2.91 (74)
1/2	15	6.69 (170)	9.37 (238)	7.24 (184)	2.91 (74)
3/4	20	6.69 (170)	9.37 (238)	7.24 (184)	2.91 (74)
1	25	8.86 (225)	9.37 (238)	7.24 (184)	2.91 (74)
1-1/4	32	8.86 (225)	9.57 (243)	7.44 (189)	3.31 (84)
1-1/2	40	8.86 (225)	9.76 (248)	7.64 (194)	3.70 (94)
2	50	8.86 (225)	9.96 (253)	7.83 (199)	4.09 (104)
2-1/2	65	11.02 (280)	10.47 (266)	8.35 (212)	5.08 (129)
3	80	11.02 (280)	10.67 (271)	8.54 (217)	5.51 (140)
4	100	11.02 (280)	10.98 (279)	8.86 (225)	6.14 (156)

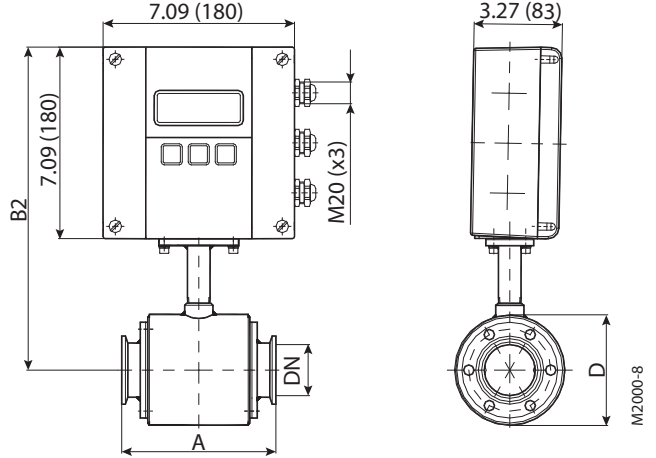
230 psi (16 bar)

### Type Food Tri-Clamp Dimensions

#### Remote Version in. (mm)



#### Mounted Version in. (mm)



in.	DN	A	B1	B2	D
3/8	10	5.71 (145)	8.98 (228)	7.52 (191)	2.91 (74)
1/2	15	5.71 (145)	8.98 (228)	7.52 (191)	2.91 (74)
3/4	20	5.71 (145)	8.98 (228)	7.52 (191)	2.91 (74)
1	25	5.71 (145)	8.98 (228)	7.52 (191)	2.91 (74)
1-1/2	40	5.71 (145)	9.37 (238)	7.91 (201)	3.70 (94)
2	50	5.71 (145)	9.57 (243)	8.11 (206)	4.09 (104)
2-1/2	65	7.87 (200)	10.08 (256)	8.62 (219)	5.08 (129)
3	80	7.87 (200)	10.28 (261)	8.82 (224)	5.51 (140)
4	100	7.87 (200)	10.59 (269)	9.13 (232)	6.14 (156)

150 psi (10 bar)

Tri-Clamp Connection		Size		BS4825		ISO2852	
ID	AD	in.	DN	AD	ID	AD	ID
		3/8	10	—	—	1.99 (50.5)	0.55 (14.0)
1/2	15	0.98 (25.0)	0.37 (9.4)	1.99 (50.5)	0.71 (18.1)		
3/4	20	0.98 (25.0)	0.62 (15.75)	1.99 (50.5)	0.90 (22.9)		
1	25	1.99 (50.5)	0.87 (22.1)	1.99 (50.5)	1.13 (28.7)		
1-1/2	32	1.99 (50.5)	1.37 (34.8)	2.52 (64.0)	1.51 (38.4)		
2	40	2.52 (64.0)	1.87 (47.5)	2.52 (64.0)	1.74 (44.3)		
2-1/2	50	3.05 (77.5)	2.37 (60.2)	3.05 (77.5)	2.22 (56.3)		
3	65	3.58 (91.0)	2.87 (72.9)	3.58 (91.0)	2.84 (72.1)		
3-1/2	80	4.17 (106.0)	3.32 (84.3)	4.17 (106.0)	3.32 (84.3)		
4	100	4.69 (119.0)	3.83 (97.4)	5.12 (130.0)	4.32 (109.7)		

150 psi (10 bar)





## Sensor and Transmitter Ordering Information for North America

### PTFE Liner

M2000	Meter Type	Detector					Electrodes & Grounding	Amplifier	Remote Cable Length	Communications/Outputs	Wiring Method	Unit of Measure Totalizer/ Flow Rate	Testing and Tagging
		PTFE C-Steel 150# flanges	PTFE C-Steel 300# flanges	PTFE Stainless Steel 150# flanges	PFA Stainless Steel 150# Flanges								
<b>Meter Type- Standard LL</b>													
1/4 in.	002	P1	P2	P4	PA								
5/16 in.	003	N/A	N/A	N/A	N/A								
3/8 in.	004	N/A	N/A	N/A	N/A								
1/2 in.	005	—	—	—	—								
3/4 in.	007	—	—	—	—								
1 in.	010	—	—	—	—								
1-1/4 in.	012	—	—	—	—								
1-1/2 in.	015	—	—	—	—								
2 in.	020	—	—	—	—								
2-1/2 in.	200	—	—	—	—								
3 in.	030	—	—	—	—								
4 in.	040	—	—	—	—								
5 in.	050	—	—	—	—								
6 in.	060	—	—	—	—								
8 in.	080	—	—	—	—								
10 in.	100	—	—	—	—								
12 in.	120	—	—	—	—								
14 in.	140	—	—	—	—								
16 in.	160	—	—	—	—								
18 in.	180	—	—	—	—								
20 in.	200	—	—	—	—								
22 in.	220	—	—	—	—								
24 in.	240	—	—	—	—								
28 in.	280	N/A	N/A	N/A	N/A								
30 in.	300	N/A	N/A	N/A	N/A								
32 in.	320	N/A	N/A	N/A	N/A								
36 in.	360	N/A	N/A	N/A	N/A								
40 in.	400	N/A	N/A	N/A	N/A								
42 in.	420	N/A	N/A	N/A	N/A								
48 in.	480	N/A	N/A	N/A	N/A								
54 in.	540	N/A	N/A	N/A	N/A								
<b>Electrodes &amp; Grounding</b>													
Alloy C with 316 Stainless Steel Grounding Rings						A							
Stainless Steel with 316 Stainless Steel Grounding Rings						S							
Platinum Plated with 316 Stainless Steel Grounding Rings						P							
Tantalum with 316 Stainless Steel Grounding Rings						T							
Platinum/Rhodium with 316 Stainless Steel Grounding Rings						R							
Alloy C Electrode and Grounding Electrode						C							
Stainless Steel Electrode and Grounding Electrode						D							
Platinum Plated Electrode and Grounding Electrode						G							
Tantalum Electrode and Grounding Electrode						L							
Platinum/Rhodium Electrode and Grounding Electrode						H							
<b>Amplifier Type</b>													
110/220V AC; Meter Mounted						M							
110/220V AC; Remote Mounted						R							
110/220V AC; Remote Mounted; Submersible						S							
110/220V AC; Remote Mounted; Submersible (IP68)						T							
24V DC; Meter Mounted						E							
24V DC; Remote Mounted						F							
24V DC; Remote Mounted; Submersible						G							
24V DC; Remote Mounted; Submersible (IP68)						B							
<b>Remote Cable Length</b>													
None						WW							
5 ft. Standard Cable						AA							
10 ft. Standard Cable						AB							
15 ft. Standard Cable						AC							
30 ft. Standard Cable						AF							
50 ft. Standard Cable						AK							
75 ft. Standard Cable						AR							
100 ft. Standard Cable						BW							
125 ft. Standard Cable						BE							
150 ft. Standard Cable						BK							
175 ft. Standard Cable						BR							
200 ft. Standard Cable						DW							
225 ft. Standard Cable						DE							
250 ft. Standard Cable						DK							
275 ft. Standard Cable						DR							
300 ft. Standard Cable						DW							
325 ft. Standard Cable						EE							
350 ft. Standard Cable						EK							
375 ft. Standard Cable						ER							
400 ft. Standard Cable						FW							
425 ft. Standard Cable						FE							
450 ft. Standard Cable						FK							
475 ft. Standard Cable						FR							
500 ft. Standard Cable						GW							
<b>Communications/Outputs</b>													
Standard Output						S							
Standard Output with HART						H							
Standard Output with PROFIBUS DP						P							
Standard Output with MODBUS 485 RTU						M							
<b>Wiring Method</b>													
None												XX	
Twist Tight - 5 ft. (MTR, ASSY)													TF
Twist Tight - 10 ft. (MTR, ASSY)													TH
Twist Tight - 25 ft. (MTR, ASSY)													TJ
Twist Tight - 75 ft. (MTR, ASSY)													TK
Nicor - 6 ft. (MTR, ASSY)													NG
Nicor - 25 ft. (MTR, ASSY)													NJ
Itron - 5 ft. (MTR, ASSY)													CF
Itron - 25 ft. (MTR, ASSY)													CJ
<b>Unit of Measure Totalizer/ Flow Rate</b>													
Gallons/gallons per minute												G	
Gallons/cubic feet per minute												B	
Gallons/cubic meters per second												D	
Cubic Meters/gallons per minute												C	
Cubic Meters/cubic meters per second												E	
Cubic Meters/cubic meters per minute												T	
Cubic Meters/cubic meters per hour												H	
Cubic Feet/gallons per minute												F	
Cubic Feet/cubic feet per minute												J	
Cubic Feet/cubic meters per hour												K	
Liters/gallons per minute												L	
Liters/liters per second												N	
Liters/liters per minute												P	
Liters/liters per hour												Q	
Million Gallons/gallons per minute												M	
Gallons/millions gallons per day												R	
Acre Feet/gallons per minute												A	
Second-Foot Day/cubic feet per second												S	
Custom Units												Z	
<b>Testing &amp; Tagging</b>													
Factory Calibrated												F	
3rd Party Calibrated (See pricing on pg. 20)												3	
Factory Calibrated/Stainless Steel Tag												S	
3rd Party Calibrated w/ Stainless Steel Tag (See pricing on pg. 20)												T	
State of Kansas Certified												K	

Sensor and Transmitter Ordering Information for North America

Halar Liner

M2000	Meter Type	Detector			Electrodes & Grounding	Amplifier	Remote Cable Length	Communications/Outputs	Wiring Method	Unit of Measure Totalizer/ Flow Rate	Testing & Tagging
		HALAR C-Steel 150# flanges	HALAR C-Steel 300# flanges	HALAR Stainless Steel 150# flanges							
		H1	H2	H4							
<b>Meter Type- Standard LL</b>											
14 in.	140	—	—	—							
16 in.	160	—	—	—							
18 in.	180	—	—	—							
20 in.	200	—	—	—							
22 in.	220	—	—	—							
24 in.	240	—	—	—							
28 in.	280	—	—	—							
30 in.	300	—	—	—							
32 in.	320	—	—	—							
36 in.	360	—	—	—							
40 in.	400	—	N/A	—							
<b>Electrodes &amp; Grounding</b>											
Alloy C with 316 Stainless Steel Grounding Rings					A						
Stainless Steel with 316 Stainless Steel Grounding Rings					S						
Platinum Plated with 316 Stainless Steel Grounding Rings					P						
Tantalum with 316 Stainless Steel Grounding Rings					T						
Platinum/Rhodium with 316 Stainless Steel Grounding Rings					R						
Alloy C Electrode and Grounding Electrode					C						
Stainless Steel Electrode and Grounding Electrode					D						
Platinum Plated Electrode and Grounding Electrode					G						
Tantalum Electrode and Grounding Electrode					L						
Platinum/Rhodium Electrode and Grounding Electrode					H						
<b>Amplifier Type</b>											
110/220V AC; Meter Mounted					M						
110/220V AC; Remote Mounted					R						
110/220V AC; Remote Mounted; Submersible					S						
110/220V AC; Remote Mounted; Submersible (IP68)					T						
24V DC; Meter Mounted					E						
24V DC; Remote Mounted					F						
24V DC; Remote Mounted; Submersible					G						
24V DC; Remote Mounted; Submersible (IP68)					B						
<b>Remote Cable Length</b>											
None						WW					
5 ft. Standard Cable						AA					
10 ft. Standard Cable						AB					
15 ft. Standard Cable						AC					
30 ft. Standard Cable						AF					
50 ft. Standard Cable						AK					
75 ft. Standard Cable						AR					
100 ft. Standard Cable						BW					
125 ft. Standard Cable						BE					
150 ft. Standard Cable						BK					
175 ft. Standard Cable						BR					
200 ft. Standard Cable						DW					
225 ft. Standard Cable						DE					
250 ft. Standard Cable						DK					
275 ft. Standard Cable						DR					
300 ft. Standard Cable						EW					
325 ft. Standard Cable						EE					
350 ft. Standard Cable						EK					
375 ft. Standard Cable						ER					
400 ft. Standard Cable						FW					
425 ft. Standard Cable						FE					
450 ft. Standard Cable						FK					
475 ft. Standard Cable						FR					
500 ft. Standard Cable						GW					
<b>Communications/Outputs</b>											
Standard Output							S				
Standard Output with HART							H				
Standard Output with PROFIBUS DP							P				
Standard Output with MODBUS 485 RTU							M				
<b>Wiring Method</b>											
None								XX			
Twist Tight - 5 ft. (MTR, ASSY)								TF			
Twist Tight - 10 ft. (MTR, ASSY)								TH			
Twist Tight - 25 ft. (MTR, ASSY)								TJ			
Twist Tight - 75 ft. (MTR, ASSY)								TK			
Nicor - 6 ft. (MTR, ASSY)								NG			
Nicor - 25 ft. (MTR, ASSY)								NJ			
Itron - 5 ft. (MTR, ASSY)								CF			
Itron - 25 ft. (MTR, ASSY)								CJ			
<b>Unit of Measure Totalizer/ Flow Rate</b>											
Gallons/gallons per minute									G		
Gallons/cubic feet per minute									B		
Gallons/cubic meters per second									D		
Cubic Meters/gallons per minute									C		
Cubic Meters/cubic meters per second									E		
Cubic Meters/cubic meters per minute									T		
Cubic Meters/cubic meters per hour									H		
Cubic Feet/gallons per minute									F		
Cubic Feet/cubic feet per minute									J		
Cubic Feet/cubic meters per hour									K		
Liters/gallons per minute									L		
Liters/liters per second									N		
Liters/liters per minute									P		
Liters/liters per hour									Q		
Million Gallons/gallons per minute									M		
Gallons/millions gallons per day									R		
Acre Feet/gallons per minute									A		
Second-Foot Day/cubic feet per second									S		
Custom Units									Z		
<b>Testing &amp; Tagging</b>											
Factory Calibrated										F	
3rd Party Calibrated (See pricing on pg. 20)										3	
Factory Calibrated/Stainless Steel Tag										S	
3rd Party Calibrated w/ Stainless Steel Tag (See pricing on pg. 20)										T	
State of Kansas Certified										K	

### Sensor Ordering Information for International

	<b>MID</b>	<input type="text"/>	-	<input type="text"/>	/	<input type="text"/>	-	<input type="text"/>	/	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	/	<input type="text"/>	-	<input type="text"/>
<b>Model</b>	MID electromagnetic flow meter	MID																
<b>Type</b>	Type 2	2																
	Type 3	3																
	Type 5	5																
	Type 6	6																
<b>Size</b>	DIN 6 to DN 2000																	
<b>Pressure rate</b>																		
<b>Process connection</b>	DIN flanges									F								
	ANSI flanges									A								
	Threads acc. DIN 11851									D								
	Tri-Clamp®									T								
	Wafer									W								
<b>Material</b>	C-steel													ST				
	SST 1.4301 (ANSI 304)													V2				
	SST 1.4404 (ANSI 316)													V4				
<b>Liner</b>	PTFE (DN 6-10)																	PT
	Hard rubber																	PFA
	Soft rubber																	HG
	Halar																	WG
																		HA
<b>Electrodes</b>	Measure + empty pipe electrode																	ML
	Measure + grounding + empty pipe electrode																	MEL
<b>Electrode material</b>	Hastelloy C																	HC
	Tantalum																	TA
	Platinum/gold plated																	PG
	Platinum/Rhodium																	PR
<b>Housing</b>	C-steel																	St
	SST 1.4301 (ANSI 304)																	V2
	SST 1.4404 (ANSI 306)																	V4

Example:  MID  2 -  100 /  16 -  F /  St -  HG -  ML /  HC -  St

### Transmitter Ordering Information for International

	<input type="text"/>	<input type="text"/>	<input type="text"/>	m
<b>Amplifier</b>	M2000 (85-265 VAC)	M20A		
	M2000 (9-36 VDC)	M20D		
<b>Mounted/remote/cable length</b>	Amplifier detector mounted		M	
	Remote version cable length		R	
<b>Remote amplifier with cable length</b>	Remote amplifier with 10 m cable length			10
	Remote amplifier with 15 m cable length			15
	Remote amplifier with 20 m cable length			20
	Remote amplifier with 25 m cable length			25
	Remote amplifier with 30 m cable length			30

Example:  M10A  R  15 m

**Control. Manage. Optimize.**

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**Environmental Site Solutions, LLC**

## **TYPE AquaGAC 830 Coconut LIQUID PHASE ACTIVATED CARBON**

AquaGAC 830 Coconut carbon high activity granular activated carbon is manufactured from selected grades of Coconut Shell and activated under rigidly controlled conditions by high temperature steam activation. The resulting product has a unique pore size distribution, low density, and high adsorption capacity AquaGAC 830 Coconut carbon is designed to efficiently purify and/or decolorize many aqueous and organic liquids.

### **Specifications:**

Iodine Number (mg/g, minimum)	950-1050
U.S. Mesh Size	8x30
Greater than 8 mesh, % maximum	5.0
Smaller than 30 mesh, % maximum	4.0
Moisture (% maximum, as packed)	1
Water Soluble Ash (% maximum)	0.25
Abrasion Number (minimum)	85

### **Typical Properties**

Surface Area (m <sup>2</sup> /gm)	950 - 1,050
Apparent Density (g/ml)	0.48-0.50
Contact pH	6.5-8.0

# ChitoVan™ *chitosan lactate cartridge*

FREE SAMPLES  
AVAILABLE



ChitoVan chitosan lactate is a **powerful, safe** and **natural** water treatment biopolymer that removes suspended sediment and other contaminants from water. ChitoVan is a powerful flocculent and when used with filtration, is capable of consistently reducing turbidities by more than 95% to less than 10 NTU. ChitoVan has been used across the U.S. and Canada to clean billions of gallons of water since its introduction in 2006.

## INSTALLATION AND USE



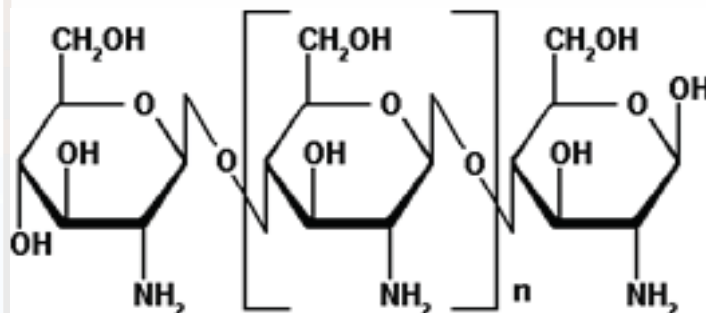
Simply anchor the cartridge in flowing dirty water and it will convert into a slow-dissolving gel. As it dissolves, chitosan is released into the water causing fine sediment particles to flocculate. Once treated, water can be gravity settled, biofiltered, infiltrated, sand filtered or filtered by a dewatering bag. Visit our website for more information to assist with installation and maintenance.

## PRODUCT AVAILABILITY

The ChitoVan Cartridge is a chitosan salt encased within a permeable cartridge. Dungeness offers four different cartridges: 1-lb black, 2-lb black, 1-lb green and 2-lb green.

ChitoVan products are available directly through Dungeness or through one of our many nationwide and Canadian distributors. Contact Dungeness Environmental to locate a distributor near you.

## WHAT IS CHITOSAN?



Chitosan (shown above) is a natural biopolymer derived from chitin - the structural material found in crustaceans. Found naturally in the environment, chitosan is 100 % biodegradable. Chitosan is a long chain polymer and possesses a strong positive charge. Dirt particles typically are negatively charged. Chitosan flocculates (clump together into a large mass) fine dirt particles causing them to settle thereby clarifying the dirty water. (See before and after treatment below.)



# ChitoVan™ *chitosan lactate cartridge*

## APPLICATIONS

ChitoVan is a versatile polymer with a wide range of water treatment applications throughout the construction and industrial field.

### CONSTRUCTION

- *Stormwater Run-off*
- *Ground Water*
- *Dewatering*
- *Dredge Water*

### INDUSTRIAL

- *Urban and Industrial Stormwater Run-off*
- *Process Water*
- *Mining*
- *Agriculture*
- *Greywater*
- *Paper Manufacturing*
- *Food Processing*
- *Organic Wastes*

## PRODUCT SPECIFICATIONS

These specifications describe some of the necessary characteristics for the ChitoVan Chitosan Lactate product required to achieve the end objectives of water treatment.

### ChitoVan Chitosan Lactate Flake -

Viscosity range: 150 cps (1% solution @ standard temperature and pressure after 2 hours of mixing)  
 pH (1% solution): 3.5 to 4.0  
 Solids content: < 1.5%  
 Turbidity: 10 NTU or less  
 Solubility: > 99%

### Ingredients -

ChitoVan Chitosan Lactate is a water treatment grade of chitosan lactate. There are no additional additives.

*Aquatic toxicity reports are available on request.*

## HOW MUCH WATER WILL CHITOVAN TREAT?

Chitosan lactate (lbs.)	Water Treated (gallons)	Dose (mg/l)
1 (Green or black cartridge)	240,000	0.5
	120,000	1
	60,000	2
2	480,000	0.5
	240,000	1
	120,000	2
4	961,000	0.5
	480,000	1
	240,000	2



phone: (425) 481-0600  
 web: [www.dungenessenviro.com](http://www.dungenessenviro.com)



**King County Industrial Waste Program - Construction Dewatering Request Form - Exhibit C**

Applicant Name / Project Name: TOC Seattle Terminal 1  
 Physical Site Address: 2737 W. Commodore Way  
 City, Zip Code: Seattle, WA 98199

Start Date: 4/1/2021 Projected End Date: 10/1/2021

April 2021	May 2021	June 2021	July 2021	Aug 2021	Sept 2020
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**Point of Discharge 1**

Remedial Excavation Dewatering						7,500 gpd
Construction/Demo Stormwater						15,437 gpd
In Site Solidification						1,000 gpd

**Table 5.3**  
**RI Analytical Results: Metals in Groundwater**

Location				02MW07		02MW17	02MW18		02MW19		02MW20		MW03
Parcel				East Waterfront- Shoreline		East Waterfront- Shoreline	East Waterfront- Shoreline		East Waterfront- Shoreline		East Waterfront- Shoreline		ASKO
Water-Bearing Zone				Shallow		Shallow	Shallow		Shallow		Shallow		Perched
Sample ID				02MW07-050319	02MW07-072519	02MW17-050619	02MW18-050619	02MW18-072519	02MW19-050619	02MW19-072519	02MW20-050619	02MW20-072519	MW03-050319
Sample Date				05/03/2019	07/25/2019	05/06/2019	05/06/2019	07/25/2019	05/06/2019	07/25/2019	05/06/2019	07/25/2019	05/03/2019
Chemical of Interest	CAS No.	Units	PCUL										
Arsenic (total)	7440-38-2	µg/L	5	4.2	3.9	1.8	3.6	1.9	<b>23</b>	<b>14</b>	<b>6.7</b>	<b>12</b>	<b>66</b>
Arsenic (dissolved)	7440-38-2	µg/L	5	--	3.7	--	--	1.9	--	<b>14</b>	--	<b>12</b>	--
Barium (total)	7440-39-3	µg/L	1,000	22	35	27	37	29	71	60	17	20	--
Barium (dissolved)	7440-39-3	µg/L	1,000	--	34	--	--	28	--	62	--	21	--
Cadmium (total)	7440-43-9	µg/L	0.20	0.20 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
Cadmium (dissolved)	7440-43-9	µg/L	0.20	--	0.2 U	--	--	0.2 U	--	0.2 U	--	0.2 U	--
Chromium (total)	7440-47-3	µg/L	1	<b>2.1</b>	1.00 U	1 U	<b>1.4</b>	1 U	<b>2.4</b>	1 U	1 U	1 U	--
Chromium (dissolved)	7440-47-3	µg/L	1	--	1.00 U	--	--	1 U	--	1 U	--	1 U	--
Lead (total)	7439-92-1	µg/L	0.50	<b>6.0</b>	0.50 U	0.5 U	0.5 U	0.5 U	<b>3.1</b>	0.5 U	0.5 U	0.5 U	--
Lead (dissolved)	7439-92-1	µg/L	0.50	--	0.50 U	--	--	0.5 U	--	0.5 U	--	0.5 U	--
Mercury (total)	7439-97-6	µg/L	0.012	<b>0.10 U</b>	<b>0.10 U</b>	<b>0.10 U</b>	<b>0.10 U</b>	<b>0.10 U</b>	<b>0.10 U</b>	<b>0.10 U</b>	<b>0.10 U</b>	<b>0.10 U</b>	--
Mercury (dissolved)	7439-97-6	µg/L	0.012	--	<b>0.10 U</b>	--	--	<b>0.10 U</b>	--	<b>0.10 U</b>	--	<b>0.10 U</b>	--
Selenium (total)	7782-49-2	µg/L	5	1.0 U	1.0 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	--
Selenium (dissolved)	7782-49-2	µg/L	5	--	1.0 U	--	--	1 U	--	1 U	--	1 U	--
Silver (total)	7440-22-4	µg/L	0.91	0.25 U	0.10 UJ	0.25 U	0.25 U	0.1 UJ	0.25 U	0.1 UJ	0.25 U	0.1 UJ	--
Silver (dissolved)	7440-22-4	µg/L	0.91	--	0.10 UJ	--	--	0.1 UJ	--	0.1 UJ	--	0.1 UJ	--

Notes:

-- Not analyzed.

**Italics** Reporting limit exceeds criteria.

**RED/BOLD** Detected exceedance of PCUL.

Abbreviations:

CAS Chemical Abstracts Service

µg/L Micrograms per liter

PCUL Preliminary cleanup level

RI Remedial Investigation

Qualifiers:

U Analyte was not detected at the given reporting limit.

UJ Analyte was not detected at the given reporting limit, which is considered to be an estimate.

**Table 5.4**  
**RI Analytical Results: TPH and BTEX in Groundwater**

Chemical of Interest					Gasoline-Range Organics	Diesel-Range Organics	Oil-Range Organics	Total DRO & ORO	Benzene	Ethylbenzene	Toluene	Xylene (total)
CAS No.					GRO	DRO	ORO	DRO+ORO	71-43-2	100-41-4	108-88-3	1330-20-7
PCUL					800	NA	NA	500	0.44	NA	NA	NA
Units					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Parcel	Water-Bearing Zone	Location	Sample ID	Sample Date								
Bulk Terminal	Shallow	01MW01	01MW01-043019	04/30/2019	100 U	50 U	250 U	250 U	0.35 UJ	1 U	1 U	3 U
Bulk Terminal-W. Commodore Way	Shallow	01MW02	01MW02-050119	05/01/2019	900	740 <sup>(1)</sup>	250 U	740	220	5.1	2.8	5.6
Bulk Terminal-W. Commodore Way	Shallow	01MW03	01MW03-050119	05/01/2019	2,000	440 <sup>(1)</sup>	250 U	440	570	1.3	6.2	6.3
Bulk Terminal	Shallow	01MW03	01MW03-050119-D	05/01/2019	1,900	440 <sup>(1)</sup>	250 U	440	610	1	5.3	5
Bulk Terminal	Shallow	01MW06	01MW06-043019	04/30/2019	100 U	490 <sup>(1)</sup>	250 U	490	0.53	1 U	1 U	3 U
Bulk Terminal	Shallow	01MW12	01MW12-043019	04/30/2019	100 U	590 <sup>(1)</sup>	250 U	590	3	1 U	1 U	3 U
Bulk Terminal	Shallow	01MW13	01MW13-050119	05/01/2019	100 U	1,500 <sup>(1)</sup>	650 <sup>(1)</sup>	2,200	0.35 UJ	1 U	1 U	3 U
Bulk Terminal	Shallow	01MW19	01MW19-043019	04/30/2019	10,000	1,900 <sup>(1)</sup>	250 U	1,900	2,600	570	66	510
Bulk Terminal	Shallow	01MW24	01MW24-043019	04/30/2019	6,100	8,700 <sup>(1)</sup>	690 <sup>(1)</sup>	9,400	1,200	64	12	46
Bulk Terminal	Shallow	01MW27	01MW27-043019	04/30/2019	100 U	110 <sup>(1)</sup>	250 U	110	2.6	1 U	1 U	3 U
Bulk Terminal-W. Commodore Way	Shallow	01MW34	01MW34-050119	05/01/2019	--	110 <sup>(1)</sup>	250 U	110	--	--	--	--
Bulk Terminal-W. Commodore Way	Shallow	01MW35	01MW35-050119	05/01/2019	100 U	550 <sup>(1)</sup>	250 U	550	0.35 UJ	1 U	1 U	3 U
Bulk Terminal-W. Commodore Way	Shallow	01MW36	01MW36-050119	05/01/2019	--	190 <sup>(1)</sup>	250 U	190	--	--	--	--
Bulk Terminal	Shallow	01MW39	01MW39-043019	04/30/2019	--	1,400 <sup>(1)</sup>	300 U	1,400	--	--	--	--
Bulk Terminal	Shallow	01MW40	01MW40-043019	04/30/2019	--	1,100 <sup>(1)</sup>	250 U	1,100	0.35 UJ	1 U	1 U	3 U
Bulk Terminal	Shallow	01MW42	01MW42-043019	04/30/2019	--	960 <sup>(1)</sup>	410 <sup>(1)</sup>	1,400	--	--	--	--
Bulk Terminal	Shallow	01MW42	01MW42-043019-D	04/30/2019	--	920 <sup>(1)</sup>	390 <sup>(1)</sup>	1,300	--	--	--	--
Bulk Terminal-W. Commodore Way	Shallow	01MW47	01MW47-050119	05/01/2019	--	--	--	--	800	28	5.3	9.1
Bulk Terminal-W. Commodore Way	Shallow	01MW49	01MW49-050119	05/01/2019	100 U	850 <sup>(1)</sup>	250 U	850	0.35 UJ	1 U	1 U	3 U
Bulk Terminal-W. Commodore Way	Shallow	01MW50	01MW50-050119	05/01/2019	--	390 <sup>(1)</sup>	250 U	390	--	--	--	--
Bulk Terminal	Shallow & Intermediate	01MW59	01MW59-043019	04/30/2019	--	860 <sup>(1)</sup>	250 U	860	--	--	--	--
Bulk Terminal	Shallow	01MW66	01MW66-043019	04/30/2019	100 U	250 <sup>(1)</sup>	250 U	250	0.35 UJ	1 U	1 U	3 U
Bulk Terminal	Shallow	01MW67	01MW67-043019	04/30/2019	--	190 <sup>(1)</sup>	250 U	190	--	--	--	--
Bulk Terminal	Shallow	01MW69	01MW69-043019	04/30/2019	--	--	--	--	0.74	9.5	1 U	13
Bulk Terminal	Shallow	01MW74	01MW74-043019	04/30/2019	100 U	50 U	250 U	250 U	0.35 UJ	1 U	1 U	3 U
Bulk Terminal	Shallow	01MW75	01MW75-050119	05/01/2019	--	740 <sup>(1)</sup>	250 U	740	0.35 UJ	1 U	1 U	3 U
Bulk Terminal-W. Commodore Way	Shallow	01MW84	01MW84-050119	05/01/2019	8,400	2,800 <sup>(1)</sup>	250 U	2,800	5 U	390	7.5	250
Bulk Terminal-W. Commodore Way	Shallow	01MW86	01MW86-050119	05/01/2019	6,500	3,700 <sup>(1)</sup>	420 <sup>(1)</sup>	4,100	1,200	130	19	580
Bulk Terminal-W. Commodore Way	Shallow	01MW87	01MW87-050119	05/01/2019	--	110 <sup>(1)</sup>	300 U	110	--	--	--	--
Bulk Terminal	Shallow	01MW88	01MW88-050119	05/01/2019	--	140 <sup>(1)</sup>	500 U	140	--	--	--	--
Bulk Terminal	Shallow	01MW88	01MW88-050319	05/03/2019	--	56 <sup>(1)</sup>	250 U	56	--	--	--	--
Bulk Terminal	Shallow	01MW90	01MW90-050119	05/01/2019	--	--	--	--	0.35 U	1 U	1 U	2 U
Bulk Terminal	Shallow	01MW99	01MW99-050119	05/01/2019	--	570 <sup>(1)</sup>	250 U	570	--	--	--	--
Bulk Terminal	Shallow	01MW100	01MW100-050119	05/01/2019	--	50 U	250 U	250 U	--	--	--	--
Bulk Terminal-W. Commodore Way	Shallow	01MW101	01MW101-050619	05/06/2019	100 U	410 <sup>(1)</sup>	250 U	410	--	--	--	--
Bulk Terminal-W. Commodore Way	Shallow	01MW102	01MW102-050619	05/06/2019	100 U	70 U	350 U	350 U	--	--	--	--
Bulk Terminal	Shallow	01MW105	01MW105-050619	05/06/2019	140	9,400 <sup>(1)</sup>	1,900 <sup>(1)</sup>	11,000	0.35 UJ	1 U	1 U	4.8
Bulk Terminal	Shallow	01MW105	01MW105-050619-D	05/06/2019	130	6,700 <sup>(1)</sup>	1,500 <sup>(1)</sup>	8,200	0.35 UJ	1 U	1 U	3.9
Bulk Terminal	Shallow	01MW105	01MW105-072519	7/25/19	100 U	120 <sup>(1)(2)</sup>	250 U	120	0.35 UJ	1 U	1 U	1 U
Bulk Terminal	Shallow	01MW105	01MW105-082919	8/29/19	--	100 <sup>(2)</sup>	250 U <sup>(2)</sup>	100	--	--	--	--
Bulk Terminal	Shallow	01MW110	01MW110-072519	7/25/19	100 U	50 <sup>(1)(2)</sup>	250 U	50	0.35 UJ	1 U	1 U	1 U
Bulk Terminal	Shallow	01MW110	01MW110-082919	8/29/19	--	50 U <sup>(2)</sup>	250 U <sup>(2)</sup>	250 U	--	--	--	--
Bulk Terminal-W. Commodore Way	Shallow & Intermediate	01MW11	01MW11-050119	05/01/2019	--	360 <sup>(1)</sup>	250 U	360	--	--	--	--
Bulk Terminal	Shallow & Intermediate	01MW37	01MW37-043019	04/30/2019	--	600 J <sup>(1)</sup>	250 U	600	--	--	--	--
Bulk Terminal	Shallow & Intermediate	01MW38	01MW38-043019	04/30/2019	--	930 <sup>(1)</sup>	300 U	930	0.62	3.3	1 U	3 U

**Table 5.4**  
**RI Analytical Results: TPH and BTEX in Groundwater**

Chemical of Interest					Gasoline-Range Organics	Diesel-Range Organics	Oil-Range Organics	Total DRO & ORO	Benzene	Ethylbenzene	Toluene	Xylene (total)
CAS No.					GRO	DRO	ORO	DRO+ORO	71-43-2	100-41-4	108-88-3	1330-20-7
PCUL					800	NA	NA	500	0.44	NA	NA	NA
Units					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Parcel	Water-Bearing Zone	Location	Sample ID	Sample Date								
Bulk Terminal-W. Commodore Way	Intermediate	01MW48	01MW48-050119	05/01/2019	100 U	660 <sup>(1)</sup>	250 U	660	0.35 UJ	1 U	1 U	3 U
Bulk Terminal-W. Commodore Way	Intermediate	01MW104	01MW104-050319	05/03/2019	100 U	120	250 U	120	0.35 UJ	1 U	1 U	3 U
Bulk Terminal-W. Commodore Way	Intermediate	01MW111	01MW111-072519	7/25/19	100 U	380 <sup>(1)(2)</sup>	1,500	1,900	0.35 UJ	1 U	1 U	1 U
Bulk Terminal-W. Commodore Way	Intermediate	01MW111	01MW111-082919	8/29/19	--	50 U <sup>(2)</sup>	250 U <sup>(2)</sup>	250 U				
Bulk Terminal-W. Commodore Way	Intermediate	01MW111	01MW111-082919-D	8/29/19	--	50 U <sup>(2)</sup>	250 U <sup>(2)</sup>	250 U				
ASKO	Perched	01MW70	01MW70-050219	05/02/2019	160	1,100 <sup>(1)</sup>	850 <sup>(1)</sup>	2,000	--	--	--	--
ASKO	Perched	01MW71	01MW71-050219	05/02/2019	--	--	--	--	0.35 U	1 U	1 U	2 U
ASKO	Perched	01MW79	01MW79-050219	05/02/2019	100 U	1,100 <sup>(1)</sup>	650 <sup>(1)</sup>	1,800	--	--	--	--
ASKO- BNSF	Perched	01MW92	01MW92-051419	05/14/2019	1,500	4,600	1,300 <sup>(1)</sup>	5,900	70 U	200 U	200 U	400 U
ASKO- BNSF	Perched	01MW96	01MW96-051419	05/14/2019	--	2,100	450 <sup>(1)</sup>	2,600	1.3	1 U	1 U	2 U
ASKO- BNSF	Perched	01MW97	01MW97-051419	05/14/2019	--	65 J	250 UJ	65 J	--	--	--	--
ASKO- BNSF	Perched	01MW98	01MW98-051419	05/14/2019	370	3,600	1,300 <sup>(1)</sup>	4,900	--	--	--	--
ASKO	Perched	MW03	MW03-050319	05/03/2019	--	--	--	--	2.1	1 U	1 U	2 U
ASKO	Shallow	01MW07	01MW07-050219	05/02/2019	--	820 <sup>(1)</sup>	250 U	820	0.35 U	1 U	1 U	2 U
ASKO	Shallow	01MW15	01MW15-050219	05/02/2019	100 U	220 <sup>(1)</sup>	250 U	220	0.41	1 U	1 U	2 U
ASKO	Shallow	01MW44	01MW44-050219	05/02/2019	470	290 <sup>(1)</sup>	250 U	290	13	1 U	1 U	2 U
ASKO	Shallow	01MW45	01MW45-050219	05/02/2019	170	850 <sup>(1)</sup>	250 U	850	1.6	1 U	1 U	2 U
ASKO	Shallow	01MW46	01MW46-050219	05/02/2019	--	280 <sup>(1)</sup>	250 U	280	14	1 U	1 U	2 U
ASKO-W. Commodore Way	Shallow	01MW53	01MW53-050219	05/02/2019	--	94 <sup>(1)</sup>	250 U	94	0.35 U	1 U	1 U	2 U
ASKO	Shallow	01MW55	01MW55-050219	05/02/2019	940	540 <sup>(1)</sup>	380 <sup>(1)</sup>	920	1.3	1 U	1 U	2 U
ASKO	Shallow	01MW56	01MW56-050219	05/02/2019	--	1,000 <sup>(1)</sup>	250 U	1,000	0.35 U	1 U	1 U	2 U
ASKO	Shallow	01MW56	01MW56-050219-D	05/02/2019	--	920 <sup>(1)</sup>	250 U	920	0.35 U	1 U	1 U	2 U
ASKO	Shallow	01MW58	01MW58-050219	05/02/2019	--	100 <sup>(1)</sup>	250 U	100	--	--	--	--
ASKO	Shallow	01MW60	01MW60-050219	05/02/2019	--	50 U	250 U	250 U	--	--	--	--
ASKO	Shallow	01MW62	01MW62-050219	05/02/2019	460	100 <sup>(1)</sup>	250 U	100	0.35	1 U	1 U	2 U
ASKO	Shallow	01MW63	01MW63-050219	05/02/2019	2,100	830 <sup>(1)</sup>	340 <sup>(1)</sup>	1,200	4.3	1 U	1 U	2 U
ASKO	Shallow	01MW64	01MW64-050219	05/02/2019	--	100 <sup>(1)</sup>	250 U	100	--	--	--	--
ASKO	Shallow	01MW80	01MW80-050219	05/02/2019	--	380 <sup>(1)</sup>	250 U	380	16	1 U	1 U	2 U
ASKO-W. Commodore Way	Shallow	01MW85	01MW85-050319	05/03/2019	--	450 <sup>(1)</sup>	250 U	450	--	--	--	--
ASKO-W. Commodore Way	Shallow	01MW89	01MW89-050219	05/02/2019	--	200 <sup>(1)</sup>	250 U	200	--	--	--	--
ASKO- BNSF	Shallow	01MW93	01MW93-051419	05/14/2019	100 U	54	250 U	54	--	--	--	--
ASKO- BNSF	Shallow	01MW94	01MW94-051419	05/14/2019	--	50 U	250 U	250 U	--	--	--	--
ASKO	Shallow	MW04	MW04-050319	05/03/2019	--	--	--	--	1.1	1 U	1 U	2 U
ASKO	Shallow	MW05	MW05-050319	05/03/2019	140	310 <sup>(1)</sup>	250 U	310	1	1 U	1 U	2 U
ASKO	Shallow	MW06	MW06-050319	05/03/2019	--	370 <sup>(1)</sup>	260 U	370	2.6	1 U	1 U	2 U
ASKO	Intermediate	01MW76	01MW76-050319	05/03/2019	--	150 <sup>(1)</sup>	250 U	150	--	--	--	--
East Waterfront	Shallow	02MW03	02MW03-050319	05/03/2019	100 U	240 <sup>(1)</sup>	250 U	240	0.35 UJ	1 U	1 U	3 U
East Waterfront	Shallow	02MW04	02MW04-050319	05/03/2019	8,500 <sup>(3)</sup>	--	--	--	3.7	44	1 U	11
East Waterfront	Shallow	02MW06	02MW06-050319	05/03/2019	--	110 <sup>(1)</sup>	250 U	110	--	--	--	--
East Waterfront	Shallow	02MW08	02MW08-050319	05/03/2019	--	110 <sup>(1)</sup>	300 U	110	--	--	--	--
East Waterfront	Shallow	02MW16	02MW16-050319	05/03/2019	--	200 <sup>(1)</sup>	250 U	200	--	--	--	--

**Table 5.4**  
**RI Analytical Results: TPH and BTEX in Groundwater**

Chemical of Interest					Gasoline-Range Organics	Diesel-Range Organics	Oil-Range Organics	Total DRO & ORO	Benzene	Ethylbenzene	Toluene	Xylene (total)
CAS No.					GRO	DRO	ORO	DRO+ORO	71-43-2	100-41-4	108-88-3	1330-20-7
PCUL					800	NA	NA	500	0.44	NA	NA	NA
Units					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Parcel	Water-Bearing Zone	Location	Sample ID	Sample Date								
East Waterfront-Shoreline	Shallow	02MW07	02MW07-050319	05/03/2019	--	220 <sup>(1)</sup>	450 <sup>(1)</sup>	<b>670</b>	--	--	--	--
East Waterfront-Shoreline	Shallow	02MW17	02MW17-050619	05/06/2019	100 U	220 <sup>(1)</sup>	250 U	220	0.35 UJ	1 U	1 U	3 U
East Waterfront-Shoreline	Shallow	02MW18	02MW18-050619	05/06/2019	100 U	190 <sup>(1)</sup>	250 U	190	--	--	--	--
East Waterfront-Shoreline	Shallow	02MW19	02MW19-050619	05/06/2019	100 U	380 <sup>(1)</sup>	300 U	380	--	--	--	--
East Waterfront-Shoreline	Shallow	02MW20	02MW20-050619	05/06/2019	100 U	210 <sup>(1)</sup>	250 U	210	0.35 UJ	1 U	1 U	3 U
East Waterfront	Intermediate	02MW05	02MW05-050319	05/03/2019	100 U	86 <sup>(1)</sup>	250 U	86	0.35 UJ	1 U	1 U	3 U
East Waterfront-Shoreline	Intermediate	02MW21	02MW21-050619	05/06/2019	100 U	75 <sup>(1)</sup>	250 U	75	0.35 UJ	1 U	1 U	3 U
East Waterfront-Shoreline	Intermediate	02MW22	02MW22-050619	05/06/2019	100 U	80 <sup>(1)</sup>	250 U	80	0.35 UJ	1 U	1 U	3 U

Notes:

-- Not analyzed.

**Italics** Reporting limit exceeds criteria.

**RED/BOLD** Detected exceedance of PCUL.

- 1 The laboratory noted that the sample chromatographic pattern does not resemble the fuel standard used for quantitation.
- 2 Analyzed after performing silica gel cleanup to remove polar organics.
- 3 Equivalent GRO concentration obtained by summing detected volatile petroleum hydrocarbon fractions.

Abbreviations:

- BTEX Benzene, toluene, ethylbenzene, and xylenes
- CAS Chemical Abstracts Service
- DRO Diesel-range organics
- GRO Gasoline-range organics
- µg/L Micrograms per liter
- NA Not applicable
- ORO Oil-range organics
- PCUL Preliminary cleanup level
- RI Remedial Investigation
- TPH Total petroleum hydrocarbons

Qualifiers:

- J Analyte was detected; concentration is considered to be an estimate.
- U Analyte was not detected at the given reporting limit.
- UJ Analyte was not detected at the given reporting limit, which is considered to be an estimate.

**Table 5.5**  
**RI Analytical Results: EPH/VPH in Groundwater**

Location				01MW19	01MW47	01MW69	01MW90	01MW71	MW03	02MW04
Parcel				Bulk Terminal	Bulk Terminal-W. Commodore Way	Bulk Terminal	Bulk Terminal	ASKO	ASKO	East Waterfront
Water-Bearing Zone				Shallow	Shallow	Shallow	Shallow	Perched	Perched	Shallow
Sample ID				01MW19-043019	01MW47-050119	01MW69-043019	01MW90-050119	01MW71-050219	MW03-050319	02MW04-050319
Sample Date				04/30/2019	05/01/2019	04/30/2019	05/01/2019	05/02/2019	05/03/2019	05/03/2019
Analyte	CAS No.	Units	PCUL							
<b>Extractable Petroleum Hydrocarbons</b>										
C8-C10 Aliphatics	NA	µg/L	NA	60 J	42 J	41 UJ	45 UJ	41 UJ	40 UJ	40 UJ
C10-C12 Aliphatics	NA	µg/L	NA	21 UJ	310 J	20 UJ	22 UJ	21 UJ	20 UJ	20 UJ
C12-C16 Aliphatics	NA	µg/L	NA	48	330	20 U	73	21 U	20 U	20 U
C16-C21 Aliphatics	NA	µg/L	NA	34	64	20 U	22 U	21 U	20 U	20 U
C21-C34 Aliphatics	NA	µg/L	NA	21 U	21 U	20 U	22 U	21 U	20 U	20 U
C8-C10 Aromatics	NA	µg/L	NA	570 J	200 J	20 UJ	22 UJ	21 UJ	20 U	20 UJ
C10-C12 Aromatics	NA	µg/L	NA	390	320	65	22 U	21 U	20 U	27
C12-C16 Aromatics	NA	µg/L	NA	520	1,100	74	55	21 U	23 J	20 U
C16-C21 Aromatics	NA	µg/L	NA	350	440	120	22 U	21 U	20 U	20 U
C21-C34 Aromatics	NA	µg/L	NA	500	550	91	22 U	21 U	20 UJ	20 U
<b>Volatile Petroleum Hydrocarbons</b>										
C5-C6 Aliphatics	NA	µg/L	NA	1,700	690	40 U	40 U	89	40 U	5,600
C6-C8 Aliphatics	NA	µg/L	NA	640	720	65	20 U	20 U	38	2,300
C8-C10 Aliphatics	NA	µg/L	NA	20 U	190	52	20 U	20 U	62	88
C10-C12 Aliphatics	NA	µg/L	NA	370	360	20 U	20 U	20 U	93	73
C8-C10 Aromatics	NA	µg/L	NA	1,800	410	100	50 U	50 U	66	180
C10-C12 Aromatics	NA	µg/L	NA	800	890	200	20 U	20 U	190	270
C12-C13 Aromatics	NA	µg/L	NA	1,000	1,600	310	20 U	20 U	65	27
<b>Volatile Organic Compounds</b>										
1,2-Dibromoethane	106-93-4	µg/L	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	107-06-2	µg/L	4.8	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methyl tert-butyl ether	1634-04-4	µg/L	24	1 U	1 U	1 U	1 U	1 U	1 U	1 U
n-Hexane	110-54-3	µg/L	NA	59	--	1 U	--	1 U	1 U	160
<b>Polycyclic Aromatic Hydrocarbons</b>										
1-Methylnaphthalene	90-12-0	µg/L	NA	67	150	1.8	0.4 U	0.4 U	--	0.42
2-Methylnaphthalene	91-57-6	µg/L	NA	91	230	0.69	0.4 U	0.4 U	--	0.46
Naphthalene	91-20-3	µg/L	NA	96	77	4.2	0.4 U	0.4 U	0.4 UJ	1.2

Note:

-- Not analyzed.

Abbreviations:

- CAS Chemical Abstracts Service
- EPH Extractable petroleum hydrocarbons
- µg/L Micrograms per liter
- NA Not applicable
- PCUL Preliminary cleanup level
- RI Remedial Investigation
- VPH Volatile petroleum hydrocarbons

Qualifiers:

- J Analyte was detected; concentration is considered to be an estimate.
- U Analyte was not detected at the given reporting limit.
- UJ Analyte was not detected at the given reporting limit, which is considered to be an estimate.

Table 5.6  
RI Analytical Results: cVOCs in Groundwater

Chemical of Interest					Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	1,2-Dichloroethane	Vinyl chloride
CAS No.					127-18-4	79-01-6	156-59-2	156-60-5	75-35-4	107-06-2	75-01-4
PCUL					2.4	0.5	16	100	7	4.8	0.2
Units					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Parcel	Water-Bearing Zone	Location	Sample ID	Sample Date							
Bulk Terminal	Shallow	01MW19	01MW19-043019	04/30/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO	Perched	01MW70	01MW70-050219	05/02/2019	1 U	310	52	71	1 U	1 U	0.69
ASKO	Perched	01MW71	01MW71-050219	05/02/2019	1 U	2,800	120	17	13	1 U	7.9
ASKO	Perched	01MW79	01MW79-050219	05/02/2019	1 U	61	28	1.5	1 U	1 U	3.8
ASKO-BNSF	Perched	01MW92	01MW92-051419	05/14/2019	200 U	5,200	570	200 U	200 U	200 U	40 U
ASKO-BNSF	Perched	01MW96	01MW96-051419	05/14/2019	1 U	1.5	3.1	1 U	1 U	1 U	6
ASKO-BNSF	Perched	01MW97	01MW197-051419	05/14/2019	1 U	54	19	1 U	1 U	1 U	0.2 U
ASKO-BNSF	Perched	01MW97	01MW97-051419	05/14/2019	1 U	56	20	1 U	1 U	1 U	0.2 U
ASKO-BNSF	Perched	01MW98	01MW98-051419	05/14/2019	10 U	810	57	10 U	10 U	10 U	2 U
ASKO	Perched	MW03	MW03-050319	05/03/2019	1 U	0.5 U	8.6	1 U	1 U	1 U	0.72
ASKO	Shallow	01MW07	01MW07-050219	05/02/2019	1 U	3.3	1.2	1 U	1 U	1 U	1.3
ASKO	Shallow	01MW15	01MW15-050219	05/02/2019	1 U	0.5 U	1.7	1 U	1 U	1 U	7.2
ASKO	Shallow	01MW44	01MW44-050219	05/02/2019	1 U	800	87	2	1.1	4.8	12
ASKO	Shallow	01MW45	01MW45-050219	05/02/2019	1 U	330	200	1 U	1	1 U	12
ASKO	Shallow	01MW46	01MW46-050219	05/02/2019	1 U	880	220	1 U	3.4	2.2	11
ASKO	Shallow	01MW53	01MW53-050219	05/02/2019	1 U	0.5 U	4.4	1 U	1 U	1 U	0.26
ASKO	Shallow	01MW55	01MW55-050219	05/02/2019	3.1	2,200	1,000 U	7.4	3.5	1 U	1.9
ASKO	Shallow	01MW56	01MW56-050219	05/02/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.61
ASKO	Shallow	01MW56	01MW56-050219-D	05/02/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.6
ASKO	Shallow	01MW58	01MW58-050219	05/02/2019	1 U	42	1.6	1 U	1 U	1 U	0.3
ASKO	Shallow	01MW60	01MW60-050219	05/02/2019	1 U	15	1 U	1 U	1 U	1 U	0.2 U
ASKO	Shallow	01MW62	01MW62-050219	05/02/2019	1 U	850	15	1 U	1 U	1 U	0.2 U
ASKO	Shallow	01MW63	01MW63-050219	05/02/2019	1 U	5,900	1,000 U	6.1	6.5	1.7	39
ASKO	Shallow	01MW80	01MW80-050219	05/02/2019	1 U	710	250	1 U	2.8	1.3	10
ASKO-W. Commodore Way	Shallow	01MW85	01MW85-050319	05/03/2019	1 U	0.5 U	2.4	1 U	1 U	1 U	7.9
ASKO-BNSF	Shallow	01MW93	01MW93-051419	05/14/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO-BNSF	Shallow	01MW94	01MW94-051419	05/14/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO-BNSF	Shallow	01MW95	01MW95-051419	05/14/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO-W. Commodore Way	Shallow	01MW106	01MW106-050319	05/03/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO-W. Commodore Way	Shallow	01MW107	01MW107-050619	05/06/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO	Shallow	MW01	MW01-050319	05/03/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO	Shallow	MW02	MW02-050319	05/03/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO	Shallow	MW02	MW02-050319-D	05/03/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO	Shallow	MW04	MW04-050319	05/03/2019	1 U	970	20	1 U	1 U	1 U	2.5
ASKO	Shallow	MW05	MW05-050319	05/03/2019	1 U	240	120	2.4	1 U	1 U	27
ASKO	Shallow	MW06	MW06-050319	05/03/2019	1 U	330	31	1 U	1.1	1 U	2.8
ASKO	Intermediate	01MW54	01MW54-050319	05/03/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO	Intermediate	01MW76	01MW76-050319	05/03/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO	Intermediate	01MW77	01MW77-050319	05/03/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U
ASKO	Intermediate	01MW78	01MW78-050219	05/02/2019	1 U	1.2	5.5	1 U	1 U	1 U	0.2 U
ASKO	Intermediate	01MW108	01MW108-050319	05/03/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.33
ASKO	Deep	01MW65	01MW65-050319	05/03/2019	1 U	0.5 U	1 U	1 U	1 U	1 U	0.2 U

Notes:

**Italics** Reporting limit exceeds criteria.  
**RED/BOLD** Detected exceedance of PCUL.

Abbreviations:

CAS Chemical Abstracts Service  
cVOC Chlorinated volatile organic compound  
µg/L Micrograms per liter  
PCUL Preliminary cleanup level  
RI Remedial Investigation

Qualifier:

U Analyte was not detected at the given reporting limit.

Table 5.7  
RI Analytical Results: SVOCs in Groundwater

Location				01MW01	01MW19	01MW27	01MW47	01MW48	01MW66	01MW67	01MW69	01MW84
Parcel				Bulk Terminal	Bulk Terminal	Bulk Terminal	Bulk Terminal	Bulk Terminal-W. Commodore Way	Bulk Terminal	Bulk Terminal	Bulk Terminal	Bulk Terminal-W. Commodore Way
Water-Bearing Zone				Shallow	Shallow	Shallow	Shallow	Intermediate	Shallow	Shallow	Shallow	Shallow
Sample ID				01MW01-043019	01MW19-043019	01MW27-043019	01MW47-050119	01MW48-050119	01MW66-043019	01MW67-043019	01MW69-043019	01MW84-050119
Sample Date				04/30/2019	04/30/2019	04/30/2019	05/01/2019	05/01/2019	04/30/2019	04/30/2019	04/30/2019	05/01/2019
Chemical of Interest	CAS No.	Units	PCUL									
Acenaphthene	83-32-9	µg/L	NA	--	2	--	5.3	--	--	--	0.14	3.4
Acenaphthylene	208-96-8	µg/L	NA	--	0.02 U	--	0.04 U	--	--	--	0.02 U	0.04 U
Anthracene	120-12-7	µg/L	NA	--	0.085	--	0.49	--	--	--	0.02 U	0.44
Benz(a)anthracene	56-55-3	µg/L	0.06	--	0.02 U	--	0.04 U	--	--	--	0.02 U	0.04 U
Benzo(b)fluoranthene	205-99-2	µg/L	0.06	--	0.02 U	--	0.04 U	--	--	--	0.02 U	0.04 U
Benzo(k)fluoranthene	207-08-9	µg/L	0.06	--	0.02 U	--	0.04 U	--	--	--	0.02 U	0.04 U
Benzo(a)pyrene	50-32-8	µg/L	0.06	--	0.02 U	--	0.04 U	--	--	--	0.02 U	0.04 U
Chrysene	218-01-9	µg/L	0.06	--	0.02 U	--	0.04 U	--	--	--	0.02 U	0.04 U
Dibenz(a,h)anthracene	53-70-3	µg/L	0.06	--	0.02 U	--	0.04 U	--	--	--	0.02 U	0.04 U
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/L	0.06	--	0.02 U	--	0.04 U	--	--	--	0.02 U	0.04 U
cPAH TEQ	CPAHTEQ	µg/L	0.06	--	0.015 U	--	0.03 U	--	--	--	0.015 U	0.03 U
Benzo(g,h,i)perylene	191-24-2	µg/L	NA	--	0.02 U	--	0.04 U	--	--	--	0.02 U	0.04 U
Fluoranthene	206-44-0	µg/L	NA	--	0.02 U	--	0.04 U	--	--	--	0.02 U	0.25
Fluorene	86-73-7	µg/L	NA	--	1.8	--	6.2	--	--	--	0.4	3.1
1-Methylnaphthalene	90-12-0	µg/L	NA	--	67	--	150	--	--	--	1.8	76
2-Methylnaphthalene	91-57-6	µg/L	NA	--	91	--	230	--	--	--	0.69	130
Naphthalene	91-20-3	µg/L	NA	--	96	--	77	--	--	--	4.2	190
Phenanthrene	85-01-8	µg/L	NA	--	0.96	--	6	--	--	--	0.079	4.2
Pyrene	129-00-0	µg/L	NA	--	0.02 U	--	0.048	--	--	--	0.02 U	0.12
Total PAHs	TPAH	µg/L	NA	--	260	--	480	--	--	--	7.3	410
Pentachlorophenol	87-86-5	µg/L	0.2	<b>2.1</b>	--	0.2 U	--	0.2 U	<b>3.6</b>	0.2	0.2 U	--

Notes:

-- Not analyzed.

**RED/BOLD** Detected exceedance of PCUL.

Abbreviations:

- CAS Chemical Abstracts Service
- cPAH Carcinogenic polycyclic aromatic hydrocarbon
- µg/L Micrograms per liter
- NA Not applicable
- PAH Polycyclic aromatic hydrocarbon
- PCUL Preliminary cleanup level
- RI Remedial Investigation
- SVOC Semivolatile organic compound
- TEQ Toxic equivalent

Qualifiers:

- U Analyte was not detected at the given reporting limit.
- UJ Analyte was not detected at the given reporting limit, which is considered to be an estimate.



Table 5.7  
RI Analytical Results: SVOCs in Groundwater

Location				01MW88	01MW90	01MW101	01MW102	01MW104	01MW71	MW03	02MW04	02MW07
Parcel				Bulk Terminal-W. Commodore Way	Bulk Terminal	Bulk Terminal-W. Commodore Way	Bulk Terminal-W. Commodore Way	Bulk Terminal-W. Commodore Way	ASKO	ASKO	East Waterfront	East Waterfront-Shoreline
Water-Bearing Zone				Shallow	Shallow	Shallow	Shallow	Intermediate	Perched	Perched	Shallow	Shallow
Sample ID				01MW88-050119	01MW90-050119	01MW101-050619	01MW102-050619	01MW104-050319	01MW71-050219	MW03-050319	02MW04-050319	02MW07-050319
Sample Date				05/01/2019	05/01/2019	05/06/2019	05/06/2019	05/03/2019	05/02/2019	05/03/2019	05/03/2019	05/03/2019
Chemical of Interest	CAS No.	Units	PCUL									
Acenaphthene	83-32-9	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Acenaphthylene	208-96-8	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Anthracene	120-12-7	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Benzo(a)anthracene	56-55-3	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Benzo(b)fluoranthene	205-99-2	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Benzo(k)fluoranthene	207-08-9	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Benzo(a)pyrene	50-32-8	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Chrysene	218-01-9	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Dibenz(a,h)anthracene	53-70-3	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
cPAH TEQ	CPAHTEQ	µg/L	0.06	0.03 U	0.03 U	0.03 U	0.03 U	--	0.03 U	0.03 UJ	0.03 U	0.03 U
Benzo(g,h,i)perylene	191-24-2	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Fluoranthene	206-44-0	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Fluorene	86-73-7	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
1-Methylnaphthalene	90-12-0	µg/L	NA	0.4 U	0.4 U	0.4 U	0.4 U	--	0.4 U	--	0.42	0.4 U
2-Methylnaphthalene	91-57-6	µg/L	NA	0.4 U	0.4 U	0.4 U	0.4 U	--	0.4 U	--	0.46	0.4 U
Naphthalene	91-20-3	µg/L	NA	0.4 U	0.4 U	0.4 U	0.4 U	--	0.4 U	0.4 UJ	1.2	0.4 U
Phenanthrene	85-01-8	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Pyrene	129-00-0	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U	--	0.04 U	0.04 UJ	0.04 U	0.04 U
Total PAHs	TPAH	µg/L	NA	0.4 U	0.4 U	0.4 U	0.4 U	--	0.4 U	0.4 UJ	2.1	0.4 U
Pentachlorophenol	87-86-5	µg/L	0.2	--	--	0.2 U	--	0.2 U	--	--	--	--

Notes:

-- Not analyzed.

**RED/BOLD** Detected exceedance of PCUL.

Abbreviations:

- CAS Chemical Abstracts Service
- cPAH Carcinogenic polycyclic aromatic hydrocarbon
- µg/L Micrograms per liter
- NA Not applicable
- PAH Polycyclic aromatic hydrocarbon
- PCUL Preliminary cleanup level
- RI Remedial Investigation
- SVOC Semivolatile organic compound
- TEQ Toxic equivalent

Qualifiers:

- U Analyte was not detected at the given reporting limit.
- UJ Analyte was not detected at the given reporting limit, which is considered to be an estimate.

**Table 5.7**  
**RI Analytical Results: SVOCs in Groundwater**

Location				02MW17	02MW18	02MW19	02MW20
Parcel				East Waterfront-Shoreline	East Waterfront-Shoreline	East Waterfront-Shoreline	East Waterfront-Shoreline
Water-Bearing Zone				Shallow	Shallow	Shallow	Shallow
Sample ID				02MW17-050619	02MW18-050619	02MW19-050619	02MW20-050619
Sample Date				05/06/2019	05/06/2019	05/06/2019	05/06/2019
Chemical of Interest	CAS No.	Units	PCUL				
Acenaphthene	83-32-9	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U
Acenaphthylene	208-96-8	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U
Anthracene	120-12-7	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U
Benz(a)anthracene	56-55-3	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U
Benzo(b)fluoranthene	205-99-2	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U
Benzo(k)fluoranthene	207-08-9	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U
Benzo(a)pyrene	50-32-8	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U
Chrysene	218-01-9	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U
Dibenz(a,h)anthracene	53-70-3	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/L	0.06	0.04 U	0.04 U	0.04 U	0.04 U
cPAH TEQ	CPAHTEQ	µg/L	0.06	0.03 U	0.03 U	0.03 U	0.03 U
Benzo(g,h,i)perylene	191-24-2	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U
Fluoranthene	206-44-0	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U
Fluorene	86-73-7	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U
1-Methylnaphthalene	90-12-0	µg/L	NA	0.4 U	0.4 U	0.4 U	0.4 U
2-Methylnaphthalene	91-57-6	µg/L	NA	0.4 U	0.4 U	0.4 U	0.4 U
Naphthalene	91-20-3	µg/L	NA	0.4 U	0.4 U	0.4 U	0.4 U
Phenanthrene	85-01-8	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U
Pyrene	129-00-0	µg/L	NA	0.04 U	0.04 U	0.04 U	0.04 U
Total PAHs	TPAH	µg/L	NA	0.4 U	0.4 U	0.4 U	0.4 U
Pentachlorophenol	87-86-5	µg/L	0.2	--	--	--	--

Notes:

-- Not analyzed.

**RED/BOLD** Detected exceedance of PCUL.

Abbreviations:

- CAS Chemical Abstracts Service
- cPAH Carcinogenic polycyclic aromatic hydrocarbon
- µg/L Micrograms per liter
- NA Not applicable
- PAH Polycyclic aromatic hydrocarbon
- PCUL Preliminary cleanup level
- RI Remedial Investigation
- SVOC Semivolatile organic compound
- TEQ Toxic equivalent

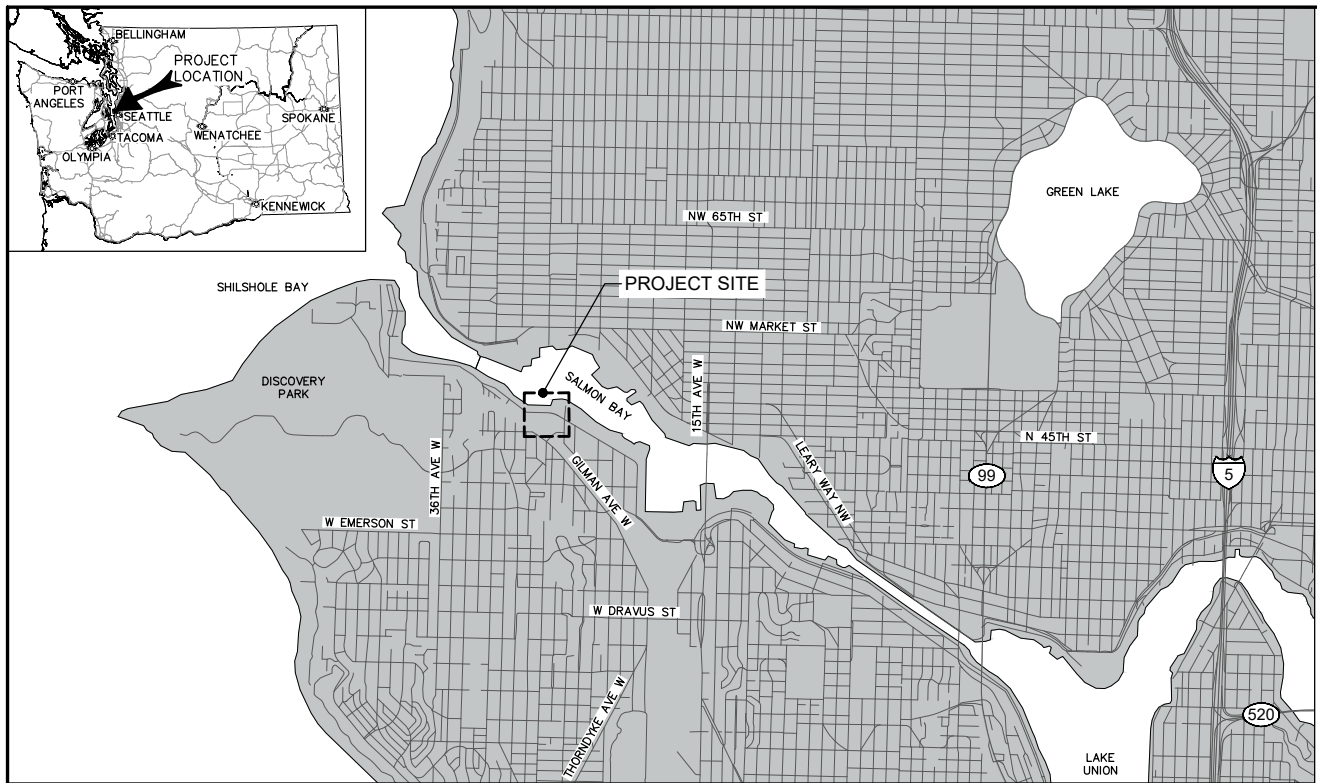
Qualifiers:

- U Analyte was not detected at the given reporting limit.
- UJ Analyte was not detected at the given reporting limit, which is considered to be an estimate.

**Appendix B Site Plans**

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# Time Oil Bulk Terminal Cleanup Action



**VICINITY MAP**  
Not to Scale

## LEGAL DESCRIPTION

**PARCEL A:**  
THE EASTERLY 78.025 FEET OF LOT 5 AND ALL OF LOTS 6, 7, 8 AND 9, BLOCK 7, SEATTLE TIDELANDS, IN KING COUNTY, WASHINGTON, AS SHOWN ON THE OFFICIAL MAPS ON FILE IN THE OFFICE OF THE COMMISSIONER OF PUBLIC LANDS AT OLYMPIA, WASHINGTON.

**PARCEL B:**  
THE EAST 111.04 FEET OF THAT PORTION OF GOVERNMENT LOT 5 OF SECTION 11, TOWNSHIP 25 NORTH, RANGE 3 EAST, WILLAMETTE MERIDIAN, IN KING COUNTY, WASHINGTON, LYING NORTH OF WEST COMMODORE WAY;

TOGETHER WITH THAT PORTION OF GOVERNMENT LOT 5 OF SECTION 11, TOWNSHIP 25 NORTH RANGE 3 EAST, WILLAMETTE MERIDIAN, IN KING COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

BEGINNING ON THE NORTHERLY LINE OF COMMODORE WAY AS NOW ESTABLISHED, AT A POINT WHICH IS 111.004 FEET WEST OF THE EAST LINE OF SAID GOVERNMENT LOT;  
THENCE WEST ALONG SAID NORTH LINE OF COMMODORE WAY 219.00 FEET;  
THENCE NORTH PARALLEL WITH THE EAST LINE OF SAID GOVERNMENT LOT TO THE SOUTHERLY LINE OF BLOCK 7, SEATTLE TIDELANDS;  
THENCE EASTERLY ALONG THE SOUTHERLY LINE OF SAID BLOCK TO A POINT WHICH IS 111.004 FEET WEST OF THE EAST LINE OF SAID GOVERNMENT LOT;  
THENCE SOUTH TO THE POINT OF BEGINNING;

EXCEPT ANY PORTION THEREOF LYING WITHIN THE SEATTLE TIDELANDS.

**PARCEL C:**  
THAT PORTION OF THE EAST 111.04 FEET GOVERNMENT LOT 5, SECTION 11, TOWNSHIP 25 NORTH, RANGE 3 EAST, WILLAMETTE MERIDIAN, IN KING COUNTY, WASHINGTON, LYING SOUTH OF COMMODORE WAY AND NORTH OF A LINE PARALLEL TO AND 180.51 FEET SOUTH OF SAID SOUTH LINE OF COMMODORE WAY, MEASURED ALONG THE EAST LINE OF SAID GOVERNMENT LOT 5;

EXCEPT THAT PORTION THEREOF, IF ANY, LYING WEST OF THE EAST LINE OF BLOCK 5, LAWTON PARK, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 12 OF PLATS, PAGE 56, IN KING COUNTY, WASHINGTON.

**PARCEL D:**  
THAT PORTION OF GOVERNMENT LOT 6, SECTION 11, TOWNSHIP 25 NORTH, RANGE 3 EAST, WILLAMETTE MERIDIAN, IN KING COUNTY, WASHINGTON, LYING NORTH OF FORT STREET (FORMERLY GOVERNMENT WAY), WEST OF 27TH AVENUE WEST, AND SOUTH OF COMMODORE WAY;

EXCEPT THE FOLLOWING PORTION:

BEGINNING AT THE SOUTHWEST CORNER OF SAID TRACT;  
THENCE NORTH ALONG THE WEST LINE OF SAID LOT 6 A DISTANCE OF 50.40 FEET;  
THENCE SOUTHEASTERLY A DISTANCE OF 84.5 FEET TO THE NORTH LINE OF FORT STREET (FORMERLY GOVERNMENT WAY);  
THENCE WEST TO THE POINT OF BEGINNING.

**PARCEL E:**  
THAT PORTION OF THE EAST 111.04 FEET OF GOVERNMENT LOT 5, SECTION 11, TOWNSHIP 25 NORTH, RANGE 3 EAST, WILLAMETTE MERIDIAN, IN KING COUNTY, WASHINGTON, LYING NORTHEASTERLY OF THAT PORTION OF THE EAST 111.04 FEET OF SAID GOVERNMENT LOT 5 CONVEYED TO THE GREAT NORTHERN RAILWAY COMPANY BY DEED RECORDED IN VOLUME 726 OF DEEDS, AT PAGE 372, UNDER

RECORDING NUMBER 652106, RECORDS OF KING COUNTY, WASHINGTON, AND SOUTHERLY OF A LINE PARALLEL TO AND 180.51 FEET SOUTHERLY OF THE SOUTHERLY MARGIN OF COMMODORE WAY MEASURED ALONG THE EAST LINE OF SAID GOVERNMENT LOT 5;

EXCEPT THAT PORTION THEREOF, IF ANY, LYING WEST OF THE EAST LINE OF BLOCK 5, LAWTON PARK, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 12 OF PLATS, PAGE 56, IN KING COUNTY, WASHINGTON.

**PARCEL F:**  
THAT PORTION OF BLOCKS 3, 4 AND 5, LAWTON PARK, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 12 OF PLATS, PAGE 56, IN KING COUNTY, WASHINGTON, AND OF VACATED STREETS AND ALLEYS ADJOINING, DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE SOUTHERLY MARGIN OF WEST COMMODORE WAY DISTANT SOUTH 54°01'35" EAST 190 FEET FROM THE NORTHWESTERLY LINE OF LOT 1, BLOCK 6, OF SAID PLAT OF LAWTON PARK;  
THENCE SOUTH 35°58'25" WEST, PARALLEL WITH SAID NORTHWESTERLY LINE TO THE NORTHEASTERLY MARGIN OF THE GREAT NORTHERN RAILWAY RIGHT OF WAY;  
THENCE SOUTHEASTERLY ALONG SAID MARGIN 500 FEET, MORE OR LESS, TO THE EAST LINE OF SAID BLOCK 5;  
THENCE NORTH 00°00'50" WEST 300 FEET, MORE OR LESS, TO THE NORTHEAST CORNER OF SAID BLOCK 5, SAID POINT BEING ON THE SOUTH MARGIN OF WEST COMMODORE WAY; THENCE WESTERLY ALONG SAID SOUTH MARGIN 400 FEET, MORE OR LESS, TO THE POINT OF BEGINNING.

**PARCEL G:**  
THAT PORTION OF GOVERNMENT LOT 5, SECTION 11, TOWNSHIP 25 NORTH, RANGE 3 EAST, WILLAMETTE MERIDIAN, IN KING COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

BEGINNING ON THE NORTH LINE OF COMMODORE WAY AS ESTABLISHED AT A POINT WHICH IS 330.004 FEET WEST OF THE EAST LINE OF SAID GOVERNMENT LOT; THENCE WEST AND NORTHWESTERLY ALONG SAID WAY LINE TO A POINT ON A LINE WHICH IS PARALLEL WITH AND 550 FEET WEST OF THE EAST LINE OF SAID GOVERNMENT LOT; THENCE NORTH ALONG SAID PARALLEL LINE TO THE SOUTHERLY LINE OF BLOCK 7, SEATTLE TIDE LANDS;  
THENCE EASTERLY ALONG SAID BLOCK 7 TO A POINT WHICH IS 330.004 FEET WEST OF THE EAST LINE OF SAID GOVERNMENT LOT;  
THENCE SOUTH TO THE BEGINNING.

**PARCEL H (SUBJECT TO CHANGE; SEE EXCEPTION 20 IN SCHEDULE B HEREIN):**  
THAT PORTION OF WASHINGTON STATE HARBOR AREA LYING NORTH OF BLOCK 7, MAP OF SEATTLE TIDE LANDS, SECTION 11, TOWNSHIP 25 NORTH, RANGE 3 EAST, W.M., DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF SAID SECTION 11;  
THENCE SOUTH 89°08'27" EAST 1323.59 FEET TO EAST LINE OF GOVERNMENT LOT 5;  
THENCE ALONG SAID EAST LINE NORTH 0°49'52" EAST 930.22 FEET TO ITS INTERSECTION WITH THE NORTH LINE OF BLOCK 7, SEATTLE TIDE LANDS, ALSO KNOWN AS THE STATE HARBOR LINE;  
THENCE NORTH 88°05'33" WEST 78.02 FEET TO THE TRUE POINT OF BEGINNING;  
THENCE NORTH 1°54'27" EAST 25.00 FEET;  
THENCE NORTH 75°32'30" WEST 366.00 FEET;  
THENCE SOUTH 14°27'30" WEST 53.00 FEET;  
THENCE SOUTH 75°32'30" EAST 210.00 FEET;  
THENCE SOUTH 1°54'27" WEST 7.16 FEET TO THE SAID HARBOR LINE;  
THENCE SOUTH 88°05'33" EAST 163.79 FEET TO THE TRUE POINT OF BEGINNING AND THE END OF THIS DESCRIPTION.

**Owner:**  
TOC Seattle Terminal 1, LLC

**Washington Department of Ecology:**  
Cleanup Oversight through a Prospective Purchaser Consent Decree No. 20-2-15215-3 SEA, effective November 25, 2020  
Ecology Project Manager: Mark Adams 425-649-7107

**Project Design Team:**  
CRETE Consulting, Inc., PC  
Primary Contact: Jamie Stevens 206-799-2744

SHEET INDEX		
SHEET NO.	DWG NO.	SHEET TITLE
1	G-1	COVER SHEET, SHEET INDEX AND VICINITY MAP
2	G-2	SITE MAP
3	G-3	GENERAL NOTES (1 OF 4)
4	G-4	GENERAL NOTES (2 OF 4)
5	G-5	GENERAL NOTES (3 OF 4)
6	G-6	GENERAL NOTES (4 OF 4)
7	G-7A	SITE SURVEY (1 OF 2)
8	G-7B	SITE SURVEY (2 OF 2)
9	G-8	SITE ACCESS, HAUL ROUTES, AND STAGING AREAS
10	G-9	DEMO AND TESC PLAN (1 OF 2)
11	G-10	DEMO AND TESC PLAN (2 OF 2)
12	G-11	TESC NOTES AND DETAILS
13	C-1	REMEDIATION AREAS
14	C-3.1	CAA-1 EXCAVATION AREA PLAN AND PROFILE
15	C-3.2	CAA-2B EXCAVATION PLAN PLAN AND PROFILE
16	C-3.3	CAA-3 AND CAA-5 EXCAVATION AREA PLAN AND PROFILE
17	C-3.4	CAA-6 AND CAA-7 EXCAVATION AREA PLAN AND PROFILE
18	C-4.1	CAA-2A INSITU SOLIDIFICATION AREA
19	C-4.2	CAA-4A INSITU SOLIDIFICATION AREA
20	C-4.3	ISS SWELL MANAGEMENT AREA
21	C5.1	UPLAND AOC CLEAN ACTION AREAS
22	C6.1	INTERCEPTOR TRENCH DESIGN
23	C7.1	TYPICAL FINAL CAP DETAILS

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Date					
Rev					
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Scale	As Noted				
	SCALE WARNING Drawing is not to scale. If scale bar doesn't measure one inch				
Designer	M. Byers				
Drafter	C. Taylor				
Checker	X				
Reviewer	X				
	Time Oil Bulk Terminal Remediation Design Seattle, Washington Cover Sheet, Sheet Index and Vicinity Map				
Drawing No.	G-1				
Sheet	1 of 23				



Rev	Date	Description	By

Client

**CRETE**  
 CONSULTING, INC.  
 108 S. Washington Street, Suite 300  
 Seattle, Washington 98104  
 (206) 491-7554  
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Scale As Noted

SCALE WARNING  
 Drawing is not to scale, if scale bar doesn't measure one inch

Designer M. Byers  
 Drafter C. Taylor  
 Checker X  
 Reviewer X

Time Oil Bulk Terminal  
 Remediation Design  
 Seattle, Washington  
**Site Map**

Drawing No.  
**G-2**  
 Sheet 2 of 23

**LEGEND**  
 [Dashed Line] PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

**EXISTING SITE PLAN**  
 0 60 120  
 SCALE IN FEET



GENERAL NOTES continued...

EARTHWORK AND SUBGRADE PREPARATION NOTES

- 1. ALL EARTHWORK AND SUBGRADE PREPARATION WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE DRAWINGS.
2. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND /OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS CONCEPTUAL. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. EXISTING UTILITIES ARE SHOWN BASED ON THE BEST AVAILABLE INFORMATION ONLY WITHIN THE LIMITS OF THE PROJECT. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL VERIFY THE PERTINENT UTILITY LOCATIONS AND ELEVATIONS. IT IS THE CONTRACTORS RESPONSIBILITY TO FULLY UNDERSTAND AND VERIFY THE CONDITION OF ANY UTILITY SERVICE LINES, AND PROTECT THOSE LINES AT ALL TIMES DURING THE COURSE OF THIS WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGES RESULTING FROM ITS ACTIONS.
3. IF DURING CONSTRUCTION, CONDITIONS ARE ENCOUNTERED WHICH DIFFER FROM THE CONDITIONS PROVIDED ON THE DRAWINGS OR LISTED WITHIN THE SPECIFICATIONS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY.
4. THE CONTRACTOR IS RESPONSIBLE FOR ALL PROJECT SAFETY.
5. USE OF DUST CONTROL MEASURES SHALL BE IMPLEMENTED AS NECESSARY TO MINIMIZE DUST GENERATION. IF WORK ACTIVITIES GENERATE VISIBLE DUST AT THE PROJECT BOUNDARIES OR IN AREAS WHERE CLEAN BACKFILL HAS BEEN PLACED, ACTIVITIES SHALL BE MODIFIED OR STOPPED WHILE DUST CONTROL MEASURES ARE IMPLEMENTED. DUST CONTROL MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, SPRINKLING AREAS WITH WATER, CHANGING THE RATE OF EXCAVATION/BACKFILLING/HAULING ACTIVITIES, OR KEEPING DROP HEIGHTS TO A MINIMUM WHILE LOADING TRUCKS.

STOCKPILE MANAGEMENT PROCEDURES

- 1. STOCKPILING SHALL BE ALLOWED ONLY IN AREAS APPROVED BY THE ENGINEER. THE EDGES OF THE STOCKPILES SHALL BE LOCATED NO CLOSER THAN 20 FEET FROM THE TOP OF THE BANK ALONG SALMON BAY.
2. STOCKPILES ARE REQUIRED TO BE LINED ON THE BOTTOM OR PLACED ON PAVEMENT TO PREVENT CONTAMINATION OF THE UNDERLYING SOIL, AND COVERED WHEN NOT DIRECTLY IN USE TO MINIMIZE THE DUST PRODUCTION AND TO PROTECT AGAINST PRECIPITATION.
3. STOCKPILE BOTTOM LINERS SHALL BE POLYETHYLENE, SHALL HAVE A MINIMUM THICKNESS OF 30 MILS AND SHALL BE RESISTANT TO WEATHERING AND DEGRADATION DUE TO CONTACT WITH CONTAMINATED MATERIALS FOR THE DURATION OF THE PROJECT WORK AND SUITABLE FOR THE INTENDED USE OF THE STOCKPILE AREA. THE LINER SHALL BE FURNISHED WITH PREFABRICATED SHOP WELDED SEAMS OR SEAMS WELDED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. DIMENSIONS MAY BE MAXIMIZED TO PROVIDE THE LARGEST MANAGEABLE SHEET.
4. THE LINER SHALL BE SUPPLIED IN ROLLS. LABELS ON EACH ROLL SHALL IDENTIFY THE THICKNESS OF THE MATERIAL, THE LENGTH AND WIDTH OF THE ROLL, LOT AND ROLL NUMBERS, AND NAME OF MANUFACTURER.
5. PREPARE THE AREA TO RECEIVE THE STOCKPILE LINER IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS TO PROVIDE A SMOOTH, FIRM SUBGRADE THAT SHALL BE FREE OF PROTRUSIONS AND SUITABLE TO PROTECT THE LINER DURING USE.
6. INSTALL BOTTOM LINER TO FULLY COVER THE SMOOTH GROUND SURFACE FOR EACH STOCKPILE. FIELD SEAMING, IF NECESSARY, SHALL BE COMPLETED IN ACCORDANCE WITH THE LINER MANUFACTURER'S RECOMMENDATIONS TO PROVIDE A WATER TIGHT SEAM. SIMPLE OVERLAPPING OF SEAMS WITHOUT SEALING IS NOT ALLOWED. ANCHOR THE LINER ADEQUATELY TO PREVENT DISPLACEMENT. MONITOR AND MAINTAIN LINER INTEGRITY. IMMEDIATELY REPAIR TEARS OR PUNCTURES WHERE DAMAGED.
7. STOCKPILE BERMS (OR ECOLOGY BLOCKS) SHALL BE FIRM, NON-YIELDING AND STABLE. BOTTOM LINER SHALL COVER ENTIRE BERM AND BE PLACED SUCH THAT ALL DRAINAGE FROM THE STOCKPILE IS CONTAINED WITHIN THE STOCKPILE CELL.
8. ONCE THE LINER IS IN PLACE AND THE STOCKPILE AREA READY TO RECEIVE/ STORE MATERIAL, THE CONTRACTOR SHALL INSTALL A CUSHIONING LAYER (MINIMUM 12 INCHES THICK) TO PROTECT THE LINER IN ACCORDANCE WITH THE LINER MANUFACTURER'S RECOMMENDATIONS. THIS LAYER CAN CONSIST OF ONSITE WASTE AS LONG AS IT MEETS THE LINER MANUFACTURER'S RECOMMENDATIONS FOR LINER PROTECTION. LEAVE THIS CUSHIONING LAYER OVER THE LINER DURING OPERATIONS TO PROTECT THE LINER FROM DAMAGE BY STOCKPILING AND LOADING OPERATIONS. SHOULD THE LINER BE DAMAGED, THE CONTRACTOR SHALL IMMEDIATELY REPAIR THE DAMAGE IN ACCORDANCE WITH

THE MANUFACTURER'S RECOMMENDATIONS AND NOT ALLOW CONTAMINATED MATERIAL OR RUN-OFF TO ESCAPE THE STOCKPILE. NO CONSTRUCTION EQUIPMENT SHALL BE ALLOWED TO DRIVE DIRECTLY OVER THE LINER.

- 9. STOCKPILE COVERS SHALL BE 6-MIL (MINIMUM THICKNESS) BLACK OR CLEAR REINFORCED POLYETHYLENE SHEETING. THE STOCKPILE COVER SHEETS SHALL BE OF SUFFICIENT LENGTH AND WIDTH TO COMPLETELY AND FULLY COVER ALL OF EACH STOCKPILE WITH NO MORE THAN TWO SHEETS.
10. STOCKPILE COVERS AND LINERS SHALL BE FREE OF HOLES OR TEARS. DEFECTIVE MATERIAL SHALL BE IMMEDIATELY REPAIRED OR REPLACED AND NOT ALLOW LEAKAGE OR ESCAPE OF MATERIAL FROM THE STOCKPILE AREA, AS DETERMINED BY THE ENGINEER.
11. INSTALL STOCKPILE COVER IN A MANNER THAT MINIMIZES WRINKLES AND PROVIDES FOR A STRAIGHT PLACEMENT. ALL SEAMS SHALL BE TAPED OR WEIGHTED DOWN FULL LENGTH AND THERE SHALL BE AT LEAST 4 FEET OF OVERLAP OF ALL SEAMS. PLACE SANDBAGS OR OTHER PREAPPROVED CLEAN WEIGHTED OBJECTS ON THE COVER AT SUFFICIENTLY CLOSE SPACING TO PREVENT UPLIFT FROM WIND. THE TOE OF SLOPES SHALL BE TIGHTLY SECURED AND COVERED BY THE SHEETING.
12. PROTECT THE COVER FROM DAMAGE. REMOVE AND REPLACE DAMAGED POLYETHYLENE SHEETING AS NEEDED OR IF DIRECTED BY THE ENGINEER.
13. FURNISH SAND BAGS OR OTHER DEVICES AS APPROVED BY THE ENGINEER OF SUFFICIENT QUANTITY AND WEIGHT AND WITH SUFFICIENTLY CLOSE SPACING TO COMPLETELY AND FULLY HOLD THE STOCKPILE COVER IN POSITION. ONLY CLEAN, UNCONTAMINATED MATERIAL SHALL BE USED TO WEIGH DOWN THE COVERING; STOCKPILE MATERIAL SHALL NOT BE USED FOR COVER WEIGHT. IN PARTICULAR, THE EDGES OF THE STOCKPILE COVER SHALL BE ADEQUATELY ANCHORED TO COMPLETELY TRAP THE MATERIAL WITHIN.
14. PROVIDE STORMWATER RUN-ON CONTROL, MANAGE ALL DRAINAGE FROM STOCKPILES, PREVENT RAIN, STORMWATER, AND SURFACE WATER FROM CONTACTING MATERIAL CONTAINED IN THE STOCKPILES.
15. COORDINATE STOCKPILING AND STOCKPILE MAINTENANCE WORK WITH EXCAVATION WORK.
16. LINE BOTTOM OF STOCKPILES AS OUTLINED IN THESE PLANS. PROVIDE STORMWATER RUN-ON CONTROL, MANAGE ALL DRAINAGE FROM STOCKPILES, PREVENT RAIN, STORMWATER, AND SURFACE WATER FROM CONTACTING MATERIAL CONTAINED IN THE STOCKPILES. COVER STOCKPILES DURING LENGTHY PERIODS OF INACTIVITY WHILE ON SITE, AT THE END OF EACH WORK DAY, JUST PRIOR TO AND DURING PERIODS OF PRECIPITATION, AND AS NECESSARY TO CONTROL DUST, EROSION AND ODORS.

STOCKPILE SAMPLING

- 1. THE FREQUENCY OF MATERIAL SAMPLING WILL DEPEND UPON THE REQUIREMENTS OF THE WASTE DISPOSAL FACILITY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CONDUCT AND COORDINATE ANY SAMPLING REQUIREMENTS MANDATED BY THE WASTE DISPOSAL FACILITY.
2. STOCKPILES LOCATED ON AREAS OVERLYING CLEAN SOILS SHALL MANDATE THAT SAMPLING OF THE UNDERLYING SOILS BE PERFORMED UPON STOCKPILE REMOVAL TO DEMONSTRATE THAT STOCKPILING DID NOT AFFECT CLEAN UNDERLYING SOILS. CONTRACTOR SHALL NOTIFY THE ENGINEER WHEN STOCKPILES HAVE BEEN COMPLETELY REMOVED AND THE ENGINEER WILL SAMPLE THE UNDERLYING SOILS. IF THE UNDERLYING SOILS ARE FOUND, THROUGH SAMPLING OR VISUAL OBSERVATIONS BY THE ENGINEER, TO BE CONTAMINATED BY THE CONTRACTOR'S STOCKPILING ACTIVITIES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMEDIATING THE CONTAMINATED SOILS TO THE ENGINEER'S SATISFACTION AT NO ADDITIONAL COST TO THE OWNER.

EXCAVATION NOTES

- 1. NO ADDITIONAL COMPENSATION SHALL BE MADE TO THE CONTRACTOR FOR DEALING WITH OBSTRUCTIONS. IF OBSTRUCTIONS ARE ENCOUNTERED DURING EXCAVATION, THE CONTRACTOR SHALL COMPLETE THE FOLLOWING STEPS:
A. NOTIFY THE ENGINEER.
B. IF THE EXPOSED OBSTRUCTION IS TOO LARGE TO REMOVE, EITHER CHIP OUT THE PORTION THAT EXTENDS INTO THE EXCAVATION, OR PROVIDE FOR THE REMOVAL TO BE COMPLETED AROUND THE OBSTRUCTION. THIS DETERMINATION WILL BE MADE WITH THE ENGINEER.
2. THE DRAWINGS IDENTIFY CONFIRMATION SAMPLING GRID CELLS THAT MUST BE SAMPLED BY THE ENGINEER TO DETERMINE IF CLEANUP GOALS HAVE BEEN MET. THE TECHNICAL EXECUTION PLAN SHALL BE DEVELOPED TO SEQUENCE THE WORK TO COINCIDE WITH THIS SAMPLING PROTOCOL.

- 3. FOR GRID CELLS THAT REQUIRE CONFIRMATION SAMPLING: UPON COMPLETION OF EXCAVATION TO THE LIMITS SHOWN ON THE DRAWINGS, THE ENGINEER WILL CONDUCT CONFIRMATION SAMPLING WITHIN THE SOIL GRID CELLS INDICATED ON THE DRAWINGS TO DETERMINE IF THE SOIL REMAINING AT THE BOTTOM AND SIDEWALLS OF EACH EXCAVATION MEETS THE REQUIRED CLEANUP GOALS.
4. NOTIFICATION:
A. THE CONTRACTOR SHALL NOTIFY THE ENGINEER UPON COMPLETION OF EXCAVATION AND DEMONSTRATE THAT THE EXCAVATION CONFIGURATION SHOWN ON THE DRAWINGS HAS BEEN ACHIEVED VIA SURVEY. THE NOTIFICATION SHALL NOT BE CONSIDERED "COMPLETE" WITHOUT SURVEY INFORMATION THAT DEMONSTRATES THAT THE EXCAVATION HAS BEEN COMPLETED IN ACCORDANCE WITH THE LINES AND GRADES SHOWN ON THE DRAWINGS.
B. FOR THE CONFIRMATION GRID CELLS THAT DO REQUIRE SAMPLING, THE ENGINEER SHALL NOTIFY THE CONTRACTOR WITHIN 3 DAYS (EXCLUDING SUNDAYS AND HOLIDAYS) OF A COMPLETE NOTIFICATION BY THE CONTRACTOR IF THE CLEANUP GOALS HAVE BEEN MET EACH GRID CELL.
5. ACTIONS THAT WILL RESULT FROM SAMPLING INCLUDE:
A. IF THE CLEANUP GOALS HAVE BEEN MET WITHIN A GRID CELL, IT WILL BE CONSIDERED READY TO BACKFILL BY THE ENGINEER AND SHALL BE BACKFILLED TO THE FINAL SITE GRADES BY THE CONTRACTOR AT A TIME THEY DEEM APPROPRIATE.
B. IF THE CLEANUP GOALS HAVE NOT BEEN MET WITHIN A GRID CELL, THE ENGINEER WILL DETERMINE WHAT ADDITIONAL DEPTH OR EXTENT OF SOIL SHALL BE REMOVED FROM THE EXCAVATION AND INFORM THE CONTRACTOR OF THE NEW REQUIRED EXCAVATION LIMITS. THE CONTRACTOR SHALL PERFORM THE ADDITIONAL REMOVAL AND PROVIDE NOTIFICATION AS DESCRIBED IN THIS SECTION. THIS PROCESS WILL CONTINUE UNTIL THE SITE CLEANUP GOALS HAVE BEEN MET.
6. THE CONTRACTOR SHALL PROVIDE A SAFE ENTRANCE INTO THE EXCAVATION FOR THE ENGINEER TO SECURE THE CONFIRMATION SAMPLES AND WORK WITH THE ENGINEER TO ACHIEVE THE SAMPLE WHICH MAY INCLUDE PROVIDING AN EXCAVATOR WITH OPERATOR THAT CAN BE USED TO REACH TO THE BOTTOM OR SIDEWALL OF THE DEEPER EXCAVATIONS TO OBTAIN A SAMPLE.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SAFETY AROUND OPEN EXCAVATIONS AND SHALL BE RESPONSIBLE FOR BACKFILLING THE OPEN EXCAVATIONS WITH CLEAN BACKFILL.

BACKFILL NOTES

- 1. SUBMIT TEST RESULTS PRIOR TO IMPORTING ANY BACKFILL MATERIAL ON THE SITE, ONE TEST FOR EVERY SOURCE OF BACKFILL MATERIAL, AND EACH TIME THE MATERIAL SOURCE IS DEEMED TO CHANGE. EACH SAMPLE SHALL BE REPRESENTATIVE OF THE CURRENT PRODUCTION AND STOCKPILE BEING SUPPLIED TO THE SITE. TESTING SHALL IN ACCORDANCE WITH
A. SIEVE ANALYSES AND COMPARISON TO THE REQUIRED SPECIFICATIONS
B. MOISTURE DENSITY CURVE FOR GRAVEL BORROW IN ACCORDANCE WITH ASTM D-1557 MODIFIED PROCTOR
C. CHEMICAL TEST RESULTS FOR ALL ANALYTES LISTED HEREIN ALONG WITH A COMPARISON OF THE ANALYTICAL TEST RESULTS TO THE SPECIFIED LEVELS
2. IMPORTED BACKFILL MATERIAL SHALL BE NATURALLY OCCURRING OR NATURAL MATERIAL BLENDED TO ACHIEVE GRADATION REQUIREMENTS LISTED HEREIN. THE BACKFILL SHALL NOT CONTAIN RECYCLED MATERIAL OF ANY TYPE AND SHALL NOT BE FROM AN INDUSTRIAL SITE. IMPORTED GRAVEL BORROW OR OTHER CLEAN SOIL SHALL BE IN COMPLIANCE WITH ANALYTICAL TESTING SPECIFICATIONS.
3. BACKFILL SHALL BE PLACED IN 12 INCH MAXIMUM LIFT THICKNESS AND COMPACTED TO 95@ASTM D-1557 MINIMUM COMPACTION.
4. THE CONTRACTOR SHALL PLACE MATERIAL USED FOR THE CONSTRUCTION OF FILL IN ROUGHLY HORIZONTAL LAYERS UPON EARTH WHICH HAS BEEN STABILIZED OR OTHERWISE APPROVED BY THE ENGINEER FOR CONSTRUCTION. THE BACKFILL SHALL BE COMPACTED WITH MODERN, EFFICIENT COMPACTING UNITS SATISFACTORY TO THE ENGINEER.
5. FIELD TESTS TO DETERMINE IN-PLACE COMPLIANCE WITH REQUIRED DENSITIES AS SPECIFIED, SHALL BE PERFORMED IN ACCORDANCE WITH ASTM D1557, D2167, OR D6938.
6. THE EXCAVATED AREA WITHIN THE W. COMMODORE WAY ROW SHALL ALSO BE BACKFILLED WITH CLEAN IMPORTED FILL AND RESTORED WITH A PAVEMENT SECTION MEETING CITY OF SEATTLE REQUIREMENTS.

MATERIAL SPECIFICATIONS

- 1.
A. QUARRY SPALLS
A.A. QUARRY SPALLS SHALL MEET THE REQUIREMENTS OF WSDOT SPECIFICATION SECTION 9-13.6.
B. GRAVEL BORROW
B.A. AGGREGATE FOR GRAVEL BORROW SHALL CONSIST OF GRANULAR MATERIAL, EITHER NATURALLY OCCURRING OR BLENDED, AND SHALL MEET THE FOLLOWING REQUIREMENTS FOR GRADATION:
SIEVE SIZE (INCHES) PERCENT PASSING
4 99 - 100
2 70 - 100
NO. 4 50 - 80
NO. 40 30 MAX.
NO. 200 7.0 MAX. \*
SAND EQUIVALENT 50 MIN.
NOTES: ALL PERCENTAGES ARE BY WEIGHT.
\* FOR BACKFILL IN WET CONDITIONS THE FINES CONTENT (MATERIAL PASSING NO. 200) SHALL BE LIMITED TO 5.0%
C. BALLAST ROCK
C.A. BALLAST ROCK SHALL MEET THE REQUIREMENTS OF WSDOT SPECIFICATION SECTION 9-03.9(1)
D. WOVEN GEOTEXTILE
D.A. WOVEN GEOTEXTILE SHALL BE US 2600 OR APPROVED EQUIVALENT

- 2. CHEMICAL ACCEPTANCE CRITERIA: CONTRACTOR SHALL PROVIDE DOCUMENTATION OF THE CHEMICAL COMPOSITION TO DEMONSTRATE THAT THE PROPOSED BACKFILL IS FREE FROM ENVIRONMENTAL CONTAMINATION. BACKFILL ANALYTES, REPORTING LIMITS, METHODS, AND CRITERIA ARE:

Table with 5 columns: Analyte, Unit, Analytical Method, Reporting Limit, Criteria. Rows include PCB Aroclors, Semi-volatile organic compounds (SVOCs), Dioxin/Furan TEQ, Arsenic, Cadmium, Chromium, Copper, Lead, Silver, Zinc, Mercury, Diesel range hydrocarbons, and Lube oil range hydrocarbons.

NOTES:
ND = NOT DETECTED AT REPORTING LIMIT; TEQ = TOXICITY EQUIVALENT.

A: MOST SVOCs, SUCH AS PAHS, HAVE REPORTING LIMITS OF 20 UG/KG DW. SOME SVOCs HAVE HIGHER REPORTING LIMITS: 2,4-DIMETHYLPHENOL - 35, 4-METHYLPHENOL - 35, BENZOIC ACID - 400, BIS(2-ETHYLHEXYL)PHTHALATE - 30, HEXACHLOROBUTADIENE - 90, DIETHYLPHTHALATE - 50, PENTACHLOROPHENOL - 200.

- 3. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION OF THE CHEMICAL COMPOSITION OF ALL IMPORT SOIL TO DEMONSTRATE THAT THE PROPOSED IMPORT MATERIAL MEETS THE CHEMICAL CRITERIA. IMPORT TESTING SHALL BE EVALUATED EITHER USING PRE-EXISTING, VERIFIABLE DATA FROM AN IMPORT SOURCE THAT WAS DEVELOPED WITHIN 180 DAYS OF THE SUBMITTAL AND IS FROM THE SAME MATERIAL SOURCE, OR BY COLLECTING SAMPLES SPECIFICALLY FOR THIS PROJECT. SAMPLES SHALL BE COLLECTED BY AN ENVIRONMENTAL PROFESSIONAL AND ALL LABORATORY TESTING SHALL BE COMPLETED BY LABS ACCREDITED BY ECOLOGY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL IMPORT MATERIAL SAMPLING, TESTING AND REPORTING.
4. ALL TESTING TO DEMONSTRATE COMPLIANCE WITH SPECIFICATIONS SHALL BE SUBMITTED AND APPROVED BY THE ENGINEER PRIOR TO PURCHASE OF THE MATERIAL. TESTING SHALL BE SUBMITTED NO LATER THAN FIVE WORKING DAYS PRIOR TO THE PLANNED DELIVERY OF MATERIALS TO THE SITE. A MINIMUM OF ONE ANALYTICAL SAMPLE SHALL BE COLLECTED FROM EACH SOURCE AND EACH MATERIAL IMPORTED.
5. THE CONTRACTOR SHALL NOT OBTAIN IMPORT MATERIAL(S) FROM INDUSTRIAL SITES. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION OF THE SOURCE AREA LAND USE AND OPERATION HISTORY WHEN PROVIDING TESTING RESULTS, TO SUPPORT THE ENGINEER'S DETERMINATION OF MATERIAL SUITABILITY.
6. THE CONTRACTOR SHALL CONDUCT ONE PHYSICAL SAMPLE FOR EACH IMPORT SOURCE PER EACH MATERIAL DELIVERED TO THE SITE FOR PLACEMENT.

Table with 5 columns: By, Description, Date, Rev, and an empty column.

Client



Table with 2 columns: Scale (As Noted), Designer (M. Byers), Drafter (C. Taylor), Checker (X), Reviewer (X).

Time Oil Bulk Terminal Remediation Design Seattle, Washington
General Notes (2 of 4)

Table with 2 columns: Drawing No. (G-4), Sheet (4 of 23).

GENERAL NOTES continued...

- IF THE IMPORT SOURCE CHANGES DURING CONSTRUCTION, NEW TESTING SHALL BE SUBMITTED FOLLOWING THE SCHEDULE AND REQUIREMENTS LISTED IN THIS SPECIFICATION. THE OWNER MAY REQUIRE ADDITIONAL TESTS IF THERE IS AN OBSERVABLE VARIANCE IN THE PROVIDED MATERIAL. SUCH TESTS SHALL BE PERFORMED AT NO ADDITIONAL COST TO THE OWNER. EACH SAMPLE SHALL BE REPRESENTATIVE OF THE CURRENT PRODUCTION AND STOCKPILE BEING SUPPLIED TO THE SITE AND TESTING SHALL BE DONE BY A ECOLOGY ACCREDITED LABORATORY.
- THE CONTRACTOR SHALL MONITOR IMPORT MATERIALS TO MAINTAIN CONSISTENT GRADATION AND CHEMICAL REQUIREMENTS AS SPECIFIED.

DEWATERING

- LOCATE DEWATERING FACILITIES WHERE THEY SHALL NOT INTERFERE WITH UTILITIES AND CONSTRUCTION WORK TO BE PERFORMED BY OTHERS INCLUDING ANY FOLLOW ON CONTRACTORS. OBTAIN APPROVAL FOR FACILITY LOCATIONS FROM THE ENGINEER.
- THE CONTRACTOR SHALL MONITOR GROUNDWATER LEVELS IN AND AROUND THE EXCAVATIONS TO ENSURE GROUNDWATER LEVELS AND HYDROSTATIC PRESSURES ARE REDUCED AS REQUIRED PRIOR TO EXCAVATION, SUCH THAT GROUNDWATER SHALL NOT PREVENT PROPER COMPLETION OF ALL WORK PERFORMED UNDER THIS CONTRACT. THE CONTRACTOR MAY USE EXISTING MONITORING WELLS.
- ACCEPTANCE BY THE ENGINEER SHALL NOT IN ANY WAY RELIEVE THE CONTRACTOR FROM THE RESPONSIBILITY FOR ERRORS THEREIN OR FROM THE RESPONSIBILITY FOR COMPLETE AND ADEQUATE DESIGN, MATERIALS, INSTALLATION METHODS, OPERATION METHODS, OR ADEQUATE MAINTENANCE OF THE SYSTEM.
- THE CONTRACTOR SHALL EMPLOY MATERIALS, EQUIPMENT, AND CONSTRUCTION METHODS COMMONLY USED AND PROVEN AS SUITABLE FOR THE DURATION OF CONSTRUCTION DEWATERING AND ANY SURFACE WATER CONTROL SYSTEMS.
- THE CONTRACTOR SHALL BEAR FULL RESPONSIBILITY FOR ACQUIRING A WATER SUPPLY WITH WHICH TO INSTALL AND OPERATE ANY DEWATERING SYSTEM COMPONENTS PROPOSED IN THE DEWATERING SYSTEM PLAN.
- THE CONTRACTOR SHALL VERIFY AND INDEPENDENTLY INTERPRET THE AVAILABLE SUBSURFACE INFORMATION PRESENTED IN THE CONTRACT DOCUMENTS AND ASSOCIATED TECHNICAL EXHIBITS AND SUPPLEMENT THE EXISTING DATA NECESSARY IN ORDER TO COMPLETE THE DESIGN AND CONSTRUCTION.
- THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE ADEQUACY OF THE DESIGNED DEWATERING SYSTEM TO PERFORM THE DESIRED FUNCTION.

INSITU SOLIDIFICATION NOTES

SUBMITTALS

- THE CONTRACTOR SHALL SUBMIT THE FOLLOWING INFORMATION IN THE TECHNICAL EXECUTION PLAN FOR THE ISS DESIGN PLAN:
  - DESCRIPTION AND SPECIFICATIONS OF ISS SYSTEM, EQUIPMENT, AND PROCESSES.
  - ISS LAYOUT DRAWING SHOWING THE CONFIGURATION AND LAYOUT OF THE ISS SYSTEM.
  - SITE MAPS SHOWING THE PROPOSED LAYOUT AND PATTERN OF THE INDIVIDUAL ISS MIXING CELLS.
  - PROPOSED APPROACH FOR MIXING CAA-4 IN TWO LIFTS, RELOCATION OF THE UPPER LIFT MIXED SOIL TO ISS SWELL MANAGEMENT AREA, AND BACKFILLING WITH LOWER LIFT ISS SWELL IN CONJUNCTION WITH PLACEMENT OF THE INTERCEPTOR TRENCH.
  - METHODS FOR DETERMINING AND VERIFYING THE COORDINATES, ELEVATIONS, AND DEPTHS OF THE ISS MIXING CELLS.
  - METHODS FOR CONTROLLING NOISE LEVELS GENERATED FROM THE ISS EQUIPMENT.
  - PROPOSED METHODS TO PREPARE GROUT MIXTURES AND TO PROPORTION REAGENTS TO VERIFY PROPER PORTIONS.
  - TOTAL ESTIMATED QUANTITY OF WATER AND SOLIDIFICATION REAGENTS REQUIRED FOR THE WORK BASED ON THESE DRAWINGS, AVAILABLE SOIL BORING INFORMATION, CONTRACTOR'S TREATABILITY STUDY, AND THE CONTRACTOR'S LAYOUT PLAN FOR THE ISS MIXING CELLS.
  - SOLIDIFICATION PROCEDURES AND SEQUENCING, INCLUDING COORDINATION WITH SHORING INSTALLATION AND INTERCEPTOR TRENCH PLACEMENT.
  - ASSOCIATED DEWATERING PROCEDURES.
  - ESTIMATED PRODUCTION RATE FOR SOLIDIFICATION IN TERMS OF NUMBER OF MIXING CELLS PER DAY.
  - METHODS FOR HANDLING GENERATED SWELL.
  - ESTIMATED SCHEDULE FOR COMPLETION.
  - ANY PROPOSED DEVIATIONS FROM THE DRAWINGS.
  - SPILL CONTROL MEASURES.
  - WASH OUT AND GROUT DISPOSAL FACILITIES AND PRACTICES.
  - EROSION CONTROL.
  - SAMPLING METHODS, PERSONNEL, AND EQUIPMENT.
  - RESUMES FOR KEY PERSONNEL ASSIGNED TO CONDUCT THE WORK, INCLUDING PROJECT SUPERINTENDED, EQUIPMENT OPERATIONS, GROUT PLANT OPERATORS, SUPERVISORY ENGINEERING STAFF AND OTHER TECHNICAL STAFF.
  - DISCUSSION OF BACKUP EQUIPMENT REQUIRED AND/OR AVAILABLE FOR THIS PROJECT.
- CONTRACTOR SHALL PROVIDE DAILY SUBMITTALS DURING THE WORK SUMMARIZING THE FOLLOWING INFORMATION AT A MINIMUM:
  - NUMBER OF MIXING CELLS SOLIDIFIED
  - MIX DESIGN CALCULATIONS
  - SOLIDIFICATION EQUIPMENT USED
  - ANY UNFORESEEN SITE CONDITIONS OR EQUIPMENT PROBLEMS THAT AFFECTED SOLIDIFICATION EFFORTS
  - ANY MODIFICATIONS OR DEVIATIONS FROM THE SPECIFICATIONS, DRAWINGS OR THE TECHNICAL EXECUTION PLAN
  - IDENTIFICATION OF PORTIONS OF MIXING CELLS NOT COMPLETED DUE TO REFUSAL
- CONTRACTOR SHALL PROVIDE WEEKLY SUBMITTALS SUMMARIZING THE FOLLOWING INFORMATION AT A MINIMUM:
  - TOTAL QUANTITY OF SOLID SOLIDIFIED FOR THE WEEK IN CUBIC YARDS AND NUMBER OF MIXING CELLS
  - QUANTITIES OF REAGENTS USED DURING THE WEEK
  - QUANTITIES OF REAGENTS DELIVERED TO THE SITE DURING THE WEEK WITH BACKUP IN FORM OF WEIGHT RECIPES, BILLS OF LADING, FLOW METER RECORDS, OR EQUIVALENT
  - PERCENT COMPLETE FOR ALL SOLIDIFICATION
  - SOLIDIFICATION PROGRESS SCHEDULE AND ANY MODIFICATIONS TO THE PROJECT SCHEDULE BASED ON THE WEEKLY PRODUCTION
  - SWELL DISPOSAL/HANDLING METHODS AND QUANTITIES MANAGED FOR THE WEEK
  - WASHOUT AND GROUT DISPOSAL AND HANDLING METHODS AND QUANTITIES MANAGED FOR THE WEEK

GROUT MIX DESIGN

- CONTRACTOR SHALL PROVIDE THE PROPOSED MIX DESIGN, BASED ON THE ADDITIONAL MIX DESIGN STUDY PERFORMED, TO BE USED FOR PRODUCTION TO MEET THE PERFORMANCE REQUIREMENTS OF THE PROJECT.
- CONTRACTOR SHALL PROVIDE PORTLAND CEMENT AND GROUND GRANULATED BLAST FURNACE SLAG (GGBFS) AS APPROVED BY THE ENGINEER IN ACCORDANCE WITH THE APPROVED PRODUCTION MIX DESIGN IN SUFFICIENT QUANTITIES TO MAINTAIN THE REQUIRED PRODUCTION RATE.
- CONTRACTOR SHALL COMPLETE A FORM ACCEPTABLE TO THE ENGINEER TO CALCULATE THE MINIMUM REAGENT PORTIONS AS FOLLOWS:

- CALCULATE THE VOLUME OF SOIL BEING TREATED IN THE EACH CELL BASED ON THE TOTAL DEPTH AND SQUARE FOOTAGE OF THE CELL.
- CALCULATE THE WEIGHT OF SOIL BEING TREATED IN THE MIXING CELL BASED ON THE PREVIOUSLY CALCULATED VOLUME, USING AN APPROPRIATE UNIT DENSITY FOR THE SOIL BEING SOLIDIFIED.
- WATER AND REAGENT ADDITION SHALL BE IN ACCORDANCE WITH THE RATIOS DEFINED IN THE ENGINEER-APPROVED PRODUCTION MIX DESIGN. CONTRACTOR SHALL KEEP THE WATER RATIO AT A MINIMUM TO OBTAIN A WORKABLE GROUT AND MINIMIZE SWELL.
- CONTRACTOR SHALL NOT MODIFY THE GROUT MIX PROPORTIONS OF THE APPROVED PRODUCTION MIX DESIGN WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER.
- CONTRACTOR SHALL PROVIDE A FORM DETAILING THE MATERIAL USED BATCH MIXING INFORMATION AND CORRECT MIX RATIO VERIFICATION FOR EACH MIXING CELL.

PERFORMANCE REQUIREMENTS

- MIXING CELLS SHALL BE LAID OUT IN A MANNER TO STABILIZE THE ENTIRE AREA SO THAT NO SOIL IS UNTREATED.
- THE PRODUCTION ISS MIXING CELLS SHALL MEET THE FOLLOWING PERFORMANCE STANDARDS. PRODUCTION MIXING CELLS THAT DO NOT MEET THE PERFORMANCE TESTING REQUIREMENTS SHALL BE RE-MIXED, RE-SAMPLED, AND RE-TESTED AT THE CONTRACTOR'S SOLE EXPENSE UNTIL THE MIXING CELL MEETS THE PERFORMANCE REQUIREMENTS:
  - HYDRAULIC CONDUCTIVITY LESS THAN 1X10-6 CM/SEC
  - UNCONFINED COMPRESSIVE STRENGTH (28 DAYS) GREATER THAN 50 PSI
  - ALL PERIMETER ISS MIXING CELLS SHALL ACHIEVE THE PERFORMANCE CRITERIA
  - UP TO 10% OF INTERIOR ISS MIXING CELLS MAY FAIL THE ABOVE CRITERIA BUT EACH GRID CELL MUST HAVE A HYDRAULIC CONDUCTIVITY NO GREATER THAN 10-5 CM/S AND A UCS NO LESS THAN 30 PSI
- CONTRACTOR SHALL COMPLETE A MINIMUM OF TWO TEST MIXING CELLS IN EACH CAA AT A LOCATION DESIGNATED BY THE ENGINEER PRIOR TO PRODUCTION MIXING CELLS TO ENSURE THAT THE PERFORMANCE STANDARDS SHALL BE ACHIEVED USING THE PRODUCTION MIX DESIGN SUBMITTED TO THE ENGINEER. CONTRACTOR SHALL OBTAIN SAMPLES OF THE TREATED SOIL MASS IN THE TEST MIXING CELLS USING THE PRODUCTION SAMPLING EQUIPMENT AND TEST THE SAMPLES TO DEMONSTRATE THAT THE PROJECT PERFORMANCE REQUIREMENTS SHALL BE ACHIEVED. THE TEST CELL(S) SHALL BE LOCATED WITHIN THE ISS FOOTPRINT AND WILL BECOME PART OF THE FINAL ISS AREA AFTER TESTING.
- THE BOTTOM ELEVATION FOR ISS TREATMENT IS SHOWN ON THE DRAWINGS FOR EACH MIXING CELL. TO THE EXTENT THAT CONTRACTOR MODIFIES THE PROPOSED MIXING CELLS, THE BOTTOM ELEVATIONS WILL NEED TO BE APPROVED BY ENGINEER. CONTRACTOR SHALL NOT DEVIATE FROM THE ELEVATIONS BY GREATER THAN 0.5 FEET WITHOUT WRITTEN AUTHORIZATION BY THE ENGINEER.
- IF SUBSURFACE OBSTRUCTIONS ARE ENCOUNTERED DURING ISS MIXING, CONTRACTOR SHALL IDENTIFY THE OBSTRUCTION, INFORM THE ENGINEER, AND DEVELOP A COURSE OF ACTION TO SAFELY AND EFFECTIVELY REMOVE THE OBSTRUCTION. DEPENDING ON THE NATURE OF THE OBSTRUCTION, THE MATERIALS SHALL BE SEPARATED AND MANAGED AS APPROVED BY ENGINEER. MATERIAL MAY BE PLACED IN THE ISS SWELL MANAGEMENT AREA OR LOADED INTO DESIGNATED WASTE CONTAINERS FOR CONTAINMENT AND TRANSPORT OF THAT CLASS OF WASTE TO AN OFF-SITE DISPOSAL FACILITY. OBSTRUCTIONS WHICH CANNOT BE PENETRATED OR REMOVED MAY BE LEFT IN PLACE WITH THE ISS EXCAVATOR PATTERN ADJUSTED TO ALLOW MIXING WHICH CAN BE COMPLETED AROUND THE OBSTRUCTION OR WITH GROUTING AROUND THE OBSTRUCTION.
- CONTRACTOR SHALL ENSURE THAT THE GROUT IS DISTRIBUTED EVENLY THROUGH THE MIXING CELL AND THAT THE GROUT AND SOIL AT EACH MIXING CELL IS A HOMOGENEOUS MIXTURE TO MEET THE PERFORMANCE REQUIREMENTS.
- CONTRACTOR SHALL INSPECT AND PREPARE A TEST SAMPLE OF TREATED SOIL. SAMPLES WILL BE VISUALLY INSPECTED TO VERIFY THAT A HOMOGENEOUS MIXTURE HAS BEEN CREATED, BASED ON THE FOLLOWING CRITERIA:
  - NO VISIBLE NON AQUEOUS PHASE LIQUID (NAPL)
  - GROUT AND SOIL ARE THOROUGHLY MIXED IN THE MIXING CELL
  - CONSISTENT COLOR FOR SAMPLES COLLECTED FROM DIFFERENT DEPTH INTERVALS AND LOCATIONS IN THE MIXING CELL
  - THERE ARE NO UNMIXED SOIL CLUMPS GREATER THAN 6 INCHES
- SAMPLES COLLECTED BY CONTRACTOR SHALL BE TESTED FOR UNCONFINED COMPRESSIVE STRENGTH AND HYDRAULIC CONDUCTIVITY TO DEMONSTRATE THAT THE SAMPLES MEET THE PERFORMANCE REQUIREMENTS.

- CONTRACTOR SHALL CONDUCT THE WORK IN A MANNER TO MINIMIZE THE AMOUNT OF SWELL PRODUCED BY THE SOLIDIFICATION PROCESSES.

SOLIDIFICATION WATER

- WATER SHALL BE OBTAINED FROM THE CITY OF SEATTLE VIA A FIRE HYDRANT OR WATER SERVICE CONNECTION, ON OR NEAR THE SITE. THE WATER SERVICE SHALL BE EQUIPPED WITH A BACKFLOW PREVENTER. CONTRACTOR SHALL OBTAIN ALL PERMITS AND ARRANGE FOR TEMPORARY HOOK UP OF WATER SERVICE AND PAY ALL FEES FOR CITY WATER USAGE. CONTRACTOR MAY USE OTHER INCIDENTAL SOURCES OF WATER (E.G. STORMWATER) FOR SOLIDIFICATION WITH APPROVAL FROM THE ENGINEER.
- CONTRACTOR SHALL PROVIDE A MEANS OF MEASURING WATER FOR BATCH MIXING. THE MEASURING DEVICE SHALL MEASURE TOTALIZED AND INSTANTANEOUS FLOWS. MEASURING DEVICES SHALL BE CALIBRATED TO WITHIN +/- 2% TO ACCURATELY MEASURE THE WATER FOR EACH BATCH. CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR THE CALIBRATION. MEASURING DEVICES SHALL BE RECALIBRATED PER THE MANUFACTURERS RECOMMENDATIONS AND MONTHLY DURING THE WORK.
- CONTRACTOR SHALL PROVIDE AND MAINTAIN ALL PIPES AND HOSES USED TO CONNECT THE GROUT MIXING PLANT TO THE CITY OF SEATTLE WATER SUPPLY SYSTEM.
- IF WATER FOR ISS IS STORED ON THE SITE, STORAGE CONTAINERS SHALL BE FREE OF ANY WASTE MATERIALS, DEBRIS, AND OTHER ITEMS THAT MAY BE DELETERIOUS TO THE EXECUTION OF THE SOLIDIFICATION PROCESSES.

REAGENTS

- CONTRACTOR SHALL PROVIDE PORTLAND CEMENT AND GGBFS APPROVED BY THE ENGINEER IN ACCORDANCE WITH THE APPROVED PRODUCTION MIX DESIGN.
- UNLESS THE LIMIT AND DEPTHS SHOWN ON THE DRAWINGS ARE INCREASED AS DETERMINED BY THE ENGINEER, THE CONTRACTOR SHALL PURCHASE ANY ADDITIONAL REAGENTS AT NO EXPENSE TO THE OWNER DUE TO WASTE OR OVER APPLICATION.
- REAGENT REQUIREMENTS (MODIFICATIONS MAY BE MADE IN ACCORDANCE WITH THE APPROVED PRODUCTION MIX DESIGN SUBMITTED BY THE CONTRACTOR)
  - PORTLAND CEMENT - TYPE I PORTLAND CEMENT MEETING THE REQUIREMENTS OF ASTM C150
  - GGBFS - GRADE 100 MEETING THE REQUIREMENTS OF ASTM C989.

GROUT PREPARATION

- CONTRACTOR SHALL PROVIDE ALL EQUIPMENT, MATERIALS, AND PERSONNEL NEEDED TO PROPERLY PREPARE THE GROUT IN ACCORDANCE WITH THE ENGINEER-APPROVED PRODUCTION MIX DESIGN AND THESE SPECIFICATIONS.
- CONTRACTOR SHALL COMPLETE A FORM TO CALCULATE THE NEEDED QUANTITIES OF WATER AND REAGENTS FOR EACH MIXING CELL:
  - AMOUNT OF EACH REAGENT ADDED
  - GROUT DENSITY
  - ISS MIXING CELL NUMBER
- CONTRACTOR SHALL ADD THE CALCULATED QUANTITIES OF WATER AND REAGENTS TO THE GROUT MIXING PLANT.
- CONTRACTOR SHALL THOROUGHLY MIX THE WATER AND REAGENT MIXTURE UNTIL IT IS A CONSISTENT AND HOMOGENOUS MIXTURE.
- CONTRACTOR SHALL PUMP THE GROUT MIXTURE FROM THE GROUT MIXING PLANT TO THE ISS EQUIPMENT.
- CONTRACTOR SHALL PROVIDE THE PUMPS, HOSES, AND PIPING AS A MEANS OF DELIVERING THE MIXED GROUT FROM THE GROUT MIXING PLANT TO THE MIXING CELL AT AN ADEQUATE PRESSURE AND FLOW RATE FOR THE SOLIDIFICATION PROCESS.
- PROCESSED GROUT HELD FOR GREATER THAN 3 HOURS PRIOR TO USING SHALL BE DISCARDED AT THE CONTRACTOR'S EXPENSE.
- CONTRACTOR SHALL PROVIDE GROUT MIXING EQUIPMENT OF SIZE AND CAPACITY AS TO NOT LIMIT THE PRODUCTION OF THE ISS MIXING EQUIPMENT.

File: D:\Projects\Create\Time Oil Seattle\G-5 thru G-6.dwg Plot Date: March 10, 2021 Plotted by: Cabryn

By							
	Description						
		Date					
		Rev					
Client	 <p>108 S. Washington Street, Suite 300 Seattle, Washington 98104 (206) 491-7554 www.creteconsulting.com</p>						
	Scale	As Noted					
	<p>SCALE WARNING Drawing is not to scale, if scale bar doesn't measure one inch</p> 						
	Designer	M. Byers					
Drafter	C. Taylor						
Checker	X						
Reviewer	X						
<p>Time Oil Bulk Terminal Remediation Design Seattle, Washington</p> <p>General Notes (3 of 4)</p>							
Drawing No. G-5							
Sheet 5 of 23							



**COORDINATION OF WORK**

1. CONTRACTOR SHALL COORDINATE ISS ACTIVITIES WITH SHORING EXCAVATION, DEWATERING, SAMPLING, BACKFILLING, AND OTHER WORK AS NECESSARY.
2. AS PART OF THE ISS WORK, DEMOLITION OF SURFACES AND EXCAVATION OF CLEAN OVERBURDEN SHALL BE CONDUCTED PRIOR TO BEGINNING ISS WORK.
3. DEWATERING SHALL BE CONDUCTED ONLY TO THE EXTENT NECESSARY TO COMPLETE THE WORK.
4. CONTRACTOR SHALL COLLECT SAMPLES FROM THE COMPLETE MIXING CELLS IN ACCORDANCE WITH THE DRAWINGS.
5. CONTRACTOR SHALL NOT BACKFILL ANY AREAS WITHOUT WRITTEN APPROVAL FROM THE ENGINEER.

**SOLIDIFICATION**

1. CONTRACTOR SHALL PROVIDE ALL PERSONNEL, EQUIPMENT, AND MATERIALS REQUIRED TO CONDUCT THE WORK IDENTIFIED IN THESE SPECIFICATIONS.
2. SOLIDIFICATION SHALL BE CONDUCTED TO THE EXTENTS, DEPTHS, AND ELEVATIONS SHOWN IN THESE DRAWINGS.
3. CONTRACTOR PERSONNEL SHALL PERFORM SURVEYING TO CONFIRM THE MIXING CELL COORDINATES AND THE GROUND SURFACE AND BOTTOM ELEVATION FOR ISS TREATMENT.
4. CONTRACTOR SHALL NOTE ANY VARIANCE FOR THE ISS DEPTH AND ADJUST GROUT MIX ACCORDINGLY.
5. REAGENT ADDITION SHALL BE AT THE PRESCRIBED PROPORTIONS IN THE APPROVED MIX DESIGN AND CALCULATED ON THE CONTRACTOR'S FORM.
6. CONTRACTOR SHALL MIX GROUT WITH IMPACTED SOIL UNTIL IT IS A HOMOGENEOUS MIXTURE OF SOIL AND GROUT FROM THE GROUND SURFACE TO THE BOTTOM ELEVATION OF ISS TREATMENT SHOWN ON THE DRAWINGS.
7. CONTRACTOR SHALL COMPLETE A FORM TO CALCULATE THE NEEDED QUANTITIES OF WATER AND REAGENTS FOR EACH MIXING CELL:
  - A. AMOUNT OF EACH REAGENT ADDED
  - B. GROUT DENSITY
  - C. ISS MIXING CELL NUMBER
  - D. MIXING CELL COORDINATES
  - E. GROUND SURFACE ELEVATION
  - F. BOTTOM ELEVATION FOR ISS TREATMENT PROVIDED IN THE DRAWINGS
  - G. ACTUAL BOTTOM ELEVATION OF MIXING CELL
  - H. START AND FINISH TIME
  - I. GROUT ADDITION RATE

**SWELL MANAGEMENT**

1. CONTRACTOR SHALL REMOVE SWELL GENERATED DURING ISS OPERATION FROM THE IMMEDIATE WORK AREA AS REQUIRED TO ALLOW WORK TO PROCEED.
2. A SPECIFIC AREA OF THE BULK TERMINAL PARCEL HAS BEEN IDENTIFIED FOR PLACEMENT OF EXCESS ISS SWELL MATERIAL. THE CONTRACTOR SHALL MOVE EXCESS ISS SWELL MATERIAL TO THE DESIGNATED AREA WHILE THE SWELL MATERIAL IS STILL WORKABLE. CONTRACTOR SHALL COORDINATE WITH ENGINEER REGARDING THE LOCATION AND THICKNESS OF SWELL PLACEMENT BASED ON ACTUAL SWELL PRODUCTION DURING CONSTRUCTION.
3. CONTRACTOR SHALL PLACE SWELL MATERIAL AT THE NORTH END OF CAA-4 IN CONJUNCTION WITH INSTALLATION OF THE INTERCEPTOR TRENCH AND ISS SURFACE GRADING. SWELL MATERIAL ADJACENT TO THE INTERCEPTOR TRENCH SHALL BE WRAPPED WITH A WOVEN GEOTEXTILE FABRIC DURING PLACEMENT AND COMPACTION TO SEPARATE THE TREATED ISS MATERIAL FROM THE TRENCH BACKFILL.
4. ISS FLUFF SHOULD BE COMPACTED IN 6-INCH LIFTS USING A DOZER FOLLOWED BY A SMOOTH DRUM ROLLER ON THE FINAL LIFT TO CREATE A SMOOTH SURFACE. ALL FILL SUPPORTING STRUCTURES, INCLUDING BUILDINGS AND PAVEMENTS, SHOULD BE MOISTURE CONDITIONED AND COMPACTED TO A DENSE AND UNYIELDING CONDITION AS DETERMINED BY PANGEO'S FIELD REPRESENTATIVE.

**PERFORMANCE MONITORING**

1. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SAMPLING AND PERFORMANCE TESTING REQUIRED IN THIS SECTION. CONTRACTOR SHALL ALSO PROVIDE A DUPLICATE SET OF SAMPLES TO THE ENGINEER UPON REQUEST OF THE ENGINEER FOR EVERY SAMPLE TAKEN FOR PRODUCTION TESTING.
2. PERIODICALLY THE ENGINEER WILL VISUALLY INSPECT EACH BATCH OF MIXED GROUT TO ENSURE THAT THE GROUT HAS BEEN SUFFICIENTLY MIXED. CONTRACTOR SHALL CONTINUE TO MIX GROUT UNTIL IT IS THOROUGHLY MIXED TO THE SATISFACTION OF THE ENGINEER.
3. CONTRACTOR SHALL COLLECT IN SITU BULK SAMPLES FROM NEWLY SOLIDIFIED MIXING CELLS.
  - A. SAMPLING TIMING - SAMPLING OF THE MIXING CELLS SHALL OCCUR WITHIN 4 HOURS OF MIXING CELL COMPLETION WHILE THE MIXING CELL IS STILL WET.
  - B. SAMPLING TOOL - CONTRACTOR SHALL PROVIDE AND USE A SUITABLE IN SITU SAMPLING TOOL TO COLLECT THE SAMPLES. THE MINIMUM SAMPLE VOLUME OF THE TOOL SHALL BE 3.0 GALLONS. THE SAMPLER SHALL CONSIST OF A WEIGHTED CHAMBER, WHICH CAN BE OPENED AND CLOSED FROM THE SURFACE TO OBTAIN MIXED SOIL AND GROUT AT DEPTH IN THE MIXING CELL. THE SAMPLER SHALL BE CAPABLE OF SAMPLING TO THE DEPTH OF THE BOTTOM ELEVATION FOR ISS TREATMENT IN ALL LOCATIONS.
  - C. SAMPLING FREQUENCY - AT A MINIMUM, 1 SAMPLE WILL BE COLLECTED FROM EACH MIXING CELL PER DAY OF PRODUCTION. THE MIXING CELL WILL BE CHOSEN BY THE ENGINEER.
  - D. NUMBER OF SAMPLES PER MIXING CELL - A SAMPLE FOR QUALITY CONTROL TESTING SHALL BE COLLECTED FROM EACH MIXING CELL. MIXING CELL SIZES HAVE BEEN SELECTED TO APPROXIMATE 1 DAY OR SHIFT OF PRODUCTION FOR 1 EXCAVATOR. THE SAMPLE WILL BE COLLECTED FROM THE LOCATION AND DEPTH SPECIFIED BY THE ENGINEER AT THE TIME OF SAMPLING AND WILL VARY FOR EACH MIXING CELL. CONTRACTOR SHALL FORM THE REQUIRED NUMBER OF INDIVIDUAL CYLINDERS OR MOLDS TO PERFORM THE TESTING DESCRIBED BELOW. ADDITIONAL CYLINDERS WILL BE REQUIRED TO PERFORM DUPLICATE TESTING ON 10% OF THE MIXING CELLS.
  - E. TESTING OF SAMPLES - CONTRACTOR SHALL BE RESPONSIBLE FOR PERFORMING ALL OF THE QUALITY CONTROL TESTING. CONTRACTOR SHALL TEST TWO CYLINDERS FROM EACH MIXING CELL. THE FIRST CYLINDER OR MOLD SHALL BE TESTED FOR HYDRAULIC CONDUCTIVITY AND UNCONFINED COMPRESSIVE STRENGTH AT 10 DAYS. THE SECOND CYLINDER SHALL BE TESTED FOR PERMEABILITY AND UNCONFINED COMPRESSIVE STRENGTH AT 28 DAYS. IF THE RESULTS AT 28 DAYS DO NOT ACHIEVE THE PROJECT PERFORMANCE REQUIREMENTS, A THIRD CYLINDER SHALL BE TESTED FOR PERMEABILITY AND UNCONFINED COMPRESSIVE STRENGTH. ADDITIONAL TESTING OF CYLINDERS FROM THE SAME MIXING CELL MAY BE REQUIRED IF THE 28 DAY TESTS DO NOT ACHIEVE THE PROJECT PERFORMANCE REQUIREMENTS. ALL ADDITIONAL TESTING PERFORMED AT THE ENGINEERS DISCRETION ON THE MIXING CELL AFTER FAILING 28 DAY TESTS SHALL BE AT THE CONTRACTOR'S EXPENSE. ALTERNATELY, THE CONTRACTOR MAY CHOOSE TO REMIX AND RETEST THE FAILING MIXING CELL RATHER THAN PERFORM ADDITIONAL LABORATORY TESTS ON SAMPLES.
4. THE ENGINEER WILL DETERMINE WHETHER THE CONTRACTOR'S ISS OPERATIONS MEET SPECIFIED PERFORMANCE REQUIREMENTS BASED ON THE QUALITY CONTROL LABORATORY TESTING RESULTS.
5. THE ENGINEER MAY REQUIRE ADDITIONAL SAMPLING DURING THE COURSE OF THE PROJECT.

File: D:\Projects\Create\Time Oil Seattle\G-6 thru G-6.dwg Plot Date: March 10, 2021 Plotted by: Cabryn

By	Date	Description

Rev	Date	Description

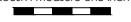
Client



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Scale	As Noted
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**SCALE WARNING**  
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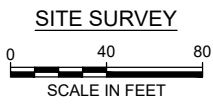
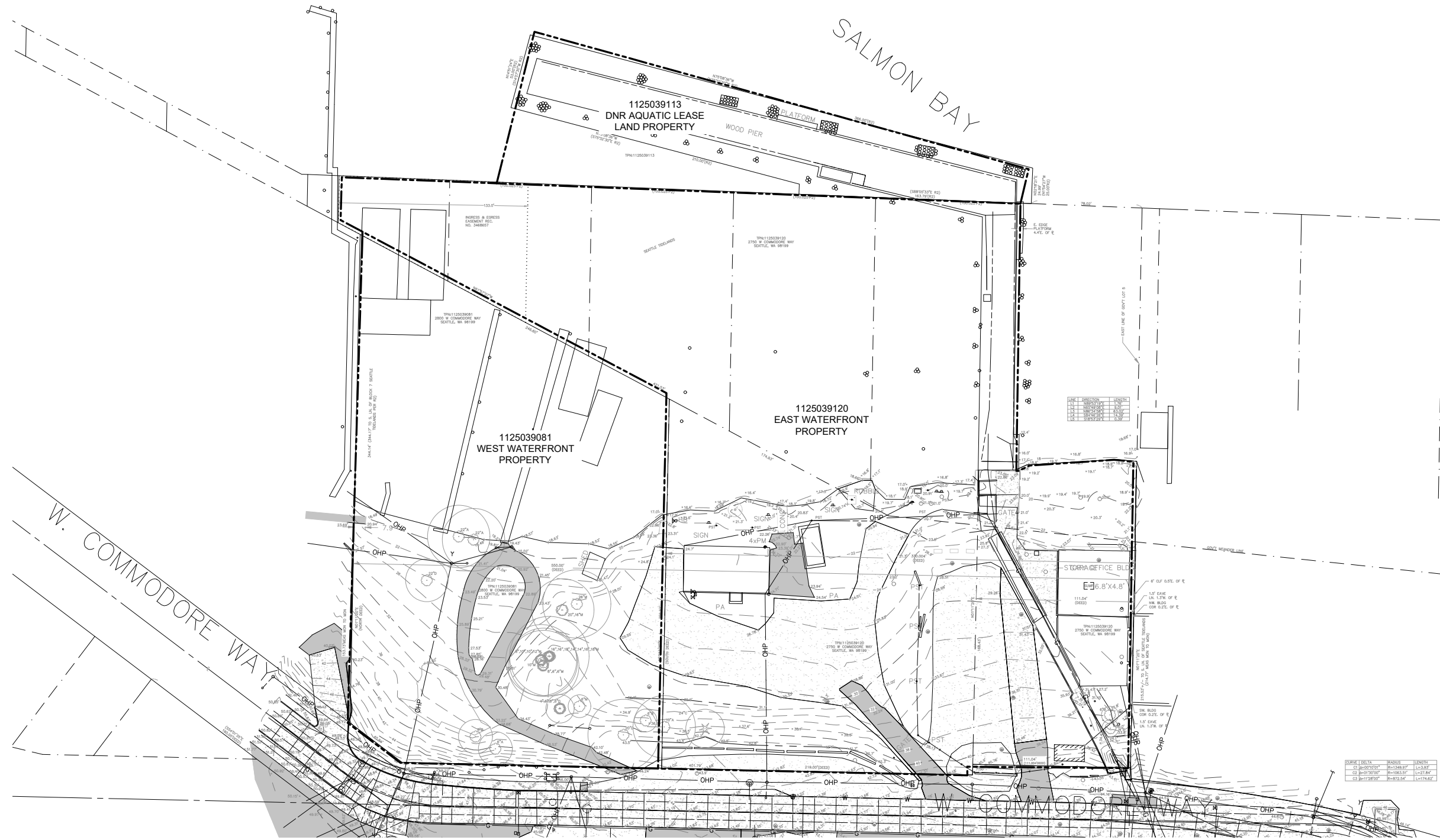
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Drafter	C. Taylor
Checker	X
Reviewer	X

**Time Oil Bulk Terminal  
Remediation Design  
Seattle, Washington**

**General Notes  
(4 of 4)**

Drawing No.  
**G-6**

Sheet **6** of 23



- NOTES**
1. SITE SURVEY BY AXIS SURVEY & MAPPING, DATED 12-9-2020.

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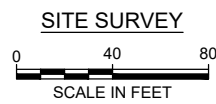
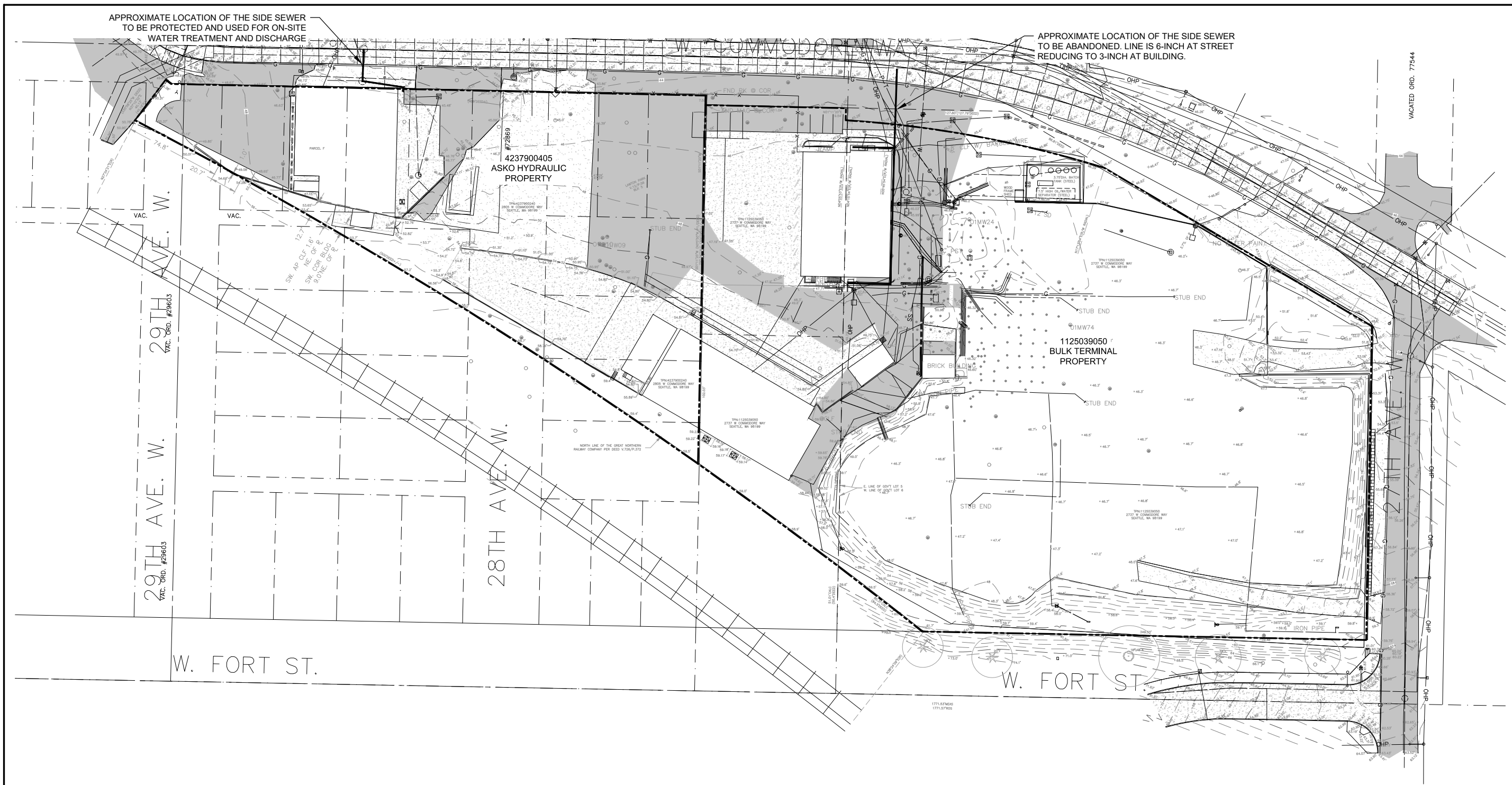
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Designer M. Byers  
 Drafter C. Taylor  
 Checker X  
 Reviewer X

Time Oil Bulk Terminal  
 Remediation Design  
 Seattle, Washington

**Site Survey**  
(1 of 2)

Drawing No.  
**G-7A**



NOTES

1. SITE SURVEY BY AXIS SURVEY & MAPPING, DATED 12-9-2020.

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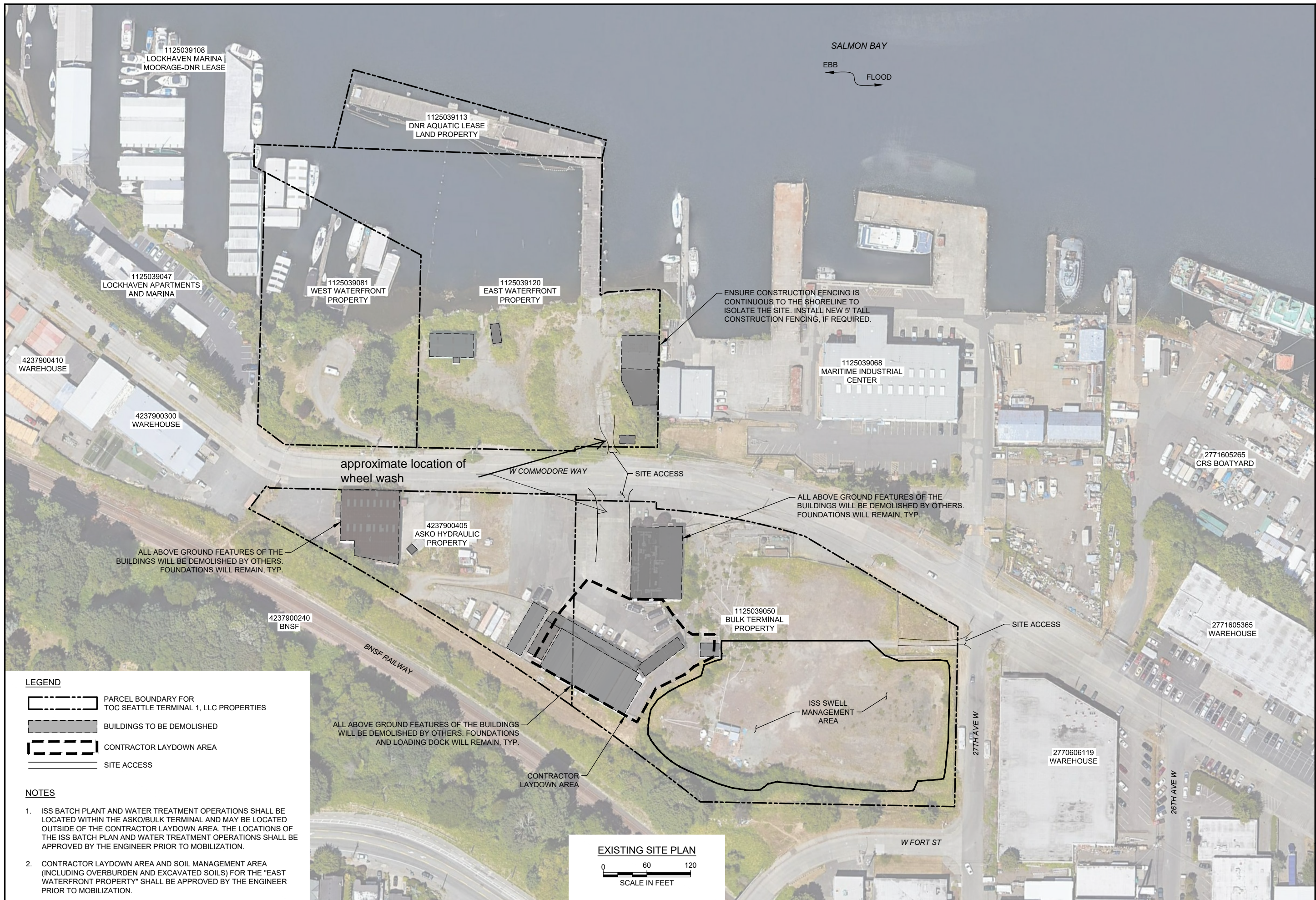
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Drafter C. Taylor  
Checker X  
Reviewer X

Time Oil Bulk Terminal  
Remediation Design  
Seattle, Washington

Site Survey  
(2 of 2)



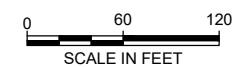
**LEGEND**

- PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES
- BUILDINGS TO BE DEMOLISHED
- CONTRACTOR LAYDOWN AREA
- SITE ACCESS

**NOTES**

1. ISS BATCH PLANT AND WATER TREATMENT OPERATIONS SHALL BE LOCATED WITHIN THE ASKO/BULK TERMINAL AND MAY BE LOCATED OUTSIDE OF THE CONTRACTOR LAYDOWN AREA. THE LOCATIONS OF THE ISS BATCH PLANT AND WATER TREATMENT OPERATIONS SHALL BE APPROVED BY THE ENGINEER PRIOR TO MOBILIZATION.
2. CONTRACTOR LAYDOWN AREA AND SOIL MANAGEMENT AREA (INCLUDING OVERBURDEN AND EXCAVATED SOILS) FOR THE "EAST WATERFRONT PROPERTY" SHALL BE APPROVED BY THE ENGINEER PRIOR TO MOBILIZATION.

**EXISTING SITE PLAN**



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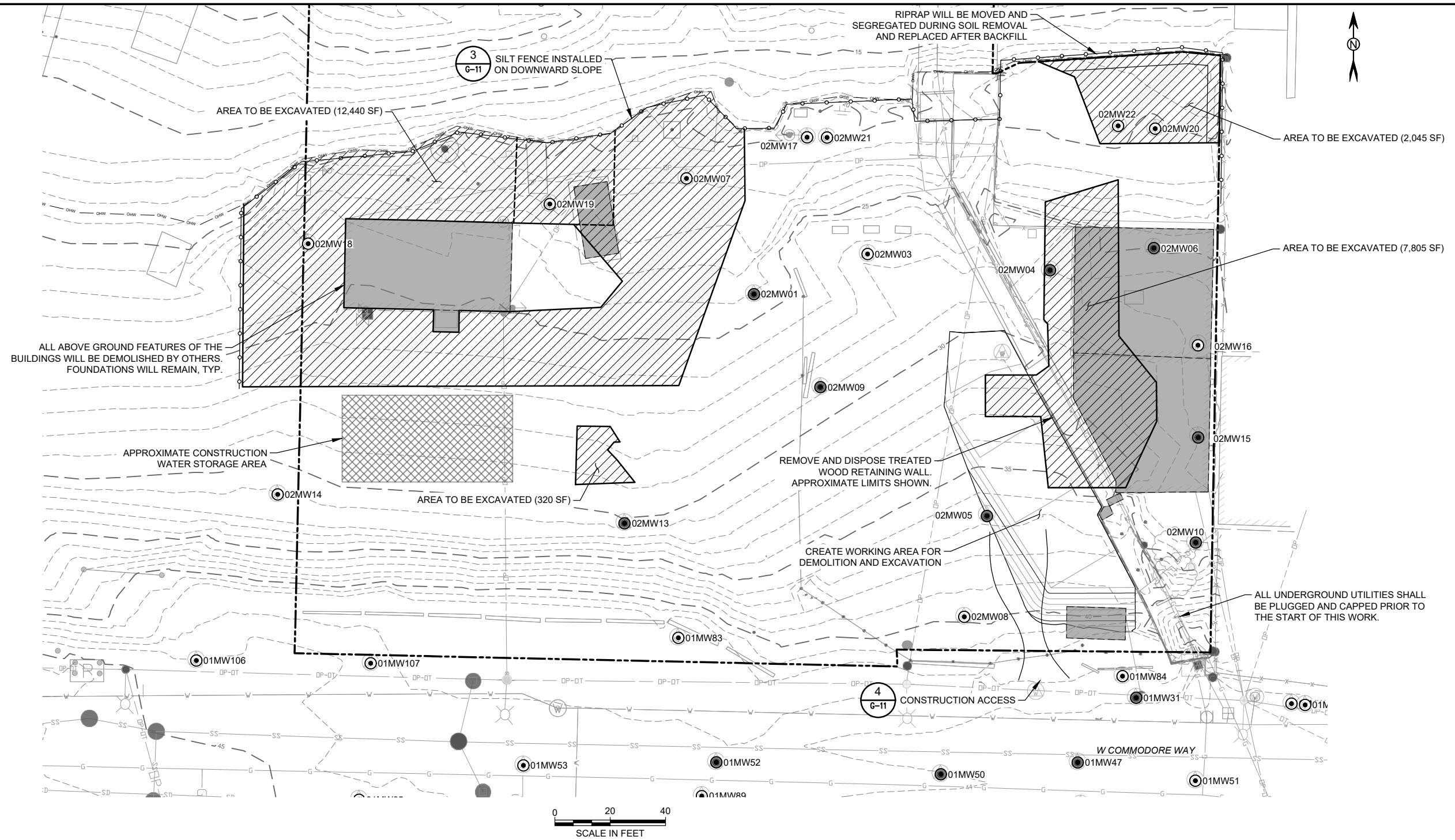
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 SCALE WARNING  
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Designer M. Byers  
 Drafter C. Taylor  
 Checker X  
 Reviewer X

**Time Oil Bulk Terminal Remediation Design Seattle, Washington**  
**Site Access, Haul Routes, and Staging Areas**

Drawing No. **G-8**  
 Sheet 9 of 23

File: D:\Projects\Crete\Time Oil Seattle\C1-C3.1 THRU C3.4-C4.1-C4.2-C5.1.dwg Plot Date: March 10, 2021 Plotted by: Cabryn



**LEGEND**

- EXCAVATION / TREATMENT AREA
- ABOVE GROUND FEATURE TO BE DEMOLISHED (UNDER SEPARATE PERMIT)
- CONSTRUCTION WATER STORAGE AREA
- MONITORING WELL TO BE PROTECTED
- MONITORING WELL TO BE DECOMMISSIONED
- TEMPORARY SILT DIKE
- ORDINARY HIGH WATER
- PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

**NOTES**

1. DEMOLITION OF UPLAND STRUCTURES IS PERMITTED UNDER SEPARATE PERMIT AND WILL OCCUR BY OTHERS PRIOR TO THE START OF THIS WORK. DEMOLITION WILL INCLUDE ALL ABOVE GRADE STRUCTURES AND ACTIVE UTILITIES ASSOCIATED WITH THE BUILDINGS. SELECTIVE DEMOLITION WILL BE REQUIRED TO REMOVE ASPHALT AND CONCRETE ABOVE WORK AREAS AND WILL BE COMPLETED BY THE REMEDIATION CONTRACTOR.
2. ALL CONTACT STORMWATER WILL BE COLLECTED DURING SITE CONSTRUCTION AND WILL BE DISCHARGED IN ACCORDANCE WITH PERMITS AND AS APPROVED BY THE ENGINEER.
3. All other storm drains within the work areas shall be plugged and protected during construction. All catch basins that require protection that are within a work area shall also be plugged to prevent discharge.

Rev	Date	Description

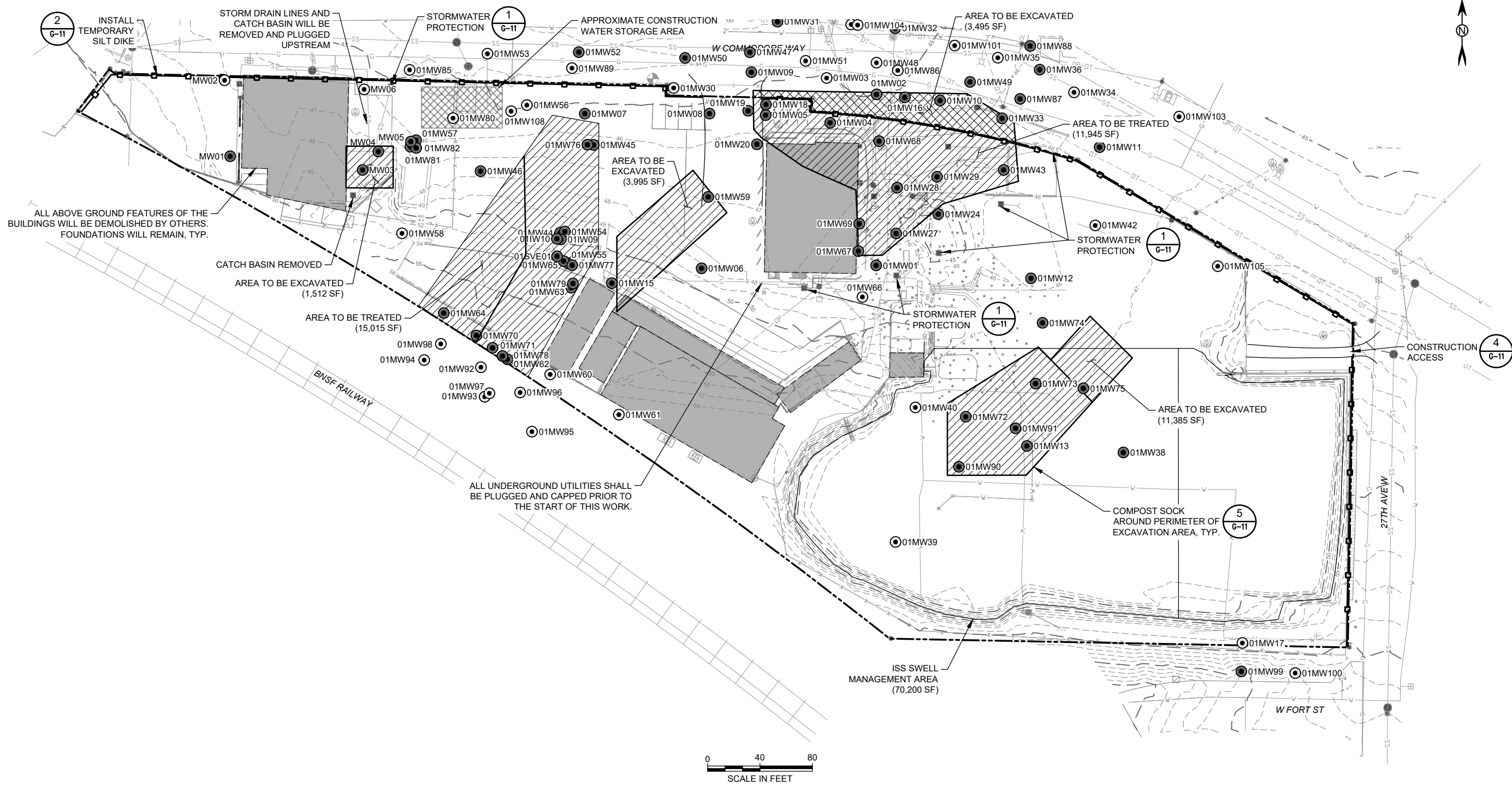
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Designer	M. Byers
Drafter	C. Taylor
Checker	X
Reviewer	X

Time Oil Bulk Terminal  
Remediation Design  
Seattle, Washington  
**Demo and TESC Plan**  
(1 of 2)

File: D:\Projects\Create\Time Oil Seattle\C1-C3.1 THRU C3.4-C4.1-C4.2-C5.1.dwg Plot Date: March 10, 2021 Plotted by: Cabryn



**LEGEND**

	EXCAVATION / TREATMENT AREA
	ABOVE GROUND FEATURE TO BE DEMOLISHED (UNDER SEPARATE PERMIT)
	CONSTRUCTION WATER STORAGE AREA
	MONITORING WELL TO BE PROTECTED
	MONITORING WELL TO BE DECOMMISSIONED
	TEMPORARY SILT DIKE
	PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

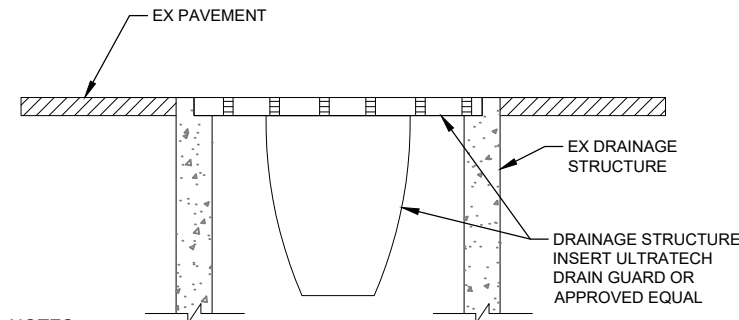
- NOTES**
- DEMOLITION OF UPLAND STRUCTURES IS PERMITTED UNDER SEPARATE PERMIT AND WILL OCCUR BY OTHERS PRIOR TO THE START OF THIS WORK. DEMOLITION WILL INCLUDE ALL ABOVE GRADE STRUCTURES AND ACTIVE UTILITIES ASSOCIATED WITH THE BUILDINGS. SELECTIVE DEMOLITION WILL BE REQUIRED TO REMOVE ASPHALT AND CONCRETE ABOVE WORK AREAS AND WILL BE COMPLETED BY THE REMEDIATION CONTRACTOR.
  - ALL CONTACT STORMWATER WILL BE COLLECTED DURING SITE CONSTRUCTION AND WILL BE DISCHARGED IN ACCORDANCE WITH PERMITS AND AS APPROVED BY THE ENGINEER.

Rev	Date	Description	
<p style="text-align: right;">Client</p> <p style="text-align: right; font-size: small;">108 S. Washington Street, Suite 300 Seattle, Washington 98104 (206) 491-7554 www.creteconsulting.com</p>			
<p>Scale: As Noted</p> <p style="font-size: x-small;">SCALE WARNING Drawing is not to scale. If scale bar doesn't measure one inch</p>			
<p>Designer: M. Byers Drafter: C. Taylor Checker: X Reviewer: X</p>			
<p><b>Time Oil Bulk Terminal Remediation Design Seattle, Washington</b></p> <p><b>Demo and TESC Plan (2 of 2)</b></p>			
<p>Drawing No. <b>G-10</b></p>			
<p>Sheet 11 of 23</p>			

**CONSTRUCTION STORMWATER AND EROSION CONTROL PLAN (CSECP) NOTES**

- SUBMIT A CONSTRUCTION STORMWATER AND EROSION CONTROL PLAN (CSECP), TREE, VEGETATION AND SOIL PROTECTION PLAN (TVSPP), SPILL PLAN (SP), AND TEMPORARY DISCHARGE PLAN (TDP) IN ACCORDANCE WITH 8-01.3(2).
- THE CONCEPTUAL CSEC MEASURES SHOWN ON THIS PLAN ARE THE MINIMUM BMPs FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE CSEC FACILITIES MUST BE UPGRADED (E.G. ADDITIONAL CATCH BASIN FILTERS, OR ADDITIONAL STORMWATER TREATMENT MEASURES) AS NEEDED, DUE TO WEATHER OR FIELD CONDITIONS TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE SYSTEM OR OFF-SITE AREAS.
- THE CONTRACTOR MUST USE PROPER EROSION AND SEDIMENT CONTROL PRACTICES ON THE CONSTRUCTION SITE AND ANY ADJACENT CONSTRUCTION STAGING AREAS TO PREVENT EROSION IN AND DOWNHILL OF DISTURBED AREAS, AND TO PREVENT THE DISCHARGE OF UPLAND SEDIMENTS OR SEDIMENT-LADEN WATER INTO WETLANDS, WATER BODIES, STREETS AND LOCAL DRAINAGE SYSTEMS.
- THE CSEC FACILITIES ON THE APPROVED PLAN WILL BE CONSTRUCTED PRIOR TO SITE DISTURBANCE TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, DRAINAGE SYSTEMS, AND ADJACENT PROPERTIES IS MINIMIZED.
- THE CONTRACTOR MUST USE BMPs (E.G. DIVERSION DITCHES, BERMS) AS APPLICABLE TO MINIMIZE OFF-SITE RUNOFF AND CLEAN STORMWATER FROM ENTERING THE PROJECT AREA.
- THE CONTRACTOR MUST NOT DISCHARGE TURBID WATER GENERATED FROM CONSTRUCTION ACTIVITIES, DIRECTLY TO ANY STREAMS, STORM WATER SYSTEM INLETS, OR DRAINAGE DITCHES.
- SOIL STOCKPILES MUST BE STABILIZED FROM EROSION, PROTECTED WITH SEDIMENT TRAPPING MEASURES, AND, WHERE POSSIBLE, LOCATED AWAY FROM STORM DRAIN INLETS.
- THE CONTRACTOR MUST EMPLOY DUST CONTROL MEASURES AS NEEDED TO PREVENT SURFACE AND AIR MOVEMENT OF DUST FROM EXPOSED SOIL SURFACES.
- CATCH BASIN PROTECTION MUST BE INSTALLED IN ANY GRATED ROAD DRAINAGE STRUCTURES, EXISTING OR NEWLY INSTALLED, WHICH ARE LIKELY TO RECEIVE RUNOFF FROM THE DISTURBED AREAS DURING CONSTRUCTION. CATCH BASIN PROTECTION SHOWN ON THE CONCEPTUAL CSEC PLANS ARE APPROXIMATE LOCATIONS. THE CONTRACTOR MUST ADD CATCH BASIN PROTECTION AS NECESSARY TO ALL GRATED CATCH BASINS THAT RECEIVE STORMWATER RUNOFF WITHIN THE PROJECT AREA AND THAT MAY OR MAY NOT BE SHOWN ON THE CSEC PLANS.
- SILT FENCES SHALL BE INSTALLED AND MAINTAINED PER CITY OF SEATTLE SPECIFICATIONS 8-01.3(10) AND 8-01.3(14).
- THE CONTRACTOR SHALL PROTECT ALL DRAINAGE AND SEWER SYSTEM PER CITY OF SEATTLE SPECIFICATIONS 8-01.3(12) AND 8-01.3(14).
- ALL COMPOST SOCKS, COMPOST BERMS, AND STRAW WATTLES SHALL BE CONSTRUCTED, INSTALLED AND MAINTAINED PER CITY OF SEATTLE SPECIFICATIONS 8-01.3(13) AND 8-01.3(14).
- BMPs (E.G. COMPOST SOCKS) MUST BE INSTALLED TO PREVENT SEDIMENT OR SEDIMENT LADEN WATERS FROM ENTERING GRATED ROADWAY INLETS WHICH HAVE NO SUMP AND MAY BE TOO SHALLOW TO EMPLOY CATCH BASIN FILTER SOCKS. OTHER BMPs, SUCH AS STREET SWEEPING AND VACUUMING MUST ALSO BE EMPLOYED AS NEEDED TO REMOVE SEDIMENT.

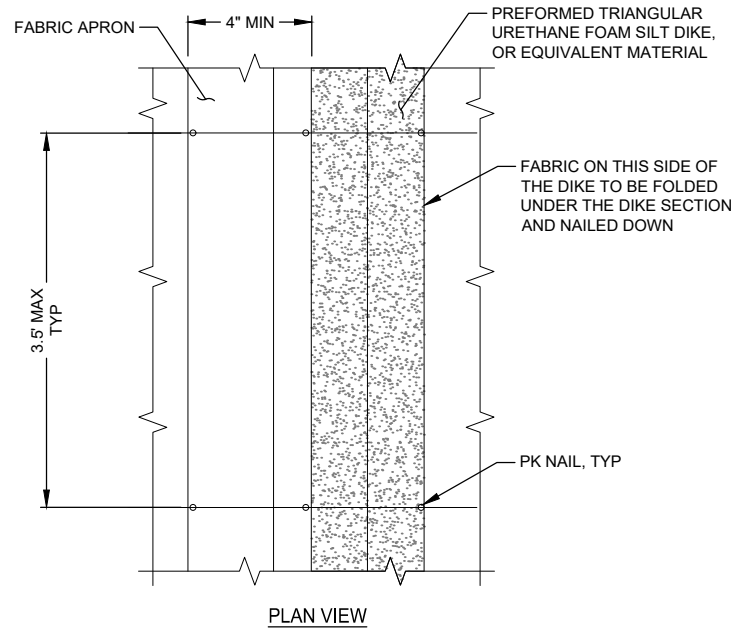
- AT NO TIME MUST MORE THAN ONE FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES MUST BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION MUST NOT FLUSH SEDIMENT LADEN WATER INTO THE DOWNSTREAM SYSTEM.
- PER CITY OF SEATTLE STANDARD SPECIFICATION SECTION 8-01.3(2)A AND THE CITY'S STORMWATER CODE, AREAS OF EXPOSED SOIL IN EXCESS OF 4,000 SQUARE FEET THAT WILL NOT BE DISTURBED FOR TWO DAYS DURING THE PERIOD FROM OCTOBER 1 TO APRIL 30, OR SEVEN DAYS DURING THE PERIOD FROM MAY 1 TO SEPTEMBER 30, WILL BE IMMEDIATELY STABILIZED WITH APPROVED CSEC METHODS (E.G., SEEDING, MULCHING, NETTING, CLEAR PLASTIC COVERING).
- THE CONTRACTOR'S CERTIFIED SEDIMENT AND EROSION CONTROL LEAD (CSECL) MUST REVIEW AND MODIFY THE CSEC PLANS ON AN AS NEEDED BASIS TO REFLECT THE SITE CONDITIONS AND CONSTRUCTION METHODS USED. THE CONTRACTOR'S CSECL MUST CONDUCT SITE INSPECTIONS AT LEAST ONCE EVERY CALENDAR WEEK AND WITHIN 24 HOURS OF ANY RUNOFF DISCHARGE FROM SITE. AFTER ANY 24-HOUR RUNOFF PRODUCING EVENT, THE CSECL WILL INSPECT CSEC MEASURES FOR INTEGRITY. ANY DAMAGED CSEC MEASURES WILL BE BROUGHT TO THE ATTENTION OF THE ENGINEER AND REPAIRED IMMEDIATELY.
- CONCRETE SAWCUTTING DEBRIS AND SLURRY MUST BE CONTAINED AND MANAGED USING APPROPRIATE BMPs TO PREVENT CONTAMINATION OF SITE WATER AND MEET DISCHARGE REQUIREMENTS. FRESH CONCRETE CAN ALSO ADVERSELY AFFECT SITE WATER QUALITY. PH SAMPLING AND TESTING MUST BE IN COMPLIANCE WITH APPLICABLE DISCHARGE AUTHORIZATIONS FROM KING COUNTY DURING CONCRETE POURS AND SAWCUTTING. IF PH EXCEEDS DISCHARGE LIMITS, APPROPRIATE BMPs MUST BE APPLIED.
- THE CONTRACTOR MUST SET ASIDE A SEPARATE AREA FOR THE WASH-OUT OF CONSTRUCTION EQUIPMENT AND TOOLS. PROCESS WATER MUST BE HAULED OFF SITE OR DISCHARGED TO SEWER IN COMPLIANCE WITH A KING COUNTY DISCHARGE AUTHORIZATION.
- TEMPORARY TRENCH DEWATERING MUST BE DISCHARGED TO AN APPROVED LOCATION. DISCHARGES TO THE SEWER SYSTEM MUST COMPLY WITH ALL PROVISIONS OF ANY DISCHARGE AUTHORIZATIONS FROM KING COUNTY AND SPU, AS WELL AS COS SPECIFICATIONS SECTION 2-08.3. & 8-01.3(2)D AND E.
- EXCAVATION SPOILS MAY BE EXTREMELY WET. CONTRACTOR MUST PREVENT MUD AND WATER FROM BEING TRACKED ALONG HAULING ROUTES BY LINING TRUCK BEDS OR BY OTHER MEANS AS NECESSARY. THE CONTRACTOR MUST ENSURE THAT SOIL, DEBRIS, OR OTHER MATERIAL TRACKED AND DEPOSITED ARE REMOVED BY SWEEPING OR BY WASHING AND PROPERLY DISPOSED PER CITY OF SEATTLE SPECIFICATIONS 8-01.3(16).
- THE CONTRACTOR IS RESPONSIBLE FOR THE SEQUENCING AND STAGING OF ALL DEMOLITION AND CSEC ACTIVITIES AT APPROPRIATE TIMES.
- PROTECT TREES & VEGETATION PER STANDARD SPECIFICATIONS 1-07.16(2) & 8-01.3(2)B. CONTACT SDOT URBAN FORESTRY (684-8621 OR 684-5041) FOR FIELD REVIEW OF TREE, VEGETATION, AND SOIL PROTECTION PLAN PRIOR TO CONSTRUCTION.
- THE CONTRACTOR MUST ENSURE THAT SOIL, DEBRIS, OR OTHER MATERIAL TRACKED AND DEPOSITED ARE REMOVED BY SWEEPING OR BY WASHING AND PROPERLY DISPOSED PER CITY OF SEATTLE SPECIFICATIONS 8-01.3(16).
- CONTRACTOR SHALL LOCATE EXISTING CATCH BASINS AND RELATED STORMWATER DRAINAGE FEATURES THAT MAY BE IMPACTED BY CONSTRUCTION ACTIVITIES DURING THE PROJECT. PROTECTION OF THESE CATCH BASINS AND RELATED STORMWATER DRAINAGE FEATURES SHALL BE COORDINATED WITH THE WORK BY THE CONTRACTOR.



**NOTES**

- ANY ACCUMULATED SEDIMENT ON OR AROUND THE FILTER FABRIC SHALL BE REMOVED. ALL SEDIMENT SHALL BE DISPOSED OF OFF-SITE.
- ANY SEDIMENT IN THE DRAINAGE STRUCTURE INSERT SHALL BE REMOVED WHEN SEDIMENT HAS FILLED ONE-THIRD OF THE INSERT. THE INSERT SHALL BE REPLACED MONTHLY OR AS DIRECTED BY THE ENGINEER.

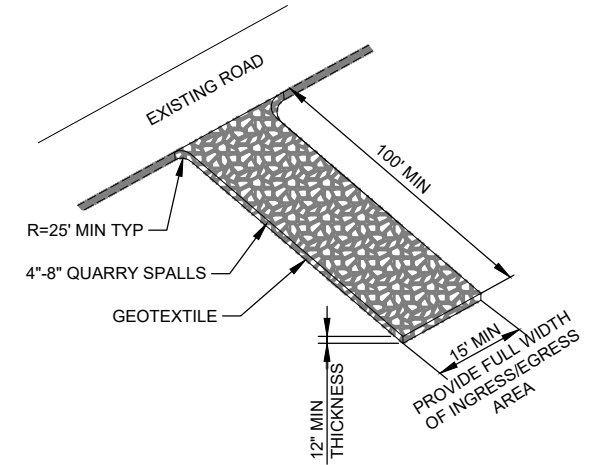
**1** TEMPORARY DRAINAGE STRUCTURE INSERT - DETAIL  
SCALE: NTS



**NOTES**

- PK NAILS SHALL BE PLACED WHERE THE UNITS OVERLAP AND IN THE CENTER OF A 7-FOOT UNIT AS SHOWN ON THE DIKE PLAN.
- ALTERNATE APPROVED HOLD DOWN DEVICE MAY BE SUBSTITUTED FOR PK NAILS (WIRE STAPLES, ETC).

**2** TEMPORARY TRIANGULAR SILT DIKE - DETAIL  
SCALE: NTS



**ELEVATION**

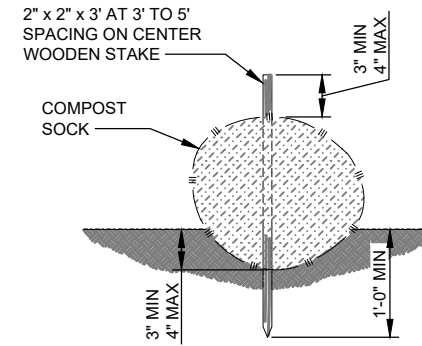
**SECTION**

**3** TEMPORARY FILTER FABRIC FENCE - DETAIL  
SCALE: NTS

**NOTES**

- ALL MATERIALS SPILLED, DROPPED, WASHED OR TRACKED FROM VEHICLES ONTO ROADWAYS MUST BE REMOVED IMMEDIATELY.
- VEHICLE TIRES SHALL BE INSPECTED TO ENSURE THEY ARE FREE OF MUD BEFORE ENTERING PUBLIC ROADWAYS.
- PROVIDE FLAGGING FOR CONSTRUCTION VEHICLES ENTERING AND LEAVING SITE AND ENTERING PUBLIC ROADWAYS.
- CONTRACTOR SHALL MAINTAIN AND AUGMENT EXISTING STABILIZED CONSTRUCTION ENTRANCES AS NEEDED TO CONTROL SEDIMENT.

**4** STABILIZED TEMPORARY CONSTRUCTION ACCESS - DETAIL  
SCALE: NTS



**NOTE**

- COMPOST SOCK SHALL BE 100% NATURAL AND BIODEGRADABLE. MATERIAL AND INSTALLATION SHALL BE PER WSDOT STANDARD SPECIFICATIONS 8-01.3(12) AND 9-14.5(6).

**5** COMPOST SOCK - DETAIL  
SCALE: NTS

OTHER POSSIBLE BMPs SHALL INCLUDE THE FOLLOWING FROM THE CONSTRUCTION STORMWATER GENERAL PERMIT, STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON (SWMWW 2019): HIGH VISIBILITY PLASTIC OR METAL FENCE (BMP C103), WHEEL WASH (BMP C106), CONSTRUCTION ROAD/PARKING AREA STABILIZATION (BMP C107), DUST CONTROL MEASURES (BMP C140), SAWCUTTING AND SURFACING POLLUTION PREVENTION MEASURES BMP C152, CONCRETE HANDLING MEASURES BMP C151 AND TEMPORARY AND PERMANENT SEEDING (BMP C120). THESE SHALL BE INSTALLED AND MAINTAINED PER THE SPECIFICATIONS PROVIDED IN THE SWMMWW.

By	Description
Date	
Rev	

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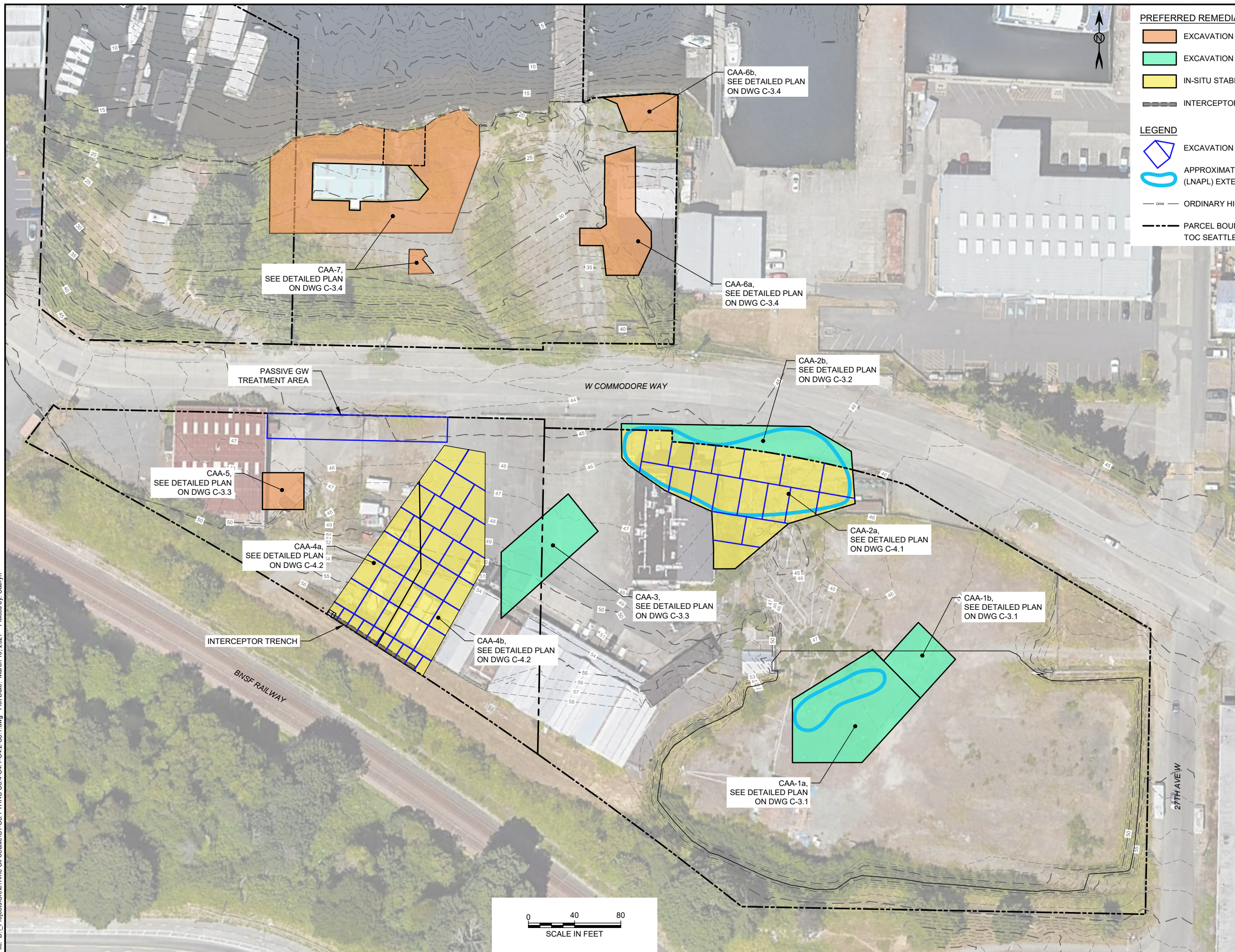
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Designer	M. Byers
Drafter	C. Taylor
Checker	X
Reviewer	X

Time Oil Bulk Terminal  
Remediation Design  
Seattle, Washington

**TESC Notes and Details**

Drawing No.	G-11
Sheet	12 of 23

File: D:\Projects\Time Oil Seattle\C1-C3.1 THRU C3.4-C4.1-C4.2-C5.1.dwg Plot Date: March 10, 2021 Plotted by: Cabryn



**PREFERRED REMEDIAL ALTERNATIVE**

- EXCAVATION TO CLEANUP LEVEL (CUL)
- EXCAVATION TO REMEDIATION LEVEL (REL)
- IN-SITU STABILIZATION / SOLIDIFICATION
- INTERCEPTOR TRENCH

**LEGEND**

- EXCAVATION MIXING GRID CELLS
- APPROXIMATE LIGHT NON-AQUEOUS-PHASE LIQUID (LNAPL) EXTENT
- ORDINARY HIGH WATER
- PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

By	Description

Rev	Date

Client

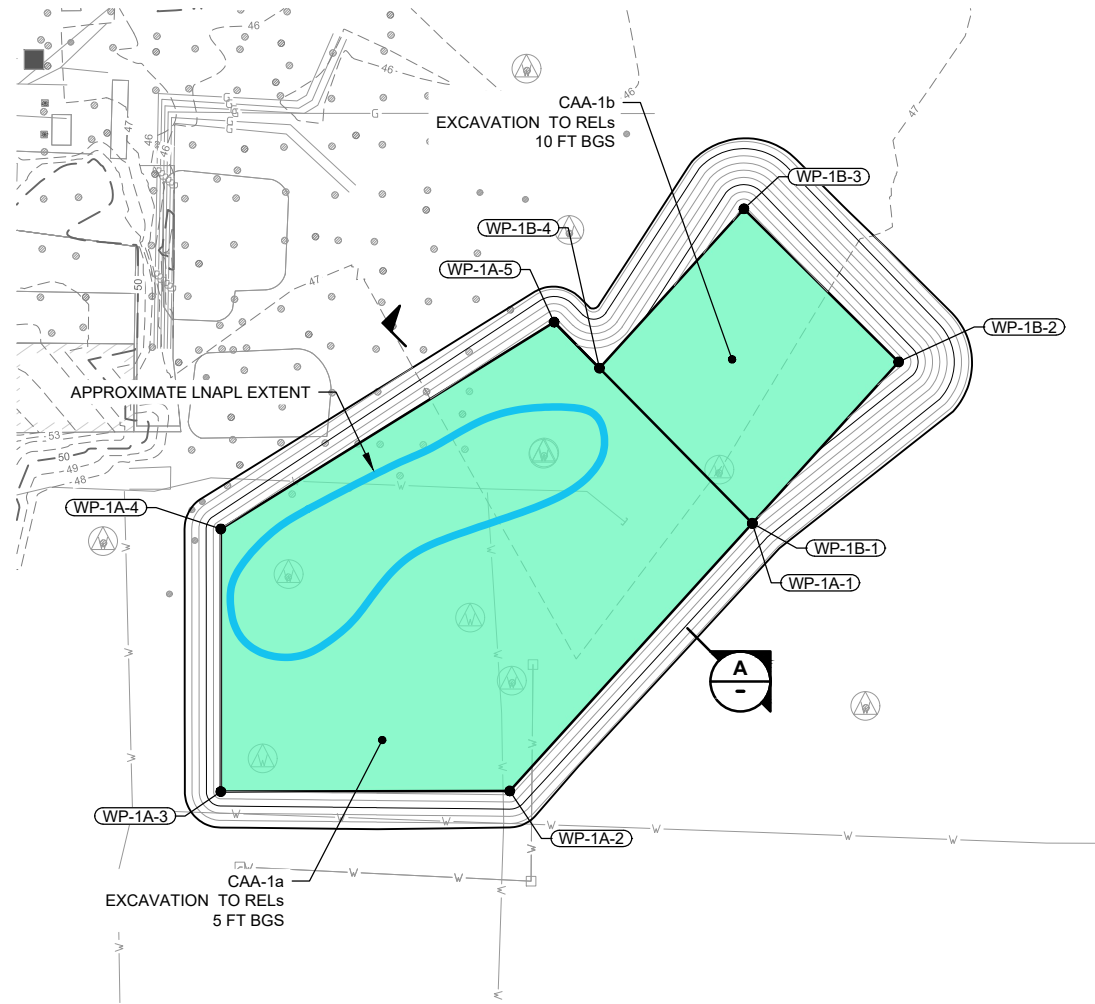
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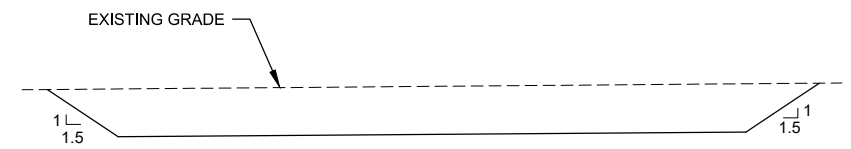
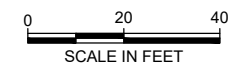
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Remediation Design  
Seattle, Washington

**Remediation Areas**

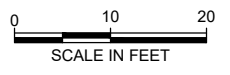




**DETAILED PLAN VIEW**  
CAA-1 EXCAVATION AREAS



**SECTION**  
SCALE: 1"=10'



**NOTES**

1. FINAL SOIL EXCAVATION DEPTHS WILL VARY BASED ON FIELD CONDITIONS. CROSS SECTIONS SHOW ANTICIPATED DEPTH AND VARIABILITY (TYP).

CAA-1a

WORKING POINTS		
POINT ID	NORTHING	EASTING
WP-1A-1	245351.26	1256363.61
WP-1A-2	245295.50	1256313.09
WP-1A-3	245295.38	1256252.89
WP-1A-4	245350.08	1256252.89
WP-1A-5	245393.18	1256322.31

CAA-1b

WORKING POINTS		
POINT ID	NORTHING	EASTING
WP-1B-1	245351.26	1256363.61
WP-1B-2	245384.89	1256394.08
WP-1B-3	245416.79	1256361.85
WP-1B-4	245383.59	1256331.77

**LEGEND**

- EXCAVATION TO REMEDIATION LEVEL (REL)
- APPROXIMATE LIGHT NON-AQUEOUS-PHASE LIQUID (LNAPL) EXTENT

**NOTES**

1. EXCAVATED AREAS WILL BE BACKFILLED AND COMPACTED WITH CLEAN IMPORT MATERIAL TO EXISTING GRADE +/- 1 FOOT. FINAL SURFACES WILL BE STABILIZED TO PREVENT EROSION.



Rev	Date	Description

Client

**CRETE CONSULTING, INC.**  
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Seattle, Washington 98104  
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Scale As Noted

**SCALE WARNING**  
Drawing is not to scale, if scale bar doesn't measure one inch

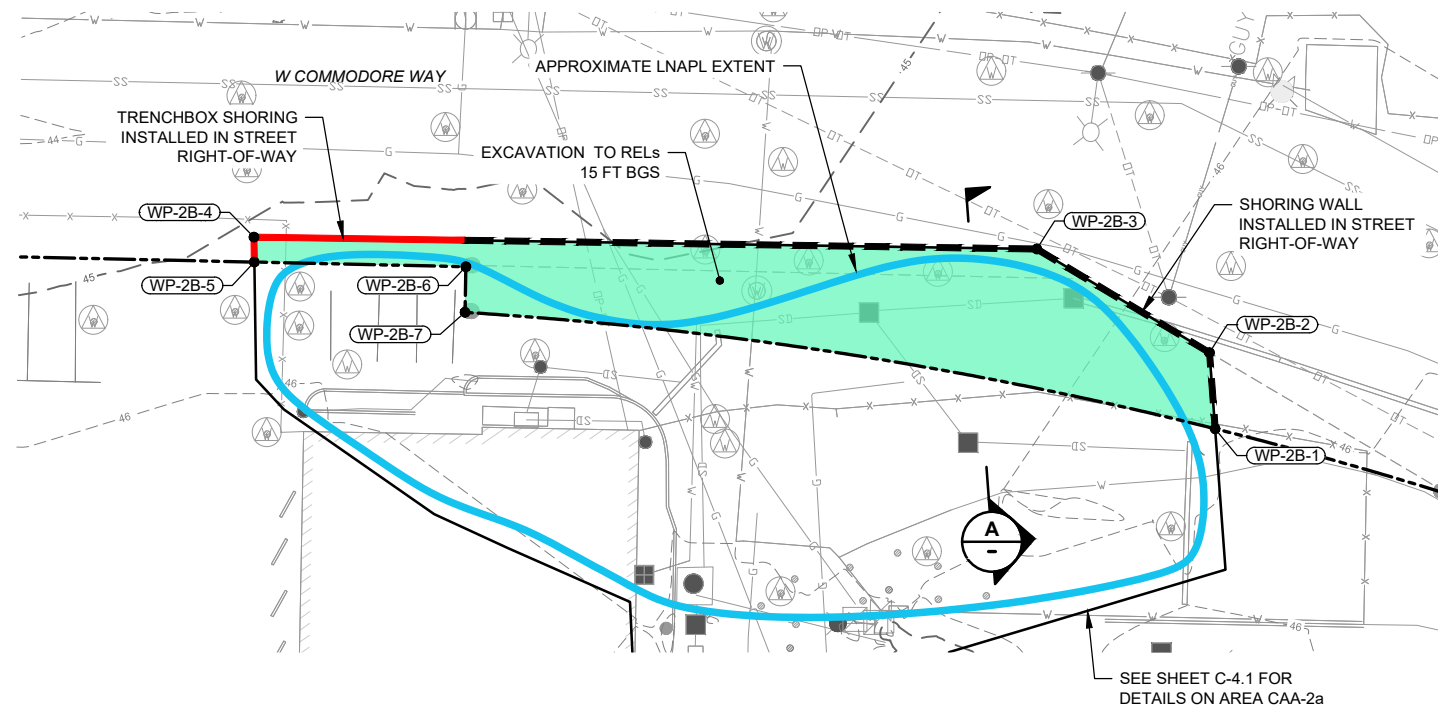
Designer M. Byers  
Drafter C. Taylor  
Checker X  
Reviewer X

Time Oil Bulk Terminal  
Remediation Design  
Seattle, Washington

**CAA-1 Excavation Area  
Plan and Profile**

Drawing No.  
**C-3.1**

Sheet 14 of 23



**DETAILED PLAN VIEW**  
CAA-2B EXCAVATION AREA

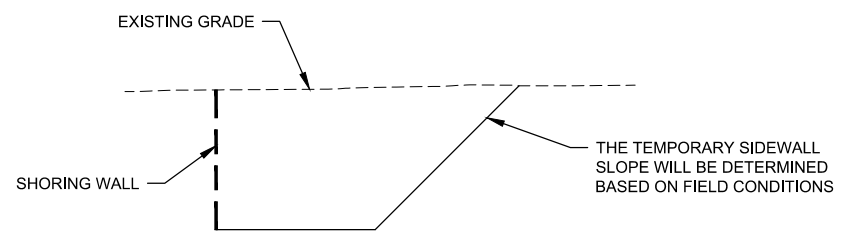
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SCALE IN FEET

CAA-2b

WORKING POINTS		
POINT ID	NORTHING	EASTING
WP-2B-1	245548.98	1256304.98
WP-2B-2	245564.83	1256303.81
WP-2B-3	245586.42	1256267.84
WP-2B-4	245588.91	1256104.74
WP-2B-5	245583.71	1256104.82
WP-2B-6	245582.74	1256148.89
WP-2B-7	245573.24	1256148.72

- LEGEND**
- EXCAVATION TO REMEDIATION LEVEL (REL)
  - APPROXIMATE LIGHT NON-AQUEOUS-PHASE LIQUID (LNAPL) EXTENT
  - PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES
  - SHORING WALL (SEE SHORING DRAWINGS SS1.0 THRU SS4.0 FOR DETAILS)
  - TRENCH BOX SHORING

- NOTES**
- EXCAVATED AREAS WILL BE BACKFILLED AND COMPACTED WITH CLEAN IMPORT MATERIAL TO EXISTING GRADE +/- 1 FOOT. FINAL SURFACES IN THE CITY OF SEATTLE ROW WILL BE RETURNED TO EXISTING CONDITIONS BASED ON CITY OF SEATTLE REQUIREMENTS.
  - UTILITIES WILL BE PROTECTED DURING CONSTRUCTION ACTIVITIES.
  - GAS LINE SHALL BE LOCATED PER THE SHORING DETAILS.
  - ALL SEWER AND STORM LINES IN THE ROW WITHIN 10 FEET (OR WITHIN 20 FEET IF SUCH LINES ARE 30 FEET OR MORE OFF SITE PROPERTY LINE) OF ANY PROPOSED SHORING ELEMENT SHALL BE VIDEOTAPED OF PRE-PROJECT CONDITION AND A COPY SENT TO SPU AT SPU\_DWW\_PIPE\_REHAB@SEATTLE.GOV PRIOR TO PRE-CONSTRUCTION MEETING. SIMILAR VIDEOTAPE OF POST-PROJECT CONDITION IS ALSO REQUIRED AND SENT TO SPU AT SAME EMAIL ADDRESS. ADD A NOTE IN THE PLANS TO THIS EFFECT.
  - THE CITY ROW SHALL BE RESTORED TO PRE EXISTING CONDITIONS BASED ON THE CITY OF SEATTLE REQUIREMENTS.



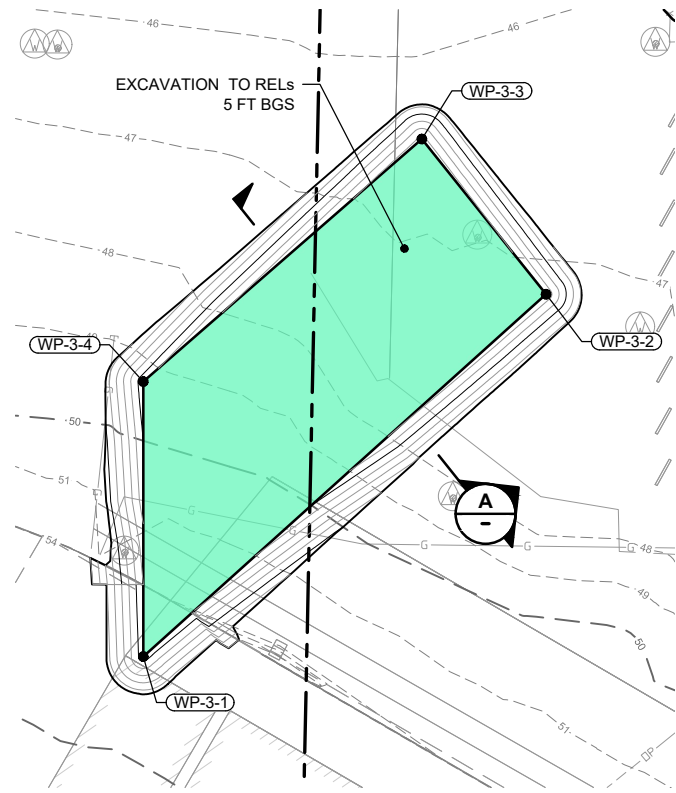
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SCALE: 1"=10'

0 10 20  
SCALE IN FEET

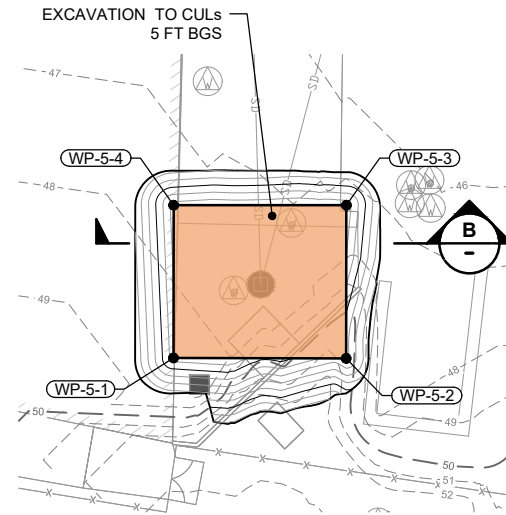
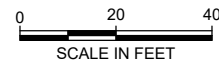
- NOTES**
- FINAL SOIL EXCAVATION DEPTHS WILL VARY BASED ON FIELD CONDITIONS. CROSS SECTIONS SHOW ANTICIPATED DEPTH AND VARIABILITY (TYP).



	By		Description					
<p style="text-align: center; font-size: small;">108 S. Washington Street, Suite 300 Seattle, Washington 98104 (206) 491-7554 www.creteconsulting.com</p>								
<p style="font-weight: bold; margin: 0;">Time Oil Bulk Terminal Remediation Design Seattle, Washington</p> <p style="font-weight: bold; margin: 0;">CAA-2b Excavation Plan Plan and Profile</p>								
Drawing No.								
C-3.2								
Sheet 15 of 23								



**DETAILED PLAN VIEW**  
CAA-3 EXCAVATION AREA



**DETAILED PLAN VIEW**  
CAA-5 EXCAVATION AREA



CAA-3

WORKING POINTS		
POINT ID	NORTHING	EASTING
WP-3-1	245420.23	1256000.75
WP-3-2	245495.70	1256084.65
WP-3-3	245528.03	1256058.78
WP-3-4	245477.52	1256000.75

CAA-5

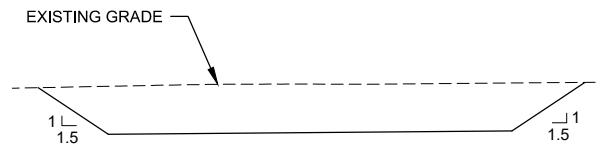
WORKING POINTS		
POINT ID	NORTHING	EASTING
WP-5-1	245514.61	1255794.03
WP-5-2	245514.51	1255829.99
WP-5-3	245546.44	1255830.03
WP-5-4	245546.44	1255794.06

**LEGEND**

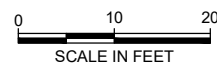
- EXCAVATION TO CLEANUP LEVEL (CUL)
- EXCAVATION TO REMEDIATION LEVEL (REL)
- PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

**NOTES**

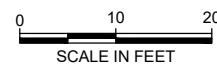
- EXCAVATED AREAS WILL BE BACKFILLED AND COMPACTED WITH CLEAN IMPORT MATERIAL TO EXISTING GRADE +/- 1 FOOT. FINAL SURFACES WILL BE STABILIZED TO PREVENT EROSION.



**A SECTION**  
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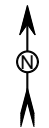


**B SECTION**  
SCALE: 1"=10'



**NOTES**

- FINAL SOIL EXCAVATION DEPTHS WILL VARY BASED ON FIELD CONDITIONS. CROSS SECTIONS SHOW ANTICIPATED DEPTH AND VARIABILITY (TYP).



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**SCALE WARNING**  
Drawing is not to scale. If scale bar doesn't measure one inch

Designer M. Byers  
Drafter C. Taylor  
Checker X  
Reviewer X

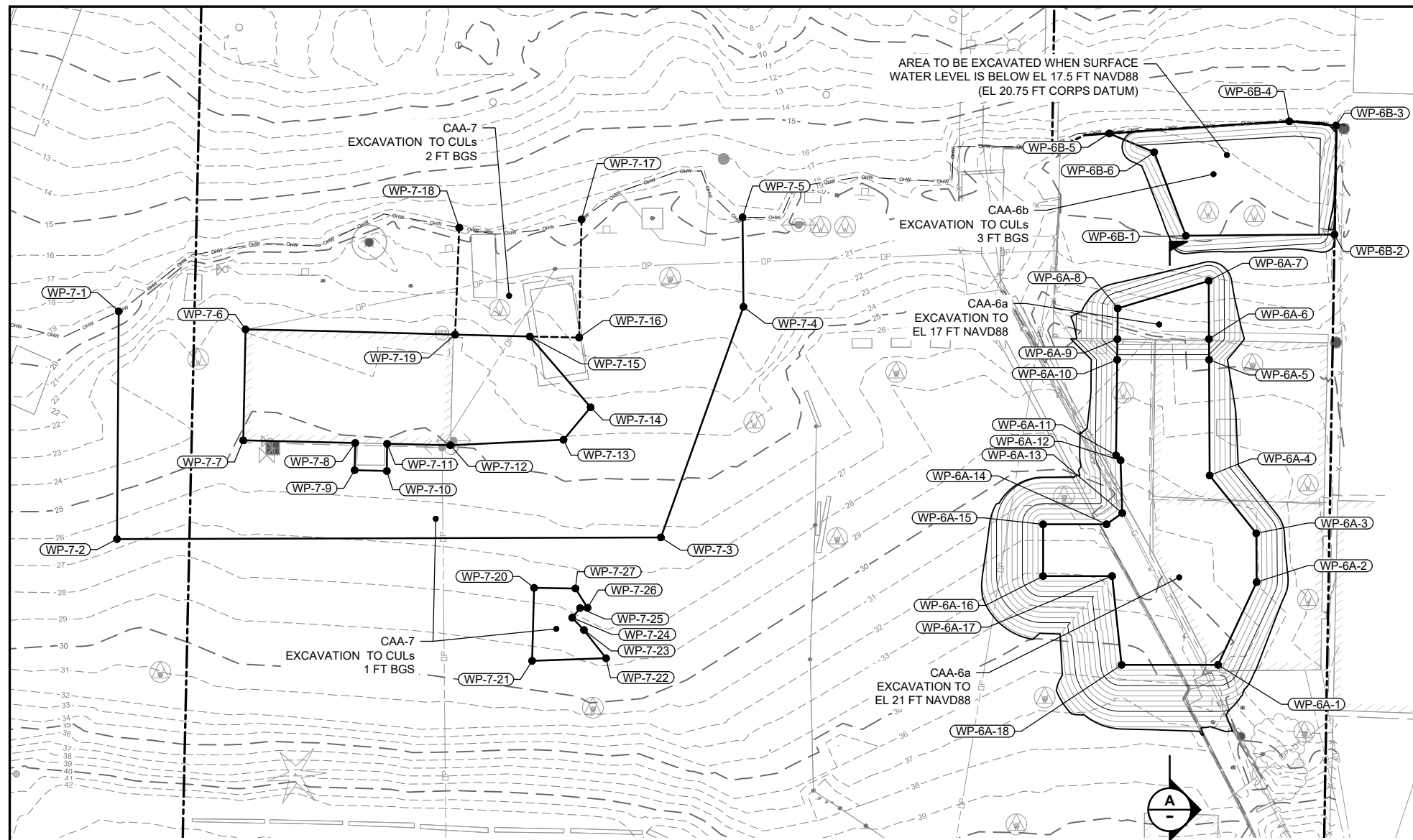
Time Oil Bulk Terminal  
Remediation Design  
Seattle, Washington

**CAA-3 and CAA-5 Excavation Area  
Plan and Profile**

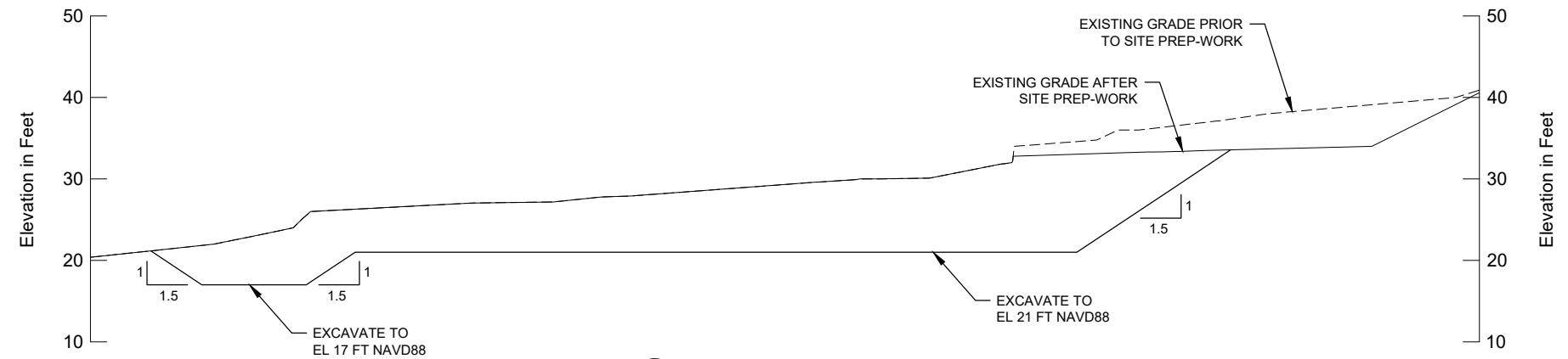
Drawing No.  
**C-3.3**

Sheet 16 of 23

File: D:\Projects\Create\Time Oil Seattle\C1-C3.1 THRU C3.4-C4.1-C4.2-C5.1.dwg Plot Date: March 10, 2021 Plotted by: Cabryn



**DETAILED PLAN VIEW**  
CAA-6 AND CAA-7 EXCAVATION AREAS



**A SECTION**  
SCALE IN FEET

CAA-6a

WORKING POINTS		
POINT ID	NORTHING	EASTING
WP-6A-1	245717.33	1256119.57
WP-6A-2	245741.32	1256130.76
WP-6A-3	245755.46	1256130.66
WP-6A-4	245772.23	1256117.13
WP-6A-5	245805.78	1256116.97
WP-6A-6	245811.78	1256116.94
WP-6A-7	245828.66	1256116.85
WP-6A-8	245820.69	1256090.50
WP-6A-9	245811.77	1256090.40
WP-6A-10	245805.77	1256090.33
WP-6A-11	245778.08	1256090.01
WP-6A-12	245776.62	1256091.31
WP-6A-13	245761.33	1256091.80
WP-6A-14	245758.08	1256087.25
WP-6A-15	245758.07	1256068.85
WP-6A-16	245743.07	1256068.85
WP-6A-17	245743.07	1256088.85
WP-6A-18	245717.33	1256091.61

CAA-6b

WORKING POINTS		
POINT ID	NORTHING	EASTING
WP-6B-1	245841.72	1256110.24
WP-6B-2	245842.06	1256153.34
WP-6B-3	245873.66	1256153.78
WP-6B-4	245874.91	1256140.25
WP-6B-5	245871.38	1256088.01
WP-6B-6	245865.94	1256101.06

CAA-7

WORKING POINTS		
POINT ID	NORTHING	EASTING
WP-7-1	245819.81	1255800.91
WP-7-2	245753.78	1255800.40
WP-7-3	245754.27	1255958.06
WP-7-4	245821.12	1255982.00
WP-7-5	245847.05	1255981.73
WP-7-6	245814.58	1255837.67
WP-7-7	245782.40	1255837.00
WP-7-8	245781.64	1255869.47
WP-7-9	245773.77	1255869.28
WP-7-10	245773.55	1255878.62
WP-7-11	245781.43	1255878.69
WP-7-12	245780.99	1255897.07
WP-7-13	245782.57	1255929.84
WP-7-14	245791.99	1255937.69
WP-7-15	245812.52	1255920.07
WP-7-16	245812.19	1255934.36
WP-7-17	245846.45	1255935.06
WP-7-18	245844.06	1255899.61
WP-7-19	245813.08	1255898.42
WP-7-20	245739.65	1255921.31

- LEGEND**
- EXCAVATION TO CLEANUP LEVEL (CUL)
  - ORDINARY HIGH WATER
  - PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

- NOTES**
- EXCAVATED AREAS WILL BE BACKFILLED AND COMPACTED WITH CLEAN IMPORT MATERIAL TO EXISTING GRADE +/- 1 FOOT. FINAL SURFACES WILL BE STABILIZED TO PREVENT EROSION.

Rev	Date	Description	By

Client

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Scale: As Noted

SCALE WARNING  
Drawing is not to scale. If scale bar doesn't measure one inch

Designer: M. Byers  
Drafter: C. Taylor  
Checker: X  
Reviewer: X

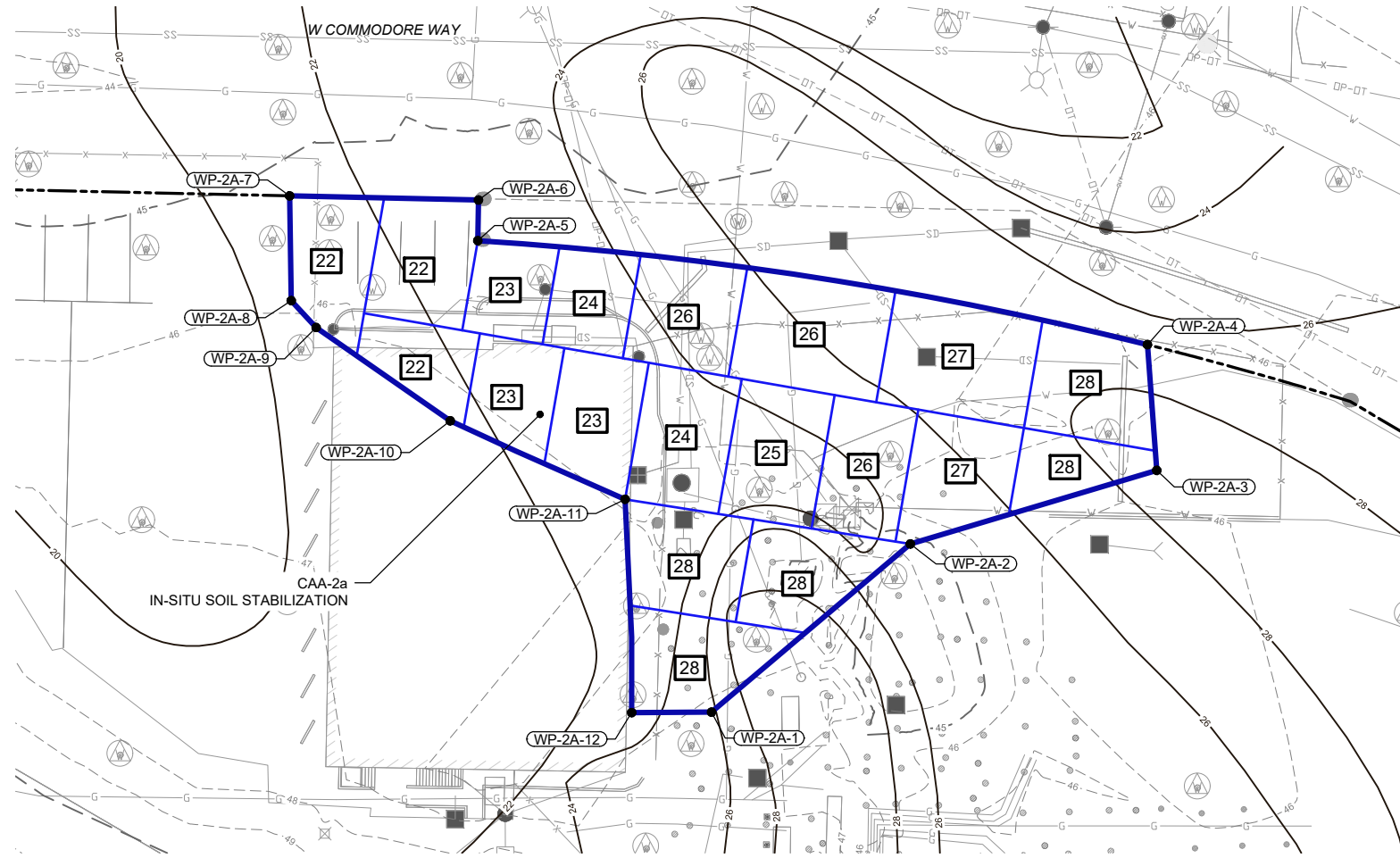
Time Oil Bulk Terminal  
Remediation Design  
Seattle, Washington

**CAA-6 and CAA-7 Excavation Area  
Plan and Profile**

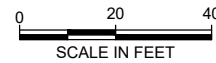
Drawing No.  
**C-3.4**

Sheet 17 of 23

- NOTES**
- FINAL SOIL EXCAVATION DEPTHS WILL VARY BASED ON FIELD CONDITIONS. CROSS SECTIONS SHOW ANTICIPATED DEPTH AND VARIABILITY (TYP).



**DETAILED PLAN VIEW**  
CAA-2A IN-SITU SOLIDIFICATION AREA



CAA-2a

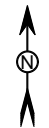
WORKING POINTS		
POINT ID	NORTHING	EASTING
WP-2A-1	245463.24	1256203.26
WP-2A-2	245502.48	1256249.65
WP-2A-3	245519.64	1256307.14
WP-2A-4	245548.98	1256304.98
WP-2A-5	245573.24	1256148.72
WP-2A-6	245582.74	1256148.89
WP-2A-7	245583.71	1256104.82
WP-2A-8	245559.25	1256105.20
WP-2A-9	245552.99	1256111.00
WP-2A-10	245531.21	1256142.30
WP-2A-11	245512.90	1256183.10
WP-2A-12	245463.12	1256184.62

**LEGEND**

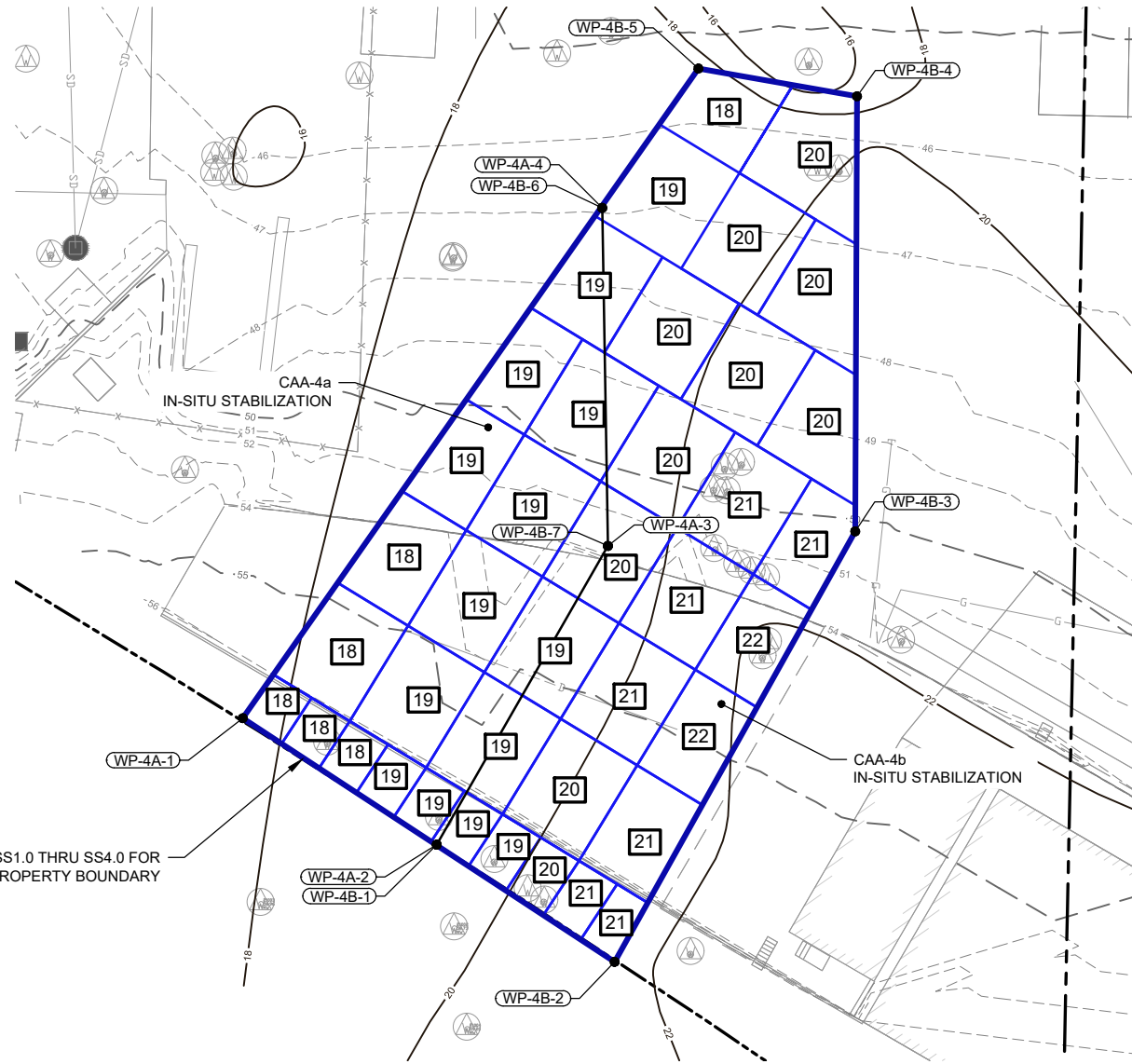
- IN-SITU STABILIZATION / SOLIDIFICATION
- EXCAVATION MIXING GRID CELL WITH MIXING BOTTOM ELEVATION (IN FEET, NAVD88)
- 20 - EXISTING SURFACE CONTOUR
- 20 - TOP OF SILT CONTOUR
- PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

**NOTES**

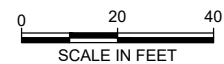
- ALL ISS TREATMENT AREAS SHALL BE COVERED WITH A WOVEN GEOTEXTILE FABRIC AND 6 INCHES OF CRUSHED ROCK OR BALLAST ROCK TO RESTORE THE AREA TO PRE-EXISTING CONDITIONS.
- THE FINAL DEPTH OF THE IN-SITU SOIL STABILIZATION AREA MAY CHANGE BASED ON FIELD CONDITIONS.



	By		Description		
	Date				
	Rev				
Client					
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Time Oil Bulk Terminal Remediation Design Seattle, Washington <b>CAA-2a Insitu Solidification Area</b>					
Drawing No. <b>C-4.1</b>					
Sheet 18 of 23					



**DETAILED PLAN VIEW**  
CAA-4a IN-SITU SOLIDIFICATION AREA



SEE SHORING DRAWINGS SS1.0 THRU SS4.0 FOR SHORING DETAILS ALONG PROPERTY BOUNDARY

CAA-4a

WORKING POINTS		
POINT ID	NORTHING	EASTING
WP-4A-1	245424.77	1255849.60
WP-4A-2	245396.49	1255892.98
WP-4A-3	245463.29	1255931.25
WP-4A-4	245538.88	1255929.98


CAA-4b

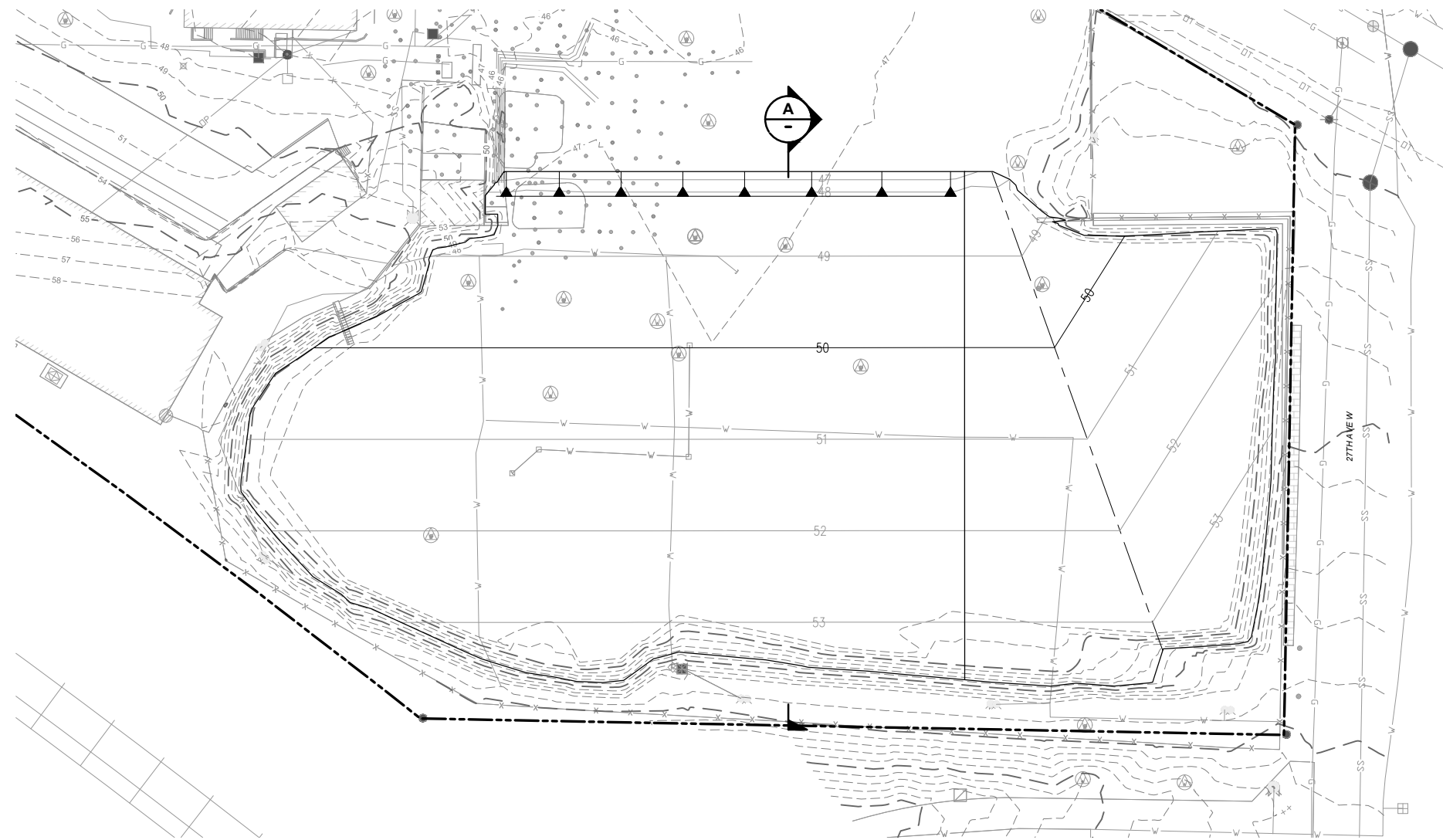
WORKING POINTS		
POINT ID	NORTHING	EASTING
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WP-4B-2	245370.29	1255932.76
WP-4B-3	245466.55	1255986.55
WP-4B-4	245563.84	1255986.96
WP-4B-5	245570.05	1255951.48
WP-4B-6	245538.88	1255929.98
WP-4B-7	245463.29	1255931.25

- LEGEND**
- IN-SITU STABILIZATION / SOLIDIFICATION
  - 24 EXCAVATION MIXING GRID CELL WITH MIXING BOTTOM ELEVATION (IN FEET, NAVD88)
  - - 20 - - EXISTING SURFACE CONTOUR
  - 20 — TOP OF SILT CONTOUR
  - PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

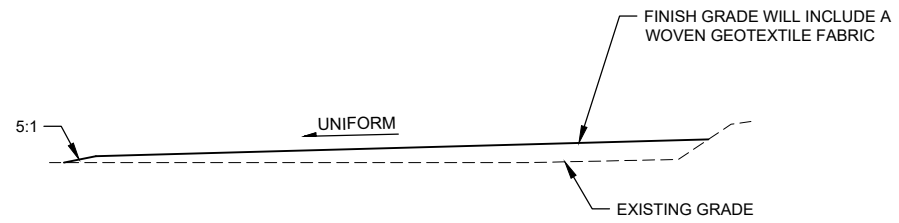
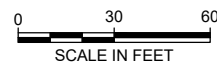
- NOTES**
- ALL ISS TREATMENT AREAS SHALL BE COVERED WITH A WOVEN GEOTEXTILE FABRIC AND 6 INCHES OF CRUSHED ROCK OR BALLAST ROCK TO RESTORE THE AREA TO PRE-EXISTING CONDITIONS.
  - THE FINAL DEPTH OF THE IN-SITU SOIL STABILIZATION AREA MAY CHANGE BASED ON FIELD CONDITIONS.



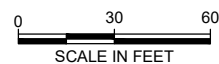
	By		Description		
	Date				
	Rev				
Client					
 108 S. Washington Street, Suite 300 Seattle, Washington 98104 (206) 491-7554 www.creteconsulting.com					
Scale As Noted					
SCALE WARNING Drawing is not to scale. If scale bar doesn't measure one inch					
Designer M. Byers Drafter C. Taylor Checker X Reviewer X					
Time Oil Bulk Terminal Remediation Design Seattle, Washington <b>CAA-4a In Situ Solidification Area</b>					
Drawing No. <b>C-4.2</b>					
Sheet 19 of 23					



**DETAILED PLAN VIEW**  
ISS SWELL MANAGEMENT AREA



**SECTION**  
SCALE: 1"=30'



Rev	Date	Description	By

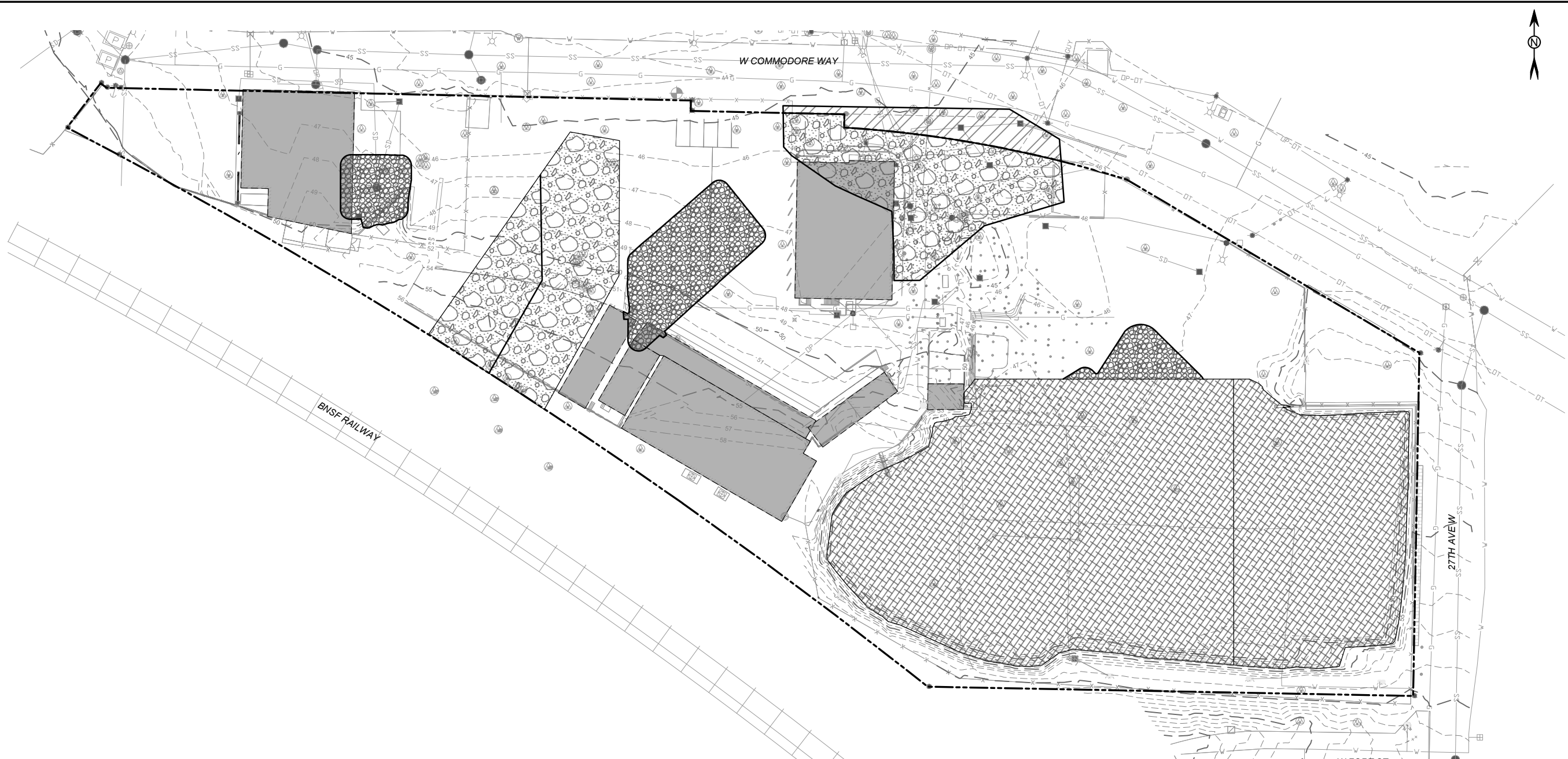
Client

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

Scale	As Noted
SCALE WARNING Drawing is not to scale, if scale bar doesn't measure one inch	
Designer	M. Byers
Drafter	C. Taylor
Checker	X
Reviewer	X

Time Oil Bulk Terminal  
Remediation Design  
Seattle, Washington





**ISS Swell Management Area**

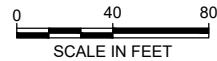


**LEGEND**

-  EXCAVATION / TREATMENT AREA
-  PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES

**STABILIZED INTERIM SURFACES**

-  ISS AREAS - WOVEN INDICATOR GEOTEXTILE FABRIC WITH 6 INCHES CRUSHED ROCK
-  ISS SWELL AREA - WOVEN INDICATOR GEOTEXTILE FABRIC (GRAVEL OR ROCK WILL BE ADDED TO SUPPORT INTERIM SITE ACTIVITIES, IF NEEDED)
-  EXCAVATION AREAS - 6 INCHES OF CRUSHED ROCK TO THE SURROUNDING GRADE
-  ROW - RESTORED TO PRE-CONSTRUCTION CONDITIONS



**NOTES**

1. EXISTING ASPHALT, CONCRETE, AND GRAVEL AREAS WILL REMAIN DURING THE INTERIM PERIOD BETWEEN SITE CLEANUP AND DEVELOPMENT.

Rev	Date	Description	By

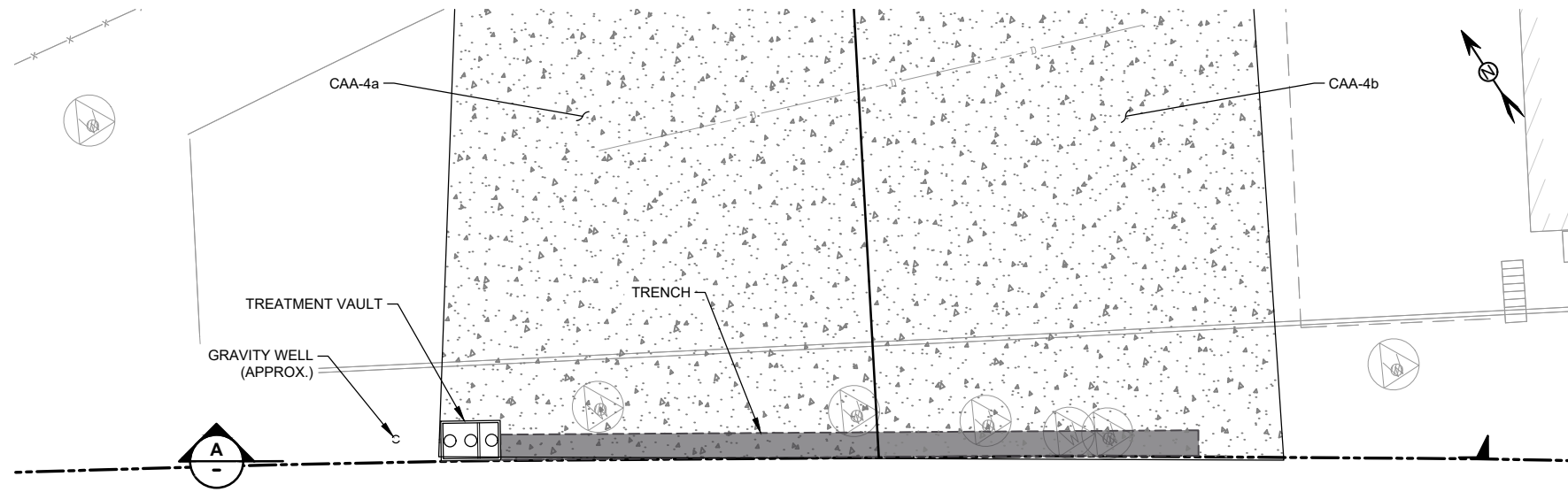
Client

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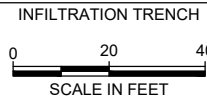
Scale	As Noted
SCALE WARNING Drawing is not to scale. If scale bar doesn't measure one inch	
Designer	M. Byers
Drafter	C. Taylor
Checker	X
Reviewer	X

Time Oil Bulk Terminal  
Remediation Design  
Seattle, Washington  
**Upland AOC Clean Action Areas  
Interim Stabilization**



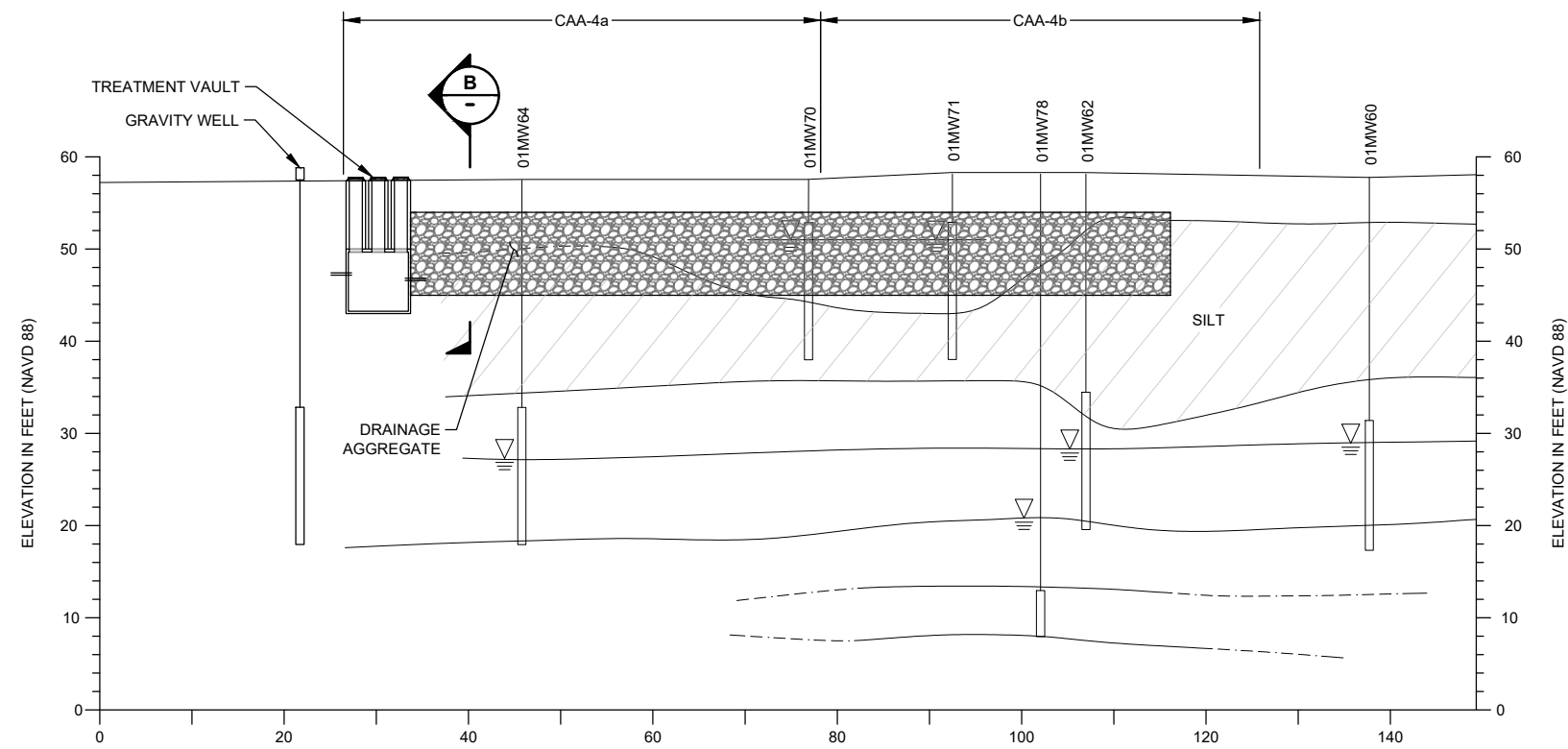


**DETAILED PLAN VIEW**

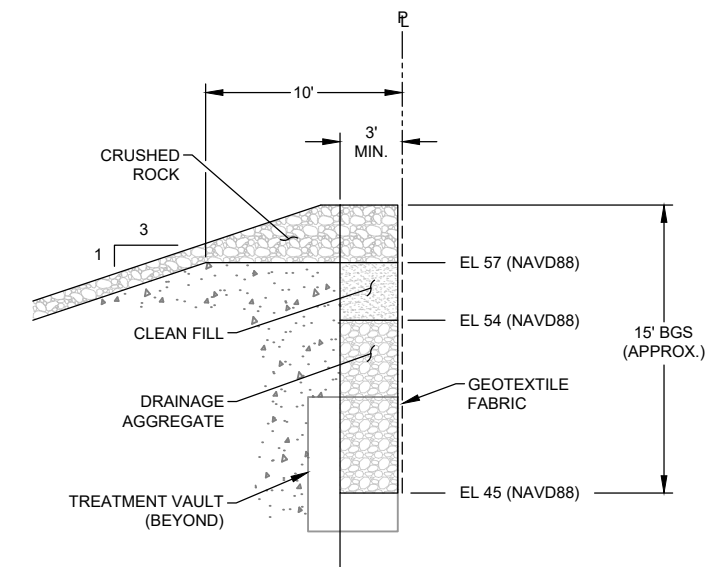
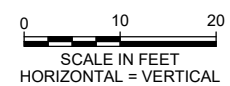


**LEGEND**

- IN-SITU STABILIZATION / SOLIDIFICATION
- PARCEL BOUNDARY FOR TOC SEATTLE TERMINAL 1, LLC PROPERTIES



**TRENCH PROFILE**



**TRENCH SECTION**



Rev	Date	Description

Client

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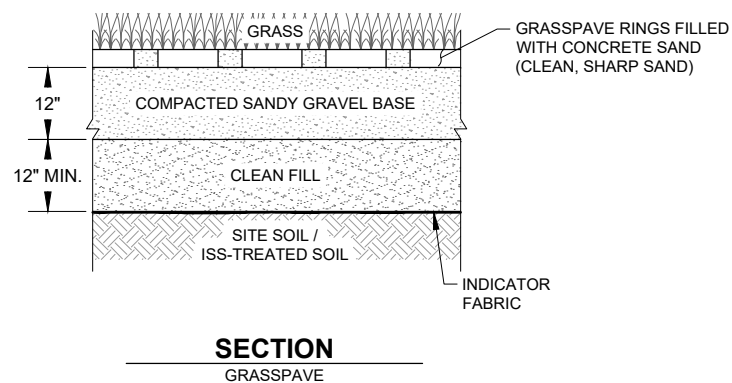
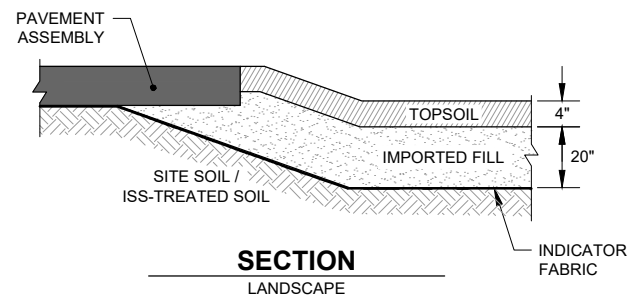
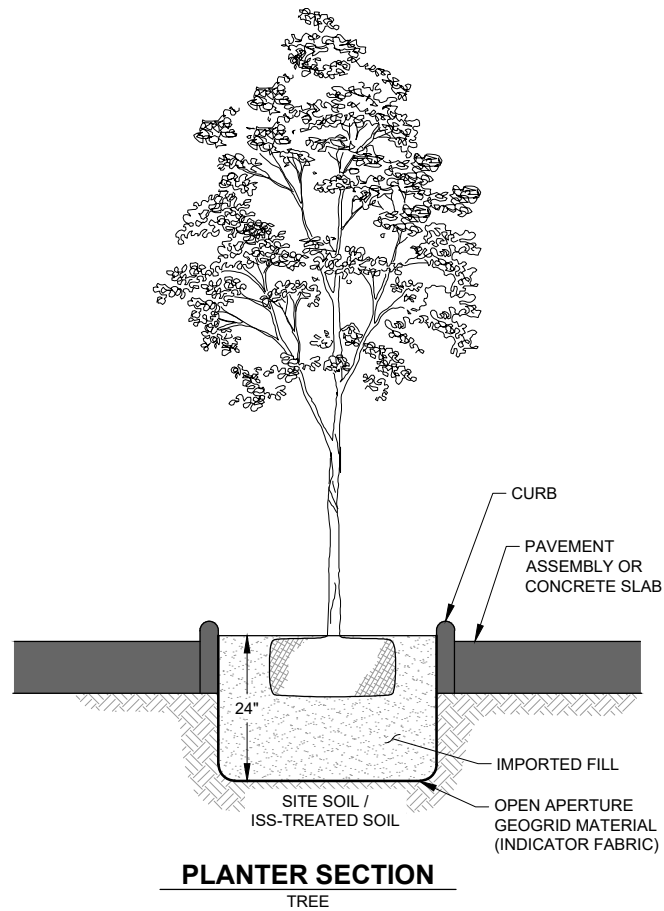
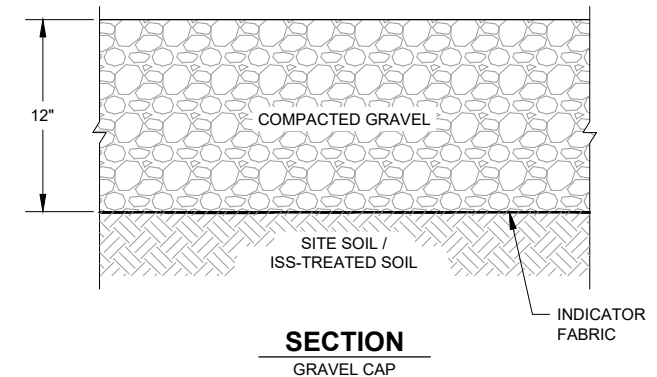
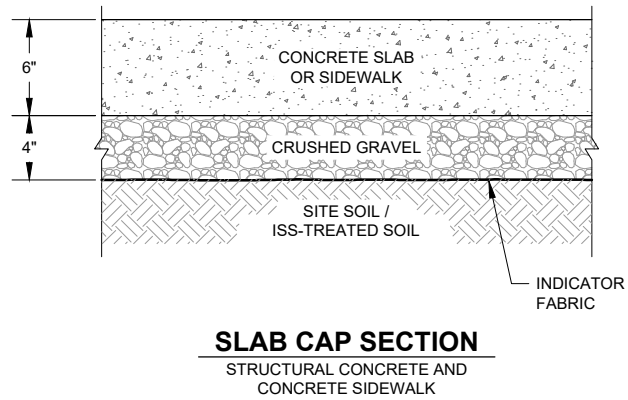
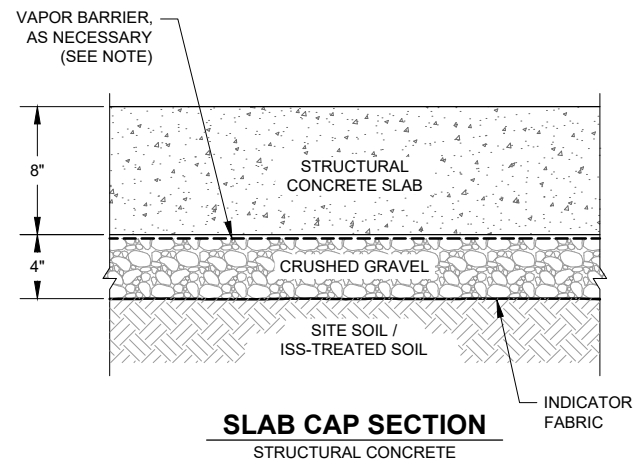
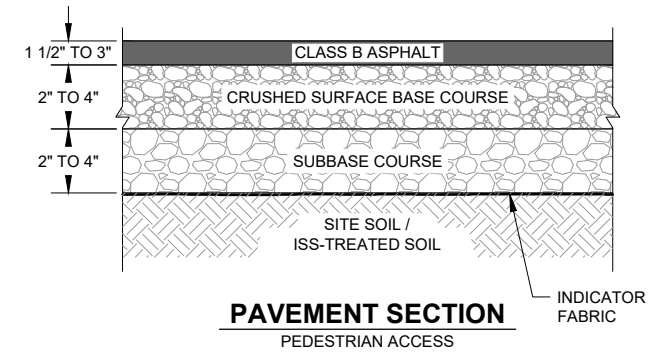
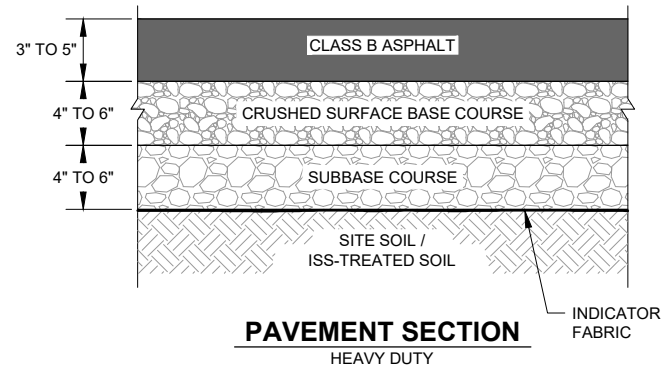
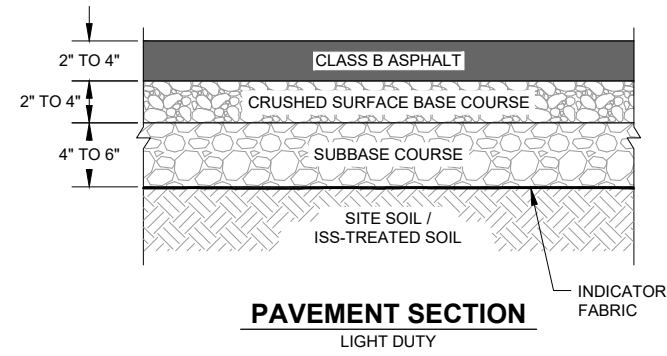
SCALE WARNING  
 Drawing is not to scale, if scale bar doesn't measure one inch

Designer M. Byers  
 Drafter C. Taylor  
 Checker X  
 Reviewer X

Time Oil Bulk Terminal  
 Remediation Design  
 Seattle, Washington

**Interceptor Trench Design**

File: D:\Projects\Create\Time Oil Seattle\C1-C3.1 THRU C3.4-C4.1-C4.2-C5.1.dwg Plot Date: March 10, 2021 Plotted by: Cabryn



**NOTES**

1. ALL ASPHALT, CONCRETE, BASE COURSE, AND GRAVEL THICKNESSES MAY BE MODIFIED BASED ON THE FINAL REDEVELOPMENT PLANS. THE THICKNESSES PROVIDED ARE TYPICAL FOR THESE TYPES OF APPLICATIONS.
2. THE NEED FOR VAPOR INTRUSION PROTECTIVE MEASURES WILL BE EVALUATED DURING THE DEVELOPMENT DESIGN.

NOT TO SCALE

By	Description
Rev	Date

Client

**CRETE CONSULTING, INC.**  
 108 S. Washington Street, Suite 300  
 Seattle, Washington 98104  
 (206) 491-7554  
 www.creteconsulting.com

Scale As Noted

SCALE WARNING  
 Drawing is not to scale, if scale bar doesn't measure one inch

Designer M. Byers  
 Drafter C. Taylor  
 Checker X  
 Reviewer X

Time Oil Bulk Terminal Remediation Design Seattle, Washington

**Typical Final Cap Details**

## **Appendix C Construction BMPs & City of Seattle Checklists and Correspondence**

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burying and smothering vegetation.

- Vegetative buffer zones for streams, lakes or other waterways shall be established by the local permitting authority or other state or federal permits or approvals.

## ***Maintenance Standards***

Inspect the area frequently to make sure flagging remains in place and the area remains undisturbed. Replace all damaged flagging immediately. Remove all materials located in the buffer area that may impede the ability of the vegetation to act as a filter.

## **BMP C103: High-Visibility Fence**

### ***Purpose***

High-visibility fencing is intended to:

- Restrict clearing to approved limits.
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
- Limit construction traffic to designated construction entrances, exits, or internal roads.
- Protect areas where marking with survey tape may not provide adequate protection.

### ***Conditions of Use***

To establish clearing limits plastic, fabric, or metal fence may be used:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared.
- As necessary to control vehicle access to and on the site.

### ***Design and Installation Specifications***

High-visibility plastic fence shall be composed of a high-density polyethylene material and shall be at least four feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every six inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high-visibility orange. The fence tensile strength shall be 360 lbs/ft using the ASTM D4595 testing method.

If appropriate install fabric silt fence in accordance with [BMP C233: Silt Fence](#) to act as high-visibility fence. Silt fence shall be at least 3 feet high and must be highly visible to meet the requirements of this BMP.

Metal fences shall be designed and installed according to the manufacturer's specifications.

Metal fences shall be at least 3 feet high and must be highly visible.

Fences shall not be wired or stapled to trees.

## Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

### **BMP C105: Stabilized Construction Access**

#### **Purpose**

Stabilized construction accesses are established to reduce the amount of sediment transported onto paved roads outside the project site by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for project sites.

#### **Conditions of Use**

Construction accesses shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential subdivision construction sites, provide a stabilized construction access for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size and configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized accesses not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

#### **Design and Installation Specifications**

See [Figure II-3.1: Stabilized Construction Access](#) for details. Note: the 100' minimum length of the access shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').

Construct stabilized construction accesses with a 12-inch thick pad of 4-inch to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction access stabilization because these products raise pH levels in stormwater and concrete discharge to waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the standards listed in [Table II-3.2: Stabilized Construction Access Geotextile Standards](#).

**Table II-3.2: Stabilized Construction Access  
Geotextile Standards**

Geotextile Property	Required Value
Grab Tensile Strength (ASTM D4751)	200 psi min.

**Table II-3.2: Stabilized Construction Access  
Geotextile Standards (continued)**

Geotextile Property	Required Value
Grab Tensile Elongation (ASTM D4632)	30% max.
Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt in areas that will be paved; this can be used as a stabilized access. Also consider the installation of excess concrete as a stabilized access. During large concrete pours, excess concrete is often available for this purpose.
- Fencing (see [BMP C 103: High-Visibility Fence](#)) shall be installed as necessary to restrict traffic to the construction access.
- Whenever possible, the access shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction accesses should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction access must cross a sidewalk or back of walk drain, the full length of the sidewalk and back of walk drain must be covered and protected from sediment leaving the site.

**Alternative Material Specification**

WSDOT has raised safety concerns about the Quarry Spall rock specified above. WSDOT observes that the 4-inch to 8-inch rock sizes can become trapped between Dually truck tires, and then released off-site at highway speeds. WSDOT has chosen to use a modified specification for the rock while continuously verifying that the Stabilized Construction Access remains effective. To remain effective, the BMP must prevent sediment from migrating off site. To date, there has been no performance testing to verify operation of this new specification. Jurisdictions may use the alternative specification, but must perform increased off-site inspection if they use, or allow others to use, it.

Stabilized Construction Accesses may use material that meets the requirements of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Section 9-03.9(1) ([WSDOT, 2016](#)) for ballast except for the following special requirements.

The grading and quality requirements are listed in [Table II-3.3: Stabilized Construction Access Alternative Material Requirements](#).

**Table II-3.3: Stabilized  
Construction Access  
Alternative Material  
Requirements**

Sieve Size	Percent Passing
2½"	99-100

**Table II-3.3: Stabilized  
Construction Access  
Alternative Material  
Requirements  
(continued)**

Sieve Size	Percent Passing
2"	65-100
¾"	40-80
No. 4	5 max.
No. 100	0-2
% Fracture	75 min.

- All percentages are by weight.
- The sand equivalent value and dust ratio requirements do not apply.
- The fracture requirement shall be at least one fractured face and will apply the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335.

### ***Maintenance Standards***

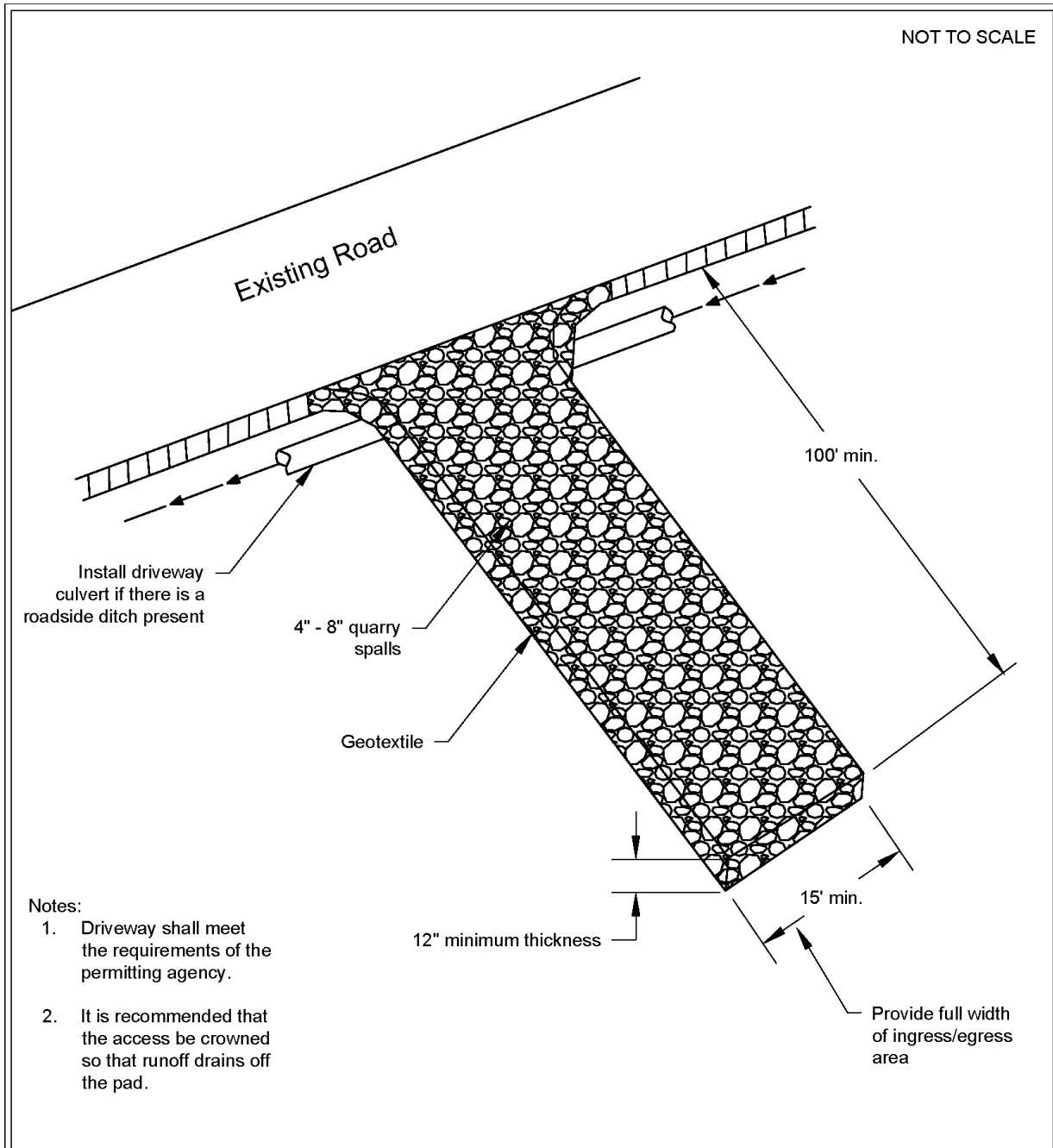
Quarry spalls shall be added if the pad is no longer in accordance with the specifications.

- If the access is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, street sweeping, an increase in the dimensions of the access, or the installation of [BMP C106: Wheel Wash](#).
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when high efficiency sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump to contain the wash water shall be considered. The sediment would then be washed into the sump where it can be controlled.
- Perform street sweeping by hand or with a high efficiency sweeper. Do not use a non-high efficiency mechanical sweeper because this creates dust and throws soils into storm systems or conveyance ditches.
- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction access(es), [BMP C103: High-Visibility Fence](#) shall be installed to control traffic.

- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.



**Figure II-3.1: Stabilized Construction Access**



## Stabilized Construction Access

Revised June 2018

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## ***Approved as Functionally Equivalent***

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology’s website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

### **BMP C106: Wheel Wash**

#### ***Purpose***

Wheel washes reduce the amount of sediment transported onto paved roads by washing dirt from the wheels of motor vehicles prior to the motor vehicles leaving the construction site.

#### ***Conditions of Use***

- Use a wheel wash when [BMP C 105: Stabilized Construction Access](#) is not preventing sediment from being tracked off site.
- Wheel washing is generally an effective BMP when installed with careful attention to topography. For example, a wheel wash can be detrimental if installed at the top of a slope abutting a right-of-way where the water from the dripping truck can run unimpeded into the street.
- Pressure washing combined with an adequately sized and surfaced pad with direct drainage to a large 10-foot x 10-foot sump can be very effective.
- Wheel wash wastewater is not stormwater. It is commonly called process water, and must be discharged to a separate on-site treatment system that prevents discharge to waters of the State, or to the sanitary sewer with local sewer district approval.
- Wheel washes may use closed-loop recirculation systems to conserve water use.
- Wheel wash wastewater shall not include wastewater from concrete washout areas.
- When practical, the wheel wash should be placed in sequence with [BMP C 105: Stabilized Construction Access](#). Locate the wheel wash such that vehicles exiting the wheel wash will enter directly onto [BMP C 105: Stabilized Construction Access](#). In order to achieve this, [BMP C 105: Stabilized Construction Access](#) may need to be extended beyond the standard installation to meet the exit of the wheel wash.

#### ***Design and Installation Specifications***

Suggested details are shown in [Figure II-3.2: Wheel Wash](#). The Local Permitting Authority may allow other designs. A minimum of 6 inches of asphalt treated base (ATB) over crushed base material or 8 inches over a good subgrade is recommended to pave the wheel wash.

Use a low clearance truck to test the wheel wash before paving. Either a belly dump or lowboy will work well to test clearance.

Keep the water level from 12 to 14 inches deep to avoid damage to truck hubs and filling the truck tongues with water.

Midpoint spray nozzles are only needed in extremely muddy conditions.

Wheel wash systems should be designed with a small grade change, 6- to 12-inches for a 10-foot-wide pond, to allow sediment to flow to the low side of pond to help prevent re-suspension of sediment. A drainpipe with a 2- to 3-foot riser should be installed on the low side of the pond to allow for easy cleaning and refilling. Polymers may be used to promote coagulation and flocculation in a closed-loop system. Polyacrylamide (PAM) added to the wheel wash water at a rate of 0.25 - 0.5 pounds per 1,000 gallons of water increases effectiveness and reduces cleanup time. If PAM is already being used for dust or erosion control and is being applied by a water truck, the same truck can be used to change the wash water.

### ***Maintenance Standards***

The wheel wash should start out each day with fresh water.

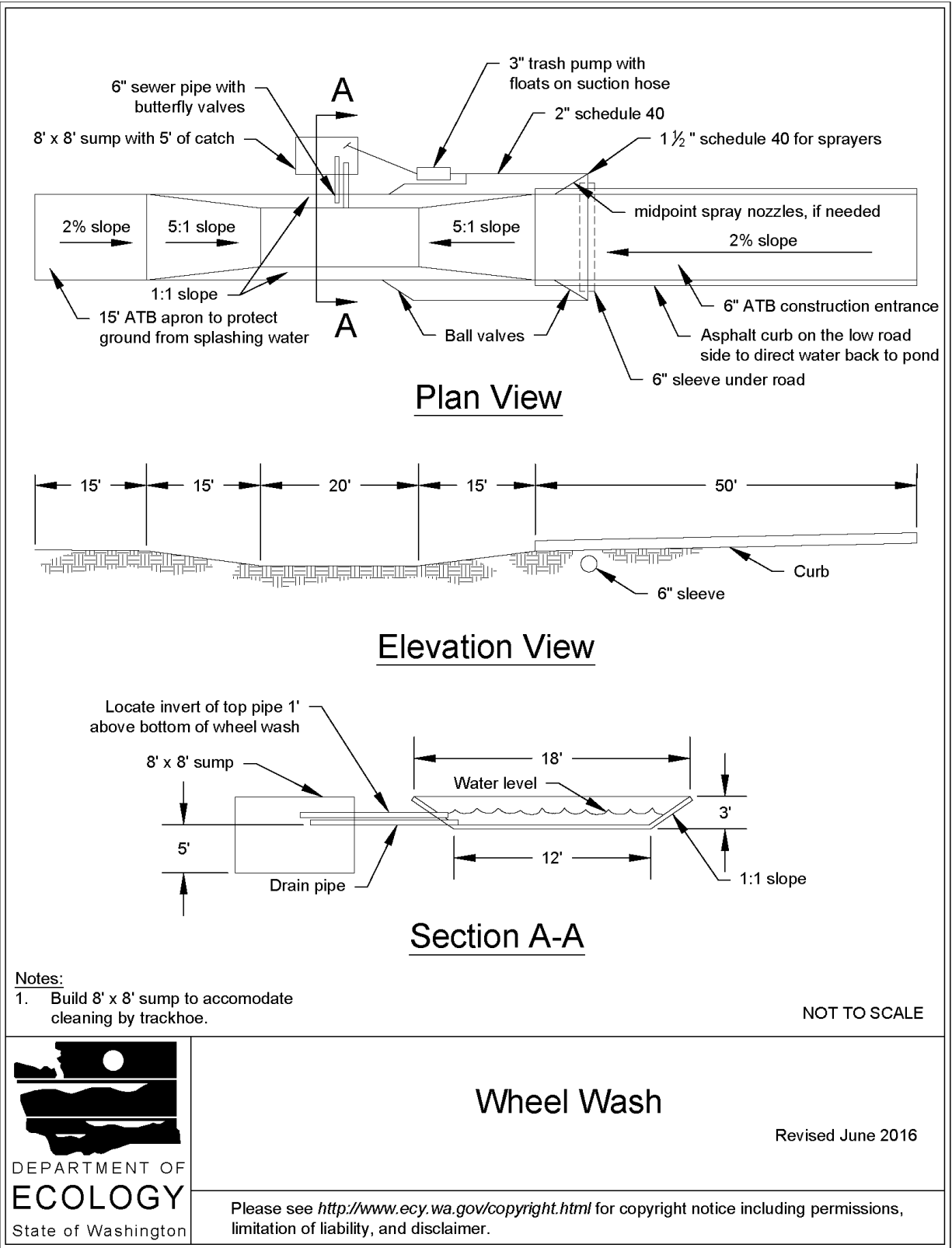
The wheel wash water should be changed a minimum of once per day. On large earthwork jobs where more than 10-20 trucks per hour are expected, the wheel wash water will need to be changed more often.

### ***Approved as Functionally Equivalent***

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

**Figure II-3.2: Wheel Wash**



## **BMP C107: Construction Road / Parking Area Stabilization**

### ***Purpose***

Stabilizing roads, parking areas, and other on-site vehicle transportation routes immediately after grading reduces erosion caused by construction traffic or stormwater runoff.

### ***Conditions of Use***

Roads and parking areas shall be stabilized wherever they are constructed, whether permanent or temporary, for use by construction traffic.

[BMP C103: High-Visibility Fence](#) shall be installed, if necessary, to limit the access of vehicles to only those roads and parking areas that are stabilized.

### ***Design and Installation Specifications***

- On areas that will receive asphalt as part of the project, install the first lift as soon as possible.
- A 6-inch depth of 2- to 4-inch crushed rock, gravel base, or crushed surfacing base course shall be applied immediately after grading or utility installation. A 4-inch course of asphalt treated base (ATB) may also be used, or the road/parking area may be paved. It may also be possible to use cement or calcium chloride for soil stabilization. If cement or cement kiln dust is used for roadbase stabilization, pH monitoring and [BMP C252: Treating and Disposing of High pH Water](#) is necessary to evaluate and minimize the effects on stormwater. If the area will not be used for permanent roads, parking areas, or structures, a 6-inch depth of hog fuel may also be used, but this is likely to require more maintenance. Whenever possible, construction roads and parking areas shall be placed on a firm, compacted subgrade.
- Temporary road gradients shall not exceed 15 percent. Roadways shall be carefully graded to drain. Drainage ditches shall be provided on each side of the roadway in the case of a crowned section, or on one side in the case of a super-elevated section. Drainage ditches shall be directed to a sediment control BMP.
- Rather than relying on ditches, it may also be possible to grade the road so that runoff sheetflows into a heavily vegetated area with a well-developed topsoil. Landscaped areas are not adequate. If this area has at least 50 feet of vegetation that water can flow through, then it is generally preferable to use the vegetation to treat runoff, rather than a sediment pond or trap. The 50 feet shall not include wetlands or their buffers. If runoff is allowed to sheetflow through adjacent vegetated areas, it is vital to design the roadways and parking areas so that no concentrated runoff is created.
- Storm drain inlets shall be protected to prevent sediment-laden water entering the drainage system (see [BMP C220: Inlet Protection](#)).

### ***Maintenance Standards***

Inspect stabilized areas regularly, especially after large storm events.

Crushed rock, gravel base, etc., shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

Perform street cleaning at the end of each day or more often if necessary.

## **BMP C120: Temporary and Permanent Seeding**

### ***Purpose***

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

### ***Conditions of Use***

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See [BMP C121: Mulching](#) for specifications.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion. See [BMP T5.13: Post-Construction Soil Quality and Depth](#).

### ***Design and Installation Specifications***

#### **General**

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed

Crushed rock, gravel base, etc., shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

Perform street cleaning at the end of each day or more often if necessary.

## **BMP C120: Temporary and Permanent Seeding**

### ***Purpose***

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

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Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

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### ***Design and Installation Specifications***

#### **General**

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed

before water flow; install sod in the channel bottom — over top of hydromulch and erosion control blankets.

- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See [BMP C121: Mulching](#) for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application. See [BMP T5.13: Post-Construction Soil Quality and Depth](#).
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
  - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
  - Phase 2- Install the rest of the mulch and tackifier over the first lift.

Or, enhance vegetation by:

- Installing the mulch, seed, fertilizer, and tackifier in one lift.
- Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
- Hold straw in place with a standard tackifier.

Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:

- Irrigation.
- Reapplication of mulch.
- Repair of failed slope surfaces.

This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bonded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).

- Seed may be installed by hand if:
  - Temporary and covered by straw, mulch, or topsoil.
  - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in [Table II-3.4: Temporary and Permanent Seed Mixes](#) include



recommended mixes for both temporary and permanent seeding.

- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.
- Consult the local suppliers or the local conservation district for their recommendations. The appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

**Table II-3.4: Temporary and Permanent Seed Mixes**

Common Name	Latin Name	% Weight	% Purity	% Germination
<b>Temporary Erosion Control Seed Mix</b>				
A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	<i>Festuca rubra var. commutata</i> or <i>Poa anna</i>	40	98	90
Perennial rye	<i>Lolium perenne</i>	50	98	90
Redtop or colonial bentgrass	<i>Agrostis alba</i> or <i>Agrostis tenuis</i>	5	92	85
White dutch clover	<i>Trifolium repens</i>	5	98	90
<b>Landscaping Seed Mix</b>				
A recommended mix for landscaping seed.				
Perennial rye blend	<i>Lolium perenne</i>	70	98	90
Chewings and red fescue blend	<i>Festuca rubra var. commutata</i> or <i>Festuca rubra</i>	30	98	90
<b>Low-Growing Turf Seed Mix</b>				
A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	<i>Festuca arundinacea var.</i>	45	98	90
Dwarf perennial rye (Barclay)	<i>Lolium perenne var. barclay</i>	30	98	90
Red fescue	<i>Festuca rubra</i>	20	98	90
Colonial bentgrass	<i>Agrostis tenuis</i>	5	98	90
<b>Bioswale Seed Mix</b>				
A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fes-	<i>Festuca arundin-</i>	75-80	98	90

**Table II-3.4: Temporary and Permanent Seed Mixes (continued)**

Common Name	Latin Name	% Weight	% Purity	% Germination
cue	<i>acea</i> or <i>Festuca elatior</i>			
Seaside/Creeping bentgrass	<i>Agrostis palustris</i>	10-15	92	85
Redtop bentgrass	<i>Agrostis alba</i> or <i>Agrostis gigantea</i>	5-10	90	80
<b>Wet Area Seed Mix</b>				
A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				
Tall or meadow fescue	<i>Festuca arundinacea</i> or <i>Festuca elatior</i>	60-70	98	90
Seaside/Creeping bentgrass	<i>Agrostis palustris</i>	10-15	98	85
Meadow foxtail	<i>Alepocurus pratensis</i>	10-15	90	80
Alsike clover	<i>Trifolium hybridum</i>	1-6	98	90
Redtop bentgrass	<i>Agrostis alba</i>	1-6	92	85
<b>Meadow Seed Mix</b>				
A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	<i>Agrostis alba</i> or <i>Agrostis oregonensis</i>	20	92	85
Red fescue	<i>Festuca rubra</i>	70	98	90
White dutch clover	<i>Trifolium repens</i>	10	98	90

**Roughening and Rototilling**

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
- Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum,

permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

### **Fertilizers**

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
- There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

### **Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix**

- On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
  - BFMs and MBFMs do not require surface preparation.
  - Helicopters can assist in installing BFM and MBFMs in remote areas.
  - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
  - Installing BFM and MBFMs can save at least \$1,000 per acre compared to blankets.

## ***Maintenance Standards***

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes run-off.

## ***Approved as Functionally Equivalent***

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology’s website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

## **BMP C121: Mulching**

### ***Purpose***

Mulching soils provides immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. There are a variety of mulches that can be used. This section discusses only the most common types of mulch.

### ***Conditions of Use***

As a temporary cover measure, mulch should be used:

- For less than 30 days on disturbed areas that require cover.
- At all times for seeded areas, especially during the wet season and during the hot summer months.
- During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.

Mulch may be applied at any time of the year and must be refreshed periodically.

For seeded areas, mulch may be made up of 100 percent:

- cottonseed meal;
- fibers made of wood, recycled cellulose, hemp, or kenaf;

## **BMP C140: Dust Control**

### ***Purpose***

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

### ***Conditions of Use***

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts to roadways, drainage ways, or surface waters are likely.

### ***Design and Installation Specifications***

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until the surface is wet. Repeat as needed. To prevent carryout of mud onto the street, refer to [BMP C 105: Stabilized Construction Access](#) and [BMP C 106: Wheel Wash](#).
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM ([BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#)) added to water at a rate of 0.5 pounds per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may reduce the quantity of water needed for dust control. Note that the application rate specified here applies to this BMP, and is not the same application rate that is specified in [BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#), but the downstream protections still apply.

Refer to [BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#) for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.

- Contact your local Air Pollution Control Authority for guidance and training on other dust control measures. Compliance with the local Air Pollution Control Authority constitutes

compliance with this BMP.

- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Techniques that can be used for unpaved roads and lots include:
  - Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
  - Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
  - Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.
  - Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
  - Encourage the use of alternate, paved routes, if available.
  - Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
  - Limit dust-causing work on windy days.
  - Pave unpaved permanent roads and other trafficked areas.

## ***Maintenance Standards***

Respray area as necessary to keep dust to a minimum.

## **BMP C150: Materials on Hand**

### ***Purpose***

Keep quantities of erosion prevention and sediment control materials on the project site at all times to be used for regular maintenance and emergency situations such as unexpected heavy rains. Having these materials on-site reduces the time needed to replace existing or implement new BMPs when inspections indicate that existing BMPs are not meeting the Construction SWPPP requirements. In addition, contractors can save money by buying some materials in bulk and storing them at their office or yard.

### ***Conditions of Use***

- Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible

pipe, sandbags, geotextile fabric and steel “T” posts.

- Materials should be stockpiled and readily available before any site clearing, grubbing, or earthwork begins. A large contractor or project proponent could keep a stockpile of materials that are available for use on several projects.
- If storage space at the project site is at a premium, the contractor could maintain the materials at their office or yard. The office or yard must be less than an hour from the project site.

## ***Design and Installation Specifications***

Depending on project type, size, complexity, and length, materials and quantities will vary. A good minimum list of items that will cover numerous situations includes:

- Clear Plastic, 6 mil
- Drainpipe, 6 or 8 inch diameter
- Sandbags, filled
- Straw Bales for mulching
- Quarry Spalls
- Washed Gravel
- Geotextile Fabric
- Catch Basin Inserts
- Steel "T" Posts
- Silt fence material
- Straw Wattles

## ***Maintenance Standards***

- All materials with the exception of the quarry spalls, steel “T” posts, and gravel should be kept covered and out of both sun and rain.
- Re-stock materials as needed.

## **BMP C151: Concrete Handling**

### ***Purpose***

Concrete work can generate process water and slurry that contain fine particles and high pH, both of which can violate water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate concrete, concrete process water, and concrete slurry from entering waters of the State.

## Conditions of Use

Any time concrete is used, utilize these management practices. Concrete construction project components include, but are not limited to:

- Curbs
- Sidewalks
- Roads
- Bridges
- Foundations
- Floors
- Runways

Disposal options for concrete, in order of preference are:

1. Off-site disposal
2. Concrete wash-out areas (see [BMP C154: Concrete Washout Area](#))
3. De minimus washout to formed areas awaiting concrete

## Design and Installation Specifications

- Wash concrete truck drums at an approved off-site location or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground (including formed areas awaiting concrete), or into storm drains, open ditches, streets, or streams. Refer to [BMP C154: Concrete Washout Area](#) for information on concrete washout areas.
  - Return unused concrete remaining in the truck and pump to the originating batch plant for recycling. Do not dump excess concrete on site, except in designated concrete washout areas as allowed in [BMP C154: Concrete Washout Area](#).
- Wash small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) into designated concrete washout areas or into formed areas awaiting concrete pour.
- At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow washwater from areas, such as concrete aggregate driveways, to drain directly (without detention or treatment) to natural or constructed stormwater conveyances.
- Contain washwater and leftover product in a lined container when no designated concrete washout areas (or formed areas, allowed as described above) are available. Dispose of contained concrete and concrete washwater (process water) properly.



- Always use forms or solid barriers for concrete pours, such as pilings, within 15-feet of surface waters.
- Refer to [BMP C252: Treating and Disposing of High pH Water](#) for pH adjustment requirements.
- Refer to the Construction Stormwater General Permit (CSWGP) for pH monitoring requirements if the project involves one of the following activities:
  - Significant concrete work (as defined in the CSWGP).
  - The use of soils amended with (but not limited to) Portland cement-treated base, cement kiln dust or fly ash.
  - Discharging stormwater to segments of water bodies on the 303(d) list (Category 5) for high pH.

### ***Maintenance Standards***

Check containers for holes in the liner daily during concrete pours and repair the same day.

## **BMP C152: Sawcutting and Surfacing Pollution Prevention**

### ***Purpose***

Sawcutting and surfacing operations generate slurry and process water that contains fine particles and high pH (concrete cutting), both of which can violate the water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate process water and slurry created through sawcutting or surfacing from entering waters of the State.

### ***Conditions of Use***

Utilize these management practices anytime sawcutting or surfacing operations take place. Sawcutting and surfacing operations include, but are not limited to:

- Sawing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

## ***Design and Installation Specifications***

- Vacuum slurry and cuttings during cutting and surfacing operations.
- Slurry and cuttings shall not remain on permanent concrete or asphalt pavement overnight.
- Slurry and cuttings shall not drain to any natural or constructed drainage conveyance including stormwater systems. This may require temporarily blocking catch basins.
- Dispose of collected slurry and cuttings in a manner that does not violate ground water or surface water quality standards.
- Do not allow process water generated during hydro-demolition, surface roughening or similar operations to drain to any natural or constructed drainage conveyance including stormwater systems. Dispose of process water in a manner that does not violate ground water or surface water quality standards.
- Handle and dispose of cleaning waste material and demolition debris in a manner that does not cause contamination of water. Dispose of sweeping material from a pick-up sweeper at an appropriate disposal site.

## ***Maintenance Standards***

Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and/or vacuum trucks.

## **BMP C153: Material Delivery, Storage, and Containment**

### ***Purpose***

Prevent, reduce, or eliminate the discharge of pollutants to the stormwater system or watercourses from material delivery and storage. Minimize the storage of hazardous materials on-site, store materials in a designated area, and install secondary containment.

### ***Conditions of Use***

Use at construction sites with delivery and storage of the following materials:

- Petroleum products such as fuel, oil and grease
- Soil stabilizers and binders (e.g., Polyacrylamide)
- Fertilizers, pesticides and herbicides
- Detergents
- Asphalt and concrete compounds

- Hazardous chemicals such as acids, lime, adhesives, paints, solvents, and curing compounds
- Any other material that may be detrimental if released to the environment

## ***Design and Installation Specifications***

- The temporary storage area should be located away from vehicular traffic, near the construction entrance(s), and away from waterways or storm drains.
- Safety Data Sheets (SDS) should be supplied for all materials stored. Chemicals should be kept in their original labeled containers.
- Hazardous material storage on-site should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- During the wet weather season (Oct 1 – April 30), consider storing materials in a covered area.
- Materials should be stored in secondary containments, such as an earthen dike, horse trough, or even a children’s wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in “bus boy” trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, within secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.
- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall not be overfilled. Containers and drums shall be stored in temporary secondary containment facilities.
- Temporary secondary containment facilities shall provide for a spill containment volume able to contain 10% of the total enclosed container volume of all containers, or 110% of the capacity of the largest container within its boundary, whichever is greater.
- Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- During the wet weather season (Oct 1 – April 30), each secondary containment facility shall be covered during non-working days, prior to and during rain events.
- Keep material storage areas clean, organized and equipped with an ample supply of appropriate spill clean-up material (spill kit).
- The spill kit should include, at a minimum:

- 1-Water Resistant Nylon Bag
- 3-Oil Absorbent Socks 3"x 4'
- 2-Oil Absorbent Socks 3"x 10'
- 12-Oil Absorbent Pads 17"x19"
- 1-Pair Splash Resistant Goggles
- 3-Pair Nitrile Gloves
- 10-Disposable Bags with Ties
- Instructions

### ***Maintenance Standards***

- Secondary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as hazardous waste unless testing determines them to be non-hazardous.
- Re-stock spill kit materials as needed.

## **BMP C154: Concrete Washout Area**

### ***Purpose***

Prevent or reduce the discharge of pollutants from concrete waste to stormwater by conducting washout off-site, or performing on-site washout in a designated area.

### ***Conditions of Use***

Concrete washout areas are implemented on construction projects where:

- Concrete is used as a construction material
- It is not possible to dispose of all concrete wastewater and washout off-site (ready mix plant, etc.).
- Concrete truck drums are washed on-site.

Note that auxiliary concrete truck components (e.g. chutes and hoses) and small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) may be washed into formed areas awaiting concrete pour.

At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.

thickness is 2 feet.

- For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), use an engineered energy dissipator.
- Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion. See [BMP C122: Nets and Blankets](#).
- Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife. See [I-2.11 Hydraulic Project Approvals](#).

## **Maintenance Standards**

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipator if sediment builds up.

## **BMP C220: Inlet Protection**

### ***Purpose***

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

### ***Conditions of Use***

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

[Table II-3.10: Storm Drain Inlet Protection](#) lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

**Table II-3.10: Storm Drain Inlet Protection**

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
<b>Drop Inlet Protection</b>			
Excavated drop inlet protection	Yes, temporary flooding may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or Earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
<b>Curb Inlet Protection</b>			
Curb inlet protection with wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
<b>Culvert Inlet Protection</b>			
Culvert inlet sediment trap	N/A	N/A	18 month expected life.

## ***Design and Installation Specifications***

### **Excavated Drop Inlet Protection**

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation should be no steeper than 2H:1V.
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.
- Clear the area of all debris.

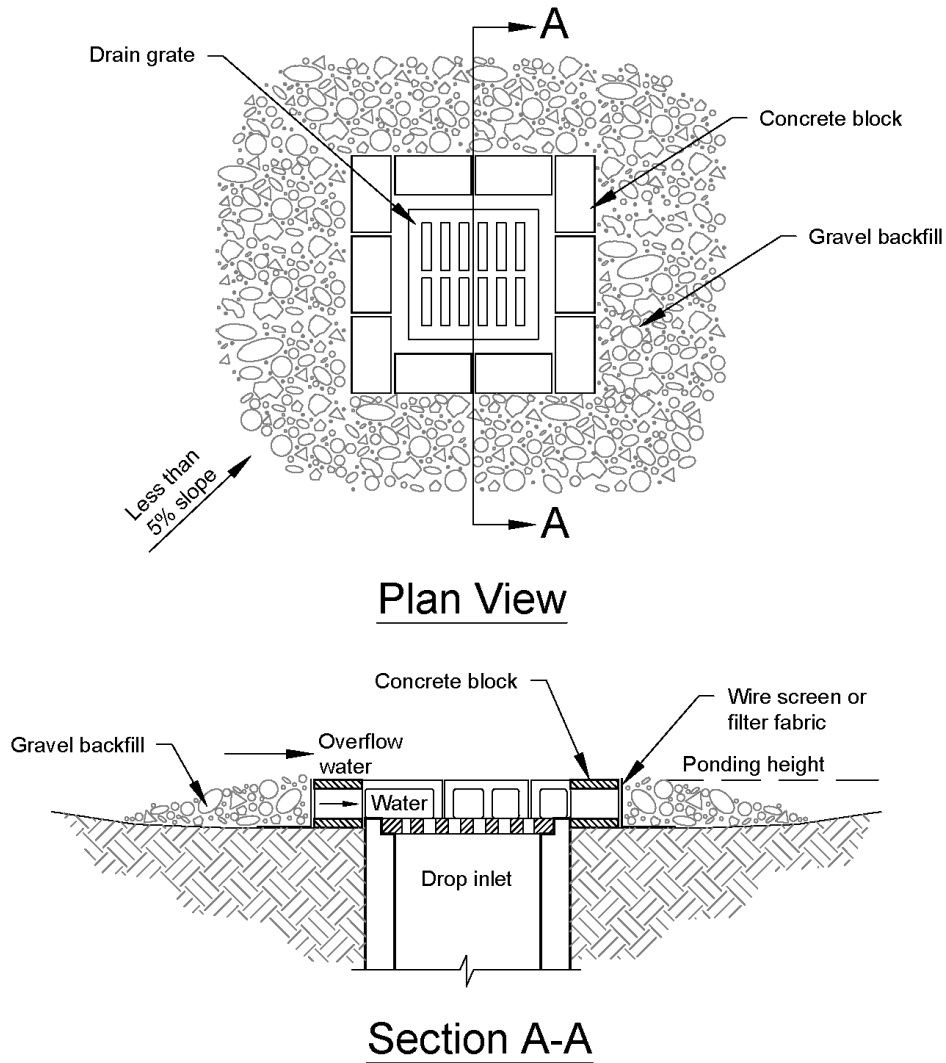
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

### **Block and Gravel Filter**

A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See [Figure II-3.17: Block and Gravel Filter](#). Design and installation specifications for block gravel filters include:

- Provide a height of 1 to 2 feet above the inlet.
- Recess the first row of blocks 2-inches into the ground for stability.
- Support subsequent courses by placing a pressure treated wood 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
  - Provide a slope of 3H:1V on the upstream side of the berm.
  - Provide a slope of 2H:1V on the downstream side of the berm.
  - Provide a 1-foot wide level stone area between the gravel berm and the inlet.
  - Use stones 3 inches in diameter or larger on the upstream slope of the berm.
  - Use gravel ½- to ¾-inch at a minimum thickness of 1-foot on the downstream slope of the berm.

**Figure II-3.17: Block and Gravel Filter**



**Notes:**

1. Drop inlet sediment barriers are to be used for small, nearly level drainage areas. (less than 5%)
2. Excavate a basin of sufficient size adjacent to the drop inlet.
3. The top of the structure (ponding height) must be well below the ground elevation downslope to prevent runoff from bypassing the inlet. A temporary dike may be necessary on the downslope side of the structure.

NOT TO SCALE



**Block and Gravel Filter**

Revised June 2016

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### **Gravel and Wire Mesh Filter**

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
  - Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
  - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
  - Provide at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 18-inches on all sides.

### **Catch Basin Filters**

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

### **Curb Inlet Protection with Wooden Weir**

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

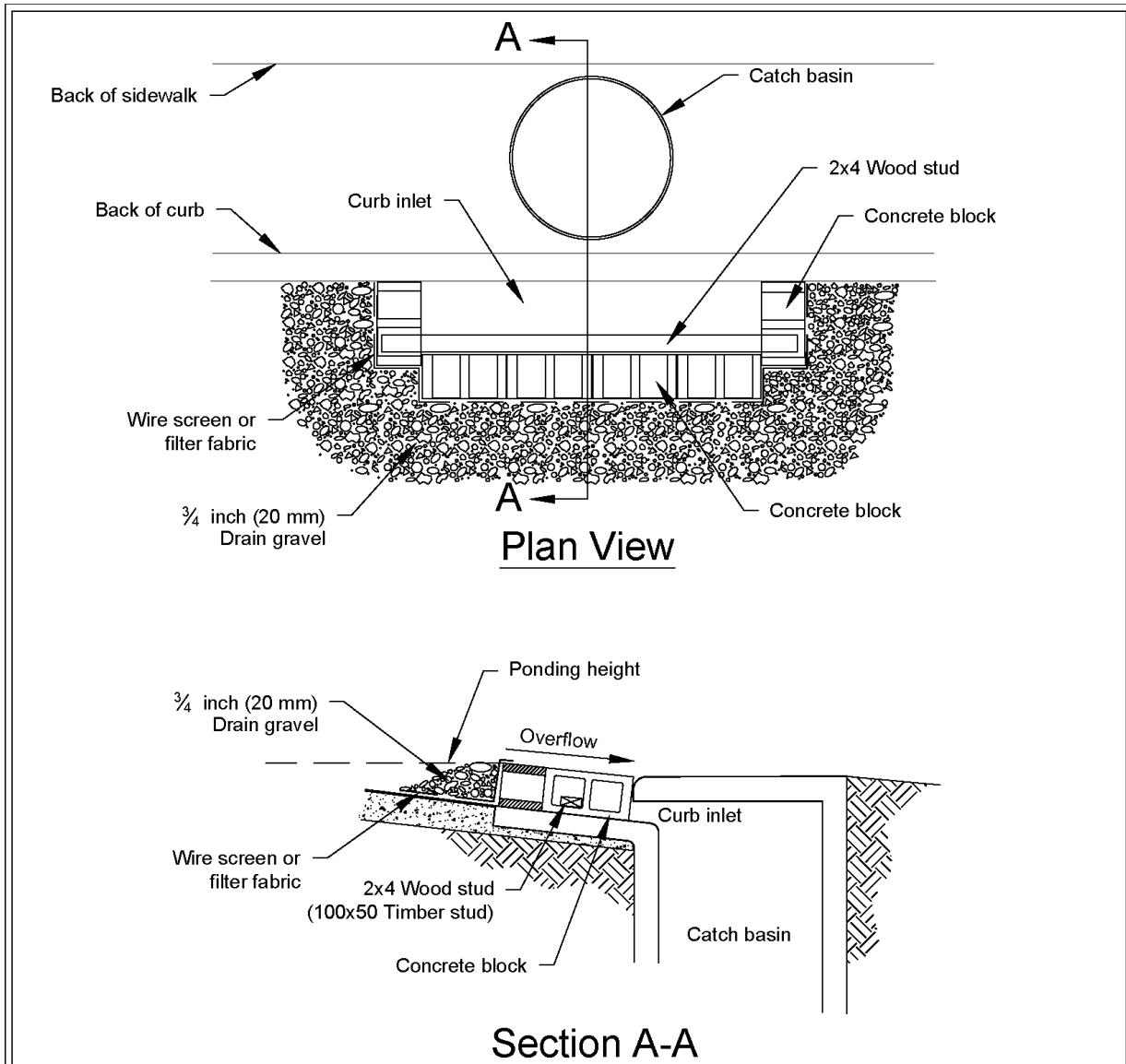
- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

### **Block and Gravel Curb Inlet Protection**

Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See [Figure II-3.18: Block and Gravel Curb Inlet Protection](#). Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

**Figure II-3.18: Block and Gravel Curb Inlet Protection**



**Notes:**

1. Use block and gravel type sediment barrier when curb inlet is located in gently sloping street segment, where water can pond and allow sediment to separate from runoff.
2. Barrier shall allow for overflow from severe storm event.
3. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE



**Block and Gravel Curb Inlet Protection**

Revised June 2016

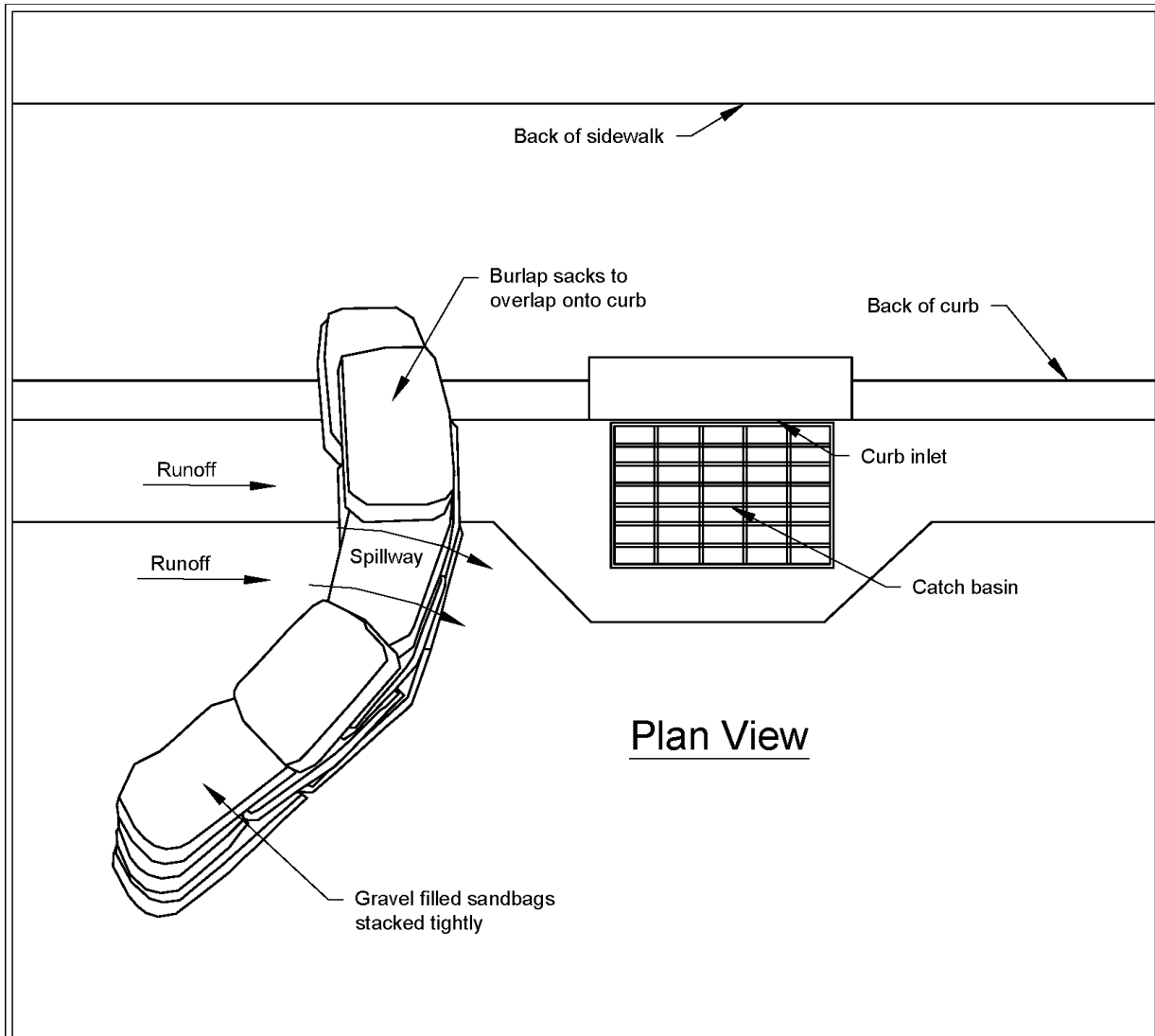
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### **Curb and Gutter Sediment Barrier**

Curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See [Figure II-3.19: Curb and Gutter Barrier](#). Design and installation specifications for curb and gutter sediment barrier include:

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

**Figure II-3.19: Curb and Gutter Barrier**



**Notes:**

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE



**Curb and Gutter Barrier**

Revised June 2016

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## ***Maintenance Standards***

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach would be to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

## ***Approved as Functionally Equivalent***

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

## **BMP C231: Brush Barrier**

### ***Purpose***

The purpose of brush barriers is to reduce the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

### ***Conditions of Use***

- Brush barriers may be used downslope of disturbed areas that are less than one-quarter acre.
- Brush barriers are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be directed to a sediment trapping BMP. The only circumstance in which overland flow can be treated solely by a brush barrier, rather than by a sediment trapping BMP, is when the area draining to the barrier is small.
- Brush barriers should only be installed on contours.

### ***Design and Installation Specifications***

- Height: 2 feet (minimum) to 5 feet (maximum).
- Width: 5 feet at base (minimum) to 15 feet (maximum).
- Filter fabric (geotextile) may be anchored over the brush berm to enhance the filtration ability of the barrier. Ten-ounce burlap is an adequate alternative to filter fabric.

## **BMP C233: Silt Fence**

### ***Purpose***

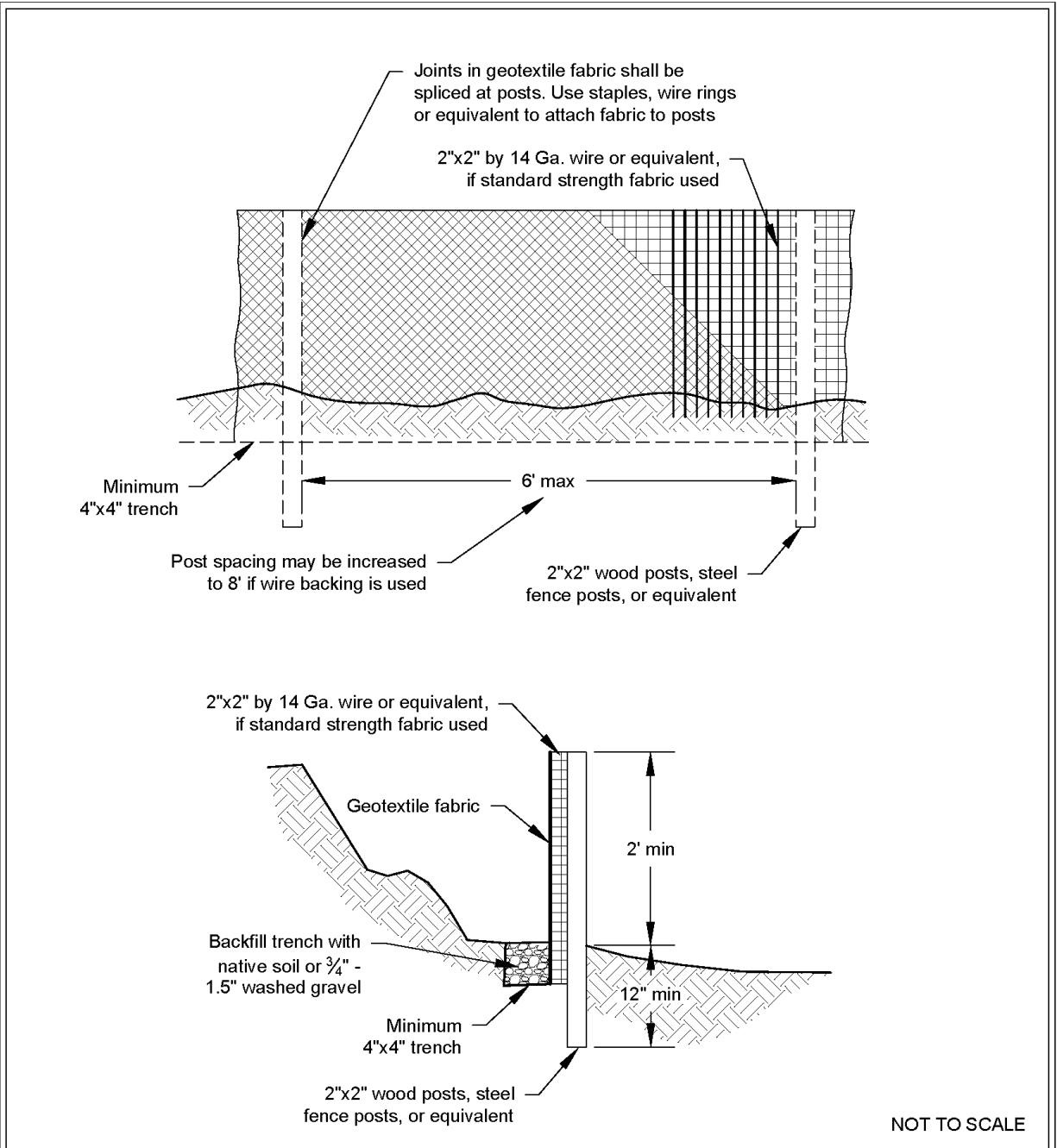
Silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

### ***Conditions of Use***

Silt fence may be used downslope of all disturbed areas.

- Silt fence shall prevent sediment carried by runoff from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.
- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Convey any concentrated flows through the drainage system to a sediment trapping BMP.
- Do not construct silt fences in streams or use in V-shaped ditches. Silt fences do not provide an adequate method of silt control for anything deeper than sheet or overland flow.

**Figure II-3.22: Silt Fence**



**Silt Fence**

Revised July 2017

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## Design and Installation Specifications

- Use in combination with other construction stormwater BMPs.
- Maximum slope steepness (perpendicular to the silt fence line) 1H:1V.
- Maximum sheet or overland flow path length to the silt fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- Use geotextile fabric that meets the following standards. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in [Table II-3.11: Geotextile Fabric Standards for Silt Fence](#)):

**Table II-3.11: Geotextile Fabric Standards for Silt Fence**

Geotextile Property	Minimum Average Roll Value
Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film woven (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec <sup>-1</sup> minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

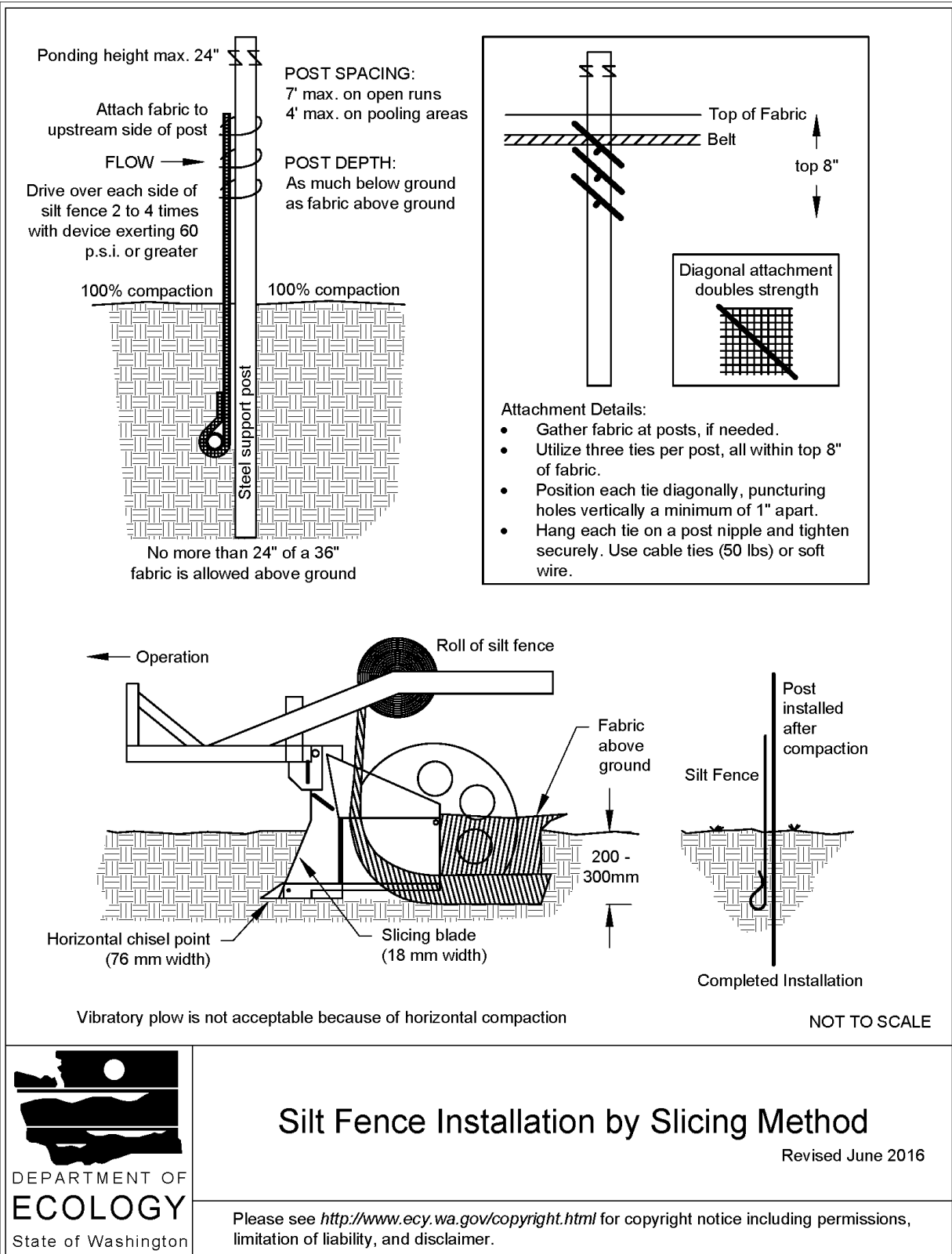
- Support standard strength geotextiles with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the geotextile. Silt fence materials are available that have synthetic mesh backing attached.
- Silt fence material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F to 120°F.
- One-hundred percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by the local jurisdiction.
- Refer to [Figure II-3.22: Silt Fence](#) for standard silt fence details. Include the following Standard Notes for silt fence on construction plans and specifications:
  1. The Contractor shall install and maintain temporary silt fences at the locations shown in the Plans.
  2. Construct silt fences in areas of clearing, grading, or drainage prior to starting those activities.

3. The silt fence shall have a 2-feet min. and a 2½-feet max. height above the original ground surface.
4. The geotextile fabric shall be sewn together at the point of manufacture to form fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided that the overlap is long enough and that the adjacent silt fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
5. Attach the geotextile fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the geotextile fabric to the posts in a manner that reduces the potential for tearing.
6. Support the geotextile fabric with wire or plastic mesh, dependent on the properties of the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the up-slope side of the posts with the geotextile fabric up-slope of the mesh.
7. Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2-inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the geotextile fabric it supports.
8. Bury the bottom of the geotextile fabric 4-inches min. below the ground surface. Backfill and tamp soil in place over the buried portion of the geotextile fabric, so that no flow can pass beneath the silt fence and scouring cannot occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches min.
9. Drive or place the silt fence posts into the ground 18-inches min. A 12-inch min. depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post min. depths by 6 inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.
10. Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6-feet. Posts shall consist of either:
  - Wood with minimum dimensions of 2 inches by 2 inches by 3 feet. Wood shall be free of defects such as knots, splits, or gouges.
  - No. 6 steel rebar or larger.
  - ASTM A 120 steel pipe with a minimum diameter of 1-inch.
  - U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft.
  - Other steel posts having equivalent strength and bending resistance to the post sizes listed above.
11. Locate silt fences on contour as much as possible, except at the ends of the fence,

where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

12. If the fence must cross contours, with the exception of the ends of the fence, place check dams perpendicular to the back of the fence to minimize concentrated flow and erosion. The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.
  - Check dams shall be approximately 1-foot deep at the back of the fence. Check dams shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence.
  - Check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Check dams shall be located every 10 feet along the fence where the fence must cross contours.
- Refer to [Figure II-3.23: Silt Fence Installation by Slicing Method](#) for slicing method details. The following are specifications for silt fence installation using the slicing method:
  1. The base of both end posts must be at least 2- to 4-inches above the top of the geotextile fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.
  2. Install posts 3- to 4-feet apart in critical retention areas and 6- to 7-feet apart in standard applications.
  3. Install posts 24-inches deep on the downstream side of the silt fence, and as close as possible to the geotextile fabric, enabling posts to support the geotextile fabric from upstream water pressure.
  4. Install posts with the nipples facing away from the geotextile fabric.
  5. Attach the geotextile fabric to each post with three ties, all spaced within the top 8-inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1-inch vertically apart. Each tie should be positioned to hang on a post nipple when tightening to prevent sagging.
  6. Wrap approximately 6-inches of the geotextile fabric around the end posts and secure with 3 ties.
  7. No more than 24-inches of a 36-inch geotextile fabric is allowed above ground level.
  8. Compact the soil immediately next to the geotextile fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips. Check and correct the silt fence installation for any deviation before compaction. Use a flat-bladed shovel to tuck the fabric deeper into the ground if necessary.

**Figure II-3.23: Silt Fence Installation by Slicing Method**



## Silt Fence Installation by Slicing Method

Revised June 2016

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## Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment trapping BMP.
- Check the uphill side of the silt fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence and remove the trapped sediment.
- Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace geotextile fabric that has deteriorated due to ultraviolet breakdown.

## BMP C234: Vegetated Strip

### Purpose

Vegetated strips reduce the transport of coarse sediment from a construction site by providing a physical barrier to sediment and reducing the runoff velocities of overland flow.

### Conditions of Use

- Vegetated strips may be used downslope of all disturbed areas.
- Vegetated strips are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be conveyed through the drainage system to [BMP C241: Sediment Pond \(Temporary\)](#) or other sediment trapping BMP. The only circumstance in which overland flow can be treated solely by a vegetated strip, rather than by a sediment trapping BMP, is when the following criteria are met (see [Table II-3.12: Contributing Drainage Area for Vegetated Strips](#)):

**Table II-3.12: Contributing Drainage Area for Vegetated Strips**

Average Contributing Area Slope	Average Contributing Area Percent Slope	Max Contributing area Flowpath Length
1.5H : 1V or flatter	67% or flatter	100 feet
2H : 1V or flatter	50% or flatter	115 feet
4H : 1V or flatter	25% or flatter	150 feet
6H : 1V or flatter	16.7% or flatter	200 feet
10H : 1V or flatter	10% or flatter	250 feet

## Conditions of Use

The construction sequence schedule is an orderly listing of all major land-disturbing activities together with the necessary erosion and sedimentation control measures planned for the project. This type of schedule guides the contractor on work to be done before other work is started so that serious erosion and sedimentation problems can be avoided.

Following a specified work schedule that coordinates the timing of land-disturbing activities and the installation of control measures is perhaps the most cost-effective way of controlling erosion during construction. The removal of ground cover leaves a site vulnerable to erosion. Construction sequencing that limits land clearing, provides timely installation of erosion and sedimentation controls, and restores protective cover quickly can significantly reduce the erosion potential of a site.

## Design Considerations

- Minimize construction during rainy periods.
- Schedule projects to disturb only small portions of the site at any one time. Complete grading as soon as possible. Immediately stabilize the disturbed portion before grading the next portion. Practice staged seeding in order to revegetate cut and fill slopes as the work progresses.

## II-3.3 Construction Runoff BMPs

### **BMP C200: Interceptor Dike and Swale**

#### *Purpose*

Provide a dike of compacted soil or a swale at the top or base of a disturbed slope or along the perimeter of a disturbed construction area to convey stormwater. Use the dike and/or swale to intercept the runoff from unprotected areas and direct it to areas where erosion can be controlled. This can prevent storm runoff from entering the work area or sediment-laden runoff from leaving the construction site.

#### *Conditions of Use*

Use an interceptor dike or swale where runoff from an exposed site or disturbed slope must be conveyed to an erosion control BMP which can safely convey the stormwater.

- Locate upslope of a construction site to prevent runoff from entering the disturbed area.
- When placed horizontally across a disturbed slope, it reduces the amount and velocity of runoff flowing down the slope.
- Locate downslope to collect runoff from a disturbed area and direct it to a sediment BMP (e.g. [BMP C240: Sediment Trap](#) or [BMP C241: Sediment Pond \(Temporary\)](#)).

## ***Design and Installation Specifications***

- Dike and/or swale and channel must be stabilized with temporary or permanent vegetation or other channel protection during construction.
  - Steep grades require channel protection and check dams.
  - Review construction for areas where overtopping may occur.
  - Can be used at the top of new fill before vegetation is established.
  - May be used as a permanent diversion channel to carry the runoff.
  - Contributing area for an individual dike or swale should be one acre or less.
  - Design the dike and/or swale to contain flows calculated by one of the following methods:
    - Single Event Hydrograph Method: The peak volumetric flow rate calculated using a 10-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the worst-case land cover condition.
- OR
- Continuous Simulation Method: The 10-year peak flow rate, as determined by an approved continuous runoff model with a 15-minute time step for the worst-case land cover condition.

Worst-case land cover conditions (i.e., producing the most runoff) should be used for analysis (in most cases, this would be the land cover conditions just prior to final landscaping).

### **Interceptor Dikes**

Interceptor dikes shall meet the following criteria:

- Top Width: 2 feet minimum.
- Height: 1.5 feet minimum on berm.
- Side Slope: 2H:1V or flatter.
- Grade: Depends on topography, however, dike system minimum is 0.5%, and maximum is 1%.
- Compaction: Minimum of 90 percent ASTM D698 standard proctor.
- Stabilization: Depends on velocity and reach. Inspect regularly to ensure stability.
- Ground Slopes <5%: Seed and mulch applied within 5 days of dike construction (see [BMP C121: Mulching](#)).
- Ground Slopes 5 - 40%: Dependent on runoff velocities and dike materials. Stabilization should be done immediately using either sod or riprap, or other measures to avoid erosion.
- The upslope side of the dike shall provide positive drainage to the dike outlet. No erosion shall

occur at the outlet. Provide energy dissipation measures as necessary. Sediment-laden runoff must be released through a sediment trapping facility.

- Minimize construction traffic over temporary dikes. Use temporary cross culverts for channel crossing.
- See [Table II-3.8: Horizontal Spacing of Interceptor Dikes Along Ground Slope](#) for recommended horizontal spacing between dikes.

**Table II-3.8: Horizontal Spacing of Interceptor Dikes Along Ground Slope**

Average Slope	Slope Percent	Flowpath Length
20H:1V or less	3-5%	300 feet
(10 to 20)H:1V	5-10%	200 feet
(4 to 10)H:1V	10-25%	100 feet
(2 to 4)H:1V	25-50%	50 feet

**Interceptor Swales**

Interceptor swales shall meet the following criteria:

- Bottom Width: 2 feet minimum; the cross-section bottom shall be level.
- Depth: 1-foot minimum.
- Side Slope: 2H:1V or flatter.
- Grade: Maximum 5 percent, with positive drainage to a suitable outlet (such as [BMP C241: Sediment Pond \(Temporary\)](#)).
- Stabilization: Seed as per [BMP C120: Temporary and Permanent Seeding](#), or [BMP C202: Riprap Channel Lining](#), 12 inches thick riprap pressed into the bank and extending at least 8 inches vertical from the bottom.

***Maintenance Standards***

- Inspect diversion dikes and interceptor swales once a week and after every rainfall. Immediately remove sediment from the flow area.
- Damage caused by construction traffic or other activity must be repaired before the end of each working day.
- Check outlets and make timely repairs as needed to avoid gully formation. When the area below the temporary diversion dike is permanently stabilized, remove the dike and fill and stabilize the channel to blend with the natural surface.



# BMP C201: Grass-Lined Channels

## *Purpose*

To provide a channel with a vegetative lining for conveyance of runoff. The purpose of the vegetative lining is to prevent transport of sediment and erosion.

## *Conditions of Use*

This practice applies to construction sites where concentrated runoff needs to be directed to prevent erosion or flooding.

- Use this BMP when a vegetative lining can provide sufficient stability for the channel cross section and at lower velocities of water (normally dependent on grade). This means that the channel slopes are generally less than 5 percent and space is available for a relatively large cross section.
- Typical uses include roadside ditches, channels at property boundaries, outlets for diversions, and other channels and drainage ditches in low areas.
- Channels that will be vegetated should be installed before major earthwork and hydroseeded with a bonded fiber matrix (BFM). The vegetation should be well established (i.e., 75 percent cover) before water is allowed to flow in the ditch unless [BMP C122: Nets and Blankets](#) is used to protect the channel. With channels that will have high flows, erosion control blankets should be installed over the hydroseed. If vegetation cannot be established from seed before water is allowed in the ditch, sod should be installed in the bottom of the ditch in lieu of hydro-mulch and blankets.

## *Design and Installation Specifications*

See [Figure II-3.10: Typical Grass-Lined Channels](#)

Locate channels where they can conform to the topography and other features such as roads. Use natural drainage systems to the greatest extent possible

- Avoid sharp changes in alignment or bends and changes in grade.
  - Do not reshape the landscape to fit the drainage channel.
  - The maximum design velocity shall be based on soil conditions, type of vegetation, and method of revegetation, but at no time shall velocity exceed 5 feet/second. The channel shall not be overtopped by the peak volumetric flow rate calculated by one of the following methods:
    - Single Event Hydrograph Method: The peak volumetric flow rate calculated using a 10-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the worst-case land cover condition.
- OR
- Continuous Simulation Method: The 10-year peak flow rate, as determined by an

approved continuous runoff model with a 15-minute time step for the worst-case land cover condition..

Worst-case land cover conditions (i.e., producing the most runoff) should be used for analysis (in most cases, this would be the land cover conditions just prior to final landscaping).

- Where the grass-lined channel will also function as a permanent stormwater conveyance facility, consult the drainage conveyance requirements of the local jurisdiction.
- An established grass or vegetated lining is required before the channel can be used to convey stormwater, unless stabilized with nets or blankets (See [BMP C122: Nets and Blankets](#)).
- If design velocity of a channel to be vegetated by seeding exceeds 2 ft/sec, a temporary channel liner is required. Geotextile or special mulch protection such as fiberglass roving or straw and netting provides stability until the vegetation is fully established. See [Figure II-3.11: Temporary Channel Liners](#).
- Check dams shall be removed when the grass has matured sufficiently to protect the ditch or swale unless the slope of the swale is greater than 4 percent. The area beneath the check dams shall be seeded and mulched immediately after dam removal.
- If vegetation is established by sodding, the permissible velocity for established vegetation may be used and no temporary liner is needed.
- Do not subject the grass-lined channel to sedimentation from disturbed areas. Use sediment-trapping BMPs upstream of the channel.
- V-shaped grass channels generally apply where the quantity of water is small, such as in short reaches along roadsides. The V-shaped cross section is least desirable because it is difficult to stabilize the bottom where velocities may be high.
- Trapezoidal grass channels are used where runoff volumes are large and slope is low so that velocities are nonerosive to vegetated linings. (Note: it is difficult to construct small parabolic shaped channels.)
- Subsurface drainage or riprap channel bottoms may be necessary on sites that are subject to prolonged wet conditions due to long duration flows or a high water table.
- Provide outlet protection at culvert ends and at channel intersections.
- Grass channels, at a minimum, should carry peak runoff for temporary construction drainage facilities from the 10-year, 24-hour storm without eroding. Where flood hazard exists, increase the capacity according to the potential damage.
- Grassed channel side slopes generally are constructed 3H:1V or flatter to aid in the establishment of vegetation and for maintenance.
- Construct channels a minimum of 0.2 foot larger around the periphery to allow for soil bulking during seedbed preparations and sod buildup.

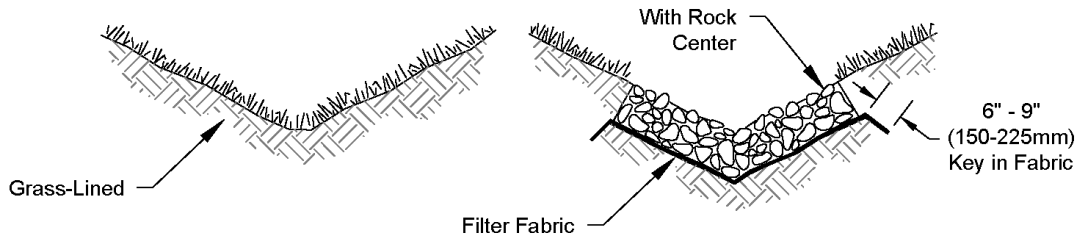
## **Maintenance Standards**

During the establishment period, check grass-lined channels after every rainfall.

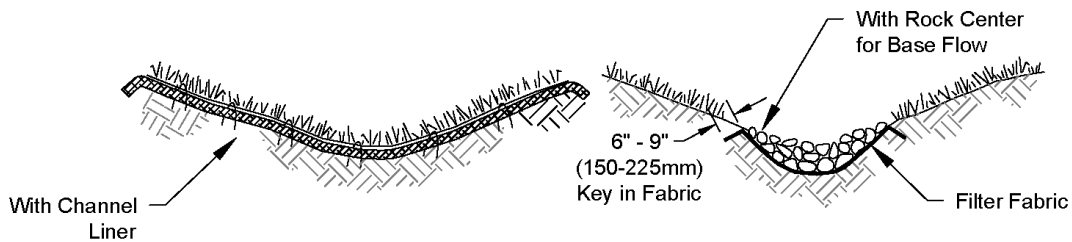
- After grass is established, periodically check the channel; check it after every heavy rainfall event. Immediately make repairs.
- Check the channel outlet and all road crossings for bank stability and evidence of piping or scour holes.
- Remove all significant sediment accumulations to maintain the designed carrying capacity. Keep the grass in a healthy, vigorous condition at all times, since it is the primary erosion protection for the channel.

**Figure II-3.10: Typical Grass-Lined Channels**

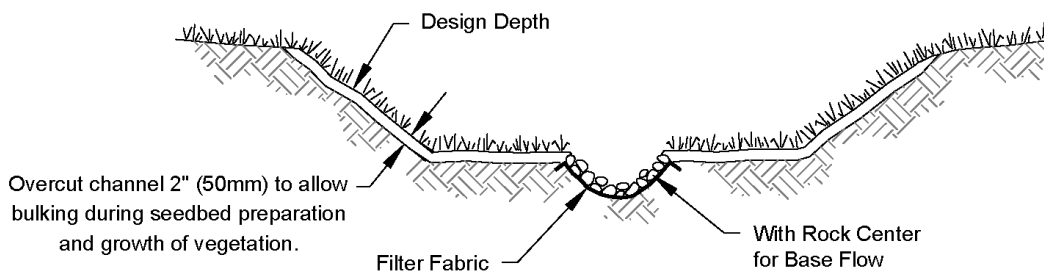
Typical V-Shaped Channel Cross-Section



Typical Parabolic Channel Cross-Section



Typical Trapezoidal Channel Cross-Section



NOT TO SCALE

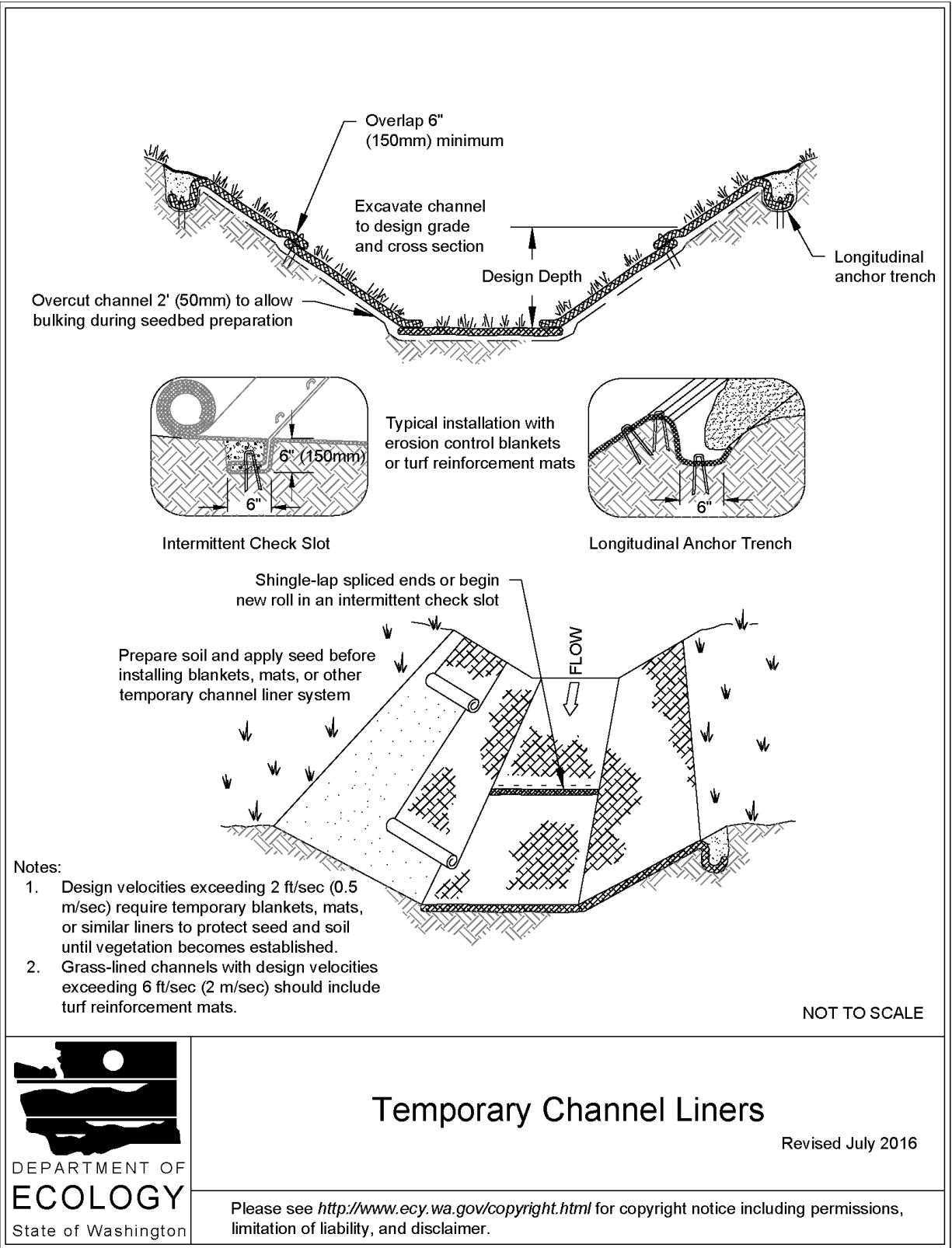


**Typical Grass-Lined Channels**

Revised June 2016

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**Figure II-3.11: Temporary Channel Liners**



## Temporary Channel Liners

Revised July 2016

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**Table 1b. Checklist to Select Large Project Construction BMPs.**

Element Number	Required Element	Project Name: Former Time Oil Bulk Terminal	
		Large Project <sup>a</sup> (check selection)	If not applicable, describe why in the space below.
1	Mark Clearing Limits and Environmentally Critical Areas	Required BMPs: <input type="checkbox"/> E1.30 Preserving Natural Vegetation (refer to Section 4.1.2.1) <input type="checkbox"/> E1.35 Buffer Zones (refer to Section 4.1.2.2) <input checked="" type="checkbox"/> E1.50 High Visibility Fencing (refer to Section 4.1.2.5)	Cleanup action boundaries are defined and will be adjacent to the shoreline.
2	Retain Top Layer	Required BMP: Within the boundaries of the project site, retain the duff layer, top soil, and native vegetation, if there is any, in an undisturbed state to the maximum extent feasible. If it is not feasible to retain the top layer in place, stockpile on site, cover to prevent erosion, and replace immediately upon completion of the ground disturbing activities to the maximum extent feasible.	Site is industrial, surface soils will be removed during excavation and disposed of because of contamination present at the site.
3	Establish Construction Access	Required BMPs: <input checked="" type="checkbox"/> E2.10 Stabilized Construction Entrance (refer to Section 4.2.1.1) <input checked="" type="checkbox"/> E2.15 Tire Wash (refer to Section 4.2.1.2) <input checked="" type="checkbox"/> E2.20 Construction Road Stabilization (refer to Section 4.2.1.3)	
4	Protect Downstream Properties and Receiving Waters	Required BMP for contributing area of 3 acres or greater: <input type="checkbox"/> Ecology BMP C241 Temporary Sediment Pond (or Basin)	Water will be captured and treated prior to discharge to the sanitary sewer. Treatment will include settlement.
5	Prevent Erosion and Sediment Transport from the Site	Required BMPs: <input checked="" type="checkbox"/> E3.10 Filter Fence (refer to Section 4.3.1) <input type="checkbox"/> Ecology BMP C231 Brush Barrier <input type="checkbox"/> E3.20 Gravel Filter Berm (refer to Section 4.3.2) AND <input checked="" type="checkbox"/> E3.40 Sediment Trap (refer to Section 4.3.6) OR <input type="checkbox"/> Ecology BMP C241 Temporary Sediment Pond (or Basin) OR <input checked="" type="checkbox"/> E3.50 Portable Sediment Tank (refer to Section 4.3.7) Additional recommended BMPs: <input type="checkbox"/> E3.30 Vegetated Strip (refer to Section 4.3.4) <input checked="" type="checkbox"/> E3.35 Straw Wattles, Compost Socks, and Compost Berms (refer to Section 4.3.5) <input type="checkbox"/> E3.60 Construction Stormwater Filtration (refer to Section 4.3.8) <input type="checkbox"/> Ecology BMP C250 Construction Stormwater Chemical Treatment	

Table 1b (continued). Checklist to Select Large Project Construction BMPs.

Element Number	Required Element	Project Name: _____	
		Large Project <sup>a</sup> (check selection)	If not applicable, describe why in the space below.
6	Prevent Erosion and Sediment Transport From the Site by Vehicles	Required BMPs: <input checked="" type="checkbox"/> E3.65 Cleaning Inlets and Catch Basins (refer to <i>Section 4.3.9</i> ) <input checked="" type="checkbox"/> E3.70 Street Sweeping and Vacuuming (refer to <i>Section 4.3.10</i> )	
7	Stabilize Soils	Required BMPs for all exposed soils and stockpiles – one or more of the following: <input type="checkbox"/> E1.10 Temporary Seeding (refer to <i>Section 4.1.1.1</i> ) <input type="checkbox"/> E1.15 Mulching, Matting, and Compost Blankets (refer to <i>Section 4.1.1.2</i> ) <input type="checkbox"/> E1.20 Clear Plastic Covering (refer to <i>Section 4.1.1.3</i> ) <input type="checkbox"/> E1.40 Permanent Seeding and Planting (refer to <i>Section 4.1.2.3</i> ) <input type="checkbox"/> E1.45 Sodding (refer to <i>Section 4.1.2.4</i> ) <input checked="" type="checkbox"/> E2.45 Dust Control (refer to <i>Section 4.2.1.6</i> ) <input type="checkbox"/> Ecology BMP C130 Surface Roughening <input type="checkbox"/> Ecology BMP C131 Gradient Terracing <input type="checkbox"/> Ecology BMP C126 Polyacrylamide for Soil Erosion Protection	Following soil excavation and ground disturbance activities all areas will be stabilized with 6 inches of crushed rock/ballast rock (or similar). Best management practices will be employed to maintain surface gravel to control soil erosion until redevelopment occurs.
8	Protect Slopes (refer to the Environmentally Critical Areas ordinance [SMC 25.09.180] for additional requirements and development standards for steep slopes)	Required BMPs – one or more of the following: <input type="checkbox"/> Level Spreader (refer to <i>Appendix E</i> ) <input type="checkbox"/> E2.35 Check Dams (refer to <i>Section 4.2.1.4</i> ) <input type="checkbox"/> E2.40 Triangular Silt Dike (Geotextile-encased Check Dam) (refer to <i>Section 4.2.1.5</i> ) <input type="checkbox"/> Pipe Slope Drains (refer to <i>Appendix E</i> ) <input type="checkbox"/> E2.70 Subsurface Drains (refer to <i>Section 4.2.3.1</i> ) <input checked="" type="checkbox"/> E2.80 Earth Dike and Drainage Swale (refer to <i>Section 4.2.3.2</i> ) <input type="checkbox"/> Ecology BMP C130 Surface Roughening <input type="checkbox"/> Ecology BMP C131 Gradient Terracing <input type="checkbox"/> Ecology BMP C201 Grass-lined Channels	All cut and fill slopes will be designed, constructed, and protected in a manner that minimizes erosion. The following specific BMPs may be used as necessary to protect slopes for this project:

Table 1b (continued). Checklist to Select Large Project Construction BMPs.

Element Number	Required Element	Project Name: _____	
		Large Project <sup>a</sup> (check selection)	If not applicable, describe why in the space below.
9	Protect Storm Drains	Required BMPs: <input checked="" type="checkbox"/> E3.25 Storm Drain Inlet Protection (refer to <i>Section 4.3.3</i> ) <input checked="" type="checkbox"/> E3.65 Cleaning Inlets and Catch Basins (refer to <i>Section 4.3.9</i> ) <input checked="" type="checkbox"/> E3.70 Street Sweeping and Vacuuming (refer to <i>Section 4.3.10</i> )	
10	Stabilize Channels and Outlets	Required BMPs – one or more of the following: <input type="checkbox"/> Level Spreader (refer to <i>Appendix E</i> ) <input type="checkbox"/> E2.35 Check Dams (refer to <i>Section 4.2.1.4</i> ) <input type="checkbox"/> E2.80 Earth Dike and Drainage Swale (refer to <i>Section 4.2.3.2</i> ) <input type="checkbox"/> Outlet Protection (refer to <i>Appendix E</i> ) <input type="checkbox"/> Ecology BMP C201 Grass-lined Channels <input type="checkbox"/> Ecology BMP C202 Channel Lining <input type="checkbox"/> Ecology BMP C203 Water Bars	Construction will not require temporary conveyance channels or outlets to Salmon Bay, streams or slopes. BMPs for stabilization channels and outlets are not anticipated for use on this project.
11	Control Pollutants (also refer to <i>Volume 4 – Source Control</i> )	Required BMPs: <input checked="" type="checkbox"/> C1.15 Material Delivery, Storage, and Containment (refer to <i>Section 5.1.1</i> ) <input checked="" type="checkbox"/> C1.20 Use of Chemicals During Construction (refer to <i>Section 5.1.2</i> ) <input checked="" type="checkbox"/> C1.25 Demolition of Buildings (refer to <i>Section 5.1.3</i> ) <input checked="" type="checkbox"/> C1.30 Building Repair, Remodeling, and Construction (refer to <i>Section 5.1.4</i> ) <input checked="" type="checkbox"/> C1.35 Sawcutting and Surfacing Pollution Prevention (refer to <i>Section 5.1.5</i> ) <input checked="" type="checkbox"/> C1.45 Solid Waste Handling and Disposal (refer to <i>Section 5.1.7</i> ) <input type="checkbox"/> C1.50 Disposal of Asbestos and Polychlorinated Biphenyls (PCBs) (refer to <i>Section 5.1.8</i> ) <input type="checkbox"/> C1.55 Airborne Debris Curtain (refer to <i>Section 5.1.9</i> ) <input checked="" type="checkbox"/> C1.56 Concrete Handling and Disposal (refer to <i>Section 5.1.10</i> ) <input type="checkbox"/> C1.59 High pH Neutralization Using CO <sub>2</sub> (refer to <i>Section 5.1.11</i> )	Hazardous building abatement work - including asbestos and PCBs, will be completed prior to this scope of work.



Table 1b (continued). Checklist to Select Large Project Construction BMPs.

Element Number	Required Element	Project Name: _____	
		Large Project <sup>a</sup> (check selection)	If not applicable, describe why in the space below.
12	Control Dewatering	Required BMP: <input checked="" type="checkbox"/> C1.40 Temporary Dewatering (refer to <i>Section 5.1.6</i> )	
13	Maintain BMPs	Required BMP: <input checked="" type="checkbox"/> Maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function.	
14	Inspect BMPs	Required BMP: <input checked="" type="checkbox"/> Inspect, maintain, and repair all BMPs as needed to assure continued performance of their intended function. <input checked="" type="checkbox"/> Certified Erosion and Sediment Control Lead (refer to <i>Section 2.3</i> ): For projects over one (1) acre; inspections should be conducted by the Certified Erosion and Sediment Control Lead identified in the Large Project Construction Stormwater and Erosion Control Plan.	
15	Execute Construction Stormwater and Erosion Control Plan	Required BMPs: Implement and maintain an updated Construction Stormwater and Erosion Control Plan beginning with initial land disturbance. <input checked="" type="checkbox"/> Retain the Large Project Construction Stormwater and Erosion Control Plan on site or within reasonable access to the site. Modify the plan as needed. Coordination with Utilities, Contractors, and Others <input checked="" type="checkbox"/> The primary project proponent should evaluate, with input from utilities and other contractors, the stormwater management requirements for the entire project, including the utilities, when preparing the Small Project Construction Stormwater and Erosion Control Plan. Project Close-out <input checked="" type="checkbox"/> Remove all temporary erosion and sediment control BMPs within 5 business days after final site stabilization is achieved, or after they are no longer needed, whichever is later.	

Table 1b (continued). Checklist to Select Large Project Construction BMPs.

Element Number	Required Element	Project Name: _____	
		Large Project <sup>a</sup> (check selection)	If not applicable, describe why in the space below.
16	Minimize Open Trenches	<p>Required BMP:                      In the construction of underground utility lines, where feasible, no more than one hundred and fifty (150) feet of trench should be opened at one time, unless soil is replaced within the same working day. Where consistent with safety and space considerations, place excavated material on the uphill side of trenches. Trench dewatering devices should discharge into a sediment trap or sediment pond.</p>	
17	Phase the Project	<p>Required BMPs:                      Construction Phasing  <input checked="" type="checkbox"/> Phase development projects where feasible in order to prevent soil erosion and, to the maximum extent practicable, the transport of sediment from the site during construction.</p> <p>Seasonal Work Limitations  <input checked="" type="checkbox"/> From October 31 through April 1, clearing, grading, and other soil disturbing activities will be subject to additional limitations.</p>	
18	Install Permanent Flow Control and Water Quality Facilities	<ul style="list-style-type: none"> <li>Refer to <i>Volume 1</i> for applicable minimum requirements and <i>Volume 3</i> for BMP design.</li> </ul>	
19	Protect Stormwater BMPs	<p>General: Protect all stormwater BMPs from sedimentation through installation and maintenance of erosion and sediment control BMPs. Restore the BMPs to their fully functioning condition if they accumulate sediment during construction. Restoring the stormwater BMP must include removal of sediment and any sediment-laden soils, and replacing the removed soils with soils meeting the design specification.</p> <p><input checked="" type="checkbox"/> The approved plan sheets provide construction sequencing that protect the infiltration facility during construction.</p> <p>Sediment Control: Protect infiltration BMPs from sedimentation that can clog the facility and reduce infiltration capacity.</p> <p><input checked="" type="checkbox"/> Minimize site disturbance at the location of the infiltration BMPs and in up-gradient areas.</p> <p><input checked="" type="checkbox"/> Do not use infiltration BMPs as sediment control facilities.</p> <p><input checked="" type="checkbox"/> Direct all drainage away from the facility location after initial rough grading.</p>	

Table 1b (continued). Checklist to Select Large Project Construction BMPs.

Element Number	Required Element	Project Name: _____	
		Large Project <sup>a</sup> (check selection)	If not applicable, describe why in the space below.
19	Protect Stormwater BMPs (continued)	<input checked="" type="checkbox"/> Flow can be directed away from the facility with temporary diversion swales or other approved protection. <input checked="" type="checkbox"/> Do not construct infiltration BMPs until all contributing drainage areas are stabilized with appropriate erosion and sediment control BMPs and to the satisfaction of the engineer. <input checked="" type="checkbox"/> Inspect and maintain erosion and sediment control practices on a regular basis. If deposition of sediment occurs in the infiltration area, remove material and scarify the surface to a minimum depth of 3 inches. <input checked="" type="checkbox"/> Control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements or base materials. <input checked="" type="checkbox"/> Permeable pavement fouled with sediments or no longer passing an initial infiltration test must be cleaned until infiltrating per design or replaced. Compaction Prevention: Soil compaction can lead to a reduction of infiltration rates and facility failure; accordingly, minimizing compaction of the base and sidewalls of the infiltration area is critical. <input checked="" type="checkbox"/> Before the development site is graded, rope/fence the area of the infiltration BMP to restrict access and flag to prevent soil compaction by heavy equipment and foot traffic. <input checked="" type="checkbox"/> Perform excavation with machinery operating adjacent to the infiltration BMP and do not allow heavy equipment with narrow tracks, narrow tires, or large lugged, high pressure tires on the bottom of the infiltration BMP footprint. <input type="checkbox"/> Protect established completed lawn and landscaped areas from compaction due to construction equipment. <input checked="" type="checkbox"/> Do not excavate during wet or saturated conditions.	There are no lawn or landscaped areas to be protected from compaction from construction equipment.

<sup>a</sup> A large project is one with greater than or equal to 5,000 square feet of new plus replaced hard surface, or greater than or equal to 1 acre of land-disturbing activity.

<sup>b</sup> Recommended BMPs provide further guidance for minimizing potential stormwater pollution resulting from activities.

## **Construction Stormwater Pollution Prevention Plan Checklist**

Project Number: \_\_\_\_\_

Review Date: \_\_\_\_\_

Onsite Inspection Review Date: \_\_\_\_\_

Construction SWPPP Reviewer: \_\_\_\_\_

**Appendix D General Permit - PLACEHOLDER**

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# Construction Stormwater Site Inspection Form

**Project Name** \_\_\_\_\_ **Permit #** \_\_\_\_\_ **Inspection Date** \_\_\_\_\_ **Time** \_\_\_\_\_

Name of Certified Erosion Sediment Control Lead (CESCL) or qualified inspector if *less than one acre*  
 Print Name: \_\_\_\_\_

Approximate rainfall amount since the last inspection (in inches): \_\_\_\_\_

Approximate rainfall amount in the last 24 hours (in inches): \_\_\_\_\_

Current Weather    Clear     Cloudy     Mist     Rain     Wind     Fog

**A. Type of inspection:**        Weekly     Post Storm Event     Other

**B. Phase of Active Construction (check all that apply):**

Pre Construction/installation of erosion/sediment controls	<input type="checkbox"/>	Clearing/Demo/Grading	<input type="checkbox"/>	Infrastructure/storm/roads	<input type="checkbox"/>
Concrete pours	<input type="checkbox"/>	Vertical Construction/buildings	<input type="checkbox"/>	Utilities	<input type="checkbox"/>
Offsite improvements	<input type="checkbox"/>	Site temporary stabilized	<input type="checkbox"/>	Final stabilization	<input type="checkbox"/>

**C. Questions:**

- |  |     |     |    |     |
|--|-----|-----|----|-----|
| 1. Were all areas of construction and discharge points inspected?  | Yes | ___ | No | ___ |
| 2. Did you observe the presence of suspended sediment, turbidity, discoloration, or oil sheen            | Yes | ___ | No | ___ |
| 3. Was a water quality sample taken during inspection? ( <i>refer to permit conditions S4 &amp; S5</i> ) | Yes | ___ | No | ___ |
| 4. Was there a turbid discharge 250 NTU or greater, or Transparency 6 cm or less?*                       | Yes | ___ | No | ___ |
| 5. If yes to #4 was it reported to Ecology?  | Yes | ___ | No | ___ |
| 6. Is pH sampling required? pH range required is 6.5 to 8.5.   | Yes | ___ | No | ___ |

If answering yes to a discharge, describe the event. Include when, where, and why it happened; what action was taken, and when.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\*If answering yes to # 4 record NTU/Transparency with continual sampling daily until turbidity is 25 NTU or less/ transparency is 33 cm or greater.

Sampling Results: \_\_\_\_\_ Date: \_\_\_\_\_

Parameter	Method (circle one)	Result			Other/Note
		NTU	cm	pH	
<i>Turbidity</i>	tube, meter, laboratory				
<i>pH</i>	Paper, kit, meter				

# Construction Stormwater Site Inspection Form

**D. Check the observed status of all items. Provide "Action Required" details and dates.**

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
1 Clearing Limits	Before beginning land disturbing activities are all clearing limits, natural resource areas (streams, wetlands, buffers, trees) protected with barriers or similar BMPs? (high visibility recommended)						
2 Construction Access	Construction access is stabilized with quarry spalls or equivalent BMP to prevent sediment from being tracked onto roads?						
	Sediment tracked onto the road way was cleaned thoroughly at the end of the day or more frequent as necessary.						
3 Control Flow Rates	Are flow control measures installed to control stormwater volumes and velocity during construction and do they protect downstream properties and waterways from erosion?						
	If permanent infiltration ponds are used for flow control during construction, are they protected from siltation?						
4 Sediment Controls	All perimeter sediment controls (e.g. silt fence, wattles, compost socks, berms, etc.) installed, and maintained in accordance with the Stormwater Pollution Prevention Plan (SWPPP).						
	Sediment control BMPs (sediment ponds, traps, filters etc.) have been constructed and functional as the first step of grading.						
	Stormwater runoff from disturbed areas is directed to sediment removal BMP.						
5 Stabilize Soils	Have exposed un-worked soils been stabilized with effective BMP to prevent erosion and sediment deposition?						

## Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
5 Stabilize Soils Cont.	Are stockpiles stabilized from erosion, protected with sediment trapping measures and located away from drain inlet, waterways, and drainage channels?						
	Have soils been stabilized at the end of the shift, before a holiday or weekend if needed based on the weather forecast?						
6 Protect Slopes	Has stormwater and ground water been diverted away from slopes and disturbed areas with interceptor dikes, pipes and or swales?						
	Is off-site storm water managed separately from stormwater generated on the site?						
	Is excavated material placed on uphill side of trenches consistent with safety and space considerations?						
	Have check dams been placed at regular intervals within constructed channels that are cut down a slope?						
7 Drain Inlets	Storm drain inlets made operable during construction are protected.						
	Are existing storm drains within the influence of the project protected?						
8 Stabilize Channel and Outlets	Have all on-site conveyance channels been designed, constructed and stabilized to prevent erosion from expected peak flows?						
	Is stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream conveyance systems?						
9 Control Pollutants	Are waste materials and demolition debris handled and disposed of to prevent contamination of stormwater?						
	Has cover been provided for all chemicals, liquid products, petroleum products, and other material?						
	Has secondary containment been provided capable of containing 110% of the volume?						
	Were contaminated surfaces cleaned immediately after a spill incident?						
	Were BMPs used to prevent contamination of stormwater by a pH modifying sources?						



# Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
9 Cont.	Wheel wash wastewater is handled and disposed of properly.						
10 Control Dewatering	Concrete washout in designated areas. No washout or excess concrete on the ground.						
	Dewatering has been done to an approved source and in compliance with the SWPPP.						
	Were there any clean non turbid dewatering discharges?						
11 Maintain BMP	Are all temporary and permanent erosion and sediment control BMPs maintained to perform as intended?						
12 Manage the Project	Has the project been phased to the maximum degree practicable?						
	Has regular inspection, monitoring and maintenance been performed as required by the permit?						
	Has the SWPPP been updated, implemented and records maintained?						
13 Protect LID	Is all Bioretention and Rain Garden Facilities protected from sedimentation with appropriate BMPs?						
	Is the Bioretention and Rain Garden protected against over compaction of construction equipment and foot traffic to retain its infiltration capabilities?						
	Permeable pavements are clean and free of sediment and sediment laden-water runoff. Muddy construction equipment has not been on the base material or pavement.						
	Have soiled permeable pavements been cleaned of sediments and pass infiltration test as required by stormwater manual methodology?						
	Heavy equipment has been kept off existing soils under LID facilities to retain infiltration rate.						

**E. Check all areas that have been inspected. ✓**

All in place BMPs  All disturbed soils  All concrete wash out area  All material storage areas   
 All discharge locations  All equipment storage areas  All construction entrances/exits

# Construction Stormwater Site Inspection Form

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F. Elements checked "Action Required" (section D) describe corrective action to be taken. List the element number; be specific on location and work needed. Document, initial, and date when the corrective action has been completed and inspected.

Element #	Description and Location	Action Required	Completion Date	Initials

*Attach additional page if needed*

**Sign the following certification:**

"I certify that this report is true, accurate, and complete, to the best of my knowledge and belief"

Inspected by: (print) \_\_\_\_\_ (Signature) \_\_\_\_\_ Date: \_\_\_\_\_

Title/Qualification of Inspector: \_\_\_\_\_

## Jamie Stevens

---

**From:** Adams, Mark (ECY) <MADA461@ECY.WA.GOV>  
**Sent:** Thursday, March 18, 2021 10:02 AM  
**To:** Jamie Stevens  
**Cc:** Wardlaw, Dennis (DAHP); Borth, Holly (DAHP); Grant Hainsworth; Lynn Grochala; Threet, Derek (ATG); Wollwage, Sarah (ECY); Seeds, Tena (ECY)  
**Subject:** RE: 2020-08-05287 DAHP - Time Oil Bulk Terminal, Seattle

Jamie:

As a follow-up to the March 15 meeting, we have considered further Ecology's responsibility and involvement with respect to DAHP's request for additional historical building documentation and possible mitigation. With respect to authority, we have concluded Ecology does not have the legal or regulatory ability under the PPCD or the MTCA regulations governing cleanup of this Site to require the actions sought by DAHP. In addition, building demolition was addressed as part of the cleanup action at this Site in the June 5, 2020 SEPA checklist, and, by association, the June 6, 2020 SEPA DNS. DAHP did comment on the SEPA documentation in an August 21 letter and did request a "thorough desktop review" of historical land use related to site archaeology. However, the letter did not include any requests related to historical buildings.

For the record, Ecology does support DAHP's goals of preserving and documenting historical structures. However, we are not able to require the actions DAHP has requested. It will be up to TOC Seattle Terminal 1, LLC to as to whether it wishes to voluntarily agree to do the additional study and potential mitigation.

If you would like to have our AAGs (Ecology and DAHP) discuss this further or join us for a meeting, please let me know, and I can set that up.

Regards,

### Mark Adams, LHG

Cleanup Project Manager  
Dept of Ecology, Toxics Cleanup Program  
3190 160th Ave SE, Bellevue, Washington 98008  
**Mobile (425) 515-5992 | Office (425) 649-7107 | [mada461@ecy.wa.gov](mailto:mada461@ecy.wa.gov)**



---

**From:** Jamie Stevens <[jamie.stevens@creteconsulting.com](mailto:jamie.stevens@creteconsulting.com)>  
**Sent:** Monday, March 8, 2021 8:20 AM  
**To:** Borth, Holly (DAHP) <[holly.borth@dahp.wa.gov](mailto:holly.borth@dahp.wa.gov)>; Adams, Mark (ECY) <[MADA461@ECY.WA.GOV](mailto:MADA461@ECY.WA.GOV)>  
**Cc:** Sonja Kleinschmidt <[sonja@crcwa.com](mailto:sonja@crcwa.com)>; Wardlaw, Dennis (DAHP) <[dennis.wardlaw@dahp.wa.gov](mailto:dennis.wardlaw@dahp.wa.gov)>; Seeds, Tena (ECY) <[TSEE461@ECY.WA.GOV](mailto:TSEE461@ECY.WA.GOV)>  
**Subject:** RE: 2020-08-05287

**THIS EMAIL ORIGINATED FROM OUTSIDE THE WASHINGTON STATE EMAIL SYSTEM - Take caution not to open attachments or links unless you know the sender AND were expecting the attachment or the link**

Holly and Mark – good morning. I wanted to reach out and see if we could set up a call to discuss this project. Would you guys be able to suggest some times that work for you? I can compile the times and get back to everyone.

The plan is to start abatement March 22 (the warehouse does have items that need to be addressed) and demo is scheduled for April 5. I thought we could determine our path forward in the next week or so and complete documentation prior to demo, then we would have the materials needed for potential mitigation activities.

These are the items I wanted to discuss with you all, hopefully this week -

1. Mitigation measures are not required for this project they are only recommended (DAHP letter attached for reference)
2. Mitigation recommendations only apply to the one building – the warehouse, built in 1947 and remodeled in 1960. Attached is the property summary. Recommendations are based on Criterion A – “for its association with the Time Oil Company.”
3. DAHP has also stated that it is eligible under Criterion C (embodying the distinct characteristics of its type and period of construction) but our research indicated that this construction style is typical throughout the state. Can DAHP expand on why Criterion C is also triggered
4. The warehouse was not determined of interest to the City of Seattle
5. What is the regulation that requires a MOU between Ecology and DAHP?
6. Discuss mitigation options typical for this sort of structure.

Jamie Stevens  
206.799.2744

---

**From:** Borth, Holly (DAHP) [<mailto:holly.borth@dahp.wa.gov>]  
**Sent:** Tuesday, March 2, 2021 8:45 AM  
**To:** Adams, Mark (ECY)  
**Cc:** Sonja Kleinschmidt; Wardlaw, Dennis (DAHP); Jamie Stevens  
**Subject:** RE: 2020-08-05287

Hi Mark,

That’s great, thank you. Attached are two MOU examples we thought would be helpful to show the general template of an MOU. The mitigation stipulations themselves can vary, the SHPO loves to see creative solutions. We have a list of ideas on our website as well: <https://dahp.wa.gov/project-review/mitigation-options>.

Best,  
Holly

**Holly Borth, M.S.** | Built Environment Compliance Reviewer  
360.890.0174 (c) | [holly.borth@dahp.wa.gov](mailto:holly.borth@dahp.wa.gov)  
[she/her/hers]

Department of Archaeology & Historic Preservation | [www.dahp.wa.gov](http://www.dahp.wa.gov)  
1110 Capitol Way S, Suite 30 | Olympia WA 98501  
PO Box 48343 | Olympia WA 98504-8343

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*My weekly hours are 7am – 3pm, Mon-Fri*  
Like [DAHP on Facebook!](#)

DAHP staff are working remotely until further notice. My hours are 7 am - 3 pm Monday - Friday. Staff no longer have land lines. For a directory of staff cell phone numbers please see our [website](#).

---

**From:** Adams, Mark (ECY) <[MADA461@ECY.WA.GOV](mailto:MADA461@ECY.WA.GOV)>  
**Sent:** Monday, March 1, 2021 11:09 AM  
**To:** Borth, Holly (DAHP) <[holly.borth@dahp.wa.gov](mailto:holly.borth@dahp.wa.gov)>  
**Cc:** Sonja Kleinschmidt <[sonja@crcwa.com](mailto:sonja@crcwa.com)>; Wardlaw, Dennis (DAHP) <[dennis.wardlaw@dahp.wa.gov](mailto:dennis.wardlaw@dahp.wa.gov)>; Jamie Stevens <[jamie.stevens@creteconsulting.com](mailto:jamie.stevens@creteconsulting.com)>  
**Subject:** RE: 2020-08-05287

Hello Holly,

Ecology is evaluating the recommendations in your letter regarding the Time Oil Bulk Terminal, but in the meantime wondered whether you had an example of, or template for, an MOU with DAHP. If so, we'd appreciate having a copy of it.

Thank you. Mark

**Mark Adams, LHG**  
Cleanup Project Manager  
Dept of Ecology, Toxics Cleanup Program  
3190 160th Ave SE, Bellevue, Washington 98008  
**Mobile (425) 515-5992** | Office (425) 649-7107 | [mada461@ecy.wa.gov](mailto:mada461@ecy.wa.gov)



---

**From:** Borth, Holly (DAHP) <[holly.borth@dahp.wa.gov](mailto:holly.borth@dahp.wa.gov)>  
**Sent:** Friday, February 26, 2021 11:46 AM  
**To:** Wardlaw, Dennis (DAHP) <[dennis.wardlaw@dahp.wa.gov](mailto:dennis.wardlaw@dahp.wa.gov)>; Jamie Stevens <[jamie.stevens@creteconsulting.com](mailto:jamie.stevens@creteconsulting.com)>  
**Cc:** Sonja Kleinschmidt <[sonja@crcwa.com](mailto:sonja@crcwa.com)>; Adams, Mark (ECY) <[MADA461@ECY.WA.GOV](mailto:MADA461@ECY.WA.GOV)>  
**Subject:** RE: 2020-08-05287

Hi Jamie,

Please see the attached and let us know if you have any questions.

Best,  
Holly

**Holly Borth, M.S.** | Built Environment Compliance Reviewer  
360.890.0174 (c) | [holly.borth@dahp.wa.gov](mailto:holly.borth@dahp.wa.gov)  
[she/her/hers]

Department of Archaeology & Historic Preservation | [www.dahp.wa.gov](http://www.dahp.wa.gov)  
1110 Capitol Way S, Suite 30 | Olympia WA 98501  
PO Box 48343 | Olympia WA 98504-8343

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My weekly hours are 7am – 3pm, Mon-Fri

Like [DAHP on Facebook!](#)

*DAHP staff are working remotely until further notice. My hours are 7 am - 3 pm Monday - Friday. Staff no longer have land lines. For a directory of staff cell phone numbers please see our [website](#).*

---

**From:** Wardlaw, Dennis (DAHP) <[dennis.wardlaw@dahp.wa.gov](mailto:dennis.wardlaw@dahp.wa.gov)>

**Sent:** Thursday, February 25, 2021 11:24 AM

**To:** Jamie Stevens <[jamie.stevens@creteconsulting.com](mailto:jamie.stevens@creteconsulting.com)>

**Cc:** Sonja Kleinschmidt <[sonja@crcwa.com](mailto:sonja@crcwa.com)>; Adams, Mark (ECY) <[MADA461@ECY.WA.GOV](mailto:MADA461@ECY.WA.GOV)>; Borth, Holly (DAHP) <[holly.borth@dahp.wa.gov](mailto:holly.borth@dahp.wa.gov)>

**Subject:** RE: 2020-08-05287

Hi Jamie,

Thank you for the email. I have sent this over to Holly Borth, our Built Environment reviewer, for review. We should have comments for you soon.

Regards,  
Dennis

---

**From:** Jamie Stevens <[jamie.stevens@creteconsulting.com](mailto:jamie.stevens@creteconsulting.com)>

**Sent:** Thursday, February 25, 2021 11:05 AM

**To:** Wardlaw, Dennis (DAHP) <[dennis.wardlaw@dahp.wa.gov](mailto:dennis.wardlaw@dahp.wa.gov)>

**Cc:** Sonja Kleinschmidt <[sonja@crcwa.com](mailto:sonja@crcwa.com)>; Adams, Mark (ECY) <[MADA461@ECY.WA.GOV](mailto:MADA461@ECY.WA.GOV)>

**Subject:** RE: 2020-08-05287

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External Email

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Dennis – Good morning. I wanted to follow up on the Time Oil Bulk Terminal facility report (project 2020-08-05287) that was submitted last week. Did you have any follow up questions or concerns you wanted to discuss based on your preliminary review? We plan to start hazardous building abatement March 22 and building demolition April 1.

We look forward to working with you and your team on this project.

Jamie Stevens, P.E.  
Environmental Engineer  
206.799.2744

Crete Consulting Inc.  
[www.creteconsulting.com](http://www.creteconsulting.com)  
[jamie.stevens@creteconsulting.com](mailto:jamie.stevens@creteconsulting.com)

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**From:** Sonja Kleinschmidt [<mailto:sonja@crcwa.com>]  
**Sent:** Wednesday, February 17, 2021 9:21 AM  
**To:** Jamie Stevens; Wardlaw, Dennis (DAHP); [MADA461@ecy.wa.gov](mailto:MADA461@ecy.wa.gov)  
**Subject:** 2020-08-05287

Hello All,

The report for the above project, Former Time Oil Terminal, has been submitted on WISAARD for review.

Thank you,  
Sonja

--

Sonja Kleinschmidt, MS/RPA  
Projects Manager/Project Archaeologist  
Cultural Resource Consultants, LLC  
P.O. Box 4159, Seattle, WA 98194  
Office: 206.855.9020 | Cell: 360.395.8879 | Web: [crcwa.com](http://crcwa.com)

## Appendix D Inadvertent Discovery Protocol



## Attachment C. Inadvertent Discovery Protocol.

□



### INADVERTENT DISCOVERY PLAN PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit <https://ecology.wa.gov/accessibility>. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Site Name(s): Time Oil Bulk Terminal      Location: Seattle  
Project Lead/Organization: Jamie      County: King  
Stevens / Crete Consulting

*If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.*

#### 1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 05-05 or Section 106).

Once completed, **the IDP shall always be kept at the project site** during all project activities. All staff, contractors, and volunteers shall be familiar with its contents and know where to find it.

#### 2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. **Always assume these are live and never touch or move.**
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items,

□

toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

**3. ON-SITE RESPONSIBILITIES**

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to **Stop-Protect-Notify**. **If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

**STEP A: Stop Work.**

All work must stop immediately in the vicinity of the discovery.

**STEP B: Protect the Discovery.**

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

**STEP C: Notify Project Archaeologist (if applicable).**

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

**STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.**

**Project Lead Contacts**

Primary Contact

Name: Jamie Stevens  
Phone: 206-799-2744  
Email: Jamie.stevens@creteconsulting.com

Alternate Contact

Name:  
Phone:  
Email:

**Ecology Contacts (completed by Ecology Project Manager)**

Ecology Project Manager

Name: Mark Adams  
Program:  
Phone: 425-649-7107  
Email: Adams@ecy.wa.gov

Alternate or Cultural Resource Contact

Name:  
Program:  
Phone:  
Email:

□

**STEP E: Ecology will notify DAHP.**

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

**Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.**

DAHP Contacts:

Name: Rob Whitlam, PhD  
Title: State Archaeologist  
Cell: 360-890-2615  
Email: [Rob.Whitlam@dahp.wa.gov](mailto:Rob.Whitlam@dahp.wa.gov)  
Main Office: 360-586-3065

**Human Remains/Bones:**

Name: Guy Tasa, PhD  
Title: State Anthropologist  
Cell: 360-790-1633 (24/7)  
Email: [Guy.Tasa@dahp.wa.gov](mailto:Guy.Tasa@dahp.wa.gov)

**4. TRIBAL CONTACTS**

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

Tribe: Duwamish Tribe  
Name: Cecile Hanson  
Title: Chair  
Phone: 206-431-1582  
Email: N/A

Historic Preservation  
Phone: 425-495-6097  
Email: [Steve@snoqualmietribe.us](mailto:Steve@snoqualmietribe.us)

Tribe: Muckleshoot Indian Tribe  
Name: Laura Murphy  
Title: Archaeologist/Cultural Resources  
Phone: 253-876-3272  
Email: [laura.murphy@muckleshoot.nsn.us](mailto:laura.murphy@muckleshoot.nsn.us)

Tribe: Suquamish Tribe  
Name: Dennis Lewarch  
Title: THPO Cultural Resources  
Phone: 360-394-8529  
Email: [dlewarch@suquamish.nsn.us](mailto:dlewarch@suquamish.nsn.us)

Tribe: Snoqualmie Indian Nation  
Name: Steven Mullen-Moses  
Title: Director of Archaeology and

Tribe: Tulalip Tribe  
Name: Richard Young  
Title: Cultural Resources  
Phone: 360-716-2652  
Email: [ryoung@tulaliptribes-nsn.gov](mailto:ryoung@tulaliptribes-nsn.gov)

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

□

**5. FURTHER CONTACTS (if applicable)**

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

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Federal Agency:

Agency:  
Name:  
Title:  
Phone:  
Email:

State Agency:

Agency:  
Name:  
Title:  
Phone:  
Email:

**6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL REMAINS**

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under **Stop-Protect-Notify**. For specific instructions on how to handle a human remains discovery, see: [RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions.](#)

**Suggestion:** If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist  
[Guy.Tasa@dahp.wa.gov](mailto:Guy.Tasa@dahp.wa.gov)  
(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

Enter contact information below (required):

- Local Medical Examiner or Coroner name and phone: Richard Harruff, Medical Officer, 206-731-3232, ext. 4
  - Local Law Enforcement main name and phone: Mitzi Johanknecht, Sheriff, 206-296-3311
  - Local Non-Emergency phone number (911 if without a non-emergency number): 206-296-3311
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
  3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
  4. If the remains are determined to be non-forensic, cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per [RCW 27.44.055](#), [RCW 68.50](#), and [RCW 68.60](#), DAHP will have jurisdiction

□

over non-forensic human remains. Ecology staff will participate in consultation. The Project Lead/Organization may also participate in consultation.

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- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in [RCW 27.44.055](#), [RCW 68.50](#), and [RCW 68.60](#).
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

## **7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS**

Archaeological resources discovered during construction are protected by state law [RCW 27.56](#) and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessments are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

An archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources

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investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

## **8. PROCEEDING WITH WORK**

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

## **9. ORGANIZATION RESPONSIBILITY**

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the site and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

## **10. ADDITIONAL RESOURCES**

### **Informative Video**

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

[Ecology's IDP Video](https://www.youtube.com/watch?v=ioX-4cXfbDY) (<https://www.youtube.com/watch?v=ioX-4cXfbDY>)



□

**Informational Resources**

[DAHP](https://dahp.wa.gov) (<https://dahp.wa.gov>)

[Washington State Archeology \(DAHP 2003\)](https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

([https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch\\_0.pdf](https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf))

[Association of Washington Archaeologists](https://www.archaeologyinwashington.com) (<https://www.archaeologyinwashington.com>)

**Potentially Interested Tribes**

[Tribal Contacts: Interactive Map of Tribes by Area](https://dahp.wa.gov/archaeology/tribal-consultation-information)

(<https://dahp.wa.gov/archaeology/tribal-consultation-information>)

[Tribal Contacts - WSDOT Tribal Contact Website](https://wsdot.wa.gov/tribal/TribalContacts.htm)

(<https://wsdot.wa.gov/tribal/TribalContacts.htm>)

**11. ADDITIONAL INFORMATION**

Please add any additional contact information or other information needed within this IDP.

Implement the IDP if you see...

**Chipped stone artifacts.**

Examples are:

- Glass-like material.
- Angular material.
- "Unusual" material or shape for the area.
- Regularity of flaking.
- Variability of size.



*Stone artifacts from Oregon.*



*Stone artifacts from Washington.*



*Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.*

**Implement the IDP if you see...**

**Ground stone artifacts.**

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.



*Artifacts from unknown locations (left and right images).*

Implement the IDP if you see...

**Bone or shell artifacts, tools, or beads.**

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a "shoehorn".
- Variability of size.
- Beads from shell (dentalium) or tusk.



Upper Left: Bone Awls from Oregon.

Upper Center: Bone Wedge from California.

Upper Right: Plateau dentalium choker and bracelet, from [Nez Perce National Historical Park](#), 19th century, made using [Antalis pretiosa](#) shells  
Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, [Public Domain](#).

Above: Tooth Pendants. Right: Bone Pendants. Both from Oregon and Washington.



**Implement the IDP if you see...**

**Culturally modified trees, fiber, or wood artifacts.**

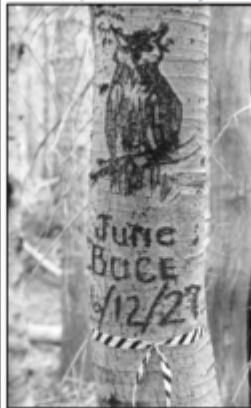
Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.



Left and Below: Culturally modified tree and an old carving on an aspen (Courtesy of DAHP). These are examples of above ground cultural resources.

Right, Top to Bottom: Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry.



**Implement the IDP if you see...**

**Strange, different, or interesting looking dirt, rocks, or shells.**

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- "Unusual" accumulations of rock (especially fire-cracked rock).
- "Unusual" shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a "layer cake" appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the "unusual" or out of place (for example, rock piles in areas with otherwise few rocks).



*Shell Midden pocket in modern fill discovered in sewer trench.*



*Underground oven. Courtesy of DAHP.*

*Shell midden with fire cracked rock.*



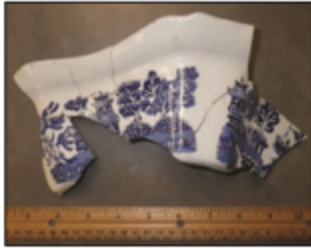
*Hearth excavated near Hamilton, WA.*

**Implement the IDP if you see...**

**Historic period artifacts (historic archaeology considered older than 50 years).**

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.



Left: Top to Bottom: Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.



Right: Collections of historic artifacts discovered during excavations in eastern Washington cities.

□

**Implement the IDP if you see...**

**Historic period artifacts (historic archaeology considered older than 50 years).**

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.



Right, from Top to Bottom:  
Coins, token, spectacles and  
Montgomery Ward pitchfork  
toy discovered during  
Seattle Smith Cove  
shantytown (45-KJ-1200)  
excavation.





□

**Implement the IDP if you see...**

- Old munition casings – if you see ammunition of any type – **always assume they are live and never touch or move!**
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.



Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. **Don't ever touch something like this!**  
Left: Maker's mark on bottom of old bottle.

Right: Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.



Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).



Can opening dates, courtesy of W.M. Schroeder.

□

**Implement the IDP if you see...**

**Historic foundations or buried structures.**

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.



Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks (above ground historic resources) uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

Implement the IDP if you see...

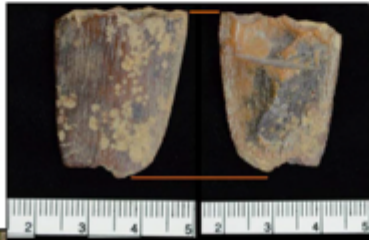
Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.

Center: Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.



Directly Above: This is a real discovery at an Ecology sewer project site.

What would you do if you found these items at a site? Who would be the first person you would call?

Hint: Read the plan!

## Appendix E Groundwater Modeling



**POREWATER SOLUTIONS**

Expertise • Experience • Innovation

## **REMEDIAL DESIGN MODELING**

**Time Oil Site**

**West Commodore Way**

**Seattle, Washington**

**Prepared For:**

Grant Hainsworth and Mike Byers  
**CRETE Consulting, Inc.**  
108 S. Washington Street, Suite 300  
Seattle, Washington 98104

**Date:**

June 5, 2021

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## 1. INTRODUCTION

This groundwater flow modeling study was conducted to support the remedial design analysis for the former TOC Holdings Co. (TOC) Seattle Terminal Properties (Site) located on W. Commodore Way in Seattle, Washington. The Site is also known as the Time Oil Bulk Terminal PPA. The Site generally consists of four separate parcels: Bulk Terminal Property, ASKO Hydraulic Property, East Waterfront Property, and West Waterfront Property. The original version of this modeling study report was prepared December 7, 2020. This current version of the modeling study report has been updated based on comments received from the Department of Ecology on March 23, 2021 and April 23, 2021. This report has also been updated to reflect the discovery of a leaking clean water underground pipe at the Bulk Terminal Property in the Spring of 2021, and how the estimated leak rate for this pipe matches closely with the enhanced recharge rate that had been calibrated last year for this same area (see Sections 2.2 and 3.1.1).

The components of the Site remedy that were of interest for this modeling study, as defined in the draft Remedial Investigation/Feasibility Study Report (Floyd Snider, 2020), are:

- In-situ soil stabilization (ISS) that extends through the perched water bearing zone (Perched WBZ) to the bottom of the shallow water bearing zone (Shallow WBZ);
- Interception trench at the upgradient portion of the ISS zone in the Perched WBZ, which is intended to recover the groundwater plume derived from an off-site source; and
- A PlumeStop® zone which will be implemented in conjunction with in-situ bioremediation in the Shallow WBZ.

The objectives of this modeling study are to:

- Refine the conceptual site model (CSM);
- Construct and calibrate a groundwater flow model for the Shallow WBZ (Shallow WBZ Model) to:
  - Estimate the degree to which ISS will reduce flow through the contaminated portion of the Shallow WBZ
  - Estimate the pH of mixed groundwater downgradient of the ISS area
  - Define post-remediation groundwater flow conditions and rates
  - Estimate groundwater flow rates through the PlumeStop zone; and
- Construct a groundwater flow model for the Perched WBZ (Perched WBZ Model) to estimate the degree to which ISS will reduce flow through the contaminated portion of the Perched WBZ, and to estimate the interception trench recovery rate.



## **2. CONCEPTUAL SITE MODEL**

The CSM was refined as part of this study to support the construction of the Shallow WBZ Model and the Perched WBZ Model. Geology is discussed in Section 2.1, hydrogeology in Section 2.2, and TCE plumes are presented in Section 2.3.

### **2.1 Geology**

Figure 2.1 illustrates ground surface elevation contours, which indicate that the surface slopes from the railroad tracks to the south (50 to 55 ft NAVD88), towards the shoreline where the ground surface is approximately 18 to 20 ft NAVD88. The ground surface slope is relatively mild at the ASKO and Bulk Terminal parcels, and this slope increases in the north towards the shoreline.

Figure 2.2 shows the locations of 10 cross-sections at the Site, seven of which are oriented in the east-west direction (A to G), and three of which are north-south (H to J). Lithology at 76 monitoring wells was discretized into a database for illustration on these cross-sections. The borehole logs were translated into a database by noting the top and bottom elevations of discrete lithologic layers at each well location.

Lithology noted in the borehole logs was classified based on four lithology types:

1. Silt/Clay;
2. Silty fine sand to sandy silt (which are sometimes difficult to distinguish in the field);
3. Fine to medium sand; and
4. Medium to coarse sand.

Figures 2.3 through 2.12 show cross-sections A through J, respectively. In addition to lithology, these cross-sections also illustrate the interpreted top and bottom of the Shallow WBZ, and the Perched WBZ where applicable. Monitoring well screen elevations are also indicated at each well location.

General findings from inspection of these cross-sections include:

- Soils in the Shallow WBZ at the ASKO Property are silty sand to sandy silt (Figure 2.10), and are fine to medium-grained sand at the Bulk Terminal Property (Figure 2.11).
- Hydraulic conductivity generally increases from south to north from the ASKO Property to the shoreline (Figure 2.10).
- There is a continuous layer of silt/clay that forms the base of the Shallow WBZ.
- The Shallow WBZ is unconfined.

- The base of the Perched WBZ is at an elevation of approximately 43 ft NAVD88 at 01MW70 and 01MW71, which are at the south boundary of the ASKO Property (Figure 2.4).
- The Perched WBZ is thickest (5 to 8 ft) in what may be a former streambed between 01MW70 and 01MW71 (Figure 2.4). The extent of the Perched WBZ west of 01MW70 is uncertain, although to the extent that it is present west of this location, it is relatively thin.
- Figure 2.4 shows that soil above the Perched WBZ at 01MW70 and 01MW71 is relatively permeable, and east and west of these locations there is more abundant silt/clay at the surface. This indicates that recharge to the Perched WBZ is highest between 01MW70 and 01MW71, and significantly lower to the west.
- Figure 2.4 indicates that the Perched WBZ is not present at 01MW62 which is directly east of 01MW71. For the purpose of this modeling study, it is assumed that the Perched WBZ is limited in eastern extent to about midway between 01MW71 and 01MW62.
- The Perched WBZ appears to extend to the north to just beyond 01MW79, where the underlying silt/clay layer is absent (Figure 2.10).
- The Perched WBZ is absent on the Bulk Terminal parcel because there is no underlying silt/clay which would hold up a perched water table (e.g., Figure 2.5).

## 2.2 Hydrogeology

Groundwater elevations were reported in Floyd Snider (2020) based on a monitoring event conducted in the Perched WBZ and Shallow WBZ in April/May of 2019. The estimated perched water table elevation contours are shown on Figure 2.13. The horizontal hydraulic gradient in the Perched WBZ is approximately 0.07 ft/ft between 01MW71 and 01MW79, indicating that the composition of this unit is more permeable than the area to the west where there is a steeper hydraulic gradient.

The Shallow WBZ groundwater elevation contours are shown on Figure 2.14. A large mound is evident on the Bulk Terminal Property, and groundwater flows from this mound onto the ASKO parcel (i.e., in a direction that is perpendicular to the groundwater elevation contours). It appears that the bulk of the groundwater flow on the ASKO Property is derived from this mound on the Bulk Terminal parcel, and that groundwater flow across the south boundary of the ASKO Property is occurring at a lower flow rate. Groundwater generally flows from these two properties towards the shoreline.

In the spring of 2021, it was discovered that a subsurface clean water pipe was leaking at the Bulk Terminal Property. A review of prior utility bills from Seattle Public Utilities (SPU) indicates that the underground pipeline had been leaking at a rate of approximately 2.6 gallons per minute (gpm) in October 2019, and that this leak rate had increased to 7 gpm by February

2021. This underground pipe leak appears to have contributed to the formation of a small pond on the Bulk Terminal Property. The leaking section of the pipe was removed in April 2021, and since then the pond has dried up. The newly discovered leakage rate of 2.5 gpm corresponding to October 2019 provides an opportunity to verify that the Shallow WBZ model was simulating an appropriately high enhanced recharge rate in this area when calibrating to the April/May 2019 groundwater monitoring event, as discussed further in Section 3.1.2. There are several areas shown on Figure 2.14 where the horizontal hydraulic gradient in the Shallow WBZ is relatively steep (e.g. east-west between 01MW06 and 01MW15, and north-south between 01MW68 and 01MW86 and also between 02MW15 and 02MW16). These areas of steeper hydraulic gradient likely reflect the presence of a reduction in aquifer hydraulic conductivity between these well pairs.

Results of seven slug tests at Site monitoring wells in the Shallow WBZ are reported in Floyd Snider (2020) to range from 2 to 5.7 ft/day. Given the range in lithology noted in the cross-sections and the variability in horizontal hydraulic gradient in the Shallow WBZ, it is expected that hydraulic conductivity at the Site has a larger range than is reflected in these limited number of slug test results.

A soil boring was conducted at the ASKO parcel in October 2020 (ISS-ASKO) to confirm the bottom depth of the Perched WBZ, and to facilitate the collection of several grain size samples from the Shallow WBZ. Lithology in the Perched WBZ observed during this soil boring includes silty fine to medium grained sand from 4.5 to 5.8 feet below ground surface (ft bgs), medium sand with trace/minor silt from 5.8 to 11 ft bgs, and silt below 11 ft bgs. Assuming that the ground surface at the ISS-ASKO boring location is approximately 4 to 5 ft below the surface at 01MW70 and 01MW71, the top of silt at ISS-ASKO is consistent with the elevation of the top of silt observed at 01MW70 and 01MW71 which corresponds to an elevation of approximately 43 ft NAVD88.

Four grain size samples were collected at ISS-ASKO with the following silt/clay (fines) content:

- 4.5 to 5.8 ft bgs: 56.4%
- 5.8 to 7.5 ft bgs: 31.1%
- 7.5 to 9 ft bgs: 24.5%
- 9 to 10.5 ft bgs: 46.9%.

These grain size analysis results indicate that the Perched WBZ has a relatively high silt/clay content and thus a relatively low hydraulic conductivity. Using the method of Chapuis (2004) to estimate hydraulic conductivity based on grain size results, the average hydraulic conductivity in the Perched WBZ over these combined four intervals was calculated to be 1.7 ft/day. This is consistent with the lower range of the slug test results in the Shallow WBZ (2 ft/day).

The bottom and top surface elevations for the Perched WBZ were interpreted from various cross-sections and are contoured on Figures 2.15 and 2.16, respectively. The corresponding

Perched WBZ saturated thickness is shown on Figure 2.17, and ranges from approximately 2 to 8 ft. The thickest portion of the Perched WBZ is centered between the apparent former streambed between 01MW70 and 01MW71, and it thins significantly to the west.

Similarly, the Shallow WBZ bottom surface elevations were interpreted from lithology on Cross-sections A through J (Figures 2.3 through 2.12, respectively), and contours of this bottom surface are shown on Figure 2.18. The Shallow WBZ bottom surface contours shown on Figure 2.18 indicate that there is a slope from east to west between the Bulk Terminal and ASKO properties, which is consistent with the general groundwater flow direction from east to west between these two parcels. The bottom surface then decreases from these two parcels towards the shoreline, where it reaches a minimum of 6.6 ft NAVD88 at monitoring well 02MW19.

The Shallow WBZ saturated thickness, which is based on the difference between the April/May 2019 water table elevations and the bottom surface, is contoured on Figure 2.19. The Shallow WBZ is relatively thick at the Bulk Terminal Property (up to 18 ft) where the large mound is observed in the water table. The saturated thickness at the ASKO Property decreases from the south boundary (10 ft) to the north boundary (4 ft). There is also a steep reduction in saturated thickness at the north boundary of the Bulk Terminal Property where it declines to a minimum of 1.0 ft at 01MW34 which is near the northeast corner of this property.

### **2.3 Chemical Presence**

Approximate TCE plumes are shown on Figure 2.20 (Perched WBZ) and Figure 2.21 (Shallow WBZ). Figure 2.20 indicates that the TCE plume derived from an off-site source upgradient of the ASKO parcel is relatively narrow, which is consistent with the limited east-west extent of the Perched WBZ.

## **3. MODELING APPROACH**

Two groundwater flow models were developed for the purpose of this remedial design analysis: the Shallow WBZ Model and the Perched WBZ Model. A more detailed construction and calibration effort was conducted for the Shallow WBZ Model given its larger extent and the availability of more geologic and hydrogeologic data. The Perched WBZ Model is more simple in nature given the relatively small extent of this unit and the corresponding reduction in available geologic and hydrogeologic data. A recharge zone was simulated in the Shallow WBZ Model to account for drainage from the Perched WBZ to the Shallow WBZ.

In both models, pre-ISS conditions were simulated first and compared to the April/May 2019 groundwater elevations shown on Figures 2.13 (Perched WBZ) and Figure 2.14 (Shallow WBZ). Then remedial conditions were simulated by using a hydraulic conductivity for the ISS zones of

$1 \times 10^{-6}$  cm/s which is expected to be an upper limit. The Perched WBZ remedy includes an interception trench which was also incorporated into the corresponding model. The Shallow WBZ model also included a simulated injection well to represent the recharge of treated effluent from the Perched WBZ permeable reactive barrier which is proposed as part of that remedy.

MODFLOW NWT (Nisonger et al., 2011) was used to simulate two-dimensional horizontal groundwater flow in each hydrostratigraphic unit. MODFLOW-NWT is formulated using a numerical methodology which allows for simulation of aquifers having regions of thin or dry conditions. Groundwater Vistas (Environmental Simulations, 2011) was used for graphical pre- and post-processing. MODPATH was used for particle tracking simulations.

The Shallow WBZ Model is described in Section 3.1, and the Perched WBZ Model is described in Section 3.2.

### **3.1 Shallow WBZ Model**

Five scenarios were constructed for the Shallow WBZ Model:

- Scenario 1: Calibration to the April/May 2019 groundwater monitoring event when leakage from the clean water line at Bulk Terminal Property was occurring at a rate of approximately 2.6 gpm;
- Scenario 2: Pre-ISS conditions after the leaking pipe had been removed;
- Scenario 3: Post-ISS conditions before development of the Site using a hydraulic conductivity of  $1 \times 10^{-6}$  cm/s for the ISS zones ( $K_{ISS}$ );
- Scenario 4: Post-ISS conditions after development has been completed, using  $K_{ISS}$  of  $1 \times 10^{-6}$  cm/s; and
- Scenario 5: Post-ISS conditions after development has been completed, using  $K_{ISS}$  of  $1 \times 10^{-7}$  cm/s; and

#### **3.1.1 Model Construction**

##### *Boundary Conditions*

Figure 3.1 shows the extent of the Shallow WBZ Model domain, which extends 4,000 ft in the east-west direction and 3,000 ft in the north-south direction. The east-west boundaries were selected to ensure that simulated flow after the ISS implementation, in the vicinity of the Site, was not artificially influenced by the locations of the model boundaries. Figure 3.1 shows that a constant-head boundary is used to represent conditions upgradient of the Site, and at the shoreline.

The upgradient constant-head boundary was calibrated to have a head of 34 ft NAVD88, and the downgradient boundary was specified to have a head of 19 ft NAVD88 based on the minimum groundwater elevation observed adjacent to the shoreline at the Site.

Model grid cells south and north of the constant head boundaries are specified to be no-flow regions (Figure 3.1).

### *Grid*

The Shallow WBZ Model grid is shown on Figure 3.2, and incorporates horizontal spacing that ranges from 6.25 to 100 ft. The smallest spacing is centered in the vicinity of the proposed ISS zones as shown on Figure 3.2.

### *Input Parameters*

The Shallow WBZ Model bottom surface elevations were specified to be consistent with observed conditions, and are shown on Figure 3.3.

Scenario 1 recharge zones are shown on Figure 3.4a (2019 conditions), and are represented as:

- Infiltration rate of zero where the ground surface is generally covered;
- Infiltration rate of 0.0023 ft/day (i.e. 10 inches per year, or inch/y) where the ground surface is uncovered to represent meteoric recharge from precipitation;
- Infiltration rate of 0.014 ft/day (i.e. 61 inch/y) in the vicinity of the mound observed in the Shallow WBZ; the rate and extent of this zone were calibrated in 2020 to match observed groundwater elevations (prior to the discovery of the leaking pipe; and
- Infiltration rate of 0.011 ft/day to represent recharge from the Perched WBZ to the Shallow WBZ in the vicinity of the area where the Perched WBZ is not present. This was estimated based on the following Perched WBZ properties: hydraulic conductivity of 2 ft/day; horizontal hydraulic gradient of 0.07 ft/ft; saturated thickness of 8 ft; and a flux region of 90 ft.

Figure 3.4a shows that the calibrated enhanced recharge rate of 61 inches per year on the Bulk Terminal Property coincides with the location of the leaking pipe, and the pond which was caused by this leaking pipe. Taking the difference between the enhanced recharge rate of 61 inch/y and the typical uncovered surface recharge rate (10 inch/y), and multiplying by the area of this enhanced recharge zone (1.23 acres), provides a simulated increased recharge rate of 3.3 gpm within the enhanced recharge zone shown on Figure 3.4a. This compares favorably with the recently estimated pipe leak rate of 2.6 gpm (see Section 2.2) corresponding to Fall 2019, and provides independent verification that the calibrated hydraulic conductivity values are representative of conditions at the Site (Note that increasing or decreasing the calibrated enhanced recharge rate at the Bulk Terminal Property would result in a corresponding increase or decrease in the calibrated hydraulic conductivity values in this area).

Figure 3.4b shows the recharge zones for Scenario 2 which represents pre-ISS conditions after the leaking pipe was removed. In this case, the enhanced recharge zone rate was replaced with the typical uncovered surface recharge rate of 10 inch/y.

Figure 3.4c shows the recharge zones for Scenario 3 (post-ISS and pre-development), where the perched recharge zone to the Shallow WBZ has been reduced to occur only outside the ISS zone.

Figure 3.4d shows the recharge zones for Scenarios 4 and 5 (post-ISS and post-development), where the planned development covered surface areas have been implemented using an infiltration rate of zero. The development plan includes an uncovered area west of the development on the ASKO property which is replaced with a typical uncovered recharge rate of 10 inch/y in these scenarios, as shown on Figure 3.4d.

Four hydraulic conductivity (K) zones were defined in the Shallow WBZ Model: K=2 ft/day in the southern region of the model; K=20 ft/day in the northern portion of the model; and low K regions of 0.1 and 0.5 ft (see Figure 3.5). The extents of these K zones were defined based on relative hydraulic gradient changes in the Shallow WBZ (based on inspection of Figure 2.14), and the relative values and extents of these K zones were adjusted during model calibration.

Note that the low K zone of 0.5 ft/day in the north and west portions of the Bulk Terminal Property was also defined based on the observation of increased silt content in the Shallow WBZ in this area, including at soil borings 01MW15, 01MW55, and 01MW65 (northwest area); as well as a cluster of boreholes with silty sand where the observed water table slope was steepest in the northeast portion of this property (01MW33, 01MW34, 01MW35, and 01MW87). The presence of silty sand at borings in these areas, which coincides with where steeper hydraulic gradients are observed, is consistent with the presence of a lower hydraulic conductivity zone in this area.

### 3.1.2 Model Calibration (Scenario 1)

Shallow WBZ Model Scenario 1 was used to calibrate the model to the April/May 2019 groundwater monitoring event, when clean water leakage was occurring from the underground pipe at the Bulk Terminal Property (see above).

The main parameters that were adjusted during model calibration (Scenario 1) were the K values of the four zones discussed above, and the rate and extent of the recharge zone where the mound was observed in the Shallow WBZ at the Bulk Terminal parcel.

Metrics which were used to evaluate the Shallow WBZ Model calibration include:

- General flow directions and horizontal hydraulic gradients (Figure 3.6);
- Modeled versus observed groundwater elevations scatter plot (Figure 3.7);
- Calibration target residual bubble plot (Figure 3.8); and
- Calibration statistics (Table 3.1).

The calibration targets were specified to be the Shallow WBZ monitoring wells with groundwater elevations that were measured during the April/May 2019 event. Figure 3.6 shows that there is a good match between observed and modeled groundwater elevations, indicating that the simulated flow directions and hydraulic gradients are consistent with observed conditions. The scatter plot (Figure 3.7) also demonstrates that there is random deviation above and below the line of best fit, which is another positive indicator that the model calibration is representative. Similarly, the calibration target residual bubble plot shown on Figure 3.8 indicates that there are no regions where the model has a large, significant bias in the estimation of the observed groundwater elevations.

Given the complexity of the distribution in observed groundwater elevations across the Site, the Shallow WBZ Model provides a reasonably good representation. It is likely that the combination of the bottom surface elevations, changes in hydraulic conductivity, and the distribution of variable infiltration rates are controlling the distribution of these observed groundwater elevations, all of which are represented in the Shallow WBZ Model.

Calibration target residuals represent the difference between the observed and modeled groundwater elevations at each well location. A negative residual implies that the model is overestimating the observed groundwater elevation, and a positive residual implies that the model is underestimating the observed groundwater elevation. Table 3.1 presents the calibration target residuals at each Shallow WBZ monitoring well location.

The root mean squared error relative to the observed range in groundwater elevations is 6.5%, which is less than the allowable threshold error of 10%, which is another indication that the calibrated model is representative.

Other calibration statistics include:

- Modeled range in groundwater elevations (19.0 to 42.9 ft NAVD88) is consistent with the observed range (18.8 to 44.7 ft NAVD88);
- Mean residual of 0.35 ft; and
- Mean absolute residual of 1.26 ft.

The MODFLOW NWT mass balance indicates that the simulated error is less than 0.01%.

During the model calibration process, it was determined that the calibration of Shallow WBZ hydraulic conductivity values and the infiltration rate in the mound area is non-unique. That is, higher values of Shallow WBZ hydraulic conductivity and infiltration rates also yield a similar array of reasonable calibration metrics. The selected set of K and infiltration rates were used because this represents the lowest (and thus most conservative) K values and is consistent with the low end of the slug test results. If the Shallow WBZ hydraulic conductivity is higher than that used in the calibrated model, then the degree of flow reduction in the ISS areas would be even greater than is simulated using these calibrated parameters.



### 3.1.3 ISS Remedial Design Analysis

Figure 3.9 shows the Shallow WBZ Model ISS scenario K zones, where a  $K_{ISS}$  of  $1 \times 10^{-6}$  cm/s (i.e., 0.00283 ft/day) was specified for the proposed ISS zones (CAA-2a at the Bulk Terminal Property, and CAA-4a/b at the ASKO Property) for model Scenario 3 (pre-development) and for Scenario 4 (post-development). The  $K_{ISS}$  was specified to be  $1 \times 10^{-7}$  cm/s for model Scenario 5 (post-development) to check the sensitivity of groundwater flow within and outside the ISS zone to this parameter.

The ISS Scenarios (3 to 5) also included a gravity well simulated near the southwest corner of ISS-4a/b to represent the recharge of treated effluent from the Perched WBZ permeable reactive barrier (see Figure 3.10). Based on the results of the Perched WBZ Model discussed below in Section 3.2.3, the estimated recharge rate for this treated effluent is 0.3 gallons per minute (gpm).

Figure 3.10a compares simulated groundwater elevation contours for Scenario 2 (pre-ISS) and Scenario 3 (post-ISS, pre-development). Particle tracks are shown at the ASKO property to facilitate an assessment of flow conditions in the vicinity of the PlumeStop zone. Figure 3.10a indicates that even without the leaking pipe at the Bulk Terminal Property in Scenario 2 (pre-ISS), there is still a simulated mound due to infiltration from the large uncovered surface at this property. This creates westward flow from the Bulk Terminal to the ASKO Property where groundwater eventually proceeds northward toward the shoreline. The simulated groundwater level in the mound at the Bulk Terminal Property in Scenario 2 is about 6 feet lower than the simulated mound in Scenario 1 (when the underground pipe was leaking).

The simulated groundwater elevations and particle tracks for Scenario 3 (post-ISS, pre-development) shown on Figure 10a indicate that:

- Groundwater flow is generally flowing around the boundary of the ISS zone with only a minor component of flow through the low-permeability ISS zone; and
- Treated effluent from the Perched WBZ that is injected into the Shallow WBZ passes through the PlumeStop zone.

Figure 10.b compares simulated groundwater elevations, and particle tracks at the ASKO property, for Scenarios 4 and 5 (both post-ISS and post-development, the former with  $K_{ISS}=1 \times 10^{-6}$  cm/s, the latter with  $K_{ISS}=1 \times 10^{-7}$  cm/s). Comparison of these two scenarios indicates that flow directions around the ISS zones are not influenced by  $K_{ISS}$ , although the mound at the Bulk Terminal Property was simulated to be approximately 2 ft higher due to the lower  $K_{ISS}$  in Scenario 5.

A water balance was conducted using the Groundwater Vistas software to assess the degree to which flow was reduced in the ISS areas relative to pre-ISS implementation conditions, to quantify the potential pH at the downgradient boundary of the mixing zone around the ISS areas, and to assess the difference in flow rate and average linear groundwater velocity

through the PlumeStop zone for each scenario. Based on work conducted in the original 2020 modeling study, the mixing or buffer zone (where the slow rate of ISS outward flow will be diluted) is estimated to have approximately 50% of the natural pre-ISS flow rate through this area.

Figure 3.11 shows the water balance zones used in Groundwater Vistas to quantify both the rates of flow through the respective ISS areas as well as the PlumeStop zone (before and after implementation).

Table 3.2 shows the simulated water balance results. In Scenario 1 (2019 conditions with leaking pipe), the total groundwater flow through CAA-4ab and CAA-2a areas is 2.0 and 1.1 gpm, respectively. In Scenario 2 (pre-ISS without the leaking pipe), these groundwater flow rates declined to 1.35 and 0.41, respectively. After ISS implementation and prior to development, the simulated flow through these ISS areas declines dramatically to 0.0028 and 0.0045 gpm, respectively. This indicates that ISS implementation will reduce the rate of groundwater flow through these areas by factors ranging from approximately 90 to 480 times. After development, the flow reduction factors increase to a range of 160 to 640 based on the maximum allowable  $K_{ISS}$  of  $1 \times 10^{-6}$  cm/s. While reducing  $K_{ISS}$  by an order of magnitude will reduce flow through the ISS area by a proportional amount, the actual flow directions and velocities around the ISS areas remain virtually the same because the  $K_{ISS}$  of  $1 \times 10^{-6}$  cm/s is sufficient to cause diversion of groundwater flow around the ISS areas.

The pH at each of these mixing zone downgradient boundaries is estimated using a weighted average approach based on the equation

$$pH_{mix} = \frac{(Q_{ISS} pH_{ISS} + Q_{buffer} pH_{buffer})}{Q_{ISS} + Q_{buffer}}$$

where  $pH_{mix}$  = pH of the mixed water at the downgradient boundary of the mixing zone;

$Q_{ISS}$  = rate of flow of groundwater seeping slowly from the ISS area (gpm)

$pH_{ISS}$  = pH of water inside the ISS area

$Q_{buffer}$  = flow rate of water wrapping around the ISS area in the buffer zone (gpm); and

$pH_{buffer}$  = pH of groundwater in the buffer zone at the upgradient boundary.

The mixing zone represents the area where the slow rate of groundwater flow from the ISS area will mix with groundwater that is wrapping around the sides of the ISS area in the buffer zone. For this calculation, the pH in the ISS zone was specified to be 12, and the pH in groundwater at the upgradient boundary of the mixing zone was specified to be 7. The Shallow WBZ Model water balance output was used to define the flow rates for the above mixing zone equation, which are presented in Table 3.3.

Based on these data, the pH of the mixed groundwater for CAA-2a and CAA-4a/b was estimated to be 7.11 and 7.02, respectively (see Table 3.3). Note that these calculations do not consider the influence of geochemical conditions which will reduce pH post-ISS implementation, such as the effects of in-situ bioremediation in the PlumeStop zone shown on Figure 3.10a. These pH mixing calculations are based on comparison of pre- and post-ISS flow rates for Scenarios 2 and 3. The flow rate through the ISS area declines in scenarios 4 and 5, so the pH results will be closer to 7.0 for these latter two model scenarios.

Table 3.4 presents the simulated groundwater flow rate and average linear groundwater velocity through the PlumeStop zone area for model scenarios 1 through 5 (i.e. before and after implementation). The simulated groundwater velocity was calculated using the simulated total groundwater flow rate through this area, an average saturated thickness of 4 ft based on inspection of Figure 2.19), an approximate length of 165 ft, and an effective porosity of 0.20. For scenarios 1 through 5, the simulated groundwater velocity through the PlumeStop area was:

- Scenario 1 (2019 conditions with leaking pipe): 1.8 ft/day;
- Scenario 2 (pre-ISS without leaking pipe): 1.3 ft/day;
- Scenario 3 (post-ISS, pre-development,  $K_{ISS}=1 \times 10^{-6}$  cm/s): 1.0 ft/day;
- Scenario 4 (post-ISS, post-development,  $K_{ISS}=1 \times 10^{-6}$  cm/s): 0.9 ft/day; and
- Scenario 5 (post-ISS, post-development,  $K_{ISS}=1 \times 10^{-7}$  cm/s): 0.9 ft/day.

These results indicate that the groundwater velocity will decline by 30% or more after ISS implementation, which will effectively increase the retention time within the PlumeStop zone, resulting in improved remediation efficiency.

### **3.2 Perched WBZ Model**

The remedy for the Perched WBZ includes the implementation of an ISS zone which extends down to the bottom of the Shallow WBZ, plus a passive interception trench at the upgradient boundary of the ISS zone and a permeable reactive barrier (PRB) to treat groundwater recovered from the interception trench.

The groundwater flow model is used to assess the degree of flow reduction that will be attained in the ISS zone, and the approximate pumping rate at the passive interception trench based on the design assumption that the hydraulic head at the trench will be maintained at its current level of 51 ft NAVD88 (i.e. groundwater elevation prior to ISS and trench construction). This modeling study is not used to verify that this head can be attained using a passive trench; this is not an objective of the modeling study.

Given the permeability of materials that will be used to construct the interception trench and the treatment vault influent elevation of 47 ft NAVD88, the resulting head at the trench will be lower than current conditions. To bracket the range of potential flow rates associated with passive collection at the interception trench, a separate scenario was simulated using a head of 45 ft NAVD88 which is close to the bottom elevation of the trench.

Section 3.2.1 presents details on the Perched WBZ Model construction, Section 3.2.2 describes model results for the pre-ISS scenario (current conditions), and Section 3.2.3 highlights model results for the ISS scenario.

### 3.2.1 Model Construction

As discussed in the CSM presented in Section 2, the primary flow in the Perched WBZ occurs in what appears to be a former streambed situated in the vicinity of 01MW70 and 01MW71. This is where saturated thickness is highest and hydraulic conductivity is probably highest. There is no perched zone to the east of this area, and if there is a connected perched zone to the west it is significantly thinner and is assumed to have a lower hydraulic conductivity.

Figure 3.12 shows the active portion of the Perched WBZ model domain, which is approximately 200 ft wide and 280 ft long. The streambed hydraulic conductivity was estimated to have an average hydraulic conductivity of 2 ft/day based on grain size analytical results (see Section 2), and the hydraulic conductivity outside this zone was estimated to be approximately an order of magnitude lower (0.2 ft/day). It is possible that the perched WBZ does not extend west of the former streambed depicted in blue on Figure 3.12, but it is being represented in the model to be conservative.

The Perched WBZ Model grid in the active portion of the model domain has a minimum grid spacing of 3.125 ft by 3.125 ft in the vicinity of the ISS zone and interception trench, and a maximum spacing of 6.25 ft by 6.25 ft in the outer reaches of the active portion of the model domain.

Figure 3.12 shows the drain boundary condition area which was used to represent the downgradient portion of the Perched WBZ where the underlying silt/clay becomes discontinuous, and water drains downward into the Shallow WBZ. The area of the drain boundary condition is consistent with the area used to simulate the Perched WBZ to Shallow WBZ recharge zone shown on Figure 3.4. The elevation used for the drain boundary condition (45 ft NAVD88) was specified to be slightly lower than the April/May groundwater elevation for monitoring well 01MW79 which is just upgradient of this drain boundary condition. The model conductance for the drain boundary condition was specified to be high (10,000 ft<sup>2</sup>/day) so that there would be no simulated resistance to drainage from the Perched WBZ which is the presumed condition in the field.

The value specified for the constant head boundary condition was determined based on the value that resulted in a simulated head of approximately 51 ft NAVD88 at the locations of

01MW70 and 01MW79, which is the observed groundwater elevation at these two wells during the April/May 2019 monitoring event. Note that the Perched WBZ Model was not “calibrated”. The model boundary conditions were specified to simulate the observed hydraulic gradient observed between 01MW70/01MW71 and 01MW79, so that the modeled specific discharge (i.e. water flux) is consistent with the observed condition. The hydraulic conductivity was specified based on the grain size analysis results discussed in Section 2, and the recharge was assumed to be zero for this small area.

Figure 3.13 shows the bottom elevation zones used in the Perched WBZ model, which are generally consistent with the observed bottom elevations at 01MW70, 01MW71, and 01MW79.

### 3.2.2 Pre-ISS Simulation

Figure 3.14 shows the simulated groundwater elevations for the pre-ISS scenario which represents current conditions. A water balance conducted using Groundwater Vistas shows that the current groundwater flow through the proposed ISS area CAA/4a/b in the Perched WBZ is 0.29 gpm (i.e. prior to ISS implementation).

### 3.2.3 Remedial Design Analysis

Figure 3.15 shows the updated hydraulic conductivity field for the ISS scenario, where the K was specified to be 0.00283 ft/day in the ISS zone.

The downgradient drain boundary condition was conservatively maintained at the pre-ISS elevation of 45 ft NAVD88. After ISS construction, there will actually be a large buildup of heads in the ISS zone, and a corresponding decrease in the flow through the ISS zone relative to what the model is predicting.

The location of the modeled interception trench is also shown on Figure 3.15. For the first scenario, a drain boundary condition was used to represent the passive interception trench, with a head of 51 ft NAVD88 (i.e., similar to April/May 2019 conditions), and a fast conductance of 10,000 ft<sup>2</sup>/day to represent negligible resistance in the trench which will be filled with gravel. As stated above, the Perched WBZ Model was not used to assess the feasibility of maintaining a head of 51 ft NAVD88 in the passive interception trench; this was an assumed condition for the remedial design modeling study.

Figure 3.16 shows the simulated groundwater elevations for the ISS scenario. While the hydraulic gradient in the ISS zone is similar to pre-ISS conditions, the hydraulic conductivity is substantially lower in the ISS zone, and thus so is the corresponding flow rate. Using the Groundwater Vistas water balance function, the modeled flow in the Perched WBZ through the ISS zone after construction is 0.0006 gpm, which represents a reduction of a factor of 500 times relative to the pre-ISS flow rate of 0.3 gpm.

For the second scenario where the trench head was simulated to be 45 ft NAVD88, the flow through the trench was reduced further to 0.00014 gpm.

The estimated recovery rate for the interception trench if the head is maintained at 51 ft NAVD88 is 0.3 gpm based on calculated recharge conditions that were present in April/May 2019. The simulated recovery rate for the lower trench head of 45 ft NAVD88 was 0.34 gpm, which is only about 10% higher than if the head at the trench were maintained at 51 ft NAVD88. This indicates that the simulated recovery rates and flow rates through the ISS areas are not very sensitive to the head specified at the interception trench.

The recovery rate during the winter season, when precipitation is at a maximum, may be higher than this simulated rate. It is recommended that additional groundwater elevation monitoring be conducted in Winter 2021 to facilitate an evaluation of the hydraulic gradient, saturated thickness, and relative specific discharge which may occur during periods of higher recharge.

This modeling study does not given an indication whether it is feasible to maintain the head in the passive trench at pre-ISS levels; focused monitoring during the first year of trench operation is recommended to verify that the head in the interception trench can be maintained at or below pre-ISS levels over various seasons. It is also recommended that geologic conditions be observed during trench excavation to confirm lithologic conditions along the trench, and to confirm the lateral and vertical extent of the Perched WBZ at the trench location. If feasible, collection of additional soil samples for physical grain size analysis during trench excavation, specifically within the sand layers in the Perched WBZ, would be useful for conducting additional estimates of hydraulic conductivity.

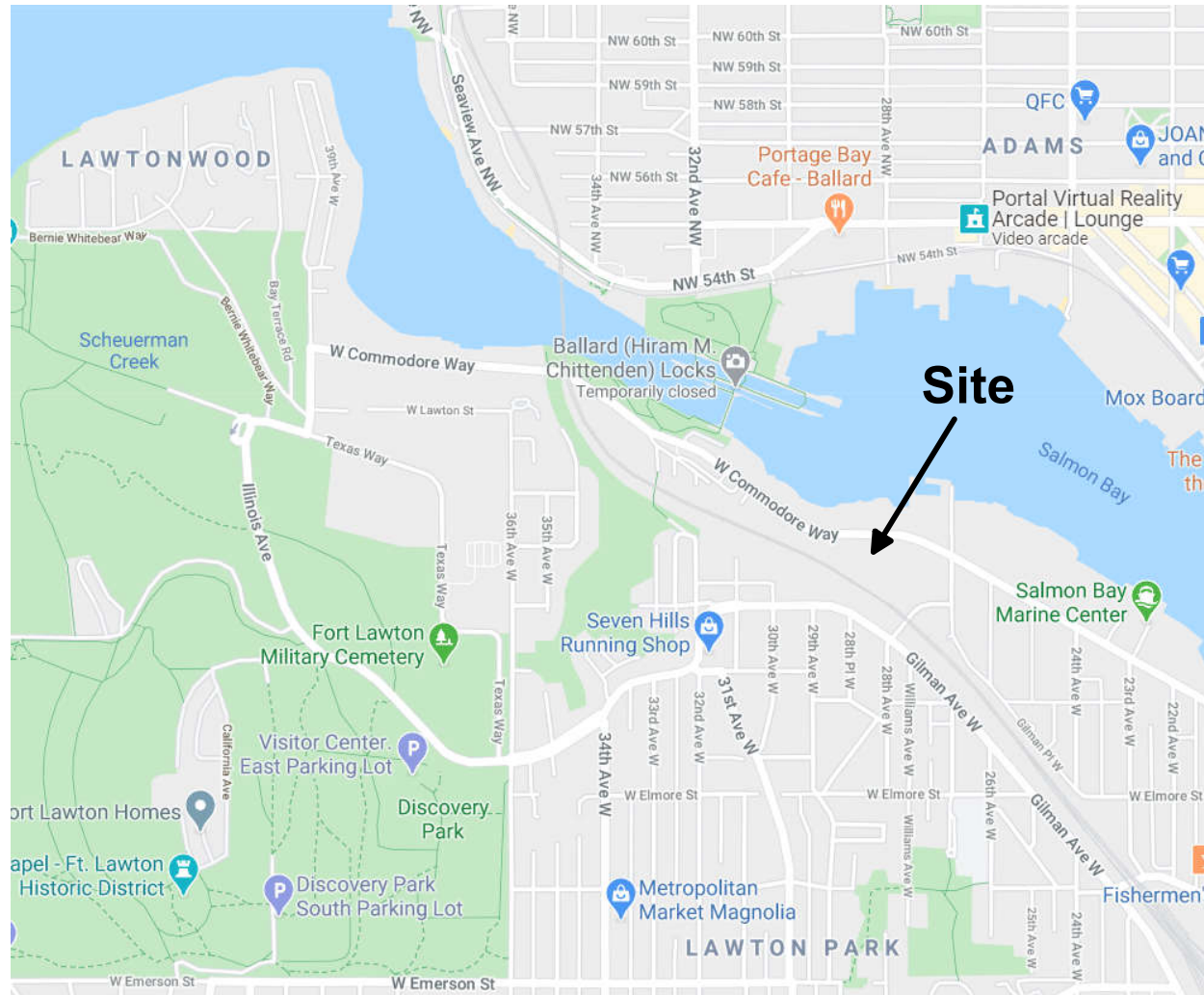
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Site Location Map

Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 1.1**



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Notes:  
1. Map reference: Google Maps

July 24, 2020





**LEGEND**

 Property boundary

Notes:  
1. Map reference: Google Earth

July 24, 2020

Aerial Photograph

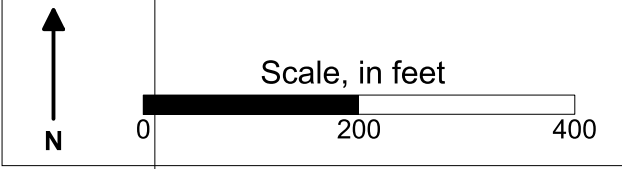
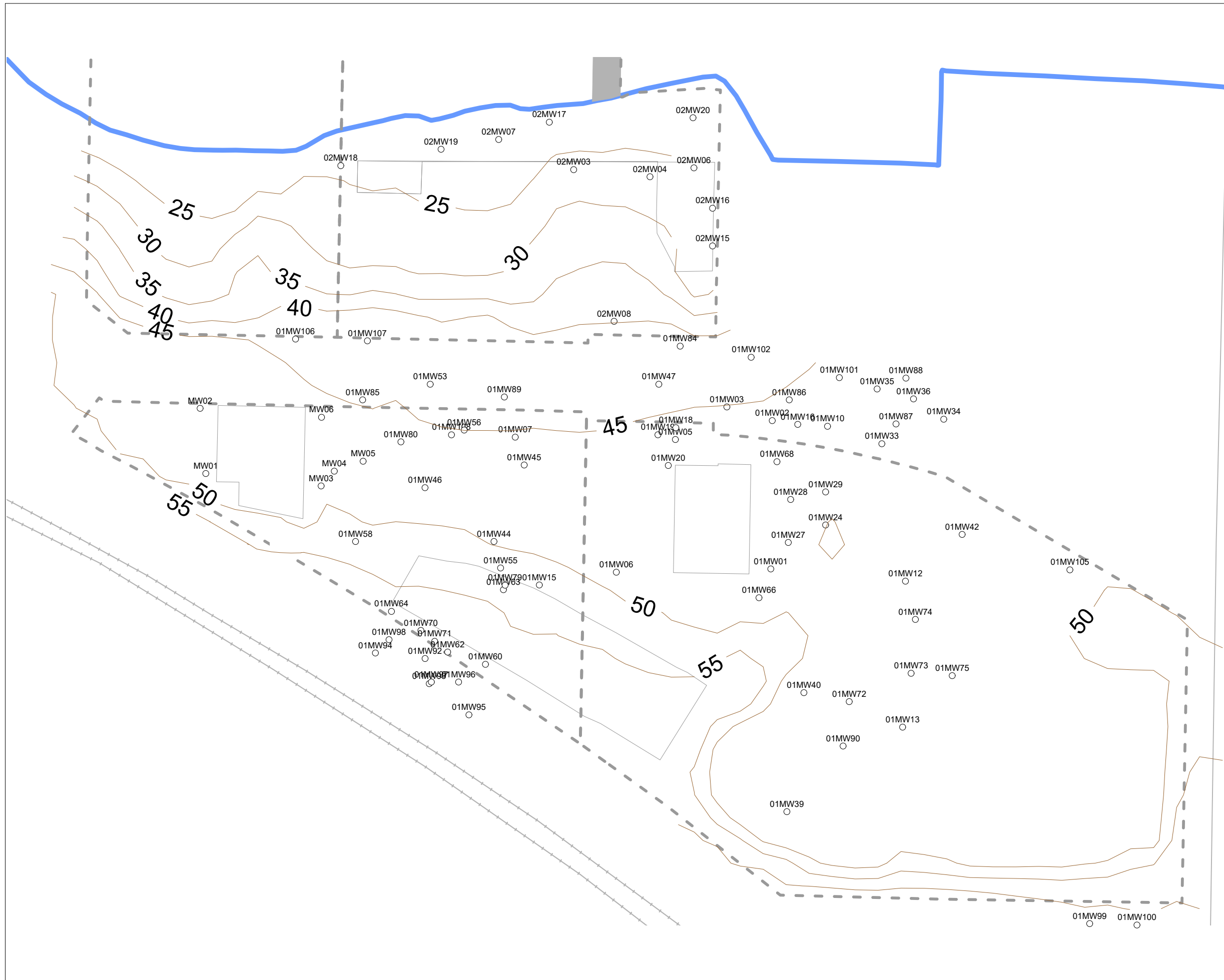
Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 1.2**



**POREWATER SOLUTIONS**

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**LEGEND**

	Monitoring well location
	Ground surface elevation contour (ft NAVD 88)
	Property boundary

- Notes:
1. Locations are approximate.
  2. Ground surface elevations were approximated based on well top of casing elevations.
  3. Ground surface elevation contour interval is 5 ft.

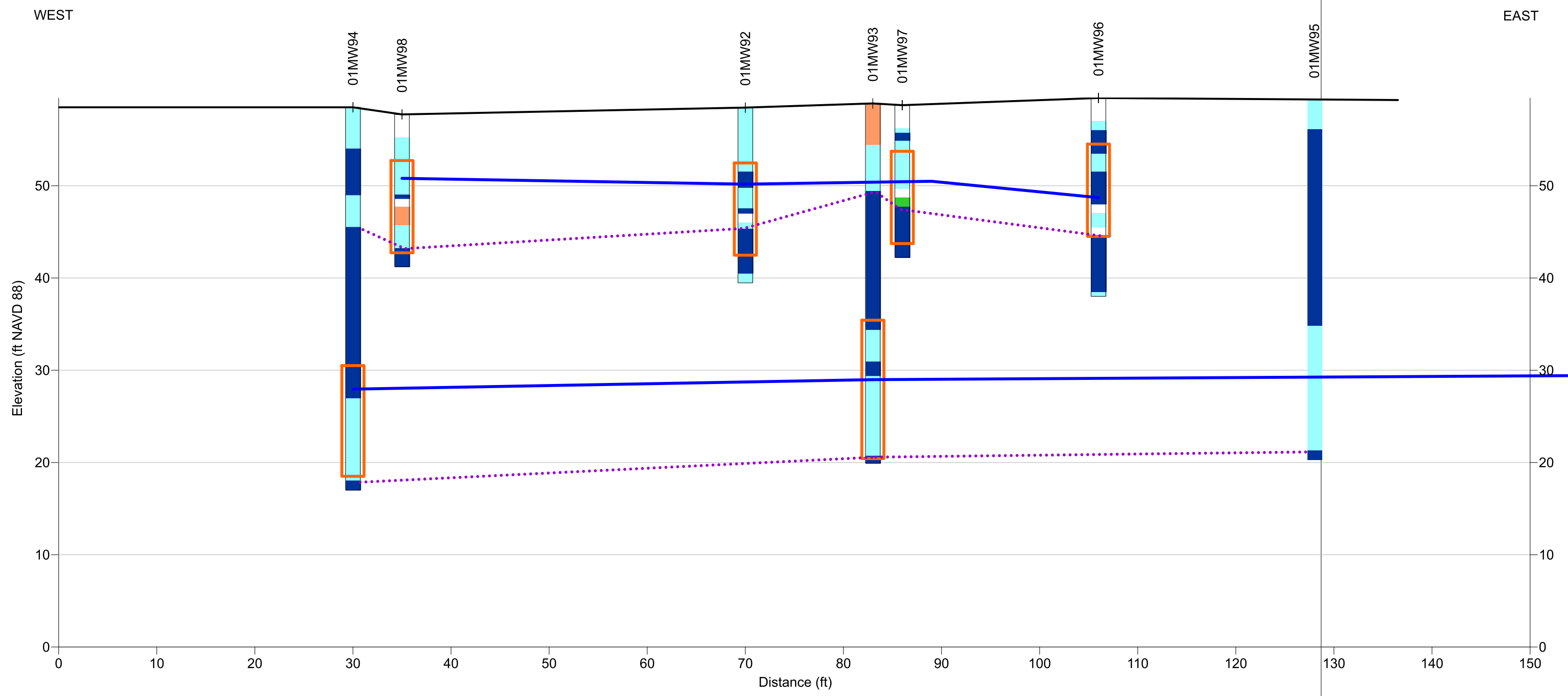
Ground Surface Elevations

Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 2.1**

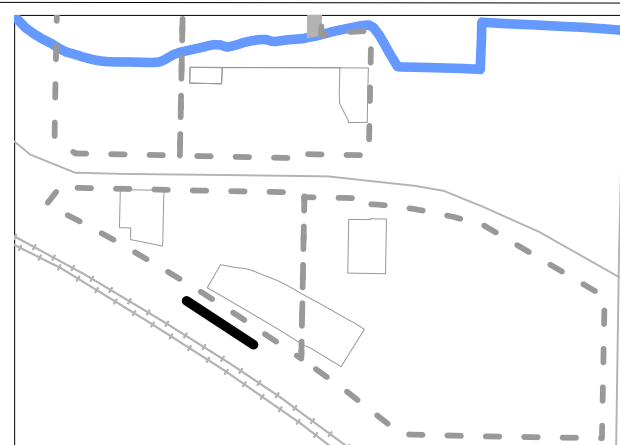






**LEGEND**


- Silt/Clay
- Silty fine sand to sandy silt
- Fine to medium sand
- Medium to coarse sand
- WBZ Water Table
- WBZ bottom surface
- Monitoring well screen



Cross-Section A

Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

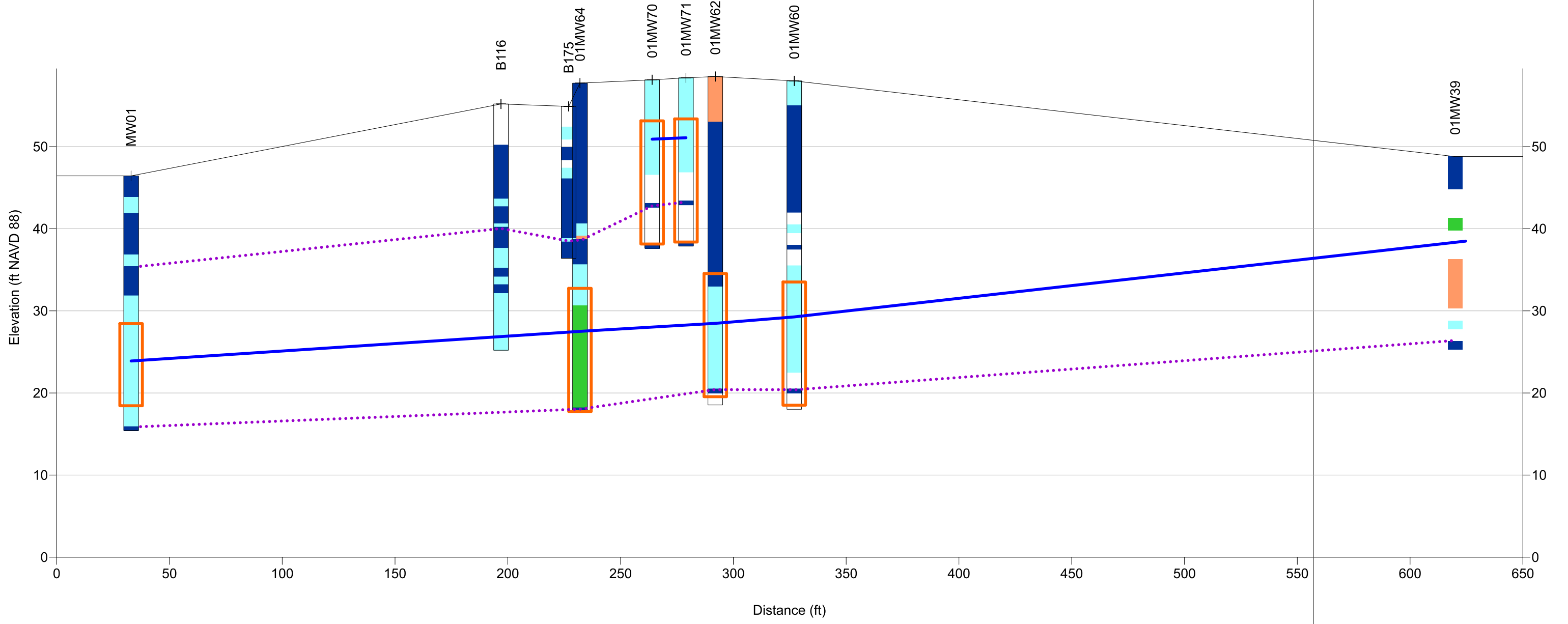
**Figure 2.3**



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WEST

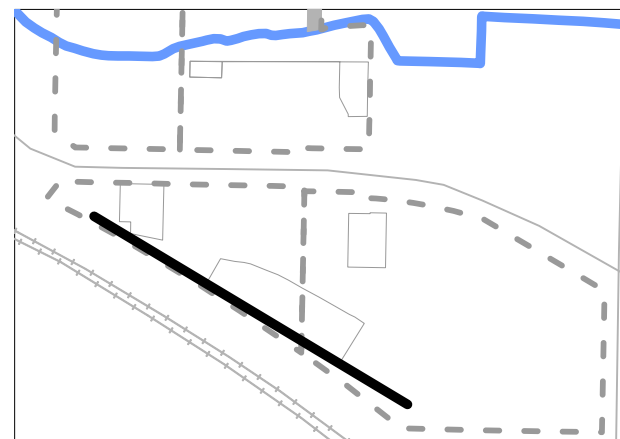
EAST



**LEGEND**

- Silt/Clay
- Silty fine sand to sandy silt
- Fine to medium sand
- Medium to coarse sand

- WBZ Water Table
- WBZ bottom surface
- Monitoring well screen



Cross-Section B

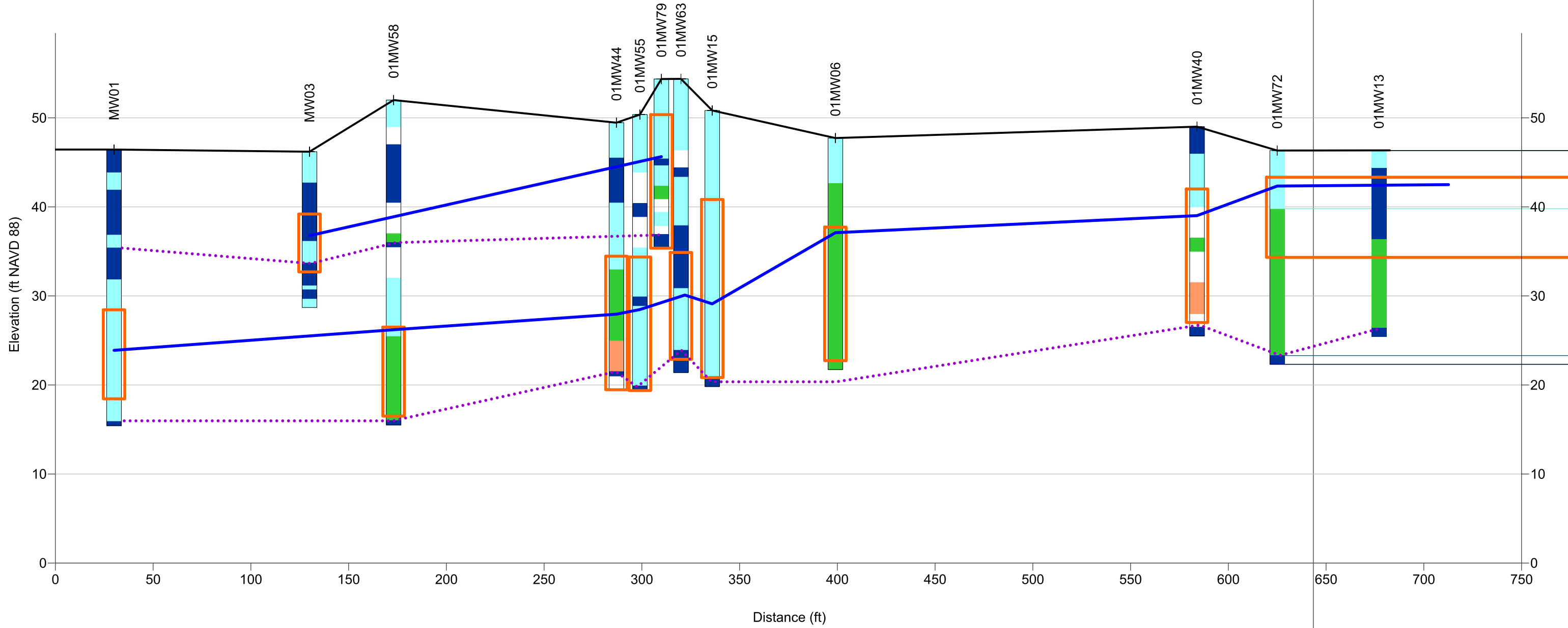
Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 2.4**



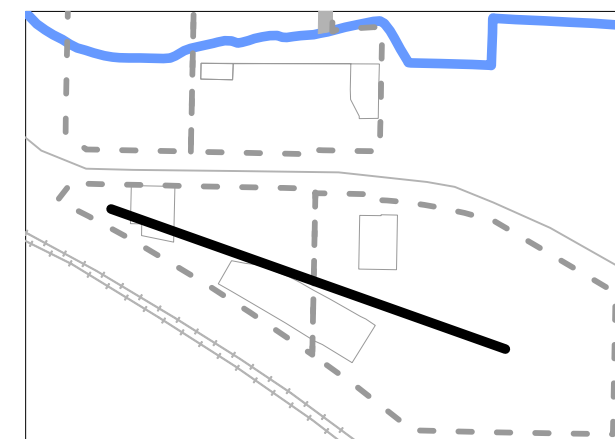
WEST

EAST



**LEGEND**

- Silt/Clay
- Silty fine sand to sandy silt
- Fine to medium sand
- Medium to coarse sand
- WBZ Water Table
- WBZ bottom surface
- Monitoring well screen



Cross-Section C

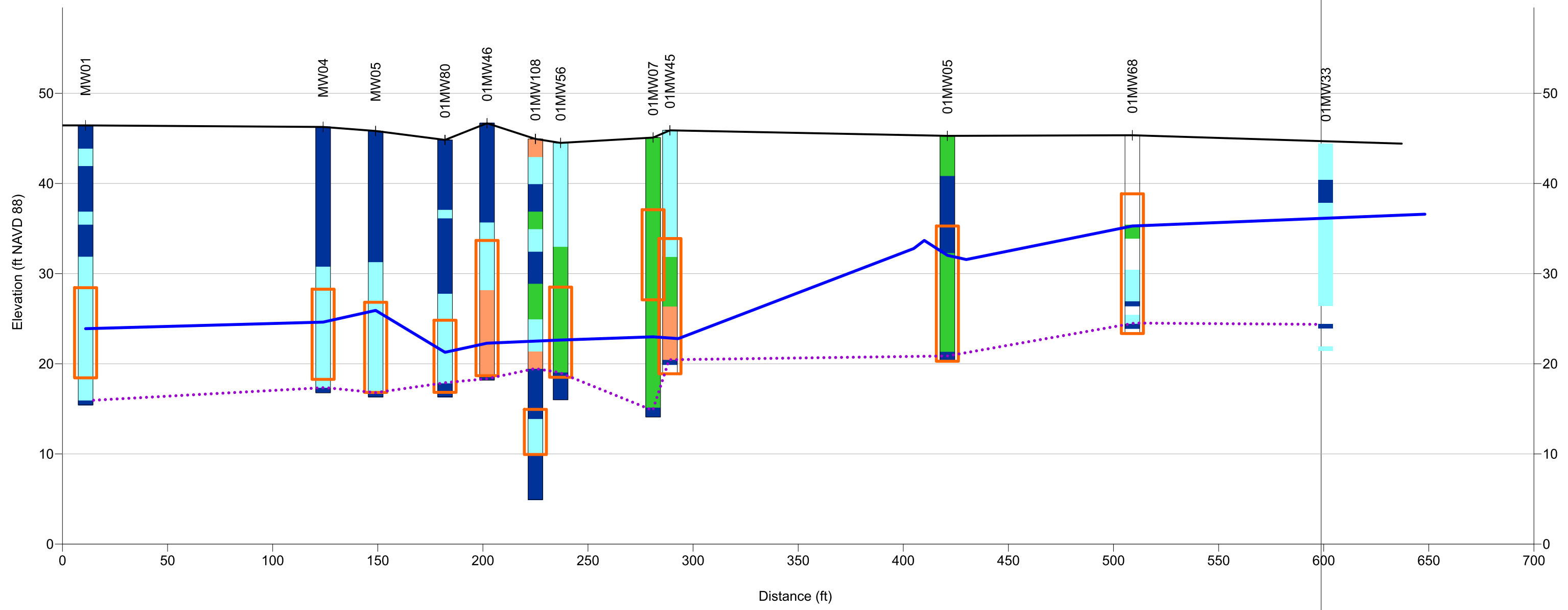
Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 2.5**



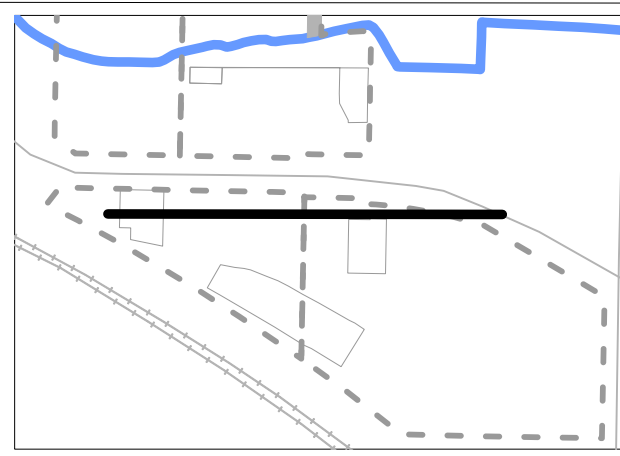
WEST

EAST



**LEGEND**


- Silt/Clay
- Silty fine sand to sandy silt
- Fine to medium sand
- Medium to coarse sand
- WBZ Water Table
- WBZ bottom surface
- Monitoring well screen



Cross-Section D

Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

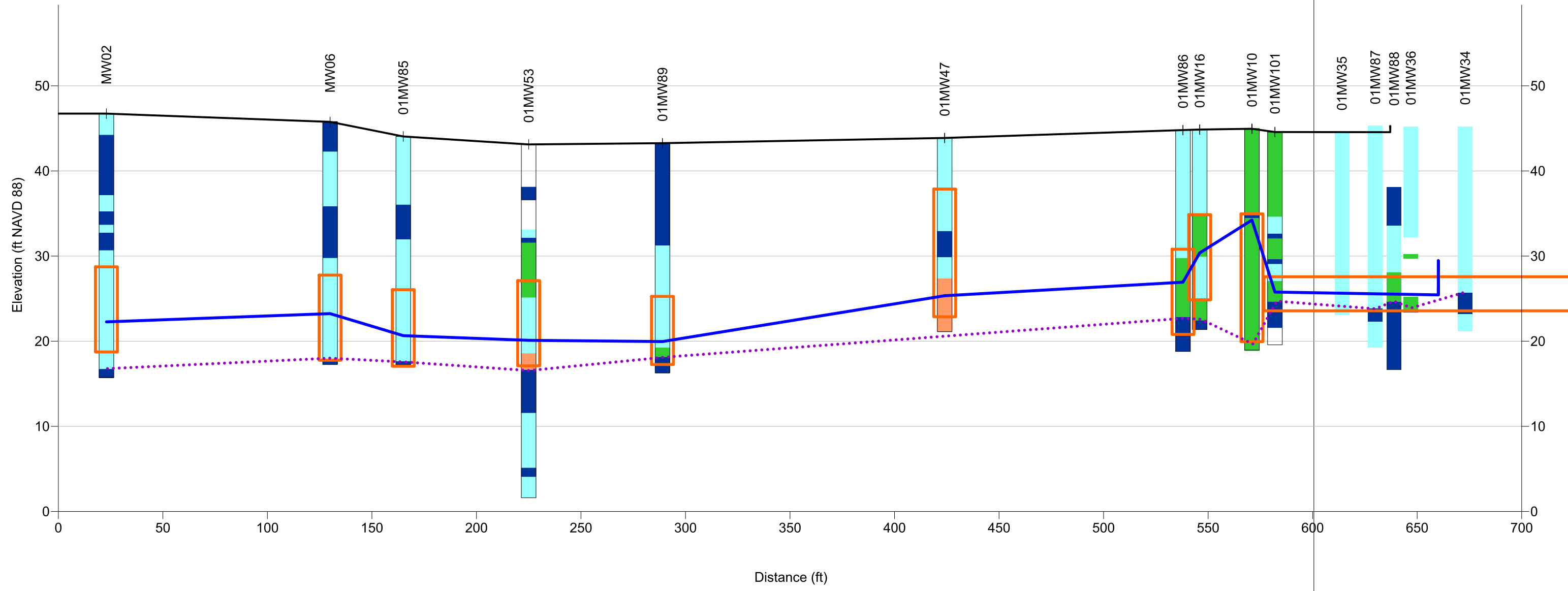
**Figure 2.6**



**POREWATER SOLUTIONS**  
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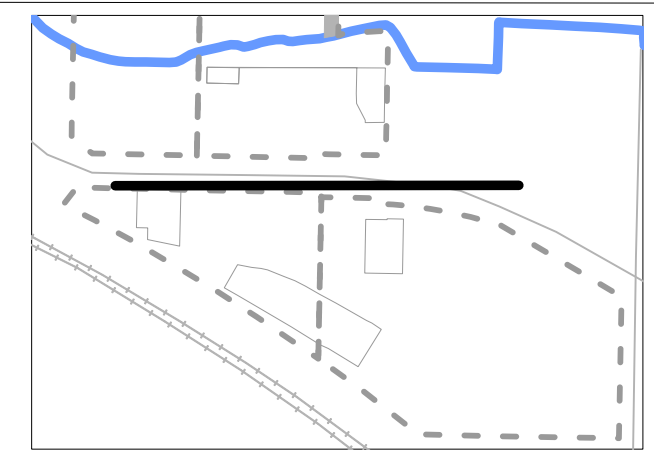
WEST

EAST



**LEGEND**

- Silt/Clay
- Silty fine sand to sandy silt
- Fine to medium sand
- Medium to coarse sand
- WBZ Water Table
- WBZ bottom surface
- Monitoring well screen



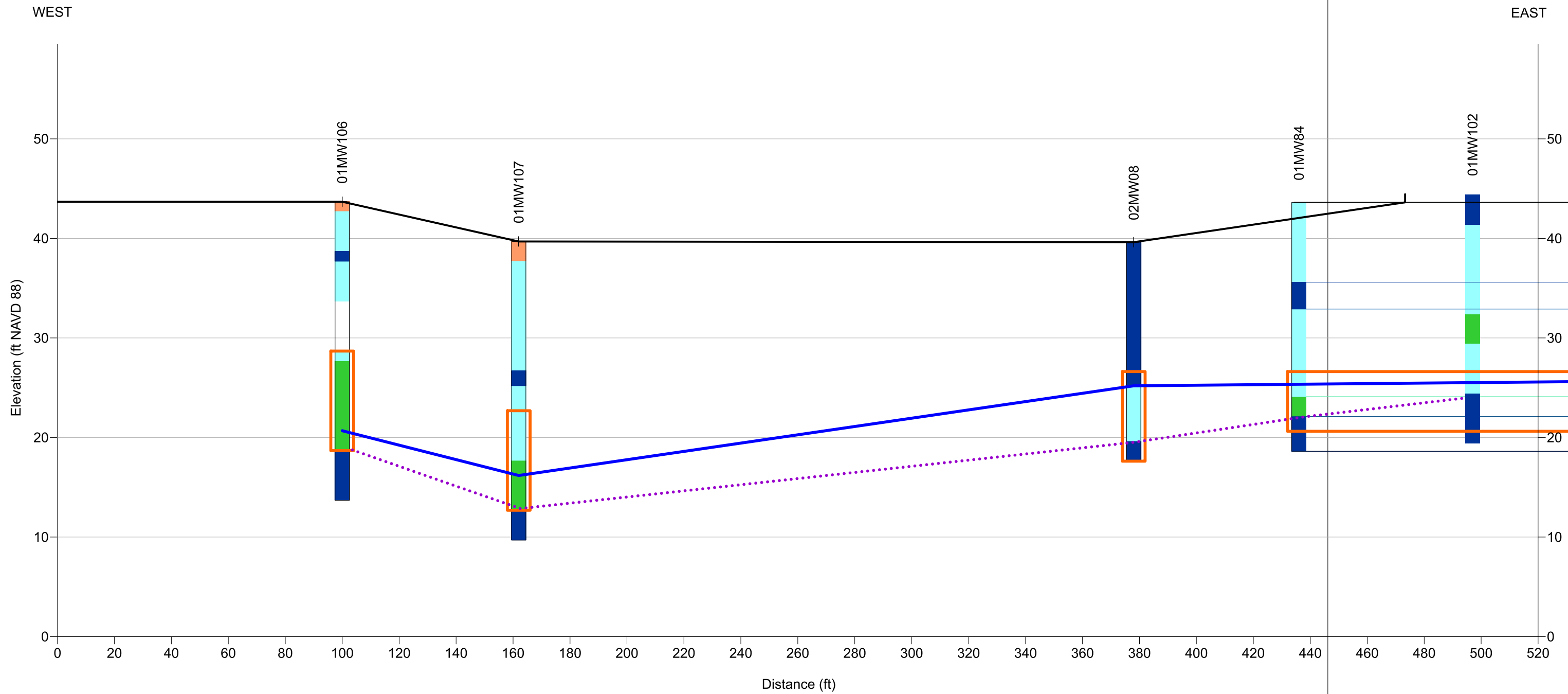
Cross-Section E

Remedial Design Modeling  
 Time Oil Bulk Terminal  
 Seattle, Washington

**Figure 2.7**



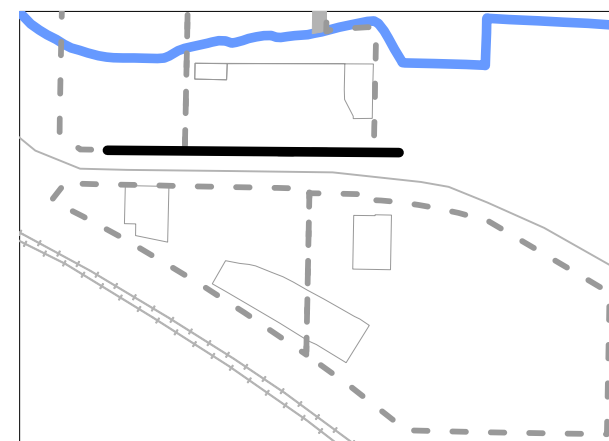




**LEGEND**

- Silt/Clay
- Silty fine sand to sandy silt
- Fine to medium sand
- Medium to coarse sand

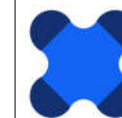
- WBZ Water Table
- WBZ bottom surface
- Monitoring well screen



Cross-Section F

Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 2.8**

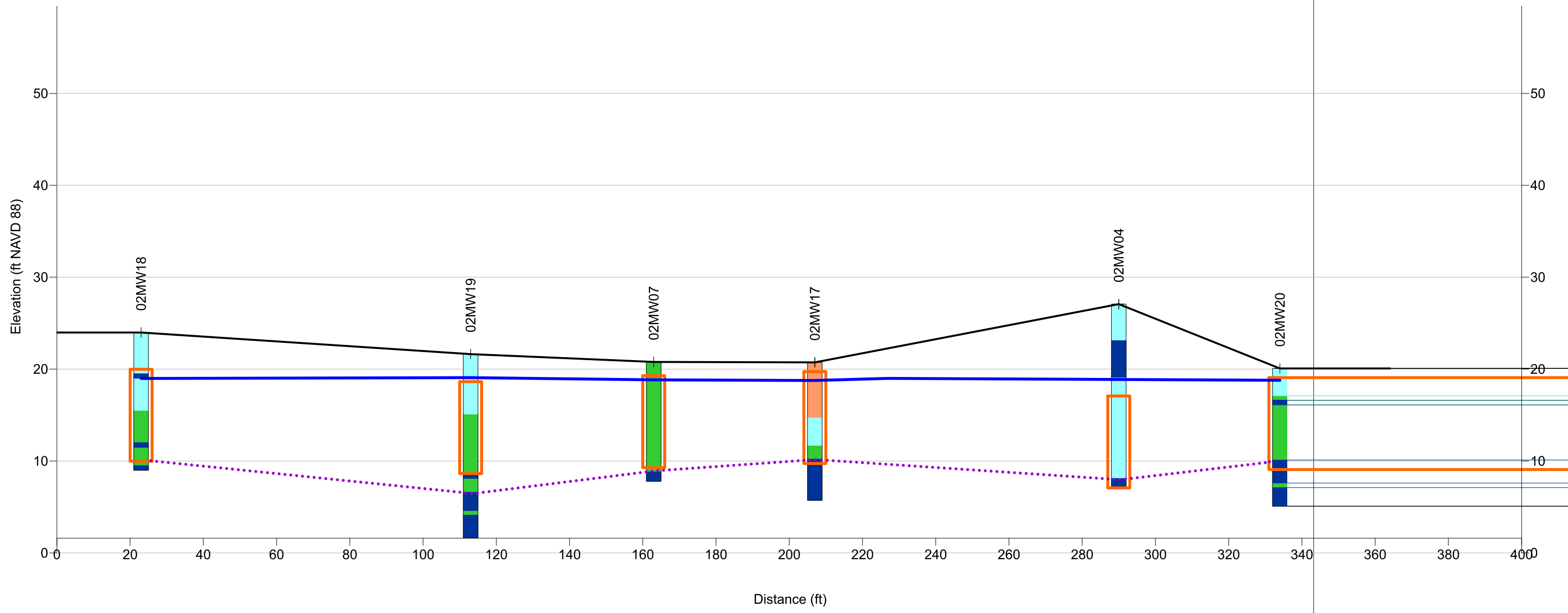


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WEST

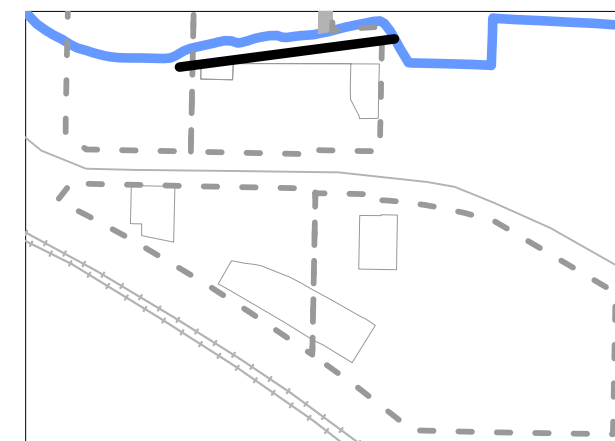
EAST



**LEGEND**

- Silt/Clay
- Silty fine sand to sandy silt
- Fine to medium sand
- Medium to coarse sand

- WBZ Water Table
- WBZ bottom surface
- Monitoring well screen



Cross-Section G

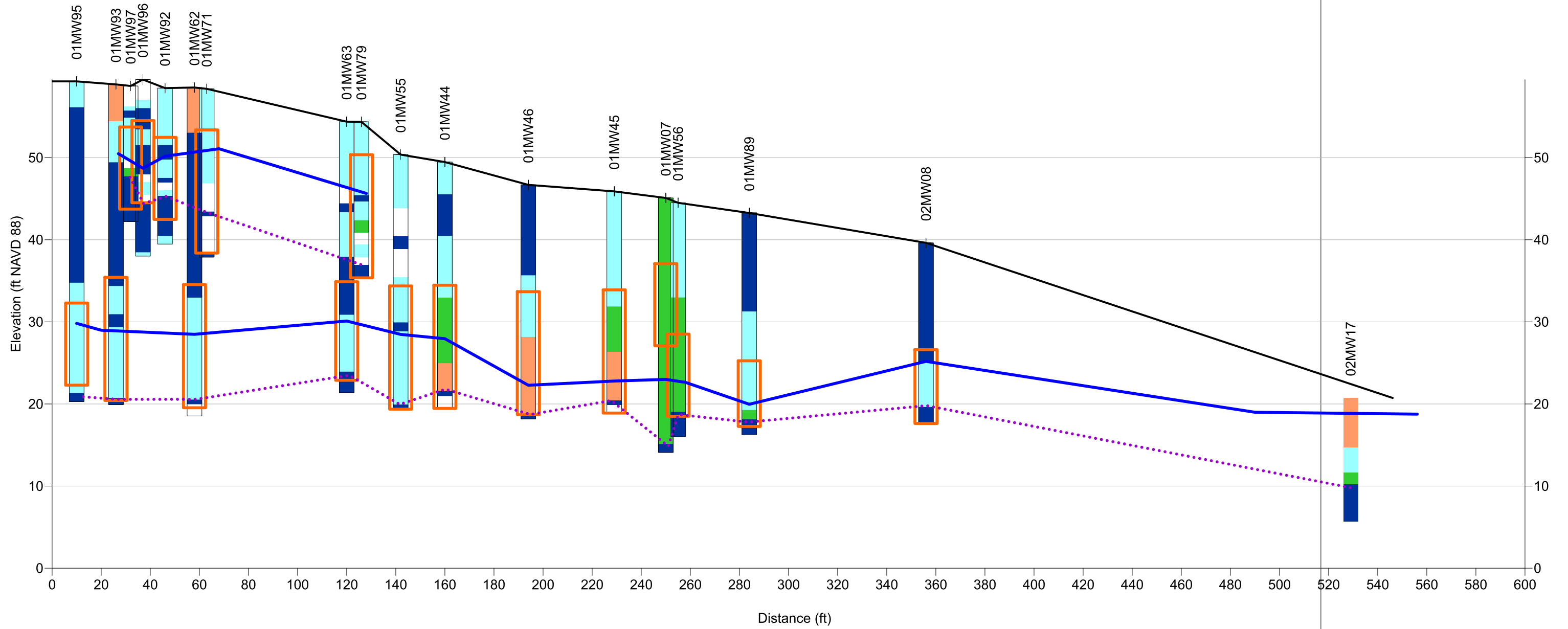
Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 2.9**



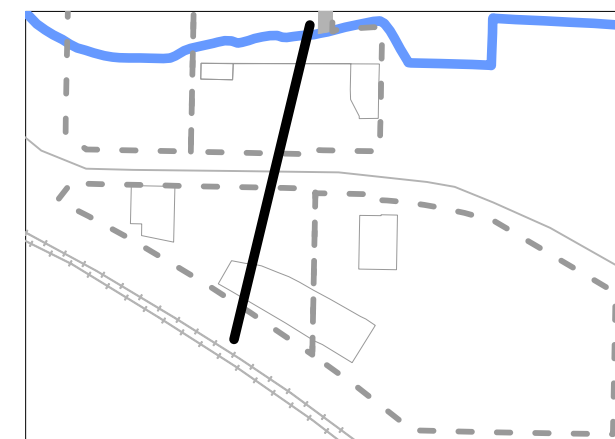
SOUTH

NORTH



**LEGEND**

- Silt/Clay
- Silty fine sand to sandy silt
- Fine to medium sand
- Medium to coarse sand
- WBZ Water Table
- WBZ bottom surface
- Monitoring well screen



Cross-Section H

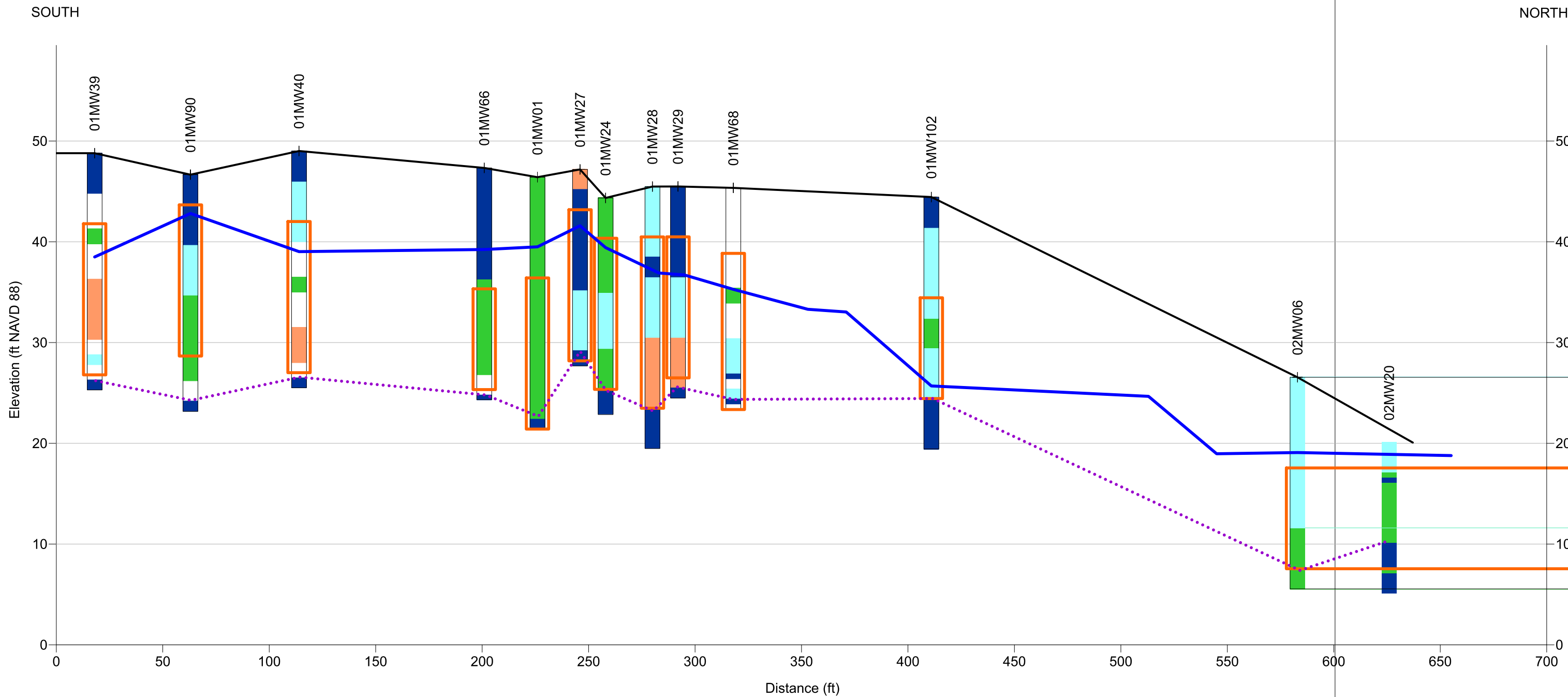
Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 2.10**



**POREWATER SOLUTIONS**

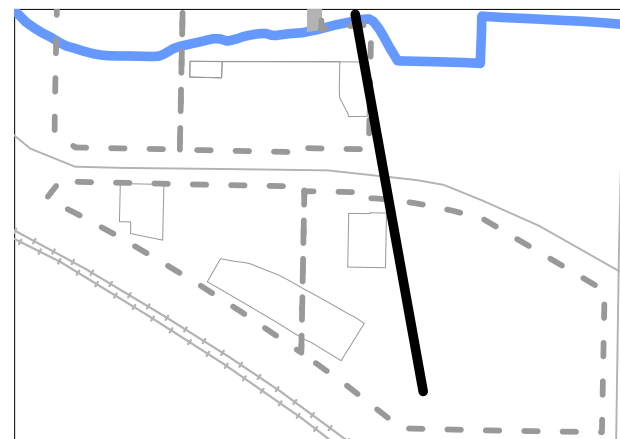
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**LEGEND**

- Silt/Clay
- Silty fine sand to sandy silt
- Fine to medium sand
- Medium to coarse sand

- WBZ Water Table
- WBZ bottom surface
- Monitoring well screen

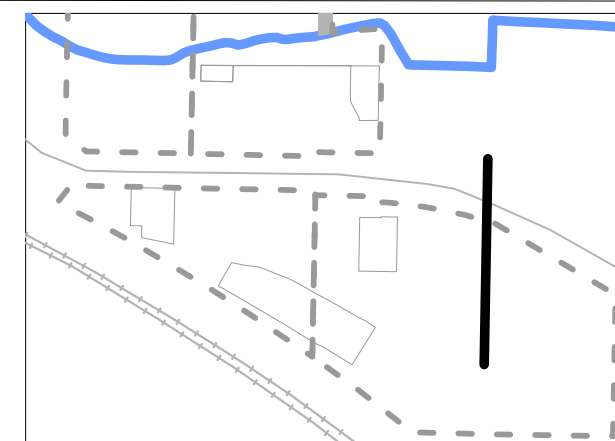
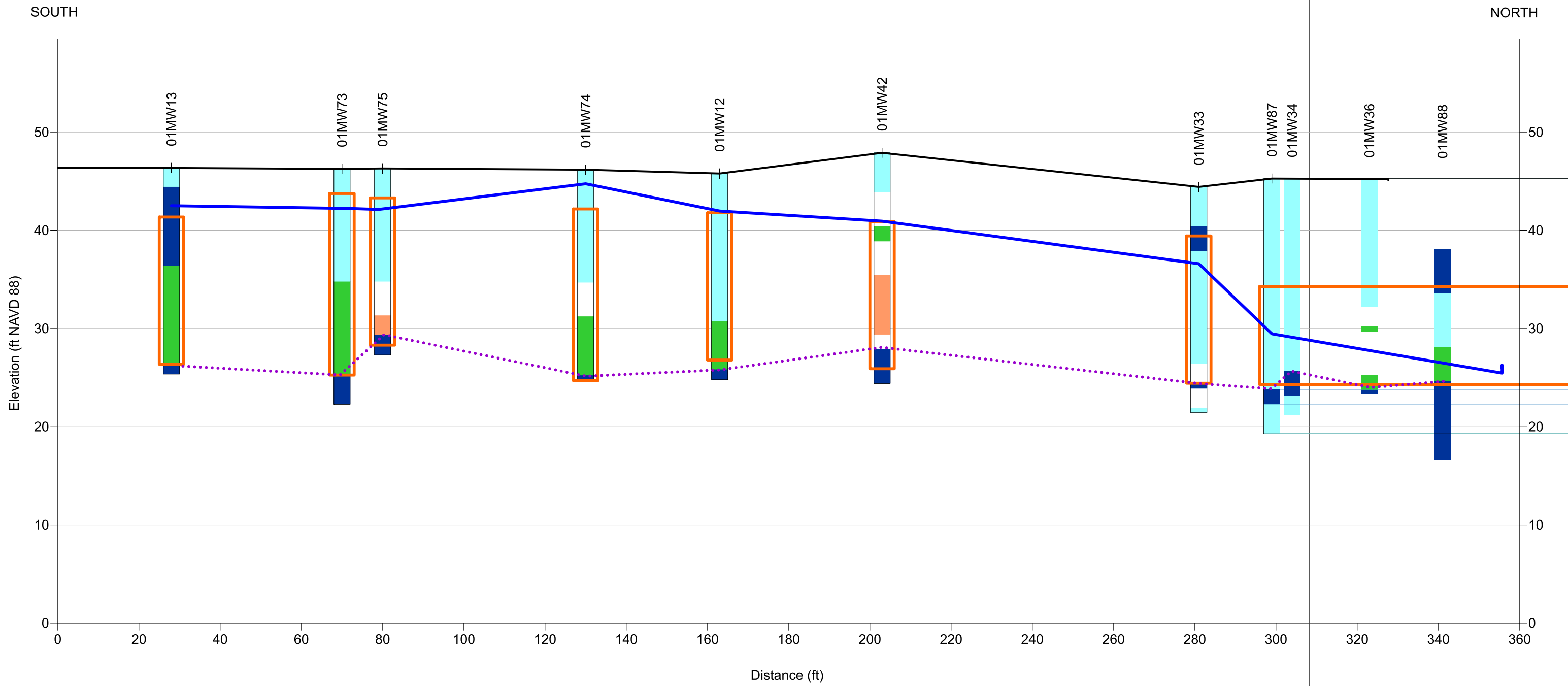


Cross-Section I

Remedial Design Modeling  
 Time Oil Bulk Terminal  
 Seattle, Washington

**Figure 2.11**

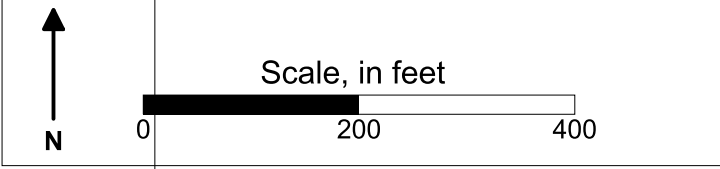
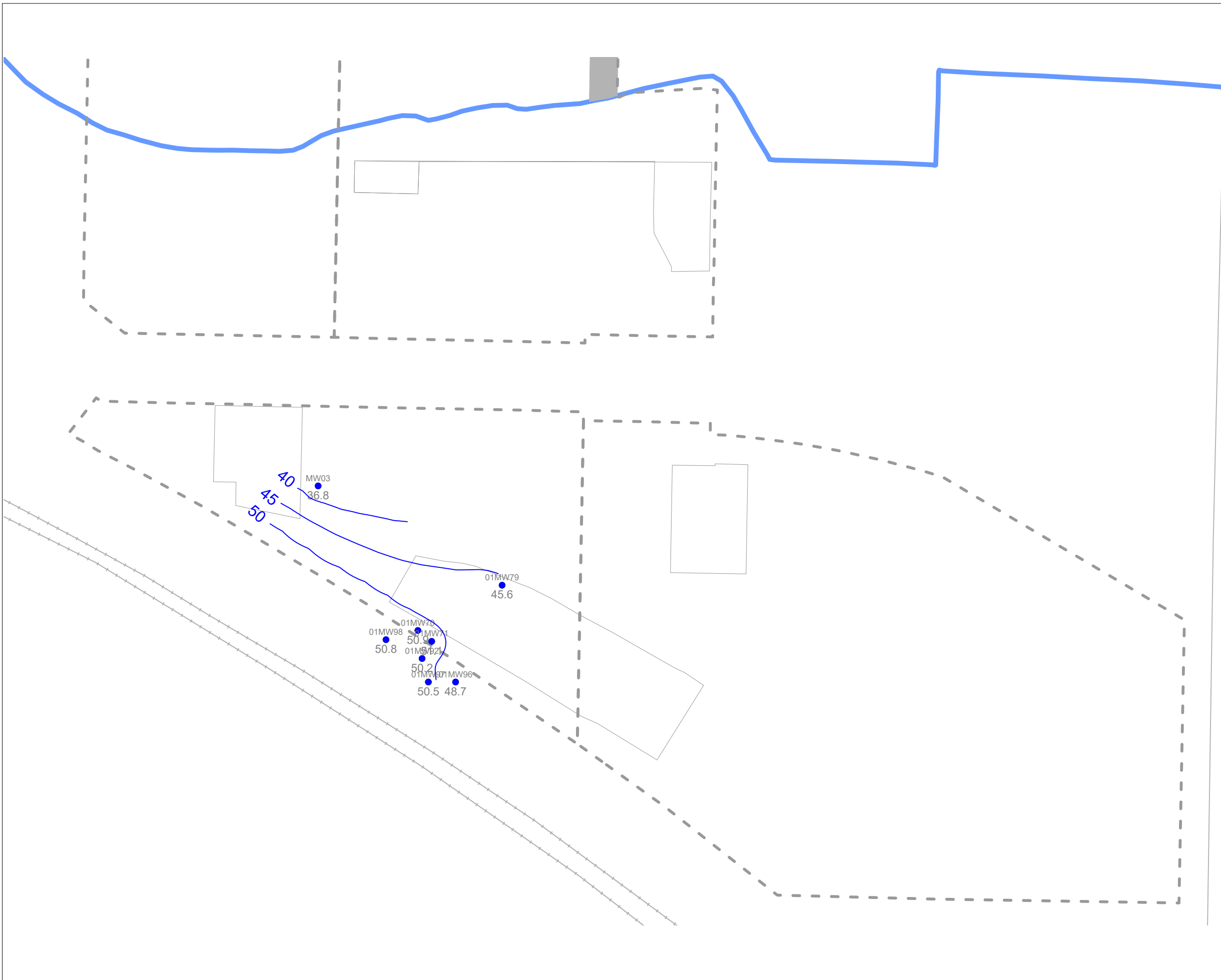




Cross-Section J

Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 2.12**



**LEGEND**

- Monitoring well location
- Ground water elevation contour (ft NAVD 88)
- - - Property boundary

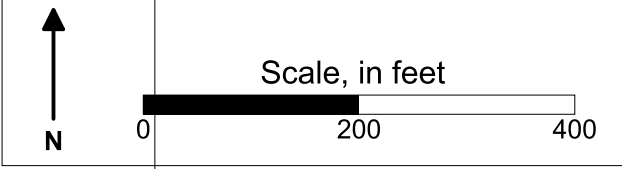
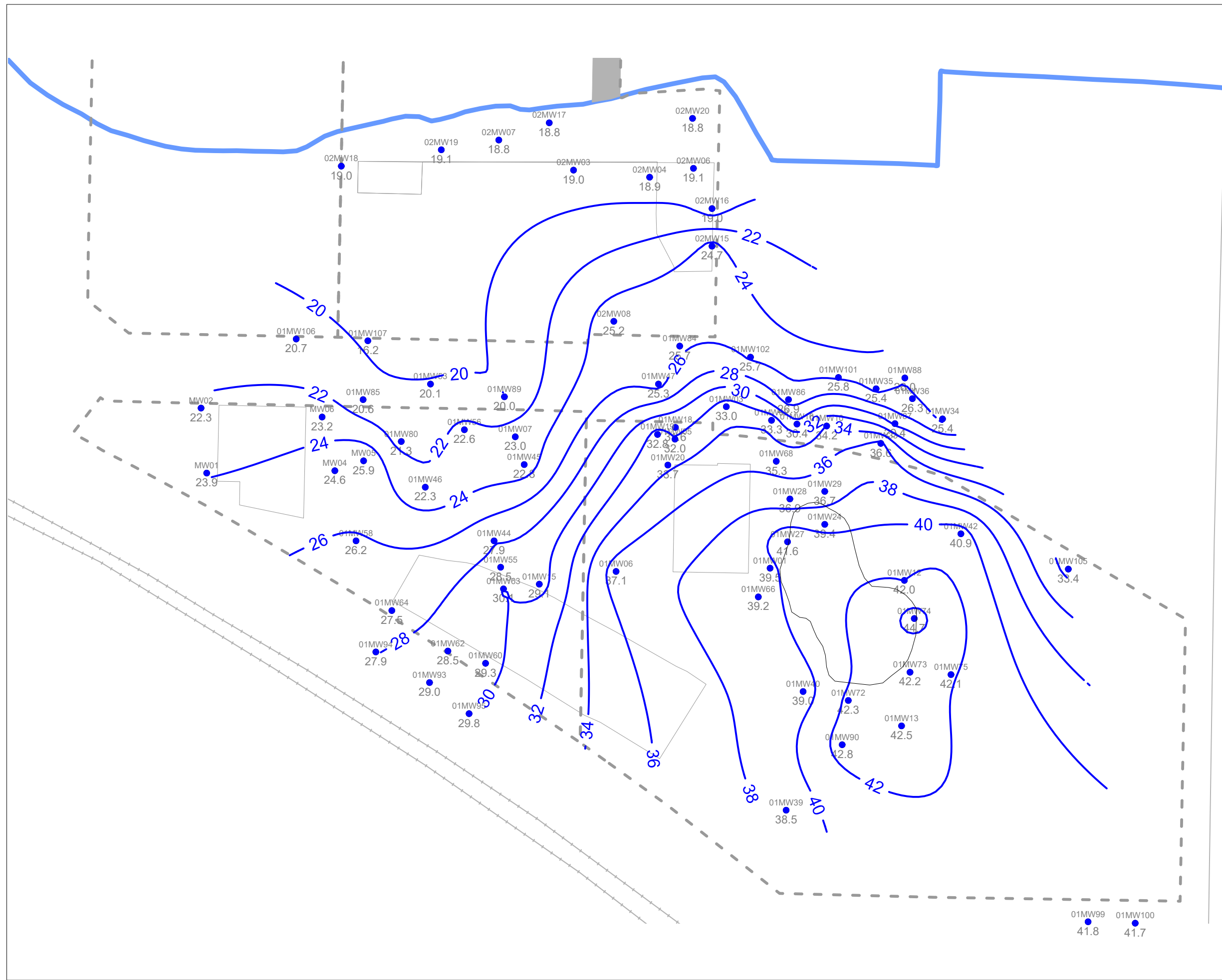
Notes:  
 1. Locations are approximate  
 2. Ground water elevations are based on April-May 2019 monitoring data.  
 3. Groundwater elevation contour interval is 1 ft.

**Ground Water Elevations  
(Perched WBZ)**

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 Time Oil Bulk Terminal  
 Seattle, Washington

**Figure 2.13**





**LEGEND**

- Monitoring well location
- Ground water elevation contour (ft NAVD 88)
- - - Property boundary

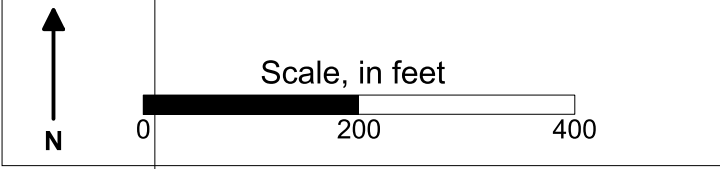
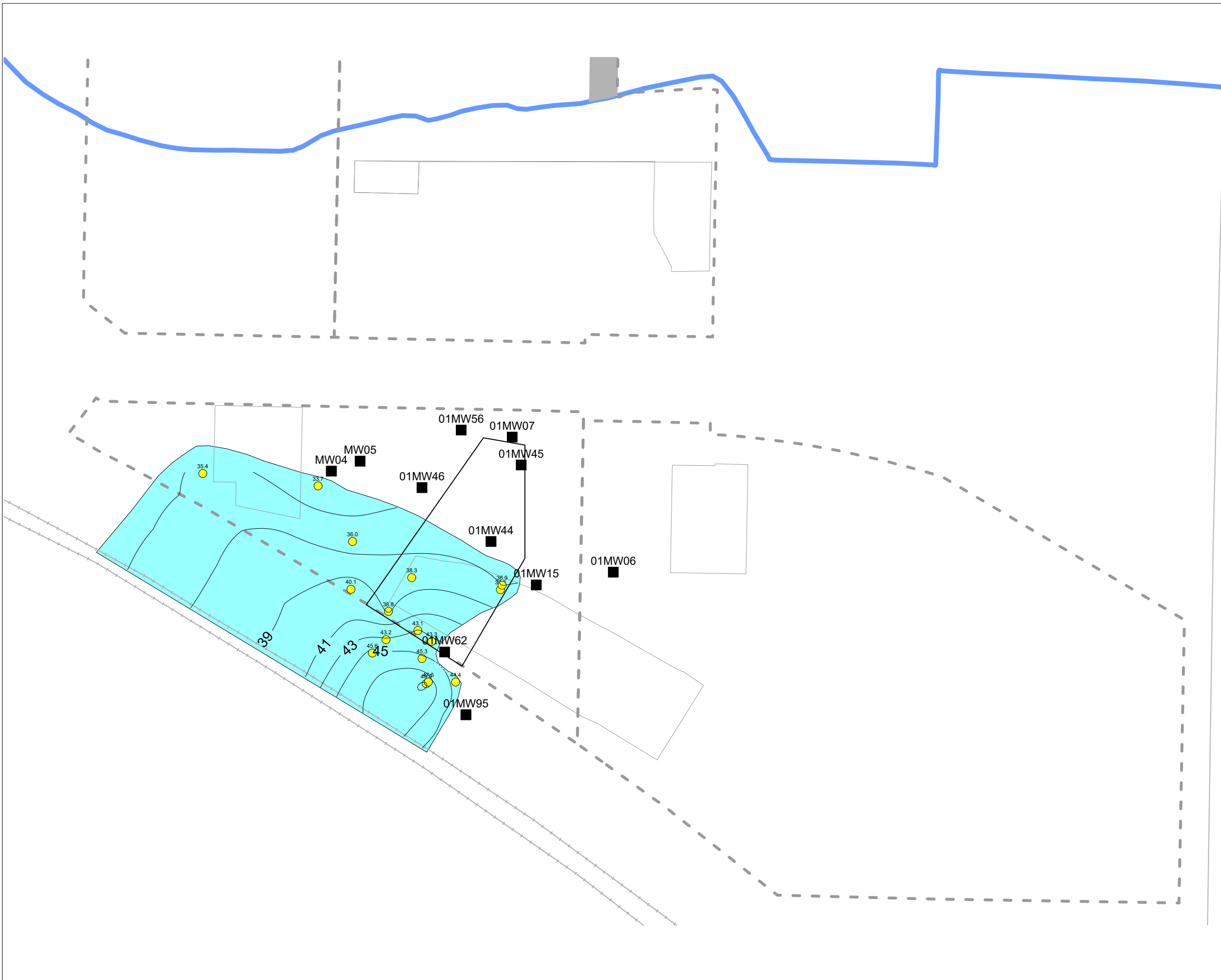
- Notes:
1. Locations are approximate
  2. Ground water elevations are based on April-May 2019 monitoring data.
  3. Groundwater elevation contour interval is 2 ft.

**Ground Water Elevations  
(Shallow WBZ)**





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**Figure 2.14**

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**LEGEND**

	Location where Perched WBZ is absent
	Bottom surface elevation contour (ft NAVD 88)
	Property boundary
	Perched WBZ

Notes:  
 1. Locations are approximate  
 2. Perched WBZ upgradient extent is uncertain

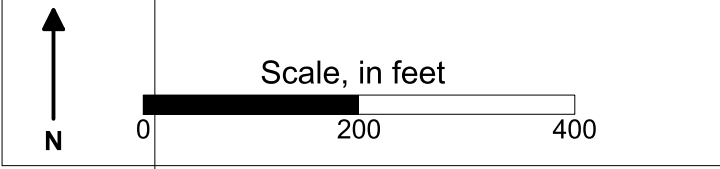
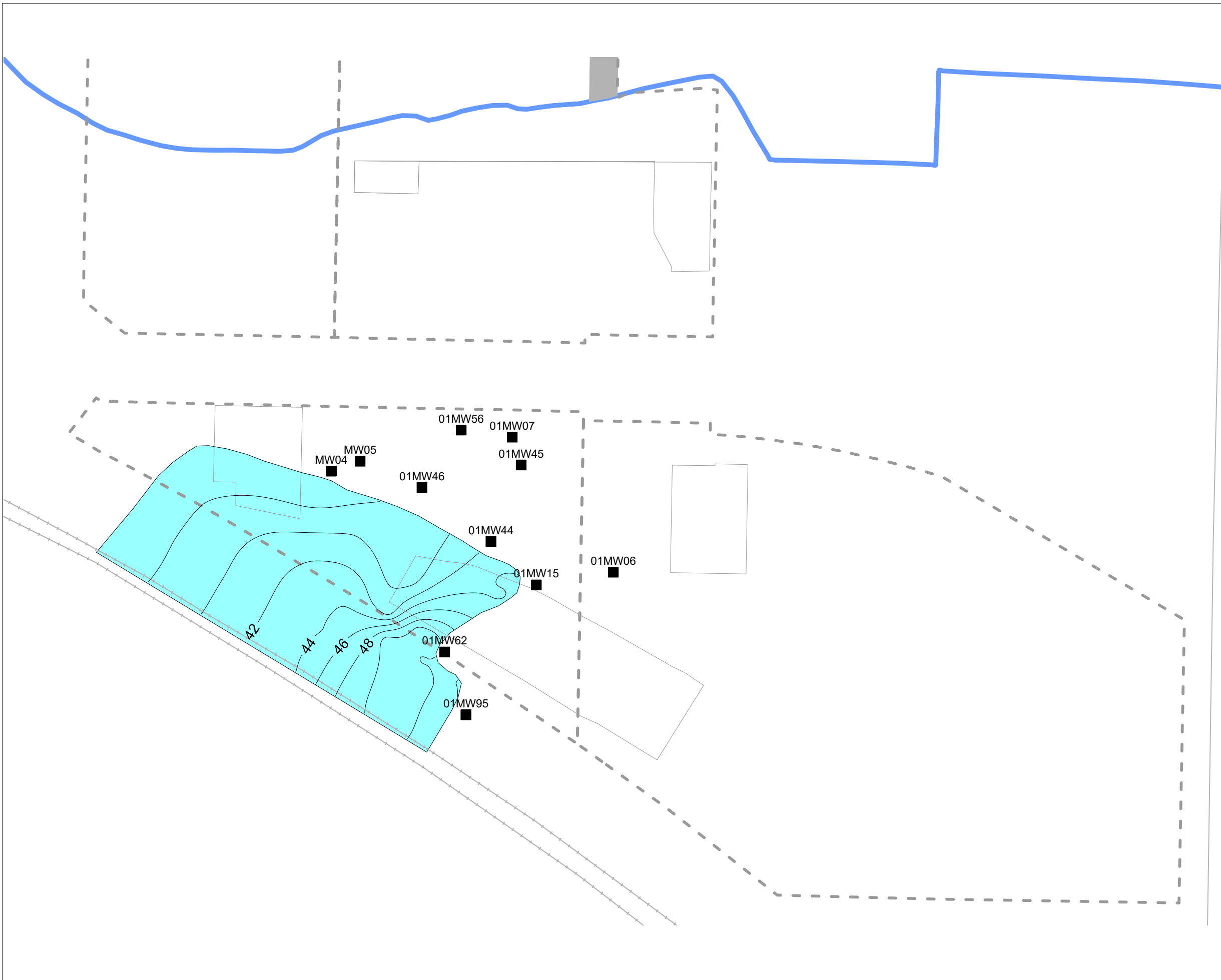
**Bottom Surface Elevations  
(Perched WBZ)**

Remedial Design Modeling  
 Time Oil Bulk Terminal  
 Seattle, Washington

**Figure 2.15**







**LEGEND**

	Location where Perched WBZ is absent
	Top surface elevation contour (ft NAVD 88)
	Property boundary
	Perched WBZ

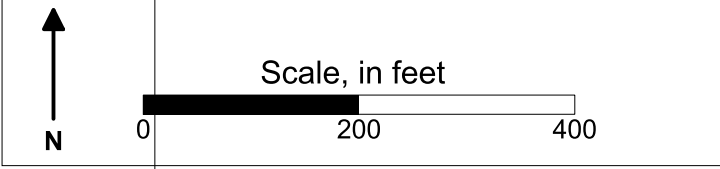
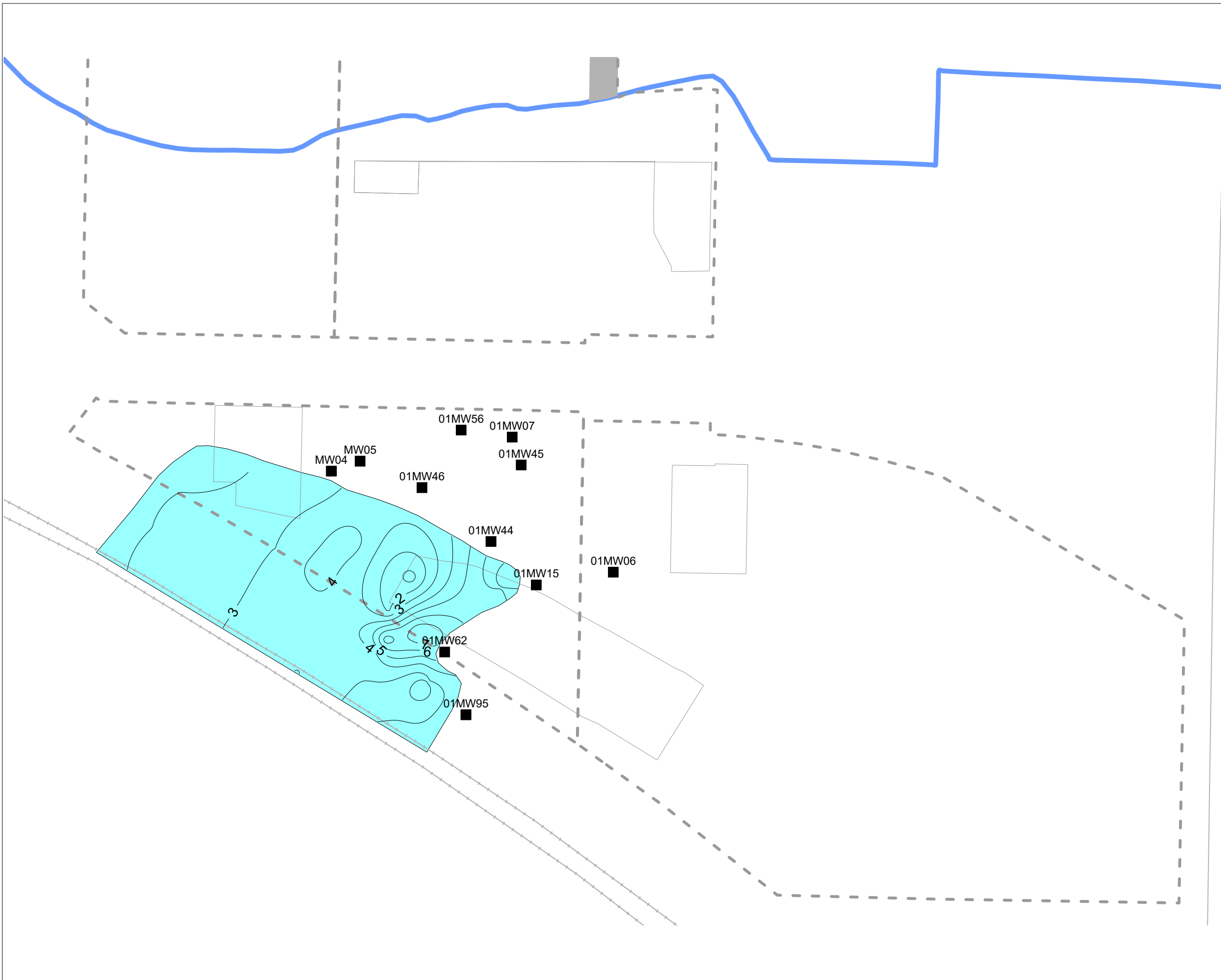
Notes:  
 1. Locations are approximate  
 2. Perched WBZ upgradient extent is uncertain  
 3. Top elevations represent the deeper of the upper silt/clay confining layer, or the Perched WBZ groundwater elevation

Top Surface Elevations  
(Perched WBZ)




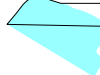
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 Seattle, Washington

**Figure 2.16**





**LEGEND**

	Location where Perched WBZ is absent
	Saturated thickness contour (ft)
	Property boundary
	Perched WBZ

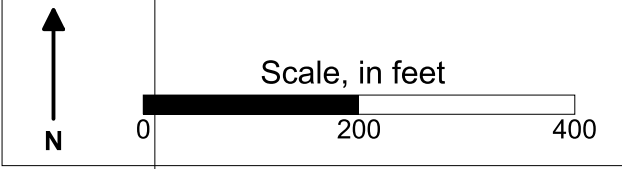
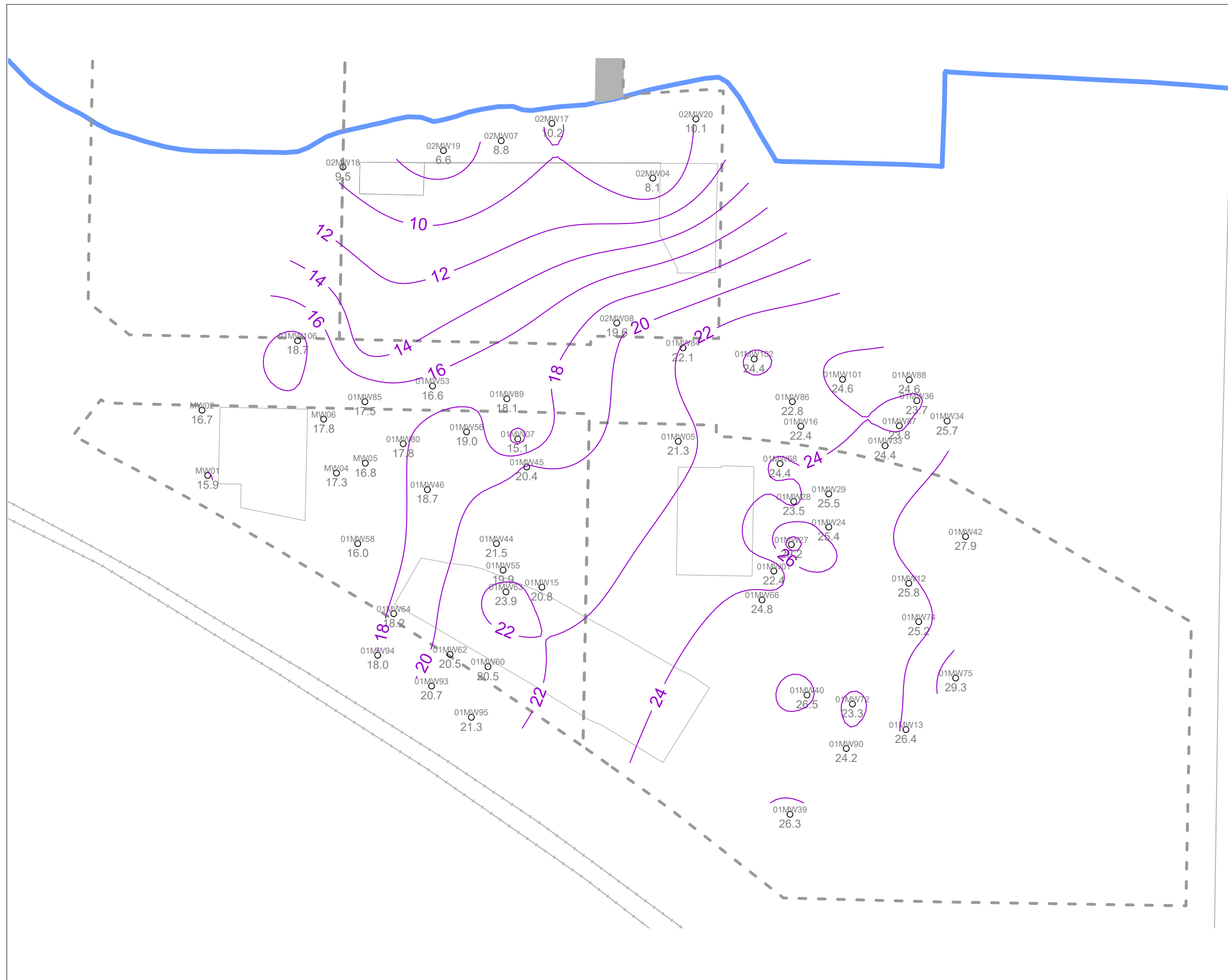
Notes:  
 1. Locations are approximate  
 2. Perched WBZ upgradient extent is uncertain

Saturated Thickness  
(Perched WBZ)

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**Figure 2.17**





**LEGEND**

	Monitoring well location
	Shallow WBZ bottom elevation contour (ft NAVD 88)
	Property boundary

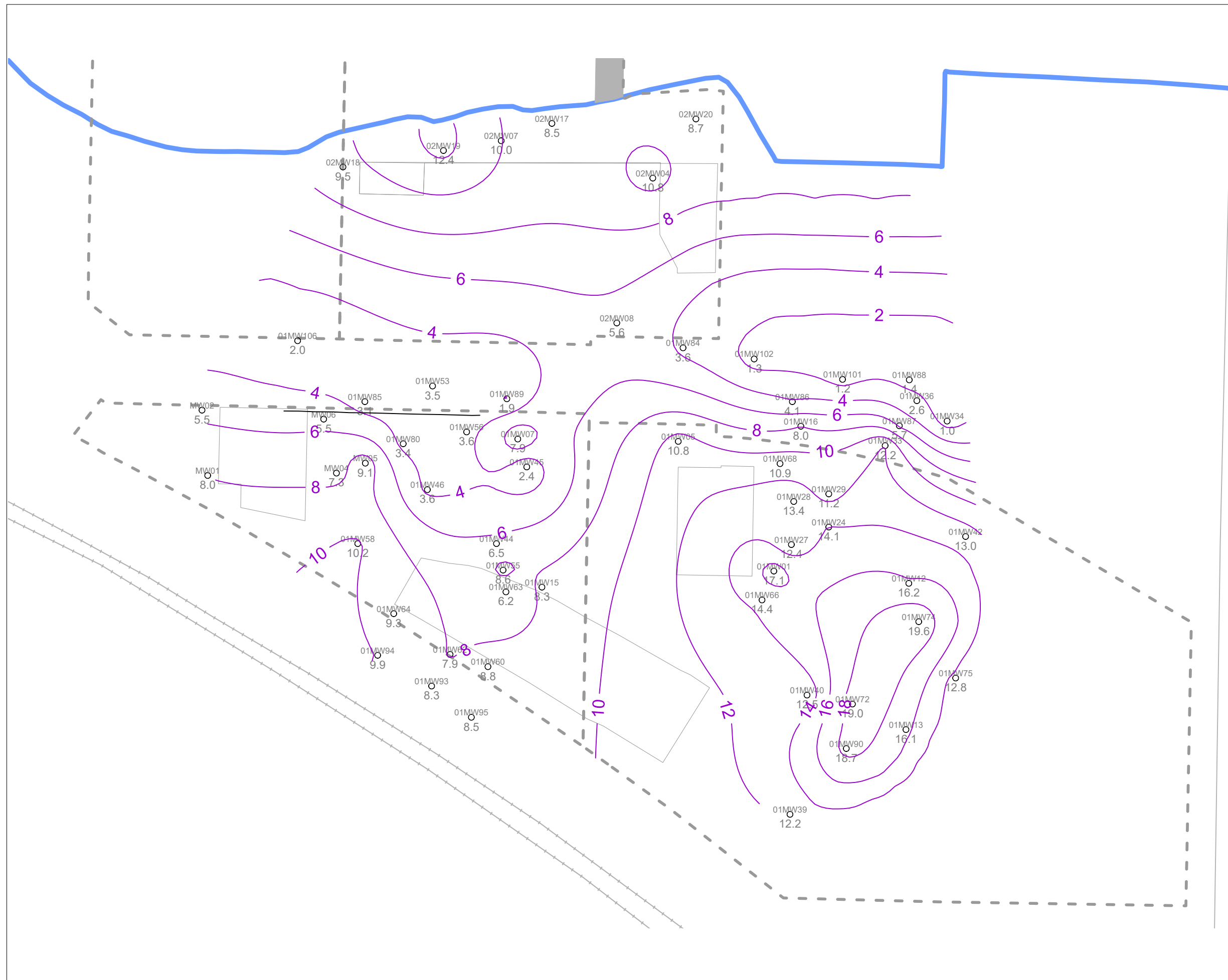
Notes:  
 1. Locations are approximate  
 2. Bottom elevation contour interval is 2 ft.

**Bottom Surface Elevations  
(Shallow WBZ)**

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 Time Oil Bulk Terminal  
 Seattle, Washington

**Figure 2.18**



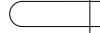
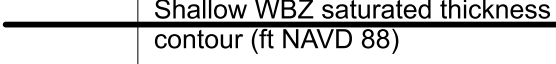



Scale, in feet

0 200 400

N

**LEGEND**

-  Monitoring well location
-  Shallow WBZ saturated thickness contour (ft NAVD 88)
-  Property boundary

Notes:  
 1. Locations are approximate  
 2. Bottom elevation contour interval is 2 ft.

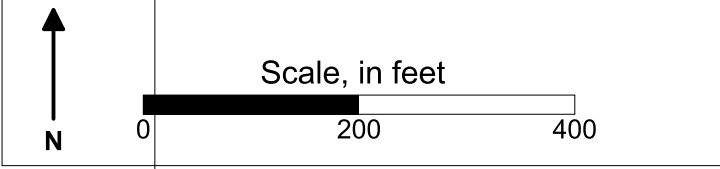
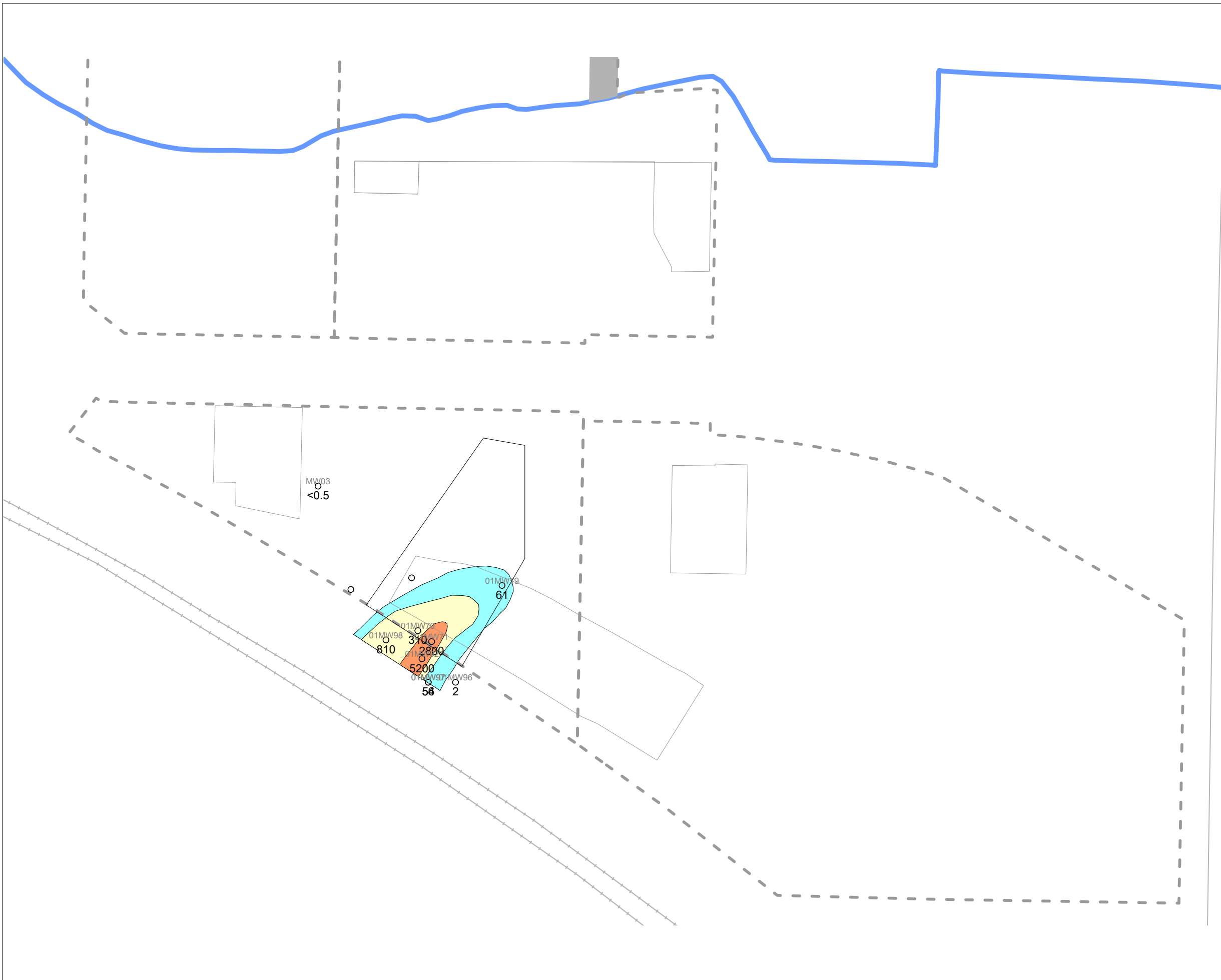
Saturated Thickness  
(Shallow WBZ)

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**Figure 2.19**



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**LEGEND**

	Monitoring well location
	Shallow WBZ saturated thickness contour (ft NAVD 88)
	Property boundary
	TCE 5 to 100 ug/L
	TCE 100 to 1,000 ug/L
	TCE > 1,000 ug/L

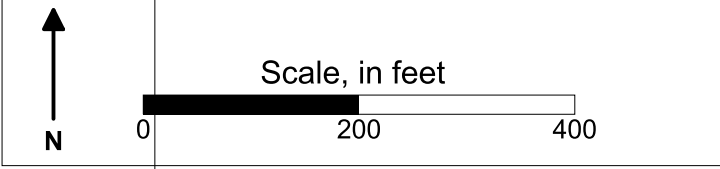
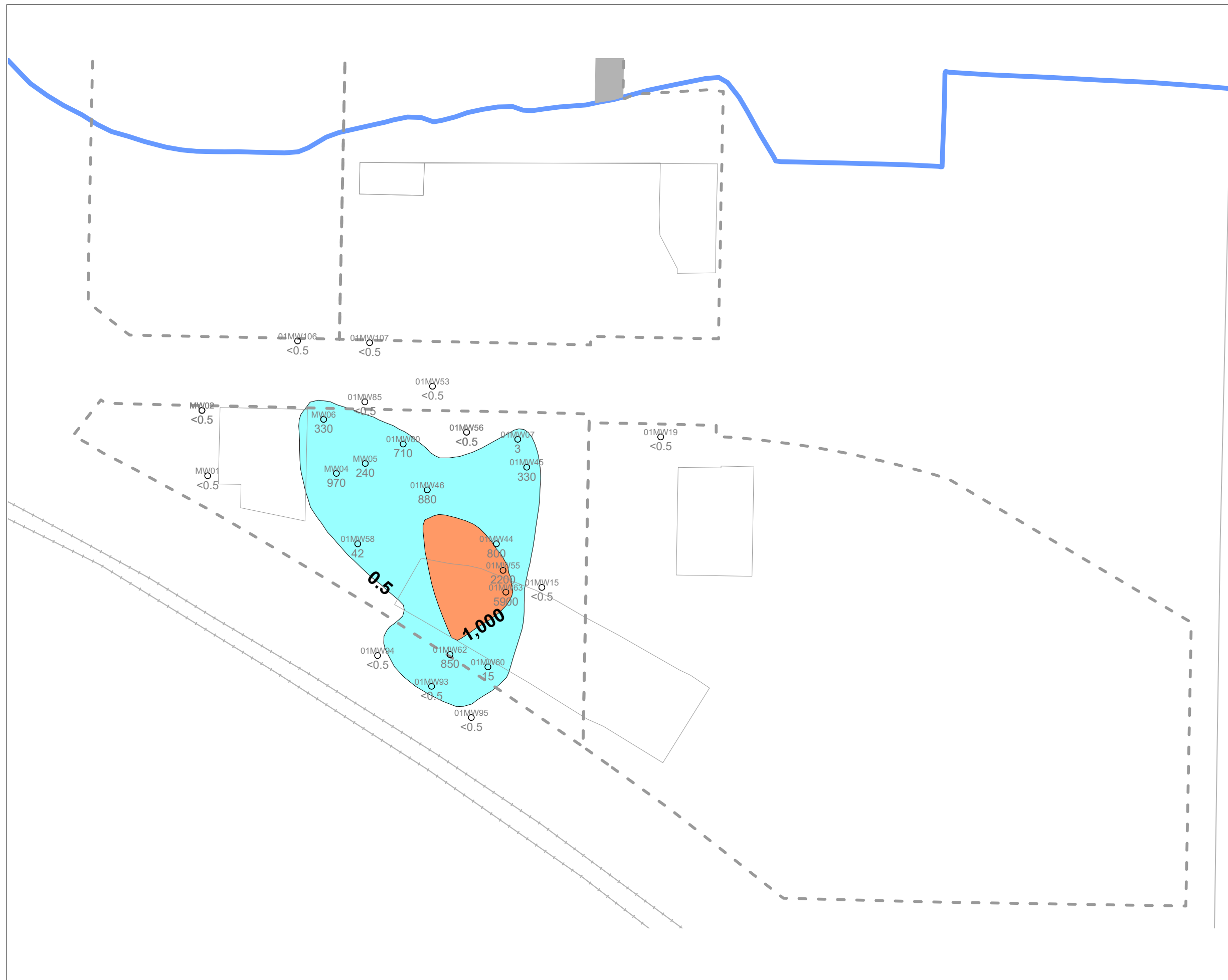
Notes:  
 1. Locations are approximate  
 2. TCE concentrations based on sampling conducted from April 30 to May 14, 2019.  
 3. TCE concentrations in ug/L.

TCE Plume (Perched WBZ)

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 Time Oil Bulk Terminal  
 Seattle, Washington

**Figure 2.20**





**LEGEND**

	Monitoring well location
	Shallow WBZ saturated thickness contour (ft NAVD 88)
	Property boundary
	TCE 0.5 to 1,000 ug/L
	TCE > 1,000 ug/L

Notes:

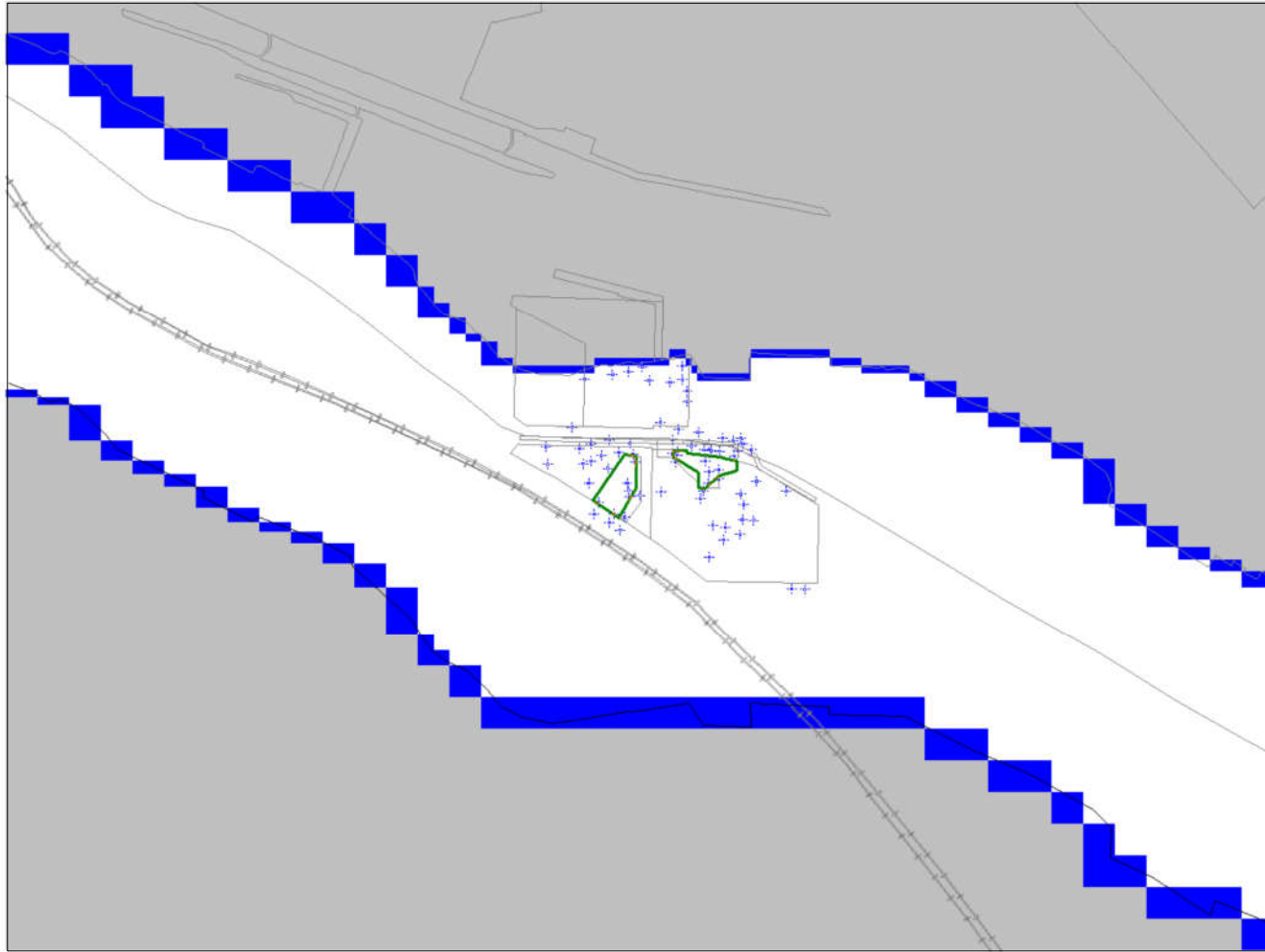
1. Locations are approximate
2. TCE concentrations based on sampling conducted from April 30 to May 14, 2019.
3. TCE concentrations in ug/L.
4. The 0.5 ug/L contour is based on Floyd Snider's figure.

TCE Plume (Shallow WBZ)




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**Figure 2.21**





**LEGEND**

-  Constant Head boundary
-  No-flow boundary
-  Proposed ISS zone boundary

Shallow WBZ Model Domain

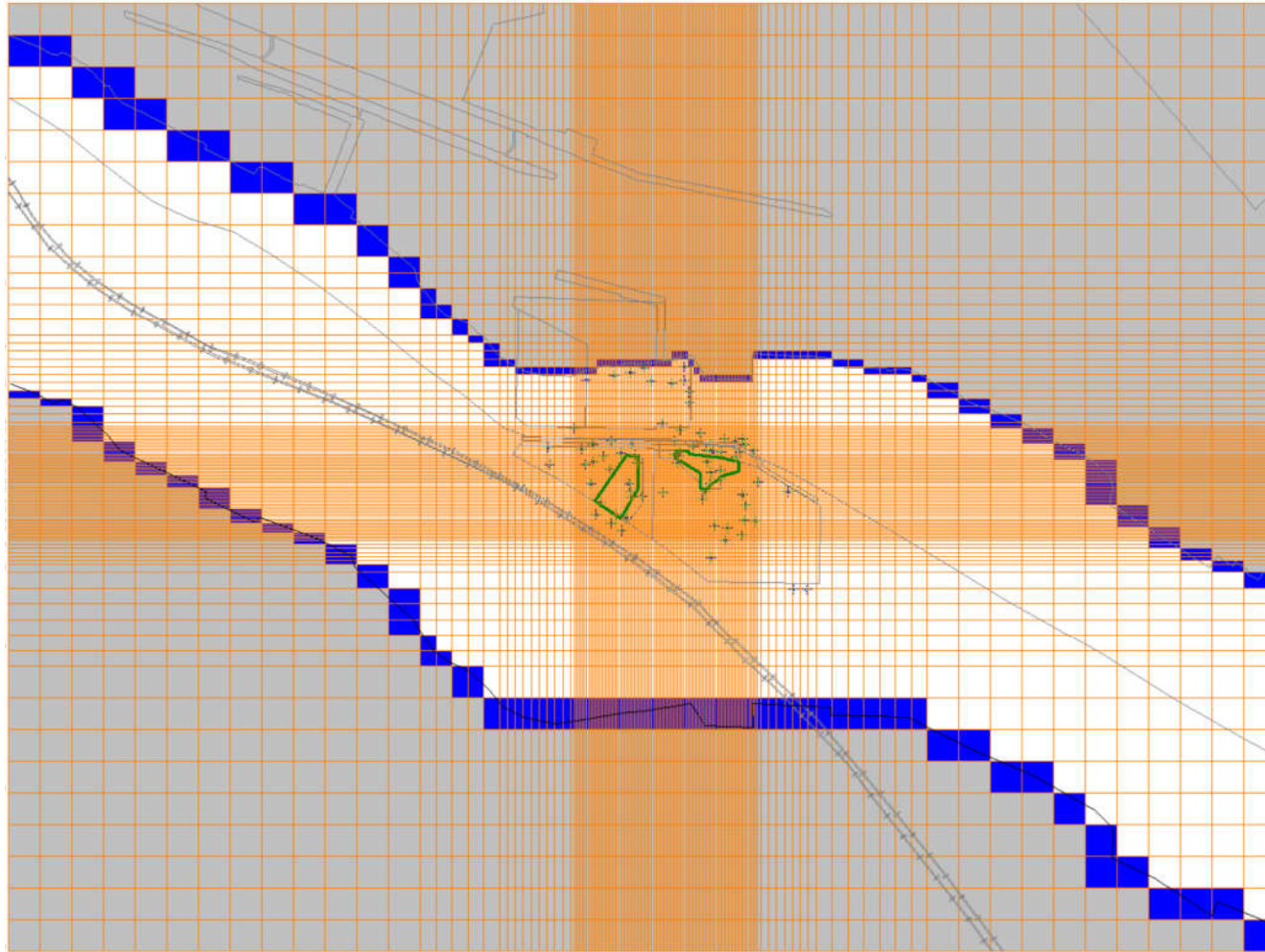
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**Figure 3.1**






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**LEGEND**

-  Constant Head boundary
-  No-flow boundary
-  Proposed ISS zone boundary

Shallow WBZ Model Grid

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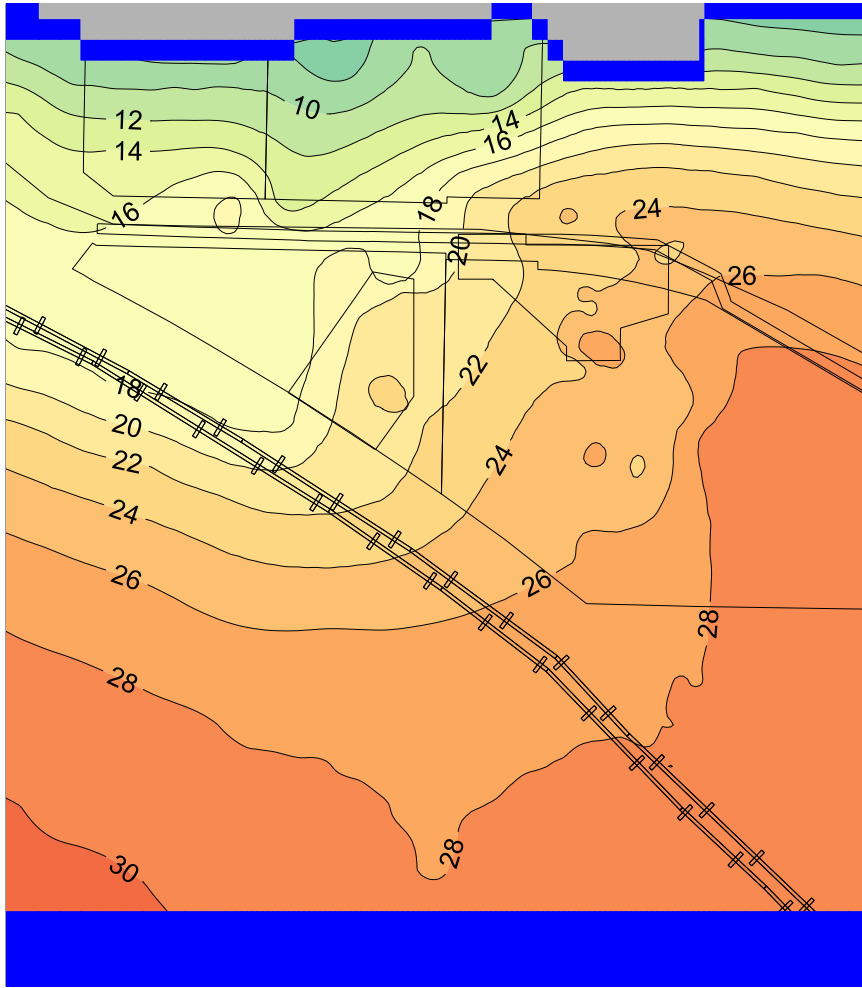
**Figure 3.2**



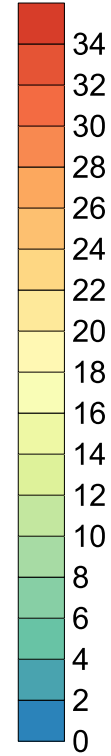
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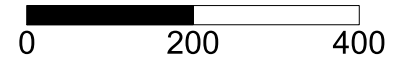







### Bottom Elevation (ft NAVD88)



Scale, in feet



#### LEGEND

-  Constant Head boundary
-  No-flow boundary
-  Proposed ISS zone boundary

Shallow WBZ Model  
Bottom Elevations

Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 3.3**

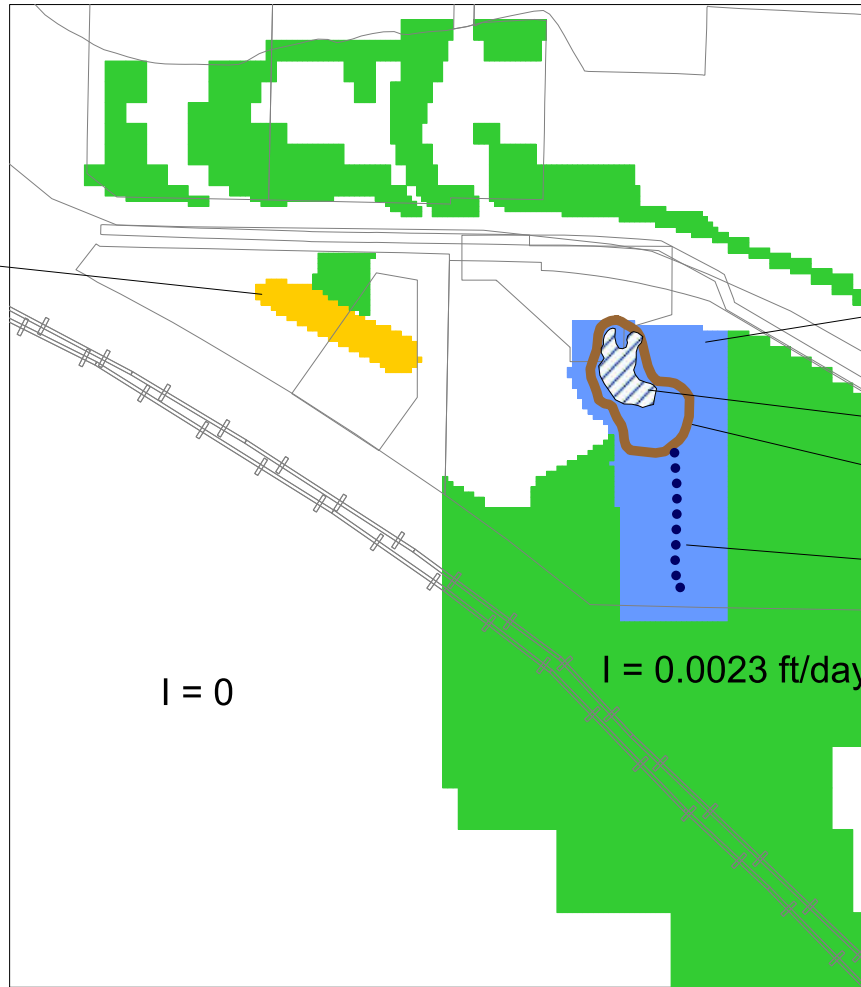


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$I = 0.011$  ft/day



$I = 0.014$  ft/day

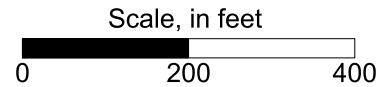
Pond (Summer 2020)

Excavation area (2012)


Leaking pipe (discovered in spring 2021)

$I = 0$

$I = 0.0023$  ft/day



**LEGEND**

 Constant Head boundary

 No-flow boundary

Shallow WBZ Model  
Recharge Zones - Scenario 1

Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 3.4a**

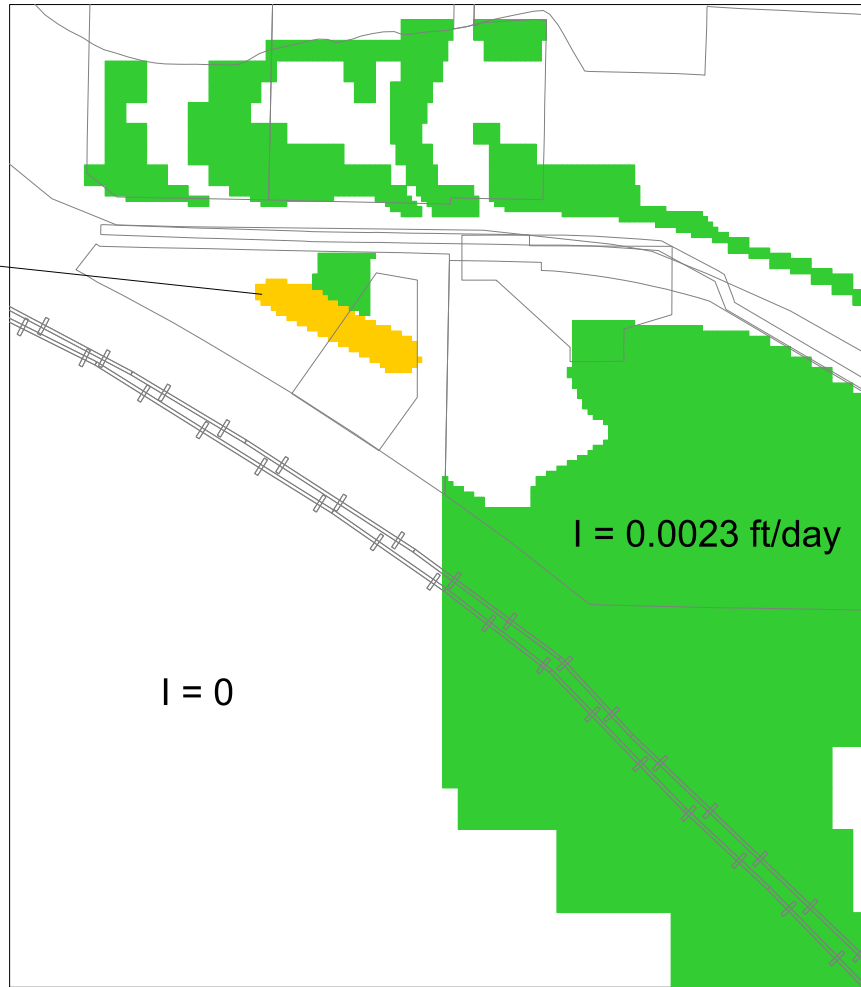


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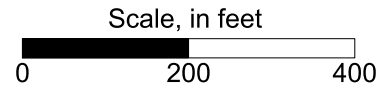


$I = 0.011 \text{ ft/day}$




$I = 0.0023 \text{ ft/day}$

$I = 0$



**LEGEND**

 Constant Head boundary

 No-flow boundary

Shallow WBZ Model  
Recharge Zones - Scenario 2

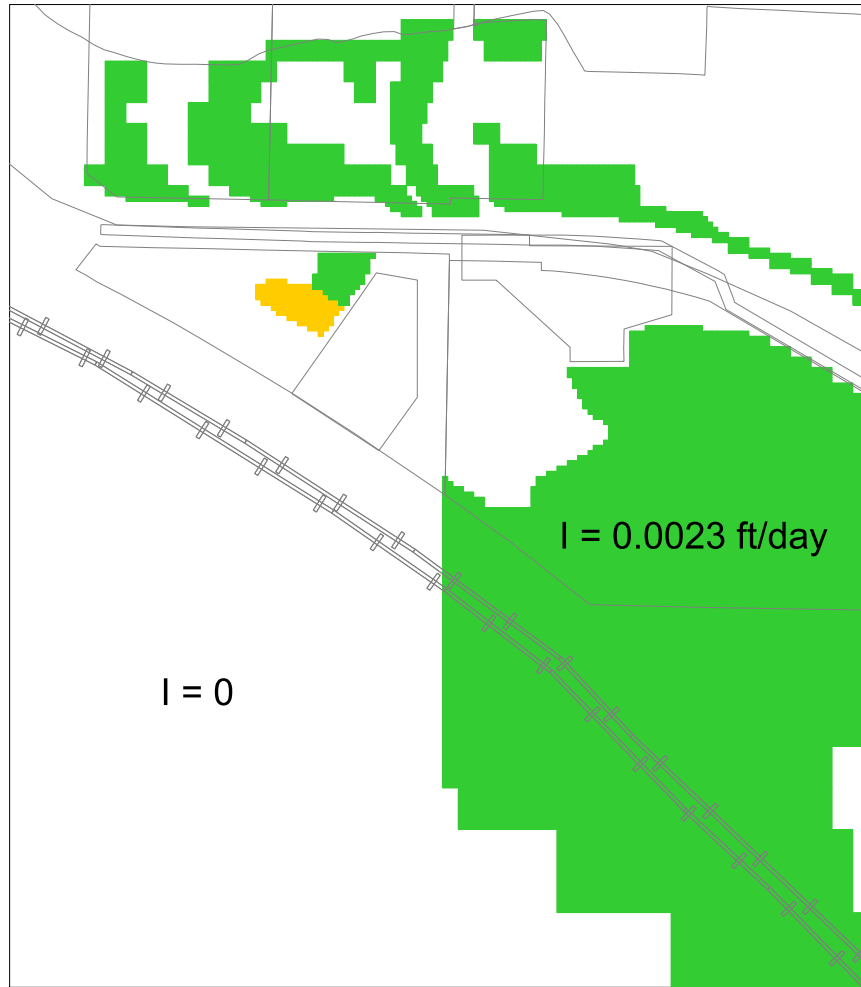
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Seattle, Washington

**Figure 3.4b**




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**LEGEND**

 Constant Head boundary

 No-flow boundary

Scale, in feet  
0 200 400

Shallow WBZ Model  
Recharge Zones - Scenario 3

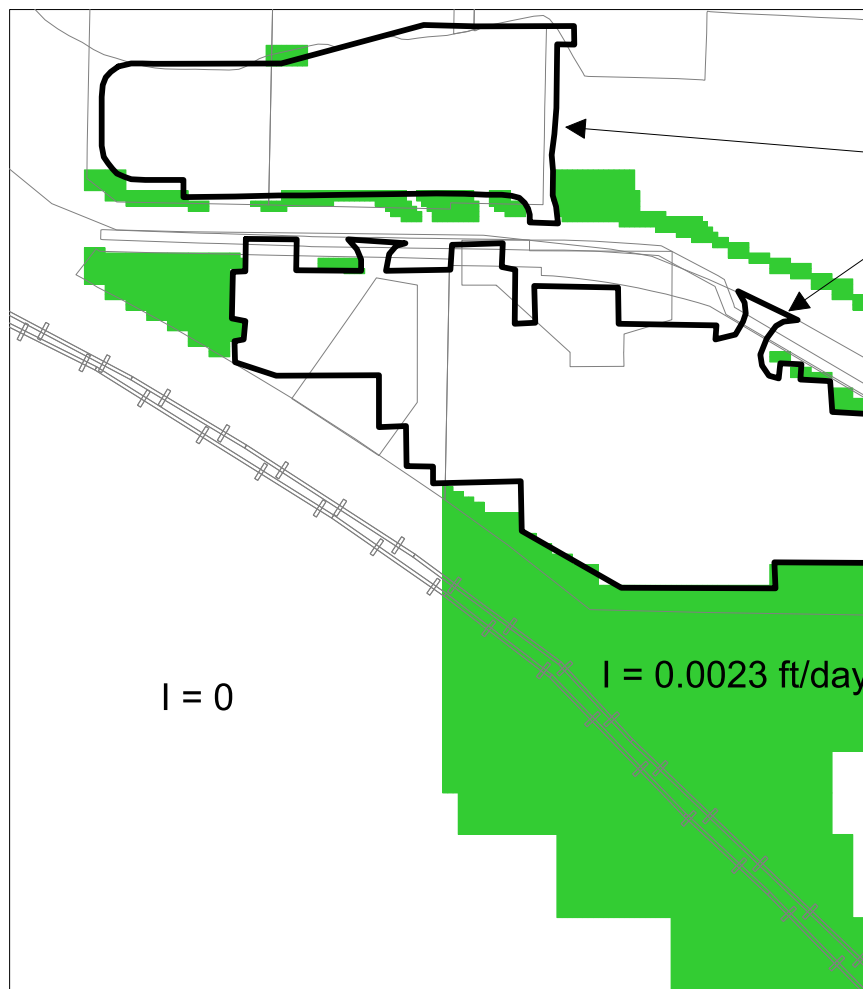
Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 3.4c**

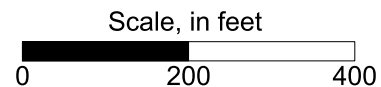


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Post-development covered areas



**LEGEND**

-  Constant Head boundary
-  No-flow boundary

Shallow WBZ Model  
Recharge Zones - Scenarios 4 and 5

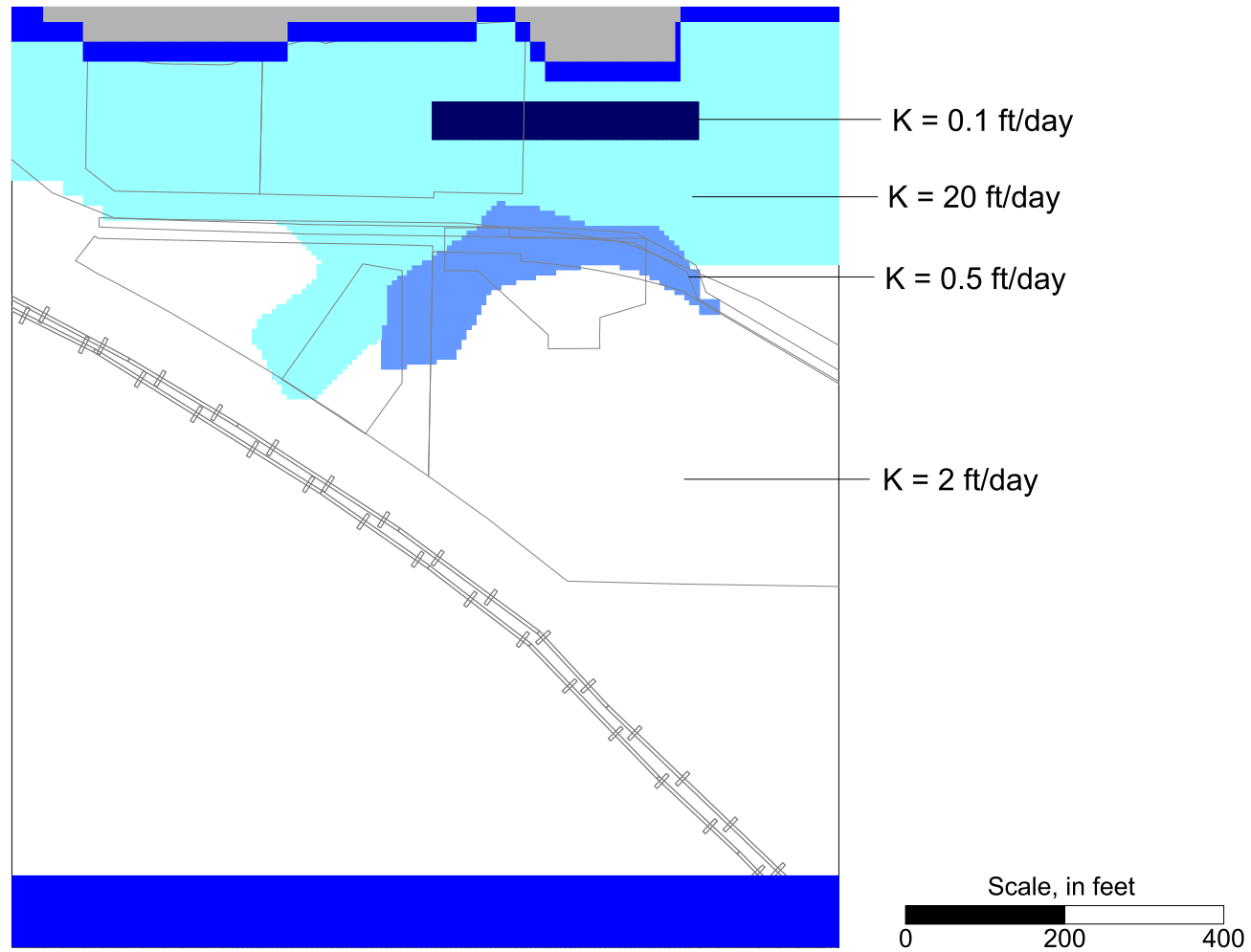
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Time Oil Bulk Terminal  
Seattle, Washington

**Figure 3.4d**





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**LEGEND**

-  Constant Head boundary
-  No-flow boundary

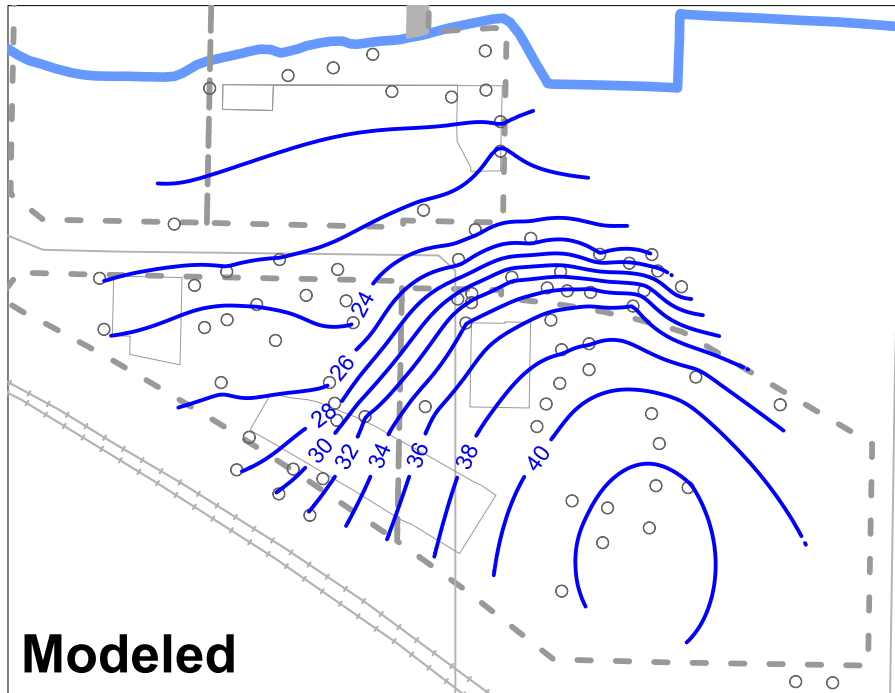
Shallow WBZ Model  
Hydraulic Conductivity (K) Zones

Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

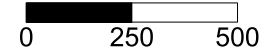
**Figure 3.5**



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Scale, in feet



**LEGEND**

- Monitoring well location
- Ground water elevation contour (ft NAVD 88)
- - - Property boundary

**Notes:**

1. Locations are approximate
2. Modeled groundwater elevation contours were prepared by kriging target well data.

**Shallow WBZ Modeled vs Observed  
Groundwater Elevation Contours**

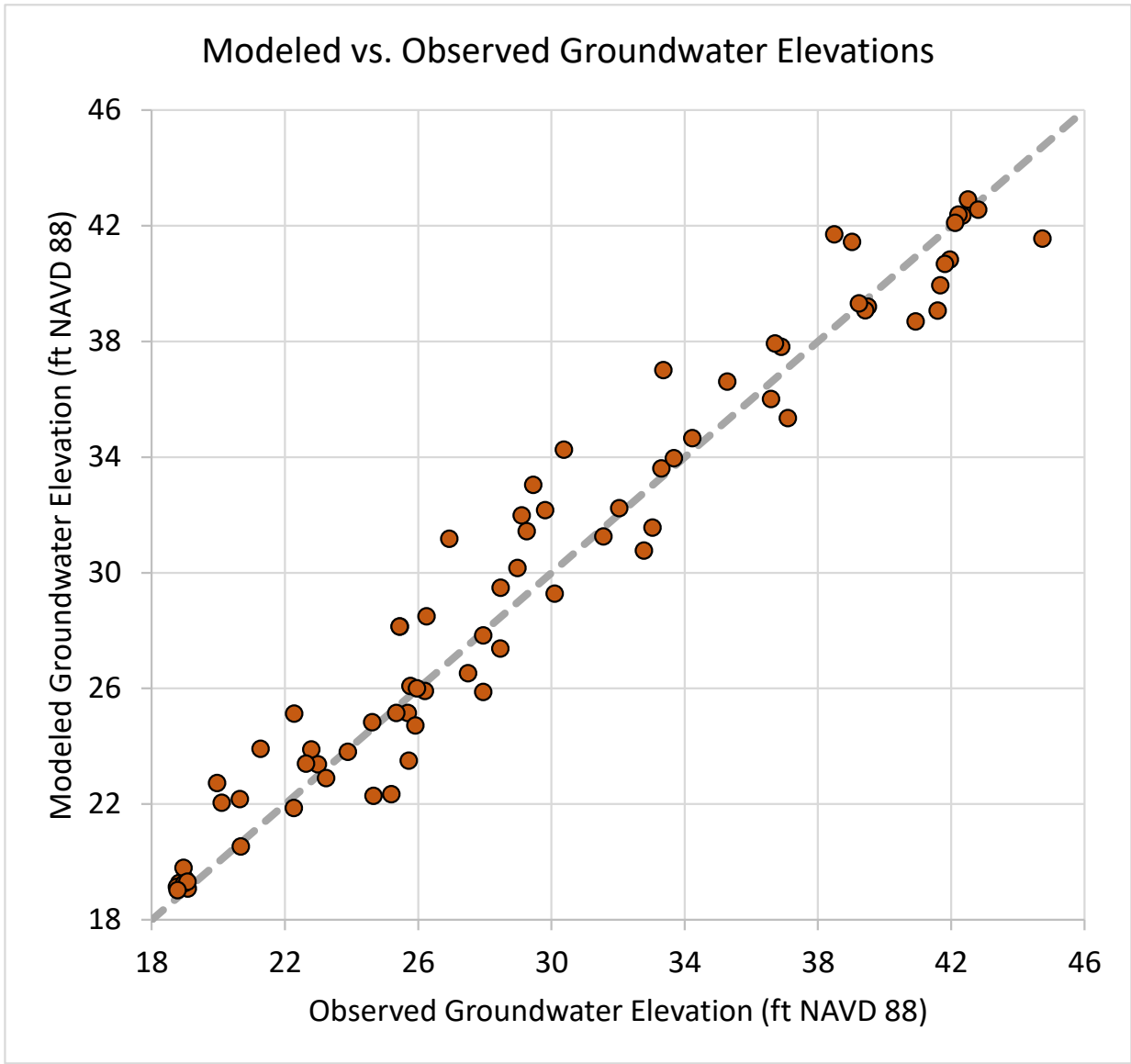
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Time Oil Bulk Terminal  
Seattle, Washington

**Figure 3.6**



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**LEGEND**

- Calibration target monitoring well
- Best-fit line

Shallow WBZ Modeled vs Observed Groundwater Elevation Scatter Plot

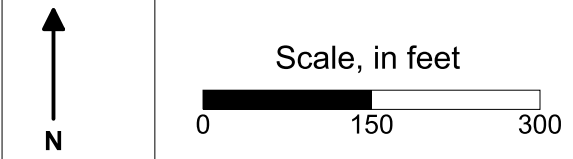
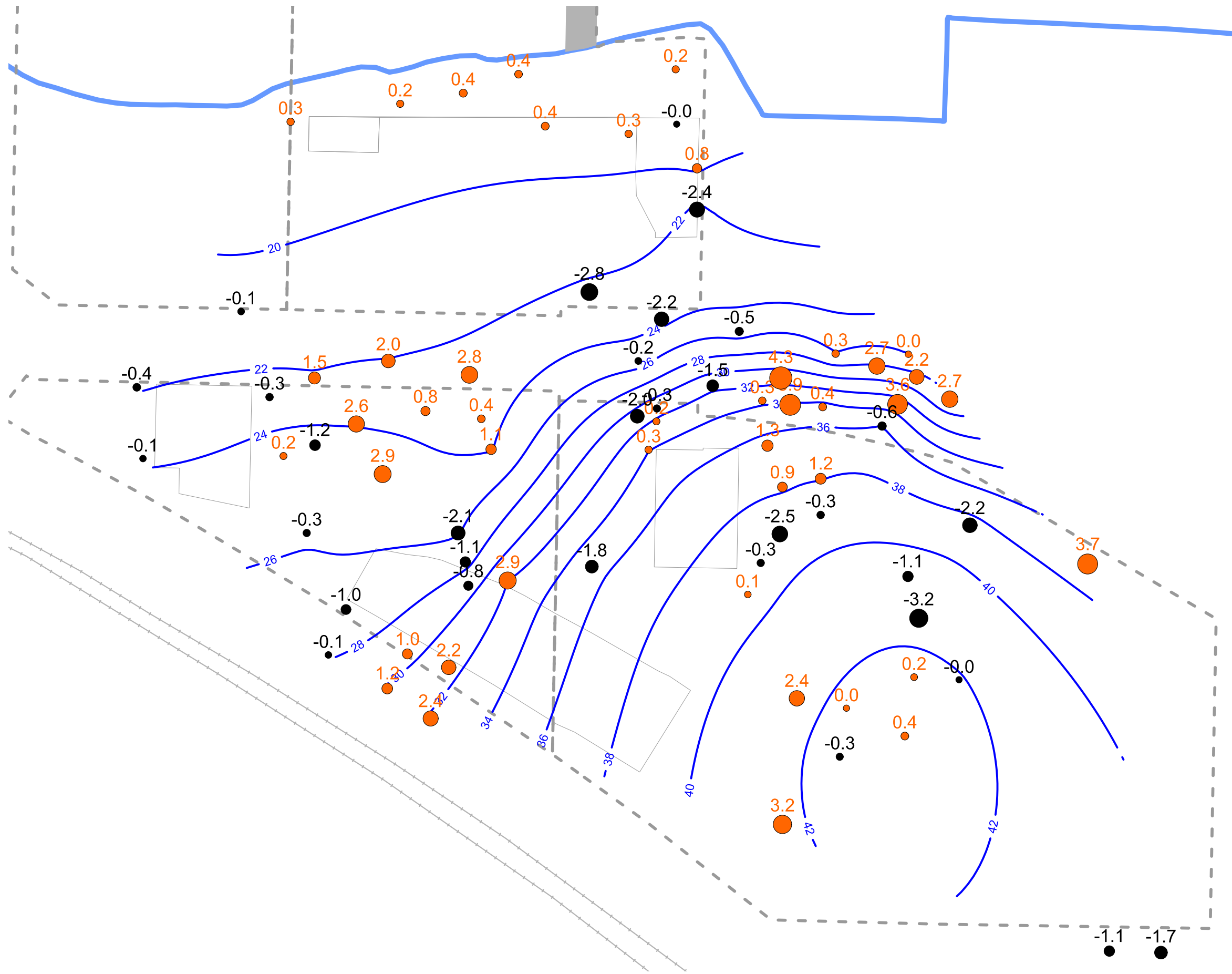
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**Figure 3.7**



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**LEGEND**

- Calibration target residual  $R < 0$
- Calibration target residual  $R > 0$
- Modeled ground water elevation contour (ft NAVD 88)
- - - Property boundary

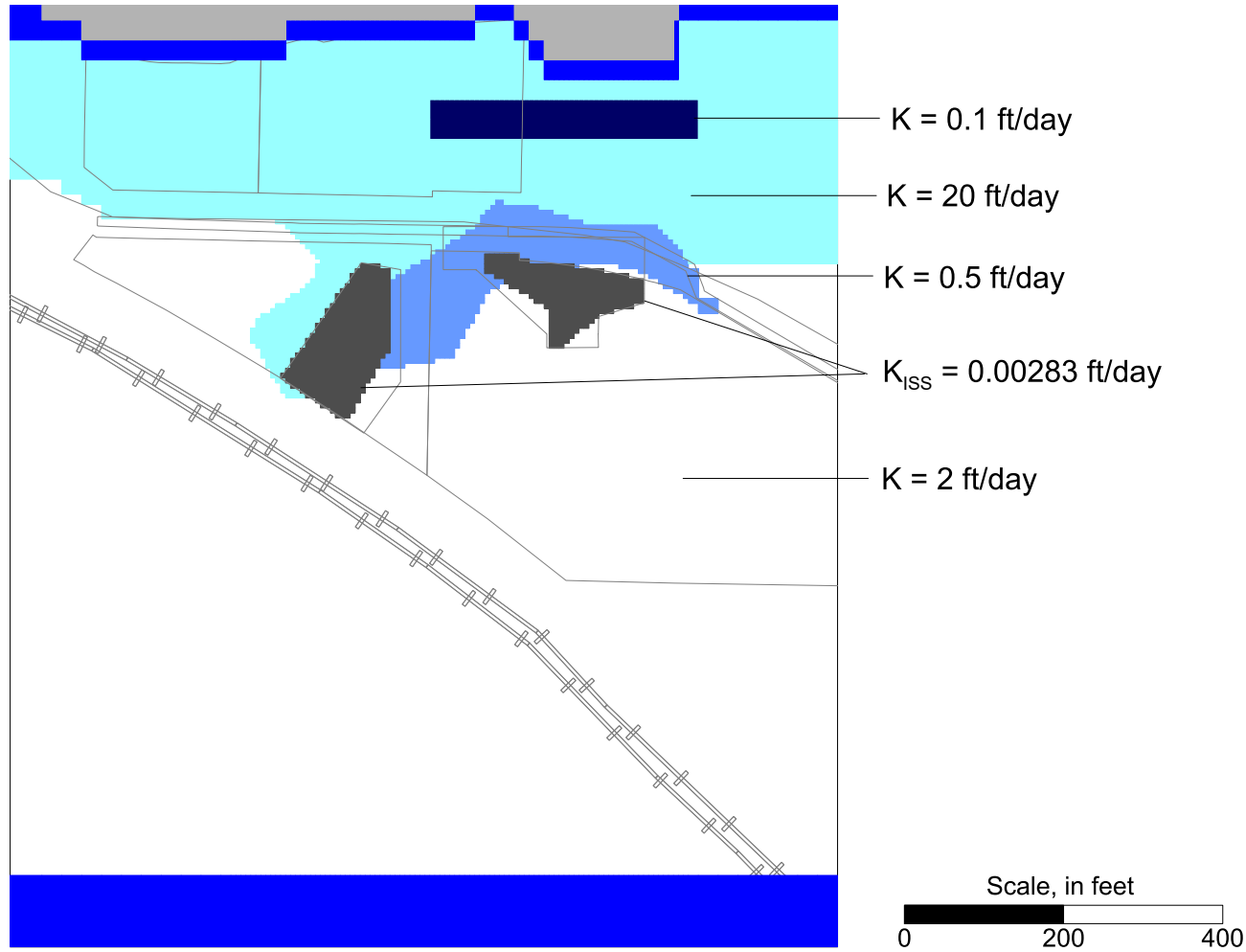
- Notes:
1. Locations are approximate
  2. Calibration target residual (R) calculated using:  
Observed GWE - Modeled GWE
  3. Target symbols are scaled according to the magnitude of the residual.
  4. A negative residual indicates that the model is underestimating GWE.
  5. GWE - groundwater elevation

Shallow WBZ Model  
Calibration Target Residual Bubble Plot



Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 3.8**





**LEGEND**

-  Constant Head boundary
-  No-flow boundary

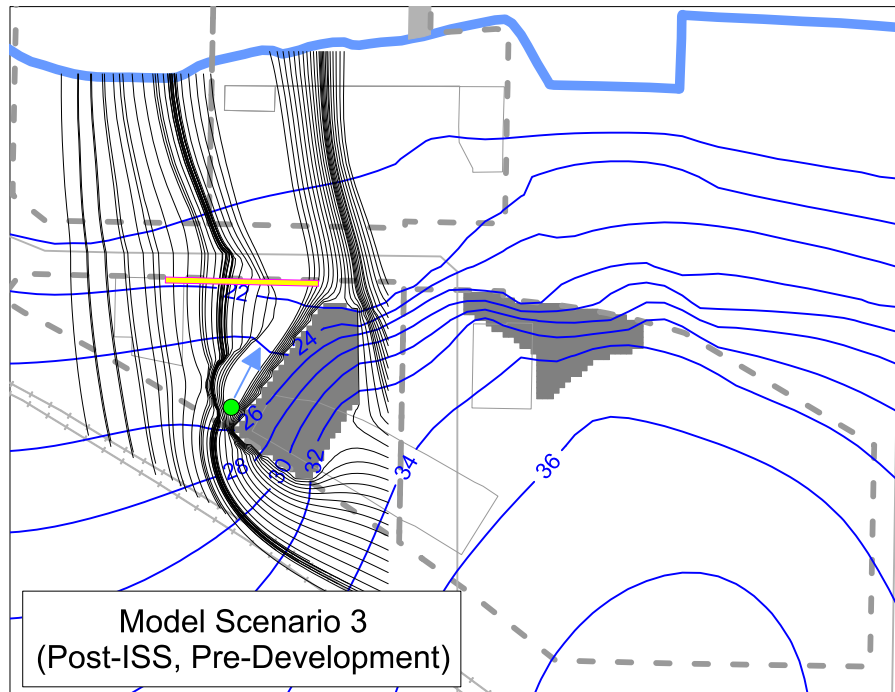
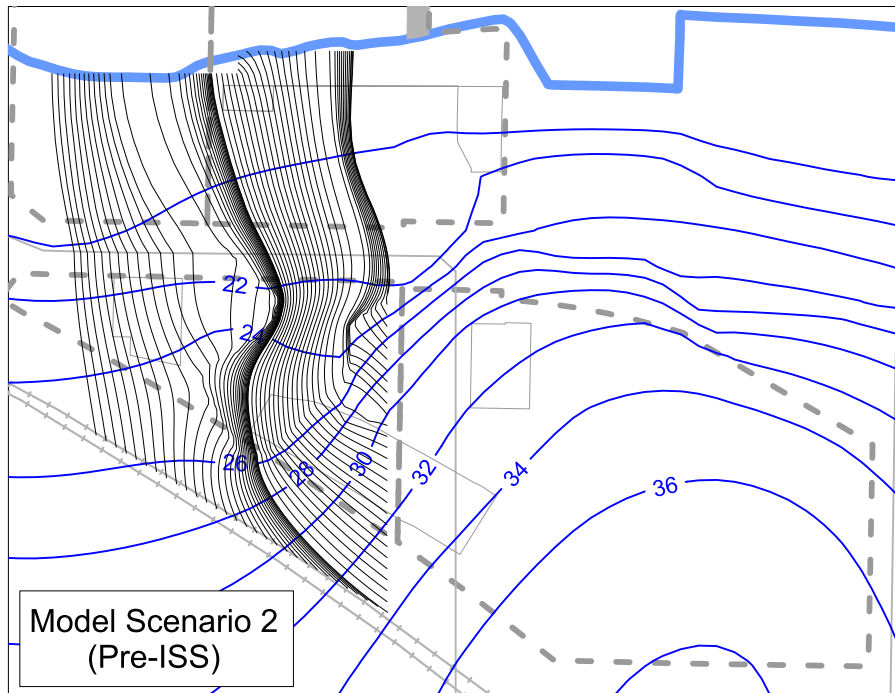
Shallow WBZ Model ISS Scenario  
Hydraulic Conductivity (K) Zones

Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

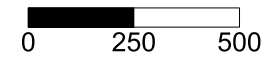
**Figure 3.9**









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Scale, in feet



**LEGEND**

-  Injection well location
-  Ground water elevation contour (ft NAVD 88)
-  Property boundary
-  PlumeStop Zone
-  Forward particle track
-  ISS Zone

Notes:

1. Locations are approximate
2. Modeled groundwater elevation contours were prepared by kriging target well data
3. Scenario 3  $K_{ISS} = 1 \times 10^{-6}$  cm/s
4. Arrow indicates approximate flow direction of injected water.

Model Results - Scenarios 2 and 3

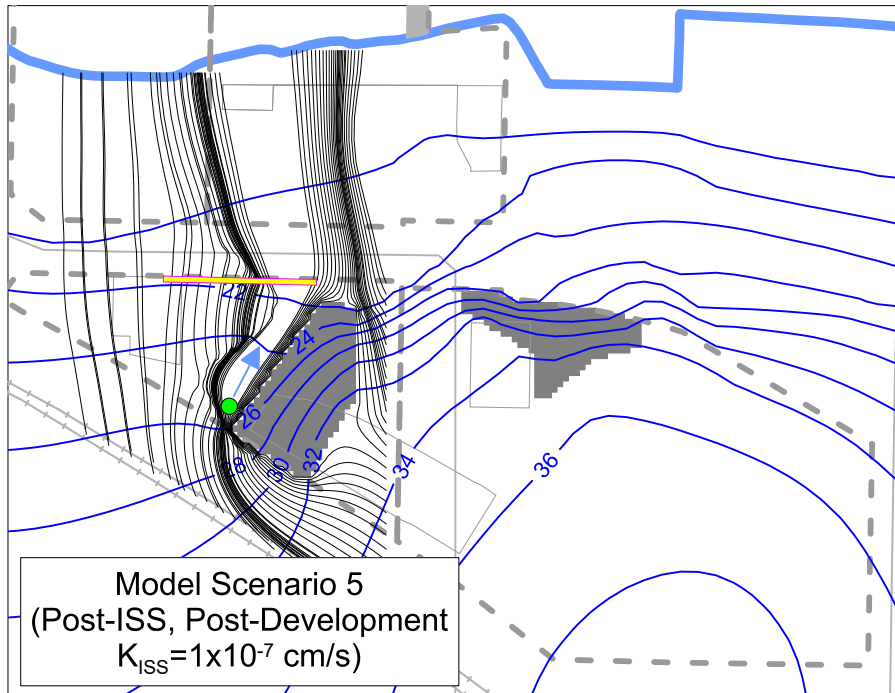
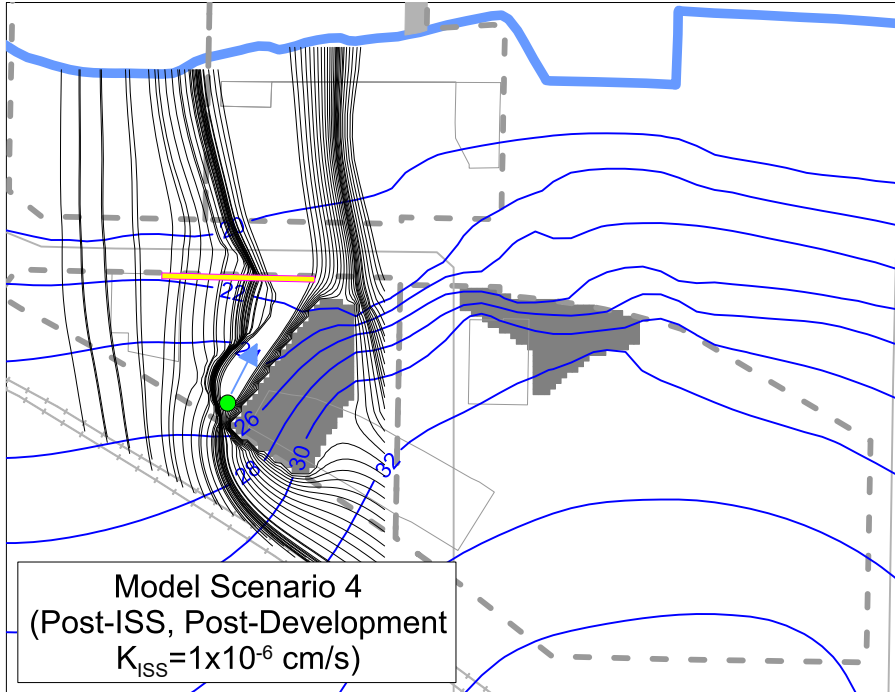
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**Figure 3.10a**



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**LEGEND**

- Injection well location
- Ground water elevation contour (ft NAVD 88)
- - - Property boundary
- PlumeStop Zone
- Forward particle track
- ISS Zone

Notes:

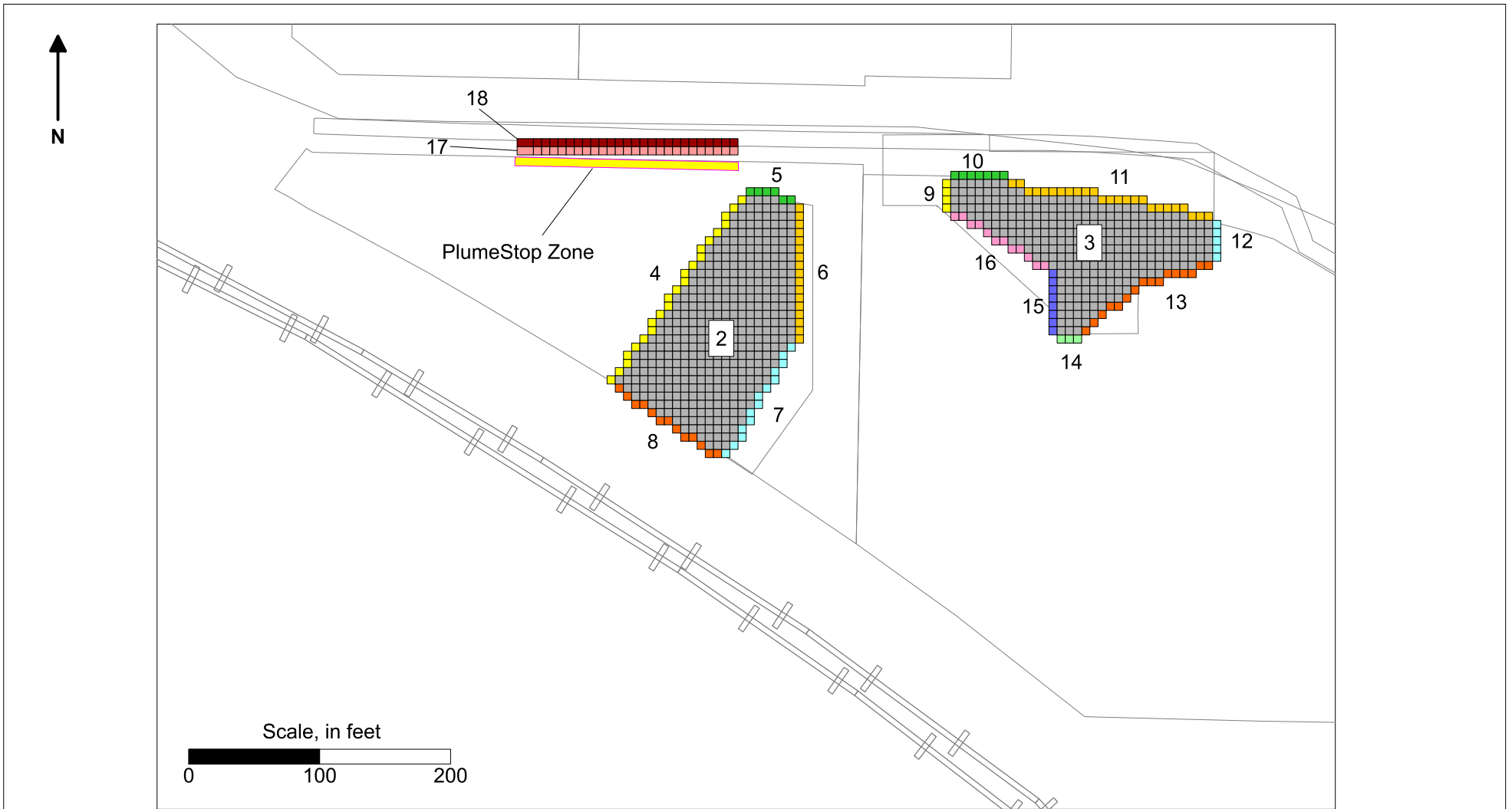
1. Locations are approximate
2. Modeled groundwater elevation contours were prepared by kriging target well data
3. Arrow indicates approximate flow direction of injected water

Model Results - Scenarios 4 and 5



Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington

**Figure 3.10b**





**LEGEND**

-  Constant Head boundary
-  No-flow boundary

**Notes:**

1. Numbers represent water balance zone IDs
2. Unshaded cells represent zone ID 1
3. The PlumeStop zone was not simulated in the model

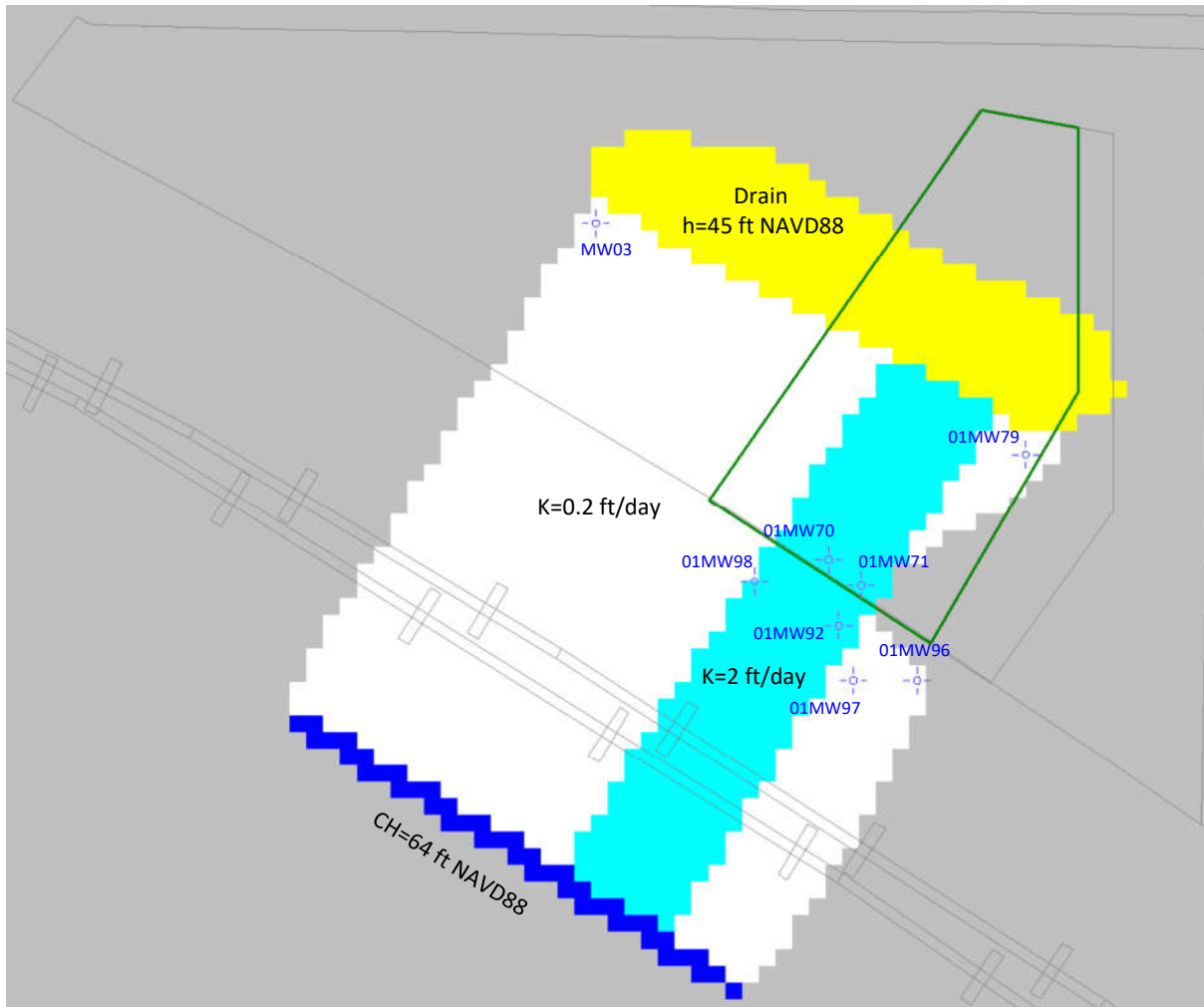
**Shallow WBZ Model  
Water Balance Zones**

Remedial Design Modeling  
Time Oil Bulk Terminal  
Seattle, Washington




**Figure 3.11**



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**LEGEND**

-  Constant Head boundary
-  No-flow boundary
-  Proposed ISS zone boundary

Perched WBZ Model Domain

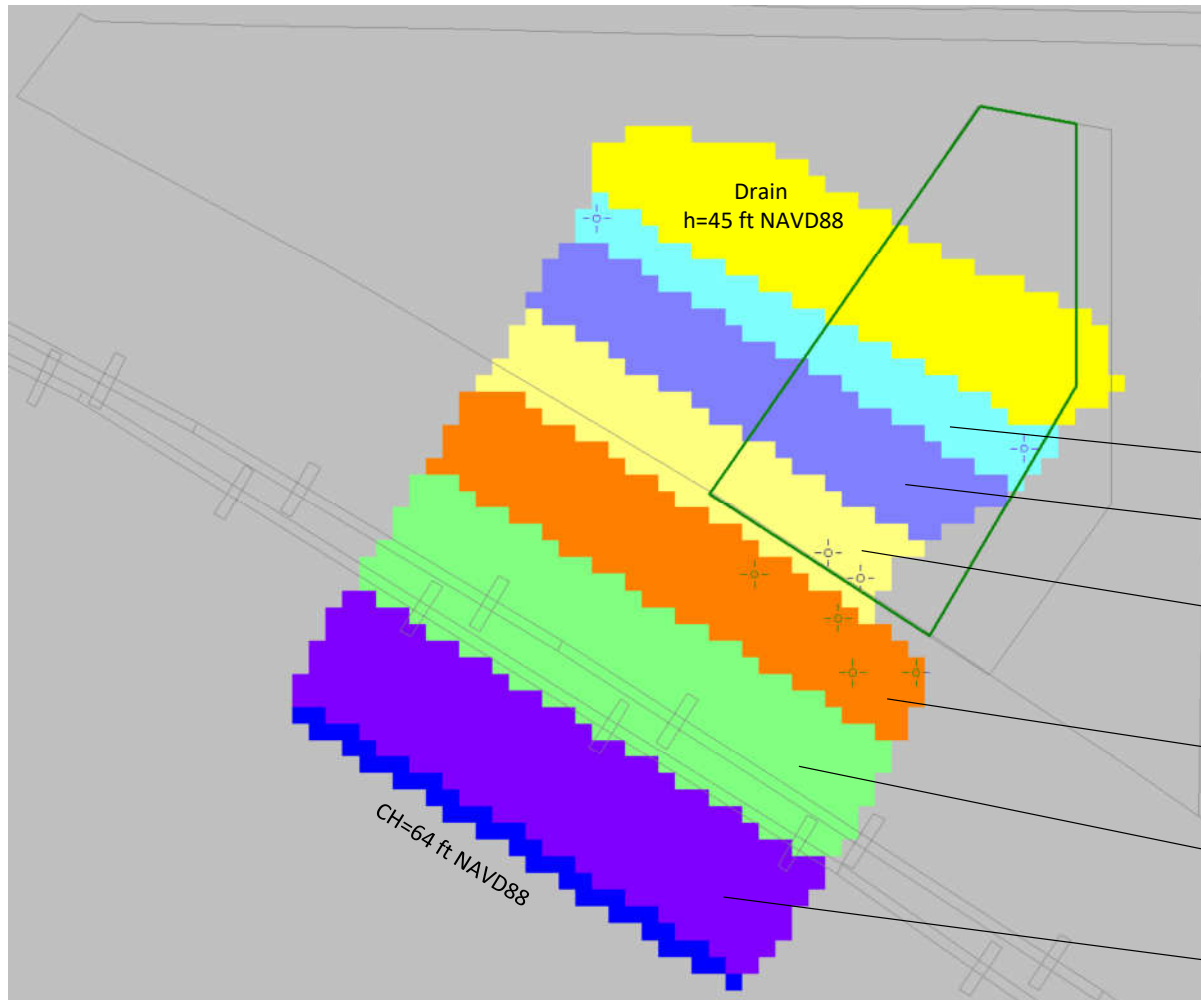
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**Figure 3.12**



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Bottom = 36 ft NAVD88

Bottom = 40 ft NAVD88


Bottom = 43 ft NAVD88

Bottom = 47 ft NAVD88


Bottom = 51 ft NAVD88

Bottom = 55 ft NAVD88

**LEGEND**

 Constant Head boundary

 No-flow boundary

 Proposed ISS zone boundary

Perched WBZ Model Bottom Elevations

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**Figure 3.13**







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**LEGEND**

-  Constant Head boundary
-  No-flow boundary
-  Proposed ISS zone boundary
-  Simulated groundwater elevation contour

Note: Groundwater elevation contour interval is 2 ft NAVD88.

Perched WBZ Model Pre-ISS  
Simulated Groundwater Elevations

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Seattle, Washington

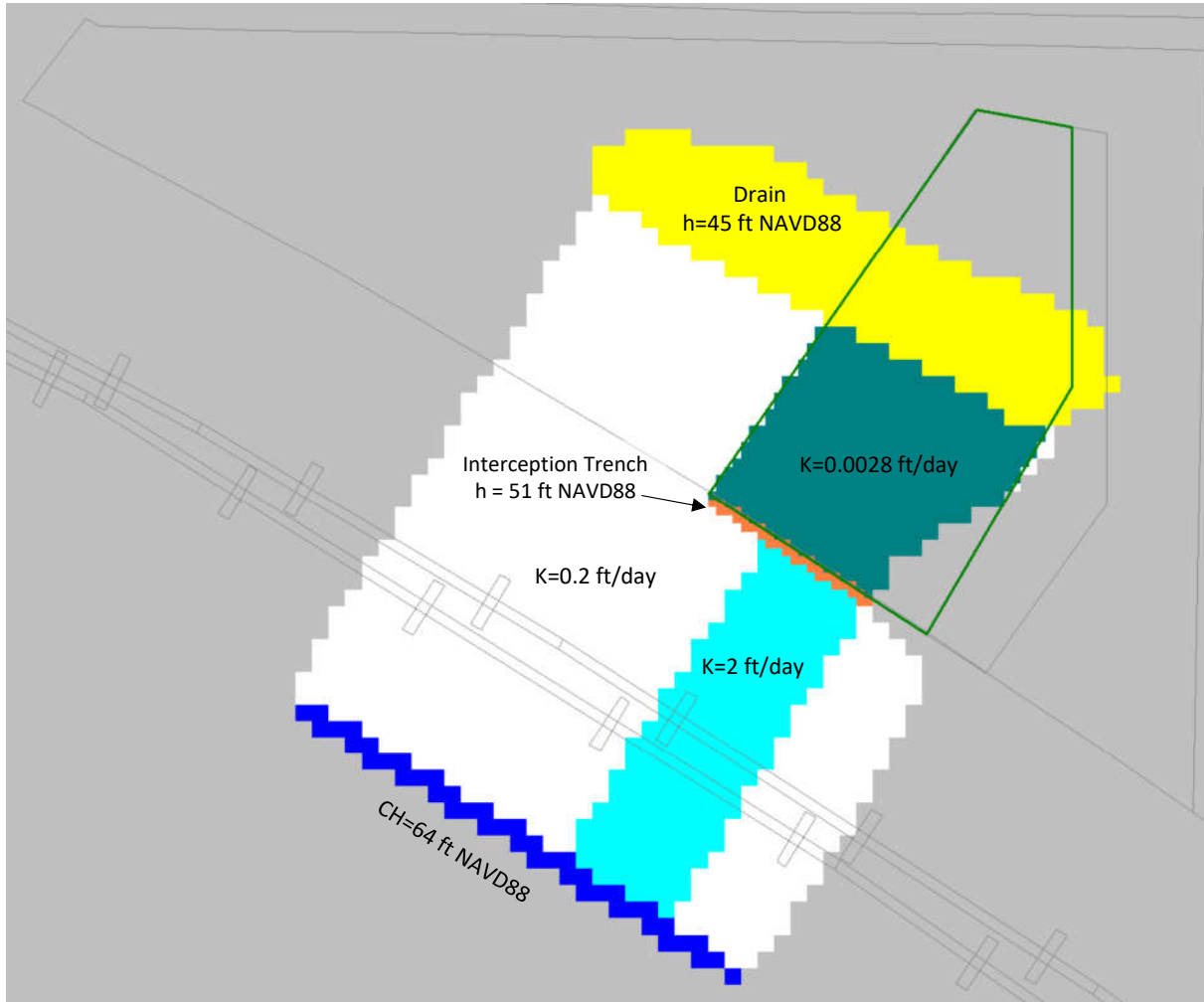
**Figure 3.14**






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**LEGEND**

-  Constant Head boundary
-  No-flow boundary
-  Proposed ISS zone boundary

Perched WBZ Model ISS Scenario  
Hydraulic Conductivity (K) Zones

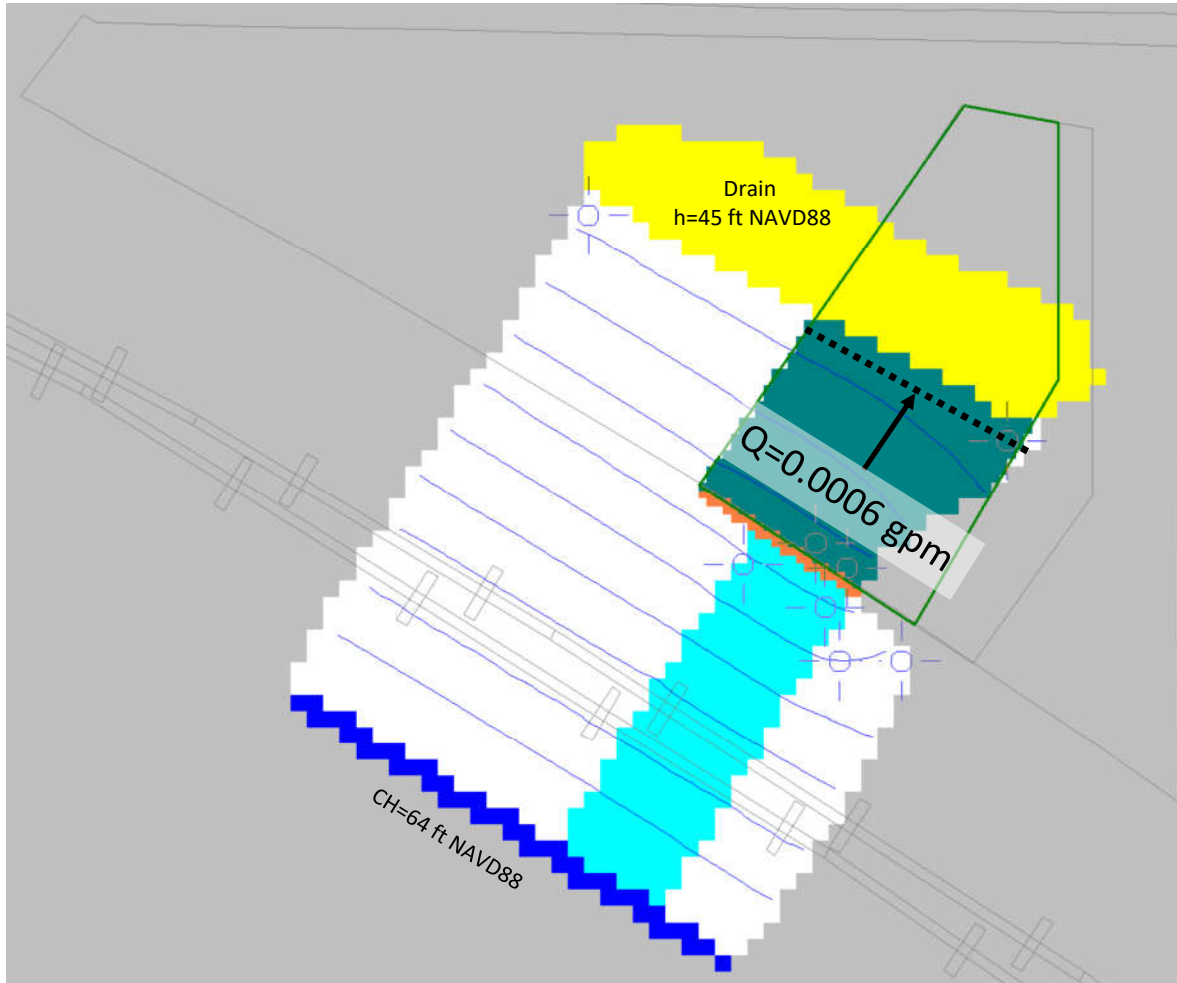
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Time Oil Bulk Terminal  
Seattle, Washington

**Figure 3.15**







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**LEGEND**

-  Constant Head boundary
-  No-flow boundary
-  Proposed ISS zone boundary
-  Simulated groundwater elevation contour

Note: Groundwater elevation contour interval is 2 ft NAVD88.

Shallow WBZ Model ISS Scenario  
Simulated Groundwater Elevations

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Time Oil Bulk Terminal  
Seattle, Washington

**Figure 3.16**



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**Table 3.1**  
**Shallow WBZ Model Calibration Targets**  
**Time Oil Site, Washington, Seattle**

<b>X</b>	<b>Y</b>	<b>Name</b>	<b>Observed Groundwater Elevation (ft NAVD88)</b>	<b>Modeled Groundwater Elevation (ft NAVD88)</b>	<b>Residual (ft)</b>
1256200.3	245455.6	01MW01	39.50	39.20	-0.30
1256201.6	245585.0	01MW02	33.30	33.62	0.32
1256162.0	245597.0	01MW03	33.03	31.57	-1.46
1256117.0	245568.5	01MW05	32.03	32.23	0.20
1256065.5	245452.7	01MW06	37.10	35.35	-1.75
1255977.2	245570.6	01MW07	22.99	23.38	0.39
1256249.8	245580.1	01MW10	34.23	34.65	0.42
1256520.0	245144.6	01MW100	41.67	39.95	-1.72
1256260.1	245622.6	01MW101	25.77	26.09	0.32
1256183.2	245640.4	01MW102	25.69	25.15	-0.54
1256461.4	245454.7	01MW105	33.36	37.01	3.65
1255785.5	245656.3	01MW106	20.68	20.54	-0.14
1256317.9	245444.8	01MW12	41.96	40.83	-1.13
1256315.4	245317.4	01MW13	42.50	42.91	0.41
1255998.3	245441.5	01MW15	29.11	31.99	2.88
1256223.9	245581.7	01MW16	30.37	34.25	3.88
1256117.5	245578.9	01MW18	31.56	31.26	-0.30
1256101.8	245572.7	01MW19	32.78	30.77	-2.01
1256110.9	245545.9	01MW20	33.68	33.96	0.28
1256248.2	245493.9	01MW24	39.42	39.08	-0.34
1256215.6	245478.6	01MW27	41.59	39.06	-2.53
1256217.7	245516.2	01MW28	36.90	37.82	0.92
1256248.2	245522.8	01MW29	36.71	37.93	1.22
1256297.3	245564.8	01MW33	36.59	36.01	-0.58
1256351.3	245586.3	01MW34	25.45	28.15	2.70
1256293.1	245612.7	01MW35	25.44	28.14	2.70
1256324.9	245604.0	01MW36	26.25	28.49	2.24
1256217.7	245246.9	01MW39	38.49	41.70	3.21
1256229.2	245347.5	01MW40	39.02	41.44	2.42
1256367.4	245485.7	01MW42	40.93	38.69	-2.24
1255958.7	245479.5	01MW44	27.95	25.87	-2.08
1255985.1	245546.3	01MW45	22.79	23.90	1.11
1255898.5	245526.5	01MW46	22.28	25.13	2.85
1256102.6	245616.8	01MW47	25.34	25.15	-0.19
1255903.0	245616.8	01MW53	20.10	22.05	1.95
1255964.5	245456.4	01MW55	28.47	27.38	-1.09
1255932.7	245576.8	01MW56	22.63	23.40	0.77
1255837.8	245479.5	01MW58	26.20	25.92	-0.28

**Table 3.1**  
**Shallow WBZ Model Calibration Targets**  
**Time Oil Site, Washington, Seattle**

<b>X</b>	<b>Y</b>	<b>Name</b>	<b>Observed Groundwater Elevation (ft NAVD88)</b>	<b>Modeled Groundwater Elevation (ft NAVD88)</b>	<b>Residual (ft)</b>
1255951.3	245372.2	01MW60	29.26	31.44	2.18
1255918.3	245383.0	01MW62	28.48	29.48	1.00
1255966.9	245437.4	01MW63	30.10	29.28	-0.82
1255869.2	245418.4	01MW64	27.50	26.52	-0.98
1256190.0	245430.4	01MW66	39.23	39.31	0.08
1256205.7	245549.2	01MW68	35.28	36.61	1.33
1256268.8	245339.7	01MW72	42.34	42.35	0.01
1256322.8	245364.4	01MW73	42.22	42.39	0.17
1256326.5	245411.4	01MW74	44.74	41.55	-3.19
1256358.7	245362.3	01MW75	42.12	42.11	-0.01
1255877.4	245566.5	01MW80	21.27	23.91	2.64
1256121.2	245650.1	01MW84	25.72	23.51	-2.21
1255844.0	245603.2	01MW85	20.65	22.17	1.52
1256216.4	245603.2	01MW86	26.93	31.18	4.25
1256309.6	245582.2	01MW87	29.45	33.04	3.59
1256318.3	245622.2	01MW88	25.96	26.01	0.05
1255967.8	245605.7	01MW89	19.96	22.74	2.78
1256263.4	245300.9	01MW90	42.81	42.55	-0.26
1255902.2	245355.3	01MW93	28.98	30.16	1.18
1255855.2	245382.1	01MW94	27.95	27.84	-0.11
1255936.8	245331.4	01MW95	29.81	32.16	2.35
1256478.7	245145.8	01MW99	41.81	40.68	-1.13
1256028.3	245804.2	02MW03	18.99	19.43	0.44
1256094.9	245798.0	02MW04	18.87	19.16	0.29
1256133.2	245805.7	02MW06	19.08	19.08	0.00
1255962.8	245830.5	02MW07	18.83	19.28	0.45
1256063.5	245671.7	02MW08	25.19	22.35	-2.84
1256149.5	245737.6	02MW15	24.66	22.29	-2.37
1256149.5	245770.5	02MW16	18.96	19.80	0.84
1256007.0	245845.6	02MW17	18.76	19.14	0.38
1255825.0	245807.7	02MW18	18.98	19.27	0.29
1255912.5	245822.0	02MW19	19.07	19.32	0.25
1256132.4	245849.5	02MW20	18.78	19.03	0.25
1255707.1	245538.9	MW01	23.89	23.81	-0.08
1255702.2	245595.8	MW02	22.27	21.87	-0.40
1255819.3	245540.9	MW04	24.62	24.84	0.22
1255844.4	245549.6	MW05	25.92	24.73	-1.19
1255808.2	245587.9	MW06	23.24	22.90	-0.34

**Table 3.2**  
**Shallow WBZ Model Water Balance at ISS Zones**  
**Time Oil Site, Washington, Seattle**

Scenario	Flow-Through Rate (gpm)			Flow Reduction Factor		
	CAA-4a/b	CAA-2a	Combined*	CAA-4a/b	CAA-2a	Combined*
1 - 2019 (with leaking pipe)	1.98	1.12	3.1	--	--	--
2 - Pre-ISS (without leaking pipe)	1.35	0.41	1.76	--	--	--
3 - Post-ISS K=1e-6 cm/s, Pre-Development	0.0028	0.0045	0.0073	482	91	241
4 - Post-ISS K=1e-6 cm/s, Post-Development	0.0021	0.0026	0.0047	643	158	374
5 - Post-ISS K=1e-7 cm/s, Post-Development	0.00021	0.00026	0.00047	6,429	1,577	3,745

Notes:

\* Combined represents the total effects of the combined flow through ISS zones CAA-4a/b and CAA-2a.

1. The flow reduction factor is calculated using Model scenario 2 as the baseline (i.e. pre-ISS conditions, without the leaking pipe)

**Table 3.3**  
**ISS pH Mixing Calculation**  
**Time Oil Site, Washington, Seattle**

Description	CAA-4a/b	CAA-2a
ISS zone flow, $Q_{ISS}$ (gpm):	0.0028	0.0045
Buffer zone flow, $Q_{buffer}$ (gpm):	0.675	0.205
Total Mixing zone flow (gpm):	0.678	0.210
Buffer zone upgradient pH, $pH_{buffer}$ :	7	7
ISS area pH, $pH_{ISS}$ :	12	12
pH at mixing zone downgradient boundary, $pH_{mix}$ :	7.02	7.11

Note:

1. ISS pH mixing calculation is based on flows through the ISS zone for Model Scenario 2 (pre-ISS) and Model Scenario 3 (Post-ISS, pre-development)
2. Buffer zone flow rates are estimated to be 50% of pre-ISS flow rates.

**Table 3.4**  
**Shallow WBZ Model Water Balance at PlumeStop Zone**  
**Time Oil Site, Washington, Seattle**

Description	Model Scenario				
	1	2	3	4	5
Flow rate through PlumeStop zone (ft <sup>3</sup> /day)	234.7	167.1	130.7	119.5	119.4
Cross-sectional area (ft <sup>2</sup> )	660	660	660	660	660
Specific discharge (ft <sup>3</sup> /ft <sup>2</sup> /day)	0.36	0.25	0.20	0.18	0.18
Effective porosity (ft <sup>3</sup> /ft <sup>3</sup> )	0.2	0.2	0.2	0.2	0.2
Groundwater velocity (ft/day)	1.8	1.3	1.0	0.9	0.9

Note:

1. Cross-sectional area is based on an average saturated thickness of 4 ft in the PlumeStop zone, and a length of approximately 165 ft.

**Appendix F      REGENESIS® Remediation Services Groundwater  
Treatment Details**



January 27, 2021

To:

TOC Seattle Terminal 1, LLC | ATTN: Kim Hempel  
[khempel@pioneerees.com](mailto:khempel@pioneerees.com) | [Kristin.Anderson@floydsnider.com](mailto:Kristin.Anderson@floydsnider.com)

Project #:

ChL66181

Subject:

Proposal for Application of PlumeStop™, Bio-Dechlor Inoculum®  
and S-MicroZVI® - Time Oil Bulk Terminal Site in Seattle,  
WA.

REGENESIS Remediation Services (RRS) appreciates the opportunity to provide TOC Seattle Terminal 1, LLC (TOC) with this proposal for in situ remedial treatment application at the former Time Oil Bulk Terminal Site located at 2737 W. Commodore Way Seattle, Washington (the Site). In this proposal we discuss our remedial approach, summarize our design, and present our implementation scope of work including cost estimates.

RRS has successfully completed hundreds of similar remediation applications across the country and has the product knowledge and implementation expertise to actively manage this field application. RRS will provide custom built injection equipment and a team of experienced personnel who specialize in applying REGENESIS' remedial technologies. Our team will ensure a high probability of success, while minimizing risks with our institutional in-house knowledge. Our best-in-class remediation design team and application services ensures proper placement, distribution, and performance of the remedial technologies being applied. With the information provided by TOC and gained during the on-site DVT event, RRS is estimating it will take a total of seven (7) days on-site to safely complete the remediation application.

If you have any questions regarding the application details provided within this proposal, please contact Isaac Gregg at 720.955.5142 ([lgregg@regenesiS.com](mailto:lgregg@regenesiS.com)); for design questions please contact Andrew Punsoni at 503.504.1399 ([Apunsoni@regenesiS.com](mailto:Apunsoni@regenesiS.com)).

Sincerely,



Isaac Gregg  
Proposal Manager



Andrew Punsoni  
Northwest District Technical Manager

## Remedial Approach

### Injection Methods

RRS will apply all materials in situ using direct-push technology (DPT) drilling techniques with appropriate injection tooling (discrete lateral pressure activated injection tool) as the delivery method. TOC will provide a qualified DPT drilling contractor.

### Summary of Relevant Design Information

A tabulated summary of pertinent design assumptions and is provided in **Table 1**. Product technical description sheets have been provided in **Appendix B**.

**Table 1: Remedial Design Summary**

<b>PlumeStop®, S-MZVI &amp; BDI Plus Application Design Summary</b>		
<i>Time Oil Final Design</i>		
<b>PlumeStop + S-MZVI</b>		<b>Technical Notes</b>
<b>Treatment Type</b>	<b>Barrier</b>	
Distance Perpendicular to Flow (ft)	165	<u>Injection Radius for Soil Coverage (ft-est.avg.)</u>
Spacing Within Rows (ft)	6.6	4.0
Number of Rows	2	
		<u>PlumeStop Injection Concentration</u>
<b>DPT Injection Points</b>	<b>50</b>	<u>(mg/L)</u>
Top Application Depth (ft bgs)	20	<b>12,142</b>
Bottom Application Depth (ft bgs)	28	
<b>PlumeStop to be Applied (lbs)</b>	<b>10,000</b>	
PlumeStop to be Applied (gals)	1,110	
<b>In Situ Chemical Reduction - S-MZVI</b>		<b>Special Instructions:</b>
S-MZVI to be added to PlumeStop (lbs)	3,500	Gallons per Foot
S-MZVI to be added to PlumeStop (gals)	232	50.00
<u>PlumeStop + S-MZVI Volume Totals</u>		-Injection to be done with pressure activated top with top-down approach.
Mixing Water (gal)	18,628	-Two-foot pushes are recommended.
<b>Total Application Volume (gals)</b>	<b>20,000</b>	-First row of points show push the tip to 22, 24, 26 and 28 feet.
Injection Volume per Point (gals)	400	
<b>Bioaugmentation - BDI Plus</b>		-The second row of points should push the tip to 21, 23, 25 and 27 feet.
<b>BDI Plus Application Points</b>	<b>50</b>	-Injection startup should complete points closest to MW-06
BDI Plus to be Applied (Liters)	18	
BDI Plus per point (Liters)	0.36	

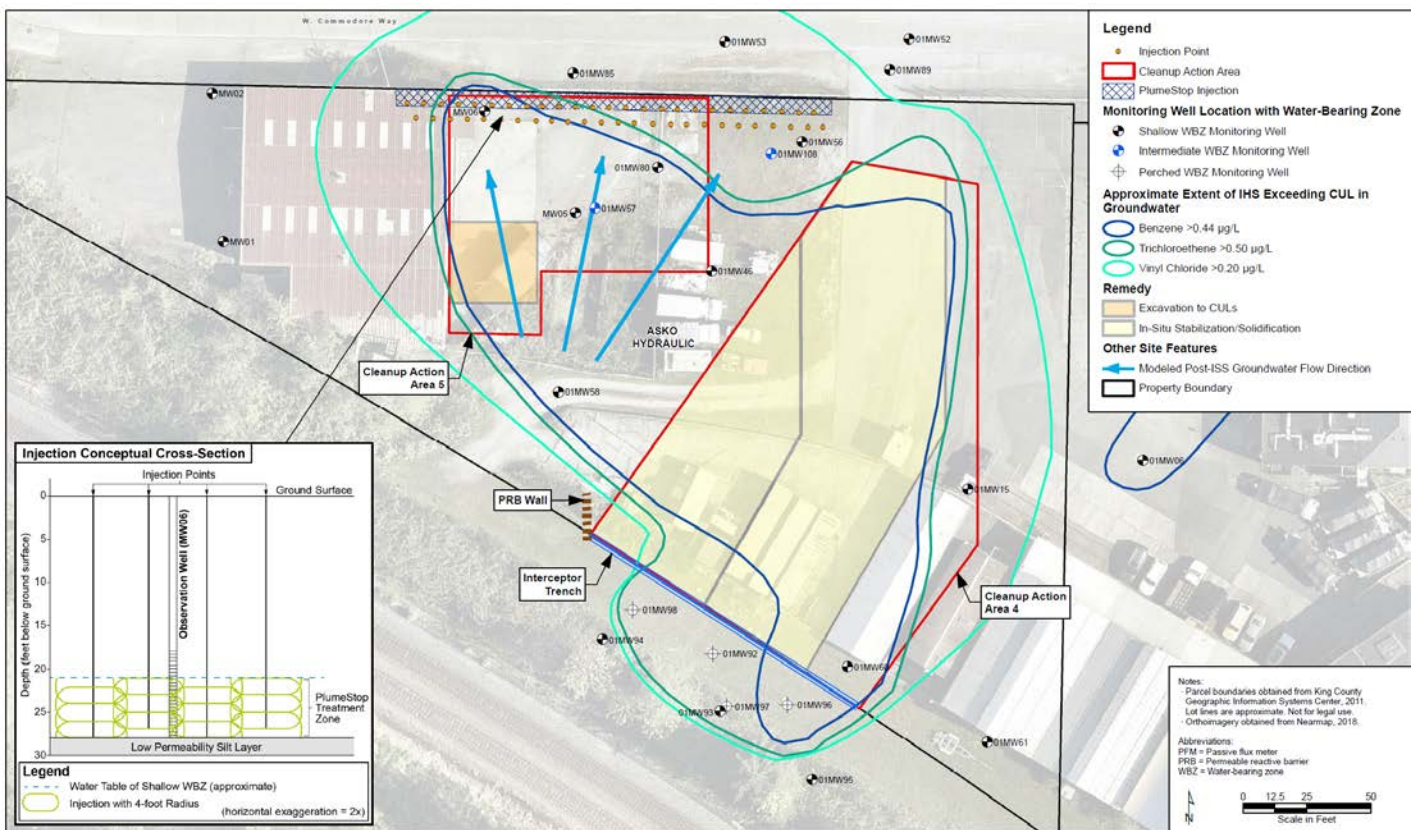
## Work Plan Summary

RRS has a national team of experts with decades of experience in the remediation industry and trained/certified field personnel with in-depth product and application knowledge. Our custom-built injection systems are specifically designed to properly apply REGENESIS products to ensure your investment in our remediation technologies achieves its full potential. Below is a summary of the work plan process, assigned responsibilities and on-site equipment that is intended to be used.

RRS will work under the direction of TOC to implement the field work associated with the application of the selected remediation technologies. Responsibilities for the implementation of this scope of work will be shared between RRS and TOC. Responsibilities for each are outlined in this section and further under the Assumptions/Qualification section.

The application of the remediation technologies will be performed via DPT injection points within the proposed PlumeStop Barrier (**Figure 1**). A secure storage/staging area for the product containers will need to be identified by TOC prior to the start of the full-scale injection activities. TOC will provide a forklift to maneuver product containers for the duration of this application.

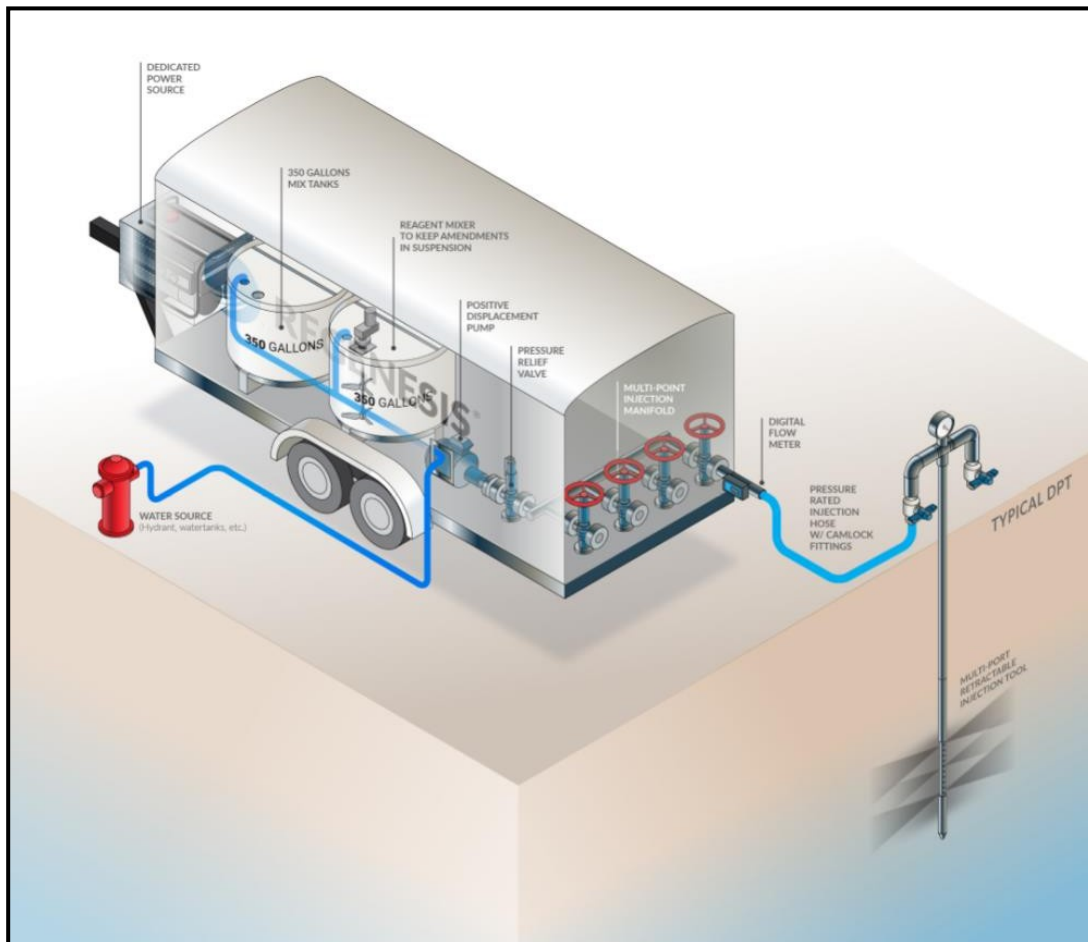
**Figure 1: Proposed PlumeStop Barrier Injection Area**



### RRS Responsibilities

- **RRS** will provide and ship the specified quantities of the remediation reagents (PlumeStop, BDI and S-MZVI) to the site address provided by TOC. RRS shipping estimates assume all products will be shipped to the site at the same time. RRS will coordinate with TOC prior to any shipment of product. Alternative shipping locations or phases could lead to an increase in freight costs.
- **RRS** will mobilize a 40-hour HAZWOPER certified crew experienced in the proper application of REGENESIS remediation technologies.
- **RRS** will supply the necessary injection tooling (DPT contractor to supply minimum of 120 linear feet of 1.5" diameter Geoprobe rods).
- **RRS** will perform site reconnaissance and pre-application activities that include H&S orientation, sensitive receptor identification and protection, treatment area layout, point location placement assistance, and equipment staging.
- **RRS** will provide site safety equipment including cones and caution tape to delineate the work area (efforts will be made to limit the impact on business operations at the site).
- **RRS** will supply and operate a custom-built injection system (**Figure 2**) equipped with:
  - Self-sufficient, dedicated power
  - Onboard mixing tanks
  - Positive displacement pump (or similar) for injecting into the TTZ
  - Injection manifold with pressure rated hosing capable of injecting into multiple points simultaneously
  - Pressure and flow gauges to monitor injection data for individual points
  - Custom injection caps equipped with safety controls for the DPT injection tool string
  - Site safety equipment and spill response kit (including wet vac)
- **RRS** will perform real-time reagent distribution diagnostics during injection activities to allow for field modifications, as needed, to ensure optimal results.
- **RRS** will work directly with our design team to fill any data gaps identified during the injection application to more effectively maintain the project objectives and goals.

**Figure 2: Injection System Diagram**



At the beginning of each day a safety tailgate meeting will be conducted and an overview of the procedures, responsibilities and goals for the day will be discussed. Injection rods equipped with an appropriate injection tool will be advanced to the bottom of the TTZ and injection will be performed in a bottom up method. The remediation technologies will be mixed with water in batches at the designated solution percentage and kept in constant suspension throughout the injection application. The mixing process ensures a homogenous solution is prepared prior to injection into the subsurface and throughout the application event. The batches will continuously be made throughout the entirety of the project until the full volume has been achieved with the appropriate amount of remedial solution being applied for each injection point and per vertical foot as best as possible.

Pressures, flow rates and total volume will be monitored and digitally documented for each injection interval. Multiple injection points may be injected into simultaneously (up to 4) to increase efficiencies on-site. The injection points and surrounding areas will be monitored for any signs of surfacing and a spill response kit will be on standby.

During the application, real-time information will be collected by the Floyd Snider Field Staff. RegenesiS will analyze and help verify design assumptions and subsurface reagent distribution. Data collected and analyzed may consist of groundwater quality parameters (i.e., pH, conductivity, DO, ORP, etc.), depth to water measurements, visual indicators through groundwater or soil samples, and in-field injection concentration test kits. No samples from the injection verification will be submitted for lab analysis. This information is typically collected during the application when within 10 feet of an appropriately screened monitoring well. All in-field data will be used for the sole purpose of reagent placement validation. Based on the information collected, the project team may choose to modify the remediation design to further optimize the injection application. This includes modification to injection concentrations, volume per vertical foot, injection intervals, etc.

Once the injection event is completed, RRS will demobilize all equipment and personnel off-site. A detailed injection summary report which includes injection point data (interval depths, injection pressure/flow rates, reagent volume, time elapsed and if surfacing occurred), field observations and any other noteworthy information will be generated and made available to TOC.

### **TOC Responsibilities**

- **TOC** will coordinate project schedule and reagent order with REGENESIS to ensure adequate mobilization time.
- **TOC** will coordinate site access with property owner to coincide with project schedule and identify a secure product staging area.
- **TOC** will contract a qualified DPT drilling rig and operator equipped with at least 120 linear feet of 1.5" diameter Geoprobe rod and proper abandonment materials per King County regulations.
- **TOC** Will call in public utility locates, should private underground utilities be within the treatment area, **TOC** will contract with a private utility locating service to mark utilities prior to RRS mobilization. RRS can provide costs if requested.
- **TOC** will provide a water source (e.g. hydrant, water truck) capable of producing at least 30 GPM for the duration of the project within 300 ft. of the project staging area, at no cost to RRS. **TOC** will coordinate and provide a backflow preventer for on-site hydrants utilization if needed. RRS can provide costs if requested.
- **TOC** will procure any necessary permits needed to complete the project including right of way, UIC and municipal.
- **TOC** is responsible for all soil, air and groundwater sampling and analysis.
- **TOC** is responsible for transportation and disposal of any contaminated waste generated on-site during injection activities, though we do not anticipate generating any such waste during injection activities.
- All empty product containers will be the responsibility of **TOC** for proper disposal/recycling. General refuse will be collected and disposed of in a **TOC** provided refuse container on-site.
- **TOC** will provide a depth to water meter and field water quality meter similar to a YSI 556 with a down-hole sensor capable of reaching the water table and well screen interval while on-site for injection activities.
- **TOC** will provide access to a restroom during on-site hours. RRS can provide costs if requested.

Once an executed agreement has been established and a work schedule has been agreed upon, RRS will begin to implement the assigned responsibilities and work with TOC accordingly.

## Safety Program

REGENESIS is committed to providing a safe and healthy working environment for all employees, clients and contractors on-site. Prior to mobilization RRS will develop a site-specific Health and Safety Plan (HASP) and designate an on-site safety officer. All personnel on-site are required to participate in daily safety tailgate meetings with the goal of proactively identifying potential hazards and mitigating risks to the full extent possible. In addition to the hours of rigorous safety training courses all personnel are required to complete, REGENESIS also incorporates a behavior-based safety program by utilizing our DoneSafe® mobile application (app) interface on every site. This app encourages our personnel to actively search for potential on-site risks and document mitigation actions taken. The effectiveness of our safety program can be seen in our industry leading EMR ratings listed in **Table 2**.

**Table 2: REGENESIS EMR Rating 2017-2020**

Year	Total Hours	EMR
2020	162,037	0.64
2019	169,964	0.66
2018	144,600	0.70
2017	140,706	0.70

## Health and Safety Plan

RRS safety tailgate meetings and HASP will include the following:

- Site map with entrance and exit points and best possible muster points depending on conditions.
- List of personnel and contact information for employees on-site and supporting the project.
- Rout to the nearest hospital or medical facility along with contact information.
- Job Hazard Analysis (JHA) detailing each job task on-site with its potential hazards and best practices to avoid those hazards.
- Description and hazards of the contaminants of concern (COC) with appropriate Personal Protection Equipment (PPE) requirements.
- List and description of REGENESIS chemicals on-site including a Safety Data Sheet (SDS) for each chemical.
- Personnel will be equipped with face coverings and follow all local Covid-19 regulation.
- Checklist of site safety equipment including fire extinguishers, eyewash station, first aid kit, spill prevention kit and any site-specific equipment needed.
- Daily Tailgate safety meeting sheet with identified hazards and risks associated with the site and job tasks for that day, along with shared learning observations from the previous day.

## Project Cost Estimate

Below is the cost estimate for RRS to provide the remediation technologies (PlumeStop, BDI and S-MZVI) and execute the application design provided in this proposal. Please also see the assumptions and qualifications section.

Time Oil Application				
Description	Quantity	Unit	Price per Unit	Subtotal
RRS Application Services (10 Days)	1	Lump Sum	\$44,440.00	\$44,440.00
Remediation Technologies <b>PlumeStop/S-MZVI/BDI</b> (Including Tax & Freight)	1	Lump Sum	\$117,640.00	\$117,440.00
<b>Total</b>				<b>\$162,080.00</b>

The cost provided above is inclusive of all product, estimated product freight, product mixing, injection services as outlined within this proposal, tax and materials to complete the work. We will submit invoice(s) when product ships and upon project completion, or end of calendar month, for RRS services. Payment terms are Net 30 days upon invoice submittal unless indicated otherwise in a master service agreement (MSA).

**\*Please note that this pricing is contingent upon completion of this scope of work without delays or work stoppages once mobilization occurs. RRS has allotted seven (7) on-site working days (10-hr days, Monday through Saturday) to apply the remediation technologies. RRS believes the scope of work provided above can be completed in this timeframe, however, if the project is delayed due to circumstances beyond our control, RRS will utilize a daily rate of \$3,500.00 plus applicable tax to the invoice price. Should the project be completed ahead of schedule, a portion of the daily rate may be credited to the final invoice after review. RRS reserves the right to modify the design and associated cost if additional information gathered warrants modification.**



## Assumption/Qualifications

In generating this proposal, REGENESIS relied upon professional judgment and site-specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site. The attached design summary tables specify the assumptions used in preparation for this technical design. We request that these modeling input assumptions be verified by your firm prior to application of PlumeStop. Other assumptions and qualifications related to this proposal are as follows:

- The above cost outlined will be valid for 60 days from date of proposal. If beyond 60 days, REGENESIS reserves the right to update cost.
- If applicable, sales tax charges for product, freight, and services are considered estimated at the time of proposal submittal. The appropriate sales tax category (i.e., product, freight, and services) and actual sales tax rate is finalized at the time of invoice and may change from date of proposal submittal.
- RRS personnel will take delivery of the Product, and **TOC** will arrange for secure storage. If additional deliveries are requested, changes to the price will be incorporated as necessary. If material needs to be stored off-site, **TOC** personnel will coordinate the delivery of the material to the site.
- RRS will have access to the site for equipment operation and secure storage of materials and equipment. Access to each work area location will be clear and free of obstructions. RRS assumes the injection trailer will be staged within 80 ft. of the furthest injection point location.
- Pricing and work schedule assume union labor and prevailing wages (Davis-Bacon) are not required.
- **TOC** will provide access to a restroom during on-site hours.
- **TOC** is responsible for securing any permits prior to mobilizing to the site.
- **TOC** is responsible for all soil, air and groundwater sampling and analysis.
- **TOC** is responsible for transportation and disposal of any contaminated waste generated on-site during injection activities, though we do not anticipate generating any such waste during injection activities.
- All private, on-site underground utilities and any known subsurface features (e.g., piping, storage tanks, septic systems, etc.) will be clearly marked/cleared by **TOC** prior to RRS mobilization to the site. RRS is not responsible for damage to any unmarked utilities or subsurface features. If as-built drawings are available for any on-site subsurface features, RRS request the right to review these drawing with **TOC** to confirm clearance for the advancement of DPT injection points.
- For safety reasons, access to the treatment area will be limited to RRS and **TOC** personnel. RRS will provide delineators and cones to section off working areas.
- The remediation design and injection procedures contain the necessary precautions to minimize the likelihood of surfacing of the treatment chemistry. RRS will monitor treatment chemistry application flow rates and pressures as well as observe for signs of reagent surfacing around active injection areas. If surfacing is detected, RRS will stop or slow down injection activities at that location to stop additional surfacing and remove/vacuum up recoverable surfaced fluid. RRS is not be responsible for treatment chemistry infiltration into undesired locations beyond our visible control.

- RRS personnel can have access to site for work up to 12 hours per day Sunday-Saturday, though, in generating the costs, a 9.5-hour, Monday through Saturday workday schedule was assumed. Additional charges will be applied for Saturday and/or Sunday work schedules.
- RRS assumes that there will be complete site access, with no areas being blocked by persons, vehicles or buildings. The injection flow rates and schedule are based on having full site access.
- RRS assumes that direct-push style drill rig can access all injection point locations and drive injection tooling to the required depth. If site conditions limit the use of the provided direct-push rig for any injection point and other drilling methods are required to complete the task, additional charges will apply.
- All injection points will be closed/backfilled according to county regulations by the DPT contractor.
- Site conditions can change over time and should be monitored post injection. REGENESIS is not responsible for changing site conditions after completing the scope of work and demobilizing from the site. This includes but is not limited to changes related to borehole abandonment (i.e., swelling of backfill material), surface restoration, well conditions, and on-site utilities.
- In generating this estimate, REGENESIS relied upon professional judgment and site-specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

## Acknowledgment

Please sign below to acknowledge acceptance of proposal **ChL66181** for the **Time Oil Bulk Terminal Site** and authorize REGENESIS to proceed with a final contract and work authorization:

### **TOC Seattle Terminal 1, LLC**

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name (print)

\_\_\_\_\_  
P.O. or Project Number

Signature above confirms signee has reviewed the proposal and agrees with all outlined responsibilities and assumptions/qualifications. Please also see our terms and conditions located in **Appendix A**. Below is a list of next steps toward implementation of this project. Please note these steps may take 4-6 weeks to complete depending upon the complexity of the project and previous experience with your company. REGENESIS Remediation Services will contact you soon to begin the implementation process.

### **Steps to Project Implementation**

- Sign acceptance of proposal
- Finalize contract documents incorporating this proposal or formal REGENESIS Subcontract Agreement
- Confirm account credit status
- Complete remediation services logistics evaluation
- Confirm delivery address and date
- Schedule application



## Appendix A

## Terms and Conditions Products and Services

- 1. PAYMENT TERMS.** Net 30 Days. Accounts outstanding after 30 days will be assessed 1.5% monthly interest. Volume discount pricing will be rescinded on all accounts outstanding over 90 days. An early payment discount of 1.5% Net 10 is available for cash or check payments only. We accept Master Card, Visa and American Express.
- 2. RETURN POLICY.** A 15% re-stocking fee will be charged for all returned goods. All requests to return product must be pre-approved by seller. Returned product must be in original condition and no product will be accepted for return after a period of 90 days.
- 3 FORCE MAJEURE.** Seller shall not be liable for delays in delivery or services or failure to manufacture or deliver due to causes beyond its reasonable control, including but not limited to acts of God, acts of buyer, acts of military or civil authorities, fires, strikes, flood, epidemic, war, riot, delays in transportation or car shortages, or inability to obtain necessary labor, materials, components or services through seller's usual and regular sources at usual and regular prices. In any such event Seller may, without notice to buyer, at any time and from time to time, postpone the delivery or service dates under this contract or make partial delivery or performance or cancel all or any portion of this and any other contract with buyer without further liability to buyer. Cancellation of any part of this order shall not affect Seller's right to payment for any product delivered or service performed hereunder.
- 4. LIMITED WARRANTY.** Seller warrants the product(s) sold and services provided as specified on face of invoice, solely to buyer. Seller makes no other warranty of any kind respecting the product and services, and expressly DISCLAIMS ALL OTHER WARRANTIES OF WHATEVER KIND RESPECTING THE PRODUCT AND SERVICES, INCLUDING ALL WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE AND NON-INFRINGEMENT.
- 5. DISCLAIMER.** Where warranties to a person other than buyer may not be disclaimed under law, seller extends to such a person the same warranty seller makes to buyer as set forth herein, subject to all disclaimers, exclusions and limitations of warranties, all limitations of liability and all other provisions set forth in the Terms and Conditions herein. Buyer agrees to transmit a copy of the Terms and Conditions set forth herein to any and all persons to whom buyer sells, or otherwise furnishes the products and/or services provided buyer by seller and buyer agrees to indemnify seller for any liability, loss, costs and attorneys' fees which seller may incur by reason, in whole or in part, of failure by buyer to transmit the Terms and Conditions as provided herein.
- 6. LIMITATION OF SELLER'S LIABILITY AND LIMITATION OF BUYER'S REMEDY.** Seller's liability on any claim of any kind, including negligence, for any loss or damage arising out of, connected with, or resulting from the manufacture, sale, delivery, resale, repair or use of any goods or performance of any services covered by or furnished hereunder, shall in no case exceed the lesser of (1) the cost of repairing or replacing goods and repeating the services failing to conform to the forgoing warranty or the price of the goods and/or services or part thereof which gives rise to the claim. IN NO EVENT SHALL SELLER BE LIABLE FOR SPECIAL INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS, OR FOR DAMAGES IN THE NATURE OF PENALTIES.
- 7. INDEMNIFICATION.** Buyer agrees to defend and indemnify seller of and from any and all claims or liabilities asserted against seller in connection with the manufacture, sale, delivery, resale or repair or use of any goods, and performance of any services, covered by or furnished hereunder arising in whole or in part out of or by reason of the failure of buyer, its agents, servants, employees or customers to follow instructions, warnings or recommendations furnished by seller in connection with such goods and services, by reason of the failure of buyer, its agents, servants, employees or customers to comply with all federal, state and local laws applicable to such goods and services, or the use thereof, including the Occupational Safety and Health Act of 1970, or by reason of the negligence or misconduct of buyer, its agents, servants, employees or customers.
- 8. EXPENSES OF ENFORCEMENT.** In the event seller undertakes any action to collect amounts due from buyer, or otherwise enforce its rights hereunder, Buyer agrees to pay and reimburse Seller for all such expenses, including, without limitation, all attorneys and collection fees.
- 9. TAXES.** Liability for all taxes and import or export duties, imposed by any city, state, federal or other governmental authority, shall be assumed and paid by buyer. Buyer further agrees to defend and indemnify seller against any and all liabilities for such taxes or duties and legal fees or costs incurred by seller in connection therewith.

**10. ASSISTANCE AND ADVICE.** Upon request, seller in its discretion will furnish as an accommodation to buyer such technical advice or assistance as is available in reference to the goods and services. Seller assumes no obligation or liability for the advice or assistance given or results obtained, all such advice or assistance being given and accepted at buyer's risk.

**11. SITE SAFETY.** Buyer shall provide a safe working environment at the site of services and shall comply with all applicable provisions of federal, state, provincial and municipal safety laws, building codes, and safety regulations to prevent accidents or injuries to persons on, about or adjacent to the site.

**12. INDEPENDENT CONTRACTOR.** Seller and Buyer are independent contractors and nothing shall be construed to place them in the relationship of partners, principal and agent, employer/employee or joint ventures. Neither party will have the power or right to bind or obligate the other party except as may be expressly agreed and delegated by other party, nor will it hold itself out as having such authority.

**13. REIMBURSEMENT.** Seller shall provide the products and services in reliance upon the data and professional judgments provided by or on behalf of buyer. The fees and charges associated with the products and services thus may not conform to billing guidelines, constraints or other limits on fees. Seller does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where seller may serve as a supplier or subcontractor to an entity which seeks reimbursement from the Government for all or part of the services performed or products provided by seller, it is the sole responsibility of the buyer or other entity seeking reimbursement to ensure the products and services and associated charges are in compliance with and acceptable to the Government prior to submission. When serving as a supplier or subcontractor to an entity which seeks reimbursement from the Government, seller does not knowingly present or cause to be presented any claim for payment to the Government.

**14. APPLICABLE LAW/JURISDICTION AND VENUE.** The rights and duties of the parties shall be governed by, construed, and enforced in accordance with the laws of the State of California (excluding its conflict of laws rules which would refer to and apply the substantive laws of another jurisdiction). Any suit or proceeding hereunder shall be brought exclusively in state or federal courts located in Orange County, California. Each party consents to the personal jurisdiction of said state and federal courts and waives any objection that such courts are an inconvenient forum.

**15. ENTIRE AGREEMENT.** This agreement constitutes the entire contract between buyer and seller relating to the goods or services identified herein. No modifications hereof shall be binding upon the seller unless in writing and signed by seller's duly authorized representative, and no modification shall be effected by seller's acknowledgment or acceptance of buyer's purchase order forms containing different provisions. Trade usage shall neither be applicable nor relevant to this agreement, nor be used in any manner whatsoever to explain, qualify or supplement any of the provisions hereof. No waiver by either party of default shall be deemed a waiver of any subsequent default.



## Remedial Design Assumptions and Qualifications

**Cost Estimate Disclaimer:** The cost listed assumes conditions set forth within the proposed scope of work and assumptions and qualifications. Changes to either could impact the final cost of the project. This may include final shipping arrangements, sales tax or application related tasks such as product storage and handling, access to water, etc. If items listed need to be modified, please contact Regenesis for further evaluation.

**Shipping Estimates:** Shipping estimates are valid for 30 days. All shipping charges are estimates and actual freight charges are calculated at the time of invoice. Additional freight charges may be assessed for any accessorial requested at the time of delivery. The estimate included within assumes standard shipping.

Standard delivery is between 8am -5pm Monday –Friday. \*accessorial – can include, but not limited to lift gate and pallet jack at delivery, inside delivery, time definite deliveries, and delivery appointments.

Please communicate any requirements for delivery with the customer service department at the time the order is placed.

**Return Policy:** To initiate a return please contact your local sales manager for an RMA. A 15% re-stocking fee will be charged for all returned goods. Return freight must be prepaid. All requests to return product must be in original condition and no product will be accepted for return after 90 days from date of delivery.

**Professional Judgement:** In generating this estimate, REGENESIS relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

REGENESIS developed this Scope of Work in reliance upon the data and professional judgments provided by those whom completed the earlier environmental site assessment(s), and in reliance upon REGENESIS' prior experience on similar project sites. The fees and charges associated with the Scope of Work were generated through REGENESIS' proprietary formulas and thus may not conform to billing guidelines, constraints or other limits on fees. REGENESIS does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where REGENESIS may serve as a supplier or subcontractor to an entity which seeks reimbursement from the Government for all or part of the services performed or products provided by REGENESIS, it is the sole responsibility of the entity seeking reimbursement to ensure the Scope of Work and associated charges are in compliance with and acceptable to the Government prior to submission. When serving as a supplier or subcontractor to an entity which seeks reimbursement from Government, REGENESIS does not knowingly present or cause to be presented any claim for payment to the government.

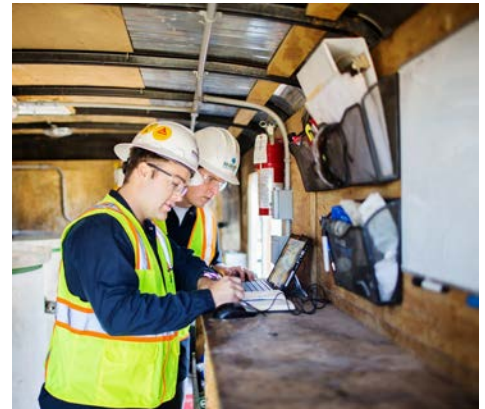


## Appendix B

# S-MicroZVI Specification Sheet

## S-MicroZVI Technical Description

S-MicroZVI™ is an *In Situ* Chemical Reduction (ISCR) reagent that promotes the destruction of many organic pollutants and is most commonly used with chlorinated hydrocarbons. It is engineered to provide an optimal source of micro-scale zero valent iron (ZVI) that is both easy to use and delivers enhanced reactivity with the target contaminants via multiple pathways. S-MicroZVI can destroy many chlorinated contaminants through a direct chemical reaction (see **Figure I**). S-MicroZVI will also stimulate anaerobic biological degradation by rapidly creating a reducing environment that is favorable for reductive dechlorination.

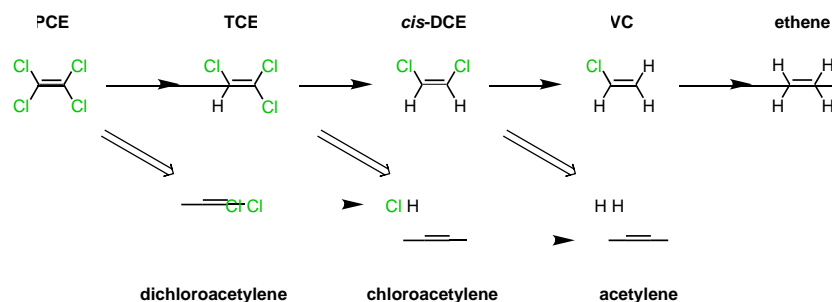


### Sulfidated ZVI

S-MicroZVI is composed of colloidal, sulfidated zero-valent iron particles suspended in glycerol using proprietary environmentally acceptable dispersants. The passivation technique of sulfidation, completed using proprietary processing methods, provides unparalleled reactivity with chlorinated hydrocarbons like PCE and TCE and increases its stability and longevity by minimizing undesirable side reactions. In addition to superior reactivity, S-MicroZVI is designed for easy handling that is unmatched by any ZVI product on the market. Shipped as a liquid suspension, S-MicroZVI requires no powder feeders, no thickening with guar, and pneumatic or hydraulic fracturing is not mandatory. When diluted with water prior to application, the resulting suspension is easy to inject using either direct push or permanent injection wells.

### S-MicroZVI is Best in Class For

- Longevity
- Kinetics
- Transport



**Figure I:** Chlorinated ethene degradation pathways and products. The top pathway with single line arrows represent the reductive dechlorination (hydrogenolysis) pathway. The lower pathway with downward facing double line arrows represent the beta-elimination pathway.

To see a list of treatable contaminants, view the S-MicroZVI treatable contaminants guide.

# S-MicroZVI Specification Sheet

## Chemical Composition

Iron, powders CAS 7439-89-6  
Iron (II) sulfide CAS 1317-37-9  
Glycerol CAS 56-81-8

## Properties

Physical State: Liquid  
Form: Viscous metallic suspension  
Color: Dark gray  
Odor: Slight  
pH: Typically 7-9 as applied  
Density: 15 lb/gal

## Storage and Handling Guidelines

### Storage:

- Use within four weeks of delivery
- Store in original containers
- Store at temperatures below 95F°
- Store away from incompatible materials

### Handling:

- Never mix with oxidants or acids
- Wear appropriate personal protective equipment
- Do not taste or swallow
- Observe good industrial hygiene practices

## Applications

S-MicroZVI is diluted with water on site and easily applied into the subsurface through low-pressure injections. S-MicroZVI can also be mixed with products like 3-D Microemulsion<sup>®</sup> or PlumeStop<sup>®</sup> prior to injection.

## Health and Safety

The material is relatively safe to handle; however, avoid contact with eyes, skin and clothing. OSHA Level D personal protection equipment including: vinyl or rubber gloves and eye protection are recommended when handling this product. Please review the Safety Data Sheet for additional storage, and handling requirements here: S-MicroZVI SDS.



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## 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](#).

# PlumeStop® Liquid Activated Carbon™ Technical Description

PlumeStop Liquid Activated Carbon is an innovative groundwater remediation technology designed to rapidly remove and permanently degrade groundwater contaminants. PlumeStop is composed of very fine particles of activated carbon (1-2µm) suspended in water through the use of unique organic polymer dispersion chemistry. Once in the subsurface, the material behaves as a colloidal biomatrix, binding to the aquifer matrix, rapidly removing contaminants from groundwater, and promoting permanent contaminant biodegradation.

This unique remediation technology accomplishes treatment with the use of highly dispersible, fast-acting, sorption-based technology, capturing and concentrating dissolved-phase contaminants within its matrix-like structure. Once contaminants are sorbed onto the regenerative matrix, biodegradation processes achieve complete remediation.



Distribution of PlumeStop in water

To see a list of treatable contaminants with the use of PlumeStop, view the [Range of Treatable Contaminants Guide](#).

## Chemical Composition

- Water - CAS# 7732-18-5
- Colloidal Activated Carbon ≤2.5 - CAS# µm 7440-44-0
- Proprietary Additives

## Properties

- Physical state: Liquid
- Form: Aqueous suspension
- Color: Black
- Odor: Odorless
- pH: 8 - 10

## Storage and Handling Guidelines

### Storage

- Store in original tightly closed container
- Store away from incompatible materials
- Protect from freezing

### Handling

- Avoid contact with skin and eyes
- Avoid prolonged exposure
- Observe good industrial hygiene practices
- Wash thoroughly after handling
- Wear appropriate personal protective equipment

# PlumeStop® Liquid Activated Carbon™ Technical Description

## Applications

PlumeStop is easily applied into the subsurface through gravity-feed or low-pressure injection.

## Health and Safety

Wash hands after handling. Dispose of waste and residues in accordance with local authority requirements. Please review the Material Safety Data Sheet for additional storage, usage, and handling requirements here: [PlumeStop SDS](#).



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**Appendix G Construction Compliance Monitoring Plan  
SAP/QAPP**



**APPENDIX G: DRAFT CONSTRUCTION  
COMPLIANCE MONITORING PLAN  
SAMPLING AND ANALYSIS/ QUALITY  
ASSURANCE PROJECT PLAN**

**Time Oil Bulk Terminal  
Seattle, Washington**

**June 28, 2021**

**APPENDIX G: DRAFT CONSTRUCTION  
COMPLIANCE MONITORING PLAN  
SAMPLING AND ANALYSIS/ QUALITY  
ASSURANCE PROJECT PLAN**

**Time Oil Bulk Terminal  
Seattle, Washington**

**June 28, 2021**

**PREPARED FOR:**

***TOC Seattle Terminal 1, LLC***

*2753 West 31<sup>st</sup> Street*

*Chicago, Illinois 60608*

**PREPARED BY:**



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Attachment A Standard Operating Procedures

# Acronyms and Abbreviations

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AOC	Area of concern
ASKO Property	ASKO Hydraulic Property
bgs	Below ground surface
CAA	Cleanup action area
CAP	Cleanup Action Plan
CUL	Cleanup level
CY	Cubic yards
DRO	Diesel-range organics
DQO	data quality objective
EDD	electronic data deliverable
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
FBI	Freidman & Bruya, Inc.
GMP	Groundwater Monitoring Plan
GRO	Gasoline-range organics
LCS/LCSD	laboratory control sample/laboratory control sample duplicate
IHS	Indicator hazardous substance
ISS	In situ solidification and stabilization
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LNAPL	Light non-aqueous-phase liquid
LTCMP	Long-Term Compliance Monitoring Plan
MCL	Maximum contaminant level
mg/kg	Milligrams per kilogram
MS	Matrix spike
MSD	Matrix spike duplicate
MTCA	Model Toxics Control Act
MDL	method detection limit
MRL	method reporting limit
MS/MSD	matrix spike/matrix spike duplicate
ORO	Oil-range organics
PID	Photoionization detector
POC	Point of compliance
PPCD	Prospective Purchaser Consent Decree
Project	Time Oil Bulk Terminal Site
PARCC	precision, accuracy, representativeness, comparability, and completeness
PDF	portable document format
PQL	practical quantitation limit
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RACR	Remedial Action Completion Report

RPD	relative percent difference
REL	Remediation level
ROW	Right of way
SDG	Sample delivery group
SOP	standard operating procedure
TCE	Trichloroethene
TOCST	TOC Seattle Terminal 1, LLC
TPH	Total petroleum hydrocarbons
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

# 1 Introduction

This Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) has been prepared for TOC Seattle Terminal 1, LLC (TOCST) for the former Time Oil Bulk Terminal<sup>1</sup> (Property) located on W. Commodore Way in Seattle, Washington. The Property generally consists of four separate parcels (commonly identified as the Bulk Terminal parcel, ASKO Hydraulic parcel [ASKO parcel], East Waterfront parcel, and West Waterfront parcel) that were acquired by TOCST in November 2020 under the terms of a Prospective Purchaser Consent Decree (PPCD) entered in King County Cause No. 20-2-15215-3 SEA (as amended). These parcels are collectively termed the Property for purposes of this document.

The purpose of this SAP is to present the methodology for collecting and analyzing samples associated with soil excavation, and other elements of the project cleanup action detailed in the Engineering Design Report (EDR). The work addressed in this SAP is being conducted in accordance with Washington Administrative Code (WAC) 173-340-820 and the Washington State Department of Ecology (Ecology) guidance (Ecology 1995).

This QAPP describes quality assurance/quality control (QA/QC) procedures associated with collecting, analyzing, validating, and using soil and groundwater data for the selected cleanup actions at the Property. This QAPP uses Ecology’s Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. July 2016. Publication No. 04-03-030 (Ecology 2016).

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<sup>1</sup> The parcels include King County Parcel Nos. 1125039050, 1125039081, 1125039120, and 4237900405, also referenced as Property for purposes of this SAP QAPP. The legal definition of the Site is set forth in the PPCD.

## 2 Sampling and Analysis Plan

This SAP addresses excavation sidewall and bottom soil sampling and ISS performance sampling. Additional samples may be required, such as water discharge samples, import fill and compaction testing. These additional samples will be collected by the Contractor and will be detailed in the Contractor’s Technical Execution Plan (as outlined in Section 5.1 of the EDR). All of this data will be collected and summarized in the Remedial Action Completion Report (RACR), which will be prepared to meet the requirements of WAC 173-340-400(6)(b).

Attachment A includes example field forms and Attachment B includes standard operating procedures (SOPs) to be used during field efforts.

### 2.1 Roles and Responsibilities

The cleanup action implementation team includes representatives from TOCST, Ecology, CRETE, Floyd|Snider and other to-be-determined organizations, contractors, and service providers. Table G-1 shows anticipated EDR implementation roles and responsibilities. This information will be updated as the project progresses.

Samples will be submitted to Friedman & Bruya, Inc, an Ecology accredited laboratory located at 3012 16<sup>th</sup> Ave W, Seattle WA.

### 2.2 Excavation Sidewall and Bottom Soil Sampling

Contaminated soil will be removed from excavations at CAA-1, CAA-2.b, CAA-3, CAA-5, CAA-6, and CAA-7, as shown on Figure G-1, using standard excavation means and methods. The excavation areas will be delineated with survey grade GPS instrumentation before excavation by the Contractor. All areas will be marked with spray paint, pin flags, wooden survey stakes, or other common marking means as the ground surface may warrant. Attachment A includes a SOP for the collection of soil samples.

Once an excavation has been completed to its planned extents, confirmation sampling will be performed as needed in order to ensure that performance criteria exceedances in soil have been removed. Confirmation sampling will include sidewall and bottom samples to supplement existing data, and locations are shown on Figures G-2 through G-8. Samples will be collected as non-sieved, grab samples from the sidewall or bottom directly or from the excavator bucket (if deeper than 4 feet or determined unsafe to enter). Soil from each sidewall location will be spooned into a stainless steel bowl and homogenized where applicable. The soil within the container will be transferred to the laboratory-supplied sample jars. Some constituents, such as benzene, are not to be homogenized, and separate concurrent samples will be collected directly into sample containers prior to homogenization. Benzene, VOC samples (including Trichloroethene), and TPH-gasoline will be collected using EPA Method 5035A grab sampling methods. The sample jars will be



placed in a cooler and delivered to the laboratory as early in the day as possible (for rapid turn-around analysis) for analyses. Soil descriptions, field screening readings (e.g., photoionization detector (PID)), and other observations during collection will be recorded in the field on a sample collection form.

Samples will be collected from the excavation areas specified in Figure G-1. Locations may be adjusted to represent locations with the greatest field indications of contamination (i.e. odors, staining, sheen or elevated headspace volatiles concentrations measured with a PID). PID measurements for screening purposes will be collected by placing a small, palm-size portion of soil in an unused quart-sized Ziplock bag, sealing the bag, waiting approximately 5-minutes and piercing the bag with the PID probe tip for headspace vapor analysis. Sample locations will be spaced throughout the excavation bottom areas as shown on Figures G-2 through G-7. Sidewall samples will be collected at about the vertical mid-point corresponding to the zone of contamination removed. Bottom and sidewall samples may be collected directly from the excavation or can be collected from excavation buckets (if excavation are greater than 4 feet in depth or determined unsafe to enter). If samples are collected from excavation equipment buckets, samples will be collected from the center of the bucket, in the area most representative of the excavation sidewall area being sampled, to avoid the sidewalls of the bucket.

The samples that will be collected at each excavation are described below. Table G-2 lists the approximate number of bottom and sidewall confirmation soil samples to be collected at each remediated CAA.

### **2.2.1 CAA-1**

Contaminated soils at CAA-1.a are to be excavated to approximately 5-ft below ground surface (bgs) and contaminated soils at CAA-1.b are to be excavated to approximately 10-ft bgs. Following soil removal to the surveyed excavation extents, the CAA-1.a and CAA-1.b excavations will be sampled as illustrated on Figure G-2.

Soil samples from CAA-1 will be analyzed for total petroleum hydrocarbon (TPH) diesel and oil range organics (DRO and ORO) by Ecology Method NWTPH-Dx, and TPH-gasoline (GRO) by Ecology Method NWTPH-Gx.

### **2.2.2 CAA-2**

Contaminated soils at CAA-2.b are to be excavated to approximately 15-ft bgs. Following soil removal to the surveyed excavation extents, the floor of the CAA-2b excavation will be sampled as illustrated on Figure G-3. No sidewalls samples will be collected as they are adjacent to shoring or the ISS treatment area (CAA-2.a) and existing data is available to define the extent of the excavation. Soil samples from CAA-2.b will be analyzed for DRO and ORO by Ecology Method NWTPH-Dx, and GRO by Ecology Method NWTPH-Gx.

In order to evaluate the performance of the ORC-Advanced amendment to the northeast portion of CAA-2.b, performance groundwater sampling will be completed downgradient of this CAA. Quarterly sampling at down-gradient monitoring wells 01MW35 and 01MW84 will be completed in accordance with the draft Groundwater Monitoring Plan (GMP), Table

A.2, included as Appendix A of the September 2020 Cleanup Action Plan (CAP). Groundwater sampling procedures are included in the GMP and are not included in this SAP/QAPP.

### **2.2.3 CAA-3**

Contaminated soils at CAA-3 are to be excavated to approximately 5-ft bgs. Following soil removal to the surveyed excavation extents, soil samples will be collected as illustrated on Figure G-4.

Soil samples from CAA-3 will be analyzed for DRO and ORO by Ecology Method NWTPH-Dx, and GRO by Ecology Method NWTPH-Gx and select sample locations will be analyzed for Trichloroethene (TCE) by EPA Method 8260.

### **2.2.4 CAA-5**

Contaminated soils at CAA-5 are to be excavated to approximately 5-ft bgs. Following soil removal to the surveyed excavation extents the CAA-5 excavation will be sampled as illustrated on Figure G-5.

Soil samples from CAA-5 will be analyzed for DRO and ORO by Ecology Method NWTPH-Dx, and GRO by Ecology Method NWTPH-Gx and for arsenic by USEPA Method SW846-6010 or 6020.

### **2.2.5 CAA-6**

Contaminated soils at CAA-6.a are to be excavated to approximately 6-ft bgs along the northern end of the excavation area and to approximately 12-ft bgs along the southern end of the excavation area, while soils at CAA-6.b will be excavated to approximately 3-ft bgs. Following soil removal to the surveyed excavation extents the CAA-6.a and CAA-6.b excavations will be sampled as illustrated on Figures G-6 and G-7, respectively. Sidewall samples will not be collected in the following circumstances: 1) along walls that expose backfill from previous excavation activities, and 2) along the Ordinary High Water (OHW) mark.

Soil samples from CAA-6.a and 6.b will be analyzed for DRO and ORO by Ecology Method NWTPH-Dx, GRO by Ecology Method NWTPH-Gx, and benzene by USEPA Method SW846-8021B.

### **2.2.6 CAA-7**

Contaminated soils at CAA-7 are to be excavated to approximately 0.5-ft bgs to 2-ft bgs. Following soil removal to the surveyed excavation extents, the floor of the CAA-7 excavation will be sampled as illustrated on Figure G-8. Note that confirmation sampling data will be used in conjunction with existing data to determine if the arsenic cleanup level (CUL) has been achieved. Sidewall samples will not be collected in the following circumstances: 1) along the OHW mark; 2) along the footprint of the former ASKO warehouse, warehouse pad and paved access driveway; and 3) along walls that expose backfill from previous excavation activities (if applicable).

Soil samples from CAA-7 will be analyzed for arsenic by USEPA Method SW846-6020.

## 2.3 ISS Sampling

The Contractor shall complete ISS mixing in each compliance grid cell to the elevations specified in Section 5.4.2.1 of the EDR. The Engineer will direct the Contractor to collect each performance sample from a specific location and depth within each compliance grid cell. The Contractor will not be provided this information until ISS mixing in that area has been completed. Sampling will occur within 4 hours of mixing completion, before the ISS mix cures. Each sample will be collected using a sample collection tool attached to the excavator, and material from the sampler will be placed directly into a 5-gallon bucket using a small shovel or other hand tools as appropriate. The ISS performance samples will be transported to the ISS testing laboratory (likely Terracon or Timely Engineering Soil Tests) for the following tests:

- Hydraulic conductivity by American Society for Testing and Materials (ASTM) standard D5084
- Unconfined compressive strength (UCS) by ASTM standard D1633

Laboratory proctor compaction testing of mixed ISS material will also be performed on samples collected from the test grid cells by ASTM standard D698.

A minimum of two test grid cells will be completed within both CAA-2a and CAA-4 prior to mixing the remaining cells to confirm that the performance standards will be achieved using the methods and mix design submitted to the Engineer.

ISS performance samples will be prepared in accordance with the sample handling procedures discussed below. All samples will be collected with oversight from the Field Manager (or representative) to ensure that all procedures are followed and documented.

## 2.4 Equipment Decontamination

Field equipment and supplies include sampling equipment (e.g., bowls, tape measures), utensils (e.g., spoons, trowels), decontamination supplies, sample containers, coolers, log books and field forms, personal protection equipment (PPE), and personal gear. Protective wear (e.g., hard hats, gloves) are described in the Health and Safety Plan (included in Appendix H of the EDR). Sample containers, coolers, and packaging material will be supplied by the analytical laboratory.

All non-dedicated sampling equipment, such as stainless-steel sampling equipment, will be washed with Liqui-nox<sup>TM</sup> detergent and rinsed with distilled water prior to use and between sampling stations. The following decontamination steps will be performed on stainless-steel bowls and spoons used for homogenizing prior to use at each station:

- Wash with Liqui-nox<sup>TM</sup>
- Double rinse with distilled/deionized water
- Final rinse with distilled/deionized water.

If a residual petroleum sheen remains on the sampling equipment or is difficult to remove using the standard decontaminations procedures above, a hexane rinse may be added, followed by a final rinse with distilled/deionized water. Pre-decontaminated sample equipment will be kept wrapped in aluminum foil until time for use. To minimize sample cross-contamination, disposable gloves will be replaced between samples, or sooner if soiled or cross-contaminated during field activities.

For any soil samples collected from the excavator bucket, extra care is required to obtain a sample which has been minimally disturbed and/or has not been in direct contact with the bucket. Soil samples will be collected using gloved hands, stainless steel spoons, and/or disposable scoops. Gloves will be changed between each sample. Disposable scoops are pre-packaged in plastic wrap and opened only when ready to use, and scoops are disposed of after one-time use (one per dedicated sample). Reusable sampling equipment such as stainless steel spoons and bowls shall be decontaminated between sample locations.

## 2.5 Sampling Containers

Requirements for sample containers and storage conditions are provided in Table G-3. All soil sample containers for chemical analysis will have screw-type lids so that they are adequately sealed. Lids of the glass containers will have Teflon™ inserts to prevent sample reaction with the plastic lid and to improve the quality of the seal. Samples for GRO and benzene will be collected directly into laboratory-prepared VOA vials using EPA method 5035. Commercially available, pre-cleaned glass jars will be used for non-volatile analytes, and the laboratory will maintain a record of certification from the suppliers.

ISS performance testing samples will be placed into commercially available 5-gallon buckets. Each bucket will be secured with a lid for transport to the testing laboratory. Buckets will be filled to about three gallons to allow sufficient sample volume and allow for swelling as the sample cures.

## 2.6 Field Logs

All field activities and observations will be noted in a field log book or corresponding field form at the time they occur. The field log book will be a bound document, and separate individual field and sample log forms will be compiled with the field log book. Information will include personnel, date, time, station designation (excavation area), sampler, types and number of samples collected (including sample IDs and locations which may be recorded on a diagram), weather conditions, concurrent Project activities, health and safety meetings conducted (tailgate meeting), and general observations. Any changes that occur at the Project (e.g., personnel, responsibilities, deviations from this plan) and the reasons for these changes will be documented in the field log book. The log book will identify onsite visitors observing the sampling; the Project will have many concurrent activities and many onsite personnel; therefore only those specifically visiting/observing confirmation sampling activities will be documented. The number of photographs taken at each sampling location will be recorded. The Field Manager is responsible for ensuring that the field log book and all field data forms are correct.

All field activities and observations will be noted in a field log book during fieldwork. The descriptions will be clearly written with enough detail so that participants can reconstruct events later if necessary. Requirements for log book entries include:

- Log books will be bound, with consecutively numbered pages.
- Removal of any pages, even if illegible, will be prohibited.
- Entries will be made legibly with black (or dark) waterproof ink.
- Unbiased, accurate language will be used.
- Entries will be made while activities are in progress or as soon afterward as possible (the date and time that the notation is made should be noted, as well as the time of the observation itself).
- Each consecutive day's first entry will be made on a new, blank page.
- The date and time, based on a 24-hour (military) will appear on each page.
- When field activity is complete, the log book will be entered into the project file.
- The person recording the information must initial and date each page of the field log book. If more than one individual makes entries on the same page, each recorder must initial and date each entry. The bottom of the page must be signed and dated by the individual who makes the last entry

Log book corrections will be made by drawing a single line through the original entry allowing the original entry to be read. The corrected entry will be written alongside the original. Corrections will be initialed, dated, and explained.

## 2.7 Sample Handling and Custody

Sample containers will be appropriately labeled and stored prior to shipment or delivery to the laboratory. Samples must be packed to prevent damage to the sample containers and labeled to allow sample identification. All samples for chemical analysis must be packaged so that they do not leak, break, vaporize or cause cross-contamination of other samples. Each individual sample must be properly labeled and identified. Soil samples for chemical analysis must be kept cool, by means of ice packs or bagged ice in coolers, during the time between collection and final packaging (preservation methods are included on Table G-3).

All samples must be clearly identified immediately upon collection. Each sample container label will list:

- Client and project name
- A unique sample description/sample ID (see Table G-2 for example sample IDs for confirmation soil samples);
- Field duplicates sample ID's will not include the parent sample ID (i.e. "Dup-01");
- Sample collection date and time.

Additionally, the sample bottle label may include:

- Sampler's name or initials
- Indication of addition of preservative, if applicable
- Analyses to be performed.

Chain-of-custody procedures are intended to document sample possession from the time of collection, through analysis, to disposal. Chain-of-custody forms must document transfers of sample custody. A sample is considered to be under custody if it is in one's possession, view, or in a designated secure area. The chain-of-custody record will include, at a minimum, the following information:

- Client and project name
- Sample collector's name
- Sampler's company mailing address and telephone number
- Designated recipient of data (name, email, and telephone number)
- Analytical laboratory's name and city
- Description of each sample (i.e., unique identifier and matrix)
- Date and time of collection
- Quantity of each sample or number of containers
- Type of analysis required
- Addition of preservative, if applicable
- Requested turn-around times (most will be expedited)
- Date and method of shipment.

When transferring custody, both the staff relinquishing custody of samples and the staff receiving custody of samples will sign, date, and note the time on the form. If the samples are being shipped, the coolers (or shipping containers) will be sealed with a chain-of-custody seal and taped shut for transfer to the laboratory. If the samples are transferred to a laboratory courier or hand delivered to the laboratory by CRETE staff, the coolers do not need to be sealed. If samples are to leave the collector's possession for shipment to the laboratory, the subsequent packaging procedures will be documented in the field book. All samples will be stored appropriately by the laboratory.

## **2.8 Analytical Methods**

Soil samples from the excavated areas will be analyzed for various combinations of arsenic, DRO and ORO, GRO, TCE, and/or benzene using the analytical methods listed in Table G-3. The analytical results will be requested on a rapid turn-around basis (24 to 48 hours) because these data will be used to make decisions regarding the adequacy of excavation. Some instances may not require rapid turn-around analyses, and result times will be assigned on a case by case basis. Additionally, some samples may be submitted to the lab and analysis placed on hold pending the results of other samples.

ISS performance testing for UCS and hydraulic conductivity will be conducted using the ASTM standards listed in Table G-3. Once the samples are submitted to the laboratory, the laboratory will divide each sample into 2 separate components. Each mixing cell will have samples submitted for a 10 day and 28 day unconfined compressive strength test, 2 separate laboratory mixing cylinders. The first cylinder will be tested for hydraulic conductivity and 10 day unconfined compressive strength test. The second cylinder will be tested for 28 day unconfined compressive strength test. The results of the 10 day sample

provide an indication of how the ISS is performing, essentially providing an early warning if an ISS mixing cell may fail performance standards. The ISS performance samples are based on a 28 day unconfined compressive strength test, final compliance will be on the 28 day sample.

## 3 Quality Objectives

The overall data quality objective for this project is the collection of representative data of known and acceptable quality. The QA procedures and measurements that will be used for this project are based on EPA guidance (EPA 2006). Parameters related to precision, accuracy or bias, representativeness, completeness, and comparability (PARCC) will be used to assess the quality of the data (Table G-4).

### 3.1 Precision

Precision is a measure of how closely one result matches another result expected to have the same value. Field precision will be assessed by collecting one duplicate sample for every ten field samples of each media. Field precision is determined by the relative percent difference (RPD) between a sample and its duplicate. However, results from the analysis of a duplicate sample also tests laboratory precision. Therefore, the RPD between the sample and the field replicate provides an indication of both the field and laboratory precision. The tolerance limit for percent differences between field duplicates is defined in Table G-4. If the RPDs exceed these limits, a replicate sample may be run to verify laboratory precision. If any RPD exceedance is linked to field sampling, the Field Manager will recheck field sampling procedures and identify the problem. Resampling and analysis may be required.

Laboratory precision can be measured through the evaluation of laboratory control samples/duplicates (LCS/LCSD). The laboratory will perform the analysis of one set of LCS/LCSD samples for every 20 samples. Laboratory precision will be evaluated by the RPD for each analyte between LCS/LCSD samples.

$$RPD = \frac{ABS(R1-R2)}{(R1+R2)/2} \times 100$$

Where:

ABS = absolute value

R1 = Sample result

R2 = Duplicate sample result.

The tolerance limit for percent differences between laboratory control sample duplicates will be  $\pm 20$  percent for soil samples and  $\pm 20$  percent for groundwater samples. If the precision values are outside this limit, the laboratory will recheck the calculations and/or identify the problem. Reanalysis may be required.

### 3.2 Accuracy

Accuracy is an expression of the degree to which a measured or computed value represents the true value. Accuracy may be expressed as a percentage of the true or reference value for reference material or as spike recovery from matrix spike/matrix spike



duplicate (MS/MSD) samples. The RPD between the MS and MSD is used to evaluate laboratory accuracy. The following equations are used to express accuracy:

- For reference materials:
  - Percent of true value = (measured value/true value) x 100
- For spiked samples:
  - Percent recovery =  $([SQ - NQ]/S) \times 100$

SQ = quantity of spike or surrogate found in sample

NQ = quantity found in native (unspiked) sample

S = quantity of spike or surrogate added to native sample

The performance of the method will be monitored using surrogate compounds or elements. For organic analyses, surrogate standards are added to samples, method blanks, matrix spikes, and calibration standards. These standards will be based on laboratory-derived control limits for surrogate recovery and MS/MSD results. If percent recoveries are not achieved, equipment will be re-calibrated, examined for malfunctions, repaired if needed, and samples will be analyzed again at the laboratory. If sufficient quantity is left from the original sample, the original sample will be used. If insufficient sample remains for additional analysis, new samples will be collected and submitted to the laboratory for analysis. Any additional sample collection will follow the procedures outlined in this SAP/QAPP.

Laboratory method reporting limits (MRL) are listed in Table G-3.

### 3.3 Representativeness

Representativeness is the degree to which data from the project accurately represent a particular characteristic of the environmental matrix which is being tested. Representativeness of samples is achieved by adherence to standard field sampling protocols and standard laboratory protocols. Representativeness will be evaluated by ensuring the approved sampling plan design is followed, and confirming the appropriate sampling techniques (e.g., sample preservation, etc.) and sample handling protocols (e.g., holding times, etc.) were used.

### 3.4 Comparability

Comparability is the qualitative similarity of one dataset to another (i.e., the extent to which different datasets can be combined for use). Comparability will be addressed through the use of field and laboratory methods that are consistent with the standard methods and procedures recommended by Ecology and/or EPA and that are commonly used for groundwater and soil studies.

### 3.5 Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

$$\text{Completeness} = \frac{\text{number of valid measurements}}{\text{total number of data points planned}} \times 100$$

The data quality objective (DQO) for completeness for all analytes is 90%. Data that have been qualified as estimated (J qualified) will be considered valid for the purpose of assessing completeness. Data that have been qualified as rejected will not be considered valid for the purpose of assessing completeness. Results will be considered valid if all the precision and accuracy targets are met. Resampling or re-analysis of remaining sample aliquots may be required if the completeness DQO is not met.

## 3.6 Laboratory QC Procedures

Additional laboratory QC procedures will be evaluated to provide supplementary information regarding overall quality of the data, performance of instruments and measurement systems, and sample-specific matrix effects.

QC samples and procedures are specified in each method protocol. All QC requirements will be completed by the laboratory as described in the protocols, including the following (as applicable to each analysis):

- Instrument tuning
- Initial calibration
- Initial calibration verification
- Continuing calibration
- Calibration or instrument blanks
- Method blanks
- LCS/LCSD
- Internal standards
- Surrogate spikes
- Serial dilutions
- MS/MSD.

## 3.7 Quality Control

### 3.7.1 Laboratory Quality Control

Only laboratories accredited in accordance with WAC 173-50, Accreditation of Environmental Laboratories will be used for this project. Internal quality control procedures are used to produce consistently high-quality data. A routine QC protocol is an essential part of the analytical process. The minimum requirements for each analytical run are described here. Additional description of laboratory QA/QC procedures can be found in the laboratory's QA manual. A project narrative detailing analytical results must accompany all data packages submitted by the laboratory.

Preparation batches have a maximum of 20 field samples of the same matrix. QA/QC samples processed with each batch are:

- **One method blank.** The method blank is used to assess the preparation batch for possible contamination during the preparation and processing steps. It consists of an analyte-free solid or analyte-free water that is processed along with and under the same conditions as the environmental samples. Concentrations of compounds detected in the blank will be compared to the samples. Any concentration of common laboratory contaminants (i.e., phthalates, acetone, methylene chloride, or 2-butanone) in a sample lower than 10 times that found in the blank will be considered a laboratory contaminant and will be qualified as such. For other contaminants, any compounds detected at concentrations lower than five times that found in the blank will be considered laboratory contamination (EPA 2017). Values reported for the method blanks are expected to be below the MDLs for all analytes, except the common laboratory contaminants. Deviations from this must be explained in the laboratory project narrative(s).
- **One Laboratory Control Sample (LCS).** The LCS is used to evaluate the performance of the total analytical system, including all preparation and analysis steps.
- **One Matrix Spike (MS).** Matrix specific QA/QC samples indicate the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. The information from these controls is sample/matrix specific and is not normally used to determine the validity of the entire batch.
- **At least one duplicate.** Duplicates are replicate aliquots of the same sample taken through the entire analytical procedure. The results from this analysis indicate the precision of the results for the specific sample using the selected method. One duplicate sample is analyzed with each preparation batch. If sufficient sample is provided, this will be either an MSD. If not, an LCSD will be analyzed.
- **Initial and continuing calibration:** A calibration standard will be analyzed each time an instrument is calibrated. The instruments used to perform the analyses will be calibrated, and the calibrations will be verified as required by EPA methodologies. For example, a standard five-point initial calibration will be utilized to determine the linearity of response with the gas chromatograph/electron capture detection. Once calibrated, the system must be verified every 12 hours. All relative response factors, as specified by the analytical method, must be greater than or equal to 0.05. All relative standard deviations, as specified by the analytical method, must be less than or equal to 30 percent for the initial calibration and less than or equal to 25 percent for the continuing calibration.
- **Surrogate evaluations:** Surrogate recovery is a QC measure used in organics analyses. Surrogates are compounds added to every sample at the initiation of preparation to monitor the success of the sample preparation on an individual sample basis (accuracy). Although some methods have established surrogate recovery acceptance criteria that are part of the method or contract compliance, for the most part, acceptable surrogate recoveries need to be determined by the laboratory. Recoveries of surrogates will be calculated for all samples, blanks, and QC samples. Acceptance limits will be listed for each

surrogate and sample type and will be compared against the actual result by the data validator.

- **Laboratory management review:** The Laboratory Project Manager will review all analytical results prior to final external distribution (preliminary results will be reported before this review). If the QA Officer finds that the data meet project quality requirements, the data will be released as “final” information. Data which are not acceptable will be held until the problems are resolved, or the data will be flagged appropriately.

### 3.7.2 Verification and Validation Methods

Analytes detected at concentrations between the MRL and the method detection limit (MDL) will be reported with a J qualifier to indicate that the value is an estimate (i.e., the analyte concentration is below the calibration range). J-qualified data are considered valid when completeness is calculated. Undetected data will be reported at the MRL. The MRL will be adjusted by the laboratory as necessary to reflect sample dilution or matrix interference.

Verification of completeness and method compliance, as well as raw data entry and calculations by analysts will be reviewed by the Laboratory QA Officer. The Laboratory QA Officer will be responsible for checking each group or test data package for precision, accuracy, method compliance, compliance to special client requirements, and completeness. The Laboratory QA Officer will also be responsible certifying that data in PDFs and EDDs are identical prior to release from the laboratory.

### 3.7.3 Field Quality Control

QA/QC samples will be collected during all sampling activities. Field duplicate and matrix spike/matrix spike duplicate samples will be collected as follows.

Field duplicate samples will use the same naming system as the environmental samples so that they are submitted “blind” to the laboratory. Field duplicates are useful in identifying problems with sample collection or sample processing. One duplicate sample will be collected for every 20 field samples of the same matrix. Each field duplicate will be analyzed for the same parameters as the parent samples to evaluate heterogeneity attributable to sample handling. Field duplicate sample IDs and associated sample location will be recorded in the field logbook.

One matrix spike/matrix spike duplicate sample (MS/MSD) will be collected for every 20 field samples. Extra sample containers (the same as those for the environmental sample) collected for MS/MSD analyses will be noted in field notes and on chain-of-custody forms submitted to the analytical laboratory. Extra sample bottles for MS/MSD will be labeled with a “-MS/MSD” suffix for clarity in sample processing.

### 3.7.4 Equipment Testing, Inspection, and Maintenance

The primary objective of an instrument/equipment testing, inspection, and maintenance program is to aid in the timely and effective completion of a measurement effort by minimizing the downtime due to component failure.

Testing, inspection, and maintenance will be carried out on all field and laboratory equipment in accordance with manufacturer's recommendations and professional judgment.

Analytical laboratory equipment preventative testing, inspection, and maintenance will be addressed in the laboratory QA manual, which will be kept on file at the contracted laboratory.

As appropriate, schedules and records of calibration and maintenance of field equipment will be maintained in the field notebook. Equipment that is out of calibration or is malfunctioning will be removed from operation until it is recalibrated or repaired.

Field equipment and laboratory instrumentation used for monitoring and sample analysis will be subject to the following calibration requirements:

- **Identification.** Either the manufacturer's serial number or the calibration system identification number will be used to uniquely identify equipment. This identification, along with a label indicating when the next calibration is due, will be attached to the equipment. If this is not possible, records traceable to the equipment will be readily available for reference.
- **Standards.** Equipment will be calibrated, whenever possible, against reference standards having known valid relationships to nationally recognized standards (e.g., National Institute of Standards and Technology) or accepted values of natural physical constraints. If national standards do not exist, the basis for calibration will be described and documented.
- **Frequency.** Equipment will be calibrated at prescribed intervals and/or prior to use. Frequency will be based on the type of equipment, inherent stability, manufacturers' recommendations, intended use, and observation of equipment readings over the course of the field work. All sensitive equipment to be used in the field or laboratory will be calibrated or checked prior to use.
- **Records.** Calibration records (certifications, logs, etc.) will be maintained for all measuring and test equipment used.

If field or laboratory equipment is found to be out of calibration, the validity of previous measurements will be investigated, and/or corrective action will be implemented. The Field QA Manager or the Laboratory QA Manager, respectively, will lead the evaluation process, which will be document in the field forms or laboratory log book, respectively.

All laboratory calibration requirements must be met before sample analysis may begin. The laboratory will follow the calibration procedures dictated by the analytical methods to be

performed. If calibration non-conformances are noted, samples will be reanalyzed under compliant calibration conditions within method-specified hold times.

### **3.7.5 Inspection and Acceptance of Supplies and Consumables**

The Field Manager will be responsible for material procurement and control. The Field Manager will verify upon receipt that materials meet the required specifications and that, as applicable, material or standard certification documents are provided, maintained, and properly stored with the project files. The Field Manager will also verify that material storage is properly maintained and that contamination of materials is not allowed.

The laboratory must document and follow procedures related to:

- Checking purity standards, reagent grade water, and other chemicals relative to intended use
- Handling disposable glassware (including appropriate grade).

The Field Manager will be responsible for procuring and transporting the appropriate sample containers, equipment, and consumables (e.g., gloves, Liqui-nox<sup>TM</sup>) to the Project. The containers will be pre-cleaned and certified by lot. If needed, reagents provided will be of the appropriate grade for the analysis. Records of these certifications and grades of material will be maintained on file at the laboratory.

## 4 Data Management Procedures

Upon receipt of data, the QA Officer will evaluate field and laboratory precision by the RPDs between the field duplicate and sample data. Non-conforming items and activities are those which do not meet the project requirements or approved work procedures. Non-conformance may be identified by any of the following groups:

- **Field staff/Manager:** during the performance of field activities, supervision of subcontractors, performance of audits
- **Laboratory staff:** during the preparation for and performance of laboratory testing, calibration of equipment, and QC activities
- **QA Staff:** during the performance of audits and during data validation, through the use of data to make decisions (i.e., do the data make sense?).

If possible, the Field Manager will identify any action that can be taken in the field to correct any non-conformance observed during field activities. If necessary and appropriate, corrective action may consist of a modification of methods or a re-collection of samples. If implementation of corrective action in the field is not possible, the non-conformance and its potential impact on data quality will be discussed with the Ecology PM and the final resolution of the non-conformance will be documented in the data quality section of the Remedial Action Completion Report (RACR).

Corrective action to be taken as a result of non-conformance during field activities will be situation-dependent. The laboratory will be contacted regarding any deviations from the QAPP, will be asked to provide written justification for such deviations, and in some instances, will be asked to reanalyze the sample(s) in question. All corrective actions must be documented. The person identifying the nonconformance will be responsible for its documentation.

Documentation will include the following information:

- Name(s) of the individual(s) identifying or originating the nonconformance
- Description of the nonconformance
- Any required approval signatures
- Method(s) for correcting the nonconformance or description of the variance granted.

Documentation will be made available to project, laboratory, and/or QA management. Appropriate personnel will be notified by the management of any significant nonconformance detected by the project, laboratory, or QA staff. Implementation of corrective actions will be the responsibility of the Field Manager or the QA Officer. Any significant recurring nonconformance will be evaluated by project or laboratory personnel to determine its cause. Appropriate changes will then be instituted in project requirements

and procedures to prevent future recurrence. When such an evaluation is performed, the results will be documented. If there are unavoidable deviations from this QAPP, the Project Manager will document the alteration and track the change in the subsequent deliverables.



## 5 Audits and Reports

Field staff will maintain field notes in a bound notebook or on field forms, and all documents, records, and data collected will be kept in a case file in a secure records filing area. All laboratory deliverables with verifiable supporting documentation shall be submitted by the laboratory to the QA Officer. The following documents will be archived at the laboratory: 1) signed hard copies of sampling and chain-of-custody records; and 2) electronic files of analytical data including extraction and sample preparation bench sheets, raw data, and reduced analytical data. The laboratory will store all laboratory documentation of sample receipt and login; sample extraction, cleanup, and analysis; and instrument output in accordance with the laboratory Standard Operating Procedure (SOP) or QA manual.

PDFs of all analytical reports will be retained in the laboratory files, and at the discretion of laboratory management, the data will be stored electronically for a minimum of 1 year. After 1 year, or whenever the data become inactive, the files will be transferred to archives in accordance with standard laboratory procedure. Data may be retrieved from archives upon request.

No audits, other than the identified data verification and validation will be conducted.

## 6 Data Quality (Usability) Assessment

The QA Officer will review the field notebooks, laboratory reports, and the data validation review to determine if the data quality objectives have been met (Table G-4). Instances where the data quality objectives were not met will be documented. The usability of the data will depend on the magnitude of the data quality objective exceedance. Data that has been rejected will be flagged as “R” and will not be included in the database. The QA Officer will determine if rejected data trigger additional sample collection.

## 7 References

Ecology 2016. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. Publication No. 04-03-030. July 2004, revised December 2016.

Ecology 2016. Guidance for Remediation of Petroleum Contaminated Sites. Publication No. 10-09-057. Revised June 2016.

EPA 2006. SW-846 on-line, test methods for evaluating solid waste— physical/chemical methods. <http://www.epa.gov/epaoswer/hazwaste/test/main.htm>.

EPA 2017. Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review. EPA-540-R-2017-002. January 2017.

# Tables

**Table G-1 Project Roles and Responsibilities**

Role	Person	Responsibilities
<b>Ecology Project Manager</b>	Tena Seeds (206-594-0089) Department of Ecology	<ul style="list-style-type: none"> <li>• Direct other Ecology staff and their consultants to review and comment on materials</li> <li>• Grant final approval on this QAPP, on data use, and on further data collection.</li> </ul>
<b>Project Coordinator</b>	Allison Geiselbrecht and Lynn Grochala Floyd   Snider (206-292-2078)	<ul style="list-style-type: none"> <li>• Designated representative responsible for overseeing the implementation of the PPCD (Allison Geiselbrecht)</li> <li>• Primary point of contact designated by the Project Coordinator for communications with Ecology related to activities performed per the PPCD (Lynn Grochala)</li> <li>• Maintaining historical site analytical database (Lynn Grochala)</li> </ul>
<b>Consultant Team Project Manager</b>	Grant Hainsworth CRETE (253-797-6323)	<ul style="list-style-type: none"> <li>• Primary point of contact with the Owner</li> <li>• Review all technical documents associated with the project for technical accuracy and feasibility, as well as adherence to budget and schedule.</li> </ul>
<b>Quality Assurance Officer</b>	Jamie Stevens CRETE (206-799-2744)	<ul style="list-style-type: none"> <li>• Monitor all aspects of the project to verify that work follows project plans</li> <li>• Review laboratory analytical data</li> <li>• Serve as liaison between the laboratory and Field Manager</li> <li>• Maintain a complete set of laboratory data</li> <li>• Evaluate conformance of the analyses with the specifications of this QAPP</li> <li>• Verify the reported results with the raw data</li> <li>• Check that EDDs match the analytical reports</li> <li>• Review compliance with field methods and procedures.</li> </ul>
<b>Field Manager</b>	Rusty Jones CRETE (932-330-1359)	<ul style="list-style-type: none"> <li>• Collect or direct collection of soil and groundwater samples</li> <li>• Maintain a log (field log book) for all sampling-related activities</li> <li>• Coordinate the sampling operations to verify that this QAPP is followed</li> <li>• Identify any deviations from this QAPP</li> <li>• Prepare the field data and information for RACR</li> <li>• Maintain the integrity of samples throughout sample collection and transport to the laboratory.</li> </ul>
<b>Laboratory Project Manager</b>	Eric Young Friedman & Bruya, Inc (206-285-8282)	<ul style="list-style-type: none"> <li>• Analysis oversight of soil and water samples</li> <li>• Practice quality assurance methods per internal laboratory SOPs and this QAPP, and document such practices</li> <li>• Verify quality of samples (e.g., cooler temperature) as they're received at the laboratory</li> <li>• Verify accuracy and completeness of laboratory reports and EDDs.</li> </ul>

**Table G-2 Confirmation Soil Samples Summary**

AOC	Analyte	Performance Criteria (mg/kg)	Sidewall Samples	Bottom Samples
CAA-1 (See Figure G-2)	GRO	5,000 (REL)	7 additional samples (typical: CAA-1-SS-#)	4 additional samples (typical: CAA-1-Base-#)
	Total DRO+ORO	12,000 (REL)		
CAA-2.b (See Figure G-3)	GRO	5,000 (REL)	0 new samples (See existing data on Figure G-3)	4 additional samples (typical: CAA-2b-Base-#)
	Total DRO+ORO	12,000 (REL)		
CAA-3 (See Figure G-4)	GRO	5,000 (REL)	4 additional samples (typical: CAA-3-SS-#)	3 additional samples for GRO and total DRO+ORO (typical: CAA-3-Base-#)
	Total DRO+ORO	12,000 (REL)		
	TCE	1.0 (REL)	2 additional samples (typical: CAA-3-SS-#)	1 additional sample (typical: CAA-3-Base-#)
CAA-5 (See Figure G-5)	Total DRO+ORO	2,000 (CUL)	4 additional samples (typical: CAA-5-SS-#)	0 new samples (See existing data on Figure G-5)
	Arsenic	7.3 mg/kg (CUL)		
CAA-6.a (See Figure G-6)	GRO	30 (CUL)	8 additional samples (typical: CAA-6a-SS-#)	4 additional samples (typical: CAA-6a-Base-#)
	Total DRO+ORO	2,000 (CUL)		
	DRO	570 (CUL)		
	ORO	1,600 (CUL)		
	Benzene	0.02 (CUL)		
CAA-6.b (See Figure G-7)	GRO	30 (CUL)	2 additional samples (typical: CAA-6b-SS-#)	1 additional sample (typical: CAA-6b-Base-#)
	Total DRO+ORO	2,000 (CUL)		
	DRO	570 (CUL)		
	ORO	1,600 (CUL)		
	Benzene	0.02 (CUL)		
CAA-7 (See Figure G-8)	Arsenic	7.3 mg/kg (CUL)	0 new samples (See existing data on Figure G-8)	7 additional samples (typical: CAA-7-Base-#)
Field Duplicate	varies (see note 1)	varies	1 per 20 soil samples (typical: Dup-01-sample date)	

Notes:  
 mg/kg Milligrams per kilogram  
 DRO – Diesel-range organics

AOC – Area of Concern  
 GRO – Gasoline-range organics

CUL – Cleanup Level

REL – Remediation Level

Note

ORO – Oil-range organics

TCE – Trichloroethene

1. Field duplicates will be collected based on 1 duplicate per 20 soil samples (total including sidewall and bottom samples). The analysis will depend on the parent sample. As an example, if a duplicate is collected from CAA-3, the duplicate will be run for the same analysis as the parent sample which will include GRO, Total DRO+ORO and possibly TCE.
2. See Figures G-2 through G-8 for sample locations, existing samples used in the confirmation sampling program, and existing data.

**Table G-3 Soil Sample Analytes and Container Requirements**

Analyte	Preparation Method	Analytical Method	Method Reporting Limit	Performance Criteria (lowest criteria)	Holding Time	Sample Container/Preservation
Arsenic (mg/kg)	3050	EPA 6020	0.3 to 5	7.3 (CUL)	6 months	4-ounce glass/None, cool to <6 °C
Benzene (mg/kg)	5035	EPA 8021	0.02	0.02 (CUL)	48 hours to freeze; 14 days to analysis	Four pre-weighed 40-ml VOA vials** / None, cool to <6 °C for up to 48 hours
Diesel Range Organics (mg/kg)	3550	NWTPH-Dx	5	570 (CUL)	14 days to extract; 40 days to analysis	4-ounce glass/None, cool to <6 °C
Oil Range Organics (mg/kg)	3550	NWTPH-Dx	5	1,600 (CUL)	14 days to extract; 40 days to analysis	4-ounce glass/None, cool to <6 °C
Gasoline Range Organics (mg/kg)	5035A	NWTPH-G	5	TPH-Gx with benzene = 30	14 days	Four pre-weighed 40-ml VOA vials** / None, cool to <6 °C for up to 48 hours
TCE (mg/kg)	5035A	EPA 8260D	0.001	1.0 (REL)	48 hours to freeze; 14 days to analysis	Four 40-ml VOA vials/ / None, cool to <6 °C for up to 48 hours
ISS Samples – unconfined compressive strength	NA	ASTMD 1633	NA	(28 days) greater than 50 psi*	28 days	5 gallon bucket/none
ISS Samples – Hydraulic Conductivity	NA	ASTMD 5084	NA	less than $1 \times 10^{-6}$ cm/sec*	28 days	5 gallon bucket/none

Notes: \*ISS testing performance criteria includes the following: Hydraulic Conductivity less than  $1 \times 10^{-6}$  cm/sec and unconfined compressive strength (UCS; 28 days) greater than 50 psi. Up to 10% of interior ISS grid cells may fail the above criteria but each grid cell must have a hydraulic conductivity no greater than  $10^{-5}$  cm/s and a UCS no less than 30 psi. Laboratory Proctor testing of mixed ISS material will be performed on samples collected from the test grid cells.

\*\*May be combined with other 5035 preparation methods

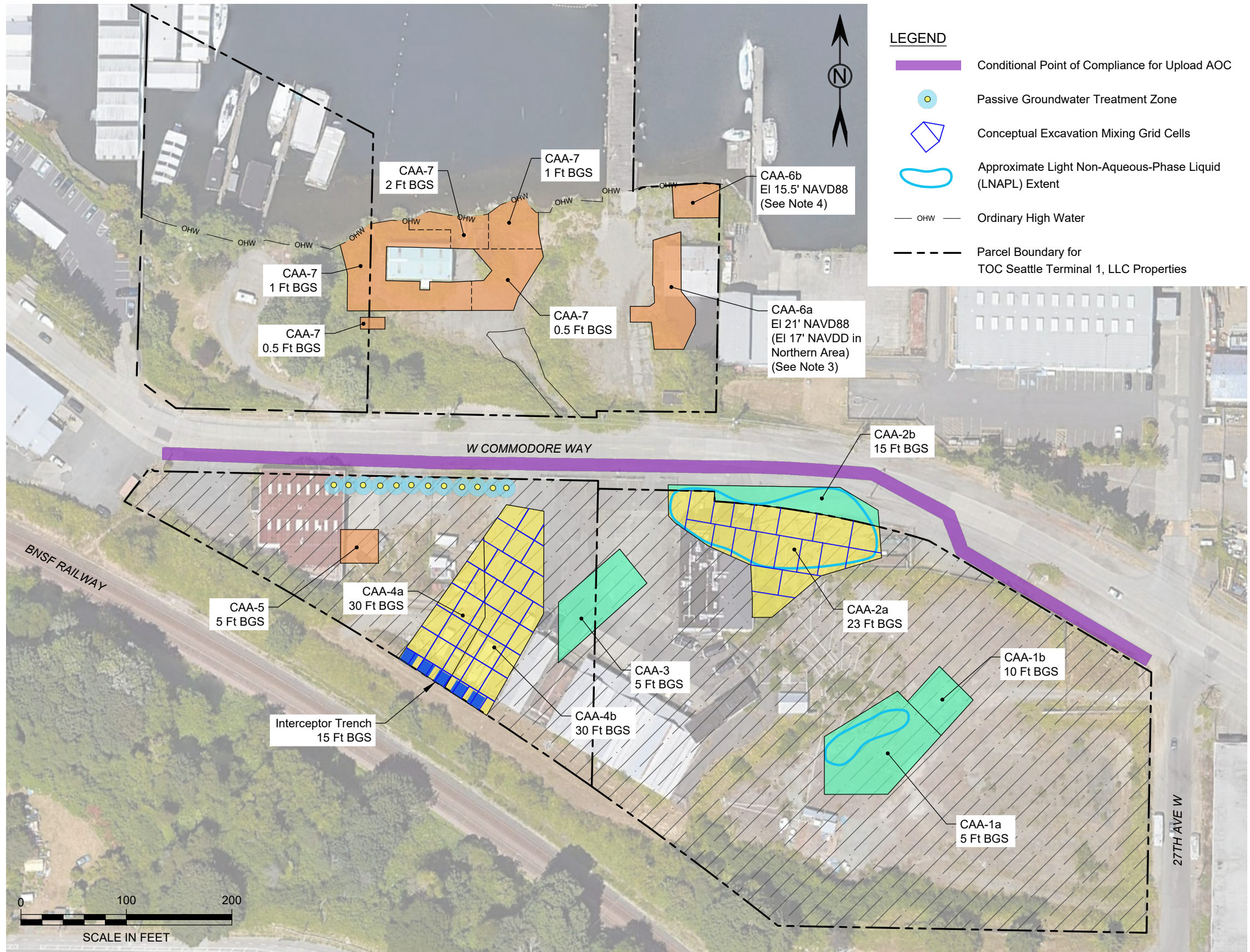


**Table G-4 Measurement Quality Objectives**







Parameter	Precision <sup>1</sup>	Accuracy	Completeness
Metals (arsenic)	20% RPD	70-130%	90%
Petroleum Hydrocarbons	30% RPD		
VOCs (Benzene and TCE)	30% RPD		

Notes: <sup>1</sup> Precision criteria apply to analytical precision only. Field duplicate precision will be screened against an RPD of 75%.  
RPD = relative percent difference



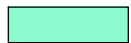



## Figures



**LEGEND**

-  Conditional Point of Compliance for Upload AOC
-  Passive Groundwater Treatment Zone
-  Conceptual Excavation Mixing Grid Cells
-  Approximate Light Non-Aqueous-Phase Liquid (LNAPL) Extent
-  Ordinary High Water
-  Parcel Boundary for TOC Seattle Terminal 1, LLC Properties

**SELECTED REMEDIAL ALTERNATIVE**

-  Capping With Pavement Or Buildings Upland Area Of Concern (AOC)
-  Excavation to Cleanup Level (CUL)
-  Excavation to Remediation Level (REL)
-  In-Situ Stabilization / Solidification
-  In-Situ Groundwater Treatment (See Note 1)
-  Interceptor Trench

**NOTES**

1. In-Situ groundwater treatment includes enhanced reductive dechlorination of the TCE and vinyl chloride groundwater plume using a trademark colloidal biomatrix and sulfidated micro zero-valent iron mixture (PlumeStop and S-MicroZVI) to create a passive treatment zone of chemical reduction and bioremediation in the Shallow WBZ and the addition of an enriched natural microbial consortium (BDI Plus) to stimulate rapid dechlorination of TCE.
2. Parcel boundaries obtained from King County GIS Center, 2011. Lot lines are approximate. Not for legal use.
3. The surface elevation at CAA-6a varies from 35' NAVD88 to 22' NAVD88. Elevations are provided to ensure final depths are achieved. The excavation will be approximately 15' ft bgs at the northern extent and 5' bgs at the southern extent.
4. The surface elevation in CAA-6b varies slightly, an elevation is provided to ensure that the excavation depth is reached throughout the excavation. The excavation will be about 3 ft bgs.

**ABBREVIATIONS**

- AOC = Area of Concern
- BDI = Bio-Dechlor INOCULUM
- CAA = Cleanup Action Area
- CUL = Cleanup Level
- CY = Cubic Yards
- Ft BGS = Feet Below Ground Surface
- ISS = In-Situ Solidification and Stabilization
- LNAPL = Light Non-Aqueous-Phase Liquid
- REL = Remediation Level
- TCE = Trichloroethene
- WBZ = Water-Bearing Zone
- OHW = Ordinary High Water Mark

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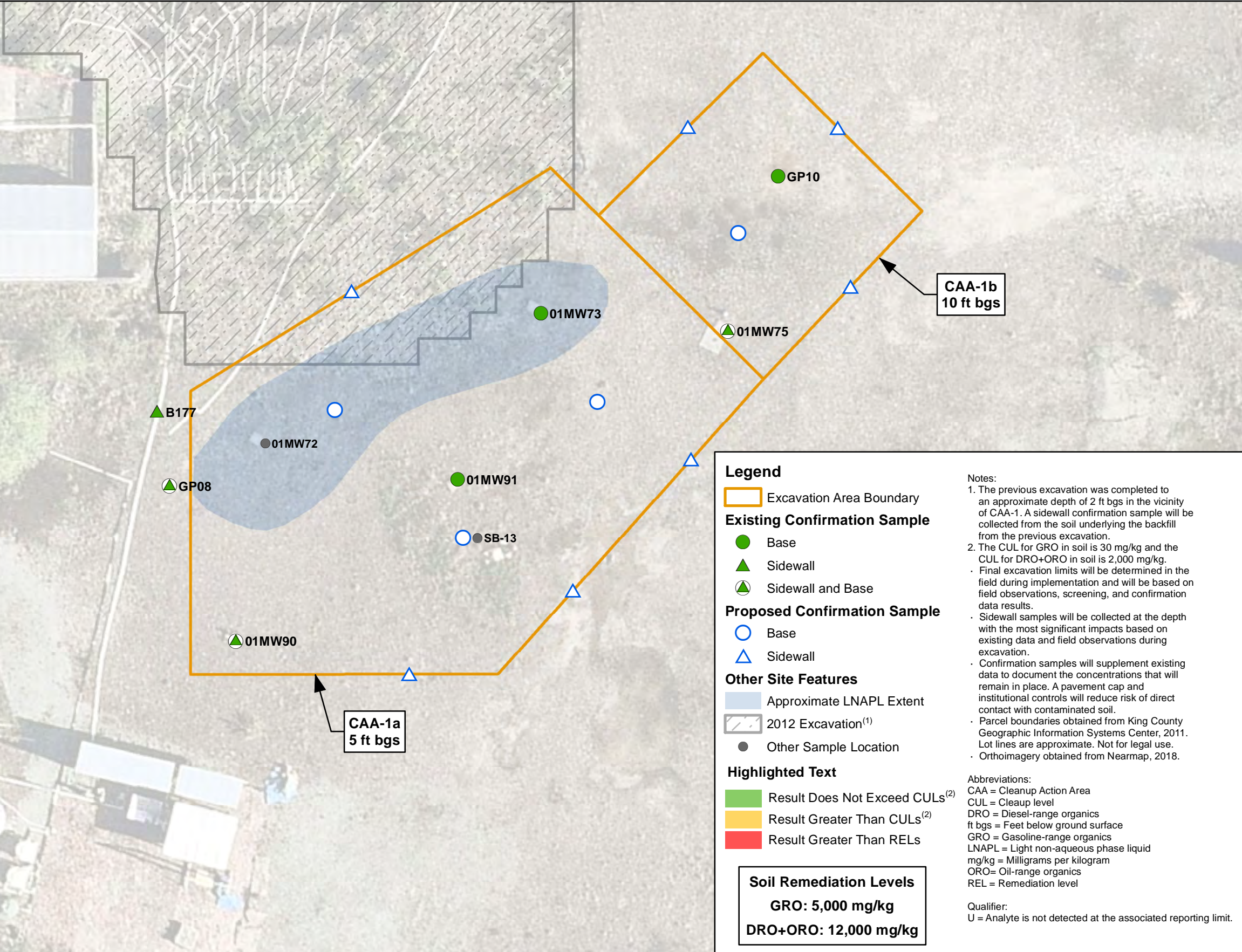
Existing Confirmation Sample Data				
Location	Depth ft bgs	Location Type	GRO mg/kg	DRO + ORO mg/kg
<b>CAA-1a</b>				
01MW73	5.5	Base	--	250 U
01MW75	5.5	Sidewall/Base	2 U	250 U
01MW90	2.5	Sidewall	2 U	250 U
01MW90	7.5	Base	2 U	250 U
01MW91	5	Base	2 U	250 U
B177	2.5	Sidewall	4.9	610
GP08	2.5	Sidewall	760	620
GP08	6	Base	4.8 U	33 U
<b>CAA-1b</b>				
GP10	15	Base	6.4	31 U

Summary of Other Available Data in CAA-1						
GRO (mg/kg)						
Depth (ft bgs)	CAA-1a					CAA-1b
	SB-13	01MW72	01MW73	01MW91	GP08	GP10
0-1		8				
2-3	9,300			5.0	760	
4-5						50
5-6				2.0 U		
6-7					4.8 U	
7-8				2.0 U		9,300
9-10						
10-11			3.0			
12-13					4.6 U	
15-16					4.8 U	6.4

DRO + ORO (mg/kg)						
Depth (ft bgs)	CAA-1a					CAA-1b
	SB-13	01MW72	01MW73	01MW91	GP08	GP10
0-1		360				
2-3	12,000			250 U	620	
4-5						160
5-6			250 U	250 U		
6-7					33 U	
7-8				250 U		16,000
9-10						
10-11			250 U			
12-13					31 U	
15-16					30 U	31 U

Note: Only depth intervals where data are available are shown.  
Existing sample is an excavation confirmation sample.



**Legend**

- Excavation Area Boundary
- Existing Confirmation Sample
  - Base
  - Sidewall
  - Sidewall and Base
- Proposed Confirmation Sample
  - Base
  - Sidewall
- Other Site Features
  - Approximate LNAPL Extent
  - 2012 Excavation<sup>(1)</sup>
  - Other Sample Location
- Highlighted Text
  - Result Does Not Exceed CULs<sup>(2)</sup>
  - Result Greater Than CULs<sup>(2)</sup>
  - Result Greater Than RELs

**Soil Remediation Levels**  
 GRO: 5,000 mg/kg  
 DRO+ORO: 12,000 mg/kg

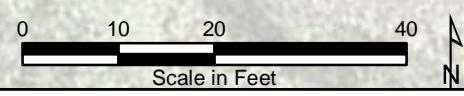
Notes:

- The previous excavation was completed to an approximate depth of 2 ft bgs in the vicinity of CAA-1. A sidewall confirmation sample will be collected from the soil underlying the backfill from the previous excavation.
- The CUL for GRO in soil is 30 mg/kg and the CUL for DRO+ORO in soil is 2,000 mg/kg.

- Final excavation limits will be determined in the field during implementation and will be based on field observations, screening, and confirmation data results.
- Sidewall samples will be collected at the depth with the most significant impacts based on existing data and field observations during excavation.
- Confirmation samples will supplement existing data to document the concentrations that will remain in place. A pavement cap and institutional controls will reduce risk of direct contact with contaminated soil.
- Parcel boundaries obtained from King County Geographic Information Systems Center, 2011. Lot lines are approximate. Not for legal use.
- Orthoimagery obtained from Nearmap, 2018.

Abbreviations:  
 CAA = Cleanup Action Area  
 CUL = Cleanup level  
 DRO = Diesel-range organics  
 ft bgs = Feet below ground surface  
 GRO = Gasoline-range organics  
 LNAPL = Light non-aqueous phase liquid  
 mg/kg = Milligrams per kilogram  
 ORO = Oil-range organics  
 REL = Remediation level

Qualifier:  
 U = Analyte is not detected at the associated reporting limit.

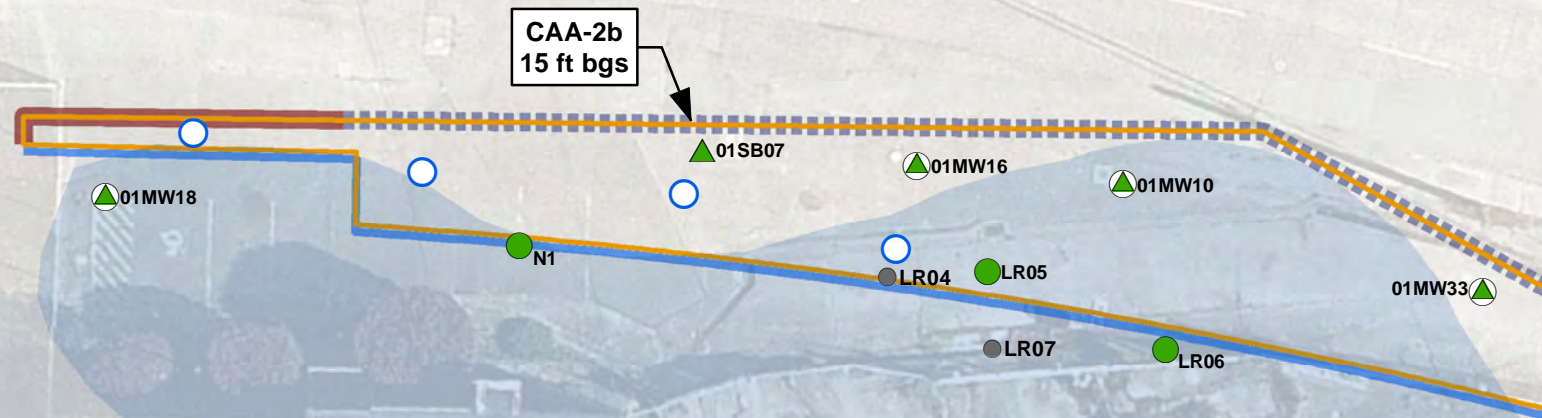


H:\GIS\Projects\Cantera-TOC\MXD\Eng Design\Compliance Sampling\Figure G-2 CAA-1 Excavation Area Sampling Plan.mxd  
 5/5/2021

Existing Confirmation Sample Data				
Location	Depth ft bgs	Location Type	GRO mg/kg	DRO + ORO mg/kg
01MW10	10	Sidewall	1,100	5,800
01MW10	15	Base	5.0 U	9,100
01MW16	5	Sidewall	5.0 U	25 U
01MW16	10	Sidewall	5.0 U	25 U
01MW16	15	Base	1,200	11,000
01MW18	5	Sidewall	5.0 U	25 U
01MW18	10	Sidewall	5.0 U	25 U
01MW18	15	Base	280	680
01MW33	8.5	Sidewall	640	7,700
01MW33	11	Sidewall	370	1,400
01MW33	18	Base	5.8	21
01SB07	5	Sidewall	1,200	2,000
LR05	15	Base	940	5,800
LR06	15	Base	5.7	10
N1	12	Base	2.0 U	17

Summary of Other Available Data in CAA-2b						
Gasoline-Range Organics (mg/kg)						
Depth (ft bgs)	01MW16	01MW18	LR04	LR05	LR06	LR07
2-3	23					
5-6	5.0 U	5.0 U	5.0 U	660	38	1,500
8-9						
10-11	5.0 U	5.0 U	830	1,300	5.0 U	530
11-12						
15-16	1,200	280	2,900	940	5.7	1,400
18-19						
20-21	5.0 U	220				
DRO + ORO (mg/kg)						
Depth (ft bgs)	01MW16	01MW18	LR04	LR05	LR06	LR07
2-3	140					
5-6	25 U	25 U	8,000	3,000	18	4,200
8-9						
10-11	25 U	25 U	7,100	15,000	320	5,800
11-12						
15-16	11,000	680	28,000	5,800	10	11,000
18-19						
20-21	25 U	25 U				

Note: Only depth intervals where data are available are shown.  
Existing sample is an excavation confirmation sample.



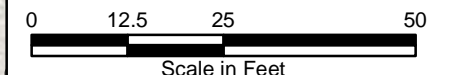
- Legend**
- Excavation Area Boundary
  - CAA-2a ISS Boundary
  - Shoring Wall
  - Trenchbox Shoring
- Existing Confirmation Sample**
- Base
  - Sidewall
  - Sidewall and Base
- Proposed Confirmation Sample**
- Base
- Other Site Features**
- Approximate LNAPL Extent
  - Other Sample Location
- Highlighted Text**
- Result Does Not Exceed CULs<sup>(1)</sup>
  - Result Greater Than CULs<sup>(1)</sup>
  - Result Greater Than RELs

**Soil Remediation Levels**  
**GRO: 5,000 mg/kg**  
**DRO+ORO: 12,000 mg/kg**

Notes:  
1. The CUL for GRO in soil is 30 mg/kg and the CUL for DRO+ORO in soil is 2,000 mg/kg.  
Final excavation limits will be determined in the field during implementation and will be based on field observations, screening, and confirmation data results.  
Confirmation samples will supplement existing data to document the concentrations that will remain in place. A pavement cap and institutional controls will reduce risk of direct contact with contaminated soil.  
Parcel boundaries obtained from King County Geographic Information Systems Center, 2011.  
Lot lines are approximate. Not for legal use.  
Orthoimagery obtained from Nearmap, 2018.

Abbreviations:  
CAA = Cleanup Action Area  
CUL = Cleanup level  
DRO = Diesel-range organics  
ft bgs = Feet below ground surface  
GRO = Gasoline-range organics  
LNAPL = Light non-aqueous phase liquid  
mg/kg = Milligrams per kilogram  
ORO = Oil-range organics  
REL = Remediation level

Qualifier:  
U = Analyte is not detected at the associated reporting limit.



Existing Confirmation Sample Data					
Location	Depth ft bgs	Location Type	GRO mg/kg	DRO +ORO mg/kg	TCE mg/kg
01MW15	2	Sidewall	5.0 U	300	--
01MW15	5	Base	5.0 U	51	--
01MW59	2.5	Sidewall	160	250 U	0.030 U
01MW59	5	Base	200	8,500	0.030 U
B91	2	Sidewall	800	8,300	--
B91	10	Base	--	--	0.098
B97	6	Base	1,600	3,200	0.031

Summary Other of Available Data in CAA-3									
GRO (mg/kg)									
Depth (ft bgs)	01MW15	01MW59	B89	B90	B91	B97	B130	SB-30	SB-31
2-3	5.0 U	160			800			5,100	580
3-4				380					
5-6	5.0 U	200							
6-7						1,600			
7-8							2.0 U		
10-11	5.0 U								
11-12			420						
13-14			9,700						
15-16	5.0 U	2.0 U							

DRO + ORO (mg/kg)									
Depth (ft bgs)	01MW15	01MW59	B89	B90	B91	B97	B130	SB-30	SB-31
2-3	300	250 U			8,300			830	19,000
3-4				24,000					
5-6	51	8,500							
6-7						3,200			
7-8							250 U		
10-11	25 U								
11-12			110						
13-14			6,000						
15-16	25 U	250 U							

TCE (mg/kg)									
Depth (ft bgs)	01MW15	01MW59	B89	B90	B91	B97	B130	SB-30	SB-31
2-3		0.030 U	0.030 U	0.030 U	0.030 U	0.030 U			
3-4				4.4					
5-6		0.030 U	0.030 U						
6-7						0.031			
10-11		0.030 U		0.030 U	0.098	0.030 U			
11-12			0.030 U						
13-14			0.030 U						
14-15					0.15				

Notes: Only depth intervals where data are available are shown.  
 B89 was excluded from the excavation as it met the decision criteria for exclusion presented in Figure 11.1 of the Supplemental Upland RIFS.  
 Existing sample is an excavation confirmation sample.



**Legend**

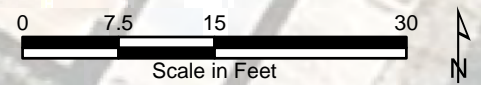
- Excavation Area Boundary
- Other Sample Location
- Existing Confirmation Sample**
  - Base
  - Sidewall
  - Sidewall and Base
- Proposed Confirmation Sample**
  - Base
  - Sidewall
- Highlighted Text**
  - Result Does Not Exceed CULs<sup>(1)</sup>
  - Result Greater Than CULs<sup>(1)</sup>
  - Result Greater Than RELs

**Soil Remediation Levels**  
**GRO: 5,000 mg/kg**  
**DRO+ORO: 12,000 mg/kg**  
**TCE: 1 mg/kg**

Notes:  
 1. The CUL for GRO in soil is 30 mg/kg and the CUL for DRO+ORO in soil is 2,000 mg/kg.  
 The goal of this excavation is to remove scattered petroleum-contaminated soil greater than the RELs and localized collocated benzene and TCE. Soil contamination in this area does not appear to be contributing to groundwater contamination and therefore the excavation will not be expanded unless there is an exceedance of the REL for GRO or total DRO and ORO in a sidewall sample. Confirmation samples will supplement existing data to document the concentrations that will remain in place. A pavement cap and institutional controls will reduce risk of direct contact with contaminated soil.  
 Sidewall samples will be collected at the depth with the most significant impacts based on existing data and field observations during excavation.  
 TCE will be analyzed at the base sample north of and the two sidewall samples south and east of the single detected REL exceedance at B90 in order to confirm that the excavation has removed the lateral extent of TCE exceeding the REL. TCE exceeding the REL is delineated vertically and in the remaining lateral directions by existing sample results.  
 Parcel boundaries obtained from King County Geographic Information Systems Center, 2011. Lot lines are approximate. Not for legal use.  
 Orthoimagery obtained from Nearmap, 2018.

Abbreviations:  
 CAA = Cleanup Action Area  
 CUL = Cleanup level  
 DRO = Diesel-range organics  
 ft bgs = Feet below ground surface  
 GRO = Gasoline-range organics  
 ORO = Oil-range organics  
 REL = Remediation level

Qualifier:  
 U = Analyte is not detected at the associated reporting limit.

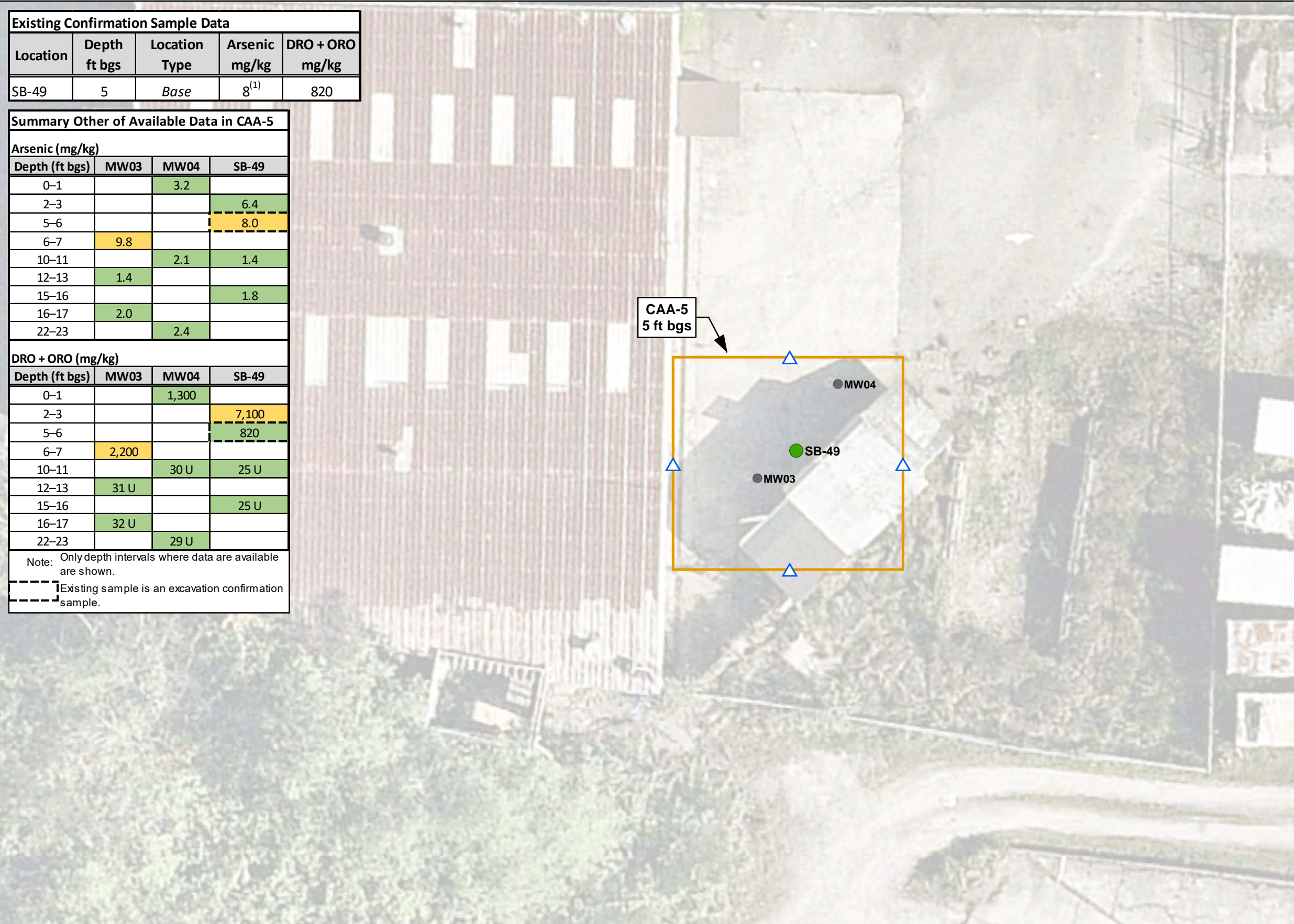


Existing Confirmation Sample Data				
Location	Depth ft bgs	Location Type	Arsenic mg/kg	DRO + ORO mg/kg
SB-49	5	Base	8 <sup>(1)</sup>	820

Summary Other of Available Data in CAA-5				
Arsenic (mg/kg)				
Depth (ft bgs)	MW03	MW04	SB-49	
0-1		3.2		
2-3			6.4	
5-6			8.0	
6-7	9.8			
10-11		2.1	1.4	
12-13	1.4			
15-16			1.8	
16-17	2.0			
22-23		2.4		
DRO + ORO (mg/kg)				
Depth (ft bgs)	MW03	MW04	SB-49	
0-1		1,300		
2-3			7,100	
5-6			820	
6-7	2,200			
10-11		30 U	25 U	
12-13	31 U			
15-16			25 U	
16-17	32 U			
22-23		29 U		

Note: Only depth intervals where data are available are shown.

Existing sample is an excavation confirmation sample.



- Legend**
- Excavation Area Boundary
  - Other Sample Location
  - Existing Confirmation Sample
    - Base
  - △ Proposed Confirmation Sample
    - △ Sidewall
- Highlighted Text**
- Result Does Not Exceed CULs
  - Result Greater Than CULs

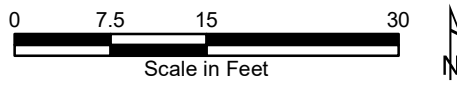
**Soil Cleanup Levels**  
 Arsenic: 7.3 mg/kg<sup>(1)</sup>  
 DRO+ORO: 2,000 mg/kg

**Soil Remediation Level**  
 DRO+ORO: 12,000 mg/kg

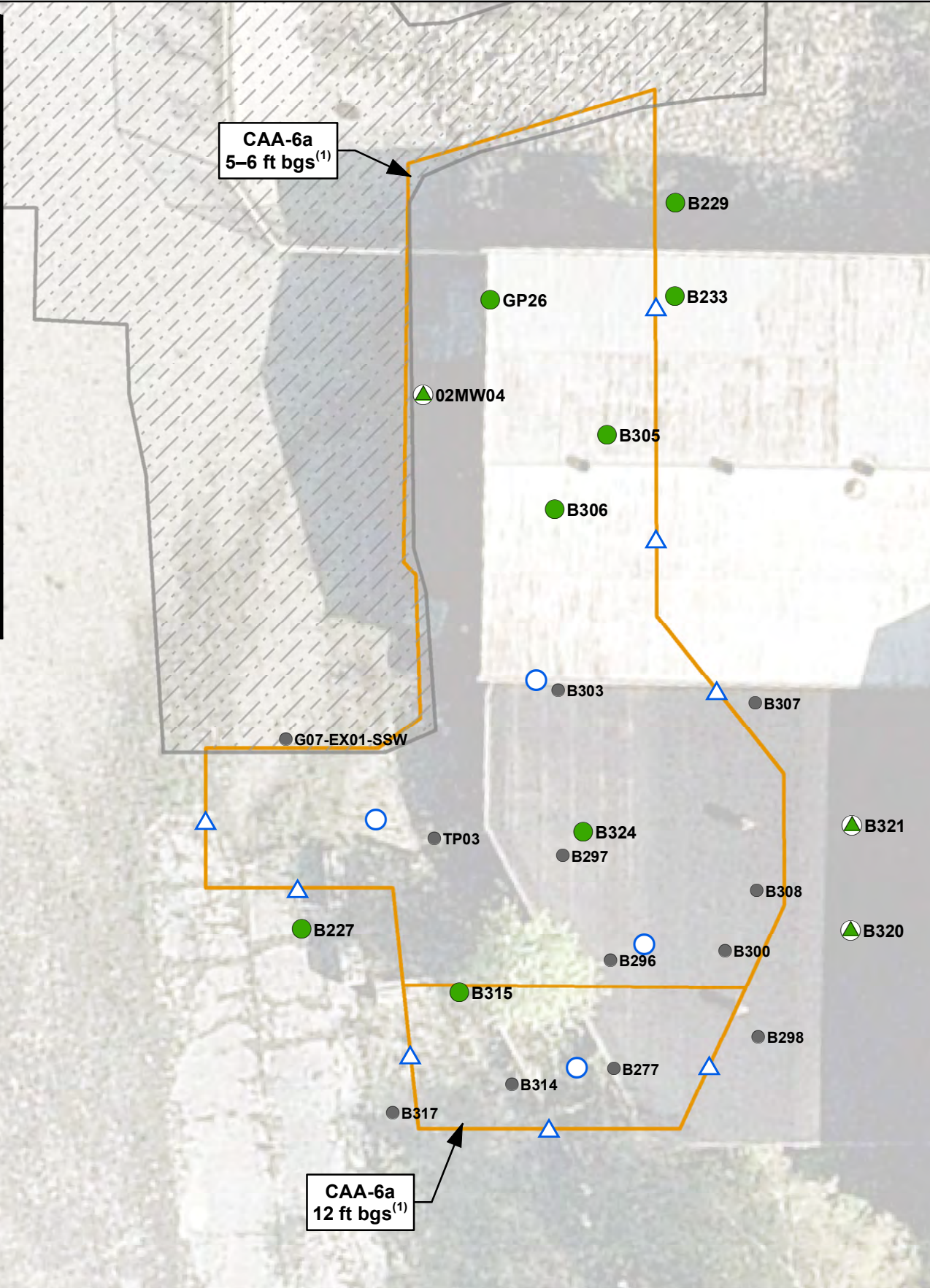
Notes:

- The CUL for Arsenic is based on natural background. Arsenic leaching to groundwater is strongly influenced by the soil's redox potential, which is biased toward reducing conditions in the presence of elevated petroleum concentrations. Removing petroleum within CAA-5 will restore the soil's natural geochemical conditions and protect groundwater.
- The goal of this excavation is to remove localized total DRO and ORO- and arsenic- contaminated soil to improve perched groundwater quality. There are no exceedances of the REL for total DRO and ORO and therefore the excavation will not be expanded unless there is an exceedance of the REL in a sidewall sample. Confirmation samples will supplement existing data to document the concentrations that will remain in place. A pavement cap and institutional controls will reduce risk of direct contact with contaminated soil.
- Sidewall samples will be collected at the depth with the most significant impacts based on existing data and field observations during excavation.
- Parcel boundaries obtained from King County Geographic Information Systems Center, 2011. Lot lines are approximate. Not for legal use.
- Orthoimagery obtained from Nearmap, 2018.

Abbreviations:  
 CAA = Cleanup Action Area  
 CUL = Cleanup level  
 DRO = Diesel-range organics  
 ft bgs = Feet below ground surface  
 mg/kg = Milligrams per kilogram  
 ORO = Oil-range organics  
 REL = Remediation level



Existing Confirmation Sample Data							
Location	Depth ft bgs	Location Type	GRO mg/kg	DRO mg/kg	ORO mg/kg	DRO + ORO mg/kg	Benzene mg/kg
<b>CAA-6a</b>							
<b>5-6 ft bgs excavation<sup>(1)</sup></b>							
O2MW04	2	Sidewall	5.0 U	10 U	25 U	25 U	0.050 U
O2MW04	5	Base	6.9	10 U	25 U	25 U	0.050 U
B227	5	Base	2.0 U	50 U	250 U	250 U	0.020 U
B229	5	Base	2.0 U	50 U	250 U	250 U	0.020 U
B233	5	Base	2.0 U	50 U	250 U	250 U	0.020 U
B305	5	Base	2.0 U	50 U	250 U	250 U	0.020 U
B306	5.5	Base	2.0 U	50 U	250 U	250 U	0.020 U
B320	3.5	Sidewall	2.0 U	50 U	250 U	250 U	0.020 U
B320	6	Base	2.0 U	50 U	250 U	250 U	0.020 U
B321	3.5	Sidewall	2.0 U	50 U	250 U	250 U	0.020 U
B321	6	Base	2.0 U	50 U	250 U	250 U	0.020 U
B324	5	Base	2.0 U	50 U	250 U	250 U	0.020 U
GP26	5	Base	19	50 U	250 U	250 U	0.020 U
<b>12 ft bgs excavation<sup>(1)</sup></b>							
B315	12.5	Base	2.0 U	50 U	250 U	250 U	0.020 U



**Legend**

- Excavation Area Boundary
- Existing Confirmation Sample
  - Base
  - Sidewall
  - Sidewall and Base
- Proposed Confirmation Sample
  - Base
  - Sidewall
- Other Site Features
  - 2013 TPH Excavation
  - Other Sample Location
- Highlighted Text
  - Result Does Not Exceed CULs
  - Result Greater Than CULs

**Soil Cleanup Levels**

GRO: 30 mg/kg  
 DRO: 570 mg/kg  
 ORO: 1,600 mg/kg  
 DRO+ORO: 2,000 mg/kg  
 Benzene: 0.020 mg/kg

Notes:

- The ground surface is sloped and excavation depths will vary accordingly, extending to a maximum depth of approximately 16 feet bgs at the southern extent of CAA-6a. The average target excavation depths are shown.
- Final excavation limits will be determined in the field during implementation and will be based on field observations, screening, and confirmation data results.
- Sidewall samples will be collected at the depth with the most significant impacts based on existing data and field observations during excavation.
- Parcel boundaries obtained from King County Geographic Information Systems Center, 2011. Lot lines are approximate. Not for legal use.
- Orthoimagery obtained from Nearmap, 2018.

Abbreviations:  
 CAA = Cleanup Action Area  
 CUL = Cleanup level  
 DRO = Diesel-range organics  
 ft bgs = Feet below ground surface  
 GRO = Gasoline-range organics  
 ORO = Oil-range organics  
 REL = Remediation level

Qualifier:  
 U = Analyte is not detected at the associated reporting limit.

0 7.5 15 30  
 Scale in Feet

I:\GIS\Projects\Cantera-TOC\MXD\Eng Design\Compliance Sampling\Figure G-6 CAA-6a Excavation Area Sampling Plan.mxd  
 4/29/2021



Summary of Other Available Data in CAA-6a

GRO (mg/kg)																	
Depth (ft bgs)	5-6 ft bgs Excavation								G07-EX01-SSW			12 ft bgs Excavation					
	B233	B296	B297	B300	B303	B305	B306	B307	B308	B324	GP26	TP03	B277	B298	B314	B315	B317
0-1		190	49		200	46											
1-2																	
2-3				280										2.0 U			
3-4						65											
4-5	2.0 U				2.0 U		2.0 U		2.0 U		19						
5-6				10		2.0 U			2.0 U	670		42		2.0 U			
6-7																	
8-9														280			
9-10	2.0 U																
10-11													2.0 U				
11-12															420	2.0 U	
14-15															2.0 U	2.0 U	2.0 U

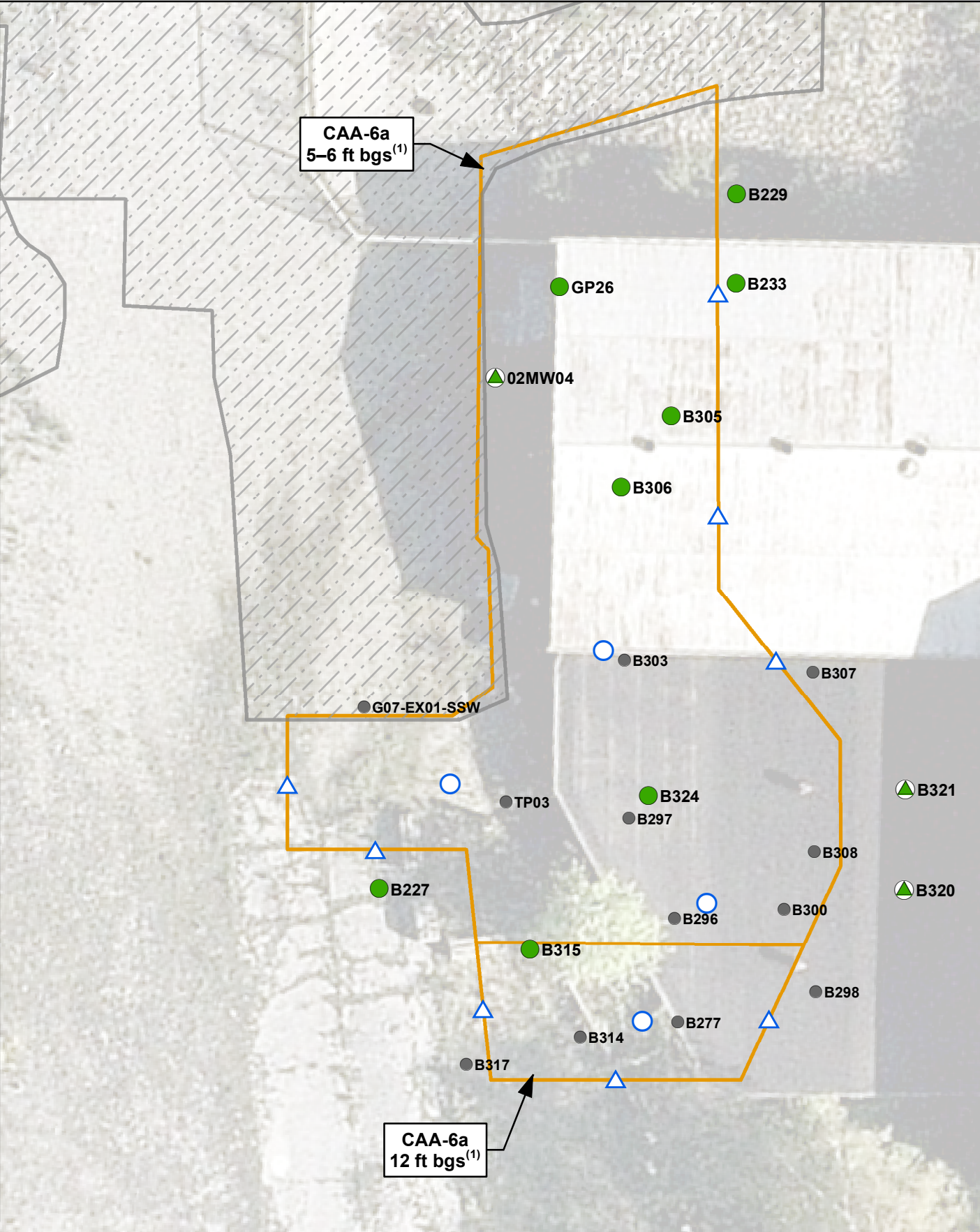
DRO (mg/kg)																	
Depth (ft bgs)	5-6 ft bgs Excavation								G07-EX01-SSW			12 ft bgs Excavation					
	B233	B296	B297	B300	B303	B305	B306	B307	B308	B324	GP26	TP03	B277	B298	B314	B315	B317
0-1		1,700	320		710	280											
1-2																	
2-3				2,500										50 U			
3-4						1,200											
4-5	50 U				50 U		50 U		50 U		50 U						
5-6				50 U		50 U			50 U	490		50 U		50 U			
6-7																	
8-9														2,000			
9-10	50 U																
10-11													50 U				
11-12															780	50 U	
14-15															50 U	50 U	50 U

ORO (mg/kg)																	
Depth (ft bgs)	5-6 ft bgs Excavation								G07-EX01-SSW			12 ft bgs Excavation					
	B233	B296	B297	B300	B303	B305	B306	B307	B308	B324	GP26	TP03	B277	B298	B314	B315	B317
0-1		13,000	1,800		3,400	250 U											
1-2																	
2-3				20,000													
3-4						1,200								250 U			
4-5	250 U				250 U		250 U		250 U		250 U						
5-6				250 U		250 U			250 U	250 U		250 U		250 U			
6-7										490							
8-9														14,000			
9-10	250 U																
10-11																	
11-12																5,500	250 U
14-15															250 U	250 U	250 U

DRO + ORO (mg/kg)																	
Depth (ft bgs)	5-6 ft bgs Excavation								G07-EX01-SSW			12 ft bgs Excavation					
	B233	B296	B297	B300	B303	B305	B306	B307	B308	B324	GP26	TP03	B277	B298	B314	B315	B317
0-1		15,000	2,100		4,100	250 U											
1-2																	
2-3				23,000													
3-4						2,400								250 U			
4-5	250 U				250 U		250 U		250 U		250 U						
5-6				250 U		250 U			250 U	490		250 U		250 U			
6-7																	
8-9														16,000			
9-10	250 U																
10-11																	
11-12																6,300	250 U
14-15															250 U	250 U	250 U

Benzene (mg/kg)																	
Depth (ft bgs)	5-6 ft bgs Excavation								G07-EX01-SSW			12 ft bgs Excavation					
	B233	B296	B297	B300	B303	B305	B306	B307	B308	B324	GP26	TP03	B277	B298	B314	B315	B317
0-1		0.020 U	0.020 U		0.020 U	0.020 U											
1-2																	
2-3				0.21											0.020 U		
3-4						0.020 U											
4-5	0.020 U				0.020 U		0.020 U		0.020 U		0.020 U						
5-6				0.076		0.020 U			0.020 U	0.020 U		0.020 U		0.020 U			
6-7									0.020 U	0.020 U							
8-9														0.19			
9-10	0.020 U																
10-11																	
11-12															0.020 U	0.020 U	
14-15															0.084	0.020 U	0.020 U

Note: Only depth intervals where data are available are shown.  
Existing sample is an excavation confirmation sample.



**Legend**

- Excavation Area Boundary
- Existing Confirmation Sample
  - Base
  - Sidewall
  - Sidewall and Base
- Proposed Confirmation Sample
  - Base
  - Sidewall
- Other Site Features
  - 2013 TPH Excavation
  - Other Sample Location
- Highlighted Text
  - Result Does Not Exceed CULs
  - Result Greater Than CULs

**Soil Cleanup Levels**

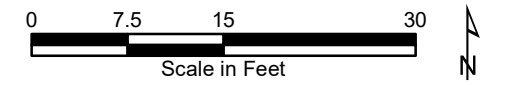
GRO: 30 mg/kg  
 DRO: 570 mg/kg  
 ORO: 1,600 mg/kg  
 DRO+ORO: 2,000 mg/kg  
 Benzene: 0.020 mg/kg

Notes:

- The ground surface is sloped and excavation depths will vary accordingly, extending to a maximum depth of approximately 16 feet bgs at the southern extent of CAA-6a. The average target excavation depths are shown.
- Final excavation limits will be determined in the field during implementation and will be based on field observations, screening, and confirmation data results.
- Sidewall samples will be collected at the depth with the most significant impacts based on existing data and field observations during excavation.
- Parcel boundaries obtained from King County Geographic Information Systems Center, 2011. Lot lines are approximate. Not for legal use.
- Orthoimagery obtained from Nearmap, 2018.

Abbreviations:  
 CAA = Cleanup Action Area  
 CUL = Cleanup level  
 DRO = Diesel-range organics  
 ft bgs = Feet below ground surface  
 GRO = Gasoline-range organics  
 ORO = Oil-range organics  
 REL = Remediation level

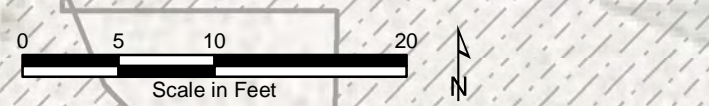
Qualifier:  
 U = Analyte is not detected at the associated reporting limit.



Existing Confirmation Sample Data							
Location	Depth ft bgs	Location Type	GRO mg/kg	DRO mg/kg	ORO mg/kg	DRO + ORO mg/kg	Benzene mg/kg
<b>CAA-6b</b>							
02MW22	3.5-4	Base	5.0 U	50 U	250 U	250 U	0.020 U
B231	2.5	Base	2.0 U	50 U	250 U	250 U	0.020 U
B271	3.5	Base	5.1	560	950	1,500	0.020 U
B273	3.5	Base	2.0 U	50 U	250 U	250 U	0.020 U
B274	2.5	Base	13	110	250 U	110	0.020 U
B275	2.5	Base	8.8	50 U	250 U	250 U	0.020 U
B276	2.5	Base	4.9	50 U	250 U	250 U	0.020 U

Summary of Other Available Data in CAA-6b					
<b>GRO (mg/kg)</b>					
Depth (ft bgs)	02MW20	02MW22	B231	B271	I03-EX01-NSW01
1-2	440	340			
2-3			2.0 U	340	
3-4		5 U		5.1	
5-6			2.0 U		2.0 U
<b>DRO (mg/kg)</b>					
Depth (ft bgs)	02MW20	02MW22	B231	B271	I03-EX01-NSW01
1-2	1,400	50 U			
2-3			50 U	2,800	
3-4		50 U		560	
5-6			50 U		50 U
<b>ORO (mg/kg)</b>					
Depth (ft bgs)	02MW20	02MW22	B231	B271	I03-EX01-NSW01
1-2	2,000	250 U			
2-3			250 U	1,600	
3-4		250 U		950	
5-6			250 U		250 U
<b>DRO + ORO (mg/kg)</b>					
Depth (ft bgs)	02MW20	02MW22	B231	B271	I03-EX01-NSW01
1-2	3,400	250 U			
2-3			250 U	4,400	
3-4		250 U		1,500	
5-6			250 U		250 U
<b>Benzene (mg/kg)</b>					
Depth (ft bgs)	02MW20	02MW22	B231	B271	I03-EX01-NSW01
1-2	0.40 U	0.030 U			
2-3			0.020 U	0.020 UJ	
3-4		0.020 U		0.020 U	
5-6			0.020 U		0.020 U

Notes: Only depth intervals where data are available are shown.  
 Only samples collected within the uplands, defined by the ordinary high water mark of Salmon Bay in accordance with the PPCD, are shown.  
 Existing sample is an excavation confirmation sample.



**Legend**

- Excavation Area Boundary
- Existing Confirmation Sample
  - Base
  - Sidewall
  - Sidewall and Base
- Proposed Confirmation Sample
  - Base
  - Sidewall
- Other Site Features
  - 2013 TPH Excavation
  - Other Sample Location
  - Ordinary High Water Mark
- Highlighted Text
  - Result Does Not Exceed CULs
  - Result Greater Than CULs

**Soil Cleanup Levels**

**GRO: 30 mg/kg**

**DRO: 570 mg/kg**

**ORO: 1,600 mg/kg**

**DRO+ORO: 2,000 mg/kg**

**Benzene: 0.020 mg/kg**

Notes:

- The ground surface is sloped and excavation depth will vary accordingly.
- Final excavation limits will be determined in the field during implementation and will be based on field observations, screening, and confirmation data results.
- The northern extent of the excavation is the ordinary high water mark, which is the demarcation between the uplands and the Salmon bay sediments as defined in the PPCD.
- An additional sidewall sample may be collected along the western excavation extent if field evidence of the former excavation isn't observed.
- Sidewall samples will be collected at the depth with the most significant impacts based on existing data and field observations during excavation.
- Parcel boundaries obtained from King County Geographic Information Systems Center, 2011.
- Lot lines are approximate. Not for legal use.
- Orthoimagery obtained from Nearmap, 2018.

Abbreviations:

CAA = Cleanup Action Area  
 CUL = Cleanup level  
 DRO = Diesel-range organics  
 ft bgs = Feet below ground surface  
 GRO = Gasoline-range organics  
 ORO = Oil-range organics  
 PPCD = Prospective Purchaser Consent Decree  
 REL = Remediation level

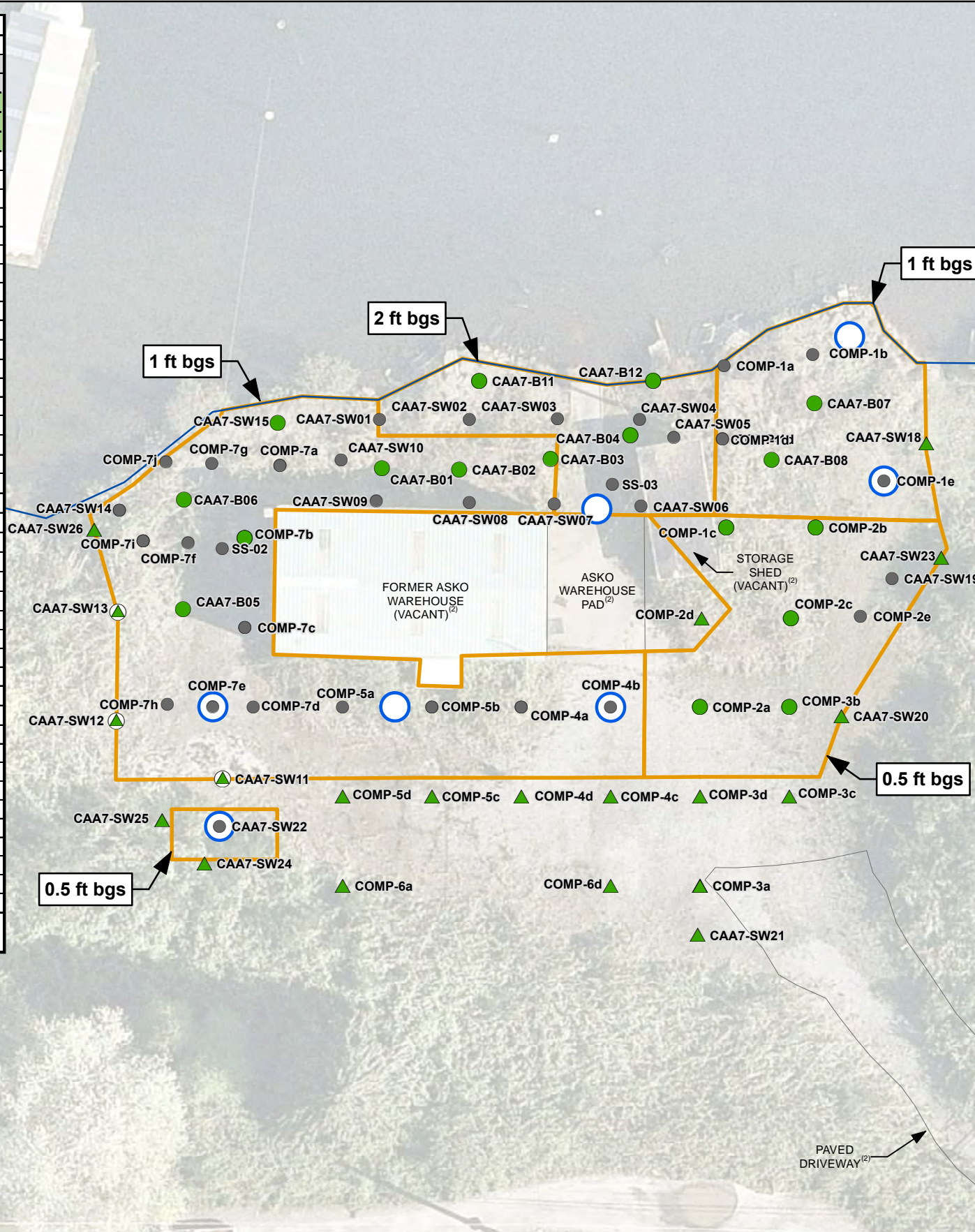
Qualifiers:

U = Analyte is not detected at the associated reporting limit.  
 UJ = Analyte is not detected at the associated reporting limit, which is an estimate.

Existing Confirmation Sample Data			
Location	Depth ft bgs	Location Type	Arsenic mg/kg
CAA7-B01	1.0-1.25	Base	3.7
CAA7-B02	1.0-1.25	Base	5.7
CAA7-B03	1.0-1.25	Base	6.7
CAA7-B04	2.0-2.25	Base	6.0
CAA7-B05	1.0-1.5	Base	9.2 <sup>(1)</sup>
CAA7-B06	1.0-1.5	Base	7.9 <sup>(1)</sup>
CAA7-B07	1.0-1.5	Base	5.8
CAA7-B08	1.0-1.5	Base	4.9
CAA7-B11	2.0-2.25	Base	6.5
CAA7-B12	2.0-2.25	Base	5.8
CAA7-SW11	0.0-0.5	Sidewall	3.6
CAA7-SW11	0.5-1.0	Base	4.9
CAA7-SW12	0.0-0.5	Sidewall	4.0
CAA7-SW12	0.5-1.0	Base	4.0
CAA7-SW13	0.0-0.5	Sidewall	2.2
CAA7-SW13	0.5-1.0	Base	2.0
CAA7-SW14	0.5-1.0	Base	6.0
CAA7-SW15	1.0-1.5	Base	7.8 <sup>(1)</sup>
CAA7-SW18	0.0-0.5	Sidewall	5.4
CAA7-SW20	0.0-0.5	Sidewall	5.0
CAA7-SW21	0.0-0.5	Sidewall	4.4
CAA7-SW23	0.0-0.5	Sidewall	11 <sup>(1)</sup>
CAA7-SW24	0.0-0.5	Sidewall	13 <sup>(1)</sup>
CAA7-SW25	0.0-0.5	Sidewall	6.4
CAA7-SW26	0.0-0.5	Sidewall	14 <sup>(1)</sup>
COMP-1c	0.5-1.0	Base	6.4
COMP-2a	0.5-1.0	Base	3.5
COMP-2b	0.5-1.0	Base	2.1
COMP-2c	0.5-1.0	Base	4.2
COMP-2e	0.5-1.0	Base	9.5
COMP-3a	0.5-1.0	Base	16
COMP-3b	0.5-1.0	Base	18
COMP-3c	0.5-1.0	Base	3.4
COMP-4a	0.5-1.0	Base	20
COMP-4b	0.5-1.0	Base	130
COMP-4c	0.5-1.0	Base	47
COMP-5a	0.5-1.0	Base	12
COMP-5b	0.5-1.0	Base	8.7
COMP-7a	0.5-1.0	Base	150
COMP-7b	0.5-1.0	Base	620
COMP-7c	0.5-1.0	Base	38
COMP-7d	0.5-1.0	Base	110
COMP-7e	0.5-1.0	Base	170
COMP-7f	0.5-1.0	Base	39
COMP-7g	0.5-1.0	Base	230
COMP-7h	0.5-1.0	Base	91
COMP-7i	0.5-1.0	Base	12
COMP-7j	0.5-1.0	Base	32
SS-02	0.5-1.0	Base	30
SS-03	0.5-1.0	Base	26
CAA7-SW22	0.5-1.0	Base	11
CAA7-SW24	0.5-1.0	Base	11

Summary of Other Available Data in CAA-7					
Location	Arsenic (mg/kg)				
	0.0-0.5	0.25-0.75	0.5-1.0	1.0-1.5	2.0-2.25
CAA7-B04				550	6.0
CAA7-B11				30	6.5
CAA7-B12				18	5.8
CAA7-SW01		35			
CAA7-SW02		15			
CAA7-SW03		150			
CAA7-SW04		1,700			
CAA7-SW05		150			
CAA7-SW06		230			
CAA7-SW07		550			
CAA7-SW08		6.8			
CAA7-SW09		9.5			
CAA7-SW10		7.2			
CAA7-SW14	28		6.0		
CAA7-SW19	19				
CAA7-SW22	37				
COMP-1a	10				
COMP-1b	14				
COMP-1c	18		6.4		
COMP-1d	22		7.5		
COMP-1e	24				
COMP-2a	16		3.5		
COMP-2b	38		2.1		
COMP-2c	150		4.2		
COMP-2e	9.5				
COMP-3a	16		4.6		
COMP-3b	18		3.4		
COMP-4a	20		7.4		
COMP-4b	130				
COMP-4c	47				
COMP-5a	12		8.7		
COMP-5b	8.7				
COMP-7a	150		36		
COMP-7b	620		88	8.1	
COMP-7c	38		8.1		
COMP-7d	110				
COMP-7e	170				
COMP-7f	39				
COMP-7g	230				
COMP-7h	91				
COMP-7i	12		11		
COMP-7j	32				
SS-02	30				
SS-03	26				

Notes: Only depth intervals where data are available are shown.  
Existing sample is an excavation confirmation sample.



**Legend**

- Excavation Area Boundary<sup>(3)</sup>
- Existing Confirmation Sample
  - Base
  - Sidewall
  - Sidewall and Base
- Proposed Confirmation Sample
  - Base
- Other Site Features
  - Other Sample Location
  - Ordinary High Water Mark
- Highlighted Text
  - Result Does Not Exceed CULs
  - Result Greater Than CULs

**Soil Cleanup Level**  
Arsenic: 7.3 mg/kg

Notes:

- Statistical compliance with the CUL, which is based on natural background concentrations, will be demonstrated in accordance with WAC 173-340-740(7)(e), with adjustment to the allowable exceedance factor and the percentage of confirmation samples exceeding the CUL in accordance with Ecology statistical guidance for assessing compliance with natural background-based CULs (Ecology 1992).
- Available records indicate the former ASKO warehouse, ASKO warehouse pad, and paved driveway were constructed prior to the start of Icycle Seafoods operations at the property and the vacant storage shed was constructed after Icycle Seafoods ceased operations.
- The Cleanup Action Area 7 excavation will extend to the edges of the paved pads and structures that pre-date Icycle Seafoods operations. Confirmation samples will not be collected along the sidewalls of the excavation defined by the paved pads and structures that predated Icycle Seafoods operations.

- Parcel boundaries obtained from King County Geographic Information Systems Center, 2011. Lot lines are approximate. Not for legal use.
- Orthoimagery obtained from Nearmap, 2018.

Abbreviations:  
CAA = Cleanup Action Area  
CUL = Cleanup level  
ft bgs = Feet below ground surface  
UCL=Upper Confidence Limit

0 15 30 60  
Scale in Feet

# **Appendix A**

## **SOPs**

<b>Excavation Subsurface Exploration Sampling</b>	June 2021	<b>CRETE SOP No. 2345</b>
	Rev. # 3	
	Jamie Stevens	

## 1 INTRODUCTION

### 1.1 Purpose and Applicability

This Standard Operating Procedure (SOP) describes the methods for excavating, logging and collecting environmental samples from excavations including: test pits, trenches or open excavations. Test pits/trenches/excavations are generally excavated to visually determine subsurface soil and rock conditions and for environmental sampling. Test pits/trenches/excavations are generally excavated by a qualified subcontractor under the direction of the project geologist/engineer.

### 1.2 General Principles

Test pit/trench/excavation subsurface explorations generally involve use of backhoes or excavators to perform excavations for the purpose of visually assessing subsurface soil/fill conditions and to allow for collection of representative soil samples. The excavation subcontractor is directed by the project geologist/engineer to complete a test pit/trench/excavation at a designated location. The lateral extent and depth of the test pit/trench/excavation is dependent upon project objectives. Once excavated, the test pit/trench is logged and sampled, if required. Following this, the test pit/trench/excavation is backfilled with the excavated material or with clean fill.

### 1.3 Quality Assurance Planning Considerations

Project personnel should follow specific quality assurance guidelines for sampling as outlined in the site-specific Quality Assurance Project Plan (QAPP) and/or Sampling Plan. Proper quality assurance requirements should be provided which will allow for collection of representative samples from representative sampling points. Quality assurance requirements typically suggest the collection of a sufficient quantity of field duplicate, field blank, and equipment blank samples.

### 1.4 Health and Safety Considerations

All utilities (electric, water, sewer, etc.) or property owners who may have equipment or transmission lines buried in the vicinity of proposed test pits should be notified. Sufficient time should be allowed after notification (typically 3 working days) for the utilities to respond and mark locations of any equipment that may be buried on site. The estimated location of utility installations, such as sewer, telephone/communications, electric, water, gas lines and other underground installations that may reasonably be expected to be encountered during excavation work, shall be verified by the site owner prior to opening an excavation and may require a private utility locate to verify location and or material

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present. The subcontractors will be made aware of the potential of encountering underground utilities at each test pit location.

To avoid the hazards associated with the cave-in or collapse of an excavation or trench, CRETE Consulting (CRETE) employees will not enter an excavation or trench to collect the required samples if the trench is greater than 4 feet deep. For excavation depths greater than 4 feet, samples will be collected remotely, using long-handled sampling tools, or directly from the bucket of the backhoe. If entry becomes necessary and the excavation is greater than 4 feet in depth, the contractor will be required to slope or shore the walls of the excavation. Specific requirements will depend on soil type and site constraints and will be addressed in the site-specific health and safety plan (HASP). All sloping or shoring must be conducted in compliance with OSHA's rules for trenching and excavation (29 CFR 1926.650-652.)

For safety reasons in case of sidewall collapse, all personnel and materials will be kept at least 2 feet from the edge of any open excavation. Open excavations can be viewed by the geologist/engineer from test pit endwalls which are more stable than test pit sidewalls.

If excavations are to be left open temporarily, the perimeter of the excavation must be marked with "Caution-Open Trench" tape. Other site-specific restrictions on leaving test pits open temporarily may be required by the property owner. Those requirements should be determined prior to startup of the excavation program.

Ambient air quality conditions should be periodically monitored both within and surrounding the excavation for potentially toxic and/or explosive atmospheric conditions.

The health and safety considerations for the site, including both potential physical and chemical hazards, will be addressed in the site-specific HASP. All field activities will be conducted in conformance to this HASP.

## **2 RESPONSIBILITIES**

### **2.1 Project Manager**

The project manager will be responsible for ensuring that the project-specific requirements are communicated to the project team and for providing the materials, resources, and guidance necessary to perform the work in accordance with this SOP and the project plan.

### **2.2 Project Geologist/Engineer**

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It will be the responsibility of the geologist/engineer to determine the location, total depth and overall size of each test pit/trench/excavation. It will also be his or her responsibility to collect representative samples from the test pit/trench/excavation and to log the test pit/trench/excavation according to the procedures described in this SOP.

### 2.3 Subcontractor

It will be the responsibility of subcontractors to construct test pits/trenches according to CRETE project-specific requirements and in accordance with OSHA safety requirements for trench construction.

## 3 REQUIRED MATERIALS

In addition to those materials provided by the subcontractor, the project geologist/sampling engineer may require:

- Stakes
- Fluorescent flagging tape/caution tape
- Sample kit (bottles, labels, custody records, cooler, ice, etc.)
- Measuring tape
- Sheet plastic
- Sampling Equipment: spoons, trowels, scoops, shovels
- Field records/logbook (test pit log, test pit profile log)
- Project plans (HASP, QAPP, Sampling Plan)
- Camera
- Global Positioning System (GPS) device
- Decontamination materials and solutions

## 4 METHOD

### 4.1 General Preparation

General locations for test pits or trenches should be marked with a stake and/or flagging tape prior to start of the excavation program. Final post-excavation locations should be documented by using topographic maps and/or other site plans. Final locations should also be measured from a fixed feature or surveyed or recorded by GPS device if necessary.

Excavation equipment should be properly decontaminated prior to initial use, between test pit/trench excavations, and following completion of the last excavation. It should be noted that excavation

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equipment may need to be brushed clean or fully decontaminated at the completed test pit location if the potential exists for spreading contaminated soils by transport of the excavation equipment.

## 4.2 Excavation

Test pits/trenches will be excavated to the depth specified in the project-specific plan. Test pit completion depths should be indicated to the subcontractor by the project geologist or engineer. The test pits or trenches will be excavated in compliance with applicable safety regulations. Walls should initially be cut as near vertical as possible to facilitate stratigraphic mapping. Proper sidewall sloping will, however, be required for test pits that extend beyond 4 feet in depth if sampling or logging personnel require access to the open excavation.

As the test pit/trench/excavation is excavated, the excavated soils should be placed to one side of the excavation and no closer than 2 feet from the excavation's edge. Depending on the project requirements, sheet plastic may be required to cover the ground surface before placing excavation soils on the ground.

Excavation should proceed slowly and with caution. The project geologist/engineer should view the excavation (from the far end wall) after each removed bucket of soil for the presence of unusual features such as waste accumulations, free liquids (water or free product), and buried utilities. The excavation subcontractor should continue the excavation only after receiving approval to proceed from the project geologist/engineer.

## 4.3 Logging

A test pit log will be prepared in the field by the geologist or engineer. The test pit log, which is similar to a boring log, will include notations on soil types and depth of stratigraphic changes, depth to water table, identification of waste materials, and the depth/location of any environmental samples that were collected. The dimensions and orientation of each test pit/trench/excavation will also be recorded on the test pit log.

A supplemental sketch is often necessary to depict the physical orientation of the strata encountered. These observations should be recorded on the test pit profile log of logbook. The test pit profile log allows for sketching a view of the test pit sidewall (i.e., a test pit cross section) and for listing of sample collection information.

The project geologist/engineer will measure the depth to the groundwater table in test pits, if encountered, only after sufficient time is allowed for stabilization of the groundwater table. If there is insufficient time to achieve stabilization, the depth to where groundwater is entering the test pit should be indicated on the logs.



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If photographs are necessary, they can be taken at this time.

#### 4.4 Sample Collection

Requirements for soil sampling will be determined by the project geologist/engineer in accordance with the project sampling plan.

Soil samples may be collected for several reasons including stratigraphic logging, field headspace organic vapor testing, and laboratory environmental testing. Soil samples may be collected from test pits/trenches from several locations: the test pit/trench/excavation sidewalls or base, the excavated soil pile, or directly from the backhoe bucket. Additional information regarding each sampling method are presented in the following subsections.

##### 4.4.1 Test Pit/Trench/Excavation Sidewall or Base Sampling

Test pit/trench/excavation sidewall or base sampling is generally the preferred method by regulatory agencies because it allows for in-situ sampling of soils. In-situ sampling limits the potential for sample contamination which can occur during the excavation procedures. This method, valid for any type of proposed analysis, is especially preferred for samples which will be analyzed for volatile organic compounds (VOC).

Sidewall or base sampling is considered to be somewhat more dangerous than sampling from the soil pile or backhoe bucket because it may require entry of sampling personnel into the excavation. A recommended option in place of entry into the excavation is to use long-handled sampling equipment. The use of long-handled sampling equipment allows for collection of samples without entry into the excavation and often from the excavation ends where it is generally considered safe. Long-handled sampling equipment can be fabricated using standard surface soil sampling equipment (trowels, scoops, etc.) attached to long wooden or aluminum extension handles with duct tape or clamps. When using duct tape, or any kind of tape, caution should be exercised during sampling not letting the sample come into contact with the tape or handle.

Regardless of whether entry into the excavation is required, sampling should be conducted in the following manner:

- Select the sampling location and “dress” the excavation surface by scraping to remove any loose surface soil or smearing residues.
- Replace the dressing tool with a clean sampling tool.
- Collect the soil sample with the sampling tool in accordance with the methods outlined within QAPP and/or sampling plan.

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- Complete the test pit log and test pit profile log to provide description and location information for each sample collected.

#### 4.4.2 Backhoe Bucket Sampling

Sampling from the backhoe bucket is an improvement on soil pile sampling in that the geologist/engineer is reasonably sure of the position where the soil was obtained. Backhoe bucket sampling is considered suitable for soil logging and headspace VOC testing; however, it is generally considered to be unsuitable for analytical testing. Sampling from the backhoe bucket may be considered suitable for analytical testing if, for instance, the base of the test pit is covered with water and use of standard sampling equipment has been unsuccessful in retrieving an acceptable sample.

Some care is required to obtain a sample which has been minimally disturbed. For example, if a cohesive block of soil is present within the bucket, the soil sample should be retrieved from within the block of soil as much as possible, breaking apart the bulk sample to access an interior portion of soil. Only soil that has not been in contact with the backhoe bucket should be taken for analytical testing.

#### 4.4.3 General Sampling Procedures

Representative samples shall be collected for laboratory analysis by the project geologist/engineer using the appropriate equipment.

Sample bottling, handling and transport shall be conducted in accordance with the requirements of the project specific QAPP.

#### 4.5 Backfilling

Prior to backfilling, all collected information will be reviewed to ensure that all the appropriate and/or required logs, photographs, measurements and samples have been collected.

After review of the records, backfilling and compaction of test pit/trenches/excavation will be accomplished according to contract specifications. If excavation sidewalls have been undermined, the excavation may require temporary expansion to backfill properly.

All test pits/trenches will be backfilled to original grade unless otherwise specified.

It should be noted that project-specific requirements may include the use of known clean backfill material. The requirements for clean backfill and the potential requirements for disposal of excavated soils should be defined within the project-specific plan.

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## 5 QUALITY CONTROL

Quality control requirements for sample collection are dependent on project-specific sampling objectives. The QAPP will provide requirements for sample preservation and holding times, container types, sample packaging and shipment, as well as requirements for the collection of various quality assurance samples such as trip blanks, field blanks, equipment blanks, and field duplicate samples.

## 6 DOCUMENTATION

Test pit locations shall be referenced on the site map. Sample locations shall be referenced on a plan view/vertical section of each test pit/trench/excavation.

Photographs of specific geologic features or exposed debris may be required for documentation purposes. A scale or an item providing a size perspective shall be placed in each photograph when possible. Photograph descriptions shall also be documented as appropriate, such as in the logbook.

The following records will be maintained:

- Test Pit Log and/or Test Pit Profile Log
- Sample collection records
- Field notebook
- Chain-of-custody forms
- Shipping receipts

All documentation will be placed in the project files and retained following completion of the project.

## 7 TRAINING/QUALIFICATIONS

Test pit/trench/excavation subsurface explorations require a moderate degree of training and experience as numerous situations may occur which will require field decisions to be made. It is recommended that inexperienced personnel be supervised for several test pit/trench/excavation explorations before working on their own. Experienced excavation subcontractors are also of great assistance with problem resolution in the field. Field personnel should be health and safety certified as specified by OSHA (29 CFR 1910.120(e)(3)(i)) to work on sites where hazardous materials may be present.

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## 8 REFERENCES

United States Environmental Protection Agency. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM). USEPA, Region 4, Enforcement and Investigations Branch, Athens, GA. November 2001.

29 CFR 1910.120

29 CFR Part 1926.650-652



## Appendix H Health and Safety Plan

# APPENDIX H: HEALTH AND SAFETY PLAN

**Time Oil Bulk Terminal**  
*Seattle, Washington*

**June 28, 2021**

*Prepared for:*  
**TOC Seattle Terminal 1, LLC**  
*2753 West 31<sup>st</sup> Street*  
*Chicago, Illinois 60608*

*Prepared for:*

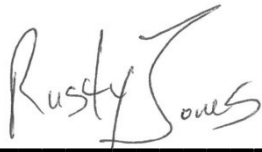


# APPENDIX H: HEALTH AND SAFETY PLAN

**Time Oil Bulk Terminal**  
***Seattle, Washington***

**June 28, 2021**

**Prepared by:**



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**Rusty Jones, Project Geologist**

**Reviewed by:**



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**Jamie Stevens, P.E.**



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## Acronyms and Abbreviations

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ACGIH	American Conference of Governmental Industrial Hygienists
APR	air purifying respirator
CAA	Cleanup Action Areas
CRETE	CRETE Consulting, Inc.
CRZ	contaminant reduction zone
COVID-19	coronavirus disease 2019
cVOC	chlorinated volatile organic compound
EPA	United States Environmental Protection Agency
HASP	Health and Safety Plan
HEPA	high-efficiency particulate air
IDHL	immediately dangerous to health and life
JHA	job hazard analysis
kV	kilovolt
MSDS	material safety data sheet
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
REL	reasonable exposure limit
Site	Time Oil Bulk Terminal Site, also referenced as Property
STEL	short-term exposure limit
SSO	Site Safety Officer
SVOC	semi-volatile organic compound
TCE	trichloroethene
TOCST	TOC Seattle Terminal 1, LLC
TPH	total petroleum hydrocarbons
TLV	threshold limit value
TWA	time weighted average
VOC	volatile organic compound
WAC	Washington Administrative Code

**MINIMUM TRAINING REQUIREMENTS**

**Time Oil Bulk Terminal Site (Site)**

All workers entering a designated **exclusion zone**, as described below, must have a current 40- or 24-hour training certificate in Hazardous Waste Operations or current 8-hour refresher. All workers on site will be required to have read and signed the Site-Specific Health and Safety Plan and attended a safety orientation. Specific types of site work, hazards, and training requirements are listed in the Job Hazard Assessment in Appendix F of this Plan.

The following table is intended to provide a summary of minimum levels of training for specific workers and job activities on site.

<b>Type of Work Involved</b>	<b>Minimum Level of Training</b>
<p>Laborers and Equipment Operators in the Exclusion Zones engaged in disturbance of contaminated media, evaluating potential employee exposures, and otherwise potentially contacting contaminated media where <b>respiratory protection is or may be required.</b></p>	<ul style="list-style-type: none"> <li>• 40-Hour Hazardous Waste Operations Training and Current 8-Hour Refresher</li> <li>• Project Safety Plan including Health and Safety Orientation</li> <li>• Read/Sign Site-Specific Health and Safety Plan</li> </ul>
<p><b>Laborers and Equipment Operators in the Exclusion Zones engaged in excavation of contaminated soil, evaluating potential employee exposures, and otherwise potentially contacting contaminated soils so long as respiratory protection is not required.</b></p>	<ul style="list-style-type: none"> <li>• 24-Hour Hazardous Waste Operations Training and Current 8-Hour Refresher</li> <li>• Project Safety Plan including Health and Safety Orientation</li> <li>• Read/Sign Site-Specific Health and Safety Plan</li> </ul>
<p><b>Workers onsite in clean or support zones for more than 8 hours, such as laborers, repair persons, inspectors, etc.</b></p> <p><b>Note: None of these workers are permitted in any portion of the exclusion or contamination reduction zones.</b></p>	<ul style="list-style-type: none"> <li>• Project Safety Plan including Health and Safety Orientation</li> <li>• Read/Sign Site-Specific Health and Safety Plan</li> </ul>

# 1 Introduction

This Health and Safety Plan (HASP) describes the health and safety protocols to be used during activities at completed at the Time Oil Bulk Terminal Site, also referenced as Property (Site). The Contractors, such as drillers, involved in this work will follow their own HASPs. CRETE Consulting, Inc. (CRETE) will oversee remediation activities, such as concrete slab removals, soil excavations, soil confirmation sampling, waste removal/hauling, trench installation, water treatment at the Site. Additionally, limited well/soil drilling, and Geoprobe boring, soil vapor borings to collect soil, groundwater and vapor samples may be conducted during confirmation sampling and post-remediation activities at the Site.

This plan was written by CRETE, who will work with various contractors, such as remediation contractors, equipment operators, trucking contractors, utility locators, to perform work on the Site. This HASP is unique to activities to be performed by CRETE staff/field managers/Site Safety Officer (SSO). General site information is summarized in Table 1-1. Background information pertaining to site history and general hazards is listed in Table 1-2.

In addition to the requirements set forth in this HASP, Crete personnel shall comply with the HASPs and related protocols of all onsite Contractors and any health and safety protocols required by the TOC Seattle Terminal 1, LLC (TOCST).

## 1.1 COVID-19 Infection Control Procedures

**This section will be updated as procedures, local and federal laws change to the Covid-19 situation. Appendix A-1 includes details and a field checklist/screening form.**

Crete has established infection control procedures (Procedures) to address the coronavirus disease 2019 (COVID-19) pandemic impacting the Puget Sound region. The intent of these Procedures is to protect all employees, subcontractors, and visitors from infection by COVID-19 at sites where Crete is actively working. A detail of all Procedures is included in Appendix A-1.

These Procedures are based on what is currently known about COVID-19. The Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) are continually updating recommended protections as needed and as additional information becomes available. These Procedures will be updated as this information evolves.

Coronaviruses are a large family of viruses that are common in humans and many different species of animals, including cattle, cats, and bats. Rarely, animal coronaviruses can infect people and then spread between people, such as with MERS-CoV and SARS-CoV. The virus that causes COVID-19 is spreading from person-to-person across the United States and

much of the world. It should be noted, however, that respiratory illnesses like seasonal influenza, are also currently widespread in many communities.

Reported COVID-19 cases have ranged from mild symptoms to severe illness and death. The following symptoms are most commonly reported. Symptoms may appear **2-14 days after exposure**.

- Loss of sense of smell
- Sore throat
- Fever
- Dry cough

If you develop **emergency warning signs** for COVID-19 get **medical attention immediately**. Emergency warning signs include:

- Difficulty breathing or shortness of breath
- Persistent pain or pressure in the chest
- New confusion or inability to arouse
- Bluish lips or face

## **SOCIAL DISTANCING**

Based on the knowledge that COVID-19 can be spread through droplet transmission, the CDC has established a safe distance parameter of six feet between people. The following procedures are designed to provide guidance for spatial distancing on the jobsite.

- Workers, if working in a team, will take separate vehicles to the job site.
- A minimum distance of six feet should be maintained from other individuals on the worksite.
- Workers will not congregate in groups of more than four other individuals.
- Workers will not be permitted to come to work if they feel sick or exhibit any symptoms common to cold, flu or COVID-19. These symptoms include a fever, sore throat, or dry cough.
- No person will eat, drink, chew gum or tobacco in potentially contaminated areas or around other people. Drinking replacement fluids for heat stress control will be permitted only in areas that are free from contamination, except in emergency situations.
- Food should be consumed in a car or away from other individuals.
- All personnel leaving potentially contaminated areas will wash their hands and face prior to entering any new area. If that is not possible, hands should be sanitized with hand-sanitizer. Hands and face should be washed with soap and water as soon as it is feasible after leaving a job site.



## **1.2 Subcontractor Distribution / Acknowledgment**

As required by regulation, the Site Safety Officer (SSO) will make available a copy of this Site-Specific Health and Safety Plan to subcontractors hired by CRETE working in contaminated areas and others who may enter the site. Subcontractors and others will read, sign, and return the attached acknowledgment form (Appendix A-2) and follow these provisions as minimum requirements. Due to their unique work activities, some subcontractors may need to follow more stringent health and safety measures in accordance with applicable regulations (e.g. heavy equipment operation safety, crane operators, etc.). It is anticipated that subcontractors will manage the hazards specific to their trade and equipment, as detailed in each contractor's Accident Prevention Plan or company Health and Safety Plan.

The SSO shall be responsible for informing all individuals assigned to work on the site, or who visit the site within the exclusion or contaminant reduction zones, of the contents of this HASP and for ensuring that each person signs the Site Safety Plan Acknowledgment Form (Appendix A-2). By signing the Site Safety Plan Acknowledgment Form, individuals recognize the site health and safety hazards, known or suspected, and will adhere to the protocols required to minimize exposure to such hazards. Subcontractors will also adhere to their own HASPs related to the work they are performing (e.g., safe drill operation).

All visitors who enter the work zone are required to sign in and sign out with the Field Manager or SSO (Appendix B).

## **1.3 Site Health and Safety Meetings**

A pre-work meeting addressing site-specific health and safety issues shall be held on the first day of mobilization to the site and prior to the commencement of any work activities. Mandatory attendance is required for all personnel assigned to the particular tasks for which the equipment was mobilized. For example, a work meeting with the excavation contractors will occur at a different time than the meetings with the ISS drillers, as these activities will be performed on different days and each have their own mobilization events. The intent of these meetings is to discuss the site-specific health and safety issues (such as known or suspected contaminants).

At the conclusion of the meeting, personnel are to sign the Site Safety Plan Acknowledgment Form in Appendix A-2, indicating their attendance and understanding of the health and safety protocols. As additional personnel are assigned to the site, it is the responsibility of the SSO to ensure that new personnel are briefed on site-specific health and safety information and that they also have signed the Site Safety Plan Acknowledgment Form (Appendix A-2).

Daily tailgate meetings will be held by the SSO or field staff in charge of the day's activities and attendance will be documented in the tailgate meeting form Appendix C).

## **1.4 Training Requirements**

All personnel assigned to work on this site beyond the support zone must have successfully completed 40 hours of Training for Hazardous Waste Site Work, in accordance with Occupational Safety Health Act (OSHA) 29 CFR 1910.120(e)(3), and must be current with their 8-hour Refresher Training, in accordance with OSHA 29 CFR 1910.120(e)(8).

Personnel managing or supervising work on site must also have successfully completed 8 hours of Manager/Supervisor Training, meeting the requirements of 29 CFR 1910.120(e)(4). Documentation of CRETE staff training is maintained in each company's respective databases. Each contractor must maintain documentation of OSHA training for personnel working on site.

Any exceptions to the training requirements will be explicitly specified either in this HASP or through a HASP amendment.

## **1.5 Medical Monitoring Requirements**

All CRETE personnel assigned to work on this site beyond the support zone must be enrolled in a medical surveillance program meeting the requirements of OSHA 29 CFR 1910.120(f). Personnel must have successfully passed an occupational physical within the past 12 months, be medically cleared to work on hazardous waste sites, and be capable of wearing appropriate personal protective equipment (PPE), including any respiratory protection.

Any exceptions to the medical monitoring requirements will be explicitly specified either in this HASP or through a HASP amendment.

## **1.6 Fit Testing Requirements**

All CRETE personnel assigned to work on this site beyond the support zone must be familiar with the requirements in the OSHA respiratory standard (29 CFR 1910.134). All personnel who are required to wear respiratory protection must have successfully passed a respirator fit test within the past 12 months. Personnel who do not have a current fit test are prohibited from working in areas where any potential exists for exceeding OSHA Permissible Exposure Limits. Documentation of a successful respirator fit test for the appropriate type of respirator needed for this work (half-face) must be maintained by each contractor performing onsite work. The SSO will check that the respirator being worn by personnel is the same size, make, and model as that specified on any respirator fit test records from the past 12-month period.

## **1.7 Project Staff Responsibilities**

The SSO is responsible for overall project administration and for coordinating health and safety protocols and procedures for all onsite CRETE personnel at all times. All applicable United States Environmental Protection Agency (EPA), OSHA, state, and local health and safety requirements shall be followed throughout the course of the project. This HASP covers only CRETE personnel onsite. Any person who observes health and safety problems or infractions should immediately report the problem or infraction to appropriate personnel.

## **1.8 Access to Employee Exposure and Medical Records**

OSHA provides employees and their designated representatives a right-of-access to relevant exposure and medical records (29 CFR 1910.20). The “Notification of Access to Employee Exposure and Medical Records” (Appendix D) is to be made accessible to all employees involved with these field operations.

## **1.9 Hazard Communication**

The SSO will advise all CRETE personnel assigned to this site of the hazards associated with working onsite and of the methods to mitigate those hazards and prevent exposures. This information will be presented to personnel prior to initiation of any field activities. The following information regarding site contaminants or any chemicals brought to the site to conduct the work will be presented to site personnel prior to conducting any field work:

- Material Safety Data Sheets (MSDS; Appendix E)
- Chemical/physical hazards
- Appropriate PPE for protection from exposure
- Labeling

**Table 1-1 General Information**

<b>Client:</b> TOC Seattle Terminal 1, LLC	<b>Project ID</b>
<b>Site Name:</b> Time Oil Bulk Terminal	
<b>Site Location:</b> 2737-2805 West Commodore Way, Seattle, WA	
<b>Description of Field Activities:</b> Site Inspection, remediation oversight (excavation and in-situ soil solidification, interceptor trench installation) and confirmation sampling.	
<b>Dates of Field Activities:</b> Q2 2021 through Q4 2021	
<b>Project Manager:</b>  Jamie Stevens and Grant Hainsworth, CRETE	<b>Project Manager Telephone Number:</b>  Jamie: 206-799-2744 Grant: 253-797-6323
<b>QA Officer:</b> Jamie Stevens, CRETE	<b>Office:</b> Seattle
<b>Site Safety Officer (SSO):</b> Rusty Jones, CRETE	<b>Field Manger Telephone #</b> 832-330-1359
<p><b>The following requirements have been fulfilled for each employee to work onsite:</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> <b>Completed OSHA 40-Hour HAZWOPER Training</b></li> <li><input checked="" type="checkbox"/> <b>Current OSHA 8-Hour HAZWOPER Refresher (within last 12 months)</b></li> <li><input checked="" type="checkbox"/> <b>Current Medical Surveillance Examination (within last 12 months)</b></li> <li><input checked="" type="checkbox"/> <b>Current Respirator Fit-test (within last 12 months)</b></li> <li><input checked="" type="checkbox"/> <b>Current First Aid and CPR Training (within last 2 years)</b></li> </ul> <p><b>Note:</b> CRETE employees may not enter a site beyond the support zone unless the training/qualifications listed above are current.</p> <p><b>The field manager and the SSO meets all the training requirements listed above and records can be provided upon request.</b></p>	

**Table 1-2 Site Background**

<b>Overall Hazard Is:</b>			
<b>High:</b> <input type="checkbox"/>	<b>Moderate:</b> <input checked="" type="checkbox"/>	<b>Low:</b> <input type="checkbox"/>	<b>Unknown:</b> <input type="checkbox"/>
<p><b>Facility Description:</b> The site has known extensive subsurface contamination from historic on-site activities, including petroleum and chlorinated volatile organic compound (cVOC) impacts. Surface soil contamination (arsenic) is also present in some waterfront areas. All former building structures have been demolished, with concrete slabs and footers remaining.</p>			
<p><b>Status:</b> The site has been primarily vacant for some time and was recently purchased in November 2020.</p>			
<p><b>Unusual Features (containers, dikes, buildings, power lines, terrain, etc.):</b> West Commodore Way bisects the Site east-west and can experience moderate volumes of vehicular traffic. Be cautious when entering and exiting site area from West Commodore Way. Drug paraphernalia has been found across the site (needles). Many parts of the site are uneven surface and trip hazards are present site-wide.</p>			
<p><b>Site History (worker injury, complaints, regulatory agency action):</b> There are known areas of groundwater and soil contamination above state and federal criteria.</p>			
<p><b>Potential Waste Types:</b> Soil and groundwater contamination, free phase product with groundwater.</p>			
<b>Liquid:</b> <input checked="" type="checkbox"/>	<b>Solid:</b> <input checked="" type="checkbox"/>	<b>Sludge:</b> <input checked="" type="checkbox"/>	<b>Debris:</b> <input checked="" type="checkbox"/>
<b>Characteristics:</b>			
<b>Corrosive:</b> <input checked="" type="checkbox"/>	<b>Ignitable:</b> <input type="checkbox"/>	<b>Volatile:</b> <input checked="" type="checkbox"/>	<b>Toxic:</b> <input checked="" type="checkbox"/>
<b>Reactive:</b> <input type="checkbox"/>	<b>Unknown:</b> <input checked="" type="checkbox"/>	<b>Radioactive:</b> <input type="checkbox"/>	<b>Other (name):</b> <input type="checkbox"/>
<p><b>Hazards posed by site activities (Job Hazard Analysis in Appendix F):</b> Potential exposure to contaminants including petroleum hydrocarbons, VOCs, SVOCs, limited cVOCs, metals. Free phase petroleum products may be encountered at site during remedial activities.</p>			
<p><b>Unusual Hazards:</b> None.</p>			

## 2 Health & Safety Risk Analysis

This section identifies the specific hazards associated with the remedial investigation work and presents an analysis of documented or potential chemical hazards at the site. Every effort must be made to reduce or eliminate exposure to these hazards. Hazards that cannot be eliminated must be abated by use of engineering controls and/or PPE.

### 2.1 Description of Site Tasks

This HASP is intended to cover activities in areas where contamination may be encountered at the Project. These activities include:

- Mobilization to the site and driving on the site; coordination with contractors on equipment and supply staging.
- Clearing vegetation for site surveys.
- Excavation surveying and marking/flagging.
- Coordination and oversight of remedial activities including soil excavation, soil stockpiling and loading (roll-offs boxes and trucks), including benching and shoring activities.
- Coordination and oversight of ISS drilling and mixing, including working around heavy equipment.
- Soil borings, Geoprobe, test pits, and sampling to collect soil data, as needed.
- Confirmation sampling and GPS data collection and mapping.
- Construction oversight of subsurface interceptor trench and remediation barrier.
- Archaeological monitoring, as needed.

A job hazard assessment that evaluates the hazards associated with each of these tasks is included with this Plan as Appendix F.

### 2.2 General Site Hazards

#### 2.2.1 Lighting

Work areas must have adequate lighting for employees to see to work and identify hazards (5-foot candles minimum, comparable to a single 75- to 100-watt bulb). Personnel should have flashlights available in all indoor or dimly lighted areas for use in the event of a power failure, or if working outdoors after daylight hours. Applicable OSHA standards for lighting (29 CFR 1910.120(m)) shall apply. **All remedial activities are expected to occur outside and mostly during daylight hours.**

## 2.2.2 Utilities

All electrical power must have a ground fault circuit interrupter as part of the circuit, including generators. All equipment must be suitable and approved for the class of hazardous atmosphere in which it is being used. Applicable OSHA standards for electric power (29 CFR 1910 Subpart S) shall apply. **The site is absent any building structures and at grade and below grade concrete structures remain in several Site areas. Any electrical power used at the site will require outdoor use of a portable electrical generator or portable battery-operated tools.**

All underground utility hazards shall be identified and/or inspected prior to conducting operations involving potential contact. Some work will occur where numerous current and historical utilities exist, and special caution should be exercised in all ground disturbing work. **\*Additional safety precautions not outlined in this HASP will need taken when working at Cleanup Action Area (CAA) 2. Active utilities will be present along the West Commodore Way right-of-way.\***

Any time work is performed in the vicinity of overhead utilities, including power lines, a spotter will be assigned to help operators maneuver equipment in and around the wires. The following distances will always be maintained around high-tension wires:

- For lines rated 50 kilovolts (kV) or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet.
- For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV over 50 kV, or twice the length of the line insulator, but never less than 10 feet.
- In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV, 10 feet for voltages over 50 kV, up to and including 345 kV, and 16 feet for voltages up to and including 750 kV.

In addition, all utility pole “guy-wire” support cables will be identified, marked, and/or barricaded prior to work. Unintended equipment or vehicle contact with these guy wires may result in utility poles or power lines falling on personnel or equipment.

## 2.2.3 Heat Stress

Work will be performed in accordance with WAC 296-62-095 with regard to heat stress. Site personnel may be required to perform their work tasks in ambient temperatures of 70 degrees F or above or while wearing impervious clothing. All personnel must be instructed on the symptoms of the primary heat-related disorders and how to minimize their chances of becoming affected by them. These disorders, their symptoms, and first-aid measures are outlined below:

- **Heat Rash:** Decreased ability to tolerate heat raised red vesicle on affected areas, and clothes that chafe. Maintain good personnel hygiene and use drying powders or lotions.
- **Heat Cramps:** Muscle spasms and pain in the extremities and abdomen. Rest in cool area and drink plenty of fluids. If pain persists, seek medical attention.

- **Heat Exhaustion:** Shallow breathing; pale, cool, moist, clammy skin, profuse sweating, dizziness, lassitude, and fainting. Rest in a cool area and drink plenty of fluids. Get medical attention prior to returning to work.
- **Heat Stroke:** Red, hot, dry skin, no perspiration, nausea, dizziness, confusion, strong rapid pulse, coma. Cool victim immediately with cool or cold water. Seek immediate medical attention.

At a minimum, personnel wearing non-breathable clothing at temperatures greater than 70 degrees F should take a break every one to two hours and drink plenty of fluids. The intake of an average of one quart of fluids per hour is recommended. CRETE is required to provide enough water on site for each employee to drink one quart per hour on site. A cool or shaded rest area should be used.

#### 2.2.4 Cold Stress

Site personnel will be instructed on the signs, symptoms, and the prevention of cold-related disorders prior to performing specific work tasks. The two major effects of cold stress are frostbite and hypothermia.

- **Frostbite:** Sudden blanching of the skin progressing to skin with a waxy or white appearance, which is firm to the touch, but the tissue beneath the skin, is resilient to the touch.
- **Hypothermia:** The symptoms of systematic hypothermia are exhibited as follows: (1) shivering, (2) apathy, listlessness, and (sometimes) rapid cooling of the body to less than 90F, (3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate, (4) freezing of the extremities, and (5) death.

Personnel will monitor themselves and other team members for signs of frostbite and hypothermia. If temperatures fall below 20°F, thermal clothing may be required. Field activities will be curtailed if equivalent wind chill temperatures are less than 0°F, unless operations are of an emergency nature.

#### 2.2.5 Noise

When the noise level of any operation exceeds the 8-hour Time Weighted Average (TWA) of 85 decibels (dB), a hearing protection program meeting the requirements of 29 CFR 1910.95 will be implemented. Noise generation at the site will primarily be created by heavy power equipment (excavators), haul truck, drilling rig equipment, generators, and power equipment attachments (e.g. jack-hammer on excavators during concrete demolition).

#### 2.2.6 Fire Prevention

Operations involving the potential for fire hazards shall be conducted in a manner that minimizes the risk. Non-sparking tools and fire extinguishers shall be used or available as required. Sources of ignition shall be removed. When necessary, explosion-proof instruments and/or bonding and grounding will be used to prevent explosion and/or fire.



All power equipment, cranes, trucks, generators, and drilling rigs will be required to have inspected, current fire extinguishers.

### **2.2.7 Severe Weather and Lightning**

The SSO will monitor local media resources to identify possible severe weather situations at the project site. Site work may be delayed, postponed, or cancelled due to severe weather based on the SSO's discretion. In the event of a weather emergency, the site will be evacuated in accordance with Section 7 of this document.

Lightning can strike up to a distance of 10 miles, but thunder can only be heard at a distance of 8 miles. Therefore, if site personnel working outdoors hear thunder and/or see lightning, work will be stopped and personnel will move to an indoor location. If indoor facilities are not available, personnel will move inside of passenger vehicles such as cars and pickups. During a thunderstorm with thunder/lightning, avoid trees/poles, standing water, high areas, and metal structures (fences, scaffolding, etc.). Work will resume 30 minutes following the final observance of thunder and/or lightning.

### **2.2.8 Heavy Equipment**

Heavy equipment to be used on this project includes excavators and drill rigs. Equipment must be maintained in good working condition and operated in a safe manner. Heavy equipment operators must be trained in the operation and handling of the applicable piece of equipment. Equipment must have audible alarms, rollover protection, seat belts, and be equipped with a fire extinguisher. Subcontractors shall not use equipment that they judge to be unsafe due to deterioration, missing parts, or obvious defects. Visual safety inspections shall be conducted daily and documented inspections shall be conducted monthly.

### **2.2.9 Slips, Trips, and Falls**

Slips, trips, and falls are a major concern while working on any site and account for a large number of occupational accidents. Personnel must be aware of their surroundings while moving about the site. Pathways and work areas must be kept free of debris and supplies to prevent unsafe walking and working conditions. Changes in elevation such as ruts, holes, broken pavement, or berms should be marked, if possible. When water is used during any of the work tasks, care must be taken to avoid creating muddy or slippery conditions. If slippery conditions are unavoidable, barriers and warning signs must be used to warn of these dangers.

### **2.2.10 Water Safety**

Work will include upland work adjacent to Salmon Bay. Work will not include activities from boats or barges. All personnel working below the OHW mark (e.g., during installation of TESC measures) must wear a properly fastened (e.g. zipped and clipped) U.S. Coast

Guard approved personal flotation device (PFD). The “buddy system” shall be mandatory for all crew members working on, over, or near the water.

## 2.3 Chemical Hazards

Data summarized in the Cleanup Action Plan (CAP) indicate that the chemicals listed in Table 2-1 exist at the site in soil and/or groundwater. Detailed hazard information for selected chemicals is available through MSDSs in Appendix E. Workers will use appropriate PPE if exposure to a known or suspected contaminated medium is likely.

### 2.3.1 Chemicals Potentially Used

In addition to the site contaminants, chemical products will be purchased for use at the site. These chemicals may include diesel fuel, gasoline, bentonite, Portland cement, silica sand, and decontamination materials such as isopropyl alcohol, n-hexane, and soaps (e.g., Alconox). Other materials may be purchased as needed. MSDSs required by OSHA will be obtained for chemical products used at the site. Copies of the MSDSs will be maintained at the site for worker review.

### 2.3.2 Sample Preservatives

Preservatives including hydrochloric acid and nitric acid may be encountered during sampling activities. Safe and proper handling techniques are to be used when collecting samples. Individuals should work upwind from the open sample keeping the bottle away from the breathing zone (approximately one arm’s length) to minimize potential exposure. Personnel should be aware of any changes in wind direction that may also affect potential for exposure to vapors. Gloves and safety glasses will always be worn when collecting samples. Sample vessel seals should be immediately replaced after sample is gathered.

Should any sample preservatives come in contact with skin, the exposed area should be thoroughly irrigated with fresh water immediately.

### 2.3.3 Hazardous Chemicals Present in Materials

#### **Total Petroleum Hydrocarbons (present in site soils, groundwater and potentially vapor)**

Total Petroleum Hydrocarbons (TPH) is a generic term based on analytical test procedures for the range of hydrocarbon materials from gasoline through heavier fuel oils. These materials typically consist of n-paraffins, isoparaffins, naphthenes, and aromatics in the boiling point range from approximately 50 to 250°C. Based on materials such as gasoline and fuel oils, TPH can be expected to typically act as a central nervous system depressant, resulting in slurred speech and mental confusion. Higher doses can result in unconsciousness and possibly death from respiratory failure. Skin contact can result in irritation, dermatitis, and defatting. Liver and kidney damage can also result following acute or chronic exposure. Exposure to diesel fuel liquid product may produce skin

irritation, and inhalation of the product mist may result in headache, nausea, and confusion.

**Benzene (present in site soils, groundwater and potentially vapor)**

Benzene exposure can occur by inhalation, percutaneous absorption, ingestion, and skin and eye contact. Like other aliphatic and aromatic hydrocarbons, acute overexposure to benzene can cause central nervous system depression. Headache, dizziness, nausea, convulsions, coma, and death can result from elevated exposures. In some cases, acute exposure has resulted in death due to ventricular fibrillation. The principal chronic hazard associated with benzene exposures is its ability to cause changes in blood cells, including anemia and cell abnormalities. Benzene has been demonstrated to cause leukemia in epidemiological studies, and it is recognized as a human carcinogen by the National Institute for Occupational Safety and Health (NIOSH) and other agencies. The Environmental Protection Agency (EPA) currently classifies benzene as a Class A, or confirmed, human carcinogen.

**Arsenic (present in in site soils and groundwater)**

The major route of exposure to arsenic is via inhalation of dusts or fumes or through ingestion of dust. Arsenic dust exposure causes irritation of the upper respiratory tract, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and darkening of the skin and small corns or warts. Ingestion of Arsenic laden dust from swallowing inhaled dust or ingesting contaminated soil may also cause gastrointestinal effects including nausea and vomiting. The PEL for arsenic dust is 0.2 mg/m<sup>3</sup> with a STEL of 0.6 mg/m<sup>3</sup>.

**Trichloroethene (present in site soils, groundwater and potentially vapor)**

TCE exposure can occur by inhalation, percutaneous absorption, ingestion, and skin and eye contact. It is colorless liquid which has a chloroform-like odor. Exposure can result in effects to the immune and reproductive systems, liver, kidneys, central nervous system, and may affect fetal development during pregnancy. Long term exposures to TCE can increase the risk of kidney cancer. There is also evidence that TCE exposure can increase the risk for non-Hodgkin's lymphoma and liver cancer. Exposure symptoms may include eye irritation, headache, dizziness, nausea; convulsions, coma, and death can result from elevated exposures. TCE is recognized as a human carcinogen by the National Institute for Occupational Safety and Health (NIOSH) and other agencies.

**Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAH)**

Epidemiological evidence suggests that workers exposed to these compounds are at increased risk of cancer at many organ sites, including lungs, kidney and skin. The major route of exposure to these compounds on this project is through inhalation of or skin contact with contaminated soils.



**Table 2-1 Chemical Hazards**

Contaminant	Unit	PEL <sup>a</sup>	TLV <sup>b</sup>	REL <sup>c</sup>	STEL <sup>d</sup>	IDLH <sup>e</sup>	Odor Threshold	IP <sup>f</sup> (in eV)
Benzene	ppm	1	0.1	0.1	1	500	34-119	9.24
Diesel (as mist)	mg/m <sup>3</sup>	5	5	5	10	Ca	None Reported	NA
Gasoline	ppm	None	300	LOQ 15	C, 500	Ca	None Reported	9.24
Trichloroethylene (TCE)	ppm	100	50	25	NA	1000	1.36	9.45
Arsenic	mg/m <sup>3</sup>	0.01	0.01	0.002	NA	5 Ca	None Reported	NA

**Note:**

<sup>a</sup> OSHA Permissible Exposure Limit (PEL) (8-hour time weighted average [TWA])

<sup>b</sup> American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) (8-hour TWA)

<sup>c</sup> National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) (8-hour TWA)

<sup>d</sup> Short-Term Exposure Limit (15-minute TWA that should not be exceeded at any time during the work day)

<sup>e</sup> Immediately Dangerous to Life & Health

<sup>f</sup> Ionization Potential

C = Ceiling Limit (Concentration that should not be exceeded during any part of the working exposure)

CA = Carcinogenic

mg/m<sup>3</sup>: milligrams per cubic meter

## 2.4 Biological Hazards

Project personnel should be provided with the information and training necessary to avoid accidental injury or illness that can result from exposure to biological hazards. This includes ensuring that the site is carefully assessed when personnel are on site so that the hazards associated with biological entities are recognized and eliminated or controlled. Potential biological hazards associated with the project site include animals, such as raccoons and rats; stinging insects, such as bees and yellow jackets; and plants, such as blackberries.

### 3 Personal Protective Equipment

PPE is required for all field work. The level of PPE required varies by the type and duration of potential exposures. The EPA terminology for protective equipment (Levels A, B, C, and D) provides guidance on typical work levels and required PPE. Additional training is required for Levels A and B; CRETE personnel are not permitted to use Level A or Level B at the Site. A guide to the type of chemical protective clothing and respirator cartridges to be used for chemicals commonly encountered during remedial investigations is provided in Table 3-1, and requirements for Level C or Level D PPE are described below.

Respiratory protective equipment shall be NIOSH-approved and use shall conform to OSHA 29 CFR 1910.134.

**Table 3-1 PPE Selection Guide**

Chemical Hazard	Glove Material	Coverall Material	Boot Material	Respirator Cartridge
<b>Acids</b> <ul style="list-style-type: none"> <li>• Hydrochloric</li> <li>• Sulfuric</li> </ul>	Butyl rubber	Saranex or Butyl rubber apron	Butyl rubber	Acid vapor
<b>Coal Tar</b> <ul style="list-style-type: none"> <li>• Polyisocyanate</li> <li>• Naphtha</li> </ul>	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor
<b>Creosote</b>	Butyl rubber	Polycoated Tyvek	Butyl rubber	Organic vapor
<b>Dry Particulates</b> <ul style="list-style-type: none"> <li>• Metals</li> <li>• Asbestos</li> </ul>	Nitrile rubber	Tyvek	Tyvek	HEPA
<b>Fuel Hydrocarbons</b> <ul style="list-style-type: none"> <li>• Gasoline</li> <li>• Diesel</li> </ul>	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor
<b>Halogens, Aliphatic</b> <ul style="list-style-type: none"> <li>• Carbon tetrachloride</li> <li>• Ethylene dichloride</li> </ul>	Teflon	Polycoated Tyvek	Nitrile rubber	Organic vapor
<b>Halogens, Vinylic</b> <ul style="list-style-type: none"> <li>• Vinyl chloride</li> </ul>	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor

*Forsberg, K. and Mansdorf, S.Z., 1997. Quick Selection Guide to Chemical Protective Clothing, Third Edition. John Wiley & Sons, Inc.*

#### 3.1 Level C

Level C protection shall be used when:

- Substance(s) require the same level of skin protection as Level B, but a lesser level of respiratory protection.
- The types of air contaminants have been identified, concentrations have been measured, and respirator decision logic indicates that air purifying respirators (APRs) are sufficient to remove the contaminants.

- The substance has adequate warning properties (odor threshold is below occupational exposure limits) and all criteria for the selection of APR have been met.

**Table 3-2 Level C PPE to be Utilized**  
(Check Appropriate PPE)

<input checked="" type="checkbox"/>	Half-face APR (OSHA/NIOSH-approved)
<input type="checkbox"/>	Full-face APR (OSHA/NIOSH-approved)
<input checked="" type="checkbox"/>	Type of Cartridges to be Used: AG/OV/P100
<input type="checkbox"/>	Chemical-resistant clothing <u>check appropriate garments</u> (one-piece coverall; hooded one- or two-piece; chemical splash suit; chemical-resistant hood and apron; disposable chemical coveralls [i.e., Tyvek]) <ul style="list-style-type: none"> <li><input type="checkbox"/> One-piece coverall</li> <li><input type="checkbox"/> Hooded one- or-two piece chemical splash suit</li> <li><input type="checkbox"/> Chemical-resistant hood and apron</li> <li><input type="checkbox"/> Disposable chemical-resistant coveralls</li> </ul> <p><b>Fabric Type:</b></p>
<input checked="" type="checkbox"/>	Disposable inner gloves (surgical)
<input type="checkbox"/>	Disposable chemical-resistant outer gloves <b>Material Type:</b>
<input type="checkbox"/>	Chemical-resistant boots with safety toe and steel shank or disposable boot covers for safety toe/work boots <b>Material Type:</b>
<input checked="" type="checkbox"/>	Work boots with steel toe
<input type="checkbox"/>	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
<input type="checkbox"/>	Safety goggles
<input checked="" type="checkbox"/>	Safety glasses
<input checked="" type="checkbox"/>	Hard hat
<input type="checkbox"/>	Hard hat with face shield
<input checked="" type="checkbox"/>	Hearing protectors ( <b>REQUIRED</b> if site noise levels are greater than 85 dB based on an 8-hour TWA). <b>Type:</b> foam or rubber ear plugs
<input type="checkbox"/>	<b>Modifications:</b> Nitrile gloves when sampling, face mask (Covid)

### 3.2 Level D

Level D protection will be used when:

- The atmosphere contains no known hazard.

- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals.
- Atmospheric concentrations of contaminants are less than the Threshold Limit Value (TLV).

**Table 3-3 Level D PPE (Minimum Work Uniform Permitted)**  
(Check Appropriate PPE)

<input checked="" type="checkbox"/>	Full-legged pants, safety vest
<input checked="" type="checkbox"/>	Work boots with safety toe
<input checked="" type="checkbox"/>	Work gloves
<input type="checkbox"/>	Safety goggles
<input checked="" type="checkbox"/>	Safety glasses
<input checked="" type="checkbox"/>	Hearing protectors ( <b>REQUIRED</b> if site noise levels are greater than 85 dB based on an 8-hour TWA)
<input checked="" type="checkbox"/>	Hard hat
<input type="checkbox"/>	Hard hat with face shield
<input type="checkbox"/>	<b>Modifications:</b> Nitrile gloves when sampling, face mask (Covid)

**Table 3-4 Activity vs. Level of Protection**

Activity	Level of PPE	Special Requirements
Groundwater, Vapor, and Soil Sampling	Level D or Level C	Wear proper protection from contaminants.
Geoprobe borings, Well Installation and Development	Level D or Level C	Hearing protection around heavy equipment
Remediation oversight and confirmation sampling	Level D or Level C	All excavations to be properly trench shored per OSHA 29 CFR 1926.650, 29 CFR 1926.651, and 29 CFR 1926.652. Personnel will not enter excavations greater than 4-feet unless properly shored or benched. A personal floatation device may be required if work is below the ordinary high water mark.



## 4 Air Monitoring and Action Levels

According to 29 CFR 1910.120(h) and Washington Administrative Code (WAC), air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection required for personnel working on site.

Air monitoring and visual observations of the site are required to determine the effectiveness of engineering controls, to reevaluate levels of protection, and determine if site conditions have changed. The monitoring will occur only during work that will disturb environmental media known to contain contaminants. This may consist of use of a 4-gas meter, as needed in excavations. Any space outside of an excavation will be unlikely to need such air monitoring.

- Personal air monitoring for metals (arsenic) will be conducted if visible dust emissions are occurring during excavation oversight and soil sampling or other site activities;
- Area sampling for VOCs with a photoionization detector (PID) will be conducted if odors are detected. A 4-gas meter includes a PID, a methane probe for lower explosive limit % (LEL), carbon monoxide (equipment exhaust) and hydrogen sulfide (common groundwater off-gassing).

Volatile organic concentrations will be assessed using a photoionization detector (PID) or 4-gas meter, such as a MultiRAE or RKI, if required.

Table 4-1 below describes the actions that will be initiated if and when air monitoring indicates potentially hazardous exposures on site.

**Table 4-1 Chemicals Requiring Initial Determination Air Monitoring**

Monitoring Device	Result	Action Required
<b>Photoionization Detector for VOCs</b>	0 to 10 units above background sustained for 1 minute	Continue Periodic Monitoring
	10 to 25 units above background sustained for 1 minute	Cease operations until the SSO has evaluated the situation Notify the project CIH who will decide whether to modify the plan (including changing engineering controls) and/or upgrade to level C, including respiratory protection
	> 25 units above background sustained for 1 minute	Cease operations until the SSO has evaluated the situation Notify the project CIH who will decide whether to modify the plan and will upgrade to level C

Air monitoring is conducted at the following times or as specified by the SSO:

- Upon initial entry to rule out oxygen deficient, flammable, and/or IDLH conditions. At this site there is no “entry”, as no work in to be completed in excavations, trenches, or small spaces.
- When the possibility of an oxygen deficient, flammable, and/or IDLH condition or flammable atmosphere has developed
- As an on-going check of the levels of contaminants in the breathing zone
- When work is initiated on a different portion of the site
- When contaminants other than those previously identified are encountered
- When a different operation is initiated
- When work involves the handling of leaking drums, containers, or when working in areas with obvious liquid contamination
- During confined space entry
- At the perimeter of the site as required
- Outside the site perimeter as required (e.g., adjacent buildings).

If deemed necessary, per the conditions noted above, real time air monitoring with direct reading instruments will conform to, at a minimum, the criteria listed in Table 4-2. All air monitoring data will be recorded in the daily field logs/notes or logged digitally and archived for future reference. All air monitoring equipment calibration

data is to be recorded in the daily field logs/notes. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications.

**Table 4-2 Air Monitoring/Instrumentation**

<b>X</b>	<b>Photoionization Detector</b> Please Check Bulb Size:		
	9.5eV: <input type="checkbox"/>	10.2eV: <input checked="" type="checkbox"/>	11.7eV: <input type="checkbox"/>
<b>Use:</b>	Detection of Organic Gases and Vapors, Program to TWA & STEL for benzene		
<b>Action Level:</b>	<p>PID reading &gt;15 ppm at point of operations for more than 1 minute → <b>Establish 25-ft diameter exclusion zone around work area</b>, monitor worker’s breathing zone.</p> <p>PID reading &gt;15 ppm in worker’s breathing zone for more than 1 minute → <b>Evacuate area or upgrade to Level C-half face respirator with organic vapor/HEPA cartridge</b>, establish contamination reduction zone with waste containers and decontamination fluids provided for personal decontamination.</p> <p>With respirator: PID reading &gt;75 ppm in worker’s breathing zone for more than 1 minute → <b>Evacuate area and move upwind</b> to allow vapors to dissipate, may resume work after vapors dissipate.</p> <p>With respirator: PID reading &gt;100 ppm in worker’s breathing zone for more than 1 minute OR &gt;300 ppm instantaneous → <b>Evacuate area and move upwind</b>. If elevated levels persist, cover impacted materials and notify SSO.</p>		
<b>Frequency:</b>	Sample the breathing space and work area periodically throughout field activities.		

## 4.1 Respirator Cartridge Change Out

In the event of the use of respiratory protection, cartridges will be replaced daily during field work. For organic cartridges, these conditions may dictate that the cartridges be replaced more frequently:

- If the organic chemical’s boiling point is <70°F and the concentration is greater than 200 ppm, contact the SSO to discuss cartridge replacement and options for respiratory protection.
- If physical work rate exceeds a moderate level, replace cartridges every 4 hours of work.

- If relative humidity exceeds 85%, replace cartridges every 4 hours of work.

## 5 Work Zones

Site control will be maintained by establishing clearly identified work zones. These will include exclusion zones, contamination reduction zones, support zones, and other work areas on site where the potential for airborne or contact exposure to hazardous substances is minimal.

### 5.1 Exclusion Zone

Exclusion zones will be established around each work activity (excavation or disturbance of soil, sediment, or groundwater) conducted in contaminated areas of the site. Only persons with appropriate training (40- or 24-hour Hazardous Waste Operations Training as described below in Section 8.0) and authorization from the SSO may enter exclusion zones. Traffic cones, barrier tape, and warning signs will be used, as necessary, to establish the zone boundaries.

Exclusion zones for subsurface work, including drilling, excavation, trenching, etc. will consist, at a minimum, of the entire excavation plus a 6-foot or greater buffer surrounding the excavation, as site configuration allows. This buffer may be expanded at the discretion of the SSO depending on site conditions, including weather and the results of air monitoring. Note: The buffer zone surrounding the excavation will be larger than six feet where the heavy equipment is located, as the track hoe will be located within the exclusion zone.

### 5.2 Contamination Reduction Zone

A contamination reduction zone will be established just outside each exclusion zone to decontaminate equipment and personnel.

This zone will be clearly delineated from the exclusion zone and support zone. The contamination reduction zone shall have boot, glove, and rain gear wash and rinse buckets, brushes, and a source of additional water (hose or water buckets) for cleaning. Care will be taken to prevent contact with used wash water. Damaged or disposable Personal Protective Equipment will be placed in plastic garbage bags for disposal as solid waste.

The exteriors of heavy equipment will be cleaned using sprayed water and brushes prior to leaving the exclusion zone to remove any loose dirt. A wheel wash will be installed in the contamination reduction zone to remove dirt from wheel treads.

### 5.3 Support Zone

A support zone will be established outside the contamination reduction zone to stage clean equipment, don personal protective equipment, take rest breaks, rehydrate, etc. This zone will be clearly delineated from the contamination reduction zone.

In summary, exclusion zones will be established for excavations and site work in areas of identified contamination. Given the site history, it is possible that contaminated soil (not previously identified) will be encountered. Should excavation or site work uncover soil or water with visible contamination or noticeable odor, the SSO will be notified, PPE will be upgraded as appropriate, and the work area will be monitored. It should be noted that metals contamination may not provide visible or other sensory clues. Because of this, general work procedures, such as minimizing dust generation and good personal hygiene, will be practiced.

#### **Minimization of Contamination**

To ensure effective work zone procedures, the amount of equipment and number of personnel permitted to enter contaminated areas must be minimized. Do not kneel on contaminated ground, stir up unnecessary dust, or perform any practice that increases the probability of hand-to-mouth transfer of contaminated materials. Use plastic drop cloths and equipment covers, where possible.

### 5.4 General Site Control Safety Procedures

- Whenever possible, avoid contact with contaminated (or potentially contaminated) surfaces. Walk around (not through) puddles and discolored surfaces. Do not kneel or set equipment on the ground. Stay away from waste drums unless it is necessary to sample or handle the drums. Protect equipment from contamination by bagging.
- Eating, drinking, and/or smoking are only permitted in designated areas in the support zone.
- Hands and face must be thoroughly washed upon leaving the CRZ.
- Beards and/or other facial hair that interferes with respirator fit will preclude admission to the exclusion zone.
- All equipment must be decontaminated or properly discarded upon exit from the exclusion zone as determined by the SSO.
- All personnel exiting the exclusion zone must go through the decontamination procedures as described in this HASP.
- PPE as described in this HASP will be required for all field personnel working on site.
- Contact lenses may be worn on the site provided safety glasses or goggles are also worn. Any exceptions to wearing of contact lenses will be specified in this HASP or through a HASP amendment.

## 6 Decontamination

In general, everything that enters the exclusion zone must either be decontaminated or properly discarded upon exit from the exclusion zone. All personnel, including any visitors, must enter and exit the exclusion zone through the CRZ.

Contaminated equipment and heavy equipment will be decontaminated and inspected by the equipment operator/contractor). Material that is generated by decontamination procedures will be discharged through the water treatment system, or drummed for offsite disposal is at tail-end of project completion.

### 6.1 Personnel Decontamination

Personnel may become contaminated in a number of ways including, not limited to:

- Contacting vapors, gases, mists, or particulates in the air
- Being splashed by materials during sampling
- Walking through puddles or on contaminated soil
- Using contaminated instruments or equipment.

Even with safeguards, personnel contamination may occur. Harmful materials can be transferred into the clean area, exposing unprotected personnel. In removing contaminated clothing, personnel may contact contaminants on clothing or inhale them. To prevent such occurrences, decontamination procedures must be developed and established before anyone enters the site and must continue throughout site operations.

Personnel decontamination procedures will be based on the contaminants of concern and the level of protection being worn by site personnel.

### 6.2 Sampling Equipment

Sampling devices, when used onsite, require special cleaning procedures (Table 6-1).

### 6.3 Disposal of Contaminated Materials

All materials and equipment used for decontamination must be disposed of properly (Table 6-1).

### 6.4 Emergency Decontamination

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment are

required, decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

## 6.5 Sanitizing of Personal Protective Equipment

Respirators, reusable protective clothing, and other personal articles not only must be decontaminated before being reused, but also sanitized. The insides of masks and clothing become soiled due to exhalation, body oils, and perspiration. Manufacturer's instructions should be used to sanitize the respirator masks. If practical, reusable protective clothing should be machine-washed after a thorough decontamination; otherwise, it must be cleaned by hand.

**Table 6-1 Decontamination Procedures**

<input type="checkbox"/>	<p><b>Level C:</b> Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, boot cover removal, outer glove removal, suit/safety boot wash, suit/safety boot rinse, (canister or mask change), safety boot removal, splash suit removal, inner glove wash, face piece removal, inner glove removal, inner clothing removal, field wash, re-dress.</p> <p><b>Modifications:</b></p>
<input checked="" type="checkbox"/>	<p><b>Level D:</b> Segregated equipment drop, boot and glove wash, boot and glove rinse, or dispose of gloves. PPE shall not be shared. Each personnel to have their own, dedicated PPE (boots, safety glasses, respirators, etc.)</p> <p><b>Modifications:</b> Change gloves between samples, or when soiled during non-sampling activities.</p>
<input checked="" type="checkbox"/>	<p><b>Heavy Equipment:</b> Decontamination: The surfaces of all heavy equipment that come into contact with soils will be cleaned prior to removal from site with power-washer or heavy brooms. The SSO is responsible for assuring decontamination activities.</p>



## 7 Emergency Response/Contingency Plan

It is essential that site personnel be prepared in the event of an emergency. Emergencies can take many forms: illnesses, injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in weather. Table 7-1 outlines the contact information for emergencies. The first two numbers should be called in the order listed for all emergencies requiring immediate assistance. The other numbers are specific to emergency type (e.g., spill, poisoning). The Project Manager and the client contact are to be notified of the incident after the emergency situation is addressed.

**Table 7-1 Emergency Contacts/Telephone Numbers**

<b>1. Fire, Police, Ambulance</b>	911 or
Capable of Transporting Contaminated Personnel?	Yes: <input checked="" type="checkbox"/> No: <input type="checkbox"/>
<b>2. Site Security</b>	NONE
<b>Hospital:</b>	<b>Swedish Emergency Room in Ballard 5350 Tallman Ave NW, Seattle, WA 98107</b>
Chemical Trauma Capabilities?	Yes: <input checked="" type="checkbox"/> No: <input type="checkbox"/>
Decontamination Capabilities?	Yes: <input checked="" type="checkbox"/> No: <input type="checkbox"/>
Directions from Site to Hospital:	Go east onto West Commodore Way, continue to 21st Ave W (Commodore Way turns into 21 <sup>st</sup> Ave W), turn left onto W Emerson Pl, continue to W Nickerson St., follow W Nickerson St loop and go north onto 15 <sup>th</sup> Ave. W. Continue on 15th Ave NW to NW Market St, turn left, Follow NW Market St to Tallman Ave NW (turn left), then follow Emergency Room signs to ER entrance.
Note:	See map for route to hospital at the end of this section. <b>The route to the hospital was verified by:</b> Rusty Jones Distance from the Site to the hospital is: 2.6 miles. The approximate driving time is: 8 minutes.
<b>Poison Control Center:</b>	(800) 732-6985
<b>Electric Company:</b> Seattle City Light	(2062) 684.300
<b>Gas Company:</b> Puget Sound Energy (PSE)	(888) 225-5773 or 911
<b>Water Company:</b> Seattle Public Utilities, Operations Control Center (24/7)	(206) 386-1800 or 911
<b>Airport:</b> SeaTac	(206) 433-5217
<b>National Response Center (for spill reporting)</b>	(800) 424-8802
<b>Washington Emergency Management Division (for spill reporting)</b>	(800) 258-5990 or (800) OILS-911

<b>Center for Disease Control</b>	(404) 639-3311 (24-hour)
<b>ATF (explosion information)</b>	(202) 927-8210
<b>Chemtrec</b>	(800) 424-9300
<b>CRETE Consulting Office and Project Managers</b>	Grant Hainsworth (253) 797-6323 Jamie Stevens (206) 799-2744
<b>CRETE Consulting Personnel Medical Consultant</b>	UW Valley Medical Center Occupation Health and Safety
<b>Client Contact</b>	Kim Hempel (Pioneer Engineering) (773) 435-3725

## 7.1 Emergency Response Plan

### 7.1.1 Pre-Emergency Planning

The SSO is responsible for emergency contingency planning and as such, is responsible for:

- Posting emergency telephone numbers and route to the hospital in the field
- Conducting a weekly inventory of site emergency equipment, spill response and supplies
- Familiarizing themselves with emergency procedures for personnel injury or suspected overexposures, fires, explosions or releases
- Identifying the names of all personnel on site who are certified in CPR and first aid
- Briefing new employees on the emergency response plan before they perform fieldwork.

### 7.1.2 Emergency Equipment and Supplies

The following emergency equipment and supplies will be available on site during days with field sampling:

- Fire extinguishers;
- Industrial first aid kit; and
- Eye wash.

### 7.1.3 Emergency Recognition and Prevention

Prevention of emergencies will be aided by the effective implementation of the health and safety procedures specified in this Site-Specific Health and Safety Plan. The following hazards which could lead to emergency situations have been identified as being potentially present during the course of field activities:

- Traumatic injury from heavy equipment accidents, rusty or sharp demolition debris, and/or falling into holes or trenches; and
- Exposure to harmful chemical dusts and vapors.

#### **7.1.4 Emergency Medical Treatment and First Aid**

- Prevent further injury, perform appropriate decontamination and notify the SSO.
- Depending upon the type and severity of the injury, the SSO will call 911 for an ambulance.
- Notify CRETE personnel.
- Prepare an incident report.

#### **7.1.5 Emergency Decontamination**

Personnel will be decontaminated to the extent feasible but life saving and first aid procedures take priority over decontamination efforts. Workers shall grossly decontaminate the injured person.

#### **7.1.6 Evacuation Routes and Procedures**

In case of emergencies, evacuation routes will be designated. Personnel will exit the site and assemble at the designated point in the support zone. The SSO will account for personnel at the on-site assembly point and notify local emergency responders. The SSO will assess the need for site evacuation based on the degree of hazard posed to personnel in the support zone.

Evacuation routes will be determined on a site-by-site basis. Elements that will be considered in the selection of the route include: wind direction, obstructions, topography, and type of emergency. Assembly Points will be determined, as needed.

#### **7.1.7 Critique of Response and Follow-up**

The Project Manager or their designee will evaluate the effectiveness of the emergency response and recommend procedures for improving emergency response to the Project CIH. Follow-up activities include notification of the CRETE Project Manager within 24 hours of the injury, investigation of cause and implementation of measures to prevent reoccurrence.



**Appendix A-1**  
**COVID-19 Infection Control Procedures**



# HEALTH AND SAFETY PLAN ADDENDUM COVID-19 INFECTION CONTROL PROCEDURES

## 1.0 INTRODUCTION

Crete Consulting (Crete) established these infection control procedures (Procedures) to address the coronavirus disease 2019 (COVID-19) pandemic impacting the Puget Sound region. The intent of these Procedures is to protect all employees, subcontractors, and visitors from infection by COVID-19 at sites where Crete is actively working.

These Procedures are based on what is currently known about COVID-19. The Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) are continually updating recommended protections as needed and as additional information becomes available. These Procedures will be updated as this information evolves.

## 2.0 SCOPE AND PURPOSE

Crete has been identified as providing an essential service, so is able to perform field work during the COVID-19 pandemic. The Procedures specified here are expected to be protective of site personnel during all field work activities. The following specific activities were considered in preparation of these procedures.

- Site inspections (Phase I);
- Site explorations (Phase II), which may include test pits, direct push drilling, auger and rotary boreholes, wells, hand and excavator bucket soil sampling for confirmation samples, groundwater sampling, indoor air and sub-slab vapor sampling, and slab coring;
- Remediation system operation, monitoring, and maintenance; and
- Construction monitoring.

## 3.0 COVID-19 PREVALENCE

Coronaviruses are a large family of viruses that are common in humans and many different species of animals, including cattle, cats, and bats. Rarely, animal coronaviruses can infect people and then spread between people, such as with MERS-CoV and SARS-CoV. The virus that causes COVID-19 is spreading from person-to-person across the United States and much of the world. It should be noted, however, that respiratory illnesses like seasonal influenza, are also currently widespread in many communities.

Reported COVID-19 cases have ranged from mild symptoms to severe illness and death. The following symptoms are most commonly reported. Symptoms may appear 2-14 days after exposure.

- Loss of sense of smell
- Sore throat

- Fever
- Dry cough

If you develop **emergency warning signs** for COVID-19 get **medical attention immediately**. Emergency warning signs include:

- Difficulty breathing or shortness of breath
- Persistent pain or pressure in the chest
- New confusion or inability to arouse
- Bluish lips or face

Older adults and people who have severe underlying chronic medical conditions like heart or lung disease or diabetes seem to be at higher risk for developing more serious complications from COVID-19 illness.

COVID-19 can be transmitted from an infected person to the surroundings or another person via the following identified pathways.

- The primary mode of transmission is believed to be through droplet transmission. This may occur when a person is in in close contact (within three feet) with someone who has respiratory symptoms (e.g., coughing or sneezing).
- There is some evidence that droplet transmission may also occur during normal breathing and speaking.
- The virus-laden droplets may also be deposited on surfaces and remain viable from hours to up to three days, depending upon the type of surface. The surface viral contamination can then be picked up by a person who comes into direct contact with that surface.

There are many other infectious agents that can impact your workplace, including common cold viruses, influenza, and Methicillin-resistant Staphylococcus aureus (MRSA). This Plan was developed primarily to address the emerging COVID-19 pandemic, but the protocols provided in this Plan will also offer protection against these other, more common, infections.

## **4.0 INFECTION CONTROL PROCEDURES**

This section presents the currently recommended infection control procedures to limit the potential for the spread of COVID-19 in the workplace and in the general public.

### **4.1 SPATIAL DISTANCING**

Based on the knowledge that COVID-19 can be spread through droplet transmission, the CDC has established a safe distance parameter of six feet between people. The following procedures are designed to provide guidance for spatial distancing on the jobsite.

- Workers, if working in a team, will take separate vehicles to the job site.
- A minimum distance of six feet should be maintained from other individuals on the worksite.

- Workers will not congregate in groups of more than four other individuals.
- Workers will not be permitted to come to work if they feel sick or exhibit any symptoms common to cold, flu or COVID-19. These symptoms include a fever, sore throat, or dry cough.
- No person will eat, drink, chew gum or tobacco in potentially contaminated areas or around other people. Drinking replacement fluids for heat stress control will be permitted only in areas that are free from contamination, except in emergency situations.
- Food should be consumed in a car or away from other individuals.
- All personnel leaving potentially contaminated areas will wash their hands and face prior to entering any new area. [If that is not possible, hands should be sanitized with hand-sanitizer. Hands and face should be washed with soap and water as soon as it is feasible after leaving a job site.](#)

#### **4.2 PERSONAL PROTECTIVE EQUIPMENT**

The following PPE is required on each job site:

- Disposable nitrile gloves should be worn at all times while on site. Gloves should be disposed each time the worker leaves the job site
- If work must be conducted in groups or a six-foot distancing is not possible, a filtering facepiece respirator is recommended. It is recognized that any device used to cover the nose and mouth may reduce exposure to virus particles. Respirators or face coverings have an added benefit in that they reduce face touching. There is currently a shortage of filtering facepiece respirators for non-medical personnel. If a commercial N-95 or other filtering facepiece respirator is not available, a cloth mask or other face cover may be used.

#### **4.3 DISINFECTION**

Cleaning for infection control is a two-step process. Surfaces must first be cleaned, then disinfected. Cleaning will remove soil and organic matter that would otherwise reduce the effectiveness of the disinfection step that follows. Water can be cold or warm, or as recommended on the label of the cleaning product used. Disinfectant cleaning will be conducted following general cleaning.

Disinfectants registered by the Environmental Protection Agency are recommended whenever they are available. Lists of all registered disinfectants can be found at [EPA-Registered Disinfectants](#) and COVID-19 disinfectants can be found at [EPA-Registered Disinfectants for COVID-19](#).

Cleaning and disinfection Procedures are as follows:

- Routinely clean all frequently touched surfaces in the workplace, such as tools, equipment, and handles.



- Provide disposable wipes so that commonly used surfaces can be wiped down by employees before each use.
- Workers will avoid sharing unsanitized equipment, including phones, tools, and equipment.
- Hands should be washed with soap and water after using the restroom, before and after lunch breaks and after co-handling objects. If that is not possible, hands should be sanitized with hand-sanitizer. Hands and face should be washed with soap and water as soon as it is feasible after leaving a job site.

## 5.0 COVID-19 JOB HAZARD ASSESSMENT

COVID-19 hazards and corresponding control measures for planned site work activities are summarized as follows:

Work Activity	Primary Potential Hazards	Control Measures
All	<ul style="list-style-type: none"> <li>• Exposure to/spreading of COVID-19</li> </ul>	<ul style="list-style-type: none"> <li>• Drive individually to the job site, lab, or to obtain equipment</li> <li>• Do not engage in group work, if possible, <a href="#">if required, limit groups to no more than 4 people</a></li> <li>• Direct workers to stay home if they are sick</li> <li>• Wear gloves, and change as needed</li> <li>• Maintain a six-foot distance from other individuals or don a mask if distancing is unavoidable</li> <li>• Disinfect frequently touched objects</li> <li>• Wash hands after using the restroom, lunch breaks and after co-handling objects</li> <li>• Eat lunch in the car or away from others</li> </ul>

## 6.0 REFERENCES

- Occupational Safety and Health Administration (OSHA)  
<https://www.osha.gov/Publications/OSHA3990.pdf>

- Centers for Disease Control (CDC) <https://www.cdc.gov/coronavirus/2019-ncov/downloads/community-mitigation-strategy.pdf>
- Washington State Department of Health. [Washington State Department of Health COVID-19](#)
- World Health Organization (WHO) <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>

**Appendix A-2**  
**Site Safety Plan Acknowledgment Form**



**Appendix B**  
**Visitor Sign-In Log**

### Visitor Sign-In Log

Client: \_\_\_\_\_

Project Name: \_\_\_\_\_

Location: \_\_\_\_\_

Field Activity: \_\_\_\_\_

Project Mgr.: \_\_\_\_\_

Field Manager: \_\_\_\_\_

Date	Name	Affiliation	Purpose of Visit	Site EHS Training		Do you have Level D PPE?		Time In	Time Out
				Yes	No	Yes	No		

## Visitor Sign-In Log

Client: \_\_\_\_\_

Project Name: \_\_\_\_\_

Location: \_\_\_\_\_

Field Activity: \_\_\_\_\_

Project Mgr.: \_\_\_\_\_

Field Manager: \_\_\_\_\_

Date	Name	Affiliation	Purpose of Visit	Site EHS Training		Do you have Level D PPE?		Time In	Time Out
				Yes	No	Yes	No		

### Visitor Sign-In Log

Client: \_\_\_\_\_

Project Name: \_\_\_\_\_

Location: \_\_\_\_\_

Field Activity: \_\_\_\_\_

Project Mgr.: \_\_\_\_\_

Field Manager: \_\_\_\_\_

Date	Name	Affiliation	Purpose of Visit	Site EHS Training		Do you have Level D PPE?		Time In	Time Out
				Yes	No	Yes	No		



**Appendix C**  
**Site Safety/Tailgate Meeting Form**

**Our behavior-based safety process is the key to our success!**

## Site Safety/Tailgate Meeting Form

Project Name: \_\_\_\_\_

Location: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Project Number: \_\_\_\_\_

Instructor: \_\_\_\_\_

---

### Safety Topics Presented

JHA: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Lessons Learned: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

General Safety Topics: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

---

Name	Attendee's Signature

**Our behavior-based safety process is the key to our success!**

## Site Safety/Tailgate Meeting Form

Project Name: \_\_\_\_\_

Location: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Project Number: \_\_\_\_\_

Instructor: \_\_\_\_\_

---

### Safety Topics Presented

JHA: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Lessons Learned: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

General Safety Topics: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

---

Name	Attendee's Signature

**Our behavior-based safety process is the key to our success!**

## Site Safety/Tailgate Meeting Form

Project Name: \_\_\_\_\_

Location: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Project Number: \_\_\_\_\_

Instructor: \_\_\_\_\_

---

### Safety Topics Presented

JHA: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Lessons Learned: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

General Safety Topics: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

---

Name	Attendee's Signature

**Appendix D**  
**Notification of Access to Employee**  
**Exposure and Medical Records**

## Notice

---

**To All Employees:** This Notice Is to Provide Information for Compliance with 29 CFR Part 1910 Subpart C - General Safety and Health Provisions - Paragraph 1910.1020, Access to Employee Exposure and Medical Records.

- (i) The existence, location, and availability of any records covered by this section is as follows:

CRETE Consulting, Inc.

100 South Washington, Suite 300  
Seattle, WA 98144  
PH: (253) 797-6323

Attn: Grant Hainsworth

Grant.hainsworth@creteconsulting.com

- (ii) The person responsible for maintaining and providing access to these records is CRETE's Environmental Health and Safety Manager.
- (iii) Each employee has the right to access these records.

**Appendix E**  
**Material Safety Data Sheets**

# MATERIAL SAFETY DATA SHEET

**LIQUINOX®**

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations



## SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **LIQUINOX®**  
CHEMICAL FAMILY NAME: Detergent.  
PRODUCT USE: Critical-cleaning detergent for laboratory, healthcare and industrial applications  
U.N. NUMBER: Not Applicable  
U.N. DANGEROUS GOODS CLASS: Non-Regulated Material  
SUPPLIER/MANUFACTURER'S NAME: Alconox, Inc.  
ADDRESS: 30 Glenn St., Suite 309, White Plains, NY 10603. USA  
EMERGENCY PHONE: **TOLL-FREE in USA/Canada** 800-255-3924  
**International calls** 813-248-0585  
BUSINESS PHONE: 914-948-4040  
DATE OF PREPARATION: May 2011  
DATE OF LAST REVISION: February 2008

## SECTION 2 - HAZARDS IDENTIFICATION

**EMERGENCY OVERVIEW:** This product is a pale yellow liquid no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable liquid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

CANADA (WHMIS) SYMBOLS

EUROPEAN and (GHS) Hazard Symbols

Non-Regulated

Not Controlled

None

Signal Word: **Caution!**

### EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1

EC# 231-791-2 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC

CAS# 84133-50-6 Not Listed in EU Chemical Inventory

EC# 232-483-0 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 215-090-9 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 241-543-5 This substance is not classified in the Annex I of Directive 67/548/EEC

### GHS Hazard Classification(s):

None

### Hazard Statement(s):

None

### Precautionary Statement(s):

P264: Wash hands thoroughly after handling

P271: Use only in well ventilated area.

### Hazard Symbol(s):

Not Classified



# MATERIAL SAFETY DATA SHEET

## LIQUINOX®

**Risk Phrases:**

None

**Safety Phrases:**

S24/25: Avoid contact with skin and eyes

**HEALTH HAZARDS OR RISKS FROM EXPOSURE:**

**ACUTE:** Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

**CHRONIC:** This product contains an ingredient which may be corrosive.

**TARGET ORGANS:**

ACUTE: Eye, respiratory System, Skin

CHRONIC: None Known

### SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Water	7732-18-5	231-791-2	Not Listed	40 – 60%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Alcohol Ethoxylate	84133-50-6	Not Listed	Not Listed	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Coconut Diethanolamide	8051-30-7	232-483-0	Not Listed	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Xylene Sulfonate	1300-72-7	215-090-9	1514	2 – 7%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tripotassium EDTA	17572-97-3	241-543-5	Not Listed	1 - 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

**NOTE:** ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

### SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

**EYE CONTACT:** If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

**SKIN CONTACT:** Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

**INHALATION:** If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing difficulty continues.

**INGESTION:** If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** Pre-existing skin, or eye problems may be aggravated by prolonged contact.

**RECOMMENDATIONS TO PHYSICIANS:** Treat symptoms and reduce over-exposure.

### SECTION 5 - FIRE-FIGHTING MEASURES

# MATERIAL SAFETY DATA SHEET

## LIQUINOX®

**FLASH POINT:**

Not Flammable

**AUTOIGNITION TEMPERATURE:**

Not Applicable

**FLAMMABLE LIMITS (in air by volume, %):**Lower (LEL): NA Upper (UEL): NA**FIRE EXTINGUISHING MATERIALS:**

As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:**

This product is non-flammable, however containers may rupture if exposed to heat or fire.

Explosion Sensitivity to Mechanical Impact:

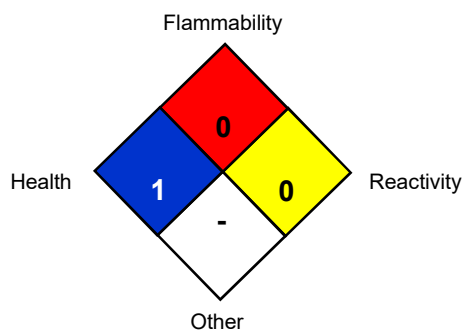
Not Sensitive.

Explosion Sensitivity to Static Discharge:

Not Sensitive

**SPECIAL FIRE-FIGHTING PROCEDURES:**

Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

**NFPA RATING SYSTEM****HMS RATING SYSTEM**

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD (BLUE)			1
FLAMMABILITY HAZARD (RED)			0
PHYSICAL HAZARD (YELLOW)			0
PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8
For Routine Industrial Use and Handling Applications			

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe \* = Chronic hazard

## SECTION 6 - ACCIDENTAL RELEASE MEASURES

**SPILL AND LEAK RESPONSE:** Personnel should be trained for spill response operations.**SPILLS:** Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Soak up with an absorbent material and place in an appropriate container for disposal. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

## SECTION 7 - HANDLING and STORAGE

**WORK PRACTICES AND HYGIENE PRACTICES:** As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.**STORAGE AND HANDLING PRACTICES:** Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

## SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

# MATERIAL SAFETY DATA SHEET

LIQUINOX®

## EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Water	7732-18-5	Not Listed	Not Listed	Not Listed
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	Not Listed	Not Listed	Not Listed
Alcohol Ethoxylate	84133-50-6	Not Listed	Not Listed	Not Listed
Coconut Diethanolamide	8051-30-7	Not Listed	Not Listed	Not Listed
Sodium Xylene Sulfonate	1300-72-7	Not Listed	Not Listed	Not Listed
Tripotassium EDTA	17572-97-3	Not Listed	Not Listed	Not Listed

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

**VENTILATION AND ENGINEERING CONTROLS:** Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

*The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.*

**RESPIRATORY PROTECTION:** Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

**EYE PROTECTION:** Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

**HAND PROTECTION:** Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

**BODY PROTECTION:** Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

## SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

<b>PHYSICAL STATE:</b>	Liquid
<b>APPEARANCE &amp; ODOR:</b>	Pale yellow liquid with no odor.
<b>ODOR THRESHOLD (PPM):</b>	Not Available
<b>VAPOR PRESSURE (mmHg):</b>	17 @ 20°C (68°F)
<b>VAPOR DENSITY (AIR=1):</b>	>1
<b>BY WEIGHT:</b>	Not Available
<b>EVAPORATION RATE (nBuAc = 1):</b>	<1
<b>BOILING POINT (C°):</b>	100°C (212°F)
<b>FREEZING POINT (C°):</b>	Not Available
<b>pH:</b>	8.5
<b>SPECIFIC GRAVITY 20°C: (WATER =1)</b>	1.083
<b>SOLUBILITY IN WATER (%)</b>	Complete
<b>COEFFICIENT OF WATER/OIL DIST.:</b>	Not Available
<b>VOC:</b>	None
<b>CHEMICAL FAMILY:</b>	Detergent

## SECTION 10 - STABILITY and REACTIVITY

**STABILITY:** Product is stable

**DECOMPOSITION PRODUCTS:** When heated to decomposition this product produces Oxides of carbon (COx), and Hydrocarbons

**MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE:** Strong acids and strong oxidizing agents.

**HAZARDOUS POLYMERIZATION:** Will not occur.

**CONDITIONS TO AVOID:** Contact with incompatible materials.

## SECTION 11 - TOXICOLOGICAL INFORMATION

# MATERIAL SAFETY DATA SHEET

LIQUINOX®

**TOXICITY DATA:** Toxicity data is not available for mixture:

**SUSPECTED CANCER AGENT:** None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

**IRRITANCY OF PRODUCT:** Contact with this product can be irritating to exposed skin, eyes and respiratory system.

**SENSITIZATION OF PRODUCT:** This product is not considered a sensitizer.

**REPRODUCTIVE TOXICITY INFORMATION:** No information concerning the effects of this product and its components on the human reproductive system.

## SECTION 12 - ECOLOGICAL INFORMATION

**ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.**

**ENVIRONMENTAL STABILITY:** No Data available at this time.

**EFFECT OF MATERIAL ON PLANTS or ANIMALS:** No evidence is currently available on this product's effects on plants or animals.

**EFFECT OF CHEMICAL ON AQUATIC LIFE:** No evidence is currently available on this product's effects on aquatic life.

## SECTION 13 - DISPOSAL CONSIDERATIONS

**PREPARING WASTES FOR DISPOSAL:** Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

## SECTION 14 - TRANSPORTATION INFORMATION

**US DOT; IATA; IMO; ADR:**

**THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.**

**PROPER SHIPPING NAME:** Non-Regulated Material

**HAZARD CLASS NUMBER and DESCRIPTION:** Not Applicable

**UN IDENTIFICATION NUMBER:** Not Applicable

**PACKING GROUP:** Not Applicable.

**DOT LABEL(S) REQUIRED:** Not Applicable

**NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004):** Not Applicable

**MARINE POLLUTANT:** None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

**U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:**

This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

**TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:**

This product is not classified as Dangerous Goods, per regulations of Transport Canada.

**INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):**

This product is not classified as Dangerous Goods, by rules of IATA:

**INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:**

This product is not classified as Dangerous Goods by the International Maritime Organization.

**EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):**

This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

## SECTION 15 - REGULATORY INFORMATION

**UNITED STATES REGULATIONS**

**SARA REPORTING REQUIREMENTS:** This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

**TSCA:** All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

**SARA 311/312:**

Acute Health: Yes                      Chronic Health: No                      Fire: No                      Reactivity: No

**U.S. SARA THRESHOLD PLANNING QUANTITY:** There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

**U.S. CERCLA REPORTABLE QUANTITY (RQ):** None

**CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):** None of the ingredients are on the California Proposition 65 lists.

# MATERIAL SAFETY DATA SHEET

## LIQUINOX®

### CANADIAN REGULATIONS:

**CANADIAN DSL/NDL INVENTORY STATUS:** All of the components of this product are on the DSL Inventory

**CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:** No component of this product is on the CEPA First Priorities Substance Lists.

**CANADIAN WHMIS CLASSIFICATION and SYMBOLS:** This product is categorized as a Not Controlled Product, as per the Controlled Product Regulations

### EUROPEAN ECONOMIC COMMUNITY INFORMATION:

#### **EU LABELING AND CLASSIFICATION:**

**Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.**

### AUSTRALIAN INFORMATION FOR PRODUCT:

**AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS:** All components of this product are listed on the AICS.

**STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS:** Not applicable.

### JAPANESE INFORMATION FOR PRODUCT:

**JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS:** The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

### INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory of Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

## SECTION 16 - OTHER INFORMATION

**PREPARED BY:** Paul Eigbrett      Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

**Disclaimer:** To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

### **ANNEX:**

#### **IDENTIFIED USES OF LIQUINOX® AND DIRECTIONS FOR USE**

**Used to clean:** Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, disk drives, clean rooms, medical devices, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, pipes, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. Used for phosphate sensitive analysis ware. FDA certified. Used to remove: Soil, grit, grime, slime, grease, oils, blood, tissue, particulates, deposits, chemical and solvents.

**Surfaces cleaned:** Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, cement and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Used for art restoration. Corrosion testing may be advisable.

**Cleaning method:** Soak, brush, sponge, cloth, ultrasonic, flow through clean-in-place. Will foam—not for spray or machine use.

**Directions:** Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 ml per liter) in cold, warm or hot

# MATERIAL SAFETY DATA SHEET

**LIQUINOX®**

water. If available, use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe or ultrasonic method. Not for spray machines, will foam. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic and metal surfaces. Corrosion testing may be advisable.

**Section 1: PRODUCT & COMPANY IDENTIFICATION**

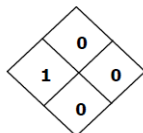
Product Name: Simple Green® All-Purpose Cleaner  
 Additional Names: Simple Green® Concentrated Cleaner Degreaser Deodorizer  
 Simple Green® Scrubbing Pad (Fluid in pad only)

Manufacturer's Part Number: \*Please refer to page 4

Company: Sunshine Makers, Inc.  
 15922 Pacific Coast Highway  
 Huntington Beach, CA 92649 USA  
 Telephone: 800-228-0709 • 562-795-6000 Fax: 562-592-3830  
 Emergency Phone: Chem-Tel 24-Hour Emergency Service: 800-255-3924

**Section 2: HAZARDS IDENTIFICATION**

**Emergency Overview:** CAUTION. Irritant. This is a Green colored liquid with a sassafras added odor. Scrubbing pad is a green fibrous rectangle infused with Simple Green Cleaner.

**NFPA/HMIS Rating:**

Health = 1 = slight

Fire, Reactivity, and Special = 0 = minimal

**Potential Health Effects**

**Eye Contact:** Mildly irritating.

**Skin Contact:** No adverse effects expected under typical use conditions. Prolonged exposure may cause dryness. Chemically sensitive individuals may experience mild irritation.

**Ingestion:** May cause stomach or intestinal irritation if swallowed.

**Inhalation:** No adverse effects expected under typical use conditions. Adequate ventilation should be present for prolonged usage in small enclosed areas.

**Section 3: COMPOSITION/INFORMATION ON INGREDIENTS**

<u>Ingredient</u>	<u>CAS Number</u>	<u>Percent Range</u>
Water	7732-18-5	≥ 78%
2-butoxyethanol	111-76-2	≤ 5%
Ethoxylated Alcohol	68439-46-3	≤ 5%
Tetrapotassium Pyrophosphate	7320-34-5	≤ 5%
Sodium Citrate	68-04-2	≤ 5%
Fragrance	Proprietary Mixture	≤ 1%
Colorant	Proprietary Mixture	≤ 1%

**Section 4: FIRST AID MEASURES**

**If Inhaled:** If adverse effect occurs, move to fresh air.

**If on skin:** If adverse effect occurs, rinse skin with water.

**If in eyes:** Flush with plenty of water. After 5 minutes of flushing, remove contact lenses, if present. Continue flushing for at least 10 more minutes. If irritation persists seek medical attention.

**If ingested:** Drink plenty of water to dilute.

**Section 5: FIRE FIGHTING MEASURES**

This formula is stable, non-flammable, and will not burn. No special procedures necessary

**Flammability:** Non-flammable  
**Flash Point:** Non-flammable

**Suitable Extinguishing Media:** Use Dry chemical, CO2, water spray or “alcohol” foam.  
**Extinguishing Media to Avoid** High volume jet water.  
**Special Exposure Hazards:** In event of fire created carbon oxides, oxides of phosphorus may be formed.  
**Special Protective Equipment:** Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

**Section 6: ACCIDENTAL RELEASE MEASURES**

**Personal Precautions:** See section 8 – personal protection.

**Environmental Precautions:** Do not allow into open waterways and ground water systems.

**Method for Clean Up:** Dilute with water and rinse into sanitary sewer system or soak up with inert absorbent material.

**Section 7: HANDLING AND STORAGE**

**Handling:** Keep container tightly closed. Ensure adequate ventilation. Keep out of reach of children.

**Storage:** Keep in cool dry area.

**Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION**

<b>Exposure Limit Values:</b>	OSHA PEL	ACGIH TLV
2-butoxyethanol	TWA 50 ppm (240 mg/m <sup>3</sup> )	20 ppm (97 mg/m <sup>3</sup> )
Tetrapotassium Pyrophosphate		5 mg/m <sup>3</sup>

**Exposure Controls:**

**Eye Contact:** Use protective glasses if splashing or spray-back is likely.  
**Respiratory:** Use in well ventilated areas.  
**Skin Contact:** Prolonged exposure or dermal sensitive individuals should use protective gloves.

**Section 9: PHYSICAL AND CHEMICAL PROPERTIES**

<b>Appearance:</b>	Green Liquid	<b>Vapor Pressure:</b>	18 mmHg @20°C; 23.5 mmHg @26°C	
<b>Odor:</b>	Added Sassafras odor	<b>Density:</b>	8.5 lb/gal;	
<b>Specific Gravity:</b>	1.010 ± 0.010	<b>Water Solubility:</b>	100%	
<b>pH:</b>	9.5 ± 0.5	<b>VOC composite Partial Pressure:</b>	TBD	
<b>Boiling Point:</b>	~210°F (98 °C)	<b>VOC:</b>	CARB Method 310	3.8%
<b>Freezing Point:</b>	~ 32°F (0 °C)		SCAQMD Method 313	2.8%
<b>Nutrient Content:</b>	Phosphorous: 0.28% Chloride: ~110 ppm	Sulfur: ~180 ppm	Fluorine: ~90 ppm	



## Section 10: STABILITY AND REACTIVITY

Stability: Stable  
 Materials to Avoid: None known  
 Hazardous Decomposition Products: Normal products of combustion - CO, CO<sub>2</sub>; Oxides of Phosphorous may occur.

## Section 11: TOXICOLOGICAL INFORMATION

Acute Toxicity: Oral LD<sub>50</sub> (rat) > 5 g/kg body weight  
 Dermal LD<sub>50</sub> (rabbit) > 5 g/kg body weight  
 Toxicity calculated from ingredients using OECD SERIES ON TESTING AND ASSESSMENT Number 33

Carcinogens: No ingredients are listed by OSHA, IARC, or NTP as known or suspected carcinogens.

## Section 12: ECOLOGICAL INFORMATION

Hazard to wild mammals: Low, based on toxicology profile  
 Hazard to avian species: Low, based on toxicology profile  
 Hazard to aquatic organisms: Low, based on toxicology profile  
 Chemical Fate Information: Readily Biodegradable per OECD 301D, Closed Bottle Test

## Section 13: DISPOSAL CONSIDERATIONS

Appropriate Method for Disposal:

Unused Product: \*Dilute with water to use concentration and dispose by sanitary sewer.  
 Used Product: \*This product can enter into clarifiers and oil/water separators. Used product may be hazardous depending on the cleaning application and resulting contaminants.  
 Empty Containers: \*Triple-rinse with water and offer for recycling if available in your area. Otherwise, dispose as non-hazardous waste.

\*Dispose of used or unused product, and empty containers in accordance with the local, State, Provincial, and Federal regulations for your location. Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

## Section 14: TRANSPORT INFORMATION

U.S. Department of Transportation (DOT) / Canadian TDG: Not Regulated

IMO / IDMG: Not classified as Dangerous  
 ICAO/ IATA: Not classified as Dangerous  
 ADR/RID: Not classified as Dangerous

U.N. Number	Not Required	Proper Shipping Name:	Detergent Solution
Hazard Class:	Non-Hazardous	Marine Pollutant:	No

**Section 15: REGULATORY INFORMATION**

All components are listed on: EINECS, TSCA, DSL and AICS Inventory.

No components listed under: Clean Air Act Section 112; Clean Water Act 307 & 311

SARA Title III 2-butoxyethanol is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 as Category N230 – Certain Glycol Ethers.

RCRA Status: Not a hazardous waste CERCLA Status : No components listed

State Right To Know Lists

2-butoxyethanol Illinois, Massachusetts, New Jersey, Pennsylvania, Rhode Island

**WHMIS Classification** – Category D, subcategory 2B, eye irritant

Name	Toxic Substances List – Schedule 1 – CEPA (Canadian Environmental Protection Act)	NPRI Inventory
2-butoxyethanol	Yes	No

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by Canada’s Controlled Products Regulation.

**Section 16: OTHER INFORMATION**

Questions about the information found on this MSDS should be directed to:

SUNSHINE MAKERS, INC. – TECHNICAL DEPARTMENT

15922 Pacific Coast Hwy. Huntington Beach, CA 92649

Phone: 800/228-0709 [8am-5pm Pacific time, Mon-Fri] Fax: 562/592-3830 Email: infoweb@simplegreen.com

**CAGE CODE 1Z575**

**GSA/FSS - CONTRACT NO. GS-07F-0065J**

**Scrubbing Pad GSA/BPA - CONTRACT NO. GS-07F-BSIMP**

**National Stock Numbers & Industrial Part Numbers:**

Simple Green	Part Number	NSN	Size
	13012	7930-01-342-5315	24 oz spray (12/case)
	13005	7930-01-306-8369	1 Gallon (6/case)
	13006	7930-01-342-5316	5 Gallon
	13016	7930-01-342-5317	15 Gallon
	13008	7930-01-342-4145	55 Gallon
	13103	N/A	2oz samples
	13225	N/A	2.5 Gallon
	13275	N/A	275 Gallon tote
	48049	N/A	1 Gallon Conc. w/ 32oz dilution
<b>Scrubbing Pad</b>	10224	7930-01-346-9148	Each (24/case)

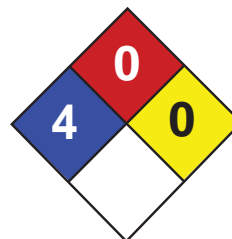
**Retail Numbers:**

Part Number	Size
13002	16 oz Trigger (12/case)
13005	1 Gallon (6/case)
13013	24 oz Trigger (12/case)
13014	67 oz / 2 L (6/case)
13033	32 oz Trigger (12/case)
80007	Tier display holding 13005 (36/Tier)

*part number is for both industrial and retail*

**\*\*International Part Numbers May Differ.**

**DISCLAIMER:** The information provided with this MSDS is furnished in good faith and without warranty of any kind. Personnel handling this material must make independent determinations of the suitability and completeness of information from all sources to assure proper use and disposal of this material and the safety and health of employees and customers. Sunshine Makers, Inc. assumes no additional liability or responsibility resulting from the use of, or reliance on this information.



Health	3
Fire	0
Reactivity	0
Personal Protection	

## Material Safety Data Sheet

### Nitric acid, 65% MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Nitric acid, 65%

**Catalog Codes:** SLN2161

**CAS#:** Mixture.

**RTECS:** Not applicable.

**TSCA:** TSCA 8(b) inventory: Water; Nitric acid, fuming

**CI#:** Not applicable.

**Synonym:** Nitric Acid, 65%

**Chemical Name:** Not applicable.

**Chemical Formula:** Not applicable.

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Water	7732-18-5	35
Nitric acid, fuming	7697-37-2	65

**Toxicological Data on Ingredients:** Nitric acid, fuming: VAPOR (LC50): Acute: 244 ppm 0.5 hours [Rat]. 344 ppm 0.5 hours [Rat].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, mucous membranes, upper respiratory

tract, skin, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

**Ingestion:**

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

**Serious Ingestion:** Not available.

#### Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** of combustible materials

**Explosion Hazards in Presence of Various Substances:**

Explosive in presence of reducing materials, of organic materials, of metals, of alkalis. Non-explosive in presence of open flames and sparks, of shocks.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:**

Flammable in presence of cellulose or other combustible materials. Phosphine, hydrogen sulfide, selenide all ignite when fuming nitric acid is dripped into gas. (Nitric Acid, fuming)

**Special Remarks on Explosion Hazards:**

Reacts explosively with metallic powders, carbides, cyanides, sulfides, alkalies and turpentine. Can react explosively with many reducing agents. Arsine, phosphine, tetraborane all oxidized explosively in presence of nitric acid. Cesium and rubidium

acetylides explode in contact with nitric acid. Explosive reaction with Nitric Acid + Nitrobenzene + water. Detonation with Nitric Acid + 4-Methylcyclohexane. (Nitric acid, fuming)

## Section 6: Accidental Release Measures

### Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

### Large Spill:

Corrosive liquid. Oxidizing material. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

### Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 23°C (73.4°F).

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

### Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 2 STEL: 4 (ppm) from ACGIH (TLV) [United States] TWA: 2 STEL: 4 from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Acrid. Disagreeable and choking. (Strong.)

**Taste:** Not available.

**Molecular Weight:** Not applicable.

**Color:** Colorless to light yellow.

**pH (1% soln/water):** Acidic.

**Boiling Point:** 121°C (249.8°F)

**Melting Point:** -41.6°C (-42.9°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.408 (Water = 1)

**Vapor Pressure:** 6 kPa (@ 20°C)

**Vapor Density:** 2.5 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 0.29 ppm

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether.

**Solubility:**

Easily soluble in cold water, hot water. Soluble in diethyl ether.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:**

Highly reactive with alkalis. Reactive with reducing agents, combustible materials, organic materials, metals, acids.

**Corrosivity:**

Extremely corrosive in presence of aluminum, of copper. Non-corrosive in presence of glass, of stainless steel(304), of stainless steel(316), of brass.

**Special Remarks on Reactivity:**

A strong oxidizer. Reacts violently with alcohol, organic material, turpene, charcoal. Violent reaction with Nitric acid + Acetone and Sulfuric acid. Nitric Acid will react with water or steam to produce heat and toxic, corrosive and flammable vapors. (Nitric acid, fuming)

**Special Remarks on Corrosivity:**

In presence of traces of oxides, it attacks all base metals except aluminum and special chromium steels. It will attack some forms of plastics, rubber, and coatings. No corrosive effect on bronze. No corrosivity data for zinc, and steel

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:**

Contains material which may cause damage to the following organs: lungs, mucous membranes, upper respiratory tract, skin, eyes, teeth.

**Other Toxic Effects on Humans:**

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

**Special Remarks on Toxicity to Animals:** LDL - Lowest Published Lethal Dose [Human] - Route: Oral; Dose: 430 mg/kg (Nitric acid, fuming)

**Special Remarks on Chronic Effects on Humans:**

May cause adverse reproductive effects (effects on newborn and fetotoxicity) based on animal data. (Nitric acid, fuming)

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Severely irritates skin. Causes skin burns and may cause deep and penetrating ulcers of the skin with a characteristic yellow to brownish discoloration. May be fatal if absorbed through skin. Eyes: Severely irritates eyes. Causes eye burns. May cause irreversible eye injury. Ingestion: May be fatal if swallowed. Causes serious gastrointestinal tract irritation or burns with nausea, vomiting, severe abdominal pain, and possible "coffee grounds" appearance of the vomitus . May cause perforation of the digestive tract. Inhalation: May be fatal if inhaled. Vapor is extremely hazardous. Vapor may cause nitrous gas poisoning. Effects may be delayed. May cause irritation of the mucous membranes and respiratory tract with burning pain in the nose and throat, coughing, sneezing, wheezing, shortness of breath and pulmonary edema. Other symptoms may include nausea, and vomiting. Chronic Potential Health Effects: Repeated inhalation may produce changes in pulmonary function and/or chronic bronchitis. It may also affect behavior (headache, dizziness, drowsiness, muscle contraction or spasticity, weakness, loss of coordinaton, mental confusion), and urinary system (kidney faillure, decreased urinary output after several hours of

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** Class 8: Corrosive material

**Identification:** : Nitric acid UNNA: 2031 PG: II

**Special Provisions for Transport:** Marine Pollutant

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

New York release reporting list: Nitric acid, fuming Rhode Island RTK hazardous substances: Nitric acid, fuming Pennsylvania RTK: Nitric acid, fuming Florida: Nitric acid, fuming Minnesota: Nitric acid, fuming Massachusetts RTK: Nitric acid, fuming

New Jersey: Nitric acid, fuming TSCA 8(b) inventory: Water; Nitric acid, fuming SARA 302/304/311/312 extremely hazardous substances: Nitric acid, fuming SARA 313 toxic chemical notification and release reporting: Nitric acid, fuming 65% CERCLA: Hazardous substances.: Nitric acid, fuming: 1000 lbs. (453.6 kg);

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):**

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

**DSCL (EEC):**

R8- Contact with combustible material may cause fire. R35- Causes severe burns. S23- Do not breathe gas/fumes/vapour/spray [\*\*\*] S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S36- Wear suitable protective clothing. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

**HMIS (U.S.A.):**

**Health Hazard:** 3

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:**

**National Fire Protection Association (U.S.A.):**

**Health:** 4

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 10:59 AM

**Last Updated:** 11/01/2010 12:00 PM

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# AMERADA HESS CORPORATION

## MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

### EMERGENCY OVERVIEW

#### DANGER!

**EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT  
- EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF  
SWALLOWED - ASPIRATION HAZARD**



NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

### 1. CHEMICAL PRODUCT and COMPANY INFORMATION (rev. Jan-04)

**Amerada Hess Corporation  
1 Hess Plaza  
Woodbridge, NJ 07095-0961**

**EMERGENCY TELEPHONE NUMBER (24 hrs):**

**CHEMTREC (800)424-9300**

**COMPANY CONTACT (business hours):**

Corporate Safety (732)750-6000

**MSDS Internet Website**

[www.hess.com/about/enviro.html](http://www.hess.com/about/enviro.html)

**SYNONYMS:** Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

### 2. COMPOSITION and INFORMATION ON INGREDIENTS \* (rev. Jan-04)

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

# AMERADAHESSCORPORATION

## MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

### 3. HAZARDS IDENTIFICATION (rev. Dec-97)

#### **EYES**

Moderate irritant. Contact with liquid or vapor may cause irritation.

#### **SKIN**

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

#### **INGESTION**

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

#### **INHALATION**

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

**WARNING:** the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

#### **CHRONIC EFFECTS and CARCINOGENICITY**

Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

#### **MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE**

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

### 4. FIRST AID MEASURES (rev. Dec-97)

#### **EYES**

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

#### **SKIN**

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

#### **INGESTION**

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

#### **INHALATION**

Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

# AMERADAHESSCORPORATION

## MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

### 5. FIRE FIGHTING MEASURES (rev. Dec-97)

#### **FLAMMABLE PROPERTIES:**

FLASH POINT:	-45 °F (-43°C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 °F (>280 °C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

#### **FIRE AND EXPLOSION HAZARDS**

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

#### **EXTINGUISHING MEDIA**

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO<sub>2</sub>, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 "Low Expansion Foam - 1994 Edition."

#### **FIRE FIGHTING INSTRUCTIONS**

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

### 6. ACCIDENTAL RELEASE MEASURES (rev. Dec-97)

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product

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vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

### 7. HANDLING and STORAGE (rev. Dec-97)

#### HANDLING PRECAUTIONS

\*\*\*\*\*USE ONLY AS A MOTOR FUEL\*\*\*\*\*

\*\*\*\*\*DO NOT SIPHON BY MOUTH\*\*\*\*\*

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

#### STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

#### WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

### 8. EXPOSURE CONTROLS and PERSONAL PROTECTION (rev. Jan-04)

#### EXPOSURE LIMITS

Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Exposure Limits	Note
Gasoline (86290-81-5)	ACGIH	300	500	A3	
Benzene (71-43-2)	OSHA	1	5	Carcinogen	
	ACGIH	0.5	2.5	A1, skin	
	USCG	1	5		
n-Butane (106-97-8)	ACGIH	800	--	2003 NOIC: 1000 ppm (TWA) Aliphatic Hydrocarbon Gases Alkane (C1-C4)	
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--		
	ACGIH	1000	--	A4	
Ethyl benzene (100-41-4)	OSHA	100	--		
	ACGIH	100	125	A3	

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Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Exposure Limits	Note
n-Hexane (110-54-3)	OSHA	500	--		
	ACGIH	50	--	skin	
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3	
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established	
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)	
	ACGIH	50	--	A4 (skin)	
1,2,4-Trimethylbenzene (95-63-6)	ACGIH	25	--		
Xylene, mixed isomers (1330-20-7)	OSHA	100	--		
	ACGIH	100	150	A4	

### **ENGINEERING CONTROLS**

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

### **EYE/FACE PROTECTION**

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

### **SKIN PROTECTION**

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

### **RESPIRATORY PROTECTION**

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

## **9. PHYSICAL and CHEMICAL PROPERTIES (rev. Jan-04)**

### **APPEARANCE**

A translucent, straw-colored or light yellow liquid

### **ODOR**

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

### **ODOR THRESHOLD**

	<u>Odor Detection</u>	<u>Odor Recognition</u>
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

### **BASIC PHYSICAL PROPERTIES**

BOILING RANGE:	85 to 437 °F (39 to 200 °C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H <sub>2</sub> O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %

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SOLUBILITY (H<sub>2</sub>O): Non-oxygenated gasoline - negligible (< 0.1% @ 77 °F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 °F); ethanol is readily soluble in water

### 10. STABILITY and REACTIVITY (rev. Dec-94)

**STABILITY:** Stable. Hazardous polymerization will not occur.

#### **CONDITIONS TO AVOID**

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

#### **INCOMPATIBLE MATERIALS**

Keep away from strong oxidizers.

#### **HAZARDOUS DECOMPOSITION PRODUCTS**

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

### 11. TOXICOLOGICAL PROPERTIES (rev. Dec-97)

#### **ACUTE TOXICITY**

Acute Dermal LD50 (rabbits): > 5 ml/kg

Acute Oral LD50 (rat): 18.75 ml/kg

Primary dermal irritation (rabbits): slightly irritating

Draize eye irritation (rabbits): non-irritating

Guinea pig sensitization: negative

#### **CHRONIC EFFECTS AND CARCINOGENICITY**

Carcinogenicity: OSHA: NO IARC: YES - 2B

NTP: NO

ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

### 12. ECOLOGICAL INFORMATION (rev. Jan-04)

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API ([www.api.org](http://www.api.org)) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

### 13. DISPOSAL CONSIDERATIONS (rev. Dec-97)

Consult federal, state and local waste regulations to determine appropriate disposal options.

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**14. TRANSPORTATION INFORMATION** (rev. Jan-04)

DOT PROPER SHIPPING NAME: Gasoline  
 DOT HAZARD CLASS and PACKING GROUP: 3, PG II  
 DOT IDENTIFICATION NUMBER: UN 1203  
 DOT SHIPPING LABEL: FLAMMABLE LIQUID

PLACARD:



**15. REGULATORY INFORMATION** (rev. Jan-04)

**U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION**

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

**CLEAN WATER ACT (OIL SPILLS)**

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

**CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)**

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

**SARA SECTION 311/312 - HAZARD CLASSES**

<u>ACUTE HEALTH</u>	<u>CHRONIC HEALTH</u>	<u>FIRE</u>	<u>SUDDEN RELEASE OF PRESSURE</u>	<u>REACTIVE</u>
X	X	X	--	--

**SARA SECTION 313 - SUPPLIER NOTIFICATION**

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents ([www.epa.gov/tri](http://www.epa.gov/tri)) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

<u>INGREDIENT NAME (CAS NUMBER)</u>	<u>CONCENTRATION - Parts per million (ppm) by weight</u>
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

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### CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)

Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

### **16. OTHER INFORMATION** (rev. Jan-04)

**NFPA® HAZARD RATING** HEALTH: 1 Slight  
FIRE: 3 Serious  
REACTIVITY: 0 Minimal

**HMIS® HAZARD RATING** HEALTH: 1 \* Slight  
FIRE: 3 Serious  
REACTIVITY: 0 Minimal  
\* CHRONIC

**SUPERSEDES MSDS DATED:** 12/30/97

### **ABBREVIATIONS:**

AP = Approximately < = Less than > = Greater than  
N/A = Not Applicable N/D = Not Determined ppm = parts per million

### **ACRONYMS:**

ACGIH	American Conference of Governmental Industrial Hygienists	NTP	National Toxicology Program
AIHA	American Industrial Hygiene Association	OPA	Oil Pollution Act of 1990
ANSI	American National Standards Institute (212)642-4900	OSHA	U.S. Occupational Safety & Health Administration
API	American Petroleum Institute (202)682-8000	PEL	Permissible Exposure Limit (OSHA)
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act	RCRA	Resource Conservation and Recovery Act
DOT	U.S. Department of Transportation [General Info: (800)467-4922]	REL	Recommended Exposure Limit (NIOSH)
EPA	U.S. Environmental Protection Agency	SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
HMIS	Hazardous Materials Information System	SCBA	Self-Contained Breathing Apparatus
IARC	International Agency For Research On Cancer	SPCC	Spill Prevention, Control, and Countermeasures
MSHA	Mine Safety and Health Administration	STEL	Short-Term Exposure Limit (generally 15 minutes)
NFPA	National Fire Protection Association (617)770-3000	TLV	Threshold Limit Value (ACGIH)
NIOSH	National Institute of Occupational Safety and Health	TSCA	Toxic Substances Control Act
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)	TWA	Time Weighted Average (8 hr.)
		WEEL	Workplace Environmental Exposure Level (AIHA)
		WHMIS	Workplace Hazardous Materials Information System (Canada)

### **DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES**

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.





## MATERIAL SAFETY DATA SHEET

**Diesel Fuel (All Types)**

**MSDS No. 9909**

### EMERGENCY OVERVIEW

#### CAUTION!

**OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT  
EFFECTS CENTRAL NERVOUS SYSTEM  
HARMFUL OR FATAL IF SWALLOWED**

**Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause moderate eye irritation and skin irritation (rash).**

**Long-term, repeated exposure may cause skin cancer.**

**If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).**



NFPA 704 (Section 16)

### 1. CHEMICAL PRODUCT AND COMPANY INFORMATION

**Hess Corporation  
1 Hess Plaza  
Woodbridge, NJ 07095-0961**

**EMERGENCY TELEPHONE NUMBER (24 hrs): CHEMTREC (800) 424-9300**

**COMPANY CONTACT (business hours): Corporate Safety (732) 750-6000**

**MSDS INTERNET WEBSITE: [www.hess.com](http://www.hess.com) (See Environment, Health, Safety & Social Responsibility)**

**SYNONYMS:** Ultra Low Sulfur Diesel (ULSD); Low Sulfur Diesel; Motor Vehicle Diesel Fuel; Diesel Fuel #2; Dyed Diesel Fuel; Non-Road, Locomotive and Marine Diesel Fuel; Tax-exempt Diesel Fuel

See Section 16 for abbreviations and acronyms.

### 2. COMPOSITION and CHEMICAL INFORMATION ON INGREDIENTS

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Diesel Fuel (68476-34-6)	100
Naphthalene (91-20-3)	Typically < 0.01

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher. Diesel fuel may be dyed (red) for tax purposes. May contain a multifunctional additive.

### 3. HAZARDS IDENTIFICATION

#### EYES

Contact with liquid or vapor may cause mild irritation.

#### SKIN

May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

#### INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.



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### **INHALATION**

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

**WARNING:** the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

### **CHRONIC EFFECTS and CARCINOGENICITY**

Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information.

IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

### **MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE**

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash).

## **4. FIRST AID MEASURES**

### **EYES**

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

### **SKIN**

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

### **INGESTION**

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

### **INHALATION**

Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

## **5. FIRE FIGHTING MEASURES**

### **FLAMMABLE PROPERTIES:**

FLASH POINT:	> 125 °F (> 52 °C) minimum PMCC
AUTOIGNITION POINT:	494 °F (257 °C)
OSHA/NFPA FLAMMABILITY CLASS:	2 (COMBUSTIBLE)
LOWER EXPLOSIVE LIMIT (%):	0.6
UPPER EXPLOSIVE LIMIT (%):	7.5

### **FIRE AND EXPLOSION HAZARDS**

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

### **EXTINGUISHING MEDIA**

**SMALL FIRES:** Any extinguisher suitable for Class B fires, dry chemical, CO<sub>2</sub>, water spray, fire fighting foam, or Halon.



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LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

### **FIRE FIGHTING INSTRUCTIONS**

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

## **6. ACCIDENTAL RELEASE MEASURES**

ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

## **7. HANDLING and STORAGE**

### **HANDLING PRECAUTIONS**

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Diesel fuel, and in particular low and ultra low sulfur diesel fuel, has the capability of accumulating a static electrical charge of sufficient energy to cause a fire/explosion in the presence of lower flashpoint products such as gasoline. The accumulation of such a static charge occurs as the diesel flows through pipelines, filters, nozzles and various work tasks such as tank/container filling, splash loading, tank cleaning; product sampling; tank gauging; cleaning, mixing, vacuum truck operations, switch loading, and product agitation. There is a greater potential for static charge accumulation in cold temperature, low humidity conditions.

Documents such as 29 CFR OSHA 1910.106 "Flammable and Combustible Liquids, NFPA 77 Recommended Practice on Static Electricity, API 2003 "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents and ASTM D4865 "Standard Guide for Generation and Dissipation of Static



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Electricity in Petroleum Fuel Systems" address special precautions and design requirements involving loading rates, grounding, bonding, filter installation, conductivity additives and especially the hazards associated with "switch loading." ["Switch Loading" is when a higher flash point product (such as diesel) is loaded into tanks previously containing a low flash point product (such as gasoline) and the electrical charge generated during loading of the diesel results in a static ignition of the vapor from the previous cargo (gasoline).]

Note: When conductivity additives are used or are necessary the product should achieve 25 picosiemens/meter or greater at the handling temperature.

### **STORAGE PRECAUTIONS**

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

### **WORK/HYGIENIC PRACTICES**

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

## **8. EXPOSURE CONTROLS and PERSONAL PROTECTION**

### **EXPOSURE LIMITS**

Components (CAS No.)	Source	Exposure Limits		Note
		TWA/STEL		
Diesel Fuel: (68476-34-6)	OSHA	5 mg/m, as mineral oil mist		A3, skin
	ACGIH	100 mg/m <sup>3</sup> (as totally hydrocarbon vapor) TWA		
Naphthalene (91-20-3)	OSHA	10 ppm TWA		A4, Skin
	ACGIH	10 ppm TWA / 15 ppm STEL		

### **ENGINEERING CONTROLS**

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

### **EYE/FACE PROTECTION**

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

### **SKIN PROTECTION**

Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.



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### **RESPIRATORY PROTECTION**

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

### **9. PHYSICAL and CHEMICAL PROPERTIES**

#### **APPEARANCE**

Clear, straw-yellow liquid. Dyed fuel oil will be red or reddish-colored.

#### **ODOR**

Mild, petroleum distillate odor

#### **BASIC PHYSICAL PROPERTIES**

BOILING RANGE: 320 to 690 oF (160 to 366 °C)  
VAPOR PRESSURE: 0.009 psia @ 70 °F (21 °C)  
VAPOR DENSITY (air = 1): > 1.0  
SPECIFIC GRAVITY (H<sub>2</sub>O = 1): 0.83 to 0.88 @ 60 °F (16 °C)  
PERCENT VOLATILES: 100 %  
EVAPORATION RATE: Slow; varies with conditions  
SOLUBILITY (H<sub>2</sub>O): Negligible

### **10. STABILITY and REACTIVITY**

**STABILITY:** Stable. Hazardous polymerization will not occur.

#### **CONDITIONS TO AVOID and INCOMPATIBLE MATERIALS**

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers; Viton ®; Fluorel ®

#### **HAZARDOUS DECOMPOSITION PRODUCTS**

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

### **11. TOXICOLOGICAL PROPERTIES**

#### **ACUTE TOXICITY**

Acute dermal LD50 (rabbits): > 5 ml/kg      Acute oral LD50 (rats): 9 ml/kg  
Primary dermal irritation: extremely irritating (rabbits)      Draize eye irritation: non-irritating (rabbits)  
Guinea pig sensitization: negative

#### **CHRONIC EFFECTS AND CARCINOGENICITY**

Carcinogenic: OSHA: NO      IARC: NO      NTP: NO      ACGIH: A3

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

#### **MUTAGENICITY (genetic effects)**

This material has been positive in a mutagenicity study.




**MATERIAL SAFETY DATA SHEET**

**Diesel Fuel (All Types)** **MSDS No. 9909**

**12. ECOLOGICAL INFORMATION**  
 Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

**13. DISPOSAL CONSIDERATIONS**  
 Consult federal, state and local waste regulations to determine appropriate disposal options.

**14. TRANSPORTATION INFORMATION**

PROPER SHIPPING NAME:	Diesel Fuel	Placard (International Only):
HAZARD CLASS and PACKING GROUP:	3, PG III	
DOT IDENTIFICATION NUMBER:	NA 1993 (Domestic) UN 1202 (International)	
DOT SHIPPING LABEL:	None	

Use Combustible Placard if shipping in bulk domestically

**15. REGULATORY INFORMATION**  
**U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION**  
 This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

**CLEAN WATER ACT (OIL SPILLS)**

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

**CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)**

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

**SARA SECTION 311/312 - HAZARD CLASSES**

<u>ACUTE HEALTH</u>	<u>CHRONIC HEALTH</u>	<u>FIRE</u>	<u>SUDDEN RELEASE OF PRESSURE</u>	<u>REACTIVE</u>
X	X	X	--	--

**SARA SECTION 313 - SUPPLIER NOTIFICATION**

This product may contain listed chemicals below the *de minimis* levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

**CALIFORNIA PROPOSITON 65 LIST OF CHEMICALS**

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

<u>INGREDIENT NAME (CAS NUMBER)</u>	<u>Date Listed</u>
Diesel Engine Exhaust (no CAS Number listed)	10/01/1990

**CANADIAN REGULATORY INFORMATION (WHMIS)**

Class B, Division 3 (Combustible Liquid) and Class D, Division 2, Subdivision B (Toxic by other means)



MSDS Number: **I8840** \* \* \* \* \* Effective Date: 08/27/04 \* \* \* \* \* Supersedes: 05/07/03

<b>MSDS</b> <b>Material Safety Data Sheet</b>	24 Hour Emergency Telephone: 908-459-2151 CHEMTREC: 1-800-424-9300
	National Response in Canada CANUTEC: 615-996-6666
From: Mallinckrodt Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	Outside U.S. and Canada Chemtrec: 703-527-3987
Mallinckrodt CHEMICALS <b>JT.Baker</b>	NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.
All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.	

## ISOPROPYL ALCOHOL (90 - 100%)

### 1. Product Identification

**Synonyms:** 2-Propanol; sec-propyl alcohol; isopropanol; sec-propanol; dimethylcarbinol  
**CAS No.:** 67-63-0  
**Molecular Weight:** 60.10  
**Chemical Formula:** (CH<sub>3</sub>)<sub>2</sub>CHOH  
**Product Codes:**  
 J.T. Baker: 0562, 5082, 9037, 9080, U298  
 Mallinckrodt: 0562, 3027, 3031, 3032, 3035, 3037, 3043, 4359, 6569, H604, H982, V555, V566, V681

### 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Isopropyl Alcohol	67-63-0	90 - 100%	Yes
Water	7732-18-5	0 - 10%	No

### 3. Hazards Identification

#### Emergency Overview

**WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE IRRITATION TO SKIN.**

**SAF-T-DATA<sup>(tm)</sup>** Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate  
 Flammability Rating: 3 - Severe (Flammable)  
 Reactivity Rating: 2 - Moderate  
 Contact Rating: 3 - Severe  
 Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER  
 Storage Color Code: Red (Flammable)

#### Potential Health Effects

##### Inhalation:

Inhalation of vapors irritates the respiratory tract. Exposure to high concentrations has a narcotic effect, producing symptoms of dizziness, drowsiness, headache, staggering, unconsciousness and possibly death.

##### Ingestion:

Can cause drowsiness, unconsciousness, and death. Gastrointestinal pain, cramps, nausea, vomiting, and diarrhea may also result. The single lethal dose for a human adult = about 250 mls (8 ounces).

##### Skin Contact:

May cause irritation with redness and pain. May be absorbed through the skin with possible systemic effects.

##### Eye Contact:

Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

##### Chronic Exposure:

Chronic exposure may cause skin effects.

##### Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or impaired liver, kidney, or pulmonary function may be more susceptible to the effects of this agent.

### 4. First Aid Measures

#### Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

#### Ingestion:



Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

**Skin Contact:**

Immediately flush skin with plenty of water for at least 15 minutes. Call a physician if irritation develops.

**Eye Contact:**

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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## 5. Fire Fighting Measures

**Fire:**

Flash point: 12C (54F) CC

Autoignition temperature: 399C (750F)

Flammable limits in air % by volume:

lcl: 2.0; ucl: 12.7

Listed fire data is for Pure Isopropyl Alcohol.

**Explosion:**

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.

**Fire Extinguishing Media:**

Water spray, dry chemical, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

**Special Information:**

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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## 6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

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## 7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Small quantities of peroxides can form on prolonged storage. Exposure to light and/or air significantly increases the rate of peroxide formation. If evaporated to a residue, the mixture of peroxides and isopropanol may explode when exposed to heat or shock.

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## 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**

For Isopropyl Alcohol (2-Propanol):

-OSHA Permissible Exposure Limit (PEL):

400 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):

200 ppm (TWA), 400 ppm (STEL), A4 - not classifiable as a human carcinogen.

**Ventilation System:**

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

**Personal Respirators (NIOSH Approved):**

If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

**Skin Protection:**

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene and nitrile rubber are recommended materials.

**Eye Protection:**

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

## 9. Physical and Chemical Properties

**Appearance:**

Clear, colorless liquid.

**Odor:**

Rubbing alcohol.

**Solubility:**

Miscible in water.

**Specific Gravity:**

0.79 @ 20C/4C

**pH:**

No information found.

**% Volatiles by volume @ 21C (70F):**

100  
**Boiling Point:**  
 82C (180F)  
**Melting Point:**  
 -89C (-128F)  
**Vapor Density (Air=1):**  
 2.1  
**Vapor Pressure (mm Hg):**  
 44 @ 25C (77F)  
**Evaporation Rate (BuAc=1):**  
 2.83

## 10. Stability and Reactivity

### Stability:

Stable under ordinary conditions of use and storage. Heat and sunlight can contribute to instability.

### Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

### Hazardous Polymerization:

Will not occur.

### Incompatibilities:

Heat, flame, strong oxidizers, acetaldehyde, acids, chlorine, ethylene oxide, hydrogen-palladium combination, hydrogen peroxide-sulfuric acid combination, potassium tert-butoxide, hypochlorous acid, isocyanates, nitroform, phosgene, aluminum, oleum and perchloric acid.

### Conditions to Avoid:

Heat, flames, ignition sources and incompatibles.

## 11. Toxicological Information

Oral rat LD50: 5045 mg/kg; skin rabbit LD50: 12.8 gm/kg; inhalation rat LC50: 16,000 ppm/8-hour; investigated as a tumorigen, mutagen, reproductive effector.

-----\Cancer Lists\-----			
Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Isopropyl Alcohol (67-63-0)	No	No	3
Water (7732-18-5)	No	No	None

## 12. Ecological Information

### Environmental Fate:

When released into the soil, this material is expected to quickly evaporate. When released into the soil, this material may leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into water, this material may biodegrade to a moderate extent. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.

### Environmental Toxicity:

The LC50/96-hour values for fish are over 100 mg/l. This material is not expected to be toxic to aquatic life.

## 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

## 14. Transport Information

### Domestic (Land, D.O.T.)

**Proper Shipping Name:** ISOPROPANOL

**Hazard Class:** 3

**UN/NA:** UN1219

**Packing Group:** II

**Information reported for product/size:** 200L

### International (Water, I.M.O.)

**Proper Shipping Name:** ISOPROPANOL

**Hazard Class:** 3

**UN/NA:** UN1219

**Packing Group:** II

**Information reported for product/size:** 200L

## 15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----

Ingredient	TSCA	EC	Japan	Australia
Isopropyl Alcohol (67-63-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----

Ingredient	--Canada--			
	Korea	DSL	NDSL	Phil.
Isopropyl Alcohol (67-63-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----

Ingredient	-SARA 302-		-SARA 313-	
	RQ	TPQ	List	Chemical Catg.
Isopropyl Alcohol (67-63-0)	No	No	Yes	No
Water (7732-18-5)	No	No	No	No

-----\Federal, State & International Regulations - Part 2\-----

Ingredient	CERCLA	-RCRA-		-TSCA-
		261.33	8(d)	
Isopropyl Alcohol (67-63-0)	No	No	No	No
Water (7732-18-5)	No	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes  
 SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No  
 Reactivity: No (Mixture / Liquid)

**Australian Hazchem Code:** 2[S]2

**Poison Schedule:** None allocated.

**WHMIS:**

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

## 16. Other Information

**NFPA Ratings:** Health: 1 Flammability: 3 Reactivity: 0

**Label Hazard Warning:**

WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE IRRITATION TO SKIN.

**Label Precautions:**

Keep away from heat, sparks and flame.  
 Keep container closed.  
 Use only with adequate ventilation.  
 Wash thoroughly after handling.  
 Avoid breathing vapor or mist.  
 Avoid contact with eyes, skin and clothing.

**Label First Aid:**

If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

MSDS Section(s) changed since last revision of document include: 16.

**Disclaimer:**

\*\*\*\*\*  
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**Prepared by:** Environmental Health & Safety

Phone Number: (314) 654-1600 (U.S.A.)

**Appendix F**  
**Job Hazard Analysis Forms**

# Job Hazard Analysis

JHA Type: <input checked="" type="checkbox"/> Investigation <input type="checkbox"/> O&M <input type="checkbox"/> Office <input checked="" type="checkbox"/> Construction		<input checked="" type="checkbox"/> New <input type="checkbox"/> Revised		Date: 4/30/2021
Office: Seattle		Client: Cantera		Location: Former Time Oil Property, 2737-2805 West Commodore Way, Seattle, WA
Work Type: Remediation Oversight, Supplemental Investigation		Work Activity: Site Inspection/Oversight, Investigation, Sampling		
<b>Personal Protective Equipment (PPE):</b> Minimum PPE is Level D including: Hard hat, safety glasses or goggles, steel-toed boots, high visibility safety vest, hearing protection as needed, and gloves as needed (type dependent on job-specific requirements). <b>Additional PPE may be required in any site-specific Health &amp; Safety Plan (HASP) available. Also refer to the HASP for air monitoring and emergency procedures.</b>				
Development Team	Position/Title	Reviewed By	Position/Title	Date
Rusty Jones	Project Geologist	Jamie Stevens	Senior Engineer	4/30/21
❶ Job Steps	❷ Potential Hazard	❸ Critical Actions		
1. All Onsite Activities	Slips/Trips/Falls Heat/Cold Stress Biological Hazards	<ul style="list-style-type: none"> <li>Keep all areas free of excess materials and debris and clear all walking paths.</li> <li>Monitor onsite workers for signs of heat/cold stress and ensure that necessary breaks are taken.</li> <li>Use insect repellent and check areas for signs of snakes, spiders, poisonous plants, ticks and mosquitoes</li> <li>Maintain a clear line of sight.</li> </ul>		
2. Utility Locate	Explosion, electrocution, injury, death or property damage	<ul style="list-style-type: none"> <li>Contact public utility locate and have utilities marked out around the site.</li> <li>Oversee a private onsite utility locate.</li> <li>Review locations against construction drawings and known utilities</li> <li>If necessary, clear upper eight feet of intended drilling location with an air/knife/vacuum truck</li> </ul>		
3. Equipment Inspections	Leaks, defective or damaged parts, slip/trip/fall hazards, fuel/oil spills, fire hazards, pinch points	<ul style="list-style-type: none"> <li>Conduct thorough inspections of all equipment at the beginning of each day and throughout the day, as appropriate.</li> <li>Check for leaking hoses or fittings, loose connections, functional controls, functional emergency shutoff and damaged equipment</li> <li>Identify pinch points</li> <li>Check that a spill kit is available for use on site in the event of a spill or that secondary containment is provided.</li> <li>Clear working areas of all unnecessary equipment.</li> </ul>		

4. Equipment Set Up	Flying debris, pinch points	<ul style="list-style-type: none"> <li>• Identify pinch points</li> <li>• Use a spotter to locate drill rig</li> <li>• Delineate work area with delineators or equivalent</li> <li>• Establish a support zone and set up sampling equipment outside of drill rig work zone</li> <li>• Use designated hand signals to approach drill crew</li> <li>• Engage outriggers</li> <li>• Lower drill rig derrick prior to moving the rig</li> </ul>
5. Concrete Coring (if necessary)	Sharp objects, rotating parts, electric tools and power equipment, hot objects	<ul style="list-style-type: none"> <li>• Buddy system lifting heavy objects (drill press).</li> <li>• Drill in marked, approved (utility and rebar cleared) areas only.</li> <li>• Anchor/bolt/clamp drill machine to ground or other secure objects to prevent movement while in use.</li> <li>• Keep hands and feet away from the rotating drill bit at all times. Avoid loose fitting clothes around powered machine.</li> <li>• Use water or non-toxic, approved coolant to cool drill bits, parts, and coring surface, vacuuming/recovering the coolant during and after use.</li> <li>• Wear hearing protection as needed in proximity to loud equipment.</li> </ul>
6. Drilling Operation	Flying debris, pinch points, back strain, cross-contamination, struck by drill rig derrick, chemical exposure, clothing caught in rotating equipment, hearing loss	<ul style="list-style-type: none"> <li>• Keep hands and feet away from the drill stem while in motion</li> <li>• Wear all appropriate PPE (incl. hearing protection)</li> <li>• Decontamination all equipment prior to use.</li> <li>• Avoid lifting heavy equipment and use the buddy system for heavy objects</li> <li>• Assure that the drill rig derrick is secured</li> <li>• Make sure all guards are in place while drilling operations are underway.</li> <li>• Do not wear loose fitting clothes or jewelry</li> </ul>
7. Collecting soil and/or samples	Pinch points, back strain, knee strain, chemical exposure	<ul style="list-style-type: none"> <li>• Identify pinch points</li> <li>• Wear all appropriate PPE</li> <li>• Place soil core samples on an elevated surface (portable table) to avoid bending.</li> <li>• Keep hands clear while core samples are removed from the drill stem</li> <li>• Sample containers may be glass and can break if handled roughly. Look into coolers before reaching into coolers in case broken glass.</li> <li>• Sample jars may contain acid preservatives. Wear nitrile gloves and safety glasses and check containers lids frequently.</li> </ul>

8. Monitoring well construction	Back strain, pinch points, chemical exposure, hearing loss	<ul style="list-style-type: none"> <li>• Identify pinch points</li> <li>• Wear all appropriate PPE</li> <li>• Use proper lifting technique and avoid lifting more than one bag of sand or bentonite at a time</li> <li>• Avoid bending while pouring sand pack or bentonite seal</li> <li>• Keep hands and feet clear as drill stem is raised out of the borehole</li> </ul>
9. Well Box Construction	Back strain, knee strain, vehicle hazards	<ul style="list-style-type: none"> <li>• Delineate work area with delineators or equivalent so you can be seen when vehicles or equipment are being moved.</li> <li>• Avoid lifting heavy objects without assistance</li> <li>• Avoid bending while laying the concrete</li> <li>• Wear knee pads when kneeling.</li> </ul>
10. Backfilling soil borings	Back strain	<ul style="list-style-type: none"> <li>• When soil borings are not completed as monitoring wells, borings must be backfilled with bentonite.</li> <li>• Avoid lifting more than one bag of bentonite at a time</li> <li>• Take breaks as necessary.</li> </ul>
11. Equipment Decontamination	Cross-contamination, chemical exposure, back strain	<ul style="list-style-type: none"> <li>• Use Alconox or Liquinox to decontaminate all equipment with potential to contact soil or groundwater</li> <li>• Ask for help when moving heavy or awkward equipment.</li> <li>• Wear all appropriate PPE</li> </ul>
12. Debris and Waste Management	Spills, chemical exposure, regulatory infractions, back strain, pinch points	<ul style="list-style-type: none"> <li>• Ensure that all soil cuttings, decontamination water and purge water are properly contained and labeled</li> <li>• Use a drum dolly or lift to move any drums onsite.</li> <li>• Clear a path before moving drums</li> <li>• Prepare a bill of lading for all waste to be moved from site.</li> </ul>
13. Demobilization	Chemical exposure, back strain, pinch points	<ul style="list-style-type: none"> <li>• Avoid lifting heavy or awkward objects without help.</li> <li>• Wear all appropriate PPE</li> <li>• Ensure that all equipment has been decontamination prior to repacking.</li> <li>• Ensure that all equipment is securely put away and tied down.</li> </ul>
14. Open Excavation 29 CFR 1926 Subpart P	Access and Egress	<ul style="list-style-type: none"> <li>• Stairways, ladders, or ramps shall be located in excavation or trenches that are more than 4 feet in depth. They shall be placed so that no worker is required to travel more than 25 feet laterally to access one.</li> <li>• Ladders shall be secured and extend 3 feet above the point of access. Metal ladders may not be used where they may contact electrical lines.</li> </ul>

<p>14. Open Excavation (continued) 29 CFR 1926 Subpart P</p>	<p>Exposure to falling objects, Cave-ins</p>	<ul style="list-style-type: none"> <li>• Equipment and spoil piles shall be kept a minimum of 2 feet from the edge of the excavation.</li> <li>• No worker is allowed underneath loads handled by lifting or digging equipment.</li> <li>• No worker is allowed underneath loads handled by lifting or digging equipment.</li> <li>• A warning system shall be used to delineate the edge of the excavation if an operator cannot see the edge of the excavation from the cab of his machine.</li> </ul>
<p>14. Open Excavation (continued) 29 CFR 1926 Subpart P</p>	<p>Inspection, Planning</p>	<ul style="list-style-type: none"> <li>• All excavations shall be properly benched, sloped, or shielded. The system used shall be chosen by the competent person on site.</li> <li>• All excavations shall be inspected daily by the competent person on site.</li> <li>• Adequate precautions shall be taken to prevent exposure to toxic atmospheric conditions.</li> <li>• An emergency rescue plan shall be in place before any worker enters an excavation.</li> </ul>