

**PORT OF TACOMA
TACOMA, WASHINGTON
WEST SITCUM 11TH ST. IMPROVEMENTS**

**PROJECT NO. 201218.01
CONTRACT NO. PA000000123
PROCUREMENT NO. 012026-1014**



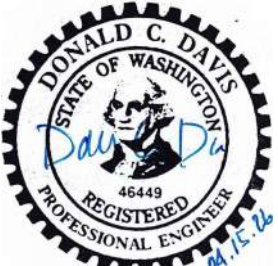
**Thais Howard, PE
Sr. Director, Engineering**

**Marcus Van Valen
Project Manager**

END OF SECTION

The undersigned Engineer of Record hereby certifies that the Technical Specifications for the following portions of this project were written by me, or under my direct supervision, and that I am duly registered under the laws of the State of Washington, and hereby affix my Professional Seal and signature.

Those Sections prepared under my direct supervision and being certified by my seal and signature below are as follows:

| SEAL & SIGNATURE | SECTION(S) |
|---|--|
|  | <p>26 00 00 - Electrical Work and General 26 01 00 - Operation and Maintenance Manuals 26 05 00 - Common Work Results for Electrical 26 05 19 - Low Voltage Eletrical Power Conductors and Cables 26 05 26 - Grounding and Bonding for Electrical Systems 26 05 33 - Raceway & Boxes for Electrical Systems 26 05 43 - Underground Ducts and Raceways for Electrical Systems</p> |
|  | <p>31 00 00 - Earthwork 31 23 33 - Trenching and Backfilling</p> |
|  | <p>32 11 23 - Crushed Surfacing Aggregates 32 12 16 - Hot-Mix Asphalt Paving 32 31 13 - Chain Link Fences And Gates</p> |
| | |

END OF SECTION

PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

- 00 01 01 - Project Title Page
- 00 01 07 - Seals Page
- 00 01 10 - Table of Contents
- 00 01 15 - List of Drawing Sheets
- 00 11 13 - Advertisement for Bids
- 00 21 00 - Instructions to Bidders
- 00 26 00 - Substitution Procedures
- 00 31 26 - Existing Hazardous Material Information
- 00 41 00 - Bid Form
- 00 43 13 - Bid Security Form
- 00 45 13 - Responsibility Detail Form
- 00 52 00 - Agreement Form
- 00 61 13.13 - Performance Bond
- 00 61 13.16 - Payment Bond
- 00 61 23 - Retainage Bond
- 00 72 00 - General Conditions
- 00 73 16 - Insurance Requirements
- 00 73 46 - Washington State Prevailing Wage Rates
- 00 73 63 - Security Requirements

SPECIFICATIONS

DIVISION 01 -- GENERAL REQUIREMENTS

- 01 10 00 - Summary
- 01 14 00 - Work Restrictions
- 01 20 00 - Price and Payment Procedures
- 01 26 00 - Change Management Procedures
- 01 29 73 - Schedule of Values
- 01 30 00 - Administrative Requirements
- 01 31 23 - Web-based Construction Management
- 01 32 16 - Construction Progress Schedule
- 01 33 00 - Submittal Procedures
- 01 35 29 - Health, Safety, and Emergency Response Procedures

- 01 35 43.13 - Hazardous Materials Handling Procedure
- 01 35 43.19 - Export Soil Management
- 01 35 47 - Air and Noise Control Procedures
- 01 35 91 - Historic/Cultural Treatment Resources
- 01 41 00 - Regulatory Requirements
- 01 42 19 - Reference Standards
- 01 45 00 - Quality Control
- 01 50 00 - Temporary Facilities and Controls
- 01 55 00 - Vehicular Access and Parking
- 01 57 13 - TESC and Project SWPPP
- 01 60 00 - Product Requirements
- 01 70 00 - Execution and Closeout Requirements
- 01 71 00 - Examination and Preparation
 - 01 71 23 - Field Engineering
 - 01 74 13 - Construction Cleaning
 - 01 74 16 - Soil Characteristics and Waste Management
- 01 77 00 - Closeout Procedures
- 01 78 23 - Operation and Maintenance Manuals

DIVISION 02 -- EXISTING CONDITIONS

- 02 41 00 - Demolition

DIVISION 26 -- ELECTRICAL

- 26 00 00 - Electrical Work General
- 26 01 00 - Operation and Maintenance Manuals
- 26 05 00 - Common Work Results for Electrical
 - 26 05 19 - Low Voltage Electrical Power Conductors and Cables
 - 26 05 26 - Grounding and Bonding for Electrical Systems
 - 26 05 33 - Raceways and Boxes for Electrical Systems
 - 26 05 43 - Underground Ducts and Raceways for Electrical Systems

DIVISION 31 -- EARTHWORK

- 31 00 00 - Earthwork
 - 31 23 33 - Trenching and Backfilling

DIVISION 32 -- EXTERIOR IMPROVEMENTS

- 32 11 23 - Crushed Surfacing Aggregates
- 32 12 16 - Hot-Mix Asphalt Paving

32 31 13 - Chain Link Fences And Gates

APPENDICES

Appendix A - Port of Tacoma Construction SWPPP Short Form

Appendix B - Initial Investigation Field Report (Washington State Department of Ecology, 2019)

Appendix C - Report of Additional Investigation - Port of Tacoma, Former Milwaukee Railyard
(Shaw Enviornmental, 2008)

Appendix D - City of Tacoma Site Development Permit #SDEV25-0257

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Contract Drawings: The following drawings are a part of the Contract Documents:

| Sheet No. | Drawing Title |
|-----------|---|
| G1.0 | Cover Sheet |
| SV1.0 | Existing Topographic Survey and Site Detail |
| SV1.1 | Existing Topographic Survey and Site Detail |
| SV1.2 | Existing Topographic Survey and Site Detail |
| D1.0 | Demolition and TESC Plan |
| D1.1 | Demolition and TESC Notes and Details |
| C1.0 | Site Plan |
| C1.1 | Demolition and TESC Notes and Details |
| C2.0 | Grading and Drainage Plan |
| C2.1 | Demolition and TESC Notes and Details |
| E0.0 | Symbols and Abbreviations |
| E1.0 | Power Plan |
| E2.0 | Photometrics |
| E3.0 | Handhole and Trench Details |
| E4.0 | Panel Schedule and Pole Details |

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

WEST SITCUM 11TH ST. IMPROVEMENTS

PROJECT NO. 201218.01 | CONTRACT NO. PA000000123

- Scope of Work:** The Work required for this Project includes:
Demolition and removal of approximately 6,200 square feet of existing gravel and asphalt pavement; subgrade preparation and grading; pavement sawcutting and trenching for the new stormwater treatment system; procurement and installation of the stormwater treatment system; installation of approximately 6,200 square feet of new asphalt pavement; procurement and installation of security fencing and LED lighting fixtures with controls; and protection of all existing utilities
- Bid Estimate:** Estimated cost range is \$300,000 to \$350,000, plus Washington State Sales Tax (WSST).
- In accordance with RCW 39.04.320, fifteen (15) percent apprenticeship participation is required for certain projects estimated to cost one million (\$1,000,000) dollars or more. Bidders may contact the Department of Labor and Industries, Specialty Compliance Services Division, Apprenticeship Section, P.O. Box 44530, Olympia, WA 98504-4530, by phone (360) 902-5320, or e-mail at Apprentice@lni.wa.gov, to obtain information on available apprenticeship programs.
- In accordance with new legislation HB 1050 all port districts are required to add the requirement that apprentices must perform 15% or more of the total labor hours in public works contracts estimated at \$1 million or more. If the 15% apprenticeship labor hours is met the contractor will receive an incentive fee of \$1,000. If less than 15% apprenticeship labor hours is used a \$500 decrease in the total amount of the contract will be taken for not meeting the required apprenticeship labor hours. L&I will monitor apprenticeship labor hours.
- Sealed Bid Date/ Time/Location:** Bids will be received at the Front Reception Desk, Port Administration Office, One Sitcum Plaza, Tacoma, Washington 98421 until **2:00 P.M. on** Tuesday, June 2, 2026, at which time they will be publicly opened and read aloud and the apparent low bid will be determined.
- Pre-Bid Conference and** A pre-Bid conference and site visit have been set for May 21 2026 at 11:30 AM.
- Site Tour:** The site visit will convene at the Port's Administrative building, located at One Sitcum Plaza. The following Personal Protective equipment is required for the site visit: sturdy shoes and reflective vest.

Attendees will be required to sign a Release and Acceptance of Responsibility and Acknowledgement of Risks Form prior to entering the site and shall provide their own Personal Protection Equipment (PPE) as required above.

Bid Security: Each Bid must be accompanied by a Bid security in an amount equal to five (5) percent of the Base Bid in a form allowed by the Instructions to Bidders.

Contact Information: Any questions to the Port may be submitted to the Procurement Department through the Procurement and Question Submission Portal (Portal link is accessible via this specific procurements website. See left side of page.). A direct link is also available here: [Procurement and Question Portal Link](#). No oral responses will be binding by the Port.

Instructions for utilizing the portal can be found here: [Procurement and Question Submission Portal Instructions](#).

Questions will not be accepted after seven (7) days prior to the Bid Date.

Bidding Documents: Plans, Specifications, Addenda, and Plan Holders List for this Project are available on-line through The Port of Tacoma's Website portoftacoma.com. Click on "Contracts," "Procurement," and then the Procurement Number PA000000123. Bidders must subscribe to the Holder's List on the right hand side of the screen in order to receive automatic email notification of future addenda and to be placed on the Holder's List.

Holder's Lists will be updated regularly and posted to the specific procurements page. Additional Instructions available in Section 00 21 00 - Instructions to Bidders.

Public Works Training Requirements: Effective July 1, 2019, all businesses are required to have training before bidding on public works projects and prevailing wage under RCW 39.04.359 and RCW 39.12, or is on the list of exempt businesses maintained by the Department of Labor and Industries. The bidder must designate a person or persons to be trained on these requirements. The training will be provided by the Department of Labor and Industries or by a training provider whose curriculum is approved by the Department of Labor and Industries.

Please refer to Labor and Industries' web site (https://www.lni.wa.gov/TradesLicensing/PrevWage/Contractors/Training.asp?utm_medium=email&utm_source=govdelivery) for more information and training dates, requirements, and exemptions. Failure to attend this training could result in a determination of "not responsible" and the bidder not being awarded a public works contract.

END OF SECTION

PART 1 - SUMMARY

1.01 DEFINITIONS

All definitions set forth in the Agreement, the General Conditions of the Contract for Construction, and in other Contract Documents are applicable to the Bidding Documents.

- A. "Addenda" are written or graphic instruments issued prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications, or corrections. The contents of an Addendum are issued in no particular order and therefore should be carefully and completely reviewed.
- B. An "Alternate Bid" (or "Alternate") is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.
- C. An "Apprentice" is a worker for whom an apprenticeship agreement has been registered and approved by the Washington State Apprenticeship and Training Council (RCW 49.04 and WAC 296-05).
- D. "Award" means the formal decision by the Port of Tacoma ("Port") notifying a Responsible Bidder with the lowest responsive Bid of the Port's acceptance of their Bid and intent to enter into a Contract with the Bidder.
- E. The "Award Requirements" include the statutory requirements as a condition precedent to Award.
- F. The "Base Bid" is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.
- G. A "Bid" is a complete and properly signed proposal to do the Work, submitted in accordance with the Bidding Documents, for the sums therein stipulated and supported by any data called for by the Bidding Documents.
- H. The "Bid Date" is the day and hour specified in the Bidding Documents, as may be changed through an Addendum, by which Bidders are required to submit Bids to the Port.
- I. The "Bid Form" is the form(s) included with the Bidding Documents, with Specification Section 00 41 00, through which a Bidder submits a Bid.
- J. A "Bidder" is a person or entity who submits a Bid.
- K. The "Bidding Documents" include the Advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form, any other sample bidding and contract forms, including those provided by reference, the Bid security, and the proposed Contract Documents, including any Addenda issued prior to the Bid Date.
- L. The "Contract Documents" proposed for the Work consist of the Agreement, the General Conditions of the Contract (as well as any Supplemental, Special, or other conditions included in the Project Manual), the Drawings, the Specifications, and all Addenda issued prior to, and all modifications issued after, execution of the Contract.

- M. The "Schedule of Unit Prices" is a separate schedule on the Bid Form for Unit Pricing as an all-inclusive price per unit of measurement for materials, equipment, or services as described in the Bidding Documents or in the proposed Contract Documents for the optional use of the Port. Quantities are not predictions of amounts anticipated. The Port may, but is not obligated to, accept a Schedule of Unit Price if it accepts the Base Bid. The Schedule of Unit Prices are not factored into the evaluation of determining the low bid amount and are not included as part of the bid award amount.
- N. A "Sub-Bidder" is a person or entity of any tier who submits a bid or proposal to or through the Bidder for materials, equipment or labor for a portion of the Work.

1.02 BIDDER'S REPRESENTATIONS

By making its Bid, each Bidder represents that:

- A. BIDDING DOCUMENTS. The Bidder has read and understands the Bidding Documents, and its Bid is made in accordance with them.
- B. PRE-BID MEETING. The Bidder has attended pre-Bid meeting(s) required by the Bidding Documents. Attendance at a mandatory meeting or training session means that, in the sole opinion of the Port, a Project representative of a Bidder has attended all or substantially all of such meeting or session.
- C. BASIS. Its Bid is based upon the materials, systems, services, and equipment required by the Bidding Documents, and is made without exception.
- D. EXAMINATION. The Bidder has carefully examined and understands the Bidding Documents, the Contract Documents including, but not limited to, any liquidated damages, insurance provisions, and the Project site, including any existing buildings, it has familiarized itself with the local conditions under which the Work is to be performed, has correlated its observations with the requirements of the proposed Contract Documents, and it has satisfied itself as to the nature, location, character, quality, and quantity of the Work, the labor, materials, equipment, goods, supplies, work, services, and other items to be furnished, and all other requirements of the Contract Documents. The Bidder has also satisfied itself as to the conditions and other matters that may be encountered at the Project site or that may affect performance of the Work or the cost or difficulty thereof, including, but not limited to, those conditions and matters affecting transportation, access, disposal, handling and storage of materials, equipment and other items; availability and quality of labor, water, electric power, and utilities; availability and condition of roads; climatic conditions and seasons; physical conditions at the Project site and the surrounding locality; topography and ground surface conditions; and equipment and facilities needed preliminary to, and at all times during, the performance of the Work. The failure of the Bidder to fully acquaint itself with any applicable condition or matter shall not in any way relieve the Bidder from the responsibility for performing the Work in accordance with, and for the Contract Sum and within the Contract Time provided for in, the Contract Documents.
- E. PROJECT MANUAL. The Bidder has checked its copies of the Project Manual (if any) with the table of contents bound therein to ensure the Project Manual is complete.
- F. SEPARATE WORK. The Bidder has examined and coordinated all Drawings, Contract Documents, and Specifications with any other contracts to be awarded separately from, but in connection with, the Work being Bid upon, so that the Bidder is fully informed as to conditions affecting the Work under the Contract being Bid upon.

- G. LICENSE REQUIREMENTS. The Bidders and Sub-Bidders are registered and hold all licenses required by the laws of Washington, including a certificate of registration in compliance with RCW 18.27, for the performance of the Work specified in the Contract Documents.
- H. CERTIFICATION. The Bidder verifies under penalty of perjury that the Bidder has not have been determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provision of Chapters 49.46, 49.48, or 49.52 RCW within the three (3) year period immediately preceding the Bid Date.
- I. NO EXCEPTIONS. Bids must be based upon the materials, systems, and equipment described and required by the Bidding Documents, without exception.

1.03 BIDDING DOCUMENTS

A. COPIES

- 1. Bidders may obtain complete sets of the Bidding Documents from The Port of Tacoma's Website www.portoftacoma.com. Click on "Contracts" then "Procurement."
- 2. Complete Sets. Bidders shall use complete sets of Bidding Documents in preparing Bids and are solely responsible for obtaining updated information. The Port does not assume any responsibility for errors or misinterpretations resulting from the use of incomplete and/or superseded sets of Bidding Documents.
- 3. Conditions. The Port makes copies of the Bidding Documents available only for the purpose of obtaining Bids on the Work and does not confer a license or grant permission for any other use.
- 4. Legible Documents. To the extent any Drawings, Specifications, or other Bidding Documents are not legible, it is the Bidder's responsibility to obtain legible documents.

B. INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

- 1. Format. The Contract Documents are divided into parts, divisions, and sections for convenient organization and reference. Generally, there has been no attempt to divide the Specification sections into Work performed by the various building trades, any Work by separate contractors, or any Work required for separate facilities in, or phases of the Project.
- 2. Duty to Notify. Bidders shall promptly notify the Port in writing of any ambiguity, inconsistency, or error that they may discover upon examination of the Bidding Documents or of the site and local conditions.
- 3. Products and Installation. All Bidders shall thoroughly familiarize themselves with specified products and installation procedures and submit to the Port any objections (in writing) no later than seven (7) days prior to the Bid Date. The submittal of the Bid constitutes acceptance of products and procedures specified as sufficient, adequate, and satisfactory for completion of the Contract.
- 4. Written Request. Bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Procurement Department through the Procurement and Question Submission Portal at least seven (7) days prior to the Bid Date (Portal link is accessible via this specific procurements website. See left side of page.). A direct link is also available here: [Procurement and Question Portal Link](#). No oral responses will be binding by the Port.

Instructions for utilizing the portal can be found here: [Procurement and Question Submission Portal Instructions](#).

5. Request to Modify Responsibility Criteria. No later than seven (7) days prior to the Bid Date, a potential Bidder may request in writing that the Port modify the Responsibility Criteria. The Port will evaluate the information submitted by the potential Bidder and respond before the Bid Date. If the evaluation results in a change of the Criteria, the Port will issue an Addendum identifying the new Criteria.
6. Addenda. The Bidder shall not rely on oral information provided at any pre-Bid meetings or during site visits. Verbal statements made by representatives of the Port are for informational purposes only. Any interpretation, correction, or change of the Bidding Documents will be made solely by written Addendum. Interpretations, corrections, or changes of the Bidding Documents made in any manner other than by written Addendum, including but not limited to, oral statements will not be binding, and Bidders shall not rely upon such statements, interpretations, corrections, or changes. The Port is not responsible for explanations or interpretations of the Bidding Documents other than in a written Addendum.
7. Site Visits. Any site visits are provided as a courtesy to potential Bidders to assist them in becoming familiar with the Project site conditions. However, only the Bidding Documents, including any issued Addenda, may be relied upon by Bidders.
8. Singular References. Reference in the singular to an article, device, or piece of equipment shall include as many of such articles, devices, or pieces as are indicated in the Contract Documents or as are required to complete the installation.
9. Utilities and Runs. The Bidder should assume that the exact locations of any underground or hidden utilities, underground fuel tanks, and plumbing and electrical runs may be somewhat different from any location indicated in the surveys or Contract Documents.

C. SUBSTITUTIONS

1. For substitutions during bidding, refer to Section 00 26 00 – Substitution Procedures.

D. ADDENDA

1. Distribution. All Addenda will be written and will be made available on the Port's website or any other source specified by the Port for the Project.
2. Copies. Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.
3. Verification and Acknowledgment of Receipt. Prior to submitting a Bid, each Bidder shall ascertain that it has received all Addenda issued. Each Bidder shall acknowledge its receipt and consideration of all Addenda in its Bid.

1.04 BIDDING PROCEDURE

A. FORM AND STYLE OF BIDS

1. Form. Bids (including required attachments) shall be submitted on forms identical to the Bid Form included with the Bidding Documents. No oral, email, or telephonic responses or modifications will be considered.
2. Entries on the Bid Form. All blanks on the Bid Form shall be filled in by typewriter, printer, or manually in ink.

3. Figures. All sums shall be expressed in figures, not words. Portions of the Bid Form may require the addition or multiplication of component bids to a total or the identification of component amounts within a total. In case of discrepancy between unit prices listed and their sum(s), the unit prices listed shall govern (rather than the sum).
4. Initial Changes. Any interlineation, alteration, or erasure shall be initialed by an authorized representative of the Bidder.
5. Bid Breakdown. The Bid Form may contain, for the Port's accounting purposes only, a breakdown of some or all of the components included in the Base Bid.
 - a. For lump-sum Bids, the total Contract Sum shall be submitted.
 - b. For unit-price Bids, a price shall be submitted for each item of the Work, an extension thereof, and, if requested, the total Contract Sum.
6. Alternates. All Alternates should be Bid. The Port reserves the right, but is not obligated, to reject any Bid on which all requested Alternates are not Bid. If no change in the Base Bid is required for an Alternate, enter "Zero" or "0." If there is no entry, the Bidder will be presumed to have made no offer to perform the Alternate. If it is not otherwise clear from the Bid or the nature of the Alternate, it will be presumed that the amount listed for an Alternate is additive rather than deductive.
7. Schedule of Unit Prices. All Unit Prices under this schedule shall be bid. The Port reserves the right, but is not obligated, to reject any Bid on which all requested Schedule of Unit Prices are not Bid.
8. No Conditions. The Bidder shall make no conditions or stipulations on the Bid Form, nor qualify its Bid in any manner.
9. Identity of Bidder. The Bidder shall include in the specified location on the Bid Form, the legal name of the Bidder and, if requested, a description of the Bidder as a sole proprietor, a partnership, a joint venture, a corporation, or another described form of legal entity. The Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. The Port verifies signature authority on the Labor and Industries website <https://secure.lni.wa.gov/verify/> under the contractor registration business owner information. If the business owner information is not current, the Bidder shall show proof of authority to sign at the request of the Port. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder
10. Bid Amounts Do Not Include Sales Tax. The Work to be performed constitutes a "retail sale" as this term is defined in RCW 82.04.050. Thus, the Base Bid amount shall include in the sum stated all taxes imposed by law, EXCEPT WASHINGTON STATE AND LOCAL SALES TAX due on the Base Bid. The engaged Contractor will pay retail sales tax on all consumables used during the performance of the Work and on all items that are not incorporated into the final Work; this tax shall be included in the Base Bid price and in any other prices set forth on the Bid Form. The Port will pay state and local retail sales tax due on each progress payment and final payment to the engaged Contractor for transmittal by the Contractor to the Washington State Department of Revenue or to the applicable local government.

B. BID SECURITY

1. Purpose and Procedure. Each Bid shall be accompanied by Bid security payable to the Port in the form required by the Bidding Documents and equal to five (5) percent of the Base Bid only (i.e., not including any Alternates or Unit Prices). The Bid security constitutes a pledge by the Bidder to the Port that the Bidder will enter into the Contract with the Port in the form provided, in a timely manner, and on the terms stated in its Bid, and will furnish in a timely manner, the payment and performance bonds, certificates of insurance, and all other documents required in the Contract Documents. Should the Bidder fail or refuse to enter into the Contract or fail to furnish such documents, the amount of the Bid security shall be forfeited to the Port as liquidated damages, not as a penalty. By submitting a Bid, each Bidder represents and agrees that the Bid security, if forfeited, is a reasonable prediction on the Bid Date of future damages to the Port. Failure of the Bidder to provide Bid Security as required shall render the bid non-responsive.
2. Form. The Bid security shall be in the form of a certified or bank cashier's check payable to the Port or a Bid bond executed by a bonding company reasonably acceptable to the Port, licensed in the State of Washington, registered with the Washington State Insurance Commissioner, possess an A.M. Best rating of "A-," Fiscal Size Category (FSC) six (6) or better, and be authorized by the U.S. Department of the Treasury. The Bid security shall be signed by the person or persons legally authorized to bind the Bidder. Bid bonds shall be submitted using the form included with the Bidding Documents.
3. Retaining Bid Security. The Port will have the right to retain the Bid security of Bidders to whom an Award is being considered until the earliest of either: (a) mutual execution of the Contract, and the Port's receipt of payment and performance bonds, (b) the specified time has elapsed so that Bids may be withdrawn, or (c) when all Bids have been rejected.
4. Return of Bid Security. Within sixty (60) days after the Bid Date, the Port will release or return Bid securities to Bidders whose Bids are not to be further considered in awarding the Contract. Bid securities of the three apparent low Bidders will be held until the Contract has been finally executed, after which all un-forfeited Bid securities will be returned. Bid security may be returned in the form provided or by separate payment.

C. SUBMISSION OF BIDS

1. Procedure. The Bid, the Bid security, and other documents required to be submitted with the Bid, shall be enclosed in a sealed envelope identified with the Project name and number and the Bidder's name and address. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face of the mailing envelope.
 - a. If a Bid is mailed, it shall be addressed to the Port of Tacoma, Contracts Department, 1 Sitcum Plaza, Tacoma, WA 98421.
 - b. If a Bid is delivered, it shall be delivered to the Front Reception Desk, Port of Tacoma, 1 Sitcum Plaza, Tacoma, WA 98421.
 - c. The time stamp clock at the Front Reception Desk at 1 Sitcum Plaza is the Port's official clock.
2. Deposit. Bids shall be deposited at the designated location prior to the Bid Date indicated in the Advertisement or Invitation to Bid, or any extension thereof made by Addendum. Bids received after the Bid Date and time specified shall be returned without consideration at the discretion of the Port, or rejected at the time of receipt.

3. Delivery. The Bidder assumes full responsibility for timely delivery at the location designated for receipt of Bids.
4. Form. Oral, facsimile, telephonic, electronic, or email Bids are invalid and will not be considered.

D. MODIFICATION OR WITHDRAWAL OF BID

1. After the Bid Date. A Bid may not be modified, withdrawn, or canceled by the Bidder during a ninety (90) day period following the Bid Date, and each Bidder so agrees by virtue of submitting its Bid.
2. Before the Bid Date. Prior to the Bid Date, any Bid submitted may be modified or withdrawn only by notice to the party receiving Bids at the place designated for receipt of Bids. The notice shall be in writing, with the signature of the Bidder, and shall be worded so as not to reveal the amount of the original Bid. Email notice will not be accepted. It shall be the Bidder's sole responsibility to verify that the notice has been received by the Port in time to be withdrawn before the Bid opening.
3. Resubmittal. Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids, provided that they are then fully in conformance with these Instructions to Bidders.
4. Bid Security with Resubmission. Bid security shall be in an amount sufficient for the Bid as modified or resubmitted.

E. COMMUNICATIONS

Communications from a Bidder related to these Instructions to Bidders must be in writing to the Procurement Department through the Procurement and Question Submission Portal (Portal link is accessible via this specific procurements website. See left side of page.) A direct link is also available here: [Procurement and Question Portal Link](#). Communications, including but not limited to, notices and requests by Sub-Bidders shall be made through the Bidder and not directly by a Sub-Bidder to the Port. No oral responses will be binding by the Port.

Instructions for utilizing the portal can be found here: [Procurement and Question Submission Portal Instructions](#).

1.05 CONSIDERATION OF BIDS

- A. OPENING OF BIDS. Unless stated otherwise in the Advertisement or Invitation to Bid or an Addendum, the properly identified Bids received on time will be opened publicly and will be read aloud. An abstract of the Base Bids and any Alternate Bids will promptly (and generally within twenty-four (24) hours) be made available to Bidders and other interested parties.
- B. REJECTION OF BIDS. The Port shall have the right, but not the obligation, to reject any or all Bids for any reason, or for no reason, to reject a Bid not accompanied by the required Bid security, or to reject a Bid which is in any way incomplete or irregular.
- C. BIDDING MISTAKES. The Port will not be obligated to consider notice of claimed Bid mistakes received more than twenty-four (24) hours after the Bid Date. In accordance with Washington law, a low Bidder that claims error and fails to enter into the Contract is prohibited from Bidding on the Project if a subsequent call for Bids is made for the Project.
- D. ACCEPTANCE OF BID (AWARD)

1. Intent to Accept. The Port intends, but is not bound, to Award a Contract to the Responsible Bidder with the lowest responsive Bid, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Port has the right to waive any informality or irregularity in any Bid(s) received and to accept the Bid which, in its judgment, is in its own best interests.
2. Alternates. The Port shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Contract or Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and the Alternates (if any) accepted. Failure to submit Bids on all Alternates may be cause for rejecting the Bidder's entire Bid. The Port retains the right to accept Alternate Bid items at the price Bid within ninety (90) days after the Contract is executed.
3. Requirements for Award. Before the Award, the lowest responsive Bidder must be deemed Responsible by the Port and must satisfy all Award Requirements.

E. BID PROTEST PROCEDURES

1. Procedure. A Bidder protesting, for any reason, the Bidding Documents, a Bidding procedure, the Port's objection to a Bidder or a person or entity proposed by the Bidder, including but not limited to, a finding of non-Responsibility, the Award of the Contract or any other aspect arising from, or relating in any way to, the Bidding, shall cause a written protest to be filed with the Port within two (2) business days of the event giving rise to the protest. (Intermediate Saturdays, Sundays, and legal holidays are not counted as business days.) The written protest shall include the name of the protesting Bidder, the bid solicitation number and title under which the protest is submitted, a detailed description of the specific factual and legal grounds for the protest, copies of all supporting documents, evidence that the apparent low bidder has been given notice of the protest, and the specific relief requested. The written protest shall be sent by email to procurement@portoftacoma.com.
2. Consideration. Upon receipt of the written protest, the Port will consider the protest. The Port may, within three (3) business days of the Port's receipt of the protest, provide any other affected Bidder(s) the opportunity to respond in writing to the protest. If the protest is not resolved by mutual agreement of the protesting Bidder and the Port, the Contracts Director of the Port, or his or her designee, will review the issues and promptly furnish a final and binding written decision to the protesting Bidder, and any other affected Bidder(s), within six (6) business days of the Port's receipt of the protest. (If more than one (1) protest is filed, the Port's decision will be provided within six (6) business days of the Port's receipt of the last protest.) If no reply is received from the Port during the six (6) business-day period, the protest will be deemed rejected.
3. Waiver. Failure to comply with these protest procedures will render a protest waived.
4. Condition Precedent. Timely and proper compliance with, and exhaustion of, these protest procedures shall be a condition precedent to any otherwise permissible judicial consideration of a protest.

1.06 POST BID INFORMATION

A. THE LOWEST RESPONSIVE BIDDER SHALL:

1. Responsibility Detail Form. Within 24 hours of the Low Responsive Bidder Selection Notification, the apparent low Bidder shall submit to the Port the Responsibility Detail Form and other required documents (Section 00 45 13) executed by an authorized company officer. As requested from the Port, the low responsive Bidder shall provide written confirmation that the person signing the Bid on behalf of the Bidder was duly authorized at the time of bid, a detailed breakdown of the Bid in a form acceptable to the Port, and other information required by the Port.
 2. The apparent low Bidder shall submit to the Port upon request:
 - a. Additional information regarding the use of the Bidder's own forces and the use of subcontractors and suppliers;
 - b. The names of the persons or entities (including a designation of the Work to be performed with the Bidder's own forces, and the names of those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work (i.e., either a listed Sub-Bidder or a Sub-Bidder performing Work valued at least ten (10) percent of the Base Bid), consistent with the listing required with the Bid; and
 - c. The proprietary names and the suppliers of the principal items or systems of materials and equipment proposed for the Work.
 3. Failure to provide any of the above information in a timely manner will constitute an event of breach permitting forfeiture of the Bid security.
 4. Bidder Responsibility. The Bidder will be required to establish, to the satisfaction of the Port, the reliability and responsibility of itself and the persons or entities proposed to furnish and perform the Work described in the Bidding Documents. If requested, the Bidder shall meet with the Port to discuss the Bid, including any pricing, the Bid components, and any assumptions made by the Bidder.
 5. Objection. Prior to an Award of the Contract, the Port will notify the Bidder in writing if the Port, after due investigation, has reasonable objection to the Bidder or a person or entity proposed by the Bidder. Upon receiving such objection, the Bidder may, at Bidder's option: (a) withdraw their Bid, (b) submit an acceptable substitute person or entity with no change in the Contract Time and no adjustment in the Base Bid or any Alternate Bid, even if there is a cost to the Bidder occasioned by such substitution, or (c) file a protest in accordance with the Bidding Documents.
 6. Change. Persons and entities proposed by the Bidder to whom the Port has made no reasonable objection must be used on the Work for which they were proposed and shall not be changed, except with the written consent of the Port.
 7. Right to Terminate. The Bidder's representations concerning its qualifications will be construed as a covenant under the Contract. If a Bidder makes a material misrepresentation on a Qualification Statement, the Port has the right to terminate the Contract for cause and may then pursue any remedies that exist under the Contract or that are otherwise available.
- B. INFORMATION FROM OTHER BIDDERS: All other Bidders designated by the Port as under consideration for Award of a Contract shall also provide a properly executed Qualification Statement, if so requested by the Port.

1.07 PERFORMANCE BOND, LABOR AND MATERIAL PAYMENT BOND, AND INSURANCE

- A. **BOND REQUIREMENTS.** Within ten (10) days after the Port's Notice of Award of the Contract, the successful Bidder shall obtain and furnish statutory bonds pursuant to RCW 39.08 covering the faithful performance of the Contract and the payment of all obligations arising thereunder in the form and amount prescribed in the Contract Documents. Bonds shall be written for one hundred (100) percent of the contract award amount, plus Washington State Sales Tax and Change Orders. The cost of such bonds shall be included in the Base Bid.
 - 1. On contracts of one hundred fifty thousand dollars (\$150,000) or less, at the option of the Contractor or the General Contractor/Construction Manager as defined in RCW 39.10.210, the Port may, in lieu of the bond, retain ten (10) percent of the contract amount for a period of thirty days after date of final acceptance, or until receipt of all necessary releases from the department of revenue, the employment security department, and the department of labor and industries and settlement of any liens filed under RCW 60.28, whichever is later. The recovery of unpaid wages and benefits must be the first priority for any actions filed against retainage held by a state agency or authorized local government.
 - 2. On contracts of one hundred fifty thousand dollars (\$150,000) or less, the Port may accept a full payment and performance bond from an individual surety or sureties.
- B. **TIME OF DELIVERY AND FORM OF BONDS.** The successful Bidder shall deliver an original copy of the required bonds to the Port, 1 Sitcum Plaza, Tacoma, WA 98421, within the time specified in the Contract Documents.
- C. **INSURANCE.** The successful Bidder shall deliver a certificate of insurance from the Bidder's insurance company that meets or exceeds all requirements of the Contract Documents.
- D. **GOVERNMENTAL REQUIREMENTS.** Notwithstanding anything in the Bidding or Contract Documents to the contrary, the Bidder shall provide all bonding, insurance, and permit documentation as required by governmental authorities having jurisdiction for any portions of the Project.

1.08 FORM OF AGREEMENT

- A. **FORM TO BE USED.** The Contract for the Work will be written on the form(s) contained in the Bidding Documents, including any General, Supplemental, or Special Conditions, and the other Contract Documents included with the project manual.
- B. **CONFLICTS.** In case of conflict between the provisions of these Instructions and any other Bidding Document, these Instructions shall govern. In case of conflict between the provisions of the Bidding Documents and the Contract Documents, the Contract Documents shall govern.
- C. **CONTRACT DELIVERY.** Within ten (10) days after Notice of Award, the Bidder shall submit a signed Contract to the Port in the form tendered to the Bidder and without modification.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes administrative and procedural requirements for substitutions.

1.02 DEFINITIONS/CLARIFICATIONS

- A. Substitutions. Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- B. The Contract Documents include performance specifications for products and equipment which meet Project requirements. In those cases where a representative item or manufacturer is named in the specification, it is provided for the sole purpose of identifying a product meeting the required functional performance, and where the words "or equal" are used, a substitution request as further described, is not required.
- C. Where non-competitive or sole source products or manufacturers are explicitly specified with the words "or approved equal," or "Engineer approved equal," or "as approved by the Engineer" are used, they shall be taken to mean "or approved equal." In these cases a substitution request as further described in this Section, is required.

1.03 SUBMITTALS

- A. Substitution Request Form. Use copy of form located at the end of this Section.
- B. Pre-Bid Substitution Requests. Submit one (1) PDF of the Substitution Request Form along with all supporting documentation for consideration of each request. Identify product, fabrication, or installation method to be replaced. Include Drawing numbers and titles. Substitution requests prior to the Bid Date may originate directly from a prime Bidder, or from a prospective Sub-Bidder.
 - 1. Documentation. Show compliance with requirements for substitutions with the following, as applicable:
 - a. Statement indicating why specified product, fabrication, or installation cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work that will be necessary to accommodate proposed substitution.
 - c. Product Data, including drawings and descriptions of products, fabrication, and installation procedures.
 - d. Samples, where applicable or requested.
 - e. Certificates and qualification data, where applicable or requested.
 - f. Research reports evidencing compliance with building code in effect for the Project.
 - 2. Engineer's Action. Engineer will review substitution requests if received through the Procurement and Question Submission Portal at least seven (7) days prior to the Bid Date (Portal link is accessible via this specific procurements website. See left side of page.) A direct link is also available here: [Procurement and Question Portal Link](#). No oral responses will be binding by the Port.
 - a. Forms of Acceptance. Substitution requests will be formally accepted via written addendum prior to the Bid Date. Bidders shall not rely upon approvals made in any other manner.

- b. Use product originally specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.
- c. The Port's decision of approval or disapproval of a proposed substitution shall be final.

Instructions for utilizing the portal can be found here: [Procurement and Question Submission Portal Instructions](#).

- C. Post-Award Substitution Requests must be submitted by the Contractor and not a Subcontractor nor Supplier.
 - 1. Documentation. Show compliance with requirements for substitutions with the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification Section. Significant qualities may include, but are not limited to, attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses. Also provide names and addresses of the applicable architect, engineer, and owner.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for the Project.
 - j. Comparison of the approved Baseline Project Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Engineer's Action. If necessary, Engineer will request additional information or documentation for evaluation within seven (7) calendar days of receipt of a request for substitution. Engineer will notify Contractor through Port of acceptance or rejection of proposed substitution within fifteen (15) calendar days of receipt of request, or seven (7) calendar days of receipt of additional information or documentation, whichever is later.
 - a. Forms of Acceptance. Change Order or Minor Change in Work.
 - b. Use product originally specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.
3. Substitutions for Cause. Submit requests for substitution immediately upon discovery of need for change, but not later than fourteen (14) days prior to date required for preparation and review of related submittals.
 - a. Conditions. Engineer will consider Contractor's request for substitution when the following conditions are satisfied:
 - 1) Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - 2) Requested substitution will not adversely affect the Baseline Project Schedule.
 - 3) Requested substitution has received necessary approvals of authorities having jurisdiction.
 - 4) Requested substitution is compatible with other portions of the Work.
 - 5) Requested substitution has been coordinated with other portions of the Work.
 - 6) Requested substitution provides specified warranty.
 - 7) If requested substitution involves more than one (1) contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
4. Substitutions for Convenience. Engineer will consider Contractor's requests for substitution if received within fourteen (14) days after the Notice of Award.
 - a. Conditions. Engineer will consider Contractor's request for substitution when the following conditions are satisfied:
 - 1) Requested substitution offers Port a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Port must assume. Port's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Port, and similar considerations.
 - 2) Requested substitution does not require extensive revisions to the Contract Documents.
 - 3) Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - 4) Requested substitution will not adversely affect the Baseline Project Schedule.
 - 5) Requested substitution has received necessary approvals of authorities having jurisdiction.

- 6) Requested substitution is compatible with other portions of the Work.
- 7) Requested substitution has been coordinated with other portions of the Work.
- 8) Requested substitution provides specified warranty.
- 9) If requested substitution involves more than one (1) contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

D. Substitutions will not be considered when:

1. Indicated or implied on shop drawings or product data submittals without formal request submitted in accordance with this Section.
2. Acceptance will require substantial revision of Contract Documents or other items of the Work.
3. Submittal for substitution request does not include point-by-point comparison of proposed substitution with specified product.

1.04 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

PROJECT TITLE: West Sitcum 11th St. Improvements **PROJECT NO.:** 201218.01
SUBMITTED BY: _____ **CONTRACT NO.:** PA000000123
PRIME/SUB/SUPPLIER: _____ **DATE:** _____

Specification Title: _____ Section No.: _____
Description: _____ Paragraph: _____
Page No.: _____

Proposed Substitution: _____
Trade Name: _____ Model No.: _____
Manufacturer: _____
Address: _____ Phone No.: _____
Installer: _____
Address: _____ Phone No.: _____
Differences between proposed substitution and specified product: _____

Point-by-Point comparative data attached - REQUIRED

Reason for not providing specified item: _____

Similar Installation:
Project: _____ A/E: _____
Address: _____
Owner: _____ Date Installed: _____
Proposed substitution affects other parts of Work: No Yes; explain _____

Supporting Data Attached:
 Drawings Product Data Samples Tests Reports Other: _____

Applicable to Substitution Requests During Construction:
Proposed to Port for accepting substitution: \$ _____
Proposed substitution changes Contract Time: No Yes [Add] [Deduct] _____ # days.

The Undersigned certifies:
• Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.

- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay Baseline Project Schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted By: _____
Signed By: _____ Firm: _____
Address: _____
Telephone: _____ Email: _____
Attachments: _____

A/E's REVIEW AND RECOMMENDATION

- Approved Substitution
- Approved Substitution as Noted
- Reject Substitution - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

ENGINEER'S REVIEW AND ACTION

- Substitution Approved - Make submittals in accordance with this Specification Section. If during construction, prepare Change Order.
- Substitution Approved as Noted - Make submittals in accordance with this Specification Section. If during construction, prepare Change Order.
- Substitution Rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section provides the notification required for disclosure of asbestos, lead-containing or other hazardous materials.

1.02 HAZARDOUS MATERIALS NOTICE

- A. The Port is reasonably certain that asbestos and lead will not be disturbed by the project. If the Contractor encounters material suspected of containing lead or asbestos which will interfere with the execution of the work, the Contractor shall stop work and notify the Engineer.
- B. Contractor is notified that certain portions of the Work area are suspected to contain petroleum hydrocarbons, as detailed in:
 - 1. Initial Investigation Field Report (Washington State Department of Ecology, 2019); Located in Appendix B.
 - 2. Report of Additional Investigation - Port of Tacoma, Former Milwaukee Railyard (Shaw Environmental, 2008); Located in Appendix C.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

BIDDER'S NAME: _____

PROJECT TITLE: WEST SITCUM 11TH ST. IMPROVEMENTS _

The undersigned Bidder declares that it has read the Contract Documents (including documents provided by reference), understands the conditions under which the Work will be performed, has examined the Project site, and has determined for itself all situations affecting the Work herein Bid upon. Bidder proposes and agrees, if this Bid is accepted, to provide at Bidder's own expense, all labor, machinery, tools, materials, etc., including all Work incidental to, or described or implied as incidental to such items, according to the Contract Documents, and that the Bidder will complete the Work within the time stated, and that Bidder will accept in full the lump sum or unit price(s) set forth below:

| ITEM NO. | DESCRIPTION OF ITEM | QTY | UOM | UNIT PRICE | EXTENDED PRICE (QTY. x UNIT PRICE) |
|----------|---------------------------------|-----|------|------------|------------------------------------|
| 1 | Mobilization and Demobilization | 1 | LS | | |
| 2 | Project Administration | 1 | LS | | |
| 3 | Surface Material Disposal | 550 | TONS | | |
| 4 | Pavement Sawcutting | 850 | LF | | |
| 5 | Storm Drain Installation | 375 | LF | | |
| 6 | Stormwater Treatment Structure | 1 | LS | | |
| 7 | Asphalt Surfacing | 300 | TONS | | |
| 8 | Type 1 Catch Basin | 2 | EA | | |
| 9 | Security Fencing | 300 | LF | | |
| 10 | Yard Lighting | 1 | LS | | |
| 11 | Unforeseen Conditions Allowance | 1 | LS | \$50,000 | \$50,000 |

| | |
|--|--|
| TOTAL BID AMOUNT | |
| 10.4% WASHINGTON STATE SALES TAX (WSST) ON BASE BID SUBTOTAL | |
| BID TOTAL (WITH WSST) | |

Note: Show prices in figures only.

Evaluation of Bids. In accordance with the provisions of the Contract Documents, Bids will be evaluated to determine the lowest Base Bid Subtotal offered by a responsible Bidder submitting a responsive Bid.

Schedule of Unit Prices. The unit prices are proposed to apply only in the event of additions to, or deletions from, the work required and ordered. All prices shall include complete installation without Washington State Sales Tax. The bidder shall propose a price for each item; failure to propose a price for each item may render the bid non-responsive. The Port reserves the right to accept or reject the unit prices proposed.

Trench Excavation Safety Provision. If the bid amount contains work which requires trenching exceeding a depth of four (4) feet, all costs for trench safety shall be included in the Base Bid and indicated below for adequate trench safety systems in compliance with RCW 39.04 and WAC 296-155-650. Bidder shall include a lump sum amount, excluding Washington State Sales Tax. If trench excavation safety provisions do not pertain to the Work, the Bidder should enter "N.A." or "Not Applicable" in the blank below.

Trench Excavation Safety: _____ (Total in Written Figures Only)

Principal Subcontractors/Suppliers. List below the name of each subcontractor or supplier to whom the Bidder proposes to subcontract the portions of the work listed below, or name itself for the work, in accordance with RCW 39.30.060.

| Work to be preformed | License Number | Name of Firm |
|----------------------|----------------|--------------|
| Electrical Work | | |
| Rebar Installation | | |
| Earthwork | | |
| | | |
| | | |

Non-Collusion Representation. The Bidder declares under penalty of perjury that the Bid submitted is genuine and not a sham or collusive bid, or made in the interest or on behalf of any person or firm not therein named; and further represents that the Bidder has not directly or indirectly induced or solicited any other bidder to submit a sham bid, or encouraged any other person or corporation to refrain from bidding; and that the Bidder has not in any manner sought by collusion to secure to the Bidder an advantage over any other bidder or bidders.

RCW 39.04.350 Certification. The Bidder represents and certifies, under penalty of perjury, that within the three- (3-) year period immediately preceding the Bid Date, the Bidder has not been determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries, nor through a civil judgment entered by a court of limited or general jurisdiction, to have willfully violated, as defined in RCW 49.48.082, any provision of Chapters 49.46, 49.48, nor 49.52 RCW.

Addenda. Bidder acknowledges receipt and acceptance of all Addenda through No. ____ (Identify Last Addenda By Number)

Bid Security. A certified check, cashier's check, or other obligation of a bank, or a bid bond in substantially the form set forth in Section 00 43 13, Bid Security Form for at least five (5) percent of the Base Bid Subtotal, shall be submitted with this Bid.

Apprenticeship Requirements. For Bids greater than one million (\$1,000,000) dollars, the apprentice labor hours required for this project are fifteen (15) percent of the total labor hours. The Bidder agrees to utilize this level of apprentice participation.

Name of Firm

Date

Signature

By Title

Mailing Address

City, State Zip Code

Telephone Number

Email Address

WA State Contractor's License No.

Employment Security Department No.

Identification of Bidder as a sole proprietor, a partnership, a joint venture, a corporation, or another described form of legal entity

END OF SECTION

KNOW ALL MEN BY THESE PRESENTS:

That we, _____, as Principal, and _____, as Surety, are held and firmly bound unto the PORT OF TACOMA as Obligee, in the penal sum of _____ Dollars, for the payment of which the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigned, jointly and severally, by these present.

The condition of this obligation is such that if the Obligee shall make any award to the Principal for _____, according to the terms of the proposal or bid made by the Principal therefor, and the Principal shall duly make and enter into a contract with the Obligee in accordance with the terms of said proposal or bid and award and shall give bond for the faithful performance thereof, with Surety or Sureties approved by the Obligee; or, if the principal shall, in case of failure to do so, pay and forfeit to the Obligee the penal amount of the deposit specified in the call for bids, then this obligation shall be null and void; otherwise it shall be and remain in full force and effect and the Surety shall forthwith pay and forfeit to the Obligee, as penalty and liquidated damages, the amount of this bond.

SIGNED, SEALED AND DATED THIS _____ DAY OF _____, 20__

BY _____
PRINCIPAL

BY _____
SURETY

AGENT AND ADDRESS

Note: Bidder may submit Surety's bid bond form, provided it is similar in substance, made out in the name of the Port of Tacoma, and that the agent's name and address appear as specified. Bonds containing riders limiting responsibility for toxic waste or limiting the term of responsibility will be rejected.

END OF SECTION

THIS IS NOT TO BE SUBMITTED WITH A BID.

THE LOW RESPONSIVE BIDDER SHALL BE REQUIRED TO COMPLETE THIS RESPONSIBILITY DETAIL FORM AS SPECIFIED IN SECTION 00 21 00 - INSTRUCTIONS TO BIDDERS. **THIS COMPLETED RESPONSIBILITY DETAIL FORM SHALL BE SUBMITTED ELECTRONICALLY (PDF) VIA EMAIL TO THE CONTACT(S) IDENTIFIED IN THE LOW RESPONSIVE BIDDER SELECTION NOTIFICATION.**

BIDDER'S COMPANY NAME: _____

For the below Mandatory Bidder Responsibility Criteria, please mark the appropriate choice.

1.01 MANDATORY BIDDER RESPONSIBILITY CRITERIA

A. The Bidder shall meet the following mandatory responsibility criteria as described in RCW 39.04.350(1). The Bidder shall be rejected as not responsible if any answer to questions 1 through 5 is "No" or any answer to questions 6 through 8 is "Yes."

1. Does the Bidder have a Certificate of Registration in compliance with RCW 18.27?
 Yes No
2. Does the Bidder have a current Washington State Unified Business Identifier number?
 Yes No
3. Does the Bidder have Industrial Insurance Coverage for the Bidder's employees working in Washington State as required in RCW 51?
 Yes No
4. Does the Bidder have an Employment Security Department number as required in RCW 50?

**Attach letter dated within six (6) months of Bid Date.*

**Request a letter electronically by clicking on the following link <https://fortress.wa.gov/esd/twt/pwcinternet/> or by emailing a request to publicworks@esd.wa.gov.*

 Yes No
5. Does the Bidder have a Washington State Excise Tax Registration number as required in RCW 82?
 Yes No
6. Has the Bidder been disqualified from bidding on any public works project under RCW 39.06.010 or 39.12.065(3)?
 Yes No
7. Has the Bidder violated RCW 39.04.370 more than one (1) time as determined by the Washington State Department of Labor and Industries?
 Yes No

- 8. Has the Bidder ever been found to be out of compliance with Apprenticeship Utilization requirements of RCW 39.04.320?
 Yes No

- 9. Has the Bidder ever been found to have willfully violated, as defined in RCW 49.48.082, any provision of Chapters 49.46, 49.48, or 49.52 RCW within the three- (3-) year period immediately preceding the date of this bid solicitation?
 Yes No

- 10. Has the Bidder completed the training required by RCW 39.04.350, or is the Bidder on the list of exempt businesses maintained by the Department of Labor and Industries?
 Yes No

If any answer to questions 1 through 5 is "No" or any answer to questions 6 through 8 is "Yes" - **STOP HERE** and contact the Contract Administrator. The Bidder is not responsible for this Work. Otherwise proceed to 1.02. **Provide attached to this completed form documentation to confirm responsibility criteria.**

For remaining criteria below, check or fill-out the appropriate item. Based upon the answer provided by the Bidder, the Port may request additional information or seek further explanation. As needed, provide backup documentation for any explanations listed below.

1.02 CONTRACT AND REGULATORY HISTORY

A. The Port will evaluate whether the Bidder's contract and regulatory history demonstrates an acceptable record of past project performance and consistent responsibility. The Bidder shall answer the following questions. The Bidder may be rejected as not responsible if any answer to questions 1 through 5 below is "Yes."

- 1. Has the Bidder had a contract terminated for cause or default in the last five (5) years?
 Yes, **If YES, explain below.** No

- 2. Has the Bidder required a Surety to take over all, or a portion of, a project to cure or respond to an asserted default or material breach of contract on the part of the Bidder on any public works project in the last five (5) years?
 Yes, **If YES, explain below.** No

- 3. Have the Bidder and major Sub-Bidders been in bankruptcy, reorganization, and/or receivership on any public works project in the last five (5) years?
 Yes, **If YES, explain below.** No

4. Have the Bidder and major Sub-Bidders been disqualified by any state or local agency from being awarded and/or participating on any public works project in the last five (5) years?

- Yes, **If YES, explain below.** No

5. Are the Bidder and major Sub-Bidders currently a party to a formal dispute resolution process with the Port (i.e., a pending mediation, arbitration, or litigation)?

- Yes, **If YES, explain below.** No

1.03 ACCIDENT/INJURY EXPERIENCE

- A. The Port will evaluate the Bidder’s accident/injury Experience Modification Factor (“EMF”) from the Washington State Department of Labor and Industries to assess whether the Bidder has an acceptable safety record preventing personal injuries on projects.
- B. List the Bidder’s accident/injury EMF for the last five (5) years. An experience factor is calculated annually by the Washington State Department of Labor and Industries.

| Year | Effective Year | Experience Factor |
|------|----------------|-------------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

If the Bidder has received an EMF of greater than 1.0 for any year, explain the cause(s) of the designation and what remedial steps were taken to correct the EMF. The Bidder may be rejected as not responsible if the Bidder’s EMF is greater than 1.0 and sufficient remedial steps have not been implemented.

1.04 WORK PERFORMED BY BIDDER

- A. The Bidder shall state the amount of the Work, as an equivalent to the Base Bid, excluding taxes, insurance, and bonding, the Bidder will execute with its own forces.

_____ %

1.05 ADDITIONAL CONTRACTOR INFORMATION

- A. As part of completing this Responsibility Detail Form, **submit the following information with the completed Responsibility Detail Form:**
 - 1. Bidder’s recent job resume, including a list of similar projects performed and contact information for the similar project owner(s), a brief description of work, start and end dates, and contract amount.
 - 2. Resumes of Bidder’s proposed project manager and job superintendent.

- B. The Bidder's failure to provide the required project information may result in a determination of the Bidder being declared non-responsible by the Port.
- C. The Bidder shall submit this completed, **SIGNED** Responsibility Detail Form electronically (PDF), with all requested backup documentation, via email to the contact(s) noted on the Low Responsive Bidder Selection Notification.
- D. The Bidder and its subcontractors to verify that its subcontractors at each tier meet the responsibility criteria as required by RCW 39.06.020 and 39.04.350.
 - 1. Bidder shall verify major subcontractors meet the responsibility criteria required. Fill out one Port of Tacoma Public Works Project Bidder Evaluation Checklist for Subcontractors for each major subcontractor and submit to the Port with this form. Backup documentation is not required to be submitted.

PROJECT: West Sitcum 11th St. Improvements

PROJECT NO.: 201218.01

CONTRACT NO.: PA000000123

Responsibility Certification Form

The Low responsive Bidder shall complete the Responsibility Detail Form, attach all documentation, and submit to the Port within twenty-four (24) hours following receipt of the Low Responsive Bidder Selection Notification. All forms shall be submitted electronically (PDF) via email to the contact(s) listed on the Selection Notice. Note, the same project may be used to demonstrate experience across multiple categories if applicable.

By completing and signing this Responsibility Detail Form, the Bidder is certifying that the information contained within the Form, the backup documentation, and any additional information requested by the Port is true and complete. The Bidder's failure to disclose the required information or the submittal of false or misleading information may result in the rejection of the Bidder's Bid, revocation of award, or contract termination.

| | |
|---|-------|
| The information provided herein is true and complete. | |
| <hr/> | <hr/> |
| Signature of Authorized Representative | Date |
| <hr/> | |
| Print Name and Title | |

**PORT OF TACOMA PUBLIC WORKS PROJECT BIDDER EVALUATION CHECKLIST FOR
 SUBCONTRACTORS**

PROJECT TITLE: West Sitcum 11th St. Improvements

BIDDER: _____

CONTRACT AND PROJECT NUMBER: PA000000123/ 201218.01 _____

This checklist shall be completed by the Bidder and its subcontractors to verify that its subcontractors at each tier meet the responsibility criteria as required by RCW 39.06.020 and RCW 39.04.350.

This checklist should be submitted to the Port of Tacoma Contracts Administrator within twenty-four (24) hours of request.

Document verification information or backup data is not to be submitted to the Port, this information should remain on file with the Contractor and be presented to the Port if requested at a later date.

| Item No. | Item | Initials/ Comments |
|----------|--|-----------------------|
| 1. | At the time of Bid submittal, have a certificate of registration in compliance with RCW 18.27: Check the L&I site https://secure.lni.wa.gov/verify/ Verify that a subcontractor has an electrical contractor license, if required by RCW 19.28, or an elevator contractor license, if required by RCW 70.87. | |
| 2. | While reviewing registration information above, also check contractor's Employer Liability Certificate to verify workers' comp (industrial insurance) premium status – current account. Complete a "Submit Contractor Tracking Request" to be notified if the contractor fails to pay workers' comp premiums or renew their contractor registration or if their electrical contractor license is suspended or revoked within one year. | |
| 3. | State excise tax registration number (Department of Revenue). (contractor's Washington State Unified Business Identifier and tax registration number) http://dor.wa.gov/content/doingbusiness/registermybusiness/brd/ . | |
| 4. | Not disqualified from bidding on any public works contract under RCW 39.06.010 or RCW 39.12.065(3) . Check the Department of Labor and Industries https://secure.lni.wa.gov/verify/ . | |
| 5. | Verify subcontractors are registered with the Washington State Employment Security Department (ESD) and have an account number. Request a letter to be sent from the subcontractor | |

| Item No. | Item | Initials/ Comments |
|-----------------|---|---------------------------|
| | <p>electronically by clicking on the following link https://esd.wa.gov/ or by emailing a request to publicworks@esd.wa.gov. Include ESD#, UBI#, and business name in the email. Certificate of Coverage letter issued/dated within the last six (6) months.</p> <p>Document if subcontractor confirms in writing, under penalty of perjury, that it has no employees and this requirement does not apply.</p> | |

END OF SECTION

THIS AGREEMENT is made and entered into by and between the PORT OF TACOMA, a State of Washington municipal corporation, hereinafter designated as the "Port," and:

The "Contractor" is: _____ (Legal Name)

_____ (Address)

_____ (Address 2)

_____ (Phone No.)

The "Project" is: **West Sitcum 11th St. Improvements** _____ (Title)

201218.01 | PA000000123 _____ (Project/Contract No.)

1002 Milwaukee Way _____ (Project Address)

Tacoma, WA 98421 _____ (Project Address 2)

The "Engineer" is: **Thais Howard, PE** _____ (Engineer)

Sr. Director of Engineering _____ (Title)

thoward@portoftacoma.com _____ (Email)

(253) 888-4718 _____ (Phone No.)

The "Contractor's Representative" is: _____ (Representative)

_____ (Title)

_____ (Email)

_____ (Phone No.)

BACKGROUND AND REPRESENTATIONS:

The Port publicly solicited bids on the Contract Documents. The Contractor submitted a Bid to the Port on the _____ day of _____, 20__ to perform the Work.

The Contractor represents that it has the personnel, experience, qualifications, capabilities, and means to accomplish the Work in strict accordance with the Contract Documents, within the Contract Time and for the Contract Price, and that it and its Subcontractors satisfy the responsibility criteria set forth in the Contract Documents, including any supplemental responsibility criteria.

The Contractor further represents that it has carefully examined, and is fully familiar with, all provisions of the Contract Documents, including any Addenda, that it has fully satisfied itself as to the nature, location, difficulty, character, quality, and quantity of the Work required by the Contract Documents and the conditions and other matters that may be encountered at or near the Project site(s), or that may affect performance of the Work or the cost or difficulty thereof, including all applicable safety and site responsibilities, and that it understands and can satisfy all scheduling and coordination requirements and interim milestones.

AGREEMENT:

The Port and the Contractor agree as follows:

1.0 CONTRACTOR TO FULLY PERFORM THE WORK

The Contractor shall fully execute and complete the entire Work for the Project described in the Contract Documents, except to the extent specifically indicated in the Agreement, the General Conditions of the Contract (as well as any Supplemental, Special, or other conditions included in the Project Manual), the Drawings, the Specifications, and all Addenda issued prior to, and all modifications issued after, execution of the Contract.

2.0 DATE OF COMMENCEMENT

The date of commencement of the Work, which is the date from which the Contract Time is measured, shall be fixed as the date of execution of the Contract.

3.0 CONTRACT TIME AND LIQUIDATED DAMAGES

The Contractor shall achieve all interim milestones as set forth in the Contract Documents and Substantial Completion of the entire Work not later than 180 calendar days from execution of the Contract, subject to adjustments of this Contract Time as provided in the Contract Documents. The Contractor shall achieve Final Completion of the entire Work within 30 calendar days of the date on which Substantial Completion is achieved.

Provisions for liquidated damages as a reasonable estimate of future loss, as of the date of this Agreement, are included in the Contract Documents. The parties agree that the stated liquidated damages are reasonable and not penalties individually nor cumulatively.

The liquidated damages for failure to achieve Substantial Completion by the required date shall be \$1,000 per calendar day. After the required Final Completion date, the liquidated damages for failure to achieve Final Completion shall be \$200 per calendar day.

Liquidated damages assessed by the Port will be deducted from monies due to the Contractor, or from monies that will become due to the Contractor. The liquidated damages, as specified and calculated herein, shall be levied, cumulatively if applicable, for each and every calendar day that Substantial Completion and/or Final Completion of the Work is delayed beyond the required completion dates, or the completion dates modified by the Port for extensions of the Contract Time.

4.0 CONTRACT PRICE

In accordance with the Contractor's Bid dated _____, the Port shall pay the Contractor in current funds for the Contractor's performance of the Contract, the Contract Price of _____ Dollars (\$_____), subject to additions and deductions as provided in the Contract Documents. State and local sales tax is not included in the Contract Price, but will be due and paid by the Port with each progress payment.

5.0 ALTERNATES

6.0 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in the Contract Documents.

This Agreement is entered into as of the day and year first written above:

CONTRACTOR

PORT OF TACOMA

By: _____

By: _____

Title: _____

Title: _____

Date: _____

Execution _____

Date:

END OF SECTION

PERFORMANCE BOND # _____

CONTRACTOR (NAME AND ADDRESS)

SURETY (NAME AND PRINCIPLE PLACE OF BUSINESS)

OWNER (NAME AND ADDRESS)

AGENT OR BROKER (FOR INFORMATION ONLY)

PORT OF TACOMA
P.O. BOX 1837
TACOMA, WA 98401-1837

KNOW ALL MEN BY THESE PRESENTS:

That _____ as Principal, hereinafter called Contractor, and _____ as Surety, hereinafter called Surety, are held and firmly bound unto the Port of Tacoma as Obligee, hereinafter called the Port, in the amount of _____ Dollars (\$ _____) for the payment whereof Contractor and Surety bind themselves, their executors, administrators, legal representatives, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS:

Contractor shall execute an agreement with the Port for West Sitcum 11th St. Improvements, Project No. 201218.01/Contract No. PA000000123, a copy of which Contract is by reference made a part hereof (the term "Contract" as used herein to include the aforesaid agreement together with all the Contract Documents, addenda, modifications, all alterations, additions thereto, deletions therefrom, and any other document or provision incorporated into the Contract) and is hereinafter referred to as the Contract.

This bond is executed and issued pursuant to the provisions of RCW 39.08.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

FURTHER:

- A. Surety hereby waives notice of any alterations, change orders, modifications, or extensions of time made by the Port.
- B. Surety recognizes that the Contract includes provisions for additions, deletions, and modifications to the Work and/or Contract Time and the amounts payable to the Contractor. Subject to the limitations contained in (A) above, Surety agrees that no such addition, deletion, or modification, or any combination thereof, shall avoid or impair Surety's obligation hereunder.
- C. Whenever Contractor has been declared by the Port to be in default, and the Port has given Surety notice of the Port's determination of such default, Surety shall promptly (in no event more than fifteen (15) days following receipt of such notice) advise the Port of its intended action to:
 - 1. Remedy the default within fifteen (15) days following its advice to the Port as set forth above, or

- 2. Assume within fifteen (15) days, following its advice to the Port as set forth above, completion of the Contract in accordance with the Contract Documents and become entitled to payment of the balance of the Contract Sum, or
- 3. Pay the Port upon completion of the Contract, in cash, the cost of completion together with all other reasonable costs and expenses incurred by the Port as a result of the Contractor's default, including but not limited to, those reasonable costs and expenses incurred by the Port in its efforts to mitigate its losses, which may include, but are not limited to, attorney's fees and efforts to complete the Work prior to the Surety exercising the options available to it as set forth herein.
- D. If the Port shall commence suit and obtain judgment against the Surety for recovery hereunder, then the Surety, in addition to such judgment, shall pay all costs and attorney's fees incurred by the Port in enforcement of its rights hereunder. Venue for any action arising out of, or in connection with, this bond shall be in Pierce County, Washington.
- E. No right or action shall accrue on this bond to, or for the use of, any person or corporation other than the Port of Tacoma.

Signed and Sealed the _____ day of _____, 20____.

IMPORTANT: Surety companies executing bonds must have an A.M. Best Rating of "A-, FSC (6)" or higher, have an underwriting limitation of not less than the Contract Sum, and be authorized to transact business in the State of Washington.

SURETY

CONTRACTOR

Signature

Signature

Printed Name and Title

Printed Name and Title

Power of Attorney attached.

END OF SECTION

LABOR AND MATERIAL PAYMENT BOND # _____

CONTRACTOR (NAME AND ADDRESS)

OWNER (NAME AND ADDRESS)

PORT OF TACOMA _____
P.O. BOX 1837 _____
TACOMA, WA 98401-1837 _____

KNOW ALL MEN BY THESE PRESENTS:

That _____ as Principal, hereinafter called Contractor, and _____ as Surety, hereinafter called Surety, are held and firmly bound unto the Port of Tacoma as Obligee, hereinafter called the Port, and all others entitled to recovery hereunder, in the amount of _____ Dollars (\$ _____) for the payment whereof Contractor and Surety bind themselves, their executors, administrators, legal representatives, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS:

Contractor shall execute an agreement with the Port for West Sitcum 11th St. Improvements, Project No. 201218.01/Contract No. PA000000123, a copy of which Contract is by reference made a part hereof (the term "Contract" as used herein to include the aforesaid agreement together with all the Contract Documents, addenda, modifications, alterations, additions thereto, deletions therefrom, and any other document or provision incorporated into the Contract) and is hereinafter referred to as the Contract.

This bond is executed pursuant to the provisions of RCW 39.08.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if Contractor shall promptly make payment to all claimants, as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract and shall indemnify and save the Port harmless from all cost and damage by reason of Contractor's default, then this obligation shall be null and void; otherwise, it shall remain in full force and effect, subject to the following conditions.

- A. Surety hereby waives notice of any alterations, change orders, modifications, or extensions of time made by the Port.
- B. Surety recognizes that the Contract includes provisions for additions, deletions, and modifications to the Work and/or Contract Time and the amounts payable to the Contractor. Subject to the limitations contained in (A) above, Surety agrees that no such addition, deletion, or modification, or any combination thereof, shall avoid or impair Surety's obligation hereunder.

- C. Surety hereby agrees that every person protected under the provisions of RCW 39.08.010 who has not been paid as provided under the Contract, and pursuant to RCW 39.08.010, less any amounts withheld pursuant to statute, and less retainage withheld pursuant to RCW 60.28, after the expiration of a period of thirty (30) days after the date on which the completion of the Contract in accordance with RCW 39.08, may sue on this bond, prosecute the suit to final judgment as may be due claimant, and have execution thereon including recovery of reasonable costs and attorney's fees as provided by RCW 39.08. The Port shall not be liable for the payment of any costs or expenses of any such suit.

- D. No suit or action shall be commenced hereunder by any claimant unless claimant shall have given the written notices to the Port, and where required, the Contractor, in accordance with RCW 39.08.030.

- E. The amount of this bond shall be reduced by, and to the extent of, any payment or payments made in good faith hereunder, inclusive of the payment by Surety of claims which may be properly filed in accordance with RCW 39.08 whether or not suit is commenced under and against this bond.

- F. If any Claimant shall commence suit and obtain judgment against the Surety for recovery hereunder, then the Surety, in addition to such judgment and attorney fees as provided by RCW 39.08.030, shall also pay such costs and attorney fees as may be incurred by the Port as a result of such suit. Venue for any action arising out of, or in connection with, this bond shall be in Pierce County, Washington.

Signed and Sealed the _____ day of _____, 20_____.

IMPORTANT: Surety companies executing bonds must have an A.M. Best Rating of "A-, FSC (6)" or higher, have an underwriting limitation of not less than the Contract Sum, and be authorized to transact business in the State of Washington.

| SURETY | CONTRACTOR |
|-----------------------------|------------------------|
| _____ | _____ |
| Signature | Signature |
| _____ | _____ |
| Printed Name and Title | Printed Name and Title |
| | |
| Power of Attorney attached. | |

END OF SECTION

BOND NO.: _____

PROJECT TITLE: West Sitcum 11th St. Improvements

PROJECT NO.: 201218.01 _____

CONTRACT NO.: PA000000123 _____

KNOW ALL MEN BY THESE PRESENTS: That we, _____
_____ a corporation existing under and by virtue of the laws of the State of Washington and authorized to do business in the State of Washington, as Principal, and _____, a corporation organized and existing under the laws of the State of _____ and authorized to transact the business of surety in the State of Washington, as Surety, are jointly and severally held and bound unto the PORT OF TACOMA, hereinafter called Port, as Obligee, and are similarly held and bound unto the beneficiaries of the trust fund created by RCW 60.28 as their heirs, executors, administrators, successors, and assigns in the penal sum of _____ (\$ _____) plus five (5) percent of any increases in the Contract Price that have occurred or may occur, due to change orders, increases in the quantities, or the addition of any new item of work.

WHEREAS, on the _____ day of _____, the said Principal herein executed Contract No. PA000000123 with the Port for West Sitcum 11th St. Improvements, Project No. 201218.01.

WHEREAS, said Contract and RCW 60.28 require the Port to withhold from the Principal the sum of five (5) percent from monies earned by the Principal on estimates during the progress of the work, hereinafter referred to as earned retained funds.

WHEREAS, the Principal has requested that the Port accept a bond in lieu of earned retained funds as allowed under RCW 60.28.

NOW THEREFORE, this obligation is such that the Surety, its successors, and assigns are held and bound unto the Port and unto all beneficiaries of the trust fund created by RCW 60.28.011(1) in the aforesaid sum. This bond, including any proceeds therefrom, is subject to all claims and liens and in the same manner and priority as set forth for retained percentages in RCW 60.28. The condition of this obligation is also that if the Principal shall satisfy all payment obligations to persons who may lawfully claim under the trust fund created pursuant to RCW 60.28, to the Port, and indemnify and hold the Port harmless from any and all loss, costs, and damages that the Port may sustain by release of said retainage to Principal, then this obligation shall be null and void, provided the Surety is notified by the Port that the requirements of RCW 60.28.021 have been satisfied and the obligation is duly released by the Port.

IT IS HEREBY DECLARED AND AGREED that the Surety shall be liable under this obligation as Principal. The Surety will not be discharged or released from liability for any act, omission, or defenses of any kind or nature that would not also discharge the Principal.

IT IS HEREBY FURTHER DECLARED AND AGREED that this obligation shall be binding upon and inure to the benefit of the Principal, the Surety, the Port, the beneficiaries of the trust fund created by RCW 60.28 and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, said Principal and said Surety have caused these presents to be duly signed and sealed this _____ day of _____, 20____.

By: _____
Principal

Address: _____

City/ST/Zip: _____

Phone: _____

Surety Name: _____

By: _____
Attorney-In-Fact

Address: _____

City/ST/Zip: _____

Phone: _____

IMPORTANT: Surety companies executing bonds must have an A.M. Best Rating of "A-, FSC (6)" or higher, and be authorized to transact business in the State of Washington.

END OF SECTION

| TABLE OF CONTENTS | | PAGE |
|--|--|-------------|
| ARTICLE 1 - THE CONTRACT DOCUMENTS | | 3 |
| 1.01 | GENERAL | 3 |
| 1.02 | DEFINITIONS | 3 |
| 1.03 | INTENT OF THE CONTRACT DOCUMENTS | 4 |
| 1.04 | CORRELATION OF THE CONTRACT DOCUMENTS | 4 |
| 1.05 | OWNERSHIP OF THE CONTRACT DOCUMENTS | 5 |
| ARTICLE 2 - PORT OF TACOMA | | 5 |
| 2.01 | AUTHORITY OF THE ENGINEER | 5 |
| 2.02 | ADMINISTRATION OF THE CONTRACT | 5 |
| 2.03 | INFORMATION PROVIDED BY THE PORT | 6 |
| 2.04 | CONTRACTOR REVIEW OF PROJECT INFORMATION | 6 |
| 2.05 | PORT'S RIGHT TO REJECT, STOP, AND/OR CARRY-OUT THE WORK | 6 |
| 2.06 | SEPARATE CONTRACTORS | 7 |
| 2.07 | OFFICERS AND EMPLOYEES OF THE PORT | 7 |
| ARTICLE 3 - CONTRACTOR'S RESPONSIBILITIES | | 7 |
| 3.01 | DUTY TO PERFORM THE ENTIRE WORK | 7 |
| 3.02 | OBSERVED ERRORS, INCONSISTENCIES, OMISSIONS OR VARIANCES IN THE CONTRACT DOCUMENTS | 7 |
| 3.03 | SUPERVISION AND RESPONSIBILITY FOR SUBCONTRACTORS | 8 |
| 3.04 | MATERIALS AND EQUIPMENT | 8 |
| 3.05 | CONTRACTOR WARRANTIES | 8 |
| 3.06 | REQUIRED WAGES | 9 |
| 3.07 | STATE AND LOCAL TAXES | 9 |
| 3.08 | PERMITS, LICENSES, FEES, AND ROYALTIES | 10 |
| 3.09 | SAFETY | 10 |
| 3.10 | CORRECTION OF WORK | 10 |
| 3.11 | UNCOVERING OF WORK | 11 |
| 3.12 | RELOCATION OF UTILITIES | 11 |
| 3.13 | LABOR | 12 |
| 3.14 | INDEMNIFICATION | 12 |
| 3.15 | WAIVER OF CONSEQUENTIAL DAMAGES | 13 |
| ARTICLE 4 - SUBCONTRACTORS AND SUPPLIERS | | 13 |
| 4.01 | RESPONSIBILITY FOR ACTIONS OF SUBCONTRACTORS AND SUPPLIERS | 13 |
| 4.02 | AWARD OF CONTRACTS TO SUBCONTRACTORS AND SUPPLIERS | 13 |
| 4.03 | SUBCONTRACTOR AND SUPPLIER RELATIONS | 14 |
| ARTICLE 5 - WORKFORCE AND NON-DISCRIMINATION REQUIREMENTS | | 15 |
| 5.01 | COMPLIANCE WITH NON-DISCRIMINATION LAWS | 15 |
| 5.02 | MWBE, VETERAN-OWNED, AND SMALL BUSINESS ENTERPRISE PARTICIPATION | 15 |
| 5.03 | APPRENTICESHIP PARTICIPATION | 15 |
| ARTICLE 6 - CONTRACT TIME AND COMPLETION | | 16 |
| 6.01 | CONTRACT TIME | 16 |
| 6.02 | PROGRESS AND COMPLETION | 16 |
| 6.03 | SUBSTANTIAL COMPLETION | 17 |

| | | |
|-------------------|---|-----------|
| 6.04 | COMPLETION OF PUNCH LIST | 17 |
| 6.05 | FINAL COMPLETION | 17 |
| 6.06 | FINAL ACCEPTANCE | 18 |
| 6.07 | PORT'S RIGHT TO USE THE PREMISES | 18 |
| ARTICLE 7 | - PAYMENT | 18 |
| 7.01 | ALL PAYMENTS SUBJECT TO APPLICABLE LAWS AND SCHEDULE OF VALUES..... | 18 |
| 7.02 | APPLICATIONS FOR PAYMENT | 19 |
| 7.03 | PROGRESS PAYMENTS | 19 |
| 7.04 | PAYMENT BY CONTRACTOR TO SUBCONTRACTORS | 19 |
| 7.05 | FINAL PAYMENT | 19 |
| 7.06 | RETAINAGE | 20 |
| 7.07 | DISPUTED AMOUNTS | 21 |
| 7.08 | EFFECT OF PAYMENT | 21 |
| 7.09 | LIENS | 21 |
| ARTICLE 8 | - CHANGES IN THE WORK | 21 |
| 8.01 | CHANGES IN THE WORK | 21 |
| 8.02 | CHANGES IN THE CONTRACT SUM | 23 |
| 8.03 | CHANGES IN THE CONTRACT TIME | 26 |
| 8.04 | RESERVATION OF RIGHTS | 27 |
| 8.05 | UNIT PRICES | 27 |
| ARTICLE 9 | - SUSPENSION AND TERMINATION OF CONTRACT | 27 |
| 9.01 | PORT'S RIGHT TO SUSPEND WORK | 27 |
| 9.02 | TERMINATION OF CONTRACT FOR CAUSE BY THE PORT | 28 |
| 9.03 | TERMINATION OF CONTRACT FOR CONVENIENCE BY THE PORT | 28 |
| 9.04 | TERMINATION OF CONTRACT BY THE CONTRACTOR | 28 |
| 9.05 | SUBCONTRACT ASSIGNMENT UPON TERMINATION | 29 |
| ARTICLE 10 | - BONDS | 29 |
| 10.01 | CONTRACTOR PERFORMANCE AND PAYMENT BONDS | 29 |
| ARTICLE 11 | - DISPUTE RESOLUTION | 30 |
| 11.01 | NOTICE OF PROTEST AND CLAIM | 30 |
| 11.02 | MEDIATION | 31 |
| 11.03 | LITIGATION | 32 |
| ARTICLE 12 | - MISCELLANEOUS | 32 |
| 12.01 | GENERAL | 32 |
| 12.02 | WAIVER | 32 |
| 12.03 | GOVERNING LAW | 33 |
| 12.04 | COMPLIANCE WITH LAW | 33 |
| 12.05 | ASSIGNMENT | 33 |
| 12.06 | TIME LIMIT ON CAUSES OF ACTION | 33 |
| 12.07 | SERVICE OF NOTICE | 33 |
| 12.08 | RECORDS | 34 |
| 12.09 | STATUTES | 34 |

ARTICLE 1 - THE CONTRACT DOCUMENTS

1.01 GENERAL

- A. Contract Documents form the Contract. The Contract Documents are enumerated in the Agreement between the Port and Contractor ("Agreement"). Together, the Contract Documents form the Contract. The Contract represents the entire integrated agreement between the parties and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only in writing and only as set forth in the Contract Documents.
- B. Headings only for convenience. The titles or headings of the sections, divisions, parts, articles, paragraphs, and subparagraphs of the Contract Documents are intended only for convenience.

1.02 DEFINITIONS

- A. "Contract Documents" proposed for the Work consist of the Agreement, the General Conditions of the Contract (as well as any Supplemental, Special, or other conditions included in the Project Manual), the Drawings, the Specifications, and all Addenda issued prior to, and all modifications issued after, execution of the Contract.
- B. "Contractor" means the person or entity contracting to perform the Work under these Contract Documents. The term Contractor includes the Contractor's authorized representative for purposes of identifying obligations and responsibilities under the Contract Documents, including the ability to receive notice and direction from the Port.
- C. "Day" means a calendar day unless otherwise specifically designated.
- D. "Drawings" are the graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, including plans, elevations, sections, details, and diagrams.
- E. "Engineer" is the Port employee generally tasked with administering the Project on the Port's behalf and the person with overall responsibility for managing, for the Port, the Project scope, budget, and schedule. To the extent empowered, the Engineer may delegate to others at the Port (such as a Project Manager or Inspector) the responsibility for performing delegated responsibilities of the Engineer's under this Contract.
- F. "Port" means the Port of Tacoma. The Port will designate in writing a representative (usually the Engineer) who shall have the authority to act on the Port's behalf related to the Project. The "Port" does not include staff, maintenance, or safety workers, or other Port employees or consultants that may contact the Contractor or be present at the Project site.
- G. "Project" is identified in the Agreement and is the total construction to be performed by or through the Port, of which the Work performed under the Contract Documents may be only a part.
- H. "Specifications" are those portions of the Contract Documents that specify the written requirements for materials, equipment, systems, standards, and workmanship for the Work and for the performance of related services.
- I. "Subcontractor" means a person or entity that contracts directly with the Contractor to perform any Work under the Contract Documents. "Subcontractor of any tier" includes Subcontractors as well as any other person or entity, including suppliers, that contracts with a Subcontractor or a lower-tier Subcontractor (also referred to as "Sub-subcontractors") to perform any of the Work.

- J. "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all labor, tools, equipment, materials, services, and incidentals necessary to complete all obligations under the Contract Documents. The Work may constitute only a part of the Project, and may interface and need to be coordinated with the work of others.

1.03 INTENT OF THE CONTRACT DOCUMENTS

- A. Intent of Contract Documents. The intent of the Contract Documents is to describe the complete Work and to include all items and information necessary for the proper execution and completion of the Work by the Contractor.
- B. Contract Documents are complementary. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor is required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.
- C. No third party contract rights. The Contract Documents shall not create a contractual relationship of any kind (1) between the Port and a Subcontractor of any tier (although the Port does not waive any third-party beneficiary rights it may otherwise have as to Subcontractors of any tier), (2) between the Contractor and the Engineer or other Port employees or consultants, or (3) between any persons or entities other than the Port and Contractor.

1.04 CORRELATION OF THE CONTRACT DOCUMENTS

- A. Precedence. In the event of a conflict or discrepancy between or among the Contract Documents, the conflict or discrepancy will be resolved by the following order of precedence: with an addendum or Change Order having precedence over an earlier document, and computed dimensions having precedence over scaled dimensions, and large scale drawings take precedence over small scale drawings:
 - 1. The signed Agreement
 - a. Supplemental Conditions
 - b. Division 00 General Conditions
 - c. Division 01 General Requirements of Specifications
 - d. All other Specifications, including all remaining divisions, material and system schedules and attachments, and Drawings
 - e. All other sections in Division 00 not specifically identified herein by Section
- B. Inconsistency between or among Contract Documents. If there is any inconsistency between the Drawings, schedules, or Specifications, or any attachments, the Contractor will make an inquiry to the Engineer to determine how to proceed, and, unless otherwise directed, the Contractor will provide the better quality or greater quantity of any work or materials, as reasonably interpreted by the Port, at no change in the Contract Sum or Contract Time. Thus, if Work is shown on Drawings, but not contained in Specifications or schedules, or contained in Specifications or schedules, but not shown on the Drawings, the Work as shown or contained will be provided at no change in the Contract Sum or Contract Time, according to Specifications or Drawings to be issued by the Port.

- C. Inconsistency with law. In the event of a conflict between the Contract Documents and applicable laws, codes, ordinances, regulations, or orders of governmental authorities having jurisdiction over the Work, or in the event of any conflict between such laws, the most stringent requirements govern.
- D. Organization of Contract Documents. The organization of the Specifications and Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of the Work to be performed. The Port assumes no responsibility for the division and proper coordination of Work between particular Subcontractors.
- E. Bid quantities are estimates only. Any "bid quantities" set forth in the Contract Documents are estimates only. The Port does not warrant that the actual amount of Work will correspond to any estimates. The basis of payment will be the actual quantities performed in accordance with the Contract Documents.

1.05 OWNERSHIP OF THE CONTRACT DOCUMENTS

- A. Port owns all Contract Documents. All Drawings, Specifications, and other Contract Documents furnished to the Contractor are Port property, and the Port retains all intellectual property rights, including copyrights. The Contract Documents are to be used only with respect to the Project.

ARTICLE 2 - PORT OF TACOMA

2.01 AUTHORITY OF THE ENGINEER

- A. Engineer will be Port's representative. The Engineer or the Engineer's designee will be the Port's representative during the Project and will administer the Project on the Port's behalf.
- B. Engineer may enforce all obligations. The Engineer has the authority to enforce all requirements imposed on the Contractor by the Contract Documents.
- C. Only Engineer is agent of Port. Other than the Engineer, no other Port employee or consultant is an agent of the Port, and none are authorized to agree on behalf of the Port to changes in the Contract Sum or Contract Time, nor to waive provisions of the Contract Documents, nor to direct the Contractor to take actions that change the Contract Sum or Contract Time, nor to accept notice of protests or claims on behalf of the Port.

2.02 ADMINISTRATION OF THE CONTRACT

- A. Port will administer Contract. The Port will provide administration of the Contract through the Engineer or the Engineer's designee. All communications with the Port or its consultants related to the Contract will be through the designated representative.
- B. Port not responsible for means and methods. The Port is not responsible for, and will have no control or charge of, the means, methods, techniques, sequences, or procedures of construction, or for safety precautions or programs incidental thereto, because these are the sole responsibility of the Contractor. If the Port makes any suggestion of means, methods, techniques, sequences, or procedures, the Contractor will exercise its independent judgment in deciding whether to adopt the suggestion, except as otherwise provided in the Contract Documents.
- C. Port not responsible for acts or omissions of Contractor or Subcontractors. The Port is not responsible for, and will have no control or charge of, the acts or omissions of the Contractor, Subcontractors of any tier, suppliers, or any of their agents or employees, or any other persons performing a portion of the Work.

- D. Port not responsible for the Work. The Port is not responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The presence of the Engineer or others at the Project site at any time does not relieve the Contractor from its responsibility for non-conforming Work.
- E. Port will have access to the Work. The Port and its representatives will at all times have access to the Work in progress, and the Contractor will provide proper facilities for such access and for inspection.

2.03 INFORMATION PROVIDED BY THE PORT

- A. Port to furnish information with reasonable promptness. The Port shall furnish information and services required of the Port by the Contract Documents with reasonable promptness.
- B. Subsurface investigation. The Port may have undertaken a limited investigation of the soil and other subsurface conditions at the Project site for design purposes only. The results of these investigations will be available for the convenience of the Contractor, but they are not Contract Documents. There is no warranty or guarantee, express or implied, that the conditions indicated are representative of those existing at the site or that unforeseen developments may not occur. The Contractor is solely responsible for interpreting the information.

2.04 CONTRACTOR REVIEW OF PROJECT INFORMATION

- A. Contractor to familiarize itself with site and conditions of Work. Prior to executing the Contract, the Contractor shall visit the site, become generally familiar with local conditions under which the Work is to be performed, and correlate personal observations with the requirements of the Contract Documents and all information provided with the Bid Documents. By signing the Contract, the Contractor confirms that the Contract Sum is reasonable compensation for the Work; that the Contract Time is adequate; that it has carefully examined the Contract Documents and the Project site; and that it has satisfied itself as to the nature, location, and character of the Work, the labor, materials, equipment, and other items required and all other requirements of the Contract Documents. The Contractor's failure fully to acquaint itself with any such condition does not relieve the Contractor from the responsibility for performing the Work in accordance with the Contract Documents, within the Contract Time, and for the Contract Sum.
- B. Contractor to review Contract Documents. Because the Contract Documents are complementary, the Contractor will, before starting each portion of the Work, carefully study and compare the various Drawings, Specifications, and other Contract Documents, as well as all information furnished by the Port.
- C. Contractor to confirm field conditions. Before starting each portion of the Work, the Contractor shall take field measurements of and verify any existing conditions, including all Work in place, and all general reference points; shall observe any conditions at the site affecting the Contractor; and shall carefully compare field measurements, conditions and other information known to the Contractor with the Contract Documents.

2.05 PORT'S RIGHT TO REJECT, STOP, AND/OR CARRY-OUT THE WORK

- A. Port may reject Work. The Port has the authority, but not the obligation, to reject work, materials, and equipment that is defective or that otherwise does not conform to the Contract Documents, and to decide questions concerning the Contract Documents. However, the failure to so reject, or the presence of the Port at the site, shall not be construed as assurance that the Work is acceptable or being completed in compliance with the Contract Documents.

- B. Port may stop Work. If the Contractor fails to correct Work that does not comply with the requirements of the Contract Documents, or repeatedly or materially fails to properly carry out the Work, the Port may issue an order to stop all or a portion of the Work until the cause for the order has been eliminated. The Port's right to stop the Work shall not impose a duty on the Port to exercise this right for the benefit of the Contractor or any third party.
- C. Port may carry-out Work. If the Contractor fails to perform the Work properly, fails to perform any provision of this Contract, or fails to maintain the Baseline Project Schedule, or if the Port reasonably concludes that the Work will not be completed in the specified manner or within the Contract Time, then the Port may, after three (3) days' written notice to the Contractor and without prejudice to any other remedy the Port may have, perform itself or have performed any or all of the Work and may deduct the cost thereof from any payment then or later due the Contractor.

2.06 SEPARATE CONTRACTORS

- A. Port may engage separate contractors or perform work with its own forces. The Port may contract with other contractors ("Separate Contractor") in connection with the Project or perform work with its own forces. The Contractor shall coordinate and cooperate with any Port forces or Separate Contractors, as applicable. The Contractor shall provide reasonable opportunity for the introduction and storage of materials and the execution of work by others.
- B. Contractor to inspect work of others. If any part of the Contractor's Work depends on the work of the Port or any Separate Contractor, the Contractor shall inspect and promptly report to the Port, in writing, any defects that impact the Contractor. Failure of the Contractor to so inspect and report defects in writing shall constitute an acceptance by Contractor of the work of the Port or Separate Contractor.
- C. Contractor to resolve claims of others. Should the Contractor, or any of its Subcontractors of any tier, cause damage of any kind, including but not limited to delay, to any Separate Contractor, the Contractor shall promptly, and using its best efforts, settle or otherwise resolve the dispute with the Separate Contractor. The Contractor shall also promptly remedy damage caused to completed or partially completed construction.

2.07 OFFICERS AND EMPLOYEES OF THE PORT

- A. No personal liability. Officers, employees, and representatives of the Port, including the Commissioners, acting within the scope of their employment, shall not be personally liable to Contractor for any acts or omissions arising out of the Project.

ARTICLE 3 - CONTRACTOR'S RESPONSIBILITIES

3.01 DUTY TO PERFORM THE ENTIRE WORK

- A. Contractor must perform entire Work in accordance with Contract Documents. The Contractor shall perform the entire Work required by the Contract in accordance with the Contract Documents. Unless otherwise specifically provided, the Contractor shall provide and pay for all labor, tools, equipment, materials, electricity, power, water, other utilities, transportation, and other facilities necessary for the execution and completion of the Work.
- B. Contractor shall be independent contractor. The Contractor shall be, and operate as, an independent contractor in the performance of the Work. The Contractor is not authorized to enter into any agreements or undertakings for, or on behalf of, the Port and is not an agent or employee of the Port.

3.02 OBSERVED ERRORS, INCONSISTENCIES, OMISSIONS, OR VARIANCES IN THE CONTRACT DOCUMENTS

- A. Contractor to notify Port of any discrepancy. The Contractor's obligations to review and carefully study the Contract Documents and field conditions are for the purpose of facilitating coordination and construction. If the Contractor at any time observes that the Contract Documents, including Drawings and Specifications, vary from the conditions of the Project site, are in error, or omit any necessary detail, the Contractor shall promptly notify the Engineer in writing through a Request for Information. Any Work done after such observation, until authorized by the Engineer, shall be at Contractor's risk. The Contractor shall also promptly report to the Engineer any observed error, inconsistency, omission, or variance with applicable laws through a Request for Information. If the Contractor fails either to carefully study and compare the Contract Documents, or to promptly report any observed error, inconsistency, omission, or variance, the Contractor shall assume full responsibility and shall bear all costs, liabilities, and damages attributable to the error, inconsistency, omission, or variance.
- B. Requests for Information. The Contractor shall submit Requests for Information concerning the Contract Documents by following the procedure and using such form as the Port may require. The Contractor shall minimize Requests for Information by thoroughly studying the Contract Documents and reviewing all Subcontractor requests. The Contractor shall allow adequate time in its planning and scheduling for a response from the Port to a Request for Information.
- C. Port may provide information to supplement Drawings and Specifications. Minor items of work or detail that are omitted from the Drawings and Specifications, but inferable from the information presented and normally provided by accepted good practice, shall be provided and/or performed by the Contractor as part of the Contract Sum and within the Contract Time. Similarly, the Engineer may furnish to the Contractor additional Drawings and clarifications, consistent with the Contract Documents, as necessary to detail and illustrate the Work. The Contractor shall conform its Work to such additional Drawings and clarifications at no increase in the Contract Sum or Contract Time.

3.03 SUPERVISION AND RESPONSIBILITY FOR SUBCONTRACTORS

- A. Contractor responsible for Work and workers. The Contractor shall have complete control of the means, methods, techniques, sequences, or procedures related to the Work, and for all safety precautions or programs. The Contractor shall have complete control over, and responsibility for, all personnel performing the Work. The Contractor is also responsible for the acts and omissions of the Contractor's principals, employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors of any tier.
- B. Contractor to supervise the Work. The Contractor shall continuously supervise and direct the Work using competent and skilled personnel and the Contractor's best skill and attention.
- C. Contractor to enforce discipline and good order. The Contractor shall enforce strict discipline and good order among all workers on the Project, and shall not employ any unfit person or anyone not skilled in the work to which they are assigned. Incompetent, careless, or negligent workers shall immediately be removed from the Work. The Port may, but is not obligated to, require the Contractor to remove from the Work, at no change in the Contract Sum or Contract Time, anyone whom the Port considers objectionable.

3.04 MATERIALS AND EQUIPMENT

- A. Material and equipment to be new. All materials and equipment to be incorporated into the Work shall be new, unless specifically provided otherwise in the Contract Documents. The Contractor shall, if required in writing by the Port, furnish satisfactory evidence regarding the kind and quality of any materials, identify the source, and warrant compliance with the Contract Documents. The Contractor shall ensure that all materials and equipment are protected, kept dry, and stored under cover in a manner to protect such materials and equipment.
- B. Material and equipment shall conform to manufacturer instructions. All materials and equipment shall conform, and shall be applied, installed, used, maintained, and conditioned in accordance with the instructions of the applicable manufacturer, fabricator, or processor, unless otherwise specifically provided by the Engineer.

3.05 CONTRACTOR WARRANTIES

- A. Work will be of good quality and performed in workmanlike manner. In addition to any specific warranties set forth in the Contract Documents, the Contractor warrants that the Work, including all materials and equipment furnished under the Contract, will be of good quality and new, will be performed in a skillful and workmanlike manner, and will conform to the requirements of the Contract Documents. Any Work not conforming to this warranty, including unapproved or unauthorized substitutions, shall be considered defective.
- B. Work will be free from defects. The Contractor warrants that the Work will be free from defects for a period of one (1) year from the date of Substantial Completion of the Project.
- C. Contractor to collect and deliver warranties to Port. The Contractor shall collect and deliver to the Port any written warranties required by the Contract Documents. These warranties shall be obtained and enforced by the Contractor for the benefit of the Port without the necessity of separate assignment. These warranties shall extend to the Port all rights, claims, benefits, and interests that the Contractor may have under express or implied warranties or guarantees against a Subcontractor of any tier, supplier, or manufacturer for defective or non-conforming Work. Warranty provisions that purport to limit or alter the Port's rights under the Contract Documents, or the laws of the State of Washington, are null and void.
- D. General requirements. The Contractor is not relieved of its general warranty obligations by the specification of a particular product or procedure in the Contract Documents. Warranties in the Contract Documents shall survive completion, acceptance, and final payment.

3.06 REQUIRED WAGES

- A. Contractor will pay required wages. The Contractor shall pay (and shall ensure that all Subcontractors of any tier pay) all prevailing wages and other wages (such as Davis-Bacon Act wages) applicable to the Project. See Specification Section 00 73 46.
- B. The Contractor shall defend (at Contractor's sole cost, with legal counsel approved by Port), indemnify, and hold the Port harmless from all liabilities, obligations, claims, demands, damages, disbursements, lawsuits, losses, fines, penalties, costs, and expenses, whether direct or indirect, and including, but not limited to, attorneys' fees and consultants' fees and other costs and expenses of litigation, from any violation or alleged violation by the Contractor or any Subcontractor of any tier of RCW 39.12 ("Prevailing Wages on Public Works") or Chapter 51 RCW ("Industrial Insurance").

3.07 STATE AND LOCAL TAXES

- A. Contractor will pay taxes on consumables. The Contractor will pay the retail sales tax on all consumables used during performance of the Work and on all items that are not incorporated into the final Work; this tax shall be included in the Contract Sum.

- B. Port will pay taxes on the Contract Sum. The Port will pay state and local retail sales tax on the Contract Sum with each progress payment, and on final payment, for transmittal by the Contractor to the Washington State Department of Revenue or to the applicable local taxing authority. Rule 170: WAC 458-20-170.
- C. Direct all tax questions to the Department of Revenue. The Contractor should direct all questions concerning taxes on any portion of the Work to the State of Washington Department of Revenue or to the local taxing authority.
- D. State Sales Tax - Rule 171: WAC 458-20-171. For work performed related to building, repairing, or improving streets, roads, etc., which are owned by a municipal corporation, or political subdivision of the state, or by the United States, and which are used, primarily, for foot or vehicular traffic, the Contractor shall include Washington State Retail Sales Taxes in the various schedule prices, or other contract amounts, including those that the Contractor pays on the purchase of materials, equipment, or supplies used or consumed in doing the Work.
 - 1. The bid form will indicate which bid items are subject to Rule 171. Any such identification by the Port is not binding upon the Department of Revenue.

3.08 PERMITS, LICENSES, FEES, AND ROYALTIES

- A. Contractor to provide and pay for permits unless otherwise specified. Unless otherwise specified, the Contractor shall procure and pay for all permits, licenses, and governmental inspection fees necessary or incidental to the performance of the Work. All costs related to these permits, licenses, and inspections shall be included in the Contract Sum. Any action taken by the Port to assist the Contractor in obtaining permits or licenses shall not relieve the Contractor of its sole responsibility to obtain and pay for permits, licenses, and inspections as part of the Contract Sum.
- B. Contractor's obligations when permit must be in Port's name. When applicable law or agency requires a permit to be issued to a public agency, the Port will support the Contractor's request for the permit and accept the permit in the Port's name, if:
 - 1. The Contractor takes all necessary steps required for the permit to be issued;
 - 2. The permit applies to Work performed in connection with the Project; and
 - 3. The Contractor agrees in writing to abide by all requirements of the permit and to defend and hold harmless the Port from any liability in connection with the permit.
- C. Contractor to pay royalties. The Contractor shall pay all royalties and license fees required for the Work unless otherwise specified in the Contract Documents.

3.09 SAFETY

- A. Contractor solely responsible for safety. The Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work and the performance of the Contract.
- B. Port not responsible for safety. The Port may identify safety concerns to the Contractor; however, no action or inaction of the Port or any third party relating to safety will: (1) relieve the Contractor of its sole and complete responsibility for safety and sole liability for any consequences, (2) impose any obligation on the Port or a third party to inspect or review the Contractor's safety program or precautions, (3) impose any continuing obligation on the Port or a third party to ensure the Contractor performs the Work safely, or (4) affect the Contractor's responsibility for the protection of property, workers, and the general public.

- C. Contractor to maintain a safe Work site. The Project site may be occupied during performance of the Work. The safety of these site occupants is of paramount importance to the Port. The Contractor shall maintain the Work site and perform the Work in a safe manner and in accordance with the Washington Industrial Safety and Health Act (WISHA) and all other applicable safety laws, rules, and regulations. This requirement shall apply continuously and not be limited to working hours.
- D. Contractor to protect Work site and adjacent property until Final Completion. The Contractor shall continuously protect the Work and adjacent property from damage. At all times until Final Completion, the Contractor shall be responsible for, and protect from damage, weather, deterioration, theft, and vandalism, the Work and all materials, equipment, tools, and other items incorporated or to be incorporated in the Work, and shall repair any damage, injury, or loss.

3.10 CORRECTION OF WORK

- A. Contractor to correct defective Work. The Contractor shall, at no cost to the Port, promptly correct Work that is defective or that otherwise fails to conform to the requirements of the Contract Documents. Such Work shall be corrected, whether before or after Substantial Completion, and even if it was previously inspected or observed by the Port.
- B. One-year correction period. The Contractor shall correct all defects in the Work appearing within one (1) year of Substantial Completion or within any longer period prescribed by law or by the Contract Documents. The Contractor shall initiate remedial action within fourteen (14) days of receipt of notice from the Port and shall complete remedial work within a reasonable time. Work corrected by the Contractor shall be subject to the provisions of this Section 3.10 for an additional one-year period following the Port's acceptance of the corrected Work.
- C. Contractor responsible for defects and failures to correct. The Contractor shall be responsible for any expenses incurred by the Port resulting from defects in the Work. If the Contractor refuses or neglects to correct the defects, or does not timely accomplish corrections, the Port may correct the Work and charge the Contractor the cost of the corrections. If damage or loss of service may result from a delay in correction, the corrections may be made by the Port and reimbursed by the Contractor.
- D. Port may accept defective work. The Port may, at its sole option, elect to retain defective or nonconforming Work. In such a case, the Port shall reduce the Contract Sum by a reasonable amount to account for the defect or non-conformance.
- E. No period of limitation established. Nothing contained in this Section 3.10 establishes a period of limitation with respect to any obligations under the Contract Documents or law. The establishment of the one (1) year correction period relates only to the specific obligation of the Contractor to correct defective or non-conforming Work.

3.11 UNCOVERING OF WORK

- A. Contractor to uncover work covered prior to inspection. If any portion of the Work is covered prior to inspection and approval, the Contractor shall, at its expense, uncover or remove the Work for inspection by the Port or others, and replace the Work to the standard required by the Contract Documents.

- B. Contractor to uncover work at Port's request. After initial inspection and observation, the Port may order a reexamination of Work, and the Work must be uncovered by the Contractor. If the uncovered Work complies with the Contract Documents, the Port shall pay the cost of reexamination and replacement. If the Work is found not to comply with the Contract Documents, the Contractor shall pay the cost of replacement, unless the Contractor demonstrates that it did not cause the defect in the Work.

3.12 RELOCATION OF UTILITIES

- A. Contractor should assume underground utilities are in approximate locations. The Contractor should assume that the locations of any underground or hidden utilities, underground tanks, and plumbing or electrical runs indicated in surveys or the Contract Documents are shown in approximate locations. The accuracy of this information is not guaranteed by the Port and shall be verified by the Contractor. The Contractor shall comply with RCW 19.122.030 and utilize a utility locator service to locate utilities on Port property. The Contractor shall bear the risk of loss if any of its Work directly or indirectly damages or interrupts any utility service or causes or contributes to damages of any nature.
- B. Utility relocation or removal. Where relocation or removal of utilities is necessary or required, it shall be performed at the Contractor's sole expense, unless the Contract Documents specify otherwise. If a utility owner is identified as being responsible for relocating or removing utilities, the work will be accomplished at the utility owner's convenience, either during, or in advance of, construction. Unless otherwise specified, it shall be the Contractor's sole responsibility to coordinate, schedule, and pay for work performed by a utility owner.
- C. Contractor to notify Port of unknown utilities. If the Contractor discovers the presence of any unknown utilities, it shall immediately notify the Engineer in writing.

3.13 LABOR

- A. Contractor responsible for labor peace. The Contractor is responsible for labor peace relating to the Work and shall cooperate in maintaining Project-wide labor harmony. The Contractor shall use its best efforts as an experienced contractor to adopt and implement policies and practices designed to avoid work stoppages, slowdowns, disputes, or strikes.
- B. Contractor to minimize impact of labor disputes. The Contractor will take all necessary steps to prevent labor disputes from disrupting or otherwise interfering with access to Port property. If a labor dispute disrupts the progress of the Work or interferes with access, the Contractor shall promptly and expeditiously take all necessary action to eliminate or minimize the disruption or interference.

3.14 INDEMNIFICATION

- A. Duty to defend, indemnify, and hold harmless. To the fullest extent permitted by law and subject to this Section 3.14, the Contractor shall defend (at the Contractor's sole cost, with legal counsel approved by Port), indemnify, and hold harmless the Port and the Northwest Seaport Alliance, including their respective Commissions, officers, managers, and employees, the Engineer, any consultants, and the agents and employees, successors and assigns of any of them (the "Indemnified Parties") from and against claims, damages, lawsuits, losses (including loss of use), disbursements, liabilities, obligations, fines, penalties, costs, and expenses, whether direct and indirect or consequential, including but not limited to, consultants' fees, and attorneys' fees incurred on such claims and in proving the right to indemnification ("Claims"), arising out of, or resulting from, the acts or omissions of the Contractor, a Subcontractor of any tier, their agents, and anyone directly or indirectly employed by any of them or anyone for whose acts they may be liable (individually and collectively, the "Indemnitor").

- B. Duty to defend, indemnify, and hold harmless for sole negligence. The Contractor will fully defend, indemnify, and hold harmless the Indemnified Parties for the sole negligence or willful misconduct of the Indemnitor.
- C. Duty to defend, indemnify, and hold harmless for concurrent negligence. Where Claims arise from the concurrent negligence of (1) the Port; and (2) the Indemnitor, the Contractor's obligations to indemnify and defend the Indemnified Parties under this Section 3.14 shall be effective only to the extent of the Indemnitor's negligence.
- D. Duty to indemnify not limited by workers' compensation or similar employee benefit acts. In claims against any of the Indemnified Parties by an employee of the Contractor, a Subcontractor of any tier, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under this Section 3.14 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable under workers' compensation acts, disability benefit acts, or other employee benefit acts. After mutual negotiation of the parties, the Contractor waives immunity as to the Indemnified Parties under Title 51 RCW, "Industrial Insurance."
- E. Intellectual property indemnification. The Contractor will be liable for and shall defend (at the Contractor's sole cost, with legal counsel approved by Port), indemnify, and hold the Indemnified Parties harmless for Claims for infringement by the Contractor of copyrights or patent rights arising out of, or relating to, the Project.
- F. Labor peace indemnification. If the Contractor fails to satisfy its labor peace obligations under the Contract, the Contractor will be liable for and shall defend (at the Contractor's sole cost, with legal counsel approved by Port), indemnify, and hold harmless the Indemnified Parties for Claims brought against the Port by third parties (including but not limited to lessees, tenants, contractors, customers, licensees, and invitees of the Port) for injunctive relief or monetary loss.
- G. Cyber risk indemnification. Contractor shall defend, indemnify, and hold harmless the Indemnified Parties from and against any liability, expense, fines, penalties, cost, demand, or other obligation, resulting from or out of any cyber-related risk that includes theft, loss or misuse of data, release of private information as result of a network breach, penetration, compromise, or loss of IT systems control.
- H. Joinder. The Contractor agrees to being added by the Port as a party to any arbitration or litigation with third parties in which the Port alleges indemnification or seeks contribution from the Indemnitor. The Contractor shall cause each of its Subcontractors of any tier to similarly stipulate in their subcontracts; in the event any does not, the Contractor shall be liable in place of such Subcontractor(s) of any tier.
- I. Other. To the extent that any portion of this Section 3.14 is stricken by a court or arbitrator for any reason, all remaining provisions shall retain their vitality and effect. The obligations of the Contractor under this Section 3.14 shall not be construed to negate, abridge, or otherwise reduce any other right or obligations of indemnity which would otherwise exist. To the extent the wording of this Section 3.14 would reduce or eliminate an available insurance coverage, it shall be considered modified to the extent necessary so that the insurance coverage is not affected. This Section 3.14 shall survive completion, acceptance, final payment, and termination of the Contract.

3.15 WAIVER OF CONSEQUENTIAL DAMAGES

- A. Mutual waiver of consequential damages. The Contractor and Port waive claims against each other for consequential damages arising out of, or relating to, this Contract. This mutual waiver includes, but is not limited to: (1) damages incurred by the Port for rental expenses, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons, and (2) damages incurred by the Contractor for principal and home office overhead and expenses including, but not limited to, the compensation of personnel stationed there, for losses of financing, business, and reputation, for losses on other projects, for loss of profit, and for interest or financing costs. This mutual waiver includes, but is not limited to, all consequential damages due to either party's termination.
- B. Limitation. Nothing contained in this Section 3.15; however, shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents, to preclude damages specified in the Agreement, or to affect the Contractor's obligation to indemnify the Port for direct, indirect, or consequential damages alleged by a third party.

ARTICLE 4 - SUBCONTRACTORS AND SUPPLIERS

4.01 RESPONSIBILITY FOR ACTIONS OF SUBCONTRACTORS AND SUPPLIERS.

- A. Contractor responsible for Subcontractors. The Contractor is fully responsible to the Port for the acts and omissions of its Subcontractors of any tier and all persons either directly or indirectly employed by the Contractor or its Subcontractors.

4.02 AWARD OF CONTRACTS TO SUBCONTRACTORS AND SUPPLIERS

- A. Contractor to provide proposed Subcontractor information. The Contractor, within ten (10) days after the Port's notice of award of the Contract, shall provide the Engineer with the names of the persons or entities proposed to perform each of the principal portions of the Work (i.e., either a Subcontractor listed in a bid or proposal or a Subcontractor performing Work valued at least ten percent (10%) of the Contract Sum) and the proprietary names, and the suppliers of, the principal items or systems of materials and equipment proposed for the Work. No progress payment will become due until after this information has been furnished.
- B. Port to respond promptly with objections. The Port may respond promptly to the Contractor in writing stating: (1) whether the Port has reasonable objection to any proposed person or entity, or (2) whether the Port requires additional time for review. If the Port makes a reasonable objection, the Contractor shall replace the Subcontractor with no increase to the Contract Sum or Contract Time. Such a replacement shall not relieve the Contractor of its responsibility for the performance of the Work and compliance with all of the requirements of the Contract within the Contract Sum and Contract Time.
- C. Reasonable objection defined. "Reasonable objection" as used in this Section 4.02 includes, but is not limited to: (1) a proposed Subcontractor of any tier different from the entity listed with the bid, (2) lack of "responsibility" of the proposed Subcontractor, as defined by Washington law and the Bidding Documents, or lack of qualification or responsibility of the proposed Subcontractor based on the Contract or Bidding Documents, or (3) failure of the Subcontractor to perform satisfactorily in the Port's opinion (such as causing a material delay or submitting a claim that the Port considers inappropriate) on one or more projects for the Port within five (5) years of the bid date.
- D. No substitution allowed without permission. The Contractor shall not substitute a Subcontractor, person, or organization without the Engineer's written consent.

4.03 SUBCONTRACTOR AND SUPPLIER RELATIONS

- A. Contractor to schedule, supervise, and coordinate Subcontractors. The Contractor shall schedule, supervise, and coordinate the operations of all Subcontractors of any tier, including suppliers. The Contractor shall ensure that appropriate Subcontractors coordinate the Work of lower-tier Subcontractors.
- B. Subcontractors to be bound to Contract Documents. By appropriate agreement, the Contractor shall require each Subcontractor and supplier to be bound to the terms of the Contract Documents and to assume toward the Contractor, to the extent of their Work, all of the obligations that the Contractor assumes toward the Port under the Contract Documents. Each subcontract shall preserve and protect the rights of the Port and shall allow to the Subcontractor, unless specifically provided in the subcontract, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Port. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with lower-tier Subcontractors.
- C. Contractor to correct deficiencies in Subcontractor performance. When a portion of the Work subcontracted by the Contractor is not being prosecuted in accordance with the Contract Documents, or if such subcontracted Work is otherwise being performed in an unsatisfactory manner in the Port's opinion, the Contractor shall, on its own initiative or upon the written request of the Port, take immediate steps to correct the deficiency or remove the non-performing party from the Project. The Contractor shall replace inadequately performing Subcontractors upon request of the Port at no change in the Contract Sum or Contract Time.
- D. Contractor to provide subcontracts. Upon request, the Contractor will provide the Port copies of written agreements between the Contractor and any Subcontractor.

ARTICLE 5 - WORKFORCE AND NON-DISCRIMINATION REQUIREMENTS

5.01 COMPLIANCE WITH NON-DISCRIMINATION LAWS

- A. Contractor to comply with non-discrimination laws. The Contractor shall fully comply with all applicable laws, regulations, and ordinances pertaining to non-discrimination.
- B. Nondiscrimination Provision
 - 1. Nondiscrimination Requirement. During the term of this Contract, Contractor, including any subcontractor, shall not discriminate on the bases enumerated at RCW 49.60.530(3). In addition, Contractor, including any subcontractor, shall give written notice of this nondiscrimination requirement to any labor organizations with which Contractor, or subcontractor, has a collective bargaining or other agreement.
 - 2. Obligation to Cooperate. Contractor, including any subcontractor, shall cooperate and comply with any Washington state agency investigation regarding any allegation that Contractor, including any subcontractor, has engaged in discrimination prohibited by this Contract pursuant to RCW 49.60.530(3).

3. Default. Notwithstanding any provision to the contrary, POT may suspend Contractor, including any subcontractor, upon notice of a failure to participate and cooperate with any state agency investigation into alleged discrimination prohibited by this Contract, pursuant to RCW 49.60.530(3). Any such suspension will remain in place until POT receives notification that Contractor, including any subcontractor, is cooperating with the investigating state agency. In the event Contractor, or subcontractor, is determined to have engaged in discrimination identified at RCW 49.60.530(3), POT may terminate this Contract in whole or in part, and Contractor, subcontractor, or both, may be referred for debarment as provided in RCW 39.26.200. Contractor or subcontractor may be given a reasonable time in which to cure this noncompliance, including implementing conditions consistent with any court-ordered injunctive relief or settlement agreement.
4. Remedies for Breach. Notwithstanding any provision to the contrary, in the event of Contract termination or suspension for engaging in discrimination, Contractor, subcontractor, or both, shall be liable for contract damages as authorized by law including, but not limited to, any cost difference between the original contract and the replacement or cover contract and all administrative costs directly related to the replacement contract, which damages are distinct from any penalties imposed under Chapter 49.60, RCW. POT shall have the right to deduct from any monies due to Contractor or subcontractor, or that thereafter become due, an amount for damages Contractor or subcontractor will owe POT for default under this provision.

5.02 MWBE, VETERAN-OWNED, AND SMALL BUSINESS ENTERPRISE PARTICIPATION.

- A. In accordance with the legislative findings and policies set forth in RCW 39.19, the Port encourages participation in all of its contracts by MWBE firms certified by the Office of Minority and Women's Business Enterprises (OMWBE). Participation may be either on a direct basis in response to this invitation or as a subcontractor to a Bidder. However, unless required by federal statutes, regulations, grants, or contract terms referenced in the Contract Documents, no preference will be included in the evaluation of Bids, no minimum level of MWBE participation shall be required as a condition for receiving an award, and Bids will not be rejected or considered non-responsive on that basis. Any affirmative action requirements set forth in federal regulations or statutes included or referenced in the Contract Documents will apply.

The Port encourages participation in all of its contracts by Veteran-owned businesses (defined in RCW 43.60.010) and located at <http://www.dva.wa.gov/program/certified-veteran--and-servicemember-owned-businesses> and Small, Mini, and Micro businesses (defined in RCW 39.26.010)

5.03 APPRENTICESHIP PARTICIPATION

- A. In accordance with RCW 39.04.320, fifteen (15) percent Apprenticeship Participation is required for all projects estimated to cost one million (\$1,000,000) dollars or more.
- B. Apprentice participation, under this contract, may be counted towards the required percentage (%) only if the apprentices are from an apprenticeship program registered and approved by the Washington State Apprenticeship and Training Council (RCW 49.04 and WAC 296-05).
- C. Bidders may contact the Department of Labor and Industries, Specialty Compliance Services Division, Apprenticeship Section, P.O. Box 44530, Olympia, WA 98504-4530 by phone at (360) 902-5320, or e-mail at Apprentice@lni.wa.gov, to obtain information on available apprenticeship programs.

- D. For each project that has apprentice requirements, the contractor shall submit a "Statement of Apprentice and Journeyman Participation" on forms provided by the Port of Tacoma, with every request for project payment. The Contractor shall submit consolidated and cumulative data collected by the Contractor and collected from all subcontractors by the Contractor. The data to be collected and submitted includes the following:
1. Contractor name and address
 2. Contract number
 3. Project name
 4. Contract value
 5. Reporting period "Beginning Date" through "End Date"
 6. Name and registration number of each apprentice by contractor
 7. Total number of apprentices and labor hours worked by them, categorized by trade or craft.
 8. Total number of journeymen and labor hours worked by them, categorized by trade or craft
 9. Cumulative combined total of apprentice and journeymen labor hours
 10. Total percentage of apprentice hours worked
- E. No changes to the required percentage (%) of apprentice participation shall be allowed without written approval of the Port. In any request for the change, the Contractor shall clearly demonstrate a good faith effort to comply with the requirements for apprentice participation.
- F. Labor hours used in the 15% labor hour calculation will include all employees working on the project who are subject to prevailing wage laws. The definition of Labor Hours is further clarified to include working supervisor and foreman hours if they are covered under prevailing wage laws based on the time spent performing laborious activities. Simply adding supervisor or foreman to the employee's title does not exempt their hours from the calculation.
- G. During the life of the project, Apprentice Utilization is actively monitored through LNIs Prevailing Wage Intents and Affidavits (PWIA) system using the certified payroll calculated percentage. In addition, the affidavit calculated percentage shown in PWIA must be at least 15.0% to be compliant. All affidavits must be filed before determining if the Apprentice Utilization Requirement was met. Failure to achieve at least 15.0% apprentice Utilization as shown in PWIA for certified payrolls and affidavits will cause a penalty of \$500.00

ARTICLE 6 - CONTRACT TIME AND COMPLETION

6.01 CONTRACT TIME

- A. Contract Time is measured from Contract execution. Unless otherwise provided in the Agreement, the Contract Time is the period of time, including authorized adjustments, specified in the Contract Documents from the date the Contract is executed to the date Substantial Completion of the Work is achieved.

- B. Commencement of the Work. The Contractor shall begin Work in accordance with the notice of award and the notice to proceed and shall complete all Work within the Contract Time. When the Contractor's signed Agreement, required insurance certificate with endorsements, bonds, and other submittals required by the notice of award have been accepted by the Port, the Port will execute the Contract and, following receipt of other required pre-work submittals, will issue a notice to proceed to allow the Contractor to mobilize and commence physical Work at the Project site, as further described in these contract documents. No Work at the Project site may commence until the Port issues a notice to proceed.
- C. Contractor shall achieve specified completion dates. The Contractor shall achieve Substantial Completion within the Contract Time and shall achieve Final Completion within the time period thereafter stated in the Contract Documents.
- D. Time is of the essence. Time limits stated in the Contract Documents, including any interim milestones, are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

6.02 PROGRESS AND COMPLETION

- A. Contractor to maintain schedule. The Contractor's sequence and method of operations, application of effort, and work force shall at all times be created and implemented to ensure the orderly, expeditious, and timely completion of the Work and performance of the Contract. The Contractor shall furnish sufficient forces and shall work such hours, including extra shifts, overtime operations, and weekend and holiday work as may be necessary to ensure completion of the Work within the Contract Time and the approved Baseline Project Schedule.
- B. Contractor to take necessary steps to meet schedule. If the Contractor fails substantially to perform in a timely manner in accordance with the Contract Documents and, through the fault of the Contractor or Subcontractor(s) of any tier, fails to meet the Baseline Project Schedule, the Contractor shall take such steps as may be necessary to immediately improve its progress by increasing the number of workers, shifts, overtime operations, or days of work, or by other means and methods, all without additional cost to the Port. If the Contractor believes that any action or inaction of the Port constitutes acceleration, the Contractor shall immediately notify the Port in writing and shall not accelerate the Work until the Port either directs the acceleration in writing or denies the constructive acceleration.
- C. Liquidated damages not exclusive. Any provisions in the Contract Documents for liquidated damages shall not preclude other damages due to breaches of Contract of the Contractor.

6.03 SUBSTANTIAL COMPLETION

- A. Substantial Completion defined. Substantial Completion is the stage in the progress of the Work, or portion or phase thereof, when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Port can fully occupy or utilize the Work, or the designated portion thereof, for its intended use, all requirements in the Contract Documents for Substantial Completion have been achieved, and all required documentation has been properly submitted to the Port in accordance with the Contract Documents. All Work, other than incidental corrective or punch list Work and final cleaning, must be completed. The fact that the Port may occupy the Work or a designated portion thereof does not indicate that Substantial Completion has occurred or that the Work is acceptable in whole or in part.
- B. Work not Substantially Complete unless Final Completion attainable. The Work is not Substantially Complete unless the Port reasonably judges that the Work can achieve Final Completion within the period of time specified in the Contract Documents.

- C. Notice of Substantial Completion. When the Work or designated portion has achieved Substantial Completion, the Port will provide a notice to establish the date of Substantial Completion. The notice shall establish responsibilities of the Port and Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall finish all remaining Work. If the notice of Substantial Completion does not so state, all responsibility for the foregoing items shall remain with the Contractor until Final Completion.

6.04 COMPLETION OF PUNCH LIST

- A. Contractor shall complete punch list items prior to Final Completion. The Contractor shall cause punch list items to be completed prior to Final Completion. If, after Substantial Completion, the Contractor does not expeditiously proceed to correct punch list items or if the Port considers that the punch list items, are unlikely to be completed prior to the date established for Final Completion (or such other period of time as is specified in the Contract Documents), the Port may, upon seven (7) days' written notice to the Contractor, take over and perform some or all of the punch list items. The Port may also take over and complete any portion of the Work at any time following Substantial Completion and deduct the actual cost of performing the Work (including direct and indirect costs) from the Contract Sum. The Port's rights under this Section 6.04 are not obligations and shall not relieve the Contractor of its responsibilities under any other provisions of the Contract Documents.

6.05 FINAL COMPLETION

- A. Final Completion. Upon receipt of written notice from the Contractor that all punch list items and other Contract requirements are completed, the Contractor will notify the Port, and the Port will perform a final inspection. If the Port determines that some or all of the punch list items have not been addressed, the Contractor shall be responsible to the Port for all costs, including re-inspection fees, for any subsequent reviews to determine completion of the punch list. When the Port determines that all punch list items have been satisfactorily addressed, that the Work is acceptable under the Contract Documents, and that the Work has fully been performed, the Port will promptly notify the Contractor of Final Completion.
- B. Contractor responsible for costs if Final Completion is not timely achieved. In addition to any liquidated damages, the Contractor is liable for, and the Port may deduct from any amounts due the Contractor, all costs incurred by the Port for services performed after the contractual date of Final Completion, whether or not those services would have been performed prior to that date had Final Completion been timely achieved.
- C. Final Completion submittals. The Port is not obligated to accept the Project as complete until the Contractor has submitted all required submittals to the Port.
- D. Contractor responsible for the Work until Final Completion. The Contractor shall assume the sole risk of loss and responsibility for all Work under the Contract, and all materials to be incorporated in the Work, whether in storage or at the Project site, until Final Completion. Damage from any cause to either permanent or temporary Work, utilities, materials, equipment, existing structures, the site, or other property owned by the Port or others, shall be repaired by the Contractor to the reasonable satisfaction of the Port at no change in the Contract Sum.

6.06 FINAL ACCEPTANCE

- A. Final Acceptance. Final Acceptance is the formal action of the Port accepting the Project as complete. Public notification of Final Acceptance will be posted on the Port's external website (<https://www.portoftacoma.com/business/contracting/final-acceptance>).

- B. Final Acceptance not an acceptance of defective Work. Final Acceptance shall not constitute acceptance by the Port of unauthorized or defective Work, and the Port shall not be prevented from requiring the Contractor to remove, replace, repair, or dispose of unauthorized or defective Work or recovering damages due to the same.
- C. Completion of Work under RCW 60.28. Pursuant to RCW 60.28, "Lien for Labor, Materials, Taxes on Public Works," completion of the Contract Work shall occur upon Final Acceptance.

6.07 PORT'S RIGHT TO USE THE PREMISES

- A. Port has right to use and occupy Work. The Port reserves the right to occupy or use any part of the Work before or after Substantial Completion of some or all of the Work without relieving the Contractor of any of its obligations under the Contract. Such occupancy or use shall not constitute acceptance by the Port of any of the Work, and shall not cause any insurance to be canceled or lapse.
- B. No compensation due if Port elects to use and occupy Work. No additional compensation shall be due to the Contractor as a result of the Port's use or occupancy of the Work or a designated portion.

ARTICLE 7 - PAYMENT

7.01 ALL PAYMENTS SUBJECT TO APPLICABLE LAWS AND SCHEDULE OF VALUES

- A. Payment of the Contract Sum. The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Port to the Contractor for performance of the Work under the Contract Documents. Payments made to the Contractor are subject to all laws applicable to the Port and the Contractor. Payment of the Contract Sum constitutes full compensation to the Contractor for performance of the Work, including all risk, loss, damages, or expense of whatever character arising out of the nature or prosecution of the Work. The Port is not obligated to pay for extra work or materials furnished without prior written approval of the Port.
- B. Schedule of Values. All payments will be based upon an approved Schedule of Values. Prior to submitting its first Application for Payment, the Contractor shall submit a Schedule of Values to the Port allocating the entire Contract Sum to the various portions of the Work. The Schedule of Values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Port may require. This schedule, unless objected to by the Port, shall be used as a basis for reviewing the Contractor's applications for payment.

7.02 APPLICATIONS FOR PAYMENT

- A. Applications for Payment. Progress payments will be made monthly for Work duly certified, approved by the Engineer, and performed (based on the Schedule of Values and actual quantities of Work performed) during the calendar month preceding the Application for Payment. These amounts are paid in trust to the Contractor for distribution to Subcontractors to the extent, and in accordance with, the approved Application for Payment.

7.03 PROGRESS PAYMENTS

- A. Progress payments. Following receipt of a complete Application for Payment, the Engineer will either authorize payment or indicate in writing to the Contractor the specific reasons why the payment request is being denied, in whole or in part, and the remedial action the Contractor must take to receive the withheld amount. After a complete Application for Payment has been received and approved by the Port, payment will be made within thirty (30) days. Any payments made by, or through, or following receipt of, payment from third parties will be made in accordance with the third party's policies and procedures.
- B. Port may withhold payment. The Port may withhold payment in whole or in part as provided in the Contract Documents or to the extent reasonably necessary to protect the Port from loss or potential loss for which the Contractor is responsible, including loss resulting from the Contractor's acts and omissions.

7.04 PAYMENT BY CONTRACTOR TO SUBCONTRACTORS

- A. Payment to Subcontractors. With each Application for Payment, the Contractor shall provide a list of Subcontractors to be paid by the Contractor. No payment request shall include amounts the Contractor does not intend to pay to a Subcontractor because of a dispute or other reason. If, however, after submitting an Application for Payment, but before paying a Subcontractor, the Contractor discovers that part or all of a payment otherwise due to the Subcontractor is subject to withholding from the Subcontractor under the subcontract (such as for unsatisfactory performance or non-payment of lower-tier Subcontractors), the Contractor may withhold the amount as allowed under the subcontract, but it shall give the Subcontractor and the Port written notice of the remedial actions that must be taken and pay the Subcontractor within eight (8) working days after the Subcontractor satisfactorily completes the remedial action identified in the notice.
- B. Payment certification to be provided upon request. The Contractor shall provide, with each Application for Payment, a certification signed by Contractor attesting that all payments by the Contractor to Subcontractors from the last Application for Payment were made within ten (10) days of the Contractor's receipt of payment. The certification will also attest that the Contractor will make payment to Subcontractors for the current Application for Payment within ten (10) days of receipt of payment from the Port.

7.05 FINAL PAYMENT

- A. Final payment. Final applications for payment are due within seven (7) days following Final Completion. Final payment of the unpaid balance of the Contract Sum, except retainage, will be made following Final Completion and within thirty (30) days of the Contractor's submission of an approved final Application for Payment.
- B. Releases required for final payment. The final payment shall not become due until the Contractor delivers to the Port a complete release of all liens arising out of the Contract, as well as an affidavit stating that, to the best of Contractor's knowledge, its release includes all labor and materials for which a lien could be filed. If a Subcontractor of any tier refuses to furnish a release or waiver required by the Port, the Port may (a) retain in the fund, account, or escrow funds in such amount as to defray the cost of foreclosing the liens of such claims and to pay attorneys' fees, the total of which shall be no less than 150% of the claimed amount, or (b) accept a bond from the Contractor, satisfactory to the Port, to indemnify the Port against the lien. If any such lien remains unsatisfied after all payments from the retainage are made, the Contractor shall refund to the Port all moneys that the Port may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

- C. Contractor to hold Port harmless from liens. The Contractor shall defend (at the Contractor's sole cost, with legal counsel approved by Port), indemnify, and hold harmless the Port from any liens, claims, demands, lawsuits, losses, damages, disbursements, liabilities, obligations, fines, penalties, costs, and expenses, whether direct or indirect, including but not limited to, attorneys' fees and consultants' fees and other costs and expenses, except to the extent a lien has been filed because of the failure of the Port to make a contractually required payment.

7.06 RETAINAGE

- A. Retainage to be withheld. In accordance with RCW 60.28, a sum equal to five percent (5%) of each approved Application for Payment shall be retained. Prior to submitting its first Application for Payment, the Contractor shall exercise one of the options listed below:
 - 1. Retained percentages will be retained by the Port in a fund; or
 - 2. Deposited by the Port in an interest-bearing account or escrow account in a bank, mutual savings bank, or savings and loan association designated by the Contractor, not subject to withdrawal until after the final acceptance of said improvement or work as completed, or until agreed to by both parties; provided that interest on such account shall be paid to the Contractor. Contractor to complete and submit Port provided Retainage Escrow Agreement (Section 00 61 23.13); or
 - 3. If the Contractor provides a bond in place of retainage, it shall be in an amount equal to 5% of the Contract Sum plus Change Orders. The retainage bond shall be based on the form furnished in Section 00 61 23 or otherwise acceptable to the Port and duly completed and signed by a licensed surety or sureties registered with the Washington State Insurance Commissioner and on the currently authorized insurance list published by the Washington State Insurance Commissioner. The surety or sureties must be rated at least "A-, FSC(6)" or higher by A.M. Best Rating Guide and be authorized by the Federal Department of the Treasury. Attorneys-in-fact who sign the retainage bond must file with each bond a certified and effective Power of Attorney statement.
- B. Contractor may withhold retainage from Subcontractors. The Contractor or a Subcontractor may withhold not more than five percent (5%) retainage from the monies earned by any Subcontractor or lower-tier Subcontractor, provided that the Contractor pays interest to the Subcontractor at the same interest rate it receives from its reserved funds. If requested by the Port, the Contractor shall specify the amount of retainage and interest due a Subcontractor.
- C. Release of retainage. Retainage will be withheld and applied by the Port in a manner required by RCW 60.28 and released in accordance with the Contract Documents and statutory requirements. Release of the retainage will be processed in the ordinary course of business within sixty (60) days following Final Acceptance of the Work by the Port provided that no notice of lien has been given as provided in RCW 60.28, that no claims have been brought to the attention of the Port, that the Port has no claims under this Contract, and that release of retention has been duly authorized by the State. The following items must also be obtained prior to release of retainage: pursuant to RCW 60.28, a certificate from the Department of Revenue; pursuant to RCW 50.24, a certificate from the Department of Employment Security; and appropriate information from the Department of Labor and Industries including approved affidavits of wages paid for the Contractor and each subcontractor.

7.07 DISPUTED AMOUNTS

- A. Disputed amounts. If the Contractor believes it is entitled to payment for Work performed during the prior calendar month in addition to the agreed-upon amount, the Contractor may submit to the Port, along with the approved Application for Payment, a separate written payment request specifying the exact additional amount claimed to be due, the category in the Schedule of Values to which the payment would apply, the specific Work for which additional payment is sought, and an explanation of why the Contractor believes additional payment is due.

7.08 EFFECT OF PAYMENT

- A. Payment does not relieve Contractor of obligations. Payment to the Contractor of progress payments or final payment does not relieve the Contractor from its responsibility for the Work or its responsibility to repair, replace, or otherwise make good defective Work, materials, or equipment. Likewise, the making of a payment does not constitute a waiver of the Port's right to reject defective or non-conforming Work, materials, or equipment (even though they are covered by the payment), nor is it a waiver of any other rights of the Port.
- B. Acceptance of final payment waives claims. Acceptance of final payment by the Contractor, a Subcontractor of any tier, or a supplier shall constitute a waiver of claims except those previously made in writing and identified as unsettled in Contractor's final Application for Payment.
- C. Execution of Change Order waives claims. The execution of a Change Order shall constitute a waiver of claims by the Contractor arising out of the Work to be performed or deleted pursuant to the Change Order, except as specifically described in the Change Order.

7.09 LIENS

- A. Contractor to discharge liens. The Contractor shall promptly pay (and secure the discharge of any liens asserted by) all persons properly furnishing labor, equipment, materials, or other items in connection with the performance of the Work including, but not limited to, any Subcontractors of any tier.

ARTICLE 8 - CHANGES IN THE WORK

8.01 CHANGES IN THE WORK

- A. Changes in the Work authorized. Without invalidating the Contract and without notice to the Contractor's surety, the Port may authorize changes in the Work after execution of the Contract, including changes in the Contract Sum or Contract Time. Changes shall occur solely by Change Order, Unilateral Change Directive, or Minor Change in Work. All changes in the Work are effective immediately, and the Contractor shall proceed promptly to perform the change, unless otherwise provided in the Change Order or Directive.
- B. Changes in the Work Defined.
 - 1. A Change Order is a written instrument signed by the Port and Contractor stating their agreement to a change in the Work and the adjustment, if any, in the Contract Sum and/or Contract Time.
 - 2. A Unilateral Change Directive is a written instrument issued by the Port to transmit new or revised Drawings, issue additions or modifications to the Contract, furnish other direction and documents adjustment, if any, to the Contract Sum and/or Contract Time. A Unilateral Change Directive is signed only by the Port, without requiring the consent or signature of the Contractor.
 - 3. A Minor Change in the Work is a written order from the Port directing a change that does not involve an adjustment to the Contract Sum or the Contract Time.

- C. Request for Proposal: At any time, the Port may issue a Proposal Request directing the Contractor to propose a change to the Contract Sum and/or Contract Time, if any, based on a proposed change in the Work. The Contractor shall submit a responsive Change Order proposal as soon as possible, and no later than fourteen (14) days after receipt, in which the Contractor specifies in good faith the extent to which the Contract Sum and/or Contract Time would change. All cost components shall be limited to the manner described in Section 8.02(B). If the Contractor fails to timely respond to a Proposal Request, the Port may issue the change as a Unilateral Change Directive.
1. Fixed price method is default for Contractor Change Order proposal. When the Port has requested that the Contractor submit a Change Order proposal, the Port may specify the basis on which the Contract Sum will be adjusted by the Contractor. The Engineer's preference, unless otherwise indicated, is for changes in the Work to be priced using Lump Sums or Unit Prices or on a time and material (Force Account) basis if unit pricing or lump sums cannot be negotiated or determined. In all instances, however, proposed changes shall include a not-to-exceed price for the change and shall be itemized for evaluation purposes in accordance with Section 8.02(B), as requested by the Engineer.
 2. The Port may accept or reject the Contractor's Change Order proposal, request further documentation, or negotiate acceptable terms with the Contractor. If The Port and Contractor reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, such agreement shall be incorporated in a Change Order.
 3. The Change Order shall constitute full payment and final settlement of all claims for time and for direct, indirect, and consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity, related to any Work either covered or affected by the Change Order, or related to the events giving rise to the request for equitable adjustment. The Port may reject a proposal, in which case the Port may either not effectuate the change or issue a Unilateral Change Directive. The Port will not make payment to the Contractor for any work until that work has been incorporated into an executed Change Order.
- D. Unforeseen Conditions: If the Contractor encounters conditions at the site that are: (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or any soils reports made available by the Port to the Contractor, or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall immediately provide oral notice to the Engineer before conditions are disturbed, followed within 24 hours by an initial written notice. The Contractor shall submit a detailed proposal no later than seven (7) days following discovery of differing site conditions. The Engineer will promptly investigate these conditions and, if the Engineer determines that they differ materially and cause an increase or decrease in the Contractor's cost or time required for performance of any part of the Work, will establish a change in the Contract Sum or Contract Time, or both, consistent with the requirements of the Contract Documents. If the Contractor disputes the Engineer's determination, the Contractor may proceed as provided in the dispute resolution procedure (Article 11). No increase to the Contract Sum or the Contract Time shall be allowed if the Contractor does not comply with the contractual requirements or if the Contractor knew, or reasonably should have known, of the concealed conditions prior to executing the Contract.

- E. Proceed Immediately: Pending agreement on the terms of the Change Order or upon determination of a differing site condition as defined in 8.01(D), the Engineer may direct Contractor to proceed immediately with the change in the Work. Contractor shall not proceed with any change in the Work until it has obtained the Engineer's written approval and documentation of the following:
1. The scope of work
 2. An agreed upon maximum not-to-exceed amount
 3. The method of final cost determination
 4. Estimated time to complete the changed work
 5. As a change in the Work is performed, unless the parties have signed a written Change Order to establish the cost of the change, the Contractor shall maintain an itemized accounting of all costs related to the change based on the categories in Section 8.02(B) and provide such data to the Port upon request. This includes, without limitation, invoices, including freight and express bills, and other support for all material, equipment, Subcontractor, and other charges related to the change and, for material furnished from the Contractor's own inventory, a sworn affidavit certifying the actual cost of such material. Failure to provide data to the Port within seven (7) days of a request constitutes a waiver of any claim. The Port may furnish any material or equipment to the Contractor that it deems advisable, and the Contractor shall have no claim for any costs or fee on such material or equipment.
- F. Procedure for Unilateral Change Directive. Whether or not the Port has rejected a Contractor's proposal, the Port may issue a Unilateral Change Directive and the Contractor shall promptly proceed with the specified Work. If the Contractor disagrees with a Unilateral Change Directive, the Contractor shall advise the Port in writing through a Change Order proposal within seven (7) days of receipt. The Contractor's Change Order proposal shall reasonably specify the reasons for any disagreement and the adjustment it proposes. Without this timely Change Order proposal, the Contractor shall conclusively be deemed to have accepted the Port's proposal.
- G. Payment pending final determination of Force Account work. Pending final determination of the total cost of Force Account Work, and provided that the Work to be performed under Force Account is complete and any reservations of rights have been signed by the Port, the Contractor may request payment for amounts not in dispute in the next Application for Payment accompanied by documentation indicating the parties' agreement. Work done on a Force Account basis must be approved in writing on a daily basis by the Engineer or the Engineer's designee and invoices shall be submitted with an Application for Payment within sixty (60) days of performance of the Work.

8.02 CHANGES IN THE CONTRACT SUM

- A. Port to Decide How Changes are Measured. The Port may elect, in its sole discretion, how changes in the Work will be measured for payment. Change in the Work may be priced on a lump sum basis, through Unit Prices, as Force Account, or by another method documented in the executed Change Order, Unilateral Change Directive, or Minor Change in the Work.
- B. Determination of Cost of Change. The total cost of any change in the Work, including a claim under Article 11, shall not exceed the prevailing cost for the Work in the locality of the Project. In all circumstances, the change in the Work shall be limited to the reasonable, actual cost of the following components:

1. Direct labor costs: These are the actual labor costs determined by the number of additional craft hours at their normal hourly rate necessary to perform a change in the Work. The hourly cost of labor will be based upon the following:
 - a. Basic wages and fringe benefits: The hourly wage (without markup or labor burden) and fringe benefits paid by the Contractor as established by the Washington Department of Labor and Industries or contributed to labor trust funds as itemized fringe benefits, whichever is applicable, not to exceed that specified in the applicable "Intent to Pay Prevailing Wage," for the laborers, apprentices, journeymen, and foremen performing or directly supervising the change in the Work on site. These wages do not include the cost of Contractor's project manager or superintendent or above, and the premium portion of overtime wages is not included unless pre-approved in writing by the Port. Costs paid or incurred by the Contractor for vacations, per diem, subsistence, housing, travel, bonuses, stock options, or discretionary payments to employees are not separately reimbursable. The Contractor shall provide to the Port copies of payroll records, including certified payroll statements for itself and Subcontractors of any tier, upon the Port's request.
 - b. Workers' insurance: Direct contributions to the State of Washington as industrial insurance; medical aid; and supplemental pension by class and rates established by the Washington Department of Labor and Industries.
 - c. Federal insurance: Direct contributions required by the Federal Insurance Compensation Act (FICA); Federal Unemployment Tax Act (FUTA); and State Unemployment Compensation Act (SUCA).
2. Direct material costs: This is an itemization, including material invoices, of the quantity and actual cost of additional materials necessary to perform the change in the Work. The cost will be the net cost after all discounts or rebates, freight costs, express charges, or special delivery costs, when applicable. No lump sum costs will be allowed unless approved in advance by the Port.
3. Construction equipment usage costs: This is an itemization of the actual length of time that construction equipment necessary and appropriate for the Work is used solely on the changed Work times the applicable rental cost as established by the lower of the local prevailing rates published in www.equipmentwatch.com, as modified by the AGC/WSDOT agreement, or the actual rate paid to an unrelated third party. If more than one rate is applicable, the lowest available rate will be utilized. Rates and quantities of equipment rented that exceed the local fair market rental costs shall be subject to the Port's prior written approval. Total rental charges for equipment or tools shall not exceed 75% of the fair market purchase value of the equipment or the tool. Actual, reasonable mobilization costs are permitted if the equipment is brought to the site solely for the change in the Work. Mobilization and standby costs shall not be charged for equipment already present on the site.

The rates in effect at the time of the performance of the changed Work are the maximum rates allowable for equipment of modern design, and in good working condition, and include full compensation for furnishing all fuel, oil, lubrication, repairs, maintenance, and insurance. No gas surcharges are payable. Equipment not of modern design and/or not in good working condition will have lower rates. Hourly, weekly, and/or monthly rates, as appropriate, will be applied to yield the lowest total cost.

4. Subcontractor costs: These are payments the Contractor makes to Subcontractors for changed Work performed by Subcontractors. The Subcontractors' cost of changed Work shall be determined in the same manner as prescribed in this Section 8.02 and, among other things, shall not include consultant costs, attorneys' fees, or claim preparation expenses.
5. Service provider costs: These are payments the Contractor makes to service providers for changed Work performed by service providers. The service providers' cost of changed Work shall be determined in the same manner as prescribed in this Section 8.02.
6. Markup: This is the maximum total amount for overhead, profit, and other costs, including office, home office and site overhead (including purchasing, project manager, superintendent, project engineer, estimator, and their vehicles and clerical assistants), taxes (except for sales tax on the Contract Sum), warranty, safety costs, printing and copying, layout and control, quality control/assurance, small or hand tools (a tool that costs \$500 or less and is normally furnished by the performing contractor), preparation of as-built drawings, impact on unchanged Work, Change Order and/or claim preparation, and delay and impact costs of any kind (cumulative, ripple, or otherwise), added to the total cost to the Port of any Change Order work. No markup shall be due, however, for direct settlements of Subcontractor claims by the Port after Substantial Completion. The markup shall be limited in all cases to the following schedule:
 - a. Direct labor costs -- 20% markup on the direct cost of labor for the party (Contractor or Subcontractor) providing labor related to the change in the Work;
 - b. Direct material costs -- 20% markup on the direct cost of material for the party (Contractor or Subcontractor) providing material related to the change in the Work;
 - c. Construction equipment usage costs -- 10% markup on the direct cost of equipment for the party (Contractor or Subcontractor) providing equipment related to the change in the Work;
 - d. Contractor markup on Subcontractor costs -- 10% markup for the Contractor on the direct cost (excluding markup) of a change in the Work performed by Subcontractors (and for Subcontractors, for a change in the Work performed by lower-tier Subcontractors); and
 - e. Service provider costs -- 5% markup for the Contractor on the direct cost (excluding markup) of a change in the Work performed by service providers.

The total summed markup of the Contractor and all Subcontractors of any tier shall not exceed 30% of the direct costs of the change in the Work. If the markup would otherwise exceed 30%, the Contractor shall proportionately reduce the markup for the Contractor and all Subcontractors of any tier.
7. Cost of change in insurance or bond premium. This is defined as:
 - a. Contractor's liability insurance: The actual cost (expressed as a percentage submitted with the certificate of insurance provided under the Contract Documents and subject to audit) of the Contractor's liability insurance arising directly from the changed Work; and
 - b. Public works bond: The actual cost (expressed as a percentage submitted under the Contract Documents and subject to audit) of the Contractor's performance and payment bond arising directly from the changed Work.

Upon request, the Contractor shall provide the Port with supporting documentation from its insurer or surety of any associated cost incurred. The cost of the insurance or bond premium together shall not exceed 2.0% of the cost of the changed Work.

8. Unit Prices. If Unit Prices are specified in the Contract Documents or established by agreement of the parties for certain Work, the Port may apply them to the changed Work. Unit Prices shall include pre-agreed rates for material quantities and shall include reimbursement for all direct and indirect costs of the Work, including overhead, profit, bond, and insurance costs arising out of, or related to, the Unit Priced item. Quantities must be supported by field measurement statements signed by the Port, and the Port shall have access as necessary for quantity measurement. The Port shall not be responsible for not-to-exceed limit(s) without its prior written approval.

8.03 CHANGES IN THE CONTRACT TIME

- A. Extension of the Contract Time. If the Contractor is delayed at any time in the commencement or progress of the Work by events for which the Port is responsible, by unanticipated abnormal weather (subject to Section 8.03(E) below), or by other causes not the fault or responsibility of the Contractor that the Port determines may justify a delay in the Contract Time, then the Contract Time shall be extended by Change Order for such reasonable time as the Port may determine. In no event, however, shall the Contractor be entitled to any extension of time absent proof of: (1) delay to an activity on the critical path of the Project, or (2) delay transforming an activity to the critical path, so as to actually delay the anticipated date of Substantial Completion.
- B. Allocation of responsibility for delay not caused by Port or Contractor. If a delay was not caused by the Port, the Contractor, or anyone acting on behalf of any of them, the Contractor is entitled only to an increase in the Contract Time but not an increase in the Contract Sum.
- C. Allocation of responsibility for delay caused by Port. If a delay was caused by the Port or someone acting on behalf of the Port and affected the critical path, the Contractor shall be entitled to a change in the Contract Time and Contract Sum in accordance with Section 8.02. The Contractor shall not recover damages, an equitable adjustment, or an increase in the Contract Sum or Contract Time from the Port; however, where the Contractor could reasonably have avoided the delay. The Port is not obligated directly or indirectly for damages for any delay suffered by a Subcontractor of any tier that does not increase the Contract Time.
- D. Allocation of responsibility for delay caused by Contractor. If a delay was caused by the Contractor, a Subcontractor of any tier, or anyone acting on behalf of any of them, the Contractor is not entitled to an increase in the Contract Time or in the Contract Sum.
- E. Adverse weather. If adverse weather is identified as the basis for a claim for additional time, the claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not reasonably have been anticipated and had an adverse effect on the critical path of construction, and that the Work was on schedule (or not behind schedule through the fault of the Contractor) at the time the adverse weather conditions occurred. Neither the Contract Time nor the Contract Sum will be adjusted for normal inclement weather. For a claim based on adverse weather, the Contractor shall be eligible only for a change in the Contract Time (but not a change in the Contract Sum) if the Contractor can substantiate that there was significantly greater than normal inclement weather considering the full term of the Contract Time.

- F. Damages for delay. In the event the Contractor (including any Subcontractors of any tier) is held to be entitled to damages from the Port for delay beyond the amount permitted in Section 8.02(B), the total combined damages to the Contractor and any Subcontractors of any tier for each day of delay shall be limited to the reasonable, actual costs of the delay for which the Port is wholly responsible. The limitation on damages set forth in this Section does not apply to any damages arising exclusively from delay to which the Contractor is entitled to recover under Section 8.03(F).
- G. Limitation on damages. The Contractor shall not be entitled to damages arising out of loss of efficiency; morale, fatigue, attitude, or labor rhythm; constructive acceleration; home office overhead; expectant under run; trade stacking; reassignment of workers; rescheduling of Work, concurrent operations; dilution of supervision; learning curve; beneficial or joint occupancy; logistics; ripple; season change; extended or increased overhead or general conditions; profit upon damages for delay; impact damages including cumulative impacts; or similar damages. Any effect that such alleged costs may have upon the Contractor or its Subcontractors of any tier is fully compensated through the markup on Change Orders paid through Section 8.02(B).

8.04 RESERVATION OF RIGHTS

- A. Reservations of rights void unless signed by Port. Reservations of rights will be deemed waived and are void unless any reserved rights are described in detail and are signed by the Contractor and the Port.
- B. Procedure for unsigned reservations of rights. If the Contractor adds a reservation of rights not signed by the Port to any Change Order, Unilateral Change Directive, Change Order proposal, Application for Payment, or any other document, all amounts and all Work therein shall be considered disputed and not payable until costs are re-negotiated or the reservation is withdrawn or changed in a manner satisfactory to, and signed by, the Port. If the Port makes payment based on a document that contains a reservation of rights not signed by the Port, and if the Contractor cashes such payment, then the reservation of rights shall be deemed waived, withdrawn, and of no effect.

8.05 UNIT PRICES

- A. Adjustment to Unit Prices. If Unit Prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed (less than eighty percent (80%) or more than one hundred and twenty percent (120%) of the quantity estimated) so that application of a Unit Price would be substantially unfair, the applicable Unit Price but not the Contract Time, shall be adjusted if the Port prospectively approves a Change Order revising the Unit Price.
- B. Procedure to change Unit Prices. The Contractor or Port may request a Change Order revising a Unit Price by submitting information to support the change. A proposed change to a Unit Price will be evaluated by the Port based on the change in cost resulting solely from the change in quantity, any change in production rate or method as compared to the original plan, and the share, if any, of fixed expenses properly chargeable to the item. If the Port and Contractor agree on the change, a Change Order will be executed. If the parties cannot agree, the Contractor shall comply with the dispute resolution procedures (Article 11).

ARTICLE 9 - SUSPENSION AND TERMINATION OF CONTRACT

9.01 PORT'S RIGHT TO SUSPEND WORK

- A. Port may suspend the Work. The Port may at any time suspend the Work, or any part thereof, by giving notice to the Contractor. The Work shall be resumed by the Contractor as soon as possible, but no later than fourteen (14) days after the date fixed in a notice to resume the Work. The Port shall reimburse the Contractor for appropriate and reasonable expenses consistent with Section 8.02 incurred by the Contractor as a result of the suspension, except where a suspension is the result of the Contractor repeatedly or materially failing to carry out or correct the Work in accordance with the Contract Documents, and the Contractor shall take all necessary steps to minimize expenses.
- B. Contractor obligations. During any suspension of Work, the Contractor shall take every precaution to prevent damage to, or deterioration of, the Work. The Contractor shall be responsible for all damage or deterioration to the Work during the period of suspension and shall, at its sole expense, correct or restore the Work to a condition acceptable to the Port prior to resuming Work.

9.02 TERMINATION OF CONTRACT FOR CAUSE BY THE PORT

- A. Port may terminate for cause. If the Contractor is adjudged bankrupt or makes a general assignment for the benefit of the Contractor's creditors, if a receiver is appointed due to the Contractor's insolvency, or if the Contractor, in the opinion of the Port, persistently or materially refuses or fails to supply enough properly skilled workmen or materials for proper completion of the Contract, fails to make prompt payment to Subcontractors or suppliers for material or labor, disregards laws, ordinances, or the instructions of the Port, fails to prosecute the Work continuously with promptness and diligence, or otherwise materially violates any provision of the Contract, then the Port, without prejudice to any other right or remedy, may terminate the Contractor after giving the Contractor seven (7) days' written notice (during which period the Contractor shall have the right to cure).
- B. Procedure following termination for cause. Following a termination for cause, the Port may take possession of the Project site and all materials and equipment, and utilize such materials and equipment to finish the Work. The Port may also exclude the Contractor from the Project site(s). If the Port elects to complete all or a portion of the Work, it may do so as it sees fit. The Port shall not be required to accept the lowest bid for completion of the Work and may choose to complete all or a portion of the Work using its own work force. If the Port elects to complete all or a portion of the Work, the Contractor shall not be entitled to any further payment until the Work is finished. If the expense of finishing the Work, including compensation for additional managerial and administrative services of the Port, exceeds the unpaid balance of the Contract Sum, the excess shall be paid by the Contractor.
- C. Port's remedies following termination for cause. The Port may exercise any rights, claims, or demands that the Contractor may have against third persons in connection with the Contract, and for this purpose the Contractor assigns and transfers to the Port all such rights, claims, and demands.
- D. Inadequate termination for cause converted to termination for convenience. If, after the Contractor has been terminated for cause, it is determined that inadequate "cause" for such termination exists, then the termination shall be considered a termination for convenience pursuant to Section 9.03.

9.03 TERMINATION OF CONTRACT FOR CONVENIENCE BY THE PORT

- A. Port may terminate for convenience. The Port may, at any time (without prejudice to any right or remedy of the Port), terminate all, or any portion of, the Contract for the Port's convenience and without cause. The Contractor shall be entitled to receive payment consistent with the Contract Documents only for Work properly executed through the date of termination, and costs necessarily incurred by reason of the termination (such as the cost of settling and paying claims arising out of the termination under subcontracts or orders), along with a fee of one percent (1%) of the Contract Sum not yet earned on the whole or part of the Work. The total amount to be paid to the Contractor shall not exceed the Contract Sum as reduced by the amount of payments otherwise made. The Port shall have title to all Work performed through the date of termination.

9.04 TERMINATION OF CONTRACT BY THE CONTRACTOR

- A. Contractor may terminate for cause. The Contractor may terminate the Contract if the Work is stopped for a period of sixty (60) consecutive days through no act or fault of the Contractor or a Subcontractor of any tier, for either of the following reasons:
 - 1. Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped; or
 - 2. An act of government, such as a declaration of national emergency, that requires all Work to be stopped.
- B. Procedure for Contractor termination. If one of the reasons described in Section 9.04A exists, the Contractor may, upon seven (7) days' written notice to the Port (during which period the Port has the opportunity to cure), terminate the Contract and recover from the Port payment for Work executed through the date of termination in accordance with the Contract Documents and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead and profit on Work executed and direct costs incurred by reason of such termination. The total recovery of the Contractor shall not exceed the unpaid balance of the Contract Sum.
- C. Contractor may stop the Work for failure of Port to pay undisputed amounts. The Contractor may stop Work under the Contract if the Port does not pay undisputed amounts due and owing to the Contractor within fifteen (15) days of the date established in the Contract Documents. If the Port fails to pay undisputed amounts, the Contractor may, upon fifteen (15) additional days' written notice to the Port, during which the Port can cure, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately, and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay, and start-up.

9.05 SUBCONTRACT ASSIGNMENT UPON TERMINATION

- A. Subcontracts assigned upon termination. Each subcontract is hereby assigned by the Contractor to the Port provided that:
 - 1. The Port requests that the subcontract be assigned.
 - 2. The assignment is effective only after termination by the Port and only for those subcontracts that the Port accepts in writing.
 - 3. The assignment is subject to the prior rights of the surety, if any, under any bond issued in accordance with the Contract Documents.

When the Port accepts the assignment of a subcontract, the Port assumes the Contractor's rights and obligations under the subcontract, but only for events and payment obligations that arise after the date of the assignment.

ARTICLE 10 - BONDS

10.01 CONTRACTOR PERFORMANCE AND PAYMENT BONDS

- A. Contractor to furnish performance and payment bonds. Within ten (10) days following its receipt of a notice of award, and as part of the Contract Sum, the Contractor shall secure and furnish duly executed performance and payment bonds using the forms furnished by the Port. The bonds shall be executed by a surety (or sureties) reasonably acceptable to the Port, admitted and licensed in the State of Washington, registered with the Washington State Insurance Commissioner, and possessing an A.M. Best rating of "A-, FSC (6)" or better and be authorized by the U.S. Department of the Treasury. Pursuant to RCW 39.08, the bonds shall be in an amount equal to the Contract Sum, and shall be conditioned only upon the faithful performance of the Contract by the Contractor within the Contract Time and upon the payment by the Contractor of all taxes, fees, and penalties to the State of Washington and all laborers, Subcontractors, and suppliers, and others who supply provisions, equipment, or supplies for the performance of the Work covered by this Contract. The bonds shall be signed by the person or persons legally authorized to bind the Contractor.
- B. On contracts of one hundred fifty thousand dollars or less, at the option of the contractor as defined in RCW 39.10.210, the Port may, in lieu of the bond, retain ten percent of the contract amount for a period of thirty days after date of final acceptance, or until receipt of all necessary releases from the department of revenue, the Employment Security Department, and the Department of Labor and Industries and settlement of any liens filed under chapter 60.28 RCW, whichever is later. The recovery of unpaid wages and benefits must be the first priority for any actions filed against retainage held by a state agency or authorized local government.

For contracts of one hundred fifty thousand dollars or less, the Port may accept a full payment and performance bond from an individual surety or sureties.
- C. Port may notify surety. If the Port makes or receives a claim against the Contractor, the Port may, but is not obligated to, notify the Contractor's surety of the nature and amount of the claim. If the claim relates to a possibility of a Contractor's default, the Port may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

ARTICLE 11 - DISPUTE RESOLUTION

11.01 NOTICE OF PROTEST AND CLAIM

- A. Dispute resolution procedure mandatory. All claims, direct or indirect, arising out of, or relating to, the Contract Documents or the breach thereof, shall be decided exclusively by the following alternative dispute resolution procedure, unless the parties mutually agree otherwise. If the Port and Contractor agree to a partnering process to assist in the resolution of disputes, the partnering process shall occur prior to, and not be in place of, the mandatory dispute resolution procedures set forth below.

- B. Notice of protest defined. Except for claims requiring notice before proceeding with the affected Work as otherwise described in the Contract Documents, the Contractor shall provide immediate oral notice of protest to the Engineer prior to performing any disputed Work and shall submit a written notice of protest to the Port within seven (7) days of the occurrence of the event giving rise to the protest that includes a clear description of the event(s). The protest shall identify any point of disagreement, those portions of the Contract Documents believed to be applicable, and an estimate of quantities and costs involved. When a protest relates to cost, the Contractor shall keep full and complete records and shall permit the Port to have access to those records at any time as requested by the Port.
- C. Claim defined. A claim is a demand by one of the parties seeking adjustment or interpretation of the Contract terms, payment of money, extension of time, or other relief with respect to the terms of the Contract Documents. The term "claim" also includes all disputes and matters in question between the Port and Contractor arising out of, or relating to, the Contract Documents. Claims must be initiated in writing and include a detailed factual statement and clear description of the claim providing all necessary dates, locations, and items of Work, the date or dates on which the events occurred that give rise to the claim, the names of employees or representatives knowledgeable about the claim, the specific provisions of the Contract Documents that support the claim, any documents or oral communications that support the claim, any proposed change in the Contract Sum (showing all components and calculations) and/or Contract Time (showing cause and analysis of the resultant delay in the critical path), and all other data supporting the claim. Claims shall also be submitted with a statement certifying, under penalty of perjury, that the claim as submitted is made in good faith, that the supporting cost and pricing data are true and accurate to the best of Contractor's knowledge and belief, that the claim is fully supported, and that the amount requested accurately reflects the adjustment in the Contract Sum or Contract Time for which Contractor believes the Port is liable. A claim shall be deemed to include all changes, direct and indirect, in cost and in time to which the Contractor and Subcontractors of any tier are entitled and may not contain reservations of rights without the Port's written approval; any unapproved reservations of rights shall be without effect.
- D. Claim procedure. The Contractor shall submit a written claim within thirty (30) days of providing written notice of protest. The Contractor may delay submitting supporting data by an additional thirty (30) days if it notifies the Port in its claim that substantial data must be assembled. Any claim of a Subcontractor of any tier may be brought only through, and after review by and concurrence of, the Contractor.
- E. Failure to comply with notice of protest and claim requirements waives claims. Any notice of protest by the Contractor and any claim of the Contractor, whether under the Contract or otherwise, must be made pursuant to, and in strict accordance with, the applicable provisions of the Contract. Failure to properly and timely submit a notice of protest or to timely submit a claim shall waive the claim. No act, omission, or knowledge, actual or constructive, of the Port shall waive the requirement for timely written notice of protest and a timely written claim, unless the Port and the Contractor sign an explicit, unequivocal written waiver approved by the Port. The Contractor expressly acknowledges and agrees that the Contractor's failure to timely submit required notices of protest and/or timely submit claims has a substantial impact upon, and prejudices, the Port. For the purpose of calculating time periods, an "event giving rise to a claim," among other things, is not a Request for Information, but rather is a response that the Contractor believes would change the Contract Sum and/or Contract Time.

- F. False claims. The Contractor shall not make any fraudulent misrepresentations, concealments, errors, omissions, or inducements to the Port in the formation or performance of the Contract. If the Contractor or a Subcontractor of any tier submits a false or frivolous claim to the Port, which for purposes of this Section 11.01(F) is defined as a claim based in whole or in part on a materially incorrect fact, statement, representation, assertion, or record, the Port shall be entitled to collect from the Contractor by offset or otherwise (without prejudice to any right or remedy of the Port) any and all costs and expenses, including investigation and consultant costs, incurred by the Port in investigating, responding to, and defending against the false or frivolous claim.
- G. Compliance with lien and retainage statutes required. If a claim relates to, or is the subject of, a lien or retainage claim, the party asserting the claim may proceed in accordance with applicable law to comply with the notice and filing deadlines prior to resolution of the claim by mediation or by litigation.
- H. Performance required pending claim resolution. Pending final resolution of a claim, the Contractor shall continue to perform the Contract and maintain the Baseline Project Schedule, and the Port shall continue to make payments of undisputed amounts due in accordance with the Contract Documents.

11.02 MEDIATION

- A. Claims must be subject to mediation. At any time following the Port's receipt of a written claim, the Port may require that an officer of the Contractor and the Port's designee (all with authority to settle) meet, confer, and attempt to resolve a claim. If the claim is not resolved during this meeting, the claim shall be subject to mandatory mediation as a condition precedent to the initiation of litigation. This requirement can be waived only by an explicit, written waiver signed by the Port and the Contractor.
- B. Mediation procedure. A request for mediation shall be filed in writing with the other party to the Contract, and the parties shall promptly attempt to agree upon a mediator. If the parties have not reached agreement within thirty (30) days of the request, either party may file the request with the American Arbitration Association, or such other alternative dispute resolution service to which the parties mutually agree, with a copy to the other party, and the mediation shall be administered by the American Arbitration Association (or other agreed service). The parties to the mediation shall share the mediator's fee and any filing fees equally. The mediation shall be held in Pierce County, Washington, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof. Unless the Port and the Contractor mutually agree in writing otherwise, all claims shall be considered at a mediation session that shall occur prior to Final Completion.

11.03 LITIGATION

- A. Claims not resolved by mediation are subject to litigation. Claims not resolved through mediation shall be resolved by litigation, unless the parties mutually agree otherwise. The venue for any litigation shall be Pierce County, Washington. The Contractor may bring no litigation on claims, unless such claims have been properly raised and considered in the procedures of this Article 11. The Contractor must demonstrate in any litigation that it complied with all requirements of this Article.

- B. Litigation must be commenced promptly. All unresolved claims of the Contractor shall be waived and released, unless the Contractor has complied with the requirements of the Contract Documents, and litigation is served and filed within 180 days of the date of Substantial Completion approved in writing by the Port or termination of the Contract. The pendency of mediation (the time period between receipt by the non-requesting party of a written mediation request and the date of mediation) shall toll these deadlines until the earlier of the mediator providing written notice to the parties of impasse, or thirty (30) days after the date of the mediation session.
- C. Port not responsible for attorneys' fees. Neither the Contractor nor a Subcontractor of any tier, whether claiming under a bond or lien statute or otherwise, shall be entitled to attorneys' fees directly or indirectly from the Port (but may recover attorneys' fees from the bond or statutory retainage fund itself to the extent allowable under law).
- D. Port may join Contractor in dispute. The Port may join the Contractor as a party to any litigation or arbitration involving the alleged fault, responsibility, or breach of contract of the Contractor or Subcontractor of any tier.

ARTICLE 12 - MISCELLANEOUS

12.01 GENERAL

- A. Rights and remedies are cumulative. The rights and remedies of the Port set forth in the Contract Documents are cumulative, and in addition to and not in limitation of, any rights and remedies otherwise available to the Port. The pursuit of any remedy by the Port shall not be construed to bar the Port from the pursuit of any other remedy in the event of similar, different, or subsequent breaches of this Contract. All such rights of the Port shall survive completion of the Project or termination of the Contractor.
- B. Reserved rights do not give rise to duty. The rights reserved or possessed by the Port to take any action shall not give rise to a duty for the Port to exercise any such right.

12.02 WAIVER

- A. Waiver must be in writing and authorized by Port. Waiver of any provisions of the Contract Documents must be in writing and authorized by the Port. No other waiver is valid on behalf of the Port.
- B. Inaction or delay not a waiver. No action, delay in acting, or failure to act by the Port shall constitute a waiver of any right or remedy of the Port, or constitute an approval or acquiescence of any breach or defect in the Work, nor shall any delay or failure of the Port to act waive or otherwise prejudice the right of the Port to enforce a right or remedy at any subsequent time.
- C. Claim negotiation not a waiver. The fact that the Port and the Contractor may consider, discuss, or negotiate a claim that has or may have been defective or untimely under the Contract, shall not constitute a waiver of the provisions of the Contract Documents, unless the Port and the Contractor sign an explicit, unequivocal waiver.

12.03 GOVERNING LAW

- A. Washington law governs. This Contract and the rights and duties of the parties hereunder shall be governed by the internal laws of the State of Washington, without regard to its conflict of law principles.

12.04 COMPLIANCE WITH LAW

- A. Contractor to comply with applicable laws. The Contractor shall at all times comply with all applicable Federal, State and local laws, ordinances, and regulations. This compliance shall include, but is not limited to, the payment of all applicable taxes, royalties, license fees, penalties, and duties.
- B. Contractor to provide required notices. The Contractor shall give notices required by all applicable Federal, State and local laws, ordinances, and regulations bearing on the Work.
- C. Contractor to confine operations at site to permitted areas. The Contractor shall confine operations at the Project site to areas permitted by applicable laws, ordinances, permits, rules and regulations, and lawful orders of public authorities and the Contract Documents.

12.05 ASSIGNMENT

- A. Assignment. The Port and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party and to the partners, successors, assigns, and legal representatives of such other party. The Contractor may not assign, transfer, or novate all or any portion of the Contract, including but not limited to, any claim or right to the Contract Sum, without the Port's prior written consent. If the Contractor attempts to make an assignment, transfer, or novation without the Port's consent, the assignment shall be of no effect, and Contractor shall nevertheless remain legally responsible for all obligations under the Contract. The Contractor also shall not assign or transfer, to any third party, any claims it may have against the Port arising under the Contract or otherwise related to the Project.

12.06 TIME LIMIT ON CAUSES OF ACTION

- A. Time limit on causes of action. The Port and Contractor shall commence all causes of action, whether in contract, tort, breach of warranty, or otherwise, against the other arising out of, or related to, the Contract in accordance with the requirements of the dispute resolution procedure set forth in Article 11 of these General Conditions, within the time period specified by applicable law, and within the time limits identified in the Contract Documents. The Contractor waives all claims and causes of action not commenced in accordance with this Section 12.06.

12.07 SERVICE OF NOTICE

- A. Notice. Written notice under the Contract Documents by either the Contractor or Port may be served on the other party by personal service, electronic or facsimile transmission, or delivery service to the last address provided in writing to the other party. For the purpose of measuring time, notice shall be deemed to be received by the other party on the next business day following the sender's electronic or facsimile transmittal or delivery by delivery service.

12.08 RECORDS

- A. Contractor and Subcontractors to maintain records and cooperate with Port audit. The Contractor and Subcontractors of any tier shall maintain books, ledgers, records, documents, estimates, bids, correspondence, logs, schedules, emails, and other tangible and electronic data and evidence relating or pertaining to costs and/or performance of the Contract ("records") to such extent, and in such detail, as will properly reflect and fully support compliance with the Contract Documents and with all costs, charges, and other amounts of whatever nature. The Contractor shall preserve these records for a period of six (6) years following the date of Final Acceptance under the Contract. Within seven (7) days of the Port's request, both during the Project and for six (6) years following Final Acceptance, the Contractor and Subcontractors of any tier shall make available, at their office during normal business hours, all records for inspection, audit, and reproduction (including electronic reproduction) by the Port or its representatives; failure to fully comply with this requirement shall constitute a material breach of contract and a waiver of all claims by the Contractor and Subcontractors of any tier.
- B. Rights under RCW 42.56. The Contractor agrees, on behalf of itself and Subcontractors of any tier, that any rights under Chapter 42.56 RCW will commence at Final Acceptance, and that the invocation of such rights at any time by the Contractor or a Subcontractor of any tier, or their respective representatives, shall initiate an equivalent right to disclosures from the Contractor and Subcontractors of any tier for the benefit of the Port.

12.09 STATUTES

- A. Contractor to comply with Washington statutes. The Contractor shall abide by the provisions of all applicable statutes, regulations, and other laws. Although a number of statutes are referenced in the Contract Documents, these references are not meant to be, and are not, a complete list.
 - 1. Pursuant to RCW 39.06, "Registration, Licensing of Contractors," the Contractor shall be registered and licensed as required by the laws of the State of Washington, including but not limited to RCW 18.27, "Registration of Contractors," and shall satisfy all State of Washington bonding and insurance requirements. The Contractor shall also have a current state Unified Business Identifier number; have industrial insurance coverage for the Contractor's employees working in Washington as required by Title 51 RCW; have an Employment Security Department number as required by Title 50 RCW; have a state excise tax registration number as required in Title 82 RCW; and not be disqualified from bidding on any public works contract under RCW 39.06.010 (unregistered or unlicensed contractors) or RCW 39.12.065(3) (prevailing wage violations).
 - 2. The Contractor shall comply with all applicable provisions of RCW 49.28, "Hours of Labor."
 - 3. The Contractor shall comply with pertinent statutory provisions relating to public works of RCW 49.60, "Discrimination."
 - 4. The Contractor shall comply with pertinent statutory provisions relating to public works of RCW 70.92, "Provisions in Buildings for Aged and Handicapped Persons," and the Americans with Disabilities Act.
 - 5. Pursuant to RCW 50.24, "Contributions by Employers," in general, and RCW 50.24.130 in particular, the Contractor shall pay contributions for wages for personal services performed under this Contract or arrange for an acceptable bond.
 - 6. The Contractor shall comply with pertinent provisions of RCW 49.17, "Washington Industrial Safety and Health Act," and Chapter 296-155 WAC, "Safety Standards for Construction Work."

7. Pursuant to RCW 49.70, "Worker and Community Right to Know Act," and WAC 296-62-054 et seq., the Contractor shall provide to the Port, and have copies available at the Project site, a workplace survey or material safety data sheets for all "hazardous" chemicals under the control or use of Contractor or any Subcontractor of any tier.
8. All products and materials incorporated into the Project as part of the Work shall be certified as "asbestos-free" and "lead-free" by United States standards, and shall also be free of all hazardous materials or substances. At the completion of the Project, the Contractor shall submit certifications of asbestos-free and of lead-free materials certifying that all materials and products incorporated into the Work meet the requirements of this Section, and shall also certify that materials and products incorporated into the Work are free of hazardous materials and substances.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes requirements for the Contractor's insurance.

1.02 SUBMITTAL REQUIREMENTS

- A. Evidence of the required insurance within ten (10) days of the issued Notice of Award to the Contractor.
- B. Updated evidence of insurance as required until final completion.

1.03 COMMERCIAL GENERAL LIABILITY (CGL) INSURANCE

- A. The Contractor shall secure and maintain until Final Completion, at its sole cost and expense, the following insurance in carriers reasonably acceptable to the Port, licensed in the State of Washington, registered with the Washington State Insurance Commissioner, and possessing an A.M. Best rating of "A-, FSC six (6)" or better.
- B. The Port of Tacoma (Port) and the Northwest Seaport Alliance (NWSA) will be included as additional insureds for both ongoing and completed operations by endorsement to the policy using ISO Form CG 20 10 11 85 or forms CG 20 10 04 13 and CG 20 37 04 13 (or equivalent coverage endorsements). The inclusion of the Port and the NWSA as additional insureds shall not create premium liability for either the Port nor the NWSA.

Also, by endorsement to the policy, there shall be:

- 1. An express waiver of subrogation in favor of the Port;
 - 2. A cross liabilities clause; and
 - 3. An endorsement stating that the Contractor's policy is primary and not contributory with any insurance carried by the Port.
- C. If the Contractor, Supplier, or Subcontractors will perform any work requiring the use of a licensed professional, per RCW 18, the Contractor shall provide evidence to the Port of professional liability insurance in amounts not less than \$1,000,000.
 - D. This insurance shall cover all of the Contractor's operations, of whatever nature, connected in any way with the Contract, including any operations performed by the Contractor's Subcontractors of any tier. **It is the obligation of the Contractor to ensure that all Subcontractors (at whatever level) carry a similar program that provides the identified types of coverage, limits of liability, inclusion of the Port and the NWSA as additional insured(s), waiver of subrogation and cross liabilities clause.** The Port reserves the right to reject any insurance policy as to company, form, or substance. Contractor's failure to provide, or the Port's acceptance of, the Contractor's certificate of insurance does not waive the Contractor's obligation to comply with the insurance requirements of the Contract as specifically described below:
 - 1. Commercial General Liability Insurance on an Occurrence Form Basis including, but not limited to:
 - a. Bodily Injury Liability;
 - b. Property Damage Liability;
 - c. Contractual Liability;

- d. Products - Completed Operations Liability;
- e. Personal Injury Liability;

Alternatively, a Commercial General Liability (CGL) policy is acceptable if all of the above coverages are incorporated in the policy and there are no marine exclusions that will remove coverage for either vessels or work done by or above or around the water.

- 2. Comprehensive Automobile Liability including, but not limited to:
 - a. Bodily Injury Liability;
 - b. Property Damage Liability;
 - c. Personal Injury Liability;
 - d. Owned and Non-Owned Automobile Liability; and
 - e. Hired and Borrowed Automobile Liability.
- 3. Technology Professional Liability Errors and Omissions Insurance appropriate to the Consultant's profession and work hereunder, with limits not less than \$2,000,000 per occurrence. Coverage shall be sufficiently broad to respond to the duties and obligations as is undertaken by the Vendor in this agreement and shall include, but not be limited to, claims involving infringement of intellectual property, copyright, trademark, invasion of privacy violations, information theft, release of private information, extortion and network security. The policy shall provide coverage for breach response costs as well as regulatory fines and penalties as well as credit monitoring expenses with limits sufficient to respond to these obligations.

The policy shall include, or be endorsed to include, **property damage liability coverage** for damage to, alteration of, loss of, or destruction of electronic data and/or information "property" of the Agency in the care, custody, or control of the Vendor.

- E. Except where indicated above, the limits of all insurance required to be provided by the Contractor shall be not less than \$2,000,000 for each occurrence. If the coverage is aggregated, the coverage shall be no less than two times the per occurrence or per claim limit. However, coverage in the amounts of these minimum limits shall not be construed as to relieve the Contractor from liability in excess of such limits. Any additional insured endorsement shall NOT be limited to the amounts specified by this Contract, unless expressly waived in writing by the Port.
- F. Contractor shall certify that its operations are covered by the Washington State Worker's Compensation Fund. The Contractor shall provide its Account Number or, if self-insured, its Certificate of Qualification Number. The Contractor shall also provide evidence of Stop-Gap Employers' Liability Insurance.
- G. The Contractor shall furnish, within ten (10) days following issuance of the Notice of Award, a certificate of insurance satisfactory to the Port evidencing that insurance in the types and minimum amounts required by the Contract Documents has been secured. The Certificate of Insurance shall be signed by an authorized representative of the insurer together with a copy of the endorsement, which shows that the Port and the NWSA are named as additional insured(s).
- H. Contractor shall provide at least forty-five (45) days prior written notice to the Port of any termination or material change, or ten (10) day's-notice in the case of non-payment of premium(s).

- I. If the Contractor is required to make corrections to the Work after Final Completion, the Contractor shall obtain at its own expense, prior to the commencement of any corrective work, insurance coverage as required by the Contract Documents, which coverage shall be maintained until the corrections to the Work have been completed and accepted by the Port.

1.04 BUILDER'S RISK INSURANCE

- A. Until Final Completion of the Work, the construction Work is at the risk of the Contractor and no partial payment shall constitute acceptance of the Work or relieve the Contractor of responsibility of completing the Work under the Contract.
- B. To the extent the Work provided under this Contract does not include the construction, rehabilitation or repair of any dam, road or bridge, and whenever the estimated cost of the Work is less than \$25,000,000, the Port and Contractor acknowledge that the Port will purchase, or has purchased, from a company or companies lawfully authorized and admitted to do business in Washington, property insurance written on a Builder's Risk "all-risk" (including Earthquake and Flood with applicable sub-limits) or equivalent policy form to cover the course of construction in the amount of the full insurable value thereof. This property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made or until no person or entity other than the Port has an insurable interest in the property, whichever is later. Without further endorsement, the coverage afforded by this insurance includes the interests of the Port, the Contractor, and Subcontractors of any tier on the Project. Coverage for materials intended to be installed in the facility will be covered by the Builder's Risk policy. Losses up to the deductible amount, and payment of any deductible amount, shall be the responsibility of the Contractor. All tools and equipment not intended as part of the construction or installation (including but not limited to Contractor's equipment and tools) will NOT be covered by the policy.

To the extent the Work provided under this Contract involves any dam, roadway or bridge, the value of which exceeds \$250,000, or whenever the estimated cost of the Work is equal to or greater than \$25,000,000, Contractor will purchase from a company or companies lawfully authorized and admitted to do business in Washington, property insurance written on a Builder's Risk "all-risk" (excluding Earthquake and Flood with applicable sub-limits) or equivalent policy form to cover the course of construction in the amount of the full insurable value thereof. This Builder's Risk insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made or until no person or entity other than the Port has an insurable interest in the property, whichever is later. Contractor shall provide evidence satisfactory to the Port confirming the coverage afforded by this insurance shall include the interests of the Port, the Contractor, and Subcontractors of any tier on the Project. Coverage for materials intended to be installed in the facility will be covered by the Builder's Risk policy purchased by the Contractor. Losses up to the deductible amount, and payment of any deductible amount, shall be the responsibility of the Contractor.

In all instances, the Contractor shall obtain property insurance for all Contractor-owned equipment and tools and, in the event of loss, payment of any deductible amount shall be the responsibility of the Contractor.

PART 2 - PRODUCTS - NOT USED

PART 3 - PRODUCTS - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 PREVAILING AND OTHER REQUIRED WAGES

- A. The Contractor shall pay (and shall ensure that all Subcontractors of any tier pay) all prevailing wages and other wages (such as Davis-Bacon Act wages) applicable to the Project.
- B. Pursuant to RCW 39.12, "Prevailing Wages on Public Works," no worker, laborer, or mechanic employed in the performance of any part of the Work shall be paid less than the "prevailing rate of wage" in effect as of the date that bids are due.
 - 1. Based on the Bid Date, the applicable effective date for prevailing wages for this Project is December 2, 2025.
- C. The State of Washington prevailing wage rates applicable for this public works Project, which is located in Pierce County, may be found at the following website address of the Department of Labor and Industries:

<https://www.lni.wa.gov/licensing-permits/public-works-projects/prevailing-wage-rates/>
- D. The schedule of the prevailing wage rates is made a part of the Contract Documents by reference as though fully set forth herein, and a printed copy of the applicable prevailing wage rates are also available for viewing at the Port Administration Building, located at 1 Sitcum Plaza, Tacoma, WA 98421 (253-383-5841). Upon request to the Procurement Department at procurement@portoftacoma.com, the Port will email or mail a hard copy of the applicable Journey Level prevailing wages for this Project.
- E. Questions relating to prevailing wage data should be addressed to the Industrial Statistician.
 - Mailing Address: Washington State Department of Labor and Industries
Prevailing Wage Office
P.O. Box 44540
Olympia, WA 98504
 - Telephone: (360) 902-5335
 - Facsimile: (360) 902-5300
 - 1. If there is any discrepancy between the provided schedule of prevailing wage rates and the published rates applicable under WAC 296-127-011, the applicable published rates shall apply with no increase in the Contract Sum. It is the Contractor's responsibility to ensure that the correct prevailing wage rates are paid.
- F. Statement to Pay Prevailing Wages
 - 1. Prior to any payment being made by the Port under this Contract, the Contractor, and each Subcontractor of any tier, shall file a Statement of Intent to Pay Prevailing Wages with the Department of Labor and Industries for approval.
 - 2. The statement shall include the hourly wage rate to be paid to each classification of workers entitled to prevailing wages, which shall not be less than the prevailing rate of wage, and the estimated number of workers in each classification employed on the Project by the Contractor or a Subcontractor of any tier, as well as the Contractor's contractor registration number and other information required by the Department of Labor and Industries.

3. The statement, and any supplemental statements, shall be filed in accordance with the requirements of the Department of Labor and Industries. No progress payment shall be made until the Port receives such certified statement.
- G. The Contractor shall post, in a location readily visible to workers, at the Project site: (i) a copy of the Statement of Intent to Pay Prevailing Wages approved by the Industrial Statistician of the Department of Labor and Industries and (ii) the address and telephone number of the Industrial Statistician of the Department of Labor and Industries to whom a complaint or inquiry concerning prevailing wages may be directed.
- H. If a State of Washington prevailing wage rate conflicts with another applicable wage rate (such as Davis-Bacon Act wage rate) for the same labor classification, the higher of the two shall govern.
- I. Pursuant to RCW 39.12.060, if any dispute arises concerning the appropriate prevailing wage rate for work of a similar nature, and the dispute cannot be adjusted by the parties in interest, including labor and management representatives, the matter shall be referred for arbitration to the Director of the Department of Labor and Industries, and his or her decision shall be final and conclusive and binding on all parties involved in the dispute.
- J. Immediately following the end of all Work completed under this Contract, the Contractor and each Subcontractor of any tier, shall file an approved Affidavit of Wages Paid with the Department of Labor and Industries.
- K. The Contractor shall defend (at the Contractor's sole cost, with legal counsel approved by Port), indemnify, and hold the Port harmless from all liabilities, obligations, claims, demands, damages, disbursements, lawsuits, losses, fines, penalties, costs, and expenses, whether direct, indirect, including, but not limited to, attorneys' fees and consultants' fees and other costs and expenses, from any violation or alleged violation by the Contractor or any Subcontractor of any tier of RCW 39.12 ("Prevailing Wages on Public Works") or RCW Title 51 ("Industrial Insurance"), including, but not limited to, RCW 51.12.050.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS APPLICABLE PORT-WIDE

- A. The Contractor shall submit, prior to the start of Work, a list of emergency contact numbers for itself and its Subcontractors, Suppliers, and manufacturer representatives. Each person on the Project site shall have a valid identification card that is tamper proof with laminated photo identification, such as one (1) of the following:
 - 1. State-issued Driver's license (also required if driving a vehicle)
 - 2. Card issued by a governmental agency
 - 3. Passport
 - 4. Pacific Maritime Association card
 - 5. Labor organization identification card
- B. Identification cards shall be visible while on the Project site or easily displayed when requested.

1.02 TRANSPORTATION WORKER IDENTIFICATION CARD (TWIC) SUMMARY

- A. TWIC is required for all personnel needing unescorted access to secure and restricted areas of Port facilities subject to 33 CFR 105, including truckers, surveyors, construction personnel, and delivery personnel. Secure areas are those areas with security measures for access control in accordance with a Coast Guard approved security plan. Restricted areas are those areas within a secure area that require increased limited access and a higher degree of security protection. New terminals under construction prior to terminal operations may not be designated secure areas. Construction on existing maritime transportation facilities and punchlist or other type of work requirements on facilities that have been certified under 33 CFR will require a TWIC.
- B. Contractors should allow for application and enrollment for the security threat assessment and issuance of TWIC when submitting a bid.

1.03 ESCORTING

- A. To access restricted Port facilities, all un-credentialed individuals must be accompanied by a person who has been issued a TWIC and trained as an escort at that specific facility. Each restricted facility has their own guidelines for escorting. Having escort training at one facility does not qualify you to escort at other facilities. Prior to conducting escort services for non-TWIC personnel, the escorts are required to contact the Facility Security Officer at the gate for verification they are on the escort list and to document who is being escorted. For required documentation, upon completion of escorting, the escort is to inform the Security officer that the escort is complete. It is the Contractor's responsibility to schedule escort training with the Facility Security Officer.
- B. For more information, refer to the Port Security website at:
<http://www.portoftacoma.com/shipping/security>
- C. For Project specific information, refer to Section 01 14 00 - Work Restrictions.

1.04 ELIGIBILITY FOR TWIC

- A. Refer to the Transportation Worker Identification Credential website at: <https://www.tsa.gov/for-industry/twic> for information on eligibility and applying for TWIC.

1.05 TWIC USE AND DISPLAY

- A. Each worker granted unescorted access to secure areas of a facility or vessel must present their cards to authorized personnel, who will compare the holder to his or her photo, inspect security features on the TWIC, and evaluate the card for signs of tampering. The Coast Guard will verify TWIC's when conducting vessel and facility inspections and during spot checks using hand-held scanners, ensuring credentials are valid.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

- A. The accompanying Drawings and Specifications show and describe the location and type of Work to be performed under this project. Work is more specifically defined on the drawings listed in Section 00 01 15.
 - 1. The Work under this contract is to provide, furnish and install all labor, materials and equipment required to complete the work, installed, tested, and ready for use, and as described in these documents.
- B. The West Sitcum 11th St. Improvements consists of:
 - 1. Demolition and removal of approximately 6,200 square feet of existing gravel and asphalt pavement; subgrade preparation and grading; pavement sawcutting and trenching for the new stormwater treatment system; procurement and installation of the stormwater treatment system; installation of approximately 6,200 square feet of new asphalt pavement; procurement and installation of security fencing and LED lighting fixtures with controls; and protection of all existing utilities.

1.02 LOCATION

- A. The work is located in the right-of-way near:
 - 1002 Milwaukee Way
 - Tacoma, WA 98421

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies work sequence and constraints.
- B. The purpose of the milestones, sequence and limitations of construction are to ensure that the Contractor understands the requirements and limitations on its work by the specific characteristics of the Contract, schedules and conducts work in a manner consistent with achieving these purposes, and complies with the construction schedule, the specific sequence, constraints, milestones and limitations of work specified.
- C. Sequence of construction. Plan the sequence of construction to accommodate all the requirements of the specifications. The Contract Price shall include all specified requirements as described in this Section.

1.02 CONTRACTOR ACCESS AND USE OF PREMISES

- A. Activity Regulations
 - 1. Ensure Contractor personnel deployed to the project become familiar with and follow all regulations or restrictions established by the Engineer.
- B. Working Facility
 - 1. The Facility will remain in operation for the duration of construction. The Contractor shall conduct all items of the Work in such a manner as to prevent interference with the normal operations of the Facility.
- C. Work Site Regulations
 - 1. Keep within the limits of work and assigned avenues of ingress and egress. Do not enter any areas outside the designated work location unless previously approved by the Engineer. The Contractor must comply with the following conditions:
 - a. Restore all common areas to a clean and useable condition that permits the resumption of Tenant operations after the Contractor ceases daily work.
 - b. Be responsible for control and security of Contractor-owned equipment and materials at the work site. Report to Port Security (phone (253) 383-9472) any missing/lost/stolen property.
 - c. Ensure all materials, tools and equipment will be removed from the site or secured within the designated laydown area at the end of each shift.
 - d. The Contractor and subcontractors, suppliers, and manufacturer representatives shall provide a list of emergency contact numbers and a list of all on-site personnel and vehicle license plates numbers to the Engineer prior to site access and start of work. Each person on the project site shall have a current Transportation Identification Card (TWIC). Contractor related deliveries may, at the Contractor's discretion and expense, provide qualified TWIC escorts in sufficient number to maintain production rates to meet schedule requirements. Otherwise, all delivery personnel are required to have a current Transportation Identification Card.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Procedures for preparation and submittal of applications for progress payments.

1.02 PAYMENT PROCEDURES

- A. Monthly pay estimates shall clearly identify the work performed for the given time period based on the approved Schedule of Values.
 - 1. At the Pre-construction meeting, the Engineer and the Contractor shall agree upon a date each month when payment applications shall be submitted.
- B. For each pay estimate the Contractor shall submit the following:
 - 1. Completed Contractor invoice and updated Schedule of Values tracking sheet as required by Division 01 or as established by the Engineer.
 - 2. Baseline Project Schedule and narrative updated as required by Section 01 32 16 of the Project Manual.
 - 3. Completed "Amounts Paid to Subcontracts and Suppliers" showing total contract amount, amount paid this estimate, total paid to date, and balance owing.
 - 4. Completed "Conditional Release and Waiver of Liens and Claims."
 - 5. An estimated cashflow statement projecting the Contractor's monthly billings on the project shall be submitted with each payment application.
- C. Prior to submitting a payment application, the Contractor and Engineer shall meet each month to review the work accomplished to determine the actual quantities including labor, materials and equipment charges to be billed.
 - 1. Prior to the payment application meeting, the Contractor shall submit to the Engineer all measurement documentation as referenced in these contract documents; to include all measurement by weight, volume or field.
 - 2. For all change work being done on a force account basis, the Contractor shall submit prior to meeting with Engineer all Force Account back-up documentation as required to process the payment application where Force Account work is being billed. The Engineer and the Contractor shall review the documentation at the payment application meeting to verify quantities and review the work accomplished.
 - 3. The Contractor shall bring a copy of all documentation to the pay application meeting with the Engineer.
 - 4. The Contractor shall submit the updated baseline project schedule for review prior to submitting the payment application to ensure the payment processing is not held up due to necessary schedule revisions.
- D. Following the Engineer's review, the Contractor shall submit the agreed upon pay estimate electronically, with complete supporting documentation attached, using Adobe PDF file format to cpinvoices@portoftacoma.com.

1.03 PAYMENT PRICING

- A. Pricing for the various lump sum or unit prices in the Bid Form, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of work being described, as necessary to complete the various items of the work in accordance with the requirements of the Contract Documents.
- B. Pricing also includes all costs of compliance with the regulations of public agencies having jurisdiction, including safety and health requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA).
- C. No separate payment will be made for any item that is not specifically set forth in the Bid Form, and all costs therefore shall be included in the prices named in the Bid Form for the various appurtenant items of work.
- D. All other work not specifically mentioned in the measurement and payment sections identified below shall be considered incidental to the work performed and merged into the various unit and lump sum prices bid. Payment for work under one item will not be paid for under any other item.
- E. The Port of Tacoma reserves the right to make changes should unforeseen conditions necessitate such changes. Where work is on a unit price basis, the actual quantities occasioned by such changes shall govern the compensation.

1.04 LUMP SUM MEASUREMENT

- A. Lump sum measurement will be for the entire item, unit of Work, structure, or combination thereof, as specified and as indicated in the Contractor's submitted bid.
 - 1. If the Contractor requests progress payments for lump sum items, such progress payments will be made in accordance with an approved Schedule of Values. The quantity for payment for completed work shall be an estimated percentage of the lump sum amount, agreed to between the Engineer and Contractor, payable in monthly progress payments in increments proportional to the work performed in amounts as agreed between the Engineer and the Contractor.

1.05 MEASUREMENT OF QUANTITIES FOR UNIT PRICES

- A. Measurement Standards:
 - 1. All Work to be paid for at a contract price per unit measurement, as indicated in the Contractor's submitted bid, will be measured by the Engineer in accordance with United States Standard Measures.
- B. Measurement by Weight:
 - 1. Reinforcing steel, steel shapes, castings, miscellaneous metal, metal fabrications, and similar items to be paid for by weight shall be measured by scale or by handbook weights for the type and quantity of material actually furnished and incorporated into the Work.

2. Unless shipped by rail, material to be measured and paid for by weight shall be weighed on sealed scales regularly inspected by the Washington State Department of Agriculture's Weights and Measures Section or its designated representative. Measurement shall be furnished by and at the expense of the Contractor. All weighing, measuring, and metering devices shall be suitable for the purpose intended and shall conform to the tolerances and specifications as outlined in Washington State Department of Transportation Standard Specifications, Division 1, General Requirements, Article 1-09.2, Weighing Equipment.
 3. Provide or utilize platform scales of sufficient size and capacity to permit the entire vehicle or combination of vehicles to rest on the scale platform while being weighed. Combination vehicles may be weighed as separate units provided they are disconnected while being weighed. Scales shall be inspected and certified as often as the Engineer may deem necessary to ascertain accuracy. Costs incurred as a result of regulating, adjusting, testing, inspecting, and certifying scales shall be borne by the Contractor.
 4. A licensed weighmaster shall weigh all Contractor-furnished materials. The Engineer may be present to witness the weighing and to check and compile the daily record of such scale weights. However, in any case, the Engineer will require that the Contractor furnish weight slips and daily summary weigh sheets. In such cases, furnish a duplicate weight slip or a load slip for each vehicle weighed, and deliver the slip to the Engineer at the point of delivery of the material.
 5. If the material is shipped by rail, the certified car weights will be accepted, provided only actual weight of material will be paid for and not minimum car weights used for assessing freight tariff. Car weights will not be acceptable for material to be passed through mixing plants. Material to be measured by weight shall be weighed separately for each bid item under which it is to be paid.
 6. Trucks used to haul material being paid for by weight shall be weighed empty daily and at such additional times as the Engineer may require. Each truck shall bear a plainly legible identification mark. The Engineer may require the weight of the material be verified by weighing empty and loaded trucks on such other scales as the Engineer may designate.
- C. Measurement by Volume:
1. Measurement by volume will be by the cubic dimension indicated in the Contractor's submitted bid. Method of volume measurement will be by the unit volume in place or removed as shown on the Contract Drawings or as specified.
 2. When material is to be measured and paid for on a volume basis and it is impractical to determine the volume by the specified method of measurement, or when requested by the Contractor in writing and accepted by the Engineer in writing, the material may be weighed in accordance with the requirements specified for weight measurement. Such weights will be converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Resident Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities will be accepted.
- D. Measurement by Area: Measurement by area will be by the square dimension shown on the Contract Drawings or as specified. Method of square measurement will be as specified.
- E. Linear Measurement: Linear measurement will be by the linear dimension listed or indicated in the Contractor's submitted bid. Unless otherwise indicated, items, components, or Work to be measured on a linear basis will be measured at the centerline of the item in place.

F. Field Measurement for Payment:

1. The Contractor shall take all measurements by providing equipment, workers, and survey crews as required to measure quantities in accordance with the provisions for measurement specified herein. No allowance will be made for specified tolerances.
2. The Engineer will verify all quantities of Work performed by the Contractor on a unit-price basis, for progress payment purposes.

1.06 REJECTED, EXCESS, OR WASTED MATERIALS

- A. Quantities of material wasted or disposed of in a manner not called for under the Contract; rejected loads of material, including material rejected after it has been placed by reasons of the failure of the Contractor to conform to the provisions of the Contract; material not unloaded from the transporting vehicle; material placed outside the lines indicated on the Contract Drawings or established by the Engineer; or material remaining on hand after completion of the Work, will not be paid for, and such quantities shall not be included in the final total quantities. No additional compensation will be permitted for loading, hauling, and disposing of rejected material.

1.07 MEASUREMENT AND PAYMENT

A. Item #1: Mobilization and Demobilization

1. Payment for Mobilization and Demobilization shall be for preparatory work and operations performed by the Contractor including, but not limited to, those necessary for the movement of its personnel, equipment, supplies and incidentals to and from the project site; temporary facilities and controls; for the establishment and removal of its offices, buildings and other facilities necessary for work on the project; for other work and operations which it must perform or costs it must incur before beginning production work on the various items on the project site, and for removal of personnel, equipment, supplies, offices, building facilities, sheds, fencing, and other incidentals from the site.
2. Mobilization and Demobilization shall be paid at the lump sum price listed in the Contractor's submitted bid. Incremental payment shall be made for each location as follows:
 - a. 40% after completion of 5% of the total contract amount of other bid items have been earned.
 - b. 40% after completion of 20% of the total contract amount of other bid items have been earned.
 - c. 20% after completion of all work on the project has been completed, including cleanup and acceptance of the project by the Port.

B. Item #2: Project Administration

1. Item Description: The Work of this item includes all administrative costs associated with administering and supervising the project including, but not limited to supervision of personnel, coordination of all work activities, coordination of subcontractors and/or suppliers, preparation and transmittal of submittals, permit acquisitions, for premiums on bonds and insurance for the project, and project overhead.
2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.

3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.
- C. Item #3: Surface Material Disposal
1. Item Description: The Work of this item includes all labor and equipment associated with the profiling, grinding, removing, hauling and disposal of the existing asphalt and gravel surface .
 2. Measurement: This item will be measured based on the unit price per ton.
 3. Payment: This item will be paid for at the Contract unit price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.
- D. Item #4: Pavement Sawcutting
1. Item Description: The Work of this item includes all labor and equipment necessary for saw cutting the existing asphalt pavement.
 2. Measurement: This item will be measured based on unit price per linear foot.
 3. Payment: This item will be paid for at the Contract unit price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.
- E. Item #5: Storm Drain Installation
1. The Work of this item includes all labor and equipment associated with installation of the storm drain system, including, but not limited to, excavation, trenching, bedding, piping, connections, and backfilling.
 2. Measurement: This item will be measured based on unit price per linear foot.
 3. Payment: This item will be paid for at the Contract unit price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.
- F. Item #6: Stormwater Treatment Structure
1. Item Description: The Work of this item includes all labor and equipment necessary to procure and install new stormwater treatment structures.
 2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
 3. Payment: This item will be paid for at the Contract unit price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.
- G. Item #7: Asphalt Surfacing
1. Item Description: The Work of this item includes all labor and equipment necessary for new asphalt surfacing, including, but not limited to, materials, plant fees, crack sealant, and compaction.
 2. Measurement: This item will be measured based on a unit price per ton.
 3. Payment: This item will be paid for at the Contract unit price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.
- H. Item #8: Type 1 Catch Basin
1. Item Description: The Work of this item includes all labor and equipment necessary for procurement and installation of new type 1 catch basins.

2. Measurement: This item will be measured based on the unit price per each.
 3. Payment: This item will be paid for at the Contract unit price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.
- I. Item #9: Security Fencing
1. Item Description: The Work of this item includes all labor and equipment necessary for removal and disposal of the existing fence and installation of the new security fencing, including, but not limited to, bases, connections, and fittings.
 2. Measurement: This item will be measured based on a unit price per linear foot.
 3. Payment: This item will be paid for at the Contract unit price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.
- J. Item #10: Yard Lighting
1. Item Description: The Work of this item includes all labor and equipment necessary for the procurement, installation and commissioning of new yard lighting including, but not limited to, lights, light pole bases switches, trenching, conduits, connections, handholes, etc.
 2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
 3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.
- K. Item #11: Unforeseen Conditions Allowance
1. Item Description: This contingency will be for UNFORESEEN CONDITIONS for work unidentified at the time of bid and will be paid preferably as negotiated unit price(s) or lump sum(s). If unit prices or lump sums cannot be established, work will be paid on a time and materials basis per section 00 72 00 General Conditions Article 8.0. Work under this bid item shall be accomplished upon written direction from the Engineer as a Minor Change in Work. This entire bid item may or may not be used.
 2. Measurement: This item will be measured based upon the method agreed upon for each Minor Change issued.
 3. Payment: This item will be paid for at the price agreed upon for each Change in Work issued by the Engineer in accordance with procedures noted in Section 01 26 00 – Change Management Procedures.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.02 SUBMITTALS

- A. The Contractor shall submit for approval the following documentation to the Port for force account change orders:
 - 1. List of Labor Rates
 - a. For the Contractor and each subcontractor, a list of labor rates for each trade applicable to the scope of work to be performed. These submitted rates shall be broken down to include the base wage, fringes, FICA, SUTA, FUTA, industrial insurance, and medical aid premiums as stated in the General Conditions. The rates shall not contain any travel time, safety, loss efficiency factors, overhead, or profit. Rates shall be submitted for straight time, overtime, and double time in a form acceptable to the Engineer. Contractor shall provide proof of all labor rate costs as required by the Engineer, including the submission of a copy of the most current Workers Compensation Rate Notice from Labor & Industries and a copy of the Unemployment Insurance Tax Rate notice from the Employment Security Department.
 - 1) If labor rates change during the course of the project or additional labor rates become required to complete the work, the Contractor shall submit new rates for approval.
 - 2. List of Equipment.
 - a. Submit for the Contractor and each subcontractor, a list of equipment and rates applicable to the scope of work to be performed. The equipment rates shall conform to the rates shown on Equipment Watch. A separate page from equipment watch detailing the hourly rate shall be submitted as backup documentation for each piece of equipment.
 - 1) If the list of equipment and/or equipment rates changes during the course of the project or additional equipment becomes required to complete the work, the Contractor shall submit a new list and rates for approval.

1.03 METHOD TO CALCULATE ADJUSTMENTS TO CONTRACT PRICE

- A. One of the following methods shall be used:
 - 1. Unit Price Method;
 - 2. Firm Fixed Price Method (Lump Sum); or,
 - 3. Time and Materials Method (Force Account).
- B. The Port preferred methods are firm fixed price or unit prices.

1.04 MINOR CHANGES IN THE WORK

- A. Engineer will issue a written directive authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.05 PROPOSAL REQUESTS

- A. Port-Initiated Proposal Requests: The Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
1. Work Change Proposal Requests issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
 2. Contractor shall submit a written proposal within the time specified in the General Conditions. The proposal shall represent the Contractor's offer to perform the requested work, and the pricing set forth within the proposal shall represent full, complete, and final compensation for the proposed change and any impacts to any other Contract Work, including any adjustments in the Contract Time.
 - a. Include a breakdown of the changed work in sufficient detail that permits the Engineer to substantiate the costs.
 - 1) Generally, the cost breakdown should be divided into the time and materials categories listed in the General Conditions under Article 8.02.B for either Lump Sum Proposals or Force Account Proposals.
 - 2) For Unit Price Proposals, include the quantity and description of all work involved in the unit pricing being proposed, along with a not to exceed total cost.
 - b. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or differing site conditions require modifications to the Contract, the Contractor may initiate a claim by submitting a request for a change to the Engineer.
1. Notify the Engineer immediately upon finding differing conditions prior to disturbing the site.
 2. Provide follow-up written notification and differing site conditions proposal within the time frames set forth in the General Conditions.
 3. Provide the differing site condition change proposal in the same or similar manner as described above under 1.05.A.
 4. Comply with requirements in Section 00 26 00 Substitution Procedures if the proposed change requires substitution of one product or system for product or system specified.
 5. Proposal Request Form: Use form acceptable to Engineer.

1.06 PROCEEDING WITH CHANGED WORK

- A. The Engineer may issue a directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order per the General Conditions, Article 8.01.E.
1. The directive will contain a description of change in the Work and a not-to-exceed amount. It will designate the method to be followed to determine the change in the Contract Sum or the Contract Time.

1.07 CHANGE ORDER PROCEDURES

- A. Issuance of Change Order
-

1. On approval of the Contractor's proposal, and following successful negotiations, the Engineer will issue a Change Order for signature by the Contractor and execution by the Engineer.
 - a. The Contractor shall sign and return the Change Order to the Engineer within **four (4) days** following receipt of the Change Order from the Engineer. If the Contractor fails to return the signed Change Order within the allotted time, the Engineer may issue a Unilateral Change Directive.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes specifications for preparation, format, and submittal of Schedule of Values.
- B. The Schedule of Values will establish unit prices for individual items of work.
- C. The Schedule of Values will be the basis for payment of contract work.

1.02 PREPARATION

- A. To facilitate monthly pay requests, develop the Schedule of Values based on the Contractor's submitted Bid Items. The Schedule of Values shall be used to provide an allocation of the Work for measurement and payment to a level of detail to ensure accurate payment for the Work accomplished. The Schedule of Values is based on unit priced bid items and a breakdown of each lump-sum bid item. The total dollars for the Schedule of Values shall total the bid amount.
- B. Obtain the agreement of the Engineer on the Schedule of Values. No payment will be made prior to an agreed upon Schedule of Values.
- C. Include an updated version of the Schedule of Values as changes occur. Update the Schedule of Values to include:
 - 1. Dollars earned and percent complete for the current progress payment period,
 - 2. Dollars earned and percent complete to-date, excluding the current progress payment period,
 - 3. Total dollars earned and percent complete to-date,
 - 4. Total dollars remaining, and
 - 5. Changes resulting from Change Orders.
- D. The total value of the line items in the Schedule of Values plus any approved Change Orders shall be equal to the current approved contract price.
- E. The value of stored material shall be identified in the Schedule of Values with both a material-purchase activity and a separate corresponding installation activity in the Construction Schedule(s).
- F. Include as exhibits, drawings or sketches as necessary, to better define the limits of pay items that are in close proximity and that have no clear boundary in the Contract Drawings.

1.03 SUBMITTAL

- A. Submit preliminary Schedule of Values within 10 days of the effective date of the Notice to Proceed.
- B. Submit corrected Schedule of Values within 10 days upon receipt of reviewed Schedule of Values.
- C. At the Engineer's request, submit documentation substantiating the cost allocations for line items within the Schedule of Values.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 SCHEDULE OF VALUES

- A. Submit the Schedule of Values in a form acceptable to the Engineer.
- B. Provide updated Schedule of Values as required by the Engineer and as indicated in the Contract Documents.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

- A. The purpose of this section is to provide the framework for communication between the Port and the Contractor by defining the types and timing of administrative tasks, including meetings and other items related to communications.

1.02 NOTICE TO PROCEED

- A. Contract execution will be made per the requirements of the Contract Documents. Once the contract has been executed and all pre-work submittals have been received, the Engineer will issue a Notice to Proceed (NTP).
 - 1. In certain instances, the Engineer may issue to the Contractor a Limited NTP for specified elements of the work described in these Contract Documents.
- B. The Contractor shall submit all pre-work submittals within 10 days of contract execution.
 - 1. No contract time extension shall be granted for any delays in issuance of the NTP by the Engineer due to the Contractor's failure to provide acceptable submittals required by the Contract Documents.

1.03 COORDINATION

- A. The Contractor shall coordinate all its activities through the Engineer.
- B. The Contractor shall coordinate construction operations as required to execute the Work efficiently, to obtain the best results where installation of one part of the Work depends on other portions.

1.04 PROJECT MEETINGS

- A. Pre-Construction Meeting
 - 1. After execution of the contract, but prior to commencement of any work at the site, a mandatory one time meeting will be scheduled by the Engineer to discuss and develop a mutual understanding relative to the administration of the safety program, preparation of the Schedule of Values, change orders, RFI's, submittals, scheduling prosecution of the work. Major subcontractors who will engage in the work shall attend.
 - 2. Suggested Agenda: The agenda will include items of significance to the project.
 - 3. Location of the Pre-Construction Meeting will be held at the Port of Tacoma Administration Building located at One Sitcum Plaza.
- B. Weekly Progress Meetings – Progress meetings include the Contractor, Engineer, consultants and others affected by decisions made.
 - 1. The Engineer will arrange meetings, prepare standard agenda with copies for participants, preside at meetings, record minutes and distribute copies within ten working days to the Contractor, meeting participants, and others affected by decisions made.
 - a. The Engineer will approve submitted meeting minutes in writing within 10 working days.
 - 2. Attendance is required for the Contractor's job superintendent, major subcontractors and suppliers, Engineer, and representatives of the Port as appropriate to the agenda topics for each meeting.

3. Standard Agenda

- a. Review minutes of previous meeting
- b. Review of work progress
- c. Field observations, problems, and decisions
- d. Identification of problems that impede planned progress
- e. Maintenance of Progress Schedule (3 weeks ahead; 1 week back)
- f. Corrective measures to regain projected schedules
- g. Planned progress during succeeding work period
- h. Coordination of projected progress
- i. Maintenance of quality and work standards
- j. Effect of proposed changes on progress schedule and coordination
- k. Demonstration that the project record drawings are up-to-date
- l. Other business relating to the work

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. The Port and Contractor shall use the Port's provided Project Management applications for electronic information exchange throughout the duration of the Contract, as later described. The joint use of these systems is to facilitate and coordinate the electronic exchange of Requests for Information, Submittals, Change Order Proposals, and project specific correspondence.

1.02 USER ACCESS LIMITATIONS

- A. Contractor's access to Port provided applications is granted and controlled by the Engineer.
 - 1. The users assigned by the Contractor shall be competent and experienced with the practices commonly employed in the industry for electronically submitting requests for information, submittals, product data, shop drawings and related items as required by the contract and the methods commonly used for project correspondence transmission and filing.
 - 2. Any users assigned by the Contractor whom the Engineer determines is incapable of performing the prescribed tasks in an accurate, competent and efficient manner will be removed upon request from the Engineer. The qualifications and identity of a replacement user shall be submitted within 24 hours for consideration by the Engineer. Once accepted by the Engineer, the user account will be modified accordingly.
 - 3. Each user must have their own account. Sharing accounts or login credentials is not allowed.

1.03 CONTRACTOR TECHNOLOGY REQUIREMENTS

- A. The Contractor is responsible for providing and maintaining web enabled devices capable of operating the Trimble Unity Construct web based application and any additional project specific software required by the Engineer effectively.

1.04 CONTRACTOR SOFTWARE REQUIREMENTS

- A. The Contractor is responsible for providing and maintaining the following:
 - 1. An office suite that is Microsoft Office 2013 compatible for generation and manipulation of correspondence.
 - 2. A program capable of editing, annotating and manipulating Adobe pdf files for inserting the Contractor's review stamp, clouding and adding notation to the files as necessary for review by the Engineer.

1.05 CONTRACTOR RESPONSIBILITY

- A. Provide all the equipment, internet connections, software, personnel and expertise required to support the use of Trimble Unity Construct as described in the contract documents.
 - 1. User account creation. Submit the full name and email of each requested user to the Engineer, or their designee. Trimble User Accounts cannot be shared and require a unique email for each user.

1.06 PORT RESPONSIBILITY

- A. Provide the Contractor with the following:

1. Two (2) User Accounts to access Trimble Unity Construct as described above. Additional user accounts may be assigned at the Engineer's discretion.
2. Information, basic user guides and requirements on methods for using Trimble Unity Construct.
3. Instruction for the Contractor's staff utilizing Trimble Unity Construct.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 UTILIZATION OF TRIMBLE UNITY CONSTRUCT

- A. The Contractor shall provide required information in a timely manner that also supports the project schedule and meets the requirements of the Contract.
- B. The Contractor shall provide and maintain competent and qualified personnel to perform the various tasks required to support the work within Trimble Unity Construct
- C. The Port will not be liable for any delays associated from the usage of Trimble Unity Construct including, but not limited to: slow response time, Port maintenance and off-line periods, connectivity problems or loss of information. Under no circumstances shall the usage of Trimble Unity Construct software be grounds for a time extension or cost adjustment to the contract.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes the requirements to provide a preliminary schedule and construction progress schedule, bar chart type.

1.02 SUBMITTALS

- A. Within 10 days following execution of the contract, submit a baseline project schedule defining planned operations.
- B. If the baseline project schedule requires revision after review, submit revised baseline project schedule within 10 days.
- C. Within 20 days after review of baseline project schedule, submit draft of proposed complete baseline project schedule for review.
- D. Submit updated progress schedule monthly to the Engineer with each pay application as required in Section 01 20 00 Price and Payment Procedures.

1.03 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or Consultant specializing in Critical Path Method (CPM) scheduling with one year's minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.04 SCHEDULE FORMAT

- A. The baseline project schedule shall be produced using the CPM format.
- B. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- C. Sheet Size: Multiples of 11 x 17 (280 x 432 mm).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 BASELINE SCHEDULE

- A. Prepare baseline project schedule in the form of a horizontal bar chart.
- B. The baseline project schedule shall include all the activities listed in the Schedule of Values and be directly related to items listed in the Bid Form. The Contractor is encouraged to add sufficient activities to facilitate a clear understanding of the means and methods planned for the various work items.
- C. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction and critical path. At a minimum it shall include and show the following:
 - 1. A time scale showing the elementary work items needed to complete the work;
 - 2. Estimated time durations for each activity, defined as any single identifiable work step within the project;
 - 3. A graphical network diagram showing the logical sequence of activities, their precedence relationships, and estimated float or leeway available for each;

4. The different categories of work as distinguished by crew requirements, equipment requirements, and construction materials; and
 5. The different areas of responsibility, such as distinctly separate or subcontracted work, and identifiable subdivisions of work.
- D. It shall be maintained and updated as necessary to accurately reflect past progress and the most probable future progress.
 - E. Activities shown shall include submittals, milestones, and sufficient task breakdown for major components of work.
 - F. Identify work of separate stages and other logically grouped activities.
 - G. Provide sub-schedules to define critical portions of the entire schedule.
 - H. Provide separate schedule of submittal dates for shop drawings, product data, samples, owner-furnished products, products identified, and dates reviewed submittals will be required from the Engineer. Indicate decision dates for selection of finishes.

3.02 PROGRESS SCHEDULE

- A. From the regularly-maintained baseline project schedule, progress schedules showing a three-week look-ahead, one-week look-back, shall be submitted and distributed at the weekly progress meetings. The progress schedule shall represent a practical plan to complete the work shown within the contract work window presented. At a minimum, the presentation, typically a Gantt-style chart, shall convey the task durations, a logical work sequence, task interdependencies, and identify important or critical constraints.
- B. Submittal and distribution of progress schedules will be understood to be the Contractor's representation that the scheduled work meets the requirements of the contract documents and that the work will be executed in the manner and sequence presented, and over the durations indicated.
- C. The scheduling, coordination, and execution of construction in accordance with the contract documents are the responsibility of the Contractor. The Contractor shall involve, coordinate, and resolve scheduling with all subcontractors, material suppliers, or others affected in development of the progress schedules.
- D. The progress schedule shall be used for coordination purposes for inspection and testing purposes as well as validation of work progress against the baseline schedule.

3.03 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- D. Indicate changes required to maintain Date of Substantial Completion.
- E. Submit reports required to support recommended changes.
- F. Contractor shall submit an updated progress schedule with each pay application and include a written narrative describing the overall progress of the work. The narrative shall include the following key aspects:

1. Progress in the last period.
2. Critical Path progress and schedule concerns.
3. Changes to schedule logic or sequencing of the work.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes the requirements to provide a submittal log and project submittals.

1.02 SUBMITTAL LOG

- A. Contractor shall, within 14 days of contract execution prepare and submit for Engineer approval a detailed log of all the submittals required under this Contract, along with any other submittals identified by the Port or Contractor. The log shall include, but not be limited to, schedules, required construction Work plans, equipment and material cut sheets, shop drawings, project record documents, test results, survey records, record drawings, results of QC testing, and all other items for which a submittal is required. The submittal log shall be organized by CSI Specification Division, and Section number and include the following information:
 - 1. Item Description
 - 2. Category
 - 3. Specification Section information of the applicable section
 - 4. After the submittal log is reviewed and approved by the Engineer, it shall become the basis for the submittal of all items by Contractor.

1.03 COMPLIANCE

- A. Failure to comply with these requirements shall be deemed as the Contractor's agreement to furnish the exact materials specified or materials selected by the Engineer based on these specifications.

1.04 SHOP DRAWINGS AND MANUFACTURERS' LITERATURE

- A. The Port will not accept shop drawings that prohibit the Port from making copies for its own use.
- B. Shop drawings shall be prepared accurately and to a scale sufficiently large to indicate all pertinent features of the products and the method of fabrication, connection, erection, or assembly with respect to the Work.
- C. All drawings submitted to the Engineer for approval shall be drawn to scale as ANSI D.
- D. Required electronic formats for these drawings are as follows:
 - 1. AutoCad DWG
 - 2. PDF - Formatted to print to half-scale using 11x17 paper
- E. Catalog cuts or brochures shall show the type, size, ratings, style, color, manufacturer, and catalog number of each item and be complete enough to provide for positive and rapid identification in the field. General catalogs or partial lists will not be accepted. Manufacturers' original electronic files are required for submitting.

1.05 SUBMITTAL REVIEW

- A. After review of each of Contractor's submittals, the submittal will be returned to Contractor with a form indicating one or more of the following:

1. No Exceptions Taken - Means, accepted subject to its compatibility with future submittals and additional partial submittals for portions of the work not covered in this submittal. But it does not constitute approval or deletion of specified or required items not shown in the partial submittal.
 2. Make Corrections Noted - Same as Item 1, except that minor corrections as noted shall be made by Contractor.
 3. Reviewed - Submittal has been reviewed by the Port, does not constitute approval, and the Contractor is responsible for requirements in submittal.
 4. Review as Noted - Submittal has to be reviewed by the Port with comments as noted.
 5. Revise and Resubmit - Means, rejected because of major inconsistencies or errors. Resolve or correct before next submittal.
 6. Rejected - Means, submitted material does not conform to the Contract Documents in a major respect (e.g., wrong material, size, capacity, model, etc.).
- B. Submittals marked "No Exceptions Taken," "Make Corrections Noted," or "Reviewed as Noted" authorizes Contractor to proceed with construction covered by those data sheets or shop drawings with corrections, if any, incorporated.
- C. When submittals or prints of shop drawings have been marked "Revise and Resubmit" or "Rejected," Contractor shall make the necessary corrections and submit required copies. Every revision shall be shown by number, date, and subject in a revision block, and each revised shop drawing shall have its latest revision numbers and items clearly indicated by clouding around the revised areas on the shop drawing.
- D. Submittals authorized by the Engineer do not in any case supersede the Contract Documents. The approval by the Engineer shall not relieve the Contractor from responsibility to conform to the Drawings or Specifications, or correct details when in error, or ensure the proper fit of parts when installed. A favorable review by the Port of shop drawings, method of work, or information regarding material and equipment Contractor proposes to furnish shall not relieve Contractor of its responsibility for errors therein and shall not be regarded as assumption of risk or liability by the Port or its officers, employees, or representatives. Contractor shall have no claim under the Contract on account of failure or partial failure, or inefficiency or insufficiency of any plan or method of work, or material and equipment so accepted. Favorable review means that the Port has no objection to Contractor using, upon its own full responsibility, the plan or method of work proposed, or furnishing the material and equipment proposed.
- E. It is considered reasonable that the Contractor's submittals shall be complete and acceptable by at least the second submission of each submittal. The Port reserves the right to deduct monies from payments due Contractor to cover additional costs for review beyond the second submission.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PREPARATION OF SUBMITTALS

- A. The Contractor shall submit all shop drawings, catalog cuts, brochures and physical samples using Trimble Unity Construct (a web based construction management software). All post-document-generated notations such as notes, arrows, stamps, clouding, or other items, are required to be shown directly on the submittal document. **Each submittal shall be accompanied by a transmittal developed within the Trimble Unity Construct software.**

- B. A separate submittal shall be prepared for each product or procedure and shall be further identified by referencing the Specification Section and paragraph number and each submittal shall be numbered consecutively.
- C. Product submittals that cannot be accomplished electronically shall be submitted electronically without attachments, marked as being hand delivered, and accompanied by a printed version of a transmittal.
- D. Shop and detail drawings shall be submitted in related packages. All equipment or material details which are interdependent, or are related in any way, must be submitted indicating the complete installation. Submittals shall not be altered once marked "No Exceptions Taken" Revisions shall be clearly marked and dated. Major revisions must be submitted for approval.
- E. The Contractor shall thoroughly review all shop and detail drawings, prior to submittal, to assure coordination with other parts of the work.
- F. Components or materials which require shop drawings and which arrive at the job site prior to approval of shop drawings shall be considered as not being made for this project and shall be subject to rejection and removal from the premises.
- G. All submittal packages including, but not limited to, product data sheets, mix designs, shop drawings and other required information for submittal must be submitted, reviewed and approved before the relevant scheduled task may commence. It is the responsibility of the Contractor to provide the submittal information which may drive a task on the construction schedule to submit items well enough in advance as to provide adequate time for review and comment from the Engineer without adversely impacting the construction schedule.
- H. When completing the Trimble Unity Construct submittal form, a Date Due field is required to be completed. This field is intended to inform the Port of the urgency of the submittal. Failure of the Port to return the submittal by the date provided by the Contractor will not be considered grounds for a contract time extension.

3.02 PRE-WORK SUBMITTALS

- A. Prior to issuance of Notice to Proceed, the following submittals must be submitted and returned to the Contractor as No Exceptions Taken, Make Corrections Noted, Reviewed, or Reviewed as Noted.
 - 1. Per 00 72 00 and 01 32 16, Baseline Project Schedule
 - 2. Per 00 73 63, Emergency Contact Numbers
 - 3. Per 01 35 29, Health and Safety Plan (HASP)
 - 4. Per 01 35 29, Spill Prevention and Countermeasures Plan (SPCC)
 - 5. Per 01 35 43.19 - Soils Management Plan
 - 6. Per 01 35 47, List of equipment and written certification

3.03 MAINTENANCE OF SUBMITTAL LOG

- A. Prepare and submit for Port review a detailed submittal log conforming to the requirements of paragraph 1.02 of this section. When approved by the Engineer, use the submittal log to track the transmittal of submittals to the Engineer, the receipt of submittal comments from the Engineer, and all subsequent action with respect to each submittal. Provide an updated copy of the submittal log to the Engineer during each weekly progress meeting, unless otherwise approved by the Engineer.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. The work includes the requirements for health and safety provisions necessary for all work at the site for this project. The work also includes compliance with all laws, regulations and ordinances with respect to safety, noise, dust, fire and police action, civil disobedience, security or traffic.
- B. Some of the work tasks may place workers in the potential position of coming into contact with regulated building materials, waste, or environmental media. Detailed information regarding the known nature and extent of refuse and regulated materials in the project area is included in Section 00 31 26 Existing Hazardous Material Information.
- C. The Contractor shall monitor site conditions for indications of identified and other potentially hazardous, dangerous, and/or regulated materials (suspicious material). Indicators of suspicious material include, but are not limited to, refuse, oily sheen or coloring on soil or water, or oily or chemical odors. If suspicious materials are encountered, the Contractor shall stop all work in that area and notify the Engineer immediately.
- D. The Contractor is alerted to the possible presence of odorous conditions during excavation and stockpiling of materials due to petroleum hydrocarbons and possibly other odorous gases. Section 00 31 26 Existing Hazardous Material Information describes odorous conditions encountered during site investigations. The Contractor shall take appropriate health and safety measures to assess concentrations of these gases, and mitigate as required. Mitigation measures shall include the use of personal protective equipment, if required.

1.02 SUBMITTALS

- A. Prior to Notice to Proceed, the Contractor shall provide a site specific Health and Safety Plan (HASP), which meets all the requirements of local, state and federal laws, rules and regulations. The HASP shall address all requirements for general health and safety and shall include, but not be limited to:
 - 1. Description of work to be performed and anticipated chemical and/or physical hazards associated with the work;
 - 2. Map of the site(s) illustrating the location of the anticipated hazards and areas of control for those hazards (including containments, exclusion/work zones, and contaminant reduction/decontamination zones);
 - 3. Hazardous material inventory and safety data sheets (SDSs) for all chemicals which will be brought on site;
 - 4. Signage appropriate to warn site personnel and visitors of anticipated site hazards;
 - 5. Documentation that the necessary workers have completed the required Hazardous Waste Operations and Emergency Response (HAZWOPER) training;
 - 6. Engineering controls/equipment to be used to protect against anticipated hazards;
 - 7. Personal protective equipment and clothing including head, foot, skin, eye, and respiratory protection;
 - 8. Procedures which will be used for:
 - a. Lockout/Tagout,

- b. Fall protection,
 - c. Trenching and shoring,
 - d. Hot work,
 - e. Explosive conditions due to methane,
 - f. Oxygen deficient conditions,
 - g. Asbestos and lead hazards,
 - h. Suspicious materials and/or unidentified materials,
 - i. Confined-space entry (could include dewatering storage tanks, manholes, or other items),
 - j. Confined-space rescue, and
 - k. Odorous conditions and toxic gases;
9. Site housekeeping procedures and personal hygiene practices;
 10. Personnel and equipment decontamination plan;
 11. Administrative controls;
 12. Emergency plan including locations of and route to nearest hospital;
 13. Medical surveillance program for site personnel before, during, and after completion of site work;
 14. Recordkeeping including:
 - a. Documentation of appropriate employee training (e.g., Hazardous Waste Operations and Emergency Response [HAZWOPER] 40-hour training for staff involved with excavation and handling of soil),
 - b. Respirator fit testing, and
 15. Name and qualification of person preparing the HASP and person designated to implement and enforce the HASP;
 16. Name and qualifications for Certified Safety Professional (CSP) or Certified Industrial Hygienist (CIH) and a copy of the CIH's or CSP's certification and resume;
 17. Excavation, stockpiling, and truck loading procedures;
 18. Lighting and sanitation; and
 19. Signatory page for site personnel to acknowledge receipt, understanding, and agreement to comply with the HASP.
- B. Prior to the start of any Work, the Contractor shall provide a site specific Spill Prevention, Control and Countermeasures (SPCC) Plan, which meets all the requirements of local, state and federal laws, rules and regulations.
- C. Contractor may submit the HASP and SPCC Plan as one comprehensive document or may submit the plans as separate documents.

1.03 POTENTIAL CHEMICAL HAZARDS

- A. Site Contaminants
-

1. The Contractor must provide site workers with Hazard Communication standard information for potential site contaminants (in accordance with WAC 296-843). The Contractor shall ensure that all site workers are aware of and understand this information. Additional information shall also be provided by the Contractor, as necessary, to meet the Hazard Communication Standard and HASP requirements as noted in WAC 296-901-14010 and 296-843. Workers shall be instructed on basic methods or techniques to assist in detecting suspicious material.

B. Potential Exposures Routes

1. Inhalation: Airborne dusts, fibers, particulates, or vapors may be released during site activities. Inhalation of airborne inorganic arsenic may occur.
2. Skin and Eye Contact: Dusts generated during site work activities may settle on the skin or clothing of site workers. Also, workers may contact potentially regulated sediments, or water, in the normal course of their work. Precautions to prevent skin or eye contact with hazardous materials will be included in the HASP. Arsenic exposure may cause skin irritation.
3. Ingestion: Inadvertent transfer of site contaminants from hands or other objects to the mouth could occur if site workers eat, drink, smoke, chew tobacco, or engage in similar activities in work areas. This could result in ingestion of site contaminants. Precautions to prevent accidental or inadvertent ingestion of hazardous materials will be included in the HASP.

- C. Chemical hazards may also result from Contractor operations resulting in inadvertent release of fuel, oil, or other chemicals in a manner that would expose workers.

1.04 POTENTIAL PHYSICAL AND OTHER HAZARDS

- A. The Work of the Contractor is described elsewhere in these specifications. Precautions to prevent all anticipated physical and other hazards, including heavy equipment and vessels, shall be addressed in the HASP.
- B. Specific aspects of construction resulting in physical hazards anticipated for this project include, but are not limited to the following:
1. Work over or adjacent to water, presenting hazards of falling into water, hypothermia from exposure to the elements, and drowning;
 2. Operation of marine equipment, including winches, dredges, and related equipment, entrapment, ensnarement, and being struck by moving parts hazards;
 3. Completion of diver surveys with specific health and safety elements;
 4. Major hazards associated with earthwork impacts from moving construction vehicles and trucks, noise, thermal stress, contact with unguarded machines, excavation hazards (i.e., cave-in, utility, etc.), strains from heavy lifting, and reduced visibility and communications difficulties in work area; and
 5. Operation of equipment, including excavators, loaders, and related equipment, presenting hazards of entrapment, ensnarement, and being struck by moving parts.
- C. Other anticipated physical hazards:
1. Heat stress, such as that potentially caused by impermeable clothing (may reduce the cooling ability of the body due to evaporation reduction);

2. Cold stress, such as that potentially caused during times when temperatures are low, winds are high, especially when precipitation occurs during these conditions;
3. Biological hazards, such as mold, insect stings, or bites, poisonous plants (i.e., poison oak, sumac, etc.); and
4. Trips and falls.

D. Firewatch Procedures

1. A firewatch is implemented to ensure the fire-safety of a building, structure or area in the event of any act (e.g., hot work) or situation instigating an increased risk of fire. The term "firewatch" is used to describe a dedicated person or persons whose sole responsibility is to look for fires within an established area.
2. A firewatch is required when all hot work is being performed.
3. The firewatch is to perform the following functions:
 - a. Firewatch personnel are to keep diligent watch for fires in the general area where the work is being performed.
 - b. Firewatch personnel are to be familiar with facilities and procedures for sounding an alarm in the event of a fire.
 - c. Firewatch personnel are to have fire extinguishing equipment readily available and be trained in its use, including practice on test fires.
 - d. Firewatch personnel are to inspect the site prior to hot work activities to ensure that combustibles are removed or covered and that any nearby holes or penetrations in the ground and walls are sealed or covered with fire-safe materials.
 - e. Firewatch personnel are to watch for fires in all exposed areas. If a fire is located, firewatch personnel are to sound the evacuation alarm immediately and after that try to extinguish the fire, only when obviously within the capacity of the equipment available.
 - f. The firewatch is to be maintained for at least 120 minutes after completion of hot work such as cutting, welding, or other open flame operations, in order to detect and extinguish smoldering and flaming fires. During this time, the work area and other adjacent areas where sparks or flame may have traveled are to be searched for signs of combustion.

PART 2 - PRODUCTS

2.01 SAFETY SIGNAGE

- A. The Contractor shall provide signage at strategic locations within the project site to alert jobsite workers and visitors of the remediation work, associated hazards, and required precautions.

2.02 PRODUCTS SPECIFIED FOR HEALTH AND SAFETY

- A. Provide the equipment and supplies necessary to support the work as described in the site-specific HASP. Equipment and supplies may include, but are not limited to:
 1. All chemicals to be used on site;
 2. A hazardous materials inventory and SDSs for the chemicals brought on site;
 3. Enclosure equipment (for dust and asbestos fiber control);
 4. Fencing and barriers;

5. Warning signs and labels;
6. Trenching equipment;
7. Fire extinguishers;
8. Equipment to support hot work;
9. Equipment to support lockout/tagout procedures;
10. Scaffolding and fall protection equipment;
11. Personal protective equipment (hard hats, foot gear, skin, eye, and respiratory protection);
12. Area and personnel exposure monitoring equipment;
13. Demolition equipment and supplies;
14. Decontamination equipment and supplies;
15. First aid equipment;
16. Spill response and spill prevention equipment; and
17. Field documentation logs/supplies.

PART 3 - EXECUTION

3.01 WORK AREA PREPARATION

- A. Contractor shall comply with health and safety rules, regulations, ordinances promulgated by the local, state, and federal government, the various construction permits, and other sections of the Contract Documents. Such compliance shall include, but not be specifically limited to: any and all protective devices, equipment and clothing; guards; restraints; locks; latches; switches; and other safety provisions that may be required or necessitated by state and federal safety regulations. The Contractor shall determine the specific requirements for safety provisions and shall have inspections and reports by the appropriate safety authorities to be conducted to ensure compliance with the intent of the regulations.
- B. Contractor shall inform employees, subcontractors and their employees of the potential danger in working with any potentially regulated materials, equipment, soils and groundwater at the project site.
 1. The Contractor shall not proceed with jobsite activities that might result in exposure of employees to hazardous materials, including arsenic, until the HASP is reviewed by the Engineer.
 2. In addition, the Engineer will submit a copy of the Contractor's HASP to Ecology for review. Ecology and the Engineer will review but not approve HASP.
- C. All Contractor employees expected to work at the jobsite or individuals entering the jobsite shall read the Contractor HASP before they enter the jobsite, and will sign a statement provided by the Contractor that they have read and understand the HASP. A copy of the Contractor's HASP shall be readily available at the site at all times the work is being performed.
- D. The Contractor's HASP shall be amended as needed by the CIH or CSP to include special work practices warranted by jobsite conditions actually encountered. Special practices could include provisions for decontamination of personnel and equipment, and the use of special equipment not covered in the initial plan.

- E. Contractor shall perform whatever work is necessary for safety and be solely and completely responsible for conditions of the job site, including safety of all persons (including employees of the Engineer, Engineer's Representative, and Contractor) and property during the Contract period. This requirement applies continuously and is not limited to normal working hours.
- F. The Engineer's review of the Contractor's performance does not include an opinion regarding the adequacy of, or approval of, the Contractor's safety supervisor, the site-specific HASP, safety program or safety measures taken in, on, or near the job site.
- G. Accidents causing death, injury, or damage must be reported immediately to the Engineer and the Port Security Department in person or by telephone or messenger. In addition, promptly report in writing to the Engineer all accidents whatsoever arising out of, or in connection with, the performance of the work whether on, or adjacent to, the site, giving full details and statements of witnesses.
- H. If a claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing within 24 hours after occurrence, to the Engineer, giving full details of the claim.

3.02 SITE SAFETY AND HEALTH OFFICER

- A. Contractor shall provide a person designated as the Site Safety and Health Officer, who is thoroughly trained in rescue procedures, has a minimum current 40-hour HAZWOPER certification (minimum), and trained to use all necessary safety equipment, air monitoring equipment, and gas detectors. The person must be available and/or present at all times while work is being performed, and conduct testing, as necessary.
- B. The Site Safety and Health Officer shall be empowered with the delegated authority to order any person or worker on the project site to follow the safety rules. Failure to observe these rules is sufficient cause for removal of the person or worker(s) from this project.
- C. The Site Safety and Health Officer is responsible for determining the extent to which any safety equipment must be utilized, depending on conditions encountered at the site.

3.03 GENERAL SAFETY GUIDELINES FOR HAZARDOUS GASES

- A. The generally accepted procedure to protect the worker from the effects of the dangers from hazardous gases is through the use of four safeguard measures:
 - 1. Test the atmosphere: Before entering a trench, underground vault, or any other excavation, the atmosphere shall be tested to detect any adverse environmental conditions with a gas detector instrument. Test instruments shall be properly maintained and calibrated. The test shall be conducted from top to bottom of the excavation or every four (4) feet.
 - 2. Ventilate all confined spaces: Before entry and during the entire time workers are in the confined space. Forced ventilation is the generally accepted procedure.
 - 3. Use appropriate safety equipment: All personnel shall be trained to operate the appropriate safety equipment that are to be utilized during the course of their work. It is the responsibility of the Contractor's Site Safety and Health Officer to ascertain that all safety equipment is being used when appropriate.
 - 4. Provide backup safety personnel: Prior to any personnel entering an excavation or confined space, a separate individual shall be positioned outside the space.

- B. Safety Monitoring Instrumentation: The Safety and Health Officer shall have appropriate instruments (detector[s]) to test for oxygen deficiency and for the presence of methane gas, hydrogen sulfide, and/or other known or suspected vapors and gases. The Site Safety and Health Officer shall periodically calibrate the instruments, regularly test the excavation or space areas and other work areas for safe working conditions, and ensure that appropriate safety equipment is available.

3.04 SUPPLEMENTAL SAFETY PROGRAM FOR GASES

- A. Supplemental to the Contractor's regular safety program, the Contractor shall develop and institute procedures to inform all workers at the site of the potential for the presence of methane and other landfill gases emanating from the natural decomposition of refuse buried at or near the job site, and the importance of safety precautions to ensure the safety of workers and the public.
- B. Recommended Precautions: In addition to conforming to safety rules and regulations of governmental authorities having jurisdiction, the Contractor shall conform to the following minimum precautionary measures:
 1. Frequently monitor for all possible hazardous gases, oxygen deficiency and other known or suspected vapors and gases.
 2. Prohibit smoking in or near open excavations, exposed refuse, and in the vicinity of underground pipe laying activities. Smoking will be permitted only in those areas designated by the Site Safety and Health Officer.
 3. In the event toxic gas is present in sufficient quantities to trigger a gas detection alarm, the Contractor shall immediately evacuate all personnel from the area until determined safe by the Site Safety and Health Officer.
 4. Do not use explosives.
 5. Do not leave refuse exposed overnight, unless otherwise approved by the Engineer. Any refuse exposed during construction activities shall be covered with at least a 6-inch layer of earth, tarps, or membrane.
 6. Do not weld in trenches, enclosed areas, or over refuse unless performed in areas tested and approved by the Site Safety and Health Officer.
 7. Construction equipment used in excavation activities and/or refuse removal operations shall be equipped with vertical exhaust and spark arresters.
 8. Electric motors utilized in excavation areas and below ground shall be explosion-proof.
 9. As construction progresses, all pipe openings and valves shall be closed as soon as installed to prevent the migration of gases through the pipeline system.
- C. Suggested Measures: If not already included in the Contractor's standard safety practices, the Contractor shall add the following measures to their safety program:
 1. Workers shall be cautioned on the possibility of collapsing excavations during construction operations near and in open excavations particularly in refuse-filled areas. Anyone working near the edge of deep excavations should be secured with a safety belt, harness, or limit line to preclude the possibility of falling into the opening. Refuse filling operations and compaction is quite variable and therefore may not provide the same slope stability as excavations in native soils.

2. Any personnel working near the edge of well excavations or similar construction should wear a harness securely attached to a lanyard. The lanyard shall be made as short as possible and securely fastened to a safe object.
3. Safe and suitable ladders that project 2 feet above the top of the trench shall be provided for all trenches over 4 feet in depth. A minimum of one ladder shall be provided for each 25 feet of open trench, and be so located that workers in the trench need not move more than 25 feet to a ladder.
4. No worker shall be allowed to work alone in an excavation. An individual shall be positioned outside the excavation, but within eyesight of the workers in the excavation, and assist them should an emergency develop.
5. Work upwind of an excavation where possible, unless the excavation is constantly monitored and declared safe.
6. Workers should avoid contact with exposed refuse where possible.
7. No excavation or drilled hole greater than 2 feet deep shall be left unattended or open overnight unless it is securely covered in a manner acceptable to the Engineer.
8. Fire extinguishers with a rating of at least A, B, and C shall be available onsite.
9. Startup and shutdown of equipment shall be avoided in areas of exposed refuse.
10. Personnel in an open excavation or in the presence of landfill gas shall be fully clothed with appropriate personal protection equipment. Workers shall immediately vacate the excavation if gases are detected therein, and shall not be permitted to re-enter the excavation unless satisfactory precautionary measures are implemented.

3.05 SPILL PREVENTION AND CONTROL

- A. The Contractor shall be responsible for prevention, containment and cleanup of spilling petroleum and other chemicals/hazardous materials used in the Contractor's operations. All such prevention, containment and cleanup costs shall be borne by the Contractor.
- B. The Contractor is advised that discharge of oil, fuel, other petroleum, or any chemicals/hazardous materials from equipment or facilities into state waters or onto adjacent land is not permitted under state water quality regulations.
- C. In the event of a discharge of oil, fuel or chemicals/hazardous materials into waters, or onto land with a potential for entry into waters, containment and cleanup efforts shall begin immediately and be completed as soon as possible, taking precedence over normal work. Cleanup shall include proper disposal of all spilled material and used cleanup materials.
- D. The Contractor shall, at a minimum, take the following measures regarding spill prevention, containment and cleanup:
 1. Fuel hoses, lubrication equipment, hydraulically operated equipment, oil drums and other equipment and facilities shall be inspected regularly for drips, leaks or signs of damage, and shall be maintained and stored properly to prevent spills. Proper security shall be maintained to discourage vandalism.
 2. All land-based chemical, oil and products' storage tanks shall be diked, contained and/or located so as to prevent spills from escaping into the water. Dikes and containment area surfaces shall be lined with impervious material to prevent chemicals or oil from seeping through the ground and dikes.

3. All visible floating sheen shall be immediately contained with booms, dikes or other appropriate means and removed from the water prior to discharge into state waters. All visible spills on land shall be immediately contained using dikes, straw bales or other appropriate means and removed using sand, sawdust or other absorbent material, which shall be properly disposed of by the Contractor. Waste materials shall be temporarily stored in drums or other leak-proof containers after cleanup and during transport to disposal. Waste materials shall be disposed offsite in accordance with applicable local, state and federal regulations.
 4. In the event of any oil or product discharges into public waters, or onto land with a potential for entry into public waters, the Contractor shall immediately notify the Port Security at their listed 24-hour response number:
 - a. Port Security: 253-383-9472
- E. The Contractor shall maintain the following materials (as a minimum) at each of the project sites:
1. Oil-absorbent booms: 100 feet;
 2. Oil-absorbent pads or bulk material, adequate for coverage of 200 square feet of surface area;
 3. Oil-skimming system; and
 4. Oil dry-all, gloves, and plastic bags.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section discloses procedures to follow if unknown regulated materials are encountered.

1.02 NOTIFICATION AND SUSPENSION

- A. In the event the Contractor detects the presence of potentially regulated materials not previously identified in this specification, the Contractor shall stop work and immediately notify the Port. Following such notification by the Contractor, the Port shall in turn notify the various governmental and regulatory agencies concerned with the presence of regulated materials, if warranted. Depending upon the type of materials identified, the Port may suspend work in the vicinity of the discovery under the provisions of General Conditions.
 - 1. Following completion of any further testing necessary to determine the nature of the materials involved, the Port will determine how the material shall be managed. Although the actual procedures used in resuming the work shall depend upon the nature and extent of the regulated material, the following alternate methods of operation are foreseen as possible:
 - a. Contractor to resume work as before the suspension.
 - b. Contractor to move its operations to another portion of the work until measures to eliminate any hazardous conditions can be developed and approved by the appropriate regulatory agencies.
 - c. The Port to direct the Contractor to dispose or treat the material in an approved manner.
 - d. The Port to terminate or modify the Contract accordingly, for unforeseen conditions.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Soils that cannot be reused onsite and are anticipated to be exported to an off-site facility must have a completed soil profile prior to export. The Port will conduct testing of material as defined further in this specification. The Contractor is responsible for any additional testing necessary to satisfy requirements of the Contractor's receiving facility.
- B. Soils excavated within the project area, as shown on the drawings, are anticipated to be free of regulated material; however, should the Contractor identify soil that cannot be reused as part of the project, the Contractor shall notify the Engineer to determine if the soil requires special handling.
 - 1. Soil with unexpected regulated material, as identified by visual and/or olfactory methods, shall be segregated from other excavated material until such time as appropriate testing and analysis can be completed by the Port. Upon completion of the soil profile, the Engineer will inform the Contractor of any special handling requirements based on the results.
 - 2. Soil beyond construction excavation limits will not require excavation unless free draining product is observed or other special conditions exist; in which case the Engineer will direct the Contractor in additional excavation. Soils determined to require special handling will be hauled and disposed of at an approved disposal facility.
- C. No soil shall be removed from the site without prior notification to the Engineer. The notification shall include:
 - 1. An estimate of the number of truck-trips, the haul destination, and the period in which these trips will be made (e.g., 20 truck-trips to the Waste Management Facility over the two-week period beginning on March 1, 2022).

1.02 DEFINITIONS

- A. Olfactory Indications (methods): Of or relating to the sense of smell. Soils containing petroleum and other volatile constituents typically exhibit characteristic odors that can be detected (and sometimes identified) by smell.
- B. Regulated Material: Any chemical, physical, biological, or radiological substance that does not occur naturally in the environment, or that occurs at concentrations higher than natural background levels, and is regulated by agencies as to the disposal/recycling facility(ies) the material can and cannot go (i.e., EPA, Department of Ecology, Tacoma-Pierce County Health Department).
- C. Soil (waste) Profile: A characterization of the chemical and physical properties of soil material designated for off-site disposal, including the presence of pollutants and their concentrations as measured by approved laboratory analytical methods. A profile is required by the receiving permitted disposal or recycling facility.
- D. Special Handling: Refers to hauling and disposal of soils that cannot be reused in place as backfill or as general fill at another (off-site) location due to the presence of pollutants in concentrations above allowable limits. Such soils must be hauled to and managed at a permitted disposal facility.

- E. Type A Regulated Soil: Soil that must be removed from the Project site and has been determined by the Engineer to contain pollutants in concentrations that exceed state or federal dangerous or hazardous designations (respectively), or other special Port-determined criteria. Type A Regulated Soil requires disposal at an approved Subtitle C hazardous waste landfill.
- F. Type B Regulated Soil: Soil that must be removed from the Project site and has been determined by the Engineer to contain pollutants in concentrations that are below dangerous or hazardous levels, but could negatively impact the quality of air, waters of the state, soils or sediments, or pose a threat to the health of humans or other living organisms, depending on where the soil is disposed. Type B Regulated Soil requires disposal an approved Subtitle D solid waste landfill.
- G. Type C Regulated Soil: Soil that must be removed from the Project site and has been determined by Engineer to contain unknown constituent(s) and/or in unknown concentration(s) and requires further analysis and characterization. Type C Regulated soil will require disposal at an approved Subtitle C hazardous waste landfill or Subtitle D solid waste landfill if additional soil characterization indicates special handling is required.
- H. Type D Soil: Soil determined by the Engineer not to require special handling with regard to this Contract. Classification of material as Type D Soil by the Port is not a certification nor does it release the Contractor of liability or obligation to meet any disposal or storage facility acceptance or testing requirements.
- I. Unexpected Regulated Material: Regulated material unexpectedly found in an excavation or in other locations where there is no prior knowledge, information, or history to indicate possible spills or releases of regulated material.
- J. Visual Indications (methods): A preliminary evaluation of the potential presence of contamination based on visual observation. For example, soils containing petroleum are frequently discolored or stained relative to non-petroleum impacted native soils or clean fill.

1.03 HEALTH AND SAFETY

- A. The Contractor is required to implement all health and safety provisions as required by Specification 01 35 29 – Health, Safety and Emergency Response. These provisions include any special monitoring, personal protective equipment, or work plans to accommodate regulated soil or material special handling. Use of environmental characterization data may not be appropriate for health and safety purposes.

1.04 SUBMITTALS

- A. Prior to excavation of any subsurface materials, the Contractor shall submit a Soils Management Plan to the Engineer. The Soils Management Plan must be approved by the Engineer prior to any excavation of subsurface materials. The Soils Management Plan must include the following:
 - 1. Identification of all soil disposal facilities anticipated to be used for soils that are determined to be Type A or Type B Regulated Soil.
 - 2. Identification of all fill sites, disposal/recycling facilities and/or end uses anticipated to be used for soil determined to be Type D Soil in accordance with paragraph 3.02 of this section.
 - 3. Contingency for delivery and placement of Type C Regulated Soil at an on-site soil stockpile area.

4. Contingency for managing soil/debris encountered during excavation that may disqualify soil for disposal or recycle at the anticipated facilities.
 5. General description of how equipment operators, safety staff and other applicable on-site personnel will identify and respond to soil containing potentially regulated material.
 6. Contractor shall coordinate with the Engineer to facilitate handling of regulated soil in accordance with this specification.
 7. Description of all haul routes to be used on the project.
- B. A completed soil profile prior to export to an off-site receiving facility.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 EXCAVATION/TESTING

- A. The field-testing for soil to be exported offsite will be performed by the Port and will result in the following classification of material:
1. Type A Regulated Soil as defined in 1.02(E) of this Section
 2. Type B Regulated Soil as defined in 1.02(F) of this Section
 3. Type C Regulated Soil as defined in 1.02(G) of this Section
 4. Type D Soil as defined in 1.02(H) of this Section
- B. Contractor shall give Port no less than one week notice for sampling export soil prior to disposal offsite. Contractor shall anticipate at least two weeks for lab results.
- C. Laboratory turnaround times may require additional time for analytical results; therefore, Contractor should coordinate with Engineer well in advance of anticipated disposal date. Samples that are required to have "rush" analysis performed due to the Contractor's failure to disclose the anticipated disposal date shall have the difference in service fees paid by the Contractor, or the Contractor may delay the disposal until the standard analysis turnaround time is complete, at no additional cost to the Port.

3.02 TRANSPORTATION AND OFF-SITE DISPOSAL OF SOILS

- A. The Contractor shall be responsible for handling, re-handling, loading, transporting, and legal off-site removal of all waste materials and excavated soils not reused onsite.
1. Contractor shall ensure that transport truck gross weight meets federal and/or state Department of Transportation (DOT) requirements and the requirements of the receiving facility, whichever is more stringent.
 2. Contractor shall take measures to prevent debris from being spilled from trucks or tracked from the site to local streets. Contractor shall sweep streets adjacent to the site as necessary or as directed by the Engineer.
 3. Contractor shall ensure that any vehicle transporting materials offsite are properly labeled and placarded in accordance with federal and state DOT requirements.
- B. Type A Regulated and Type B Regulated Soil shall be hauled to an approved facility by the Contractor for disposal.

- C. Type C Regulated Soil is of unknown origin or special circumstances. Type C Regulated Soil shall be hauled to an on-site segregated stockpile area. The Contractor shall protect the material from weather and other disturbances once stockpiled. The Port will inform the Contractor of the soil profile following additional analysis of the suspect material (as needed), and the soil will be categorized as either Type A Regulated, Type B Regulated or Type D Soil and disposed of accordingly.
- D. Type D Soil that is not reused onsite shall be hauled by the Contractor to a site determined by the Contractor. If the receiving/disposal facility requires additional testing or certification of this soil, Contractor shall complete these requirements, at no additional cost to the Port. The Port will not certify or declare the material suitable for unrestricted use.

3.03 OTHER REQUIREMENTS

- A. Type A, Type B or Type C Regulated Soil may be, upon approval of the Engineer, temporarily stockpiled within the construction area. Contractor shall place an impervious liner beneath the soil and securely cover the stockpile with waterproof covering (e.g., plastic sheeting). Additional measures (e.g., berm, jersey barriers, silt fence, etc.) may be required to minimize soil runoff from the stockpile area. The soil shall be removed prior to completion of Work.
- B. Contractor shall provide the Engineer with all hauling receipts (or copies of receipts) from the disposal facility for all Type A, Type B or Type C Regulated Soil at least weekly.
- C. The Engineer may shut down excavation activities should unexpected regulated material be encountered during excavation.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. The Work includes the requirements to provide air and noise control measures until Final Completion of the Work.

1.02 SUBMITTALS

- A. Prior to Notice to Proceed, the Contractor shall submit a list of equipment to be used on the project and written certification that all equipment on the list and any additional equipment, including Contractor's, subcontractors or supplier's equipment, shall meet the requirements of 3.01 below.

PART 2 - PRODUCTS - NOT USED

PART 3 – EXECUTION

3.01 AIR POLLUTION CONTROL

- A. The Contractor shall meet or exceed EPA Tier 2 off-road diesel engine emission standards for off-road equipment \geq 25hp and meet or exceed EPA 1994 on-road diesel engine emission standards for on-road equipment except as follows:
 - 1. Equipment being used in an emergency or public safety capacity
- B. The Contractor shall not discharge smoke, dust, and other hazardous materials into the atmosphere that violate local, state or federal regulations.
- C. No vehicles can idle for more than 5 consecutive minutes, except as follows:
 - 1. Idling is required to bring or maintain the equipment to operating temperature;
 - 2. Engine idling is necessary to accomplish work for which the equipment was designed (i.e. operating a crane); or
 - 3. Idling vehicles being used in an emergency or public safety capacity.
- D. The Contractor shall minimize nuisance dust by cleaning, sweeping, vacuum sweeping, sprinkling with water, or other means. Equipment for this operation shall be on the job site or available at all times.

3.02 NOISE CONTROL

- A. The Contractor shall comply with all local controls and noise level rules, regulations and ordinances which apply to work performed pursuant to the Contract.
- B. All internal combustion engines used on the job shall be equipped with a muffler of a type recommended by the manufacturer.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. The Work shall consist of the procedures to be followed in the event that cultural and/or historical resources are inadvertently discovered during the projects activities.

PART 2 – PRODUCTS – NOT USED.

PART 3 – EXECUTION

3.01 PROTOCOLS FOR DISCOVERY OF ARCHAEOLOGICAL RESOURCES

- A. In the event that archaeological resources are encountered within the project, the following actions will be taken:
 - 1. All ground disturbing and construction activity at the specific location will stop and the area will be protected via temporary fencing or other appropriate measures.
 - 2. The Contractor's work supervisor will be notified immediately.
 - 3. Contact the PORT's Engineer and Environmental Project Manager immediately.
 - 4. A work stoppage zone, as determined by the Archaeologist and PORT, will be established.
 - 5. The PORT's Environmental Project Manager will contact the appropriate agencies where the discovery is located as well as the Washington State Department of Archaeology and Historic Preservation (DAHP) the Puyallup Tribe (TRIBE) and the U.S. Army Corps of Engineers (Corp).
 - 6. The Work Stoppage Zone will remain protected until further decisions can be made regarding the area.
 - 7. The Contractor will be allowed to continue ground disturbing and other construction activities outside of the established work stoppage zone.

3.02 PROTOCOLS FOR DISCOVERY OF HUMAN REMAINS

- A. In the event of that human remains are encountered within the project, the following actions, consistent with RCWs 68.50.645, 27.44.055 and 68.60.055 will be taken:
 - 1. All ground disturbing and construction activity at the specific location will stop and the area will be protected via temporary fencing or other appropriate measures. The remains will not be touched, moved or further disturbed.
 - 2. The Contractor's work supervisor will be notified immediately.
 - 3. Contact the Port's Engineer and Environmental Project Manager immediately.
 - 4. The Environmental Project Manager will notify the county medical examiner / coroner and local law enforcement.
 - 5. A Work Stoppage Zone will be determined and remain protected until further decisions can be made regarding the area.
 - 6. The Contractor will be allowed to continue ground disturbing and other construction activities outside of the established work stoppage zone.

3.03 PROTOCOLS FOR CONFIDENTIALITY

- A. In the event of that human remains or cultural resources are discovered within the project area, the Port and the Contractor shall keep and maintain all information regarding any discovery confidential.
 - 1. At no time shall the Contractor contact the media, any third party or otherwise share information regarding the discovery with any member of the public.
 - 2. If the Contractor is contacted by the media or the public regarding any discovery, they shall refrain from comment, and contact the Port's Environmental Project Manager immediately.

END OF SECTION

PART 1 - GENERAL

1.01 PERMITS, CODES, AND REGULATIONS

- A. The following permits/approvals have been applied for (or are on file) and incorporated into the Contract Documents:
 - 1. City of Tacoma Site Development Permit No. SDEV25-0257
 - a. Permit approval is pending completion of a required pre-construction meeting with the City of Tacoma.
- B. Conform with the requirements of listed permits and additional or other applicable permits, codes, and regulations as may govern the Work.
- C. Obtain and pay fees for licenses, permits, inspections, and approvals required by laws ordinances, and rules of appropriate governing or approving agencies necessary for proper completion of Work (other than those listed under item 1.01.A above and Special Inspections called for by the International Building Code).
- D. Conform with current applicable codes, regulations and standards, which is the minimum standard of quality for material and workmanship. Provide labor, materials, and equipment necessary for compliance with code requirements or interpretations, although not specifically detailed in Drawings or specifications. Be familiar with applicable codes and standards prior to bidding.
- E. Process through Engineer, request to extend, modify, revise, or renew any of the permits (listed in 1.01.A above). Furnish requests in writing and include a narrative description and adequate Drawings to clearly describe and depict proposed action. Do not contact regulatory agency with requests for permit extensions, modifications, revisions, or renewals without the prior written consent of the Engineer.

1.02 VARIATIONS WITH CODES, REGULATIONS AND STANDARDS

- A. Nothing in the Drawings and specifications permits Work not conforming to codes, permits, or regulations. Promptly submit written notice to the Engineer of observed variations or discrepancies between the Contract Documents and governing codes and regulations.
- B. Appropriate modifications to the Contract Documents will be made by Change Order to incorporate changes to Work resulting from code and/or regulatory requirements. Contractor assumes responsibility for Work contrary to such requirements if Work proceeds without notice.
- C. Contractor is not relieved from complying with requirements of Contract Documents which may exceed, but not conflict with requirements of governing codes.

1.03 COORDINATION WITH REGULATORY AGENCIES

- A. Coordinate Work with appropriate governing or regulating authorities and agencies.
- B. Provide advance notification to proper officials of Project schedule and schedule revisions throughout Project duration, in order to allow proper scheduling of inspection visits at proper stages of Work completion.
- C. Regulation coordination is in addition to inspections conducted by Engineer. Notify Engineer at least 48 hours in advance of scheduled inspections involving outside regulating officials, to allow Engineer to be present for inspections.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes requirements relating to referenced standards.

1.02 QUALITY ASSURANCE

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue specified in this section, except where a specific date is established by applicable code.
- C. Should specified reference standards conflict with Contract Documents, request clarification from the Engineer before proceeding.
- D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Engineer shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 QUALITY CONTROL FOR COMPLIANCE:

- A. The Contractor shall perform such detailed examination, inspection, quality control and assurance of the Work as to ensure that the Work is progressing and is being completed in strict accordance with the Contract Documents. The Contractor shall plan and lay out all Work in advance of operations so as to coordinate all Work without delay or revision. The Contractor shall be responsible for inspection of portions of the Work already performed to determine that such portions are in proper condition to receive subsequent Work. Under no conditions shall a portion of Work proceed prior to preparatory work having been satisfactorily completed. The Contractor shall ensure that the responsible Subcontractor has carefully examined all preparatory work and has notified the Contractor (who shall promptly notify the Port in writing) of any defects or imperfections in preparatory work that will, in any way, affect completion of the Work.

1.02 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop Drawings or as instructed by the manufacturer.
- G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.04 TESTING SERVICES

- A. Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities.
 - 1. Neither observations by an inspector retained by the Port, the presence or absence of such inspector at the site, nor inspections, tests, or approvals by others, shall relieve the Contractor from any requirement of the Contract Documents, nor is any such inspector authorized to change any term or condition of the Contract Documents.

- B. Necessary materials testing shall be performed by an independent testing laboratory during the execution of the Work and paid for by the Port of Tacoma, unless otherwise specified. Access to the area necessary to perform the testing and/or to secure the material for testing, shall be provided by the Contractor.
- C. Testing does not relieve Contractor from performing work to contract requirements.
- D. Re-testing required because of non-conformance to specified requirements will be charged to the Contractor by deducting testing charges from the Contract Sum via Change Order.
- E. Material testing for initial material approval will be performed by an independent, certified laboratory and paid for by the Contractor. These tests must be dated within six (6) months of the submittal date.
- F. Subsequent sampling and testing, required as the work progresses to ensure continual control of materials and compliance with all requirements of the Contract documents, shall be the responsibility of the Port, except as required by other sections of these Specifications.

1.05 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up equipment, test, and adjust and balance equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer 30 days in advance of required observations. Observer subject to approval of Engineer.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes requirements relating to the following:
 - 1. Temporary utilities,
 - 2. Temporary telecommunications services,
 - 3. Temporary sanitary facilities,
 - 4. Temporary Controls: Barriers, enclosures, and fencing, and
 - 5. Field offices.

1.02 TEMPORARY UTILITIES

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes. Contractor is responsible for getting required permits and meters from the City of Tacoma.
- B. Existing facilities may not be used.
- C. New permanent facilities may not be used.
- D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization. It is the Contractor's responsibility to be able to receive phone calls and emails at the job site.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.
- C. At end of construction, return facilities to same or better condition as originally found.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for Port's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

- A. Construction: Contractor's option.
- B. Provide 6 ft. (1.8 m) high fence around construction site; equip with sufficient with locks.

1.07 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to final inspection.

- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.
- D. Restore new permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes requirements relating to the following:
 - 1. Access roads
 - 2. Parking
 - 3. Construction parking controls
 - 4. Traffic Control
 - 5. Flares and lights
 - 6. Haul routes
 - 7. Maintenance
 - 8. Removal, repair
 - 9. Mud from site vehicles

PART 2 - PRODUCTS

2.01 SIGNS, SIGNALS, AND DEVICES

- A. Post Mounted and Wall Mounted Traffic Control and Informational Signs, as specified.
- B. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.
- C. Flag Person Equipment: As required by local jurisdictions.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

3.02 ACCESS TO SITE

- A. Contractor shall conduct all business through the gate assigned by the Engineer.
 - 1. The Contractor may be required to relocate entry and related work areas as required by Port Operations.
- B. Provide unimpeded access for emergency vehicles. Maintain 20 foot (6 m) width driveways with turning space between and around combustible materials.
- C. Provide and maintain access to fire hydrants free of obstructions.

3.03 PARKING

- A. All Contractor's employee cars and work vehicles will be parked on-site as designated by the Engineer.

3.04 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Port operations.
- B. Prevent parking on or adjacent to access roads or in non-designated areas.

3.05 TRAFFIC CONTROL

- A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
- B. The Contractor shall erect and maintain all construction signs, warning signs, detour signs, flaggers and other traffic control devices necessary for the safe ingress and egress of the Project Site. Traffic control shall include but is not limited to:
 - 1. Flaggers to direct traffic as required by Tacoma Rail to accommodate the Contractor's work.
 - 2. The Contractor shall be liable for injuries and damages to persons and property suffered by reason of the Contractor's operations or any negligence in connection therewith.
 - 3. Flagging, signs, and all other traffic control devices furnished or provided shall conform to established WSDOT and City of Tacoma standards. No work shall be done on or adjacent to the above locations until all necessary signs and traffic control devices are in place. During the course of the work, the Contractor shall be responsible for providing and maintaining adequate traffic control measures for the protection of the Contractor's work and the public.

3.06 FLARES AND LIGHTS

- A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.07 HAUL ROUTES

- A. Confine construction traffic to designated haul routes.
- B. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.08 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, Products, mud, snow, and ice.
- B. Maintain existing paved areas used for construction. Promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.09 REMOVAL, REPAIR

- A. Repair existing facilities damaged by use, to original condition.
- B. Repair damage caused by installation.

3.10 PUBLIC STREET AND ONSITE ROADWAY CLEANING

- A. The Contractor shall be responsible for preventing dirt and dust escaping from trucks and other vehicles operating on or departing the project site by sweeping, covering dusty loads, washing truck tires, and all other reasonable methods.
- B. When trucks and other equipment are operating on paved public streets and site roadways/paved surfaces, the Contractor will be required to clean said streets, roadways, and other paved surfaces at least daily, and at other times if required by the Engineer.

- C. In the event that the above requirements are violated and no action is taken by the Contractor after notification of infraction by the Engineer, the Port reserves the right to have the streets, roadways, and other paved surfaces in question cleaned by others and have the expense of the operation charged to the Contractor.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. The Work shall consist of planning, installing, inspecting, maintaining and removing Temporary Erosion and Sediment Control (TESC) Best Management Practices (BMPs) to prevent pollution of air and water; and to control, respond to, and dispose of eroded sediment and turbid water during the term of the Contract.
- B. These TESC requirements shall apply to all areas associated with the Work, including but not limited to the following:
 - 1. Work areas;
 - 2. Equipment and material storage areas;
 - 3. Staging areas;
 - 4. Stockpiles; and
 - 5. Discharge points within or adjacent to the work areas that are impacted by stormwater runoff from the site.
- C. Acceptance of TESC plans does not constitute an approval of permanent Work or drainage design (e.g., size and location of roads, pipes, restrictors, channels, retention facilities, utilities, etc.).
- D. Contractor shall read and conform to all requirements set forth in Washington Department of Ecology's (Ecology) Phase I Municipal Stormwater Permit (MS4) for projects less than one acre.

1.02 REFERENCES

- A. The rules, requirements, and regulations that apply to this Work include, but are not necessarily limited to the following:
 - 1. Washington Department of Ecology, "Stormwater Management Manual for Western Washington," current version.
 - 2. Washington Department of Ecology Phase I Municipal Stormwater Permit (MS4), current version.
 - 3. Washington State Department of Transportation, current version, Standard Specification M41-10, Division 8-01 Erosion Control and Water Pollution Control.
 - 4. Pierce County Stormwater and Site Development Manual, current version (if applicable).

1.03 SUBMITTALS

- A. Prior to the start of any construction activities, a Construction Stormwater Pollution Prevention Plan (SWPPP), as required by the MS4.
 - 1. Contractor shall comply with a Contractor provided project SWPPP.
 - 2. Contractor shall be responsible for updating the project SWPPP during construction to reflect the required changes to BMPs and personnel, as needed, to comply with the MS4 at no additional cost to the Port.
- B. Safety Data Sheet (SDS) for any dust palliative product.

- C. A copy of all Contractor site inspection logs at a time interval (e.g., weekly, monthly) specified by the Engineer.
- D. Water Management Plan/Temporary Dewatering Plan.

1.04 AUTHORITY OF ENGINEER

- A. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations, as determined by analysis of project conditions; and to direct the Contractor to provide immediate permanent or temporary pollution control measures to minimize impacts to adjacent streams or other watercourses, lakes, ponds, and other areas of water impoundment.
- B. In the event that areas adjacent to the work area are suffering degradation due to erosion, sediment deposit, water flows, or other causes, the Engineer may stop construction activities until the Contractor rectifies the situation.

PART 2 – PRODUCTS

2.01 DUST CONTROL

- A. Dust palliative for dust control proposed by the Contractor and approved by the Engineer.

PART 3 – EXECUTION

3.01 GENERAL

- A. The Port is subject to a Phase I Municipal Stormwater Permit (MS4). The Contractor shall be responsible for compliance with the Department of Ecology Western Washington Stormwater Management Manual, Volume II, Construction Stormwater Pollution Prevention for the duration of the project.
- B. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply as determined by the Engineer.
- C. No project discharge of water shall be allowed that exceeds the regulated pollutant levels in Ecology's NPDES permit associated with the Project and any CSGP-associated Administrative Orders (if applicable).
- D. Contractor shall be solely responsible for all BMP modifications and upgrades to comply with the MS4 and the requirements of this Section, at no additional cost to the Port.
- E. Contractor shall be solely responsible for any damages and fines incurred because of Contractor, subcontractor, or supplier actions in implementing the requirements of this Section.
- F. The Contractor shall be solely responsible for schedule impacts incurred because of Contractor, subcontractor, or supplier actions in implementing the requirements of this Section.

3.02 TEMPORARY EROSION AND SEDIMENT CONTROL DEVELOPMENT

- A. Contractor shall prepare and submit a site-specific SWPPP prior to initiating ground disturbing activities.
 - 1. The SWPPP describes construction activities and sequencing, and the proposed Temporary and Permanent Erosion and Sediment Control measures. If there are any changes to BMPs or personnel on the site, Contractor must update the SWPPP and be prepared to submit the SWPPP to the Port and Ecology upon request.

2. The SWPPP shall consist of planning, installing, inspecting, maintaining, and removing TESC BMPs per Volume II of the Stormwater Management Manual for Western Washington (current version) or equivalent. The BMPs shown in the Drawings are the minimum required to prevent pollution of air and water, to control peak volumetric flow rates and velocity of stormwater, and to control, respond to, and dispose of eroded sediment and turbid water during the term of the Contract.
 3. A SWPPP template is available to the Contractor for this purpose in Appendix A. The template was prepared by the Port to meet part of the National Pollution Discharge Elimination System (NPDES) stormwater permit requirements for the project. Contractor may use the applicable Port template to prepare the project SWPPP or prepare their own SWPPP. If the Contractor elects to prepare their own SWPPP, it must meet or exceed the control measures required by Ecology (reference Ecology's Stormwater Management Manual for Western Washington, current version).
 4. If Contractor chooses to write a SWPPP separate from the Port-provided SWPPP, it must comply with all of the requirements set forth by the CSGP.
- B. Contractor shall develop project-specific TESC BMPs and incorporate them into the SWPPP. Contractor shall address the following issues as part of developing and implementing the BMPs:
1. TESC BMPs must meet the requirements in Ecology's Volume II of the Stormwater Management Manual for Western Washington (current version) or equivalent.
 2. TESC notes and details shown in the Drawings and the information in this Section form a basis of the minimum requirements for a TESC Plan. Contractor shall develop a TESC Plan specific to the construction schedule and proposed means and methods prior to commencing construction activities for the duration of the Project.
- C. Contractor shall inspect the existing system and report to the Engineer the levels of existing material prior to installation of TESC BMPs.

3.03 TEMPORARY EROSION AND SEDIMENT CONTROL IMPLEMENTATION

- A. Contractor is responsible for implementing and updating the SWPPP including TESC BMPs.
1. Contractor shall inspect the TESC measures daily and maintain these measures to ensure continued proper functioning for the duration of the Project.
 2. Contractor will be responsible for documenting TESC site inspections on a weekly basis in areas of active construction and on a monthly basis in areas that have undergone stabilization. Contractor shall keep records of the inspections on site.
 3. During the construction period the Contractor shall, at no additional cost to the Port, upgrade and/or maintain TESC measures as needed, based on Contractor means and methods, work sequencing, and changing site conditions (e.g., changes to impervious surface coverage, proximity of work to storm conveyance systems, storm events, etc.). Contractor shall modify these measures for changing site conditions and update the SWPPP to document all modifications made.
- B. Contractor shall clean all stormwater components affected by construction debris prior to Work completion, per TESC BMPs for catch basin maintenance. The cleaning process shall not flush sediment-laden water into a downstream system.

- C. Contractor shall ensure that water, or a dust palliative and a dispensing subcontractor, if needed, is available for project use. It is the responsibility of the Contractor to develop and adhere to appropriate safety measures pertaining to the palliative use. This also includes ensuring the dispensing subcontractor develops and adheres to the appropriate safety measures, if a dispensing subcontractor is used. Water used for dust suppression shall not be applied at such a rate or in a location that it will generate runoff from the site.
- D. Areas of exposed soils, including embankments, which will not be disturbed for two days during the wet season (October 1 through April 30) or seven days during the dry season (May 1 through September 30), shall immediately be stabilized by the Contractor with an Ecology-approved TESC measure (e.g., seeding, mulching, plastic covering, etc.).
- E. TESC measures in an inactive area shall be inspected and maintained by the Contractor until the area is permanently stabilized.
- F. In the event that additional temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the Work as scheduled or as ordered by the Engineer, such work shall be performed by the Contractor at its own expense.
- G. Contractor shall remove all TESC facilities, install permanent site surfacing improvements and permanent BMPs with minimal disturbance, and shall clean stormwater facilities prior to Work completion.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes the requirements to provide product data under the applicable specification section.

1.02 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 - PRODUCTS

2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.

2.02 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PART 3 - EXECUTION

3.01 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.02 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Prevent contact with material that may cause corrosion, discoloration, or staining.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes information on warranty, operation and maintenance manuals, and as built documentation.
- B. Prior to requesting final inspection, the Contractor shall assure itself that the project is complete in all aspects.

PART 2 - PRODUCTS

2.01 WARRANTY

- A. The Contractor warrants the labor, materials and equipment delivered under the contract to be free from defects in design, material, or workmanship, and against damage caused prior to final inspection. Unless otherwise specified, this warranty extends for a period of one (1) year from the date of Substantial Completion.
- B. The Contractor shall promptly (within 48-hours) repair or replace all defective or damaged items delivered under the contract. The Contractor will haul away all defective or damaged items prior to Substantial Completion.
- C. In the event of equipment failure, during such time or in such a location that immediate repairs are mandatory, the Contractor shall respond promptly, irrespective of time. If the Contractor is not available, the Port will effect repairs. The Contractor shall then reimburse the Port for parts and labor necessary to correct deficiencies as defined within the warranty clause and time.

2.02 OPERATION AND MAINTENANCE MANUALS

- A. The following information (minimum of 3 copies) shall be furnished for all items of equipment on the Project requiring operational and/or maintenance procedures and for any additional items indicated by the Engineer:
 - 1. Lubrication Information: This shall consist of the manufacturer's recommendations regarding the lubricants to be used and the lubrication schedule to be followed.
 - 2. Control Diagrams: Diagrams shall show internal and connection wiring and as-built wiring diagrams (where applicable).
 - 3. Start-up Procedures: These instructions consist of equipment manufacturer's recommendations for installation, adjustment, calibration, and troubleshooting.
 - 4. Operating Procedures: These instructions consist of the equipment manufacturer's recommended step-by-step procedures for starting, operating, stopping the equipment under specified modes of operation, and for long-term shut-down (moth-balling).
 - 5. Preventative Maintenance Procedures: These instructions consist of the equipment manufacturer's recommended steps and schedules for maintaining the equipment.
 - 6. Overhaul Instructions: These instructions consist of the manufacturer's directions for the disassembly, repair and reassembly of the equipment and any safety precautions that must be observed while performing the work.
 - 7. Parts List: This list consists of the generic title and identification number of each component part of the equipment. This list shall include weights of individual components of each item of equipment weighing over 100 pounds.

8. Spare Parts List: This list consists of the manufacturer's recommendations of number of parts which should be stored by the Port and any special storage precautions which may be required.
9. Exploded View: Exploded or cut views of equipment shall be provided if available as a standard item of the manufacturer's information. When exploded or cut views are not available, plan and section views shall be provided with detailed callouts.
10. Specific Information: Where items of information not included in the above list are required, they will be provided as described in the specifications for the equipment.
11. Complete identification, including model and serial numbers.
12. Submittal information, as specified in Section 013300 Submittal Procedures.
13. Warranty Information: This information consists of the name, address, and telephone number of the manufacturer's representative to be contacted for warranty, parts, or service information.
14. Maintenance information summaries shall be prepared on 8-1/2" x 11" paper and digital version (PDF format) on CD-ROM and shall contain the following information compiled from manufacturer's recommendations in the order shown.
 - a. Description or name of item of equipment
 - b. Asset number (to be provided at a later date)
 - c. Manufacturer
 - d. Name, address, and telephone number of local manufacturer's representative
 - e. Serial number (where applicable)
 - f. Equipment nameplate data
 - g. Recommended maintenance procedures:
 - 1) Description of procedures.
 - 2) Lubricant(s) or other materials required (where applicable), including type of lubricant, lubricant manufacturer, and specific compound.
 - 3) Additional information as required for proper maintenance.
 - h. Maintenance schedule, broken down into:
 - 1) Daily
 - 2) Weekly
 - 3) Monthly
 - 4) Quarterly
 - 5) Semi-Annually
 - 6) Annually
 - i. Recommended spare parts (where applicable)
 - j. Asset Number Information:
 - 1) Provide the following information in Excel spreadsheet format:

- (a) Asset Number (to be provided at a later date)
- (b) Description
- (c) Plan Sheet Number
- (d) Parcel Number
- (e) Vendor
- (f) Manufacturer
- (g) Model Year
- (h) Serial Number
- (i) Warranty - Start Date; Finish Date
- (j) Required Preventative Maintenance
- (k) Purchase Price
- (l) Make
- (m) Model
- (n) Fuel Used
- (o) Capacity

2) Asset Number Information will be required for the following items:

- (a) (a)

- 15. Provide video tapes, DVDs, and audio-visual training materials utilized in the manufacturer's instruction program for the Port.
- 16. All such information shall be organized by the Contractor into 3-inch, 3-post, expandable metal binders. The binders shall be sized for material approximately 8-1/2 by 11 inches, and the material in the binders shall not protrude beyond the covers. The binder(s) shall be divided with coversheets for each major item of equipment. The cover sheets shall be typewritten to indicate the name, type of equipment, and location(s) within the Project where installed. A neatly typewritten index shall be provided. The number of copies of such binders to be submitted shall be equal to the total of the Contractor's requirements plus five (5) paper copies and an electronic copy in PDF format to be retained by the Port.
- 17. All operation and maintenance information shall be comprehensive and detailed and shall contain information adequately covering all normal operation and maintenance procedures.
- 18. All information shall be specific for the items of equipment installed on the project. Material not directly applicable shall be removed, omitted, or clearly marked as inapplicable.
- 19. Lubricants shall be described in detail, including type, recommended manufacturer, and manufacturer's specific compound to be used.
- 20. If manufacturer's standard brochures and manuals are used to describe operating and maintenance procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project.

21. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated. It shall be the responsibility of the Contractor to ensure that all operation and maintenance materials are obtained. Material submitted must meet the approval of the Engineer prior to project acceptance.

PART 3 - EXECUTION

3.01 FINAL DOCUMENTS

A. Project As-Built Drawings

1. Project As-Built Drawings shall be compiled by the Contractor and submitted to the Engineer for translation to the Record Drawings on a monthly basis.
2. The Project As-Built Drawings will be submitted on paper full-sized (ANSI D) copy.
3. Drawings shall be kept current and shall be done at the time the material and equipment is installed. Annotations to the record documents shall be made with an erasable colored pencil conforming to the following color code:
 - a. Additions - Red
 - b. Deletions - Green
 - c. Comments - Blue
 - d. Dimensions - Graphite
4. Project As-Built Drawings must be complete and accepted by the Engineer before Final Completion is issued.
5. As-Built Drawings shall be in accordance with horizontal and vertical control as shown on the drawings.

B. Final Survey

1. See Section 01 71 23 Field Engineering for Final Survey requirements. The Final Survey shall be completed and submitted to the Engineer within 30 days of Substantial Completion. Final Survey must be complete and accepted by the Engineer before Final Completion is issued.

C. The following Certificates shall be submitted by the Contractor prior to Final Completion:

1. Certificates of Conformance
 - a. Notice of Termination (NOT) Construction Stormwater General Permit: (Confirmation of Termination request acceptance by DOE).

3.02 CLEAN-UP

- A. Definition: Except as otherwise specifically provided, "clean" (for the purpose of this Article) shall be interpreted as meaning the level of cleanliness generally provided by commercial building maintenance subcontractors using commercial quality building maintenance equipment and materials.
- B. General: Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described above.
- C. Site: Unless otherwise specifically directed by the Engineer, hose down all paved areas on the site, all public sidewalks and catch basins on adjoining streets. Completely remove all resultant debris.

D. Structure:

1. Exterior: Visually inspect all exterior surfaces and remove all traces of soil, waste material, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior or the structure. In the event of stubborn stains not removable with water, the Engineer may require light sandblasting or other cleaning at no additional cost to the Port.
 2. Interior: Visually inspect all interior surfaces and remove all traces of soil, waste material, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. Remove all paint droppings, spots, stains, and dirt from finished surfaces. Use only the specified cleaning materials and equipment.
 3. Clean all glass inside and outside.
 4. Polished Surfaces: To all surfaces requiring the routine application of buffed polish, apply the specified polish as recommended by the manufacturer of the material being polished.
- E. Timing: Schedule final cleaning as approved by the Engineer to enable the Port to occupy a completely clean project.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes requirements relating to the following:
 - 1. Examination, preparation, and general installation procedures
 - 2. Cutting and patching

1.02 SUBMITTALS

- A. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project;
 - 2. Integrity of weather exposed or moisture resistant element;
 - 3. Efficiency, maintenance, or safety of any operational element;
 - 4. Visual qualities of sight exposed elements; and
 - 5. Work of the Port or separate Contractor.
- B. Project As-Built Documents: Accurately record actual locations of capped and active utilities.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.

- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.04 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work;
 - 2. Fit products together to integrate with other work;
 - 3. Provide openings for penetration of mechanical, electrical, and other services;
 - 4. Match work that has been cut to adjacent work;
 - 5. Repair areas adjacent to cuts to required condition;
 - 6. Repair new work damaged by subsequent work;
 - 7. Remove samples of installed work for testing when requested; and
 - 8. Remove and replace defective and non-conforming work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work snug to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.

3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.05 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.06 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes field engineering and land surveying services by Contractor.

1.02 DESCRIPTION OF SERVICES

- A. Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements.
- B. Sole responsibility for establishing all locations, dimensions and levels of items of work.
- C. Sole responsibility for provision of all materials required to establish and maintain benchmarks and control points, including batter boards, grade stakes, structure elevation stakes, and other items.
- D. Keeping a transit, theodolite, or TST (total station theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the project site at all times.
- E. Provision of facilities and assistance necessary for Engineer to check lines and grade points placed by Contractor.
 - 1. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for Unit Price work have been completed and accepted by Engineer.
- F. Preparation and maintenance of daily reports of activity on the work. Submission of reports containing key progress indicators and job conditions to Engineer.
 - 1. Major equipment and materials installed as part of the work.
 - 2. Location of areas in which construction was performed.
 - 3. Work performed, including field quality control measures and testing.
 - 4. Weather conditions.
 - 5. Instructions received from Engineer or Port, if any.
- G. Preparation and maintenance of professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.

1.03 REFERENCE STANDARDS

- A. FGDC-STD-007.1 - Geospatial Positioning Accuracy Standards - Part 1: Reporting Methodology; 1998.
- B. FGDC-STD-007.2 - Geospatial Positioning Accuracy Standards - Part 2: Standards for Geodetic Networks; 1998.
- C. FGDC-STD-007.4 - Geospatial Positioning Accuracy Standards - Part 4: Architecture, Engineering, Construction, and Facilities Measurement; 2002.
- D. State Plane Coordinate System for the State in which the Project is located.

1.04 QUALITY ASSURANCE

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 FIELD ENGINEERING

- A. Maintain field office files, drawings, specifications, and record documents.
- B. Coordinate field engineering services with Contractor's subcontractors, installers, and suppliers as appropriate.
- C. Prepare layout and coordination drawings for construction operations.
- D. Check and coordinate the work for conflicts and interferences, and immediately advise Engineer and Port of all discrepancies of which Contractor is aware.
- E. Cooperate as required with Engineer and Port in observing the work and performing field inspections.
- F. Review and coordinate work on a regular basis with shop drawings and Contractor's other submittals.
- G. Check the location, line and grade of every major element as the work progresses. Notify the Engineer when deviations from required lines or grades exceed allowable tolerances. Include in such notifications a thorough explanation of the problem, and a proposed plan and schedule for remedying the deviation. Do not proceed with remedial work without Port's concurrence of the remediation plan.

3.02 LAND SURVEYING

- A. General: Follow standards for geospatial positioning accuracy.
 - 1. FGDC-STD-007.1as amended by Authority Having Jurisdiction.
 - 2. FGDC-STD-007.2as amended by Authority Having Jurisdiction.
 - 3. FGDC-STD-007.4as amended by Authority Having Jurisdiction.
- B. Coordinate survey data with the State Plane Coordinate System of the State in which the Project is located.
- C. Contractor is responsible for the restoration of all property corners and control monuments damaged or destroyed by construction-related activities. Any disturbed monuments must be replaced at Contractor's expense by a surveyor licensed in the State in which the Project is located, and approved by the Engineer.
 - 1. Temporarily suspend work at such points and for such reasonable times as the Port may require for resetting monuments. The Contractor will not be entitled to any additional compensation or extension of time.

3.03 REPORTS

- A. Submit two copies of Contractor's daily reports at Engineer's field office (or electronically) by 9:00 AM the next working day after the day covered in the associated report. Daily report shall be signed by responsible member of Contractor's staff, such as project manager or superintendent, or foreman designated by Contractor as having authority to sign daily reports.

3.04 RECORDS

- A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.
 - 1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the State in which the Project is located. Record Contractor's surveyor's original field notes, computations, and other surveying data in Contractor-furnished hard-bound field books. Contractor is solely responsible for completeness and accuracy of survey work, and completeness and accuracy of survey records, including field books. Survey records,(including field books) may be rejected by Port due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.
 - 2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Engineer.
- B. Submit three copies of final property survey to Port. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey. Include the following information:

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes information for progress and final cleaning and restoration of damaged work prior to final inspection.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.01 PROGRESS CLEAN-UP

- A. The Contractor shall clean the project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with all requirements for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials for the type of material to be stored.
 - 4. Coordinate progress cleaning for joint use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free from waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section _____.

- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration until Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.02 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances.
 - f. Remove debris and surface dust from limited access spaces, including roofs, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Remove labels that are not permanent.
 - i. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - j. Leave Project clean and ready for occupancy.

3.03 REPAIR OF WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surface, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
2. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes construction waste management requirements.

1.02 DESCRIPTION OF WORK

- A. The work includes demolition and removal within the project areas as shown on the drawings. The work also includes waste generated by construction activities, materials, packaging, scraps, and garbage.
- B. Soils excavated within the projects areas, as shown on the drawings, are anticipated to be free of contamination, however, should the Contractor, using visual and olfactory methods, identify potentially contaminated soil, the Contractor shall notify the Engineer to determine if the soil requires special handling.
 - 1. This material shall be segregated from other excavated material. It shall be stockpiled on plastic and covered with plastic until such time as appropriate testing and analysis can be completed by the Engineer. Upon completion of the testing and analysis the Engineer will direct the Contractor concerning the disposition of the material.
 - 2. Soil beyond construction excavation limits will not require excavation unless free draining product is observed or other special conditions exist in which case the Engineer will direct the Contractor in additional excavation. Soils determined to be contaminated will be hauled and disposed of at a locations designated in the following paragraphs.

1.03 DEFINITIONS

- A. Co-mingled or Off-site Separation: Collecting all material types into a single bin or mixed collection system and separating the waste materials into recyclable material types at an off-site facility.
- B. Construction, Demolition and Land-Clearing (CDL) Waste: Includes all nonhazardous solid wastes resulting from construction, remodeling, alterations, repair, demolition, and land clearing. Includes material that is recycled, reused, salvaged or disposed as garbage.
- C. Hazardous/Dangerous Waste: As defined by Chapter 70.105.010 Revised Code of Washington and 40 Code of Federal Register 261 and by Washington Administrative Code 173-303.
- D. Proper Disposal: As defined by the jurisdiction receiving the waste.
- E. Recyclable Materials: Products and materials that can be recovered and remanufactured into new products.
- F. Recycling: The process of sorting, cleaning, treating and reconstituting materials for the purpose of using the material in the manufacture of a new product. Can be conducted on-site (as in the grinding of concrete).
- G. Recycling Facility: An operation that is permitted to accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product.
- H. Salvage for Reuse: Existing usable product or material that can be saved and reused in some manner on the project site or other projects off-site.
- I. Salvage for Resale: Existing usable product or material that can be saved and removed intact (as is) from the project site to another site for resale to others without remanufacturing.

- J. Source-Separated Materials: Materials that are sorted at the site into separate containers for the purpose of reuse or recycling.
- K. Sources Separation: Sorting the recovered materials into specific material types with no, or a minimum amount of, contamination on site.
- L. Time-Based Separation: Collecting waste during each phase of construction or deconstruction that results in primarily one major type of recovered material. The material is removed before it becomes mixed with the material from the next phase of construction.
- M. Garbage: Product or material typically considered to be trash or debris that is unable to be salvaged for resale, salvaged and reused, returned, or recycled.
- N. Olfactory Indications (methods): Of or relating to the sense of smell. Soils contaminated with petroleum and other volatile constituents typically exhibit characteristic odors that can be detected (and sometimes identified) by smell.
- O. PID: Photo Ionization Detector. A field instrument that is used to detect the presence of and give a relative indication of the concentration of vapors emitted from volatile constituents (contamination) in environmental media (soil and water).
- P. Soil (waste) Profile: A characterization of the chemical and physical properties of a waste material including the types of contaminants and their concentrations as measured by approved laboratory analytical methods. A profile is required by the receiving permitted disposal or recycling facility.
- Q. Special Handling: Refers to hauling and disposal of soils that, because they are contaminated, cannot be reused in place as backfill or as general fill at another location. Such soils must be hauled to and managed at a permitted disposal or recycling facility.
- R. Type A Contaminated Soil: Soil that must be removed from the Project site and has been determined by the Engineer to contain petroleum hydrocarbons in concentrations exceeding state or federal cleanup standards or special Port determined criteria. Type A soil requires disposal at an approved facility.
- S. Type B Contaminated Soil: Soil that must be removed from the Project site and has been determined by the Engineer to contain petroleum hydrocarbons or other contaminants in concentrations that will require disposal or recycling at one of the approved facility.
- T. Type C Contaminated Soil: Soil determined by Engineer to contain unknown constituent(s) and requires further testing and classification. Type C soil requires disposal at one of the approved facility.
- U. Type D Material: Material including soil, determined by the Engineer not to require special handling with regard to this Contract. Classification of material as Type D material by the Port is not a certification nor does it release the Contractor of liability or obligation to meet any disposal or storage facility acceptance or testing requirements.
- V. Unanticipated Contamination: Contamination unexpectedly found in an excavation or in other locations where there is no prior knowledge, information, or history to indicate possible spills or releases of contamination.
- W. Visual Indications (methods): A preliminary evaluation of the potential presence of contamination based on visual observation. For example, fuel contaminated soils are frequently discolored or stained relative to non-petroleum impacted native soils or clean fill.

1.04 SUBMITTALS

- A. Waste Management Plan
- B. Waste Management Final Report
- C. Soils Management Plan
- D. Soils Hauling Receipts

1.05 PERFORMANCE GOALS

- A. General: Divert CDL waste to the maximum extent practicable from the landfill by one or a combination of the following activities:
 - 1. Salvage
 - 2. Reuse
 - 3. Source separated CDL recycling
 - 4. Co-mingled CDL recycling
- B. CDL waste materials that can be salvaged, resold, reused or recycled, include, but are not limited to the following:
 - 1. Clean dimensional wood, pallet wood, plywood, OSB, and particleboard
 - 2. Asphalt
 - 3. Concrete and concrete masonry units
 - 4. Ferrous and non-ferrous metals
 - 5. Field office waste paper, aluminum cans, glass, plastic, and cardboard
- C. Hazardous/Dangerous Wastes, contaminated soils and other hazardous materials such as paints, solvents, adhesives, batteries, and fluorescent light bulbs and ballasts shall be disposed of at applicable permitted facilities.

1.06 WASTE MANAGEMENT PLAN

- A. Submit a Waste Management Plan within 10 days after the notice to proceed and not less than 5 days before any demolition activities in accordance with these specifications. Provide a Waste Management Plan in a format as approved by the Engineer.
- B. The Waste Management Plan shall include the following:
 - 1. Name of designated Waste Management Coordinator.
 - 2. A list of waste materials, including estimated types and quantities, of the waste that will be generated. Indicate salvaged for resale, salvaged for reuse, recycled, or disposed for each item.
 - 3. Identify waste handling methods to be used, including one or more of the following:
 - a. Method 1 - Contractor or subcontractor(s) hauls recyclable materials to an approved recycling facility.
 - b. Method 2 - Contracting with diversion/recycling hauler to haul recyclable material to an approved recycling or material recovery facility.
 - c. Method 3 - Recyclable material reuse on-site.

- d. Method 4 - Recyclable material salvage for resale.
 - e. Method 5 - Contractor or subcontractor hauls waste to an approved disposal facility.
 - 4. Identification of each recycling, disposal, or material recovery facility to be utilized, including name, address and types of materials being recycled at each facility.
 - 5. Description of the method to be employed in collecting, and handling, waste materials.
 - 6. Description of methods to communicate Waste Management Plan to personnel and subcontractors.
 - 7. Actions that will be taken to reduce solid waste generation.
- C. Revise and resubmit Waste Management plan as required by the Engineer. Approval of the Contractor's Plan does not relieve the Contractor of responsibility for compliance with all applicable laws and regulations. Distribute copies of the Waste Management Plan to each subcontractor.

1.07 WASTE MANAGEMENT FINAL REPORT

- A. Provide a Waste Management Final Report, in a format approved by the Engineer. The Waste Management Final Report shall list the following for the project:
- 1. A record of each waste material type and quantity recycled, reused, salvaged, or disposed from the Project. Include total quantity of waste material removed from the site and hauled to a landfill.
 - 2. Percentage of total waste material generated that was recycled, reused, or salvaged.
- B. Quantities shall be reported by weight (tons) unless otherwise approved by the Engineer.
- C. Submit copies of manifests, weight tickets, recycling/disposal receipts or invoices, which validate the calculations or a signed certification of completeness and accuracy of the final quantities reported.

1.08 SOILS MANAGEMENT PLAN

- A. A minimum of 10 days prior to excavation of any subsurface materials, submit a Soils Management Plan to the Engineer. The Soils Management Plan must be approved by the Engineer prior to any excavation of subsurface materials. Include the following in the Soils Management Plan:
- 1. Identification of all soil disposal/recycling facilities to be used on the project for Type A and B Contaminated Soil.
 - 2. Identification of all fill sites, disposal facilities and/or end uses of material determined to be Type D Material.
 - 3. Contingency for delivery and placement of Type C Contaminated Soil at an onsite Soil Stockpile area.
 - 4. Contingency for managing debris encountered during excavation that may disqualify soil for disposal or recycle at the approve facilities.
 - 5. General description of how equipment operators, safety personnel and other applicable Contractor shall coordinate with the Engineer to facilitate handling of contaminated soil in accordance with this specification.
 - 6. Description of all haul routes to be used on the project.

- B. Include in the Two Week Look Ahead Schedule specific time frames for excavation. Each excavation activity shall be given an individual line item description, time frame and duration.
- C. Notify the Engineer prior to hauling contaminated soil to the soil disposal facility. The notification shall include:
 - 1. An estimate of the number of truck-trips, the haul destination, and the period in which these trips will be made (e.g., 20 truck-trips to the Waste Management Facility over the two-week period beginning on March 1, 2012).

1.09 QUALITY ASSURANCE

- A. Regulatory Requirements: The Contractor shall maintain compliance with all applicable Federal, State, or Local laws that apply to Construction Waste Management and material salvage, reuse, recycling and disposal.
- B. Disposal Sites, Recyclers and Waste Materials Processors: All facilities utilized for management of any materials covered under this specification must maintain all necessary permits as required by federal, state and local jurisdictions.

1.10 HEALTH AND SAFETY

- A. The Contractor is required to implement all health and safety provisions as required by Specification 01 35 29 - Health, Safety and Emergency Response Procedures.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 WASTE DISPOSAL

- A. Source-Separated CDL Recycling: Provide individual containers for separate types of CDL waste to be recycled, clearly labeled with a list of acceptable and unacceptable materials.
- B. Co-Mingled CDL Recycling: Provide containers for co-mingled CDL waste to be recycled, clearly labeled with a list of acceptable and unacceptable materials.
- C. Landfill: Provide containers for CDL waste that is to be disposed of in a landfill clearly labeled as such.
- D. Removal of CDL Waste from Project Site: Transport CDL waste off Port's property and provide legal disposal.

3.02 SOIL DISPOSAL

- A. Excavation/Testing: The field-testing for contaminated soil will be performed by the Port and will result in the following classification of material as defined in paragraph DEFINITIONS of this section:
 - 1. Type A Contaminated Soil.
 - 2. Type B Contaminated Soil.
 - 3. Type C Contaminated Soil.
 - 4. Type D Material.
- B. Disposition of Material
 - 1. Type A and B Contaminated Soil: Material determined to be Type A or B Contaminated Soil shall be hauled by the Contractor to an approved facility for disposal.

2. Type C Material: Material determined to be Type C is of unknown origin or special circumstances. Material determined to be Type C contaminated soils shall be hauled to an onsite Soil Stockpile Site area. The Contractor shall protect the material once stockpiled. The Port will direct the Contractor on the disposition of the material following the analysis of the suspect material.
3. Type D Material: Material determined not to require special handling (Type D) shall be hauled by the Contractor to a site determined by the Contractor. If testing or certification of this material is required by the receiving site, the Contractor shall complete these requirements. The Port will not certify or declare the material suitable for unrestricted use.

C. Other Requirements

1. Cover all soil stockpiles and maintain stockpile areas in accordance with SECTION 01 57 13 - Temporary Erosion and Sediment Control and Construction Stormwater Pollution Prevention.
2. Material determined to be Type A, Type B or Type C contaminated material may be, upon approval of the Engineer, temporarily stockpiled within the construction area. Provide an impervious liner beneath this soil and securely cover with a waterproof covering. Remove the material prior to completion of work in the work area.
3. Submit all hauling receipts (or copies of receipts) from the receiving facility for all Type A, Type B or Type C Contaminated soil at least weekly.
4. The Engineer may require shut down of excavation should unforeseen condition warrant.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures
 - 2. Final completion procedures
 - 3. Warranties
 - 4. As-Built Drawings

1.02 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

1.03 PROJECT SUBMITTALS

- A. Submittal of Project Warranties
- B. Record Drawings
 - 1. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous recordkeeping requirements and submittals in connection with various construction activities.
- C. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.04 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request:
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Port unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in individual Sections, including specific warranties, operation and maintenance manuals, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by the Contract Document or Engineer. Label with manufacturer's name and model number where applicable.
 - 4. Submit test/adjust/balance records.
 - 5. Submit changeover information related to Port's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request:
1. Make final changeover of permanent locks and deliver keys to Port
 2. Complete startup and testing of systems and equipment
 3. Perform preventive maintenance on equipment used prior to Substantial Completion
 4. Instruct Port's personnel in operation, adjustment, and maintenance of products, equipment, and systems
 5. Advise Port of changeover in heat and other utilities
 6. Terminate and remove temporary facilities from Project site
 7. Complete final cleaning requirements
- D. Submit a written request for inspection to determine Substantial Completion a minimum of DD days prior to the date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Notice of Substantial Completion after inspection or will notify Contractor of items, either on the Contractor's list or additional items identified by the Engineer, that must be completed or corrected before notice will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.05 PUNCH LIST (LIST OF INCOMPLETE ITEMS)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of Construction.
1. Organize list of spaces in sequential order.
 2. Organize items applying to each space by major elements.

1.06 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete and submit the following:
1. Submittal of all remaining items, including as-built documents, final completion construction photographic documentation, damage or settlement surveys, surveys, and similar final record information and all other submittals defined in the Contract Documents.
 2. List of Incomplete Items: Submit copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (Punch List). Copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of DD days prior to date the work will be complete and ready for final inspection and tests. On receipt of request, the Engineer will either proceed with inspection or notify contractor of unfulfilled requirements.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

C. Execution of all Change Orders.

1.07 FINAL ACCEPTANCE PROCEDURES

A. Submittals Prior to Final Acceptance:

1. Receipt and approval of application for final payment; due within seven (7) days of receipt of Final Completion by the Engineer;
2. Contractor's signed waiver and release of claims on the Engineer provided form;
3. Contractor's submittal of list of all suppliers and subcontractors and the total amounts paid to each on the Engineer provided form; and
4. Contractor's submittal of a list of all subcontractors and suppliers requiring Affidavits of Wages paid on the Contract and certify that each of companies will submit an approved Affidavit of Wages paid to the Port within 30 days.

- B. The Contract Administrator will issue the Final Acceptance Memo upon receipt of the required submittals.

PART 2 - PRODUCTS

2.01 CONTRACTOR'S WARRANTY

- A. The Contractor warrants the labor, materials and equipment delivered under the contract to be free from defects in design, material, or workmanship, and against damage caused prior to final inspection. Unless otherwise specified, this warranty extends for a period of one (1) year from the date of Substantial Completion.
1. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit the Port's rights under warranty.
 2. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Port or Port tenants during construction.
 3. Submit Warranties to the Engineer as a submittal, as described in 01 33 00 – Submittal Procedures.
 4. Provide additional copies of each warranty in Operation and Maintenance Manuals as described in 01 78 23 – Operation and Maintenance Manuals.
- B. In the event of equipment failure, during such time or in such a location that immediate repairs are mandatory, the Contractor shall respond promptly (within 48 hours), irrespective of day of the week. If the Contractor is not available, the Port will affect repairs. The Contractor shall then reimburse the Port for parts and labor necessary to correct deficiencies as defined within the warranty clause and time.

2.02 AS-BUILT DRAWINGS

- A. Project As-Built Drawings: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

- B. Project As-Built Drawings shall be compiled by the Contractor and submitted to the Engineer for translation to the Record Drawings on a monthly basis.
 - 1. The Project As-Built Drawings will be submitted on paper full-sized (ANSI D) copy.
 - 2. Drawings shall be kept current and shall be done at the time the material and equipment is installed. Annotations to the record documents shall be made with an erasable colored pencil conforming to the following color code:
 - a. Additions – Red
 - b. Deletions – Green
 - c. Comments – Blue
 - d. Dimensions – Graphite
 - 3. Project As-Built Drawings must be complete and accepted by the Engineer before Final Completion is issued.
 - 4. As-Built Drawings shall be in accordance with horizontal and vertical control as shown on the drawings.

PART 3 – EXECUTION

3.01 MAINTENANCE OF AS-BUILT DRAWINGS

- A. The Contractor shall maintain at the Project site, in good order for ready reference by the Engineer, one complete copy of the Contract Documents, including Addenda, Change Orders, other documents issued by the Port, a current Progress Schedule, and approved Submittals. The Contractor shall also generate and keep on site all documents and reports required by applicable permits.
- B. The Contractor's As-Built Drawings shall be updated to record all changes made during construction. The location of all existing or new underground piping, valves and utilities, and obstructions located during the Work shall be appropriately marked until the Contractor incorporates the actual field dimensions and coordinates into the as-built drawings. The as-built drawings shall be updated at least weekly and before elements of the Work are covered or hidden from view. After the completion of the Work, the as-built drawings shall be provided to the Port.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Operation and Maintenance Manual Submittal

1.02 SUBMITTALS

- A. Operation and Maintenance Data:
 - 1. For equipment, or component parts of equipment put into service during construction and operated by the Port, submit completed documents within ten days after acceptance.
 - 2. Submit electronic (PDF) copies of completed documents 10 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of all document sets as required prior to final submission.
 - 3. Submit electronic (PDF) sets of revised final documents in final form by Final Completion.

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE MANUALS

- A. For large equipment (such as pumps, generators, machinery), the following information (minimum of 3 printed copies, plus one electronic copy on CD) shall be furnished for all items on the Project requiring operational and/or maintenance procedures and for any additional items indicated by the Engineer. Printed information shall be organized by the Contractor into appropriately sized 3-ring binders (no larger than 3”). The binders shall be sized for material approximately 8-1/2 by 11 inches, and the material in the binders shall not protrude beyond the covers. The binder(s) shall be divided with coversheets for each major item of equipment. The cover sheets shall be typewritten to indicate the name, type of equipment, and location(s) within the Project where installed. A neatly typewritten index shall be provided. Electronic information shall be in PDF format (additional formats where specified) and shall be organized with folders with appropriate file names so information is easily accessible:
 - 1. Equipment Maintenance Summary:
 - a. Provide the following information (as applicable, indicate ‘N/A’ where an item does not apply) in Excel spreadsheet format:
 - 1) Asset Number (to be provided by the Engineer at a later date)
 - 2) Description
 - 3) Plan Sheet Number
 - 4) Parcel Number
 - 5) Vendor
 - 6) Manufacturer
 - 7) Model Year
 - 8) Serial Number
 - 9) Warranty – Start Date; Finish Date
 - 10) Required Preventative Maintenance
 - 11) Purchase Price

- 12) Make
 - 13) Model
 - 14) Fuel Used
 - 15) Capacity
2. Lubrication Information: This shall consist of the manufacturer's recommendations regarding the lubricants to be used and the lubrication schedule to be followed. Lubricants shall be described in detail, including type, recommended manufacturer, and manufacturer's specific compound to be used.
 3. Control Diagrams: Diagrams shall show internal and connection wiring and as-built wiring diagrams (where applicable).
 4. Start-up Procedures: These instructions consist of equipment manufacturer's recommendations for installation, adjustment, calibration, and troubleshooting.
 5. Operating Procedures: These instructions consist of the equipment manufacturer's recommended step-by-step procedures for starting, operating, stopping the equipment under specified modes of operation, and for long-term shut-down (moth-balling).
 6. Preventative Maintenance Procedures: These instructions consist of the equipment manufacturer's recommended steps and schedules for maintaining the equipment.
 7. Overhaul Instructions: These instructions consist of the manufacturer's directions for the disassembly, repair and reassembly of the equipment and any safety precautions that must be observed while performing the work.
 8. Parts List: This list consists of the generic title and identification number of each component part of the equipment. This list shall include weights of individual components of each item of equipment weighing over 100 pounds.
 9. Spare Parts List: This list consists of the manufacturer's recommendations of number of parts which should be stored by the Port and any special storage precautions which may be required.
 10. Exploded View: Exploded or cut views of equipment shall be provided if available as a standard item of the manufacturer's information. When exploded or cut views are not available, plan and section views shall be provided with detailed callouts.
 11. Specific Information: Where items of information not included in the above list are required, they will be provided as described in the specifications for the equipment.
 12. Complete identification, including model and serial numbers.
 13. Submittal information, as specified in Section 01 33 00 Submittal Procedures.
 14. Warranty Information: This information consists of the name, address, and telephone number of the manufacturer's representative to be contacted for warranty, parts, or service information.
 15. Provide DVDs, and audio-visual training materials utilized in the manufacturer's instruction program for the Port.
 16. All operation and maintenance information shall be comprehensive and detailed and shall contain information adequately covering all normal operation and maintenance procedures.

17. All information shall be specific for the items of equipment installed on the project. Material not directly applicable shall be removed, omitted, or clearly marked as inapplicable.
 18. If manufacturer's standard brochures and manuals are used to describe operating and maintenance procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project.
 19. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated. It shall be the responsibility of the Contractor to ensure that all operation and maintenance materials are obtained. Material submitted must meet the approval of the Engineer prior to project final acceptance.
- B. For small equipment and products (such as furnishings or equipment not requiring routine maintenance), the following information (minimum of 3 printed copies, plus one electronic copy on CD) shall be furnished for all items on the Project requiring operational and/or maintenance procedures and for any additional items indicated by the Engineer. Printed information shall be organized by the Contractor into appropriately sized 3-ring binders (no larger than 3"). The binders shall be sized for material approximately 8-1/2 by 11 inches, and the material in the binders shall not protrude beyond the covers. The binder(s) shall be divided with coversheets for each major item of equipment. The cover sheets shall be typewritten to indicate the name, type of equipment, and location(s) within the Project where installed. A neatly typewritten index shall be provided. Electronic information shall be in PDF format (additional formats where specified) and shall be organized with folders and appropriate file names so as to make the information easily accessible:
1. Product Summary:
 - a. Provide the following information (as applicable, indicate 'N/A' where an item does not apply) in Excel spreadsheet format:
 - 1) Asset Number (to be provided by the Engineer at a later date)
 - 2) Description
 - 3) Plan Sheet Number
 - 4) Parcel Number
 - 5) Vendor
 - 6) Manufacturer
 - 7) Model Year
 - 8) Serial Number
 - 9) Warranty – Start Date; Finish Date
 - 10) Purchase Price
 - 11) Make
 - 12) Model
 2. Operating Procedures: These instructions consist of the manufacturer's recommended step-by-step procedures for use of the product.
 3. Maintenance Procedures: These instructions consist of the equipment manufacturer's recommended steps and schedules for maintaining the product.

4. Specific Information: Where items of information not included in the above list are required, they will be provided as described in the specifications for the equipment.
5. Complete identification, including model and serial numbers.
6. Submittal information, as specified in Section 01 33 00 Submittal Procedures.
7. Warranty Information: This information consists of the name, address, and telephone number of the manufacturer's representative to be contacted for warranty, parts, or service information.
8. Provide DVDs, and audio-visual training materials utilized in the manufacturer's instruction program for the Port.
9. All operation and maintenance information shall be comprehensive and detailed and shall contain information adequately covering all normal operation and maintenance procedures.
10. All information shall be specific for the items of equipment installed on the project. Material not directly applicable shall be removed, omitted, or clearly marked as inapplicable.
11. If manufacturer's standard brochures and manuals are used to describe operating and maintenance procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project.
12. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated. It shall be the responsibility of the Contractor to ensure that all operation and maintenance materials are obtained. Material submitted must meet the approval of the Engineer prior to project final acceptance.

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. A The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following.
 - 1. Section 01 10 00 – Summary
 - 2. Section 01 35 43.19 – Export Soil Management
 - 3. Section 01 74 16 – Soil Characteristics and Waste Management
 - 4. Section 31 23 33 – Trenching and Backfilling

1.02 DESCRIPTION OF WORK

- A. The extent and location of the "Demolition" work is indicated on the drawings, in the specifications, and as outlined below.
 - 1. Removal and disposal, in whole or in part, of all items (demolition materials, debris, etc.) in compliance with the specifications and all agencies of jurisdiction. All items shall become the property of the Contractor unless otherwise noted.
 - 2. Backfilling and compaction of holes, voids, trenches, or pits that result from such removal.
- B. The details shown on the drawings are based upon information contained in the reference drawings. The details indicate typical features of the various structures and shall not be construed as complete or adequate to supplant actual on-site inspection, additional review, and interpretation of the reference drawings by the Contractor.
- C. In general, demolition work shall be in accordance with all applicable local, state, and federal regulations, and all permit requirements for the project.

1.03 SITE CONDITIONS:

- A. The West Sitcum Terminal is an operating facility. The work shall be completed in accordance with access shown on the drawings. Access to the site is restricted by ongoing terminal operations. Contractor operations shall be restricted to the designated areas. See Section 01 14 00 – Work Restrictions
 - 1. Coordinate and schedule, with the Engineer, access to the site in advance, and acknowledge that terminal operations take precedence over construction activities.
 - 2. For access to the site see Section 01 55 00 – Vehicular Access and Parking
 - 3. All demolition items not identified for salvage or recycle shall become the property of the Contractor. Disposal of all demolition items shall be in accordance with the specifications, local, state and federal requirements.

1.04 SUMMARY

- A. Items and material categories for demolition include, but are not limited to, the following:
 - 1. Asphalt and concrete pavement and/or foundations.
 - 2. Fencing.

1.05 SUBMITTALS

- A. Demolition Management Plan (DMP) with documentation that includes and addresses the following:
 - 1. Work sequence and schedule. Include phased demolition requirements consistent with the overall project schedule.
 - 2. Activity-based schedule.
 - 3. Means and methods to protect existing infrastructure and stockpile materials. Include the methods used to provide temporary supports, bracing, and shoring.
 - 4. Means and methods to prevent demolition materials, debris, water from construction activities, etc. from entering the Sitcum Waterway.
 - 5. Laydown areas for materials management.
 - 6. Worker safety, toolbox meetings, and signs.
 - 7. Protection of the public or other persons in areas surrounding the work.
 - 8. Contractor quality control plan.
 - 9. Schedule of disposal sites, their locations, and the materials that will be disposed at each site.
- B. If the DMP is revised, resubmit with any proposed changes for review by the Engineer prior to incorporating changes to means, methods, equipment, tools, temporary supports, etc.
- C. Utility locate survey results described in Part 3 – Execution

PART 2 - PRODUCTS

2.01 GENERAL

- A. All demolition products that are required to repair, accomplish, or be incorporated into the work shall be selected by the Contractor, subject to the approval of the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

- A. A utility locate survey, including ground penetrating radar (GPR), shall be performed and submitted to the Engineer for approval that locates all existing utilities in areas of excavation prior to start of demolition. Coordinate and resolve with the Port and terminal operators to turn off or de-energize affected services before starting demolition.
 - 1. Verify all items for demolition and disposal as early as practicable prior to start of the work.
 - a. Notify the Engineer immediately if observed conditions differ from anticipated conditions.

3.02 DEMOLITION OF STRUCTURES

- A. Completely remove and dispose of all designated items. Infrastructure or materials designated to remain that are damaged by Contractor activities shall be replaced or repaired at the Contractor's expense.

- B. All pavements designated for removal shall be broken up, prior to loading and disposal. Do not damage existing pavement which is to remain in place. Pavement demolition shall be accomplished by making neat vertical saw cuts at the boundaries of areas to be removed. Vertical saw cuts damaged by Contractor shall be repeated prior to paving at Contractor's expense.
- C. Blasting shall not be used.

3.03 DEMOLITION OF UTILITIES

- A. Notify the Engineer a minimum of 72 hours before scheduled demolition of utilities. Meeting the conditions required by the Port and affected utility shall be the sole responsibility of the Contractor.
- B. Existing Abandoned Electrical and Communication Utilities: Port shall review and approve any proposed removal of a portion of any existing abandoned electrical or communication conduit within the demolition area.

3.04 EXCESS MATERIAL

- A. The Port encourages recycling of materials from demolition. Contractor shall recycle to the extent possible, in a manner acceptable to environmental agencies and the Port, any of the materials designated for demolition and disposal. See Section 01 74 16 – Soil Characteristics and Waste Management. Existing demolished materials shall not be reused on this project.
- B. Disposal of all asphalt pavement and concrete shall be at a Contractor-selected recycle site.

3.05 DISPOSAL

- A. Disposal shall be in accordance with the Specifications, and in compliance with local, state, and federal regulatory agencies.
- B. Cleanup: After removal of all demolition items and materials, clean the area. There shall be no debris, rubble or litter left at the site from any of the demolition operations and the site shall be clean.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY OF WORK

- A. The extent and location of "Electrical Work" Work is shown in the Contract Documents. This Section includes general requirements for accomplishing electrical Work as specified herein and indicated on the Drawings.
- B. Electrical hot Work may be required to be performed on portions of the electrical power distribution and utilization equipment. The Contractor and its subcontractors shall provide personal protection equipment (PPE), training, authority having jurisdiction (AHJ) safety compliance and all necessary tools for the execution of such Work.
- C. Electrical Primary civil (trench, conduit, and vaults) system, and secondaries shall be installed by a qualified electrical contractor licensed in the state of Washington under RCE 19.28.
- D. Contractor shall provide all labor and materials for a complete electrical system.
- E. Contractor shall provide all labor and materials to install owner furnished equipment.
- F. Contractor shall purchase and obtain all required electrical and mechanical permits.
- G. Contractor shall coordinate all required power outages with the owner and Tacoma Public Utilities.

1.02 GOVERNING CODES, STANDARDS AND REFERENCES

- A. FAA (Federal Aviation Administration)
- B. NFPA 70: National Electrical Code (NEC)
- C. NFPA 70 E: Standard for Electrical Safety in the Workplace
- D. Tacoma Public Utilities
- E. State of Washington Dept. of Labor & Industries.
- F. Underwriters Laboratories, Inc.
- G. WAC 296-45
- H. State requirements for highway signage, flagging, and re-routing traffic
- I. State of Washington safety rules and health standards

1.03 SUBMITTALS

- A. Submit materials data in accordance with Section 01 33 00 – Submittals Procedures. Furnish manufacturers' technical literature, standard details, product specifications, and installation instructions.
- B. Submittals shall include the following:
 - 1. Review of Shop Drawings and Brochures shall not relieve the Contractor of responsibility for dimensions and/or errors that may be contained therein, or deviations from Contract Document requirements. It shall be clearly understood that the noting of some errors, but the overlooking of others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings and Brochures, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the review of the Shop Drawings and Brochures.

2. Manufacturer Approval Drawings: Equipment that is laid out, configured, or designed by manufacturer based on performance specifications only shall be submitted to the Engineer for approval prior to release of drawings for manufacturing.
- C. Ordering Materials: Order materials within two (2) weeks of receiving approved submittals from the Engineer. Provide proof of order placement upon request. Failure to comply will be considered non-performance and progress payments will be suspended until proof of order placement is reviewed and accepted by the Engineer.

1.04 DRAWINGS

- A. The electrical drawings are diagrammatic and are not intended to show all raceway, wiring, exact locations of equipment, terminations, or number or types of fittings required by the electrical system. Provide all related electrical Work which is specified herein, diagrammed or scheduled on the electrical drawings, required by code enforcing agencies and as indicated on other details or elevations for complete and operating electrical systems. Since the drawings of floor, wall, and ceiling installation are made at a small scale, outlets, devices, equipment, etc. are indicated only in their approximate location unless dimensioned or otherwise indicated. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned and coordinate such locations with the Work of other trades to prevent interferences. Verify all dimensions on the job. Do not scale the electrical drawings.

1.05 PRODUCTS

- A. General: Products are specified by manufacturer name, description, and/or catalog number to show intended function and quality. Report discrepancies, such as discontinued equipment or catalog numbers, to the Engineer prior to bidding. If the Contractor is unable to interpret any part of the plans and/or specifications, he shall notify the Engineer, who will issue interpretation and/or additional clarifications to Bidders before the project is bid.
- B. Manufacturers: Provide only equipment specified in the Contract Documents or approved by addendum. Manufacturers' catalog numbers and descriptions establish the quality of product required.
- C. Warranty: Warranty shall be manufacturer's standard or a minimum of one year unless noted otherwise in Division 26 Electrical Sections.

1.06 SUBSTITUTIONS

- A. Substitutions of specified materials are not allowed without prior approval.

1.07 QUALITY ASSURANCE

- A. All materials shall be new, unless noted otherwise. Properly store all materials and equipment for protection from physical damage or damage due to corrosion.
- B. Review accessibility of equipment for operation, maintenance and repair prior to installation. Proceed with installation only after unsatisfactory conditions have been corrected
- C. Equipment Manufacturer Qualifications: Equipment manufacturers shall have at least 10 years experience in manufacturing products and accessories similar to those for this Project, with a record of successful in-service performance.

1.08 COORDINATION AND SCHEDULING

- A. Coordinate and schedule electrical Work with the Work of other trades. Every reasonable effort shall be made to prevent conflicts as to space requirements, dimensions, locations, code required working spaces, access openings, drawout and removal spaces or other matters tending to obstruct or delay the Work of other trades. All changes caused by failure to coordinate shall be made at the Contractor's expense.

1.09 SAFETY AND PROTECTION

- A. Safety Measures To Be Taken: The Engineer has not been retained or compensated to provide design and construction review services relating to the Contractor's safety precautions or to the means, methods, techniques, sequences or procedures required for the Contractor to perform his Work. The Contractor will be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the Work. This requirement will apply continuously and not be limited to normal working hours. The duty of the Engineer to conduct construction observations of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site. It shall be the Contractor's responsibility to comply with applicable safety and health regulations for construction. The Contractor shall consult with the state or federal safety inspector for interpretation whenever in doubt as to whether safe conditions do or do not exist or whether they are or are not in compliance with state or federal regulations.
- B. Protection: The Contractor shall take whatever measures are required to ensure that electrical safety and protection are maintained, including the proper covering, signage, and securing of "live" circuits.
- C. Project "Electrical Safety Rules" are as follows:
 - 1. Work on Electrical circuits operating at over 50 volts, phase to ground, or greater shall be conducted in accordance with acceptable industry safety standards.
 - 2. Power Outages: Any essential outages required in the course of construction, whether for temporary services, cutovers, or testing, shall be closely coordinated with the Engineer and shall occur at times approved by the Port by means of shutdown notification request. Contractor shall identify all systems affected and provide copy of panel schedules of panelboards affected by shutdown notification request.
 - 3. Electrical circuits operating at over 300 volts phase to ground, or circuits serviced by a transformer over 150 kVA, shall be de-energized before proceeding with the Work.
 - 4. Electrical circuits shall be considered de-energized only after compliance with Lock-out Tag-out procedures and under the following conditions:
 - a. Switches connecting subject circuit to the energy supply are observed in the "open" position, with an air break, and locked and tagged out in accordance with Lock-out Tag-out procedures.
 - b. Electrically operated switches are visibly "open", blocked or racked in the "open" position, and locked and tagged out "open".
 - c. If the supply circuit break is not visible and clearly identified, the circuit shall be grounded. If the ground connection is not within sight of the Work area, the ground connection shall be locked and tagged out before proceeding with the Work.
 - d. Oil switches are observed "open" in a sight window and locked and tagged out "open," or fuse carrier is removed in oil fuse cutouts and locked and tagged out "open."

5. Use of Red Safety Tags
 - a. For protection of personnel working on circuits, safety tags shall be filled out and attached to any opened switch or equipment.
 - b. Safety tags shall be removed only the by the Port of Tacoma employee who placed the tag, or by another Port of Tacoma employee who has been authorized to remove the tag in writing by the employee who placed the tag. The Port of Tacoma Maintenance Electrical Systems Manager or his designated representative may authorize removal of a safety tag placed by an employee who is not available to remove the tag at the time of need only after carefully checking that the circuit is ready to be energized.
 - c. Equipment with a safety tag attached shall not be operated, and connections with a safety tag attached shall not be changed.
 6. Insulated cables, operated at over 300 volts to ground, shall be handled when energized only with rubber gloves tested to 22,000 volts by a Washington State approved testing laboratory.
 7. Insulated cables that have been in operation shall be cut only with grounded cable shears, or shall be grounded by driving a grounded sharp tool through the shielding and the conductors before cutting.
 8. All personnel working around energized electrical equipment shall comply with NFPA 70 E per equipment labels. If no label is present personnel shall wear standard insulated, non-conducting hard hats and shall wear fire retardant garments with no metallic zipper fasteners.
 9. Ladders used in any electrical Work shall be of wood or fiberglass construction.
 10. All panelboards, junction boxes, electrical devices and other similar equipment which is being worked on and which have exposed live wires, bus bars, or terminals operating above 50 volts shall be covered adequately for the voltage with an electrical insulating material and labeled with a "Caution" sign when Contractor personnel are not present. The Caution sign shall advise that exposed electrical parts are behind the temporary protective cover.
 11. Contractors engaged on Port of Tacoma projects or working on Port of Tacoma property shall be governed by Port of Tacoma rules. The Contractor shall place their lock and tag only after Port of Tacoma Electric Shop or designee has placed a lock and tag. The Contractor shall designate a supervisor for all contract personnel and operations. This supervisor shall be on the job whenever contract operations are in progress.
- D. Comply with the following procedures for medium-voltage manhole access:
1. All switching of the medium-voltage system must be approved in advance and coordinated through the Electrical Shop.
 2. Schedule requests for Electrical Shop assistance a minimum of seven (7) days in advance.
 3. Comply with Confined Space Entry Requirements, lock and tag out procedures, and all other applicable State safety requirements.
 4. Complete a confined space entry permit for each entry. Submit to the Engineer.
 5. Ventilate and monitor the confined space. A top man is required at all times.

6. Complete lock and tag out once line clearance has been given, and attach locks and tags to any opened switch or equipment. Submit tags to Electrical Shop upon completion of the Work.
 7. Provide effective barriers to prevent others from falling into the open vault. Close and secure vaults when not attended.
 8. Comply with State requirements for highway signage, flagging, and re-routing traffic.
- E. Before entry is made into energized electrical cable vaults or manholes, an infrared tester shall be used to scan the cables and connector components. If a temperature difference of 10 degrees Fahrenheit is detected between the cable and connector components, or any reading greater than 140 degrees Fahrenheit is detected from the cables or components the entry shall not be made! The Contractor shall notify the Engineer.

1.10 ELECTRICAL SERVICE

- A. Continuity of Service: Provide temporary service to existing systems as required to maintain continuous operation without reducing equipment efficiency. Coordinate the extent of temporary services with the Engineer.
- B. Power Outages: Outages shall be kept to an absolute minimum. Any essential outages required in the course of construction, whether for temporary services, cutovers, or testing, shall be closely coordinated with the Engineer and shall occur at times approved by the Port of Tacoma.

1.11 DEMOLITION

- A. General: De-energize circuits in demolition areas to ensure a safe condition.
- B. Existing material that is not to be reused or is not requested by the Port to be retained shall be removed from the site and shall become the property of the Contractor for salvage. All materials removed from the site shall be disposed of at facilities licensed for the material.
- C. In areas of where alterations are to be done, existing conduits may be reused, with the approval of the Engineer, in their original location, unless noted otherwise.
 1. Wiring that is discovered with damaged or deteriorating insulation shall be replaced with new.
 2. No existing conduit or wiring once removed may be reused, unless noted otherwise.
- D. Remove all unused exposed conduit except where located in or above existing construction, which is not being altered and would require removal and replacement of the existing construction.

1.12 ELECTRICAL EQUIPMENT INSTALLATION

- A. Comply with Division 1 General Requirements Sections for environmental regulatory requirements, quality control, construction facilities and temporary controls, traffic control, access control, and signage requirements.
- B. Provide electrical connection of all owner and contractor furnished equipment having electrical requirements. Make final connections for all equipment. Refer to Division 26 Electrical for motor starters and controls furnished integrally with equipment.
 1. Make electrical connections in accordance with manufacturer's written instructions, with recognized industry practices, and complying with requirements of the National Electrical Code.

2. Verify all electrical loads (voltage, phase, full load amperes, number and point of connections, minimum circuit capacity, etc.) for equipment furnished under other divisions of this specification by reviewing respective shop drawings furnished under each division.
 3. Meet with each subcontractor furnishing equipment requiring electrical service to review electrical characteristics for each equipment item before rough-in begins. Report any variances from electrical characteristics noted on the electrical drawings to the Engineer before proceeding with rough-in Work.
- C. National Electrical Code Compliance: Comply with applicable portions of National Electrical Code as to the type of products used and provisions for electrical power connections.
- D. Underwriters Laboratories acceptance: All material and equipment within the scope of the UL Re-examination service shall be approved by Underwriters Laboratories, Inc. for the purpose for which they are used and shall bear their label.
- E. Cutting and Patching: Provide and coordinate the locations of all openings required in the building construction for installation of the Work.
1. Drill penetrations required through existing concrete slabs or walls with a diamond core drill. In no case shall any structural member be cut.
 2. Provide approved sleeves as required for electrical penetrations through floors and walls. Seal all openings around conduits in sleeves with a material of equal fire rating as the surface penetrated.
 3. Obtain written approval from a Structural Engineer licensed in the State of Washington prior to cutting any reinforcing bars.
 4. Provide weekly updated Submittal Log of all penetrations and cuts performed.
- F. Equipment Bases and Fastening: Comply with seismic anchorage and bracing requirements for equipment and equipment racks.
- G. Equipment Accessibility: Comply with applicable codes and install equipment to be accessible for operation, maintenance or repair. Equipment deemed inaccessible shall be reported to the Engineer, and relocated as directed.
- H. Electrical Work Exposed to Weather: Provide weatherproof enclosures and corrosion protection for all ferrous metal portions of electrical Work exposed to weather, including conduit, clamps, supports, and hardware.
1. All galvanized electrical equipment exposed to the weather shall be painted to prevent leaching of zinc into the stormwater system. Paint coating shall be a minimum of 3 mils thick, and application as part of the manufacturing process is preferred over painting in the field.

1.13 EARTHWORK

- A. Existing Underground Utilities: Verify, before any excavation, the location of all existing utilities in the area of new construction. Exercise extreme care with all Work adjacent to these utilities. A designated representative of the Contractor shall advise the Port of Tacoma and Tacoma Power where they can be contacted in any emergency.
1. Review drawings and notify the Engineer of any deviations in duct runs to avoid conflicts with existing utilities. Any changes in the Work resulting in the same quantities of trenching material shall not entitle the Contractor to any claim for an addition to this Contract.

2. The Contractor is responsible for any damage done to existing utility installations during the course of the Work. All damaged installations shall be replaced to the satisfaction of the utility or agency involved at the expense of the Contractor.
- B. Comply with the Division 1 General Requirements and Division 31 Earthwork requirements for site work, including excavation, bracing and shoring, erosion control, requirements for temporary pumping equipment, backfilling, patching and paving, sod replacement, removal of surplus material, and requirements for traffic control during construction.

1.14 PROJECT FINALIZATION

- A. Fully test and adjust all equipment installed under this specification and demonstrate its proper operation.
 1. Testing that involves use of instruments other than meggers and volt-ohm meters shall be performed by an independent testing agency.
- B. Where circuits have been added, removed or relocated on panelboards and switchboards, the Contractor shall provide to the Port as-built panel and switchboard schedules in Port standard excel format. Coordinate submittal of schedules with Port Construction Manager.
- C. Present the Port with Certificate of Inspection from the Authorities Having Jurisdiction upon completion of the Work stating that all Work complies with all applicable Codes and Ordinances.
- D. Comply with Division 1 General Requirements for cleaning, closeout procedures, commissioning, training, operations and maintenance manuals, and record drawings.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDED

- A. Formatting manual submittals
- B. Compiling product data and related information appropriate for owners maintenance and operation.
 - 1. Modifying data as required to accurately represent completed installations.
 - 2. Obtain and Include Owner Furnished Equipment Data in O& M for a complete package.
- C. Instructing Owners personnel in maintenance, equipment, and systems operations prior to Owners acceptance of any portion or stage of the work.
- D. For additional data requirements see respective specification sections.

1.02 RELATED SECTIONS

- A. Coordinate related requirements specified in other parts of the Project Manual, including but not limited to the following:
 - 1. Division 26 - Electrical

1.03 FORM OF SUBMITTALS

- A. Prepare data in instructional manual form for use by owner's personnel.
- B. Format:
 - 1. Size: 8-1/2 X 11 inches
 - 2. Paper: 20 lb. minimum; white for typed pages
 - 3. Tests: Manufacturers printed data or neatly type written information on 20lb paper.
 - 4. Drawings:
 - a. Provide reinforced punched binder tab, bound in with text.
 - b. Fold oversized drawings and place in pocket glued to inside of back cover.
 - 5. Arrange content by systems, under section numbers and sequence of table of contents is Project Manual.
 - 6. Provide flyleaf for project and major component parts of equipment followed by typed descriptions. Provide indexed tabs.
 - 7. Cover: Identify each volume with typed or printed title: "Operation and Maintenance Instructions". Identify the following:
 - a. Title of project, names of Owner, Engineer, Contractor, Subcontractor, subject matter and completion date of Contract.
 - b. Identify general subject matter included in the Manual.
- C. Binder:
 - 1. Commercial quality, 8-1/2 x 11 inch, 3 ring binder with durable hardback and cleanable plastic covers
 - 2. Maximum ring size: As suitable to content, 3 inch maximum.

3. When multiple binders are used, correlate data into related groupings.

1.04 CONTENTS OF MANUALS

- A. Neatly typewritten table of contents: Arrange systematically in relation to Project Manual Table of Contents. Include following information:
 1. Project title
 2. Engineer
 3. Contractor - name of responsible principal, address and telephone.
 4. An indexed list of each product and system data sheets.
 5. Show for each product the name, address and telephone number of the responsible.
 - a. Subcontractor or installer
 - b. Maintenance contractor, as applicable
 6. Maintenance contractor, as applicable
 7. Clearly identify by name and other symbols products and component parts as set forth in the Contract Documents.
- B. Product data:
 1. Submit original product literature only. Copies are not acceptable.
 2. Include only sheets pertinent to specific product.
 3. Annotate each sheet to:
 - a. Clearly identify specific product or part installed.
 - b. Clearly identify data applicable to installation
 - c. Delete inapplicable information.
 4. Coordinate identification of equipment to match the construction documents.
- C. Drawings:
 1. Supplement product data with Drawings required to clearly illustrate
 - a. Control and flow diagrams.
 - b. Relations of component parts of equipment systems.
- D. Supplement product and installation data with service schedule.
 1. Organize in consistent format under separate headings for different service procedures.
 2. Instances that might affect validity of warranties and bonds.
- E. Provide a copy of each warranty, bond and service contract issued.
 1. Provide information sheet for Owners personnel. Indicate:
 - a. Proper procedures in event of failure.
 - b. Instances that might affect validity of warranties and bonds.

1.05 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Each item of equipment and each system: Include description of unit or system and component parts. Give function, normal operating characteristics and limiting conditions. Include performance curves with engineering data and tests. Include complete nomenclature and commercial number of replaceable parts.
- B. Panelboard circuit directories: Provide electrical service characteristics, controls and communications.
- C. Include "as-installed color-coded" wiring diagrams.
- D. Operating procedures: Include start up, break in and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown and emergency instructions. Include summer/winter, and any special operating instructions.
- E. Maintenance requirements: Include routine procedures and guide for trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing and checking instructions or complete replacement, as required.
- F. Provide servicing and lubrication schedule. List lubricants required.
- G. Include manufacturers printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturers parts list, illustrations, assembly drawings and diagrams required for maintenance.
- J. Provide as installed control diagrams by controls manufacturer.
- K. Provide list of original manufacturers spare parts, current prices and recommended quantities to be maintained in storage.
- L. Additional requirements: As specified in individual specifications section.
- M. Provide a listing in the Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.06 INSTRUCTION OF OWNER PERSONNEL

- A. Before final inspection, instruct Owners designated personnel in operation, adjustment and maintenance of products, equipment and systems at agreed upon time. Demonstrate for equipment requiring particular seasonal operation. Perform instructions for other seasons within 6 months.

1.07 SUBMITTALS

- A. Submit one copy of completed volumes in final form 45 days prior to final inspection. A copy will be returned after final inspection with Construction Managers and Engineers comments. Revise content of documents as required before final submittal.
- B. Submit five copies of revised volumes of data in final form within 10 days after final inspection.

1.08 PREVENTATIVE MAINTENANCE INSTRUCTIONS

- A. Prepare preventative maintenance instructions. Include for each piece of equipment or system furnished, requiring periodic inspections, lubrication, adjustment and the like. Insure optimum and continued performance as originally specified.
 - 1. Preventative maintenance instructions: Prepare on form acceptable to Owner.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Raceways
- B. Wires and cables
- C. Boxes
- D. Wiring devices
- E. Supporting devices
- F. Electrical identification

PART 2 - PRODUCTS

2.01 RACEWAYS

- A. Rigid metal conduit and fittings (ferrous):
 - 1. Galvanized rigid steel conduit: UL 6; thick wall steel, hot-dip galvanized, threaded.
 - 2. Fittings and conduit bodies: UL 514B; threaded type, galvanized, material to match conduit.
- B. Flexible metal conduit and fittings:
 - 1. Flexible metal conduit: UL 1; galvanized steel.
 - 2. Liquidtight flexible metal conduit: UL 360; flexible metal conduit with copper bonding tape and PVC weatherproof jacket.
 - 3. Fittings: UL 514B; galvanized steel, insulated throat.
- C. Rigid nonmetallic conduit:
 - 1. Conduit: UL 651; schedule 80 PVC.
 - 2. Fittings and conduit bodies: UL 514B.
- D. Wireway and auxiliary gutters:
 - 1. UL 870; lay-in type, no knockouts, hinged cover, NEMA 4X stainless Steel unless otherwise indicated on Drawings.
 - 2. Size: 10 x 10-inch minimum.
 - 3. Hinges: Stainless steel
 - 4. Captive Bolts and hardware: Stainless Steel

2.02 BOXES

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover and threaded hubs.
- D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

- E. Device Box Dimensions: 4 inches square by 2-1/8 inches deep
- F. Outdoor device Boxes: Cast construction, gasketed cover, threaded hubs, internal grounding screw, deep type for depth unless otherwise indicated or required for installation.

2.03 WIRE AND CABLE

- A. Rubber-insulated building wire:
 - 1. Exterior feeders and branch circuits: UL 44; copper, stranded conductor, 600 volt insulation, type XHHW.
- B. Wiring connections and splices:
 - 1. Use UL listed compression type connectors with insulating covers for copper wire splices and taps.
 - 2. For 8 AWG and smaller, use insulated spring connectors with plastic caps; 3M Scotchlok, or equal.
 - 3. For 6 AWG and larger, use UL listed compression type in-line splices. Insulate splice to 150% of conductor insulation value.

2.04 WIRING DEVICES

- A. General: Specification grade and UL listed.
- B. Receptacles: UL 498 and NEMA WD 1 Standard NEMA configurations as shown on Drawings. See attached cross reference for approved manufacturers and receptacle numbers.
- C. Provide wet location rated "While In Use" covers for outdoor device boxes.

2.05 SUPPORTING DEVICES

- A. Adequate for weight of equipment and conduit, including wiring, which they carry.
- B. Conform to seismic requirements of the Current Uniform Building Code .
- C. Conduit clamps, straps, and supports: Stainless Steel
- D. Screw/bolt retained clamp, spring steel clips and clamps are not acceptable.
- E. Support channel: Stainless Steel, 12 gauge, Uprights back-to-back 1-5/8 x 1-5/8- inch minimum size configuration, laterals 1-5/8 x 1-5/8-inch minimum size.
- F. Hardware: Stainless Steel.

2.06 ELECTRICAL IDENTIFICATION

- A. Nameplates: Engraved metal or phenolic with 1/4-inch white letters on black background.
- B. Labels: Embossed adhesive tape, 3/8-inch, white letters on black background.
- C. Wire and cable markers: Cloth markers, split sleeve or tubing type.
- D. Control panel wire markers: Heat shrink tubular type, machine embossed lettering, black letters on white background.

PART 3 - EXECUTION

3.01 RACEWAY INSTALLATION

- A. Size raceway as shown on the Drawings.
-

- B. Arrange raceway to maintain headroom and present a neat appearance. Headroom to be 7'-0" minimum unless otherwise shown on Drawings.
- C. Route exposed raceway parallel and perpendicular to walls and adjacent piping. In finished spaces, install EMT and conduit concealed in walls and ceiling.
- D. Maintain minimum 6-inch clearance between raceway and piping. Maintain 12 inch clearance between raceway and heat sources such as flues, steam pipes, and heating appliances.
- E. Arrange raceway supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using lay-in adjustable hangers, clevis hangers, or bolted split stamped stainless steel hangers.
- F. Group raceway in parallel runs where practical and use rack constructed of steel support channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- G. Do not fasten raceway with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
- H. Where raceways enter/exit floor, provide threaded coupling with upper end flush with finished floor. Install threaded plugs in unused conduits.
- I. Use hydraulic one-shot conduit bender or factory elbows for bends in raceway larger than 1-1/4 inch size.
- J. Use suitable caps to protect installed raceway against entrance of dirt and moisture.
- K. Provide #10 steel wire or 1/4-inch poly rope pull string in all power and data/communication raceways, except sleeves and nipples.
- L. Seal between raceway and building where raceway passes through exterior wall or rated firewall. All compounds must be UL listed for the application.

3.02 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on the Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Electrical box locations shown on the Drawings are approximate unless dimensioned. Verify location of outlets in offices and work areas prior to rough-in.
- C. Locate and install to maintain headroom and to present a neat appearance. Headroom to be 7-foot minimum unless otherwise shown on Drawings.
- D. Do not install outlet boxes back-to-back in walls, provide 16-inch minimum separation.
- E. Utilize multiple gang boxes; sectional boxes are not acceptable.

3.03 SUPPORTING DEVICES

- A. Fasten hanger rods, conduit clamps, outlets, and junction boxes to equipment support structure using approved stainless steel bolts and clamps.
- B. Do not use powder-actuated anchors. Do not drill, cut, or weld building structural steel members.
- C. Fabricate supports from stainless steel support channel; rigidly welded or bolted to present a neat appearance. Provide polymer channel endcaps for ends of channel.

- D. Install surface mounted cabinets, enclosures, and panels with a minimum of four anchors. Provide stainless steel channel supports and provide minimum 1/4-inch gap between wall and equipment.

3.04 MOUNTING HEIGHTS AND ORIENTATION

- A. Outdoor areas: mount receptacles at 48 inches above finished floor unless otherwise noted.
- B. Mount 120V straight blade receptacles with ground blade at bottom.

3.05 GENERAL WIRING METHODS

- A. Use minimum #12 AWG for power and lighting circuits, and minimum #14 AWG for control wiring, unless otherwise noted on the Drawings.
- B. Comply with NFPA 79 for all wiring in industrial control panels.
- C. Do not splice feeder conductors, unless otherwise noted on the Drawings.

3.06 FIELD QUALITY CONTROL

- A. Perform continuity test and insulation resistance test on all power and equipment branch circuit conductors. Verify proper phasing connections. Test both new and modified circuits with a 1,000V megger.

3.07 CIRCUIT IDENTIFICATION

- A. Degrease and clean surfaces to receive nameplates and labels.
- B. Provide nameplates on all panelboards, control panels, and all exterior equipment and devices.
- C. Secure nameplates to equipment using stainless steel drive screws or rivets. Adhesives are not acceptable.
- D. Install labels (embossed tape) on other interior boxes and devices.
- E. Include power source on all nameplates and labels. (e.g. - "MDB-1/2a" for circuit 2a from panel MDB-1).
- F. Provide wire markers on each conductor in panelboards, pull boxes, outlets and junction boxes, and at all load connections. Identify with branch circuit or feeder number as indicated on Drawings. For control wiring, identify with wire number indicated on the schematic or interconnection diagrams.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Building wire
- B. Cable
- C. Wiring connections and terminations

1.02 RELATED SECTIONS

- A. Electrical Testing

1.03 REFERENCED STANDARDS

- A. NEMA WC 3 Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- B. NEMA WC 7 Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

1.04 SUBMITTALS

- A. Submit Shop Drawings and product data under the provisions of Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.01 BUILDING WIRE

- A. Rubber-insulated building wire: NEMA WC 3.
- B. Feeders and branch circuits outdoors, underground #12 and larger: Copper stranded, conductor, 600 volt insulation, XHHW-2 stranded copper wire.
- C. Control circuit conductors in control panels type MTW stranded copper minimum size #14.
- D. Control circuit conductors in switchgear type SIS stranded copper.

PART 3 - EXECUTION

3.01 GENERAL WIRING METHODS

- A. Use wire no smaller than 12 AWG for power and lighting circuits, and wire no smaller than 14 AWG for control wiring.
- B. Use 10 AWG conductor for 20-ampere, 120-volt branch circuit home runs longer than 125 feet, and for 20-ampere, 277-volt branch circuit home runs longer than 200 feet.
- C. Place an equal number of conductors for each phase of a circuit in the same raceway or cable.
- D. Splice only in junction or outlet boxes.
- E. Neatly train and lace wiring inside boxes, equipment, and panel boards.
- F. Use equal conductor lengths for parallel circuits.

3.02 WIRING INSTALLATION IN RACEWAY

- A. Pull all conductors into a raceway at the same time. Use UL-listed wire-pulling lubricant for pulling 6 AWG and larger wires.

- B. Install wire in raceway after interior of building has been protected from the weather and mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.

3.03 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage.
- B. Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal slips or plastic cable ties to support cables from structure or ceiling suspension system. Include bridle rings or drive rings.
- C. Use suitable cable fittings and connectors.

3.04 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes.
- B. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.
- C. Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150% of the insulation value of conductor.
- D. Thoroughly clean wires before installing lugs and connectors.
- E. Make splices, taps and terminations to carry full capacity of conductors without perceptible temperature rise.
- F. Terminate spare conductors with electrical tape.

3.05 FIELD QUALITY CONTROL

- A. Field Inspection and Testing shall be performed as specified in section 26 08 01 Electrical Testing
- B. Inspect wire and cable for physical damage and proper connection.
- C. Provide Low Voltage Electrical Power Cable Insulation Test
- D. Torque test conductor connections and terminations to manufacturer's recommended values.
- E. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY OF WORK

- A. The extent and location of "Grounding" Work is shown in the Contract Documents. This section includes grounding of electrical systems and equipment. Grounding requirements specified in this section may be supplemented by special requirements of systems described in other Sections.

1.02 GOVERNING CODES, STANDARDS AND REFERENCES

- A. ASTM B8 (American Society for Testing and Materials) - Standard Specification for Concentric-Lay-Stranded Copper conductors, Hard, Medium-Hard, or Soft.
- B. NFPA 70 (National Fire Protection Association) - National Electrical Code.
- C. ANSI/NFPA 780 (National Fire Protection Association) - Standard for the Installation of Lightning Protection Systems.
- D. ANSI/UL 96 (Underwriter's Laboratory) - Lightning Protection Components.
- E. ANSI/UL 467 (Underwriter's Laboratory) - Grounding and Bonding Equipment.

1.03 SUBMITTALS

- A. Submit materials data in accordance with of Section 01 33 00 - Submittal Procedures. Furnish manufacturers' technical literature, standard details, product specifications, calibration reports, and installation instructions for all products.
- B. Submittals shall include the following:
 - 1. Submit product data for the following:
 - a. Grounding conductors and cables.
 - b. Grounding connectors.
 - c. Grounding electrodes.
 - d. Ground bus.
 - e. Test wells.
 - f. Exothermic weld kit
 - 2. Grounding plans and calculations for Contractor's designed ground system.
 - 3. Submittal log of locations where Contractor will bond grounding conductors to structural steel.
 - 4. Field Test Reports: Submit written test reports to include the following:
 - a. Test procedures used.
 - b. Test results that comply with requirements.
 - c. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
 - d. Soil types and conditions where ground tests were performed.
 - 5. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

- a. Test wells.
- b. Ground rods.
- c. Ground rings.
- d. Grounding arrangements and connections for separately derived systems.

1.04 QUALITY ASSURANCE

- A. Listing and Labeling: Provide electrical components, devices, and accessories that are Listed and Labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authority Having Jurisdiction, and marked for specific types, sizes, and combinations of conductors and connected items.
- B. Comply with IEEE 837 and UL 467.
- C. Comply with IEEE Std. 142 (Green Book).
- D. Comply with NFPA 70.
- E. Comply with IEEE C2 for overhead-line construction and medium-voltage underground construction.
- F. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grounding Conductor Fittings:
 - a. Erico Inc.
 - b. Chance/Hubbell.
 - c. Fushi Copperweld.
 - d. Erico Inc.; Electrical Products Group.
 - e. Framatome Connectors; Division of Bain Capital.
 - f. Burndy Electrical; Division of Hubbell.
 - g. Ideal Industries, Inc.
 - h. ILSCO.
 - i. Kearney/Cooper Power Systems.
 - j. Lyncole XIT Grounding; Division of VFC.
 - k. O-Z/Gedney Co.
 - l. Raco, Inc.; Division of Hubbell.
 - m. Thomas & Betts, Electrical; Division of ABB.
 - n. Or Approved Equal.
 - 2. Grounding Connectors and Rods:

- a. Harger
 - b. Galvan
 - c. Erico.
 - d. ILSCO.
 - e. Lyncole XIT Grounding; Division of VFC.
 - f. O-Z/Gedney.
 - g. Raco, Inc.; Division of Hubbell.
 - h. Thomas & Betts; Division of ABB.
 - i. Or Approved Equal.
3. Acceptable Manufacturers Ground Bars
- a. Harger GBI series
 - b. Erico EGBA series
 - c. Or Approved Equal.

2.02 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
- B. Material: Stranded Copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation in sizes available.
- D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- E. Grounding Electrode Conductors: Stranded cable, size as shown in drawings.
- F. Underground Conductors: Bare, tinned, stranded, except as otherwise indicated.
- G. Bare Copper Conductors: Assembly of stranded conductors, ASTM B 8.
- H. Copper Bonding Conductors:
 - 1. Bonding Conductor: #4 or #6 AWG, stranded copper conductor, sized per drawings.
 - 2. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- I. Bonding Straps: Soft copper.

2.03 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Pressure Connectors: High-conductivity-plated units.
- C. Bolted Connectors: Heavy-duty, copper, bolted-pressure type only.

- D. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.
- E. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.04 GROUNDING ELECTRODES

- A. Ground Rods: Solid copper clad steel, 3/4-inch diameter by 10-foot length.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- E. Ground Rod Clamps at Manholes: Use bolted pressure clamps with at least two bolts.
- F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
 - 2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.
- G. Underground Grounding Conductors: Install bare stranded copper conductor, size as indicated on drawings.
 - 1. Copper conductor, #2/0 AWG minimum. Bury at least 24 inches below grade.
 - 2. Ductbank Ground Conductors: Install a #4/0 AWG bare copper conductor embedded in concrete of each medium voltage ductbank. Provide a ground conductor with each medium voltage feeder circuit sized per the NEC.

3.02 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in raceways with all feeders and branch circuits unless otherwise noted.
- C. Provide an exterior personal safety ground bus bar on the back side of all medium voltage switchgear.
- D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

- E. Circuits: Install insulated equipment grounding conductor in branch-circuit runs from power panels or power-distribution units.
- F. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal.
 - 1. Isolate grounding conductor from raceway and from panelboard grounding terminals.
 - 2. Terminate at equipment grounding conductor terminal of the applicable derived system or service.
- G. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

3.03 BUILDING PERIMETER GROUND

- A. Ground the steel framework of structures and enclosures with the ground electrode system.

3.04 INSTALLATION

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes and connect to the service grounding electrode conductor.
 - 1. Drive ground rods until tops are 2 inches below finished floor or final grade.
 - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment.
 - 1. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp.
 - 2. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts.
 - 3. Install straps only in locations accessible for maintenance.
- D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building.
 - 1. Connect grounding conductors to main metal water service pipes by grounding clamp connectors.
 - 2. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting.
 - 3. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- E. Equipment Structures: Comply with the requirements of IEEE C2, current edition.
 - 1. Grounding conductor shall be bare copper not less than 8 AWG.
 - 2. Gates shall be bonded to grounding conductor with flexible bonding jumper.
 - 3. Barbed wire shall be bonded to the grounding conductor.

3.05 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For #8 AWG and larger, use pressure-type grounding lugs. #10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Non-contact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Provide flexible grounding strap mounted to raceway exterior where raceway crosses a seismic joint.
 - 1. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing.
 - 2. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted-and clamped-type connections between conductors and ground rods.
- F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values.
- G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the grounding conductor.
- H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.06 IDENTIFICATION

- A. Identify grounding system components as required by the Authority Having Jurisdiction and as specified in Section 26 05 53 - Electrical Identification.

3.07 FIELD QUALITY CONTROL

- A. All ground system test shall be performed in the presence of the Engineer.
- B. Testing: Perform the following field quality-control testing:
 - 1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Test by one of the following methods for resistance measurement, and correct any deficiencies detected during testing:
 - 1) Perform fall of potential test per IEEE Standard No. 81, Section 9.04 on the main grounding electrode or system for each substation and building.
 - 2) Perform the two-point method test per IEEE No.81 Section 9.03 to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral and/or derived neutral points.
 - 3) Perform ground continuity test between main ground system and equipment frame, system neutral and/or derived neutral point. Conduct test by passing a minimum of ten amperes dc current between ground reference system and the ground point to be tested. Measure voltage drop and calculate resistance by voltage drop method.
 - c. Test Requirements:
 - 1) Equipment Rated 500 kVA and Less: 10 ohms.
 - 2) Equipment Rated 500 to 1000 kVA: 5 ohms.
 - 3) Equipment Rated More Than 1000 kVA: 2 ohms.
 - 4) Power Distribution Units or Panelboards Serving Electronic Equipment: 2 ohms.
 - 5) Substations, substation manholes, and Pad-Mounted Switching Equipment: 1 ohms.
 - 6) Manhole Grounds: 10 ohms.
 - d. Excessive Ground Resistance: If resistance to ground exceeds specified values at any single ground location and as a collective ground system, notify Engineer promptly and include recommendations to reduce ground resistance.
 - 4. Record test results. Provide bi-weekly Ground Resistance Test Report results to Engineer.

- C. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes.
1. Identify each ground rod by letter in alphabetical order, and key to the record of tests and observations.
 2. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following: Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior duct banks, manholes, and underground utility construction.

1.03 DEFINITIONS

- A. LFMC: Liquidtight flexible metal conduit.
- B. RGSC: Rigid galvanized steel conduit.
- C. RNC: Rigid nonmetallic conduit.
- D. RSC: Rigid steel conduit.

1.04 SUBMITTALS

- A. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work. Custom enclosures and cabinets.
 - 1. For handholes and boxes for underground wiring, including the following:
 - a. Duct entry provisions, including locations and duct sizes.
 - b. Frame and cover design.
 - c. Grounding details.
 - d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
 - e. Joint details.
- B. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Structural members in the paths of conduit groups with common supports.
- C. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces defined in Division 26, Include the following:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will retain its enclosure characteristics, including its interior accessibility, after the seismic event."
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For professional engineer and testing agency.

E. Source quality-control test reports.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch minimum.

C. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch with overlapping sleeves protecting threaded joints.

D. Joint Compound for Rigid Steel Conduit: Listed for use in cable connector assemblies and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.02 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arnco Corporation.
2. CANTEX Inc.
3. CertainTeed Corp.; Pipe & Plastics Group.
4. Condux International, Inc.
5. Electri-Flex Co.
6. Lamson & Sessions; Carlon Electrical Products.
7. Manhattan/CDT/Cole-Flex.
8. RACO; a Hubbell Company.
9. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Type EPC-80-PVC, unless otherwise indicated.

- C. LFNC: UL 1660.
- D. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC: UL 514B.

2.03 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Arnco Corporation.
 - 2. Endot Industries Inc.
 - 3. IPEX Inc.
 - 4. Lamson & Sessions; Carlon Electrical Products.
- B. Description: Comply with UL 2024; flexible type, approved for general-use installation.

2.04 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements.
- C. Description: Stainless Steel Sheet metal sized and shaped as indicated, NEMA 250, Type 4X unless otherwise indicated.
- D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- E. Wireway Covers: painted steel indoors, 316 SS outdoors, Hinged type and flanged-and-gasketed type in wet areas.

2.05 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. EGS/Appleton Electric.
 - 3. Erickson Electrical Equipment Company.
 - 4. Hoffman.
 - 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 - 6. O-Z/Gedney; a unit of General Signal.
 - 7. Robroy Industries, Inc.; Enclosure Division.
 - 8. Scott Fetzer Co.; Adalet Division..
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA 12 indoors, NEMA 4X outdoors.

- D. Hinged-Cover Enclosures: NEMA 250, Type 12 indoor type 4X outdoor, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: painted Steel indoors, 316 Stainless Steel outdoors.
 - 2. Nonmetallic Enclosures: FRP.
- E. Cabinets:
 - 1. NEMA 250, Type 12 indoors, Type 4X, 316 Stainless Steel outdoors, box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Painted steel indoors, 316 SS outdoors, Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

2.06 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Refer to specification 26 05 43

2.07 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.08 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with AASHTO H20/HS20-44. Strength tests shall be for specified tier ratings of products supplied.
 - 1. Tests of materials shall be performed by an independent testing agency.
 - 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 - 3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit.
 - 2. Concealed Conduit, Above ground: Rigid steel conduit.
 - 3. Underground Conduit: Refer to 26 05 43, underground ducts and raceways for electrical systems.

4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X.
 6. Application of Handholes and Boxes for Underground Wiring: refer to specification 26 05 43 Underground Ducts and Raceways for Electrical Systems
- B. Comply with the following indoor applications, unless otherwise indicated: vertical loading.
1. All above ground conduits shall be RGSC type.
 2. All underground factory elbows shall be PVC coated RGSC.
 3. All conduits making transition from underground to above ground shall be PVC coated RGSC.
 4. Boxes and Enclosures: NEMA 250, Type 4X, stainless steel in damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

3.02 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated
- H. Raceways Embedded in Slabs:
1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 3. Change from nonmetallic raceway to rigid steel conduit before rising above the floor.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than # 4 AWG.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.

3.03 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Refer to specification 26 05 43 Underground ducts and raceways for electrical systems.

3.04 INSTALLATION OF MINOR UNDERGROUND CONDUIT

- A. For major underground conduit installation, greater than 50 feet, comply with Division 26 Section "Underground Ducts and Raceways for Electrical Systems."
 - 1. All buried conduit shall be 6" below bottom of slab (if applicable). No conduits shall be encased in floor slabs.
- B. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earthwork" for pipe less than 6 inches
 - 2. Install backfill as specified in Division 31 Section "Earthwork." in nominal diameter.
 - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand-tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earthwork."
 - 4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. All stub-ups shall have threaded coupling set flush with floor. Plus those that are not in use. Install insulated grounding bushings on terminations at equipment.
 - 5. Bury warning planks approximately 12 inches above direct buried conduits, placing them 24 inches o.c. Align planks along the width and along the centerline of conduit.

3.05 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to finishes recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touch up coating as recommended by manufacturer.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Subcontract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks.
 - 2. Handholes and boxes.
 - 3. Manholes.
- B. This section applies to power and communications systems.

1.03 DEFINITION

- A. RNC: Rigid nonmetallic conduit.

1.04 SUBMITTALS

- A. Product Data: For the following:
 - 1. Duct-bank materials, including reinforcing materials, separators and miscellaneous components.
 - 2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
 - 3. Accessories for manholes, handholes, pull boxes, and other utility structures.
 - 4. Warning tape.
 - B. Shop Drawings for Precast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:
 - 1. Duct entry provisions, including locations and duct sizes.
 - 2. Reinforcement details.
 - 3. Frame and cover design and manhole frame support rings.
 - 4. Ladder.
 - 5. Grounding details.
 - 6. Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
 - 7. Joint details.
 - C. Shop Drawings for Factory-Fabricated Handholes and Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:
 - 1. Duct entry provisions, including locations and duct sizes.
 - 2. Cover design.
 - 3. Grounding details.
-

4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
 5. Ladder cover details.
- D. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.
1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
- E. Product Certificates: For concrete and steel used in precast concrete manholes, handholes, and pull boxes as required by ASTM C 858.
- F. Qualification Data: For professional engineer and testing agency.
- G. Source quality-control test reports.
- H. Field quality-control test reports.
- I. All covers shall be traffic rated for heavy trucks.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Comply with ANSI C2.
- C. Comply with NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.
- B. Store precast concrete and other factory-fabricated underground utility structures at project site as recommended by manufacturer to prevent physical damage. arrange so identification markings are visible.
- C. Lift and support precast concrete units only at designated lifting or supporting points.

1.07 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 1. Notify Engineer no fewer than five days in advance of proposed interruption of electrical service.
 2. Do not proceed with interruption of electrical service without Engineer's written permission.

1.08 COORDINATION

- A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.
- B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by the Engineer.

1.09 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Furnish cable-support stanchions, arms, insulators and associated fasteners and accessories in quantities equal to 5 percent of quantity of each item installed.

PART 2 - PRODUCTS

2.01 CONDUIT

- A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.
- B. RNC: NEMA TC 2 Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B, Unless otherwise noted.
- C. Liquid-tight flexible metallic conduit.

2.02 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other equal manufacturers.
 - 1. Cantex, Inc.
 - 2. CertainTeed Corp.; Pipe & Plastics Group.
 - 3. Condux International, Inc.
 - 4. ElecSys, Inc.
 - 5. Electri-Flex Company.
 - 6. IPEX Inc.
 - 7. Lamson & Sessions; Carlon Electrical Products.
 - 8. Manhattan/CDT; a division of Cable Design Technologies.
 - 9. Spiraduct/AFC Cable Systems, Inc.
- B. Duct Accessories:
 - 1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
 - 2. Warning Tape: Underground-line warning tape specified in Division 16 Section "Electrical Identification" for power and communications systems.

2.03 PRECAST CONCRETE HANDHOLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other equal manufacturer.
 - 1. Oldcastle Precast Group
 - 2. Columbia Precast Products.
 - 3. Riverton Concrete Products; a division of Cretex Companies, Inc.
 - 4. Utility Concrete Products, LLC.

5. Approved Equal
- B. Comply with ASTM C 858 for design and manufacturing processes.
- C. Ferrous metal hardware shall be stainless steel.
- D. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
 1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
 2. Entire assembly shall be aircraft rated.
 3. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 4. Cover Legend: Molded lettering, "ELECTRICAL" or COMMUNICATIONS."
 5. Configuration: Units shall be designed for flush burial and have closed bottom.
 6. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
 - a. Type and size shall match fittings to duct or conduit to be terminated.
 - b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.
 7. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.04 PRECAST MANHOLES

- A. General Use Manholes
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other equal manufacturer.
 - a. Oldcastle Precast Group
 - b. Columbia Precast Products.
 - c. Riverton Concrete Products; a division of Cretex Companies, Inc.
 - d. Utility Concrete Products, LLC.
- B. Comply with ASTM C 858, with structural design loading as specified in Part 3 "Underground Enclosure Application" Article and with interlocking mating sections, complete with accessories, hardware, and features.
 1. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches vertically and horizontally to accommodate alignment variations.
 - a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.
 - b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.

- c. Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.
 2. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
 - a. Type and size shall match fittings to duct or conduit to be terminated.
 - b. Fittings shall align with elevations of approaching ducts and be located near interior corners of manholes to facilitate racking of cable.
 3. Manhole Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and locking provisions, aircraft load rating.
 4. Cover Legend: Molded lettering, "ELECTRICAL" or "COMMUNICATIONS."
- C. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

2.05 PULL BOXES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Armorcast Products Company.
 2. Carson Industries LLC.
 3. CDR Systems Corporation.
 4. Hubbell Power Systems; Lenoir City Division.
 5. New Basis.
- B. Description: Design according to ASTM C858 and Comply with AASHTO H-20/HS-20-44 load rating requirements with 125kip minimum load rating.
 1. Color: Gray.
 2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and greater than or equal to 125kip
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, "ELECTRIC" or "COMMUNICATIONS" as indicated for each service.
 6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
 7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 8. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

- C. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

2.06 UTILITY STRUCTURE ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Bilco Company
 - 2. Hubbell Power Systems.
 - 3. McKinley Iron Works, Inc.
 - 4. NewBasis.
 - 5. Oldcastle Precast Group.
 - 6. Riverton Concrete Products; a division of Cretex Companies, Inc.
 - 7. Strongwell Corporation; Lenoir City Division.
 - 8. Underground Devices, Inc.
 - 9. Utility Concrete Products, LLC.
 - 10. Utility Vault Co.
- B. Ferrous metal hardware, where indicated, shall be hot-dip galvanized complying with ASTM A 153 and ASTM A 123.
- C. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.
 - 1. Frame and Cover: Weatherproof, gray cast iron complying with
 - a. ASTM A 48/A 48M, Class 35B with milled cover-to-frame bearing surfaces; diameter, 29 inches
 - b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.
 - 2. Cover Legend: Cast in. Selected to suit system.
 - a. Legend: "ELECTRIC-LV" for duct systems with power wires and cables for systems operating at 600 V and less.
 - b. Legend: "ELECTRIC-HV" for duct systems with medium-voltage cables.
 - c. Legend: "COMMUNICATIONS" for communications, data, and telephone duct systems.
 - 3. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.
 - a. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. where packaged mix complying with ASTM C 387, Type M, may be used.
- D. Manhole Sump Frame and Grate: ASTM A 48/A 48M, Class 30B, gray cast iron.

- E. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2- inch diameter eye, and 1-by-4-inch bolt.
 - 1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.
 - F. Pulling Eyes in Non-concrete Walls: Eyebolt with reinforced fastening, 1-1/4-inch diameter eye, rated 2500-lbf Minimum tension.
 - G. Pulling-In and Lifting Irons in Concrete Floors: 7/8-inch-diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.
 - 1. Ultimate Yield Strength: 40,000-lbf shear and 60,000-lbf tension.
 - H. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch ID by 2-3/4 inches deep, flared to 1-1/4 inches minimum at base.
 - 1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.
 - I. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steelwedge type with stainless-steel expander clip with 1/2-inch bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.
 - J. Cable Rack Assembly: Stainless Steel, except insulators.
 - 1. Stanchions: T-section or channel; 2-1/4-inch nominal size; punched with 14 holes on 1-1/2-inch centers for cable-arm attachment.
 - 2. Arms: 1-1/2 inches wide, lengths ranging from 3 inches with 450-lb minimum capacity to 18 inches with 250-lb minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.
 - 3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.
 - K. Cable Rack Assembly: Nonmetallic. Components fabricated from nonconductive, fiberglass-reinforced polymer.
 - 1. Stanchions: Nominal 36 inches high by 4 inches wide, with minimum of 9 holes for arm attachment.
 - 2. Arms: Arranged for secure, drop-in attachment in horizontal position at any location on cable stanchions, and capable of being locked in position. Arms shall be available in lengths ranging from 3 inches with 450-lb minimum capacity to 20 inches with 250-lb minimum capacity. Top of arm shall be nominally 4 inches wide, and arm shall have slots along full length for cable ties.
 - L. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.
 - M. Portable Manhole Ladders: UL-listed, heavy-duty fiberglass specifically designed for portable use for access to electrical manholes. Minimum length equal to distance from deepest manhole floor to grade plus 36 inches. Three required.
 - N. Cover Hooks: Heavy duty, designed for lifts 60 lb and greater. Six required.
-

PART 3 - EXECUTION

3.01 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Cables over 600 V: RNC, NEMA Type EPC-80-PVC, in reinforced concrete-encased duct bank, unless otherwise indicated.
- B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-80-PVC, in direct-buried duct bank, unless otherwise indicated.
- C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-80-PVC, in direct-buried duct bank, unless otherwise indicated.
- D. Underground Ducts for Telephone, Communications, or Data Cables: RNC, NEMA Type EPC-80-PVC, in reinforced concrete-encased duct bank, unless otherwise indicated.

3.02 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes, Manholes and Pullboxes:
 - 1. Units in Roadways, parking lots and other Deliberate Traffic Paths: Precast concrete. Aircraft Rated.
 - a. **INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES**
- B. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- C. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- D. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finish grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.03 EARTHWORK

- A. Excavation and Backfill: Comply with Division 31 Section "Earthworks."
- B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
- D. Do not cut existing pavement in the path of underground ducts and utility structures. Jack and bore under existing roadways and driveways as indicated.

3.04 DUCT INSTALLATION

- A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.
 - B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 25 feet , both horizontally and vertically, at other locations, unless otherwise indicated.
 - C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
 - D. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use
 1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
 2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
 3. Grout end bells into structure walls from both sides to provide watertight entrances.
 - E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition.
 - F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
 - G. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.
 - H. Direct-Buried Duct Banks:
 1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
 2. Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
 3. Excavate trench bottom to provide firm and uniform support for duct bank.
 4. Install backfill as specified in Division 31, "Earthmoving."
 5. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction.
 6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and communications ducts.
-

7. Depth: Install top of duct bank below finished grade, as scheduled herein, unless otherwise indicated.
 - a. Primary Feeder and Service Lateral Duct– 36”
 - b. 480/277V, 208/120V and Communications Duct – 24”

3.05 GROUNDING

- A. Ground underground ducts and utility structures according to Division 26 Section “Grounding and Bonding for Electrical Systems.”

3.06 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
 3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 05 26 Section "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Prepare test and inspection reports.

3.07 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The work includes excavating, filling, and constructing pavement, gravel base and subgrade courses.

1.02 REFERENCES

- A. General: Publications listed below form a part of this Specification to the extent indicated by references thereto.
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM C29/C29M - Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
 - 2. ASTM D1556/D1556M - Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
 - 3. ASTM D1557 - Test Methods Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 - 4. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
 - 5. ASTM D6938 - Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- C. Washington State Department of Transportation (WSDOT)
 - 1. Standard Specifications for Road, Bridge, and Municipal Construction
- D. Environmental Protection Agency (EPA)
 - 1. EPA SW 846 - Test Methods for Evaluating Solid Waste, Physical/Chemical Methods; United States Environmental Protection Agency, SW-846; Current edition.
- E. Washington Administrative Code (WAC)
 - 1. WAC Ch. 173-340 - Model Toxics Control Act
 - 2. WAC Ch. 173-303 - Dangerous Waste Regulations

1.03 SUBMITTALS

- A. Submit test reports for the following:
 - 1. Sieve analysis of materials used for backfill and select fill.
 - 2. Degree of Compaction: Degree of compaction shall be expressed as a percentage of maximum density obtained by test procedures presented in ASTM D1557 or ASTM D2167.
 - 3. Sources of all imported material and certification that materials are clean and free of contamination.
- B. Submit test reports for the following
 - 1. Sieve analysis for all borrow materials.
 - 2. Proctor data for all borrow materials.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Materials shall be of the quality, size, shape, gradation, or equal to that manufacture as specified herein.

2.02 GRAVEL BASE MATERIAL

- A. Gravel base material: Clean, well graded granular material meeting the requirements of WSDOT Standard Specifications Section 9-03.9(3) – Crushed Surfacing Top or Base Course.

PART 3 – EXECUTION

3.01 GENERAL

- A. Excavating and grading shall be completed within the tolerances established or within reasonably close conformity with the alignment grade and cross sections indicated on the Drawings or Specifications.

3.02 EXCAVATION FOR STRUCTURES AND UTILITIES

- A. All foundations and utility structures shall be founded on compacted subgrade. Excavated material may be reused if it meets the requirements for fill, or as approved by the Engineer. Compact fill material as specified.
- B. Brace and shore sides of excavations. Comply with all federal, state, and local regulations regarding shoring, bracing, and other protection requirements.
- C. Keep water out of excavated pits and trenches by pumping or other means of dewatering. Water level shall be kept below the bottom of concrete pours before, during, and for a minimum of three days thereafter.
- D. Protect excavated material, stockpiled for use as backfill, from contamination by other materials and from damage by weather by covering with waterproof sheeting or other suitable means, as approved by the Engineer.
- E. Take appropriate steps to prevent damaging adjacent structures during excavation.
- F. Unsuitable Structural and Trench Excavation: Unsuitable materials (if encountered) shall be excavated to the depth designated by the Engineer. Unsuitable material shall be replaced with gravel base material, or other materials approved by the Engineer.

3.03 EXPORT MATERIAL

- A. Material to be exported from the site must be stockpiled and characterized prior to offsite disposal. The Contractor will stockpile material at a location onsite as directed by the Engineer. Stockpiled material shall be placed on the pavement, covered with plastic sheeting and anchored to prevent rain water from contacting material. Refer to Paragraph 3.05 for characterization and disposal requirements. Contractor shall base their bid on the assumption that excavated material is not regulated.

3.04 CONTAMINATED/HAZARDOUS SOILS AND GROUNDWATER

- A. Contractor shall monitor soils and groundwater by instructing workers in observing and reporting questionable materials, odors, oily sheen or color on soils and water, and oily or chemical odors. If unexpected hazardous or contaminated materials are encountered, Contractor shall stop work in that area immediately and notify the Engineer.

3.05 CHARACTERIZATION TESTING, REPORTING, AND CERTIFICATION

- A. Provide characterization and testing as described below for all off-site borrow materials.
- B. The Contractor is responsible for all testing costs associated with characterization of off-site borrow materials.
- C. Provide the following information with each sample submitted:
 - 1. Material Source
 - 2. Proposed On-site Use
 - 3. Sampling dates
 - 4. Chain of custody
 - 5. Sampling locations
 - 6. Contractor's certification that the samples submitted are representative of the materials that shall be reused at the site.
- D. Characterization Testing shall include:
 - 1. Maximum Dry Density (ASTM D1557)
 - 2. Weight per unit volume of uncompacted material (ASTM C29/C29M)
 - 3. Priority Pollutant Metals (EPA SW 846 6010/6020/ 7041)
 - 4. Volatile Organic Compounds (EPA SW 846 8260)
 - 5. Semi-volatile Organic Compounds (EPA SW 846 8270)
 - 6. PCBs and Pesticides (EPA SW 846 8080)
 - 7. Petroleum Hydrocarbons (NWTPH-HCID)

3.06 FILL AND BACKFILL FOR STRUCTURES AND UTILITIES

- A. Place fill to lines and grades indicated on the Drawings.
- B. Remove water from excavated areas, by pumping or other means, before placing any fill material.
- C. Compact subgrade, as specified later in this section, before placing any fill material.
- D. Do not place any fill against concrete walls/structures until the concrete has attained its specified design strength and/or certain other construction sequence criteria, if noted on the Drawings, are met, or as specifically approved by the Engineer.
- E. Place fill in layers not exceeding 6 inches (loose thickness) and compact to at least 98% of dry density (ASTM D1557). Select backfill shall be used for materials placed beyond the limits defined for structural excavation.

3.07 COMPACTION

- A. Compaction shall be performed with approved compaction equipment suited to the soil and the area being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. The moisture content of fill material shall be within 2 percent of the optimum moisture content at the time of compaction.

- B. Each lift of material placed shall be uniformly compacted to the density indicated for the specific material and use set forth in these Specifications. The percent of density required is in relation to the maximum density obtainable at optimum moisture content (Compaction Control Density) as determined in Section 3.08 "Compaction Control Tests."

3.08 COMPACTION CONTROL TESTS

- A. Laboratory and field tests shall be performed by the Port:
- B. Compaction control density shall be the maximum density at optimum moisture content as determined by ASTM D1557, Standard Methods for Moisture-Density Relationships of Soil and Soil Aggregates, Methods A, B, C or D as applicable.
- C. Field tests to determine in-place compliance with required densities as specified, shall be performed in accordance with ASTM D1556/D1556M or D2167.

3.09 PREPARATION FOR CRUSHED SURFACING AGGREGATES

- A. Preparation of Subgrade
 - 1. Immediately prior to placement of surfacing materials, clean the entire width of the area of all debris and dispose of as directed by the Engineer. All depressions or ruts which contain storm water shall be drained.
 - 2. Shape the entire subgrade to a smooth uniform surface, true to line, grade, and cross section. Thoroughly compact the material for a depth of twelve inches below the finish subgrade elevation to 95% of the maximum density as determined by compaction tests ASTM D1557. If soft or spongy material underlying the upper twelve inches of the area being prepared precludes satisfactory compaction of the upper twelve inches, loosen, aerate, or excavate, replace, and compact to the required density as directed by the Engineer.
 - 3. Remove and dispose of excess. Subgrade areas deficient in materials shall be brought to grade by importing suitable materials. Materials added to subgrade areas deficient in materials shall be watered and compacted as necessary to yield a true finished subgrade as described above.
 - 4. Once the subgrade is prepared, maintain the subgrade for surfacing in the finished condition until the first course of surfacing has been placed.
- B. Subgrade Protection
 - 1. Take all precautions necessary to protect the subgrade (including utility backfills and exposed excavation surfaces) from damage.
 - 2. Protect the exposed excavation areas from excessive wetness due to rainfall. Protection measures may include covering with plastic or other means.
 - 3. Where approved compacted subgrades are disturbed by subsequent operations or adverse weather, scarify the subgrades and compact to the required density prior to further construction thereon.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. A Work herein generally covers trenching, backfilling and compaction required for installation of stormwater systems and electrical conduit and vaults. Trench excavation and backfill shall include all excavation, backfilling, disposal of surplus and unsuitable material and all other work incidental to the construction of trenches.

1.02 QUALITY ASSURANCE

- A. On-Site Testing and Inspection: The Port will provide and pay for on-site testing and inspection services. Sampling and testing for compliance with the contract provisions will be in accordance with Section 01 45 00 – Quality Control. The Contractor shall assist in obtaining samples and may obtain copies of test results performed by the Port at no cost. Tests conducted for the sole benefit of the Contractor shall be at the Contractor's expense.
- B. Compaction Control Tests: The Port will provide and pay for laboratory and on-site field compaction control tests in accordance with the applicable provisions of these specifications.
 - 1. The compaction control density shall be the maximum density at optimum moisture content as determined by ASTM D 1557.
 - 2. Field tests to determine in-place compliance with required densities as specified, shall be performed in accordance with ASTM D 6938.
- C. Comply with applicable provisions of all pertinent local and state codes and regulations.
- D. Dewatering Work Plan: Describe methods to be employed in removing water from excavations and diverting surface water from other areas or structures. Describe the basic components of the dewatering system proposed and its planned method of operation. Dewatering shall be constructed and operated in such a manner as to avoid conflicts with ongoing activities.

1.03 SITE CONDITIONS

- A. There are existing utilities buried in the ground within the trenching locations of this project. Contractor shall hire a private utility locate company to scan the trench alignments and identify the presence and location of existing utilities. Locate company shall use traditional utility locate equipment and Ground Penetrating Radar (GPR). Those utilities which are to remain shall be protected from damage during construction and remain operational throughout the project. Damage to existing active utilities shall be repaired by the Contractor at no additional cost to the Port.
- B. There are existing ground wires present that likely will not be identified by utility locate. If Contractor discovers damages existing ground wires during excavation, Contractor shall stop work and coordinate with the Port to implement appropriate repairs.
- C. Ground water elevations fluctuate but shall be assumed to be approximately 3 feet below existing grade. Saturated soil material removed below ground water level shall not be reused for backfill material and shall be considered geotechnically unsuitable.

1.04 SUBMITTALS

- A. Before bringing to the site, perform, pay for, and submit test reports for all imported materials to determine the achievable in-place densities of off-site borrow source materials, in accordance with the requirements for compaction control tests referenced herein.
- B. Refer to Section 32 11 23 – Crushed Surfacing Aggregates.

PART 2 - PRODUCTS

2.01 GRAVEL BACKFILL FOR FOUNDATIONS

- A. Gravel backfill for foundations shall be used a leveling pad under electrical vaults and shall consist of imported clean, well graded crushed granular material meeting the requirements of Section 32 11 23 Crushed Surfacing Aggregate.

2.02 TRENCH BACKFILL MATERIAL

- A. It is anticipated the quantity of geotechnically suitable excavated in-situ material resulting from construction activities will exceed the quantity of required backfill material for the project.
- B. Material used for backfill and trench backfill material shall be geotechnically suitable excavated in-situ material generated during site construction.
- C. Geotechnically suitable material shall be clean, free-draining, sandy gravel or gravelly sand that is free from deleterious coatings and shall contain no organic matter, soft friable particles, or other performance-reducing properties, as determined by the Engineer.
 - 1. The material shall not have excessive moisture content, excessive fine-grained fraction passing the U.S. No. 200 sieve, or other factors rendering the material unsuitable for placement, compaction, or supporting surface loads.
 - 2. 100% of material shall pass a 3-inch screen.
 - 3. The moisture content of fill material shall be within minus 2 percent to plus 1 percent of the optimum moisture content at the time of compaction.

2.03 RECYCLED MATERIALS

- A. Asphalt removed by demolition activities shall be taken to a Contractor selected and Port approved recycler but shall not be reused on-site. Refer to Section 01 74 16 – Soil Characteristics and Waste Management.

2.04 CONTROLLED DENSITY FILL (CDF)

- A. Controlled Density Fill (CDF), also may be referred to as lean concrete or controlled low strength material, shall be dyed red and meet the following requirements:
- B. CDF is a self-compacting, cementitious, flowable material requiring no subsequent vibration or tamping to achieve consolidation. The Contractor shall submit a mix design in writing to the Port for review and approval. Contractor shall utilize ACI 229 as a guide to develop the CDF mix design. No CDF shall be placed until the mix design has been approved. CDF shall be designed to have a minimum 28-day strength of 50 psi and a maximum 28-day strength not to exceed 300 psi. The CDF consistency shall be flowable (approximate slump 3 to 10 inches).
- C. The following testing methods shall be used by the Contractor to develop the CDF mix design:
 - 1. 28-day compressive strength – ASTM D4832
 - 2. Unit weight, yield, and air content – ASTM D6023
 - 3. Slump – FOP for AASHTO T 119
- D. The water/cement ratio shall be calculated on the total weight of cementitious material. Admixtures and foaming agents, if used, shall meet the requirements of ASTM C869. Admixtures shall be used in accordance with the manufacturer's recommendations and non-chloride accelerating admixtures may be used to accelerate the hardening of CDF.

- E. Mix design to have a minimum 28-day compressive strength of 50 psi and a maximum 28-day compressive strength not to exceed 300 psi. CDF consistency shall be flowable, approximately 3 to 10 inches.

2.05 UNDERGROUND MARKING TAPE

- A. Underground marking tape shall consist of inert polyethylene plastic, 4-mil thickness that is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil, with a metallic foil core to provide the most positive detection and pipeline locators.
- B. The tape shall be color coded and shall be imprinted continuously over its entire length in permanent black ink. The message shall convey the type of line buried below and shall also have the word "Caution" prominently shown. Color for electrical shall be red.

PART 3 - EXECUTION

3.01 EXCAVATION

- A. The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, cross sections, details, and elevations indicated and as specified. Satisfactory excavated materials shall be put into temporary stock pile locations as required to be used later for backfill within the limits of the work. Geotechnically unsatisfactory materials encountered within the limits of the work shall be removed and replaced with satisfactory materials as directed by the Engineer. Geotechnically unsatisfactory material and surplus / excess satisfactory excavated material not required for backfill shall be hauled off site and disposed of by the Contractor. Unsatisfactory excavated material shall be stockpiled separately from satisfactory material. During construction, excavation and fill shall be performed in a manner and sequence that will provide sufficient quantities for material reuse at all times.
- B. All excavated material shall be stockpiled in the area shown on the drawings to allow time for the Port to test the material before Contractor hauls material to an approved off-site disposal facility. Approved plastic material shall be placed on the existing impervious surface prior to placing stockpiled materials. Refer to Division 1 specifications for material handling and disposal requirements.

3.02 EXCAVATIONS FOR UTILITY STRUCTURES

- A. Excavation shall be of sufficient size to permit the placement of the full length and width of utility structures. Base of excavation shall meet the requirements of 3.03 and 3.04 of this section. Utility structures including bearing pads shall be placed on minimum of 6 inches of base- course aggregate compacted to 95% of the maximum density. If base of excavation is over saturated due to ground water refer to requirements of paragraph 3.04 of this section.

3.03 REMOVAL OF UNYIELDING MATERIAL

- A. Where over depth is not indicated and unyielding material such as rock or other hard material is encountered in the bottom of the excavation, such material shall be removed and replaced with compacted geotechnically satisfactory backfill materials.

3.04 REMOVAL OF UNSTABLE MATERIAL

- A. Where unstable or geotechnically unsatisfactory material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with compacted geotechnically satisfactory backfill materials. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Port. If material is unstable due to ground water conditions, dewater excavation and remove unstable material to a minimum additional depth of 2 feet. Place 2 feet minimum depth of quarry spalls to stabilize base of excavation. Wrap / surround quarry spalls with geotextile fabric (bottom, top, and sides) to separate from existing soils and backfill material. All geotextile joints shall have minimum one foot overlap.

3.05 TRENCH EXCAVATION

- A. The Contractor shall maintain, at all times during the execution of this work, safe and stable excavations.
- B. The Contractor shall conduct all operations with the least possible obstruction and inconvenience to the Port.
- C. The trench width and depth shall be as detailed on the drawings. All visible stones at base of electrical trench shall be removed. Placement of bedding material shall precede the installation of vaults.
- D. For trench excavation, unsuitable material at the base of the trench shall be removed. Excavation shall be continued to such additional depth and width as required by the Engineer. The trench shall be backfilled to conform with section shown on drawings with crushed surfacing base course, and compacted to form a uniformly dense, unyielding foundation.
- E. All excess or unsatisfactory material excavated from trenches shall be placed in trucks and hauled to temporary on-site stockpile area to allow Port to perform testing of the material prior to Contracting hauling to disposal site. Excess or unsatisfactory material shall not be placed adjacent to the trench and shall not be reused as backfill.
- F. The Contractor shall furnish, install, and operate all necessary equipment to keep excavations free from water during construction, and shall dewater and dispose of the water. Sufficient pumping equipment in good working condition shall be available at all times for all emergencies, including power outage, and shall have available at all times competent workers for the operation of the pumping equipment.

3.06 SHORING

- A. Where required, the Contractor shall provide all materials, labor, and equipment necessary to shore trenches to protect the Work, existing property, utilities, pavement, etc., and to provide safe working conditions in the trench. Shoring shall be in accordance with applicable local, State, or Federal safety codes, including WAC 296-155 part N.
- B. If workers enter any trench or other excavation 4 feet or more in depth, it shall be shored. To avoid excessive excavation area and resulting pavement demo and restoration, open trenches to avoid shoring for excavations greater than 4 feet are prohibited. The Contractor alone shall be responsible for worker safety, and the Port assumes no responsibility.
- C. Upon completing the Work, the Contractor shall remove all shoring. Damages resulting from improper shoring or failure to shore shall be the sole responsibility of the Contractor.

3.07 TEMPORARY TRENCH COVER

- A. Where required by the Port to maintain temporary vehicular access to opposite side of trench work area, the Contractor shall provide temporary steel plate trench covers of thickness necessary to support HS-25 truck traffic loads based on span dimension across trenches.

3.08 BEDDING AND BACKFILLING

- A. Electrical Trenches:
 - 1. Electrical trenches shall be as shown on electrical drawings. Extend placement of material above the conduit to the height shown in the details on the drawings in a manner to avoid damaging or disturbing the conduit.
 - 2. Trench backfill above sand material shall be clean earth or sand, free from clay, frozen lumps, roots, or moisture in excess of that permitting required compaction. Rocks or lumps larger than 3 inches maximum shall not be used.
 - 3. Bedding and Trench backfill shall be accomplished in such a manner that the conduit will not be shifted out of position nor damaged by impact or overloading. All compaction shall be in accordance Paragraph 1.03.
 - 4. The Contractor shall not operate heavy equipment over the top of the electrical trench until all work is complete.
- B. General Backfill:
 - 1. Backfill material shall be clean earth or sand, free from clay, frozen lumps, roots, or moisture in excess of that permitting required compaction. Rocks or lumps larger than 3 inches maximum shall not be used. Backfill shall be placed in horizontal layers no more than 6 inches thick and compacted to 95 percent maximum density.

3.09 COMPACTION

- A. Contractor shall properly place and compact all bedding and backfill material to at least 95% of dry density determined in accordance with ASTM D 1557.
- B. For trenches, successive horizontal layers shall not exceed 6 inches in loose thickness.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions and General Requirements, apply to the work as if specified in this section. Work related to this section is described in:
 - 1. Section 31 23 33 – Trenching and Backfilling
 - 2. Section 32 12 16 – Hot Mix Asphalt Paving

1.02 DESCRIPTION OF WORK

- A. The extent of work is indicated on the drawings. The work includes the requirements for furnishing and installing imported aggregate base. Work includes transporting, placing, shaping and compacting base courses in conformance with these specifications and the dimensions and sections indicated on the drawings or within the lines and grades established by the Engineer.

1.03 QUALITY ASSURANCE

- A. Contractor shall submit material test results for review and approval prior to procurement.
- B. On-Site Testing and Inspection: The Port will provide and pay for on-site testing and inspection services to ensure compliance with the contract provisions. The Contractor shall assist in obtaining samples and may obtain copies of test results performed by the Port at no cost. Tests conducted for the sole benefit of the Contractor shall be at the Contractor's expense. In place density will be determined using Test Methods FOP for AASHTO T 310 and WSDOT SOP 615.

1.04 SUBMITTALS

- A. Submit test reports in accordance with Section 01 33 00 - Submittal Procedures, for Contractor furnished import aggregate base as follows:
 - 1. Sieve analyses
 - 2. Los Angeles Wear Percentage, 500 Rev
 - 3. Degradation Factor
 - 4. Number of fracture faces of the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335
 - 5. Borrow Source Characterization
 - 6. Maximum Density and Optimum Moisture Content, determined by one of the following applicable methods as applicable:
 - a. Materials with less than 30 percent by weight retained on the No. 4 sieve shall be determined using FOP for AASHTO T 99 Method A.
 - b. Materials with 30 percent or more by weight retained on the No. 4 sieve and less than 30 percent retained on the 3/4-inch sieve shall be determined by WSDOT T 606 or FOP for AASHTO T 180 Method D.
 - c. Materials with 30 percent or more retained on the 3/4-inch sieve shall be determined by WSDOT T 606.

PART 2 - PRODUCTS

2.01 CRUSHED SURFACING AGGREGATE

- A. Material used for crushed surfacing aggregate base course shall be imported aggregate complying with the following requirements and characterized in accordance with the requirements of Section 31 23 33 – Trenching and Backfilling.
- B. Crushed surfacing shall be manufactured from ledge rock, talus, or gravel. The materials shall be uniform in quality and free from wood, roots, bark, and other extraneous or objectionable material and shall meet the following quality test requirements:
 - 1. Los Angeles Wear, 500 Rev.: 35 percent max.
 - 2. Degradation Factor: 25 min. (Crushed Surfacing Top Course)
 - 3. Degradation Factor: 15 min. (Crushed Surfacing Base Course)
- C. Crushed Surfacing Top Course shall meet the following requirements for grading and quality:

| Sieve Size | Percent Passing |
|-----------------|-----------------|
| 3/4" | 99-100 |
| 1/2" | 80-100 |
| No. 4 | 46-66 |
| No. 40 | 8-24 |
| No. 200 | 10.0 max |
| % Fracture | 75 min |
| Sand Equivalent | 40 min |

- D. Crushed Surfacing Base Course shall meet the following requirements for grading and quality:

| Sieve Size | Percent Passing |
|-----------------|-----------------|
| 1-1/4" | 99-100 |
| 1" | 80-100 |
| 5/8" | 50-80 |
| No. 4 | 25-45 |
| No. 40 | 3-18 |
| No. 200 | 7.5 max |
| % Fracture | 75 min |
| Sand Equivalent | 40 min |

- 1. All percentages are by weight
- E. The fracture requirement shall be at least one fractured face and will apply to the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335.
- F. The portion of crushed surfacing retained on a No. 4 sieve shall not contain more than 0.15 percent wood waste.

PART 3 - EXECUTION

3.01 EQUIPMENT

- A. All equipment necessary for the satisfactory installation of crushed stone surfacing base course shall be submitted to the Port for review and approval prior to beginning work.

3.02 PLACEMENT OF CRUSHED STONE SURFACING

- A. **Mixing:** The surfacing material and water shall be mixed in a central mixing plant. The completed mixture shall be a thoroughly mixed combination of proportioned materials and water, uniform in distribution of particle sizes and moisture content. A mixture containing water in excess of the proportion established by the Engineer will not be accepted.
- B. **Placing and Spreading:** Each layer of surfacing material shall be spread by equipment that is approved by the Engineer. Equipment that causes segregation of the surfacing material during the placing and spreading operation will not be allowed. Material shall be placed in layers not exceeding 4-inches.
- C. **Shaping and Compacting:** Immediately following spreading and final shaping, each layer of surfacing shall be compacted to at least 95 percent of maximum density before the next succeeding layer of surfacing or pavement is placed. The determination of field in-place density shall be made by the Nuclear gauge. When the thickness of surfacing is less than:
 - 1. 0.15 foot, density testing will not be required and the Engineer will determine the number of coverages required for the particular compaction equipment available. A mist spray of water shall be applied as needed to replace moisture lost by evaporation. The completed layer shall have a smooth, tight, uniform surface true to the line, grade, and cross-section shown in the Plans.
- D. **Weather Limitations:** When, in the opinion of the Engineer, the weather is such that satisfactory results cannot be obtained, the Contractor shall suspend operations until the weather is favorable. No surfacing materials shall be placed during rainfall or snow, or placed on soft, muddy, or frozen Subgrade.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The extent of work is indicated on the Drawings. The work includes the requirements for producing, transporting, placing, shaping and compacting of one or more courses of materials in conformance with these Specifications and the dimensions and sections indicated on the Drawings.

1.02 QUALITY ASSURANCE

- A. The Port will provide necessary inspection services. Sampling and testing for compliance with the Contract provisions shall be in accordance with Section 01 33 00 - Submittal Procedures of these Specifications. The Contractor may obtain copies of results of tests performed by the Port from the office of the Port, at no cost. Tests conducted for the sole benefit of the Contractor, shall be at the Contractor's expense.
- B. Unless otherwise referenced or modified herein, quality control and quality standards for this section shall be as specified in the Washington State Department of Transportation Standard Specifications for Road, Bridge and Municipal Construction M41-10, 2026 edition (WSDOT Standard Specifications).
- C. Weather limitations shall be in accordance WSDOT Standard Specifications Section 5-04.3(1). Place HMA only during dry weather and on dry surfaces – no exception. Performance Grade HMA placed on wet surfaces and/or during rainfall are subject to removal and replacement at Contractor's expense. Rainfall shall not be in the forecast for the duration of the anticipated placement timeframe of HMA.
- D. Unless otherwise directed, asphalt courses shall not be constructed when the average surface temperatures are less than that specified in WSDOT Standard Specifications, Section 5-04.3(1), Table 5. Temperature of the HMA during placement shall be as required by Binder manufacturer.
- E. Truck tickets for HMA shall clearly state mix number that corresponds with submittal information. If mix number is not shown on truck ticket, asphalt will not be allowed to be placed and Contractor will return material at his own expense – no exceptions.
- F. Mixing Plant shall conform to the requirements of WSDOT Standard Specification Section 5-04.3(3)A.
- G. Hauling Equipment shall conform to the requirements of WSDOT Standard Specification Section 5-04.3(3)B.
- H. Pavers shall conform to the requirements of WSDOT Standard Specification Section 5-04.3(3)C.
- I. Material Transfer Device or Material Transfer Vehicle shall conform to the requirements of WSDOT Standard Specification Section 5-04.3(3)D.
- J. Rollers shall conform to the requirements of WSDOT Standard Specification Section 5-04.3(3)E.

1.03 SUBMITTALS

- A. The Contractor shall submit a mix design listed on the WSDOT Qualified Products List (QPL) or previously approved for use at a Port of Tacoma container terminal within the last 24 months. Contractor shall meet the requirements of paragraph 2.02 of this specification section. Submit WSDOT Forms 350-041 and 250-042 to the Engineer to request approval of a mix design from the WSDOT QPL. If mix design is from a past Port of Tacoma project, submit all test data demonstrating the mix design meets the requirements of WSDOT
 - 1. Standard Specification Sections 9-03.8(2) and 9-03.8(6). Contractor is responsible for identifying anti-strip requirements for the HMA. Submittal shall include binder manufacturer's recommendations for placement temperature of the HMA. Statistical evaluation shall have been used for mix design in accordance with WSDOT Standard Specification, Section 5- 04.3(9). Mix design shall ensure a target air void content of 4 percent is used. Asphalt content shall not be arbitrarily increased in construction to facilitate compaction, to minimize segregation, or for any other reason.
- B. Styrene Butadiene Styrene (SBS) Polymer Modified Performance Graded Asphalt Binder:
 - 1. Name of supplier.
 - 2. Certificate of Polymer Modified Binder Analysis
 - 3. Temperature – viscosity relationship
 - 4. Minimum / maximum mixing, placement and compaction temperature (degrees F) as recommended by polymer modified binder manufacturer.
- C. Joint Sealer: Submit manufacturer product data
- D. Tack Coat: Submit product data

1.04 TESTING REQUIREMENTS

- A. Testing shall comply with the WSDOT Standard Specifications Sections 9-03.8(2) and 9-03.20. Aggregates for the HMA Class specified shall meet the requirements for pavements having greater than 10 million ESAL's in accordance with WSDOT Standard Specifications Section 9-03.8(2).

PART 2 - PRODUCTS

2.01 GENERAL

- A. Materials shall be in accordance with WSDOT Section 5-04.2 and as referenced herein.

2.02 HOT MIX ASPHALT (HMA) MIX DESIGN

- A. Obtaining Project Approval: Mix designs shall be listed on the WSDOT QPL. Submit WSDOT Forms 350-041 and 250-042 to the Engineer to request approval of a mix design from the QPL on this project. Follow other requirements in WSDOT Standard Specifications, Section 5-04.2(2).
- B. Mix design shall have been originally developed in accordance with WSDOT SOP 732. Mix design shall comply with WSDOT Standard Specifications, Sections 9-03.8(2) and 9-03.8(6).
- C. HMA shall be Class 1/2". Minimum gyration level for mix preparation shall conform to $N_{design} = 100$. Target air void percentage (V_a) of mix design at the design number of gyrations shall be 4.0%. VMA and VFA shall meet the requirements of WSDOT Section 9-03.8(2). Mix design shall assume ESAL's > 10 million.

- D. Required Density at Ndesign: The HMA design when compacted in accordance with AASHTO T 312, shall have a required density that is a percent of theoretical maximum specific gravity (%Gmm) = 96.

2.03 ASPHALT MATERIALS

- A. Aggregate for asphalt concrete shall conform to the grading requirement of Section 9-03.8, and the following:
1. General requirements shall be in accordance with WSDOT Specification, Section 9-03.8(1).
 2. Test requirements shall be in accordance with WSDOT Specification, Section 9-03.8(2).
 3. Grading requirements shall be in accordance with WSDOT Specification, Section 9-03.8(3).
 4. Mineral filler, when used, shall be in accordance with WSDOT Specification, Section 9-03.8(5) and AASTHO M 17.
 5. Proportions of materials shall be in accordance with WSDOT Specification, Section 9-03.8(6).
 6. Job mix tolerances and adjustments shall be in accordance with WSDOT Specification, Section 9-03.8(7).
 7. Test Methods for Aggregates shall be in accordance with test requirements in WSDOT Section 9-03.20.
- B. Asphalt Binder: Manufacturer shall be included on WSDOT QPL. Binder shall be a Styrene Butadiene Styrene (SBS) Polymer Modified Performance Graded Asphalt Binder (PGAB). Performance grade for all courses of paving shall be PG 58V-22. Asphalt shall conform to the requirements of WSDOT Section 9-02.1(4) for Performance Grade HMA PG 58V-22, including elastic recovery. SBS Polymer Modified PGAB shall have the following binder-enhancement characteristics:
1. Higher stiffness at high-service temperatures, resulting in reduced levels of rutting and shoving
 2. Lower stiffness and faster relaxation properties at low service temperatures, resulting in reduced thermal cracking
 3. Increased adhesion between the asphalt binder and the aggregate in the presence of moisture, resulting in a reduced likelihood of stripping
 4. Improved aging characteristics, which help delay the deleterious impacts of oxidation and provide a more durable pavement
- C. Joint sealer: To be used at joints between existing asphalt and HMA placement areas. Hot applied PG 58H-22, elastically modified composition of asphalt cement and other modifiers. The sealant shall contain no solvent.
- D. Tack coat: Cationic emulsified asphalt CSS-1 or CSS-1h. The CSS-1 and CSS-1h may be diluted with water at a rate not to exceed one part water to one part emulsified asphalt. Do not allow the tack coat material to exceed the maximum temperature recommended by the asphalt supplier. CSS-1 and CSS-1h shall conform to WSDOT Standard Specifications, Section 5-04 and 9-02.1(6).

PART 3 - EXECUTION

3.01 GENERAL - PLACING HMA

- A. HMA shall be prepared from materials as previously described and by plants and methods conforming to the WSDOT Standard Specifications. Delivery of materials to the site shall meet the requirements of the WSDOT Standard Specifications.
- B. Minimum lift thickness for Class 1/2" PG HMA shall be 2 inches. Maximum lift thickness for final lift (wearing course) shall be 3.60 inches (0.30 feet) and 4.20 inches (0.35 feet) for other lifts in accordance with WSDOT Standard Specifications Section 5-04.3(7). Apply tack coat between all lifts of HMA.
- C. Construction shall be in accordance with the requirements of WSDOT Standard Specifications, Section 5-04.3.

3.02 SAW-CUTTING EXISTING ASPHALT PAVEMENT

- A. Saw-cut existing asphalt where indicated on the drawings so existing asphalt can be removed to perform required work. If clean vertical saw-cut edge is damaged by the Contractor during construction, Contractor shall saw-cut asphalt beyond damaged edge and remove asphalt prior to placing HMA at no additional cost to the Port.

3.03 TACK COAT

- A. Prior to applying tack coat, clean asphalt pavement surfaces in accordance with WSDOT Standard Specifications, Section 5-04.3(4). Areas to receive tack coat must be approved by the Engineer prior to application.

3.04 COMPACTION

- A. Immediately after the HMA has been spread and struck off, and after surface irregularities have been adjusted, thoroughly and uniformly compact the mix. The completed course shall be free from ridges, ruts, humps, depressions, objectionable marks, and irregularities and shall conform to the line, grade, and cross-section shown in the Plans.
- B. Compact the mix when it is in the proper condition so that no undue displacement, cracking, or shoving occurs. Compact areas inaccessible to large compaction equipment by mechanical or hand tampers. Remove HMA that becomes loose, broken, contaminated, shows an excess or deficiency of asphalt, or is in any way defective. Replace the removed material with new HMA, and compact it immediately to conform to the surrounding area.
- C. The type of rollers to be used and their relative position in the compaction sequence shall generally be the Contractor's option, provided the specified densities are attained. Exceptions are as follows:
 - 1. Pneumatic tired rollers shall be used for compaction of the wearing course beginning October 1st of any year through March 31st of the following year. Coverage with a steel wheel roller may precede pneumatic tired rolling. Unless otherwise approved by the Engineer, operate rollers in the static mode when the internal temperature of the mix is less than 175°F. Regardless of mix temperature, do not operate a roller in a mode that results in checking or cracking of the mat.
- D. HMA shall be compacted to a specified minimum level of relative density. After completion of the finish rolling, HMA compaction testing shall be performed with a nuclear density gauge in accordance with FOP for AASHTO T 355. Acceptable level of relative density shall be at least 93 percent of the theoretical maximum density determined using FOP for AASHTO T 209.

3.05 HMA PAVEMENT JOINTS

- A. Transverse and longitudinal joints in HMA shall be in accordance with WSDOT Standard Specifications, Section 5-04.3(12)A.

3.06 JOINT SEALER PLACEMENT

- A. Apply joint sealer to the interface between existing asphalt or concrete and where HMA is being placed.

3.07 SURFACE SMOOTHNESS

- A. Surface smoothness of completed pavement shall conform to the specific requirements of WSDOT Standard Specifications, Section 5-04.3(13).

3.08 PROTECTION OF PAVED SURFACES

- A. Do not permit vehicular traffic, including heavy equipment, on pavement until surface temperature has cooled to at least 120 degrees F. Measure surface temperature by approved thermometers or other satisfactory methods.

3.09 TESTING

- A. Testing shall comply with the WSDOT Standard Specifications, Section 5-04.3(10).
- B. Finish Surface Texture of Wearing Course: Visually check final surface texture for uniformity and reasonable compactness and tightness. Final wearing course with a surface texture having undesirable irregularities such as segregation, cavities, pulls or streaks, indentations, ripples, or lack of uniformity shall be removed and replaced at the Contractor's expense.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 31 23 33 – Trenching and Backfilling
 - 2. Section 32 12 16 – Hot Mix Asphalt Paving

1.02 DESCRIPTION OF WORK

- A. The extent and location of the chain link fence and gate work is indicated on the drawings. The work includes the requirements for furnishing and installing all items and components of a completed fence system in conformance with these specifications and the dimensions and sections indicated on the drawings.

1.03 QUALITY ASSURANCE

- A. Engage an experienced installer having at least five (5) years' experience with similar projects and having completed at least five chain link fencing projects with the same materials, similar security requirements, and of similar scope.
- B. The Port will provide inspection service. The Contractor shall provide all necessary assistance in carrying out such inspections and tests, at no additional cost to the Port.
- C. This section references quality and specification standards by the American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference (use the most current edition at the time of bid unless otherwise indicated).

1.04 SUBMITTALS

- A. Documentation demonstrating the qualifications and experience of the installer as described above.
- B. Shop drawings, catalog cuts, and fabrication methods for fencing fabric, fabric coating, framework, posts, rails, fittings, barbed wire, cantilever sliding gate, lock mechanism details, and other fencing elements.
 - 1. Provide plans, sections, and elevation drawings for all elements.
 - 2. Indicate all material types and show compliance with the drawings and specifications.
 - 3. Include details of the relationship of the gate and gate clearances to finish grades at various stages of opening and closing. Ensure adequate clearance between gate panels and finish grades.
- C. Submit the manufacturer's written specifications detailing the polymer/vinyl coating product components and the methods of application or fabrication.

PART 2 - PRODUCTS

2.01 CHAIN LINK FENCE

- A. General:
 - 1. Supply chain link fences and gates including accessories, fittings, and fastening from a single manufacturer.

2. The fence shall be chain link fabric supported on a steel frame, the posts of which are embedded in concrete foundations. Barbed wire supported on brackets above the fabric portion shall be installed as indicated on the drawings.
 - a. All steel fabric, framework, and fittings shall be hot-dipped galvanized after fabrication.
 3. Zinc-coated before weaving in accordance with ASTM A 392, Class 1 coating, and according to ASTM A 817 for Type II, Class 4 coating. The wire shall be 2-inch by 2-inch No. 9 gauge with 70,000 psi strength woven into steel chain link fabric and the fabric shall be twisted and barbed on both selvages.
 4. Polymer coat in accordance with ASTM F 668, Class 2a coating. Color black in accordance with ASTM F 934. Submit the manufacturer's written specifications detailing the coating product and method of fabrication.
 5. Supply 5 aerosol spray cans each containing a minimum of 14 ounces of touch-up paint in the color specified. The touch-up paint shall be compatible with the polymer coating system used.
- B. Framework:
1. Posts, rails, and braces shall be ASTM A 53 material and in accordance with ASTM F 1083.
 2. Line posts: 2.375-inch outside diameter, schedule 40 pipe weighing 3.65 pounds per foot.
 3. End, corner, or pull posts: 2.875-inch outside diameter, schedule 40 pipe weighing
 - a. 5.80 pounds per foot.
 4. Top rails and post braces: 1.66-inch outside diameter, schedule 40 pipe weighing
 - a. 2.27 pounds per foot.
 5. Swing gate posts: 2.875-inch outside diameter, schedule 40 pipe weighing 5.80 pounds per foot, for single gate up to 6-ft or double gate up to 12-ft. 4.0-inch outside diameter, schedule 40 pipe weighing 9.12 pounds per foot, for single gate up to 13-ft or double gate up to 20-ft. 6.625-inch outside diameter, schedule 40 pipe weighing 18.99 pounds per foot, for single gate up to 18-ft or double gate up to 36-ft.
 6. Cantilever sliding gate posts: 6.625-inch outside diameter, schedule 40 pipe weighing
 - a. 18.99 pounds per foot, for single gate up to 20-ft or double gate up to 38-ft
 7. Tubular framework shall exhibit no red rust on the exterior coated surface after 950 hours, and no red rust on the interior coated surface after 300 hours, exposure to salt spray according to ASTM B 117.
 8. Tension wire: No. 7 gage (0.177-inch diameter) marcelled tension wire according to ASTM A 824, Type II, coated with not less than 0.80 ounce of zinc per square foot of uncoated wire surface. Polymer coat in accordance with ASTM F 1664, Class 2a coating. Color black in accordance with ASTM F 934.
 9. All fittings, accessories, and hardware for chain link fence shall conform to the requirements of ASTM F 626 and match other framework material types. Polymer coat metallic-coated tie wires, clips, and hog rigs according to ASTM F 668 and match the color of the chain-link fabric in accordance with ASTM F 934. Barbed wire arm types as shown on the drawings.

C. Gates:

1. Design and fabricate gates to withstand wind and swing loads. Include allowances for future installation of slats, windscreens, inserts, signage, etc.
2. Construct swing gates and frames in accordance with ASTM F 900, unless noted otherwise, and to the dimensions shown on the drawings. Apply two coats of "GALVACON", or approved equal, in accordance with ASTM A 780 to welded corners of the gate frames, or use manufacturer's pre-fabricated galvanized corner connections.
3. Construct gates with chain-link fabric fastened to the ends of gate frame bars by tension bars and fabric bands, and to the top and bottom rails by tie wires in the same manner as the chain link fence fabric.
4. Cross-trussing shall be minimum 3/8-inch galvanized steel adjustable rods of the same material as the gate frame.
5. Install complete with hinges, latches, and drop-bar locking devices designed for the type of gate, posts, and lock used.
6. Provide positive-type latching devices with provisions for padlocking. Supply of padlocks is not required.

D. Cantilever Sliding Gates:

1. Design and fabricate gates to withstand wind and other site-specific environmental and operational loads. Include allowances for future installation of slats, windscreens, inserts, signage, etc.
2. Construct gates with chain-link fabric fastened to the ends of gate frame bars by tension bars and fabric bands. Fasten fabric to the top and bottom rails by tie wires in the same manner as the chain link fence fabric.
3. Fabric: As specified for chain link fence above.
4. Construct gates and frames in accordance with ASTM F 900, unless noted otherwise, and to the dimensions shown on the drawings.
5. Apply two coats of "GALVACON", or approved equal, in accordance with ASTM A 780 to welded corners of the gate frames, or use manufacturer's pre-fabricated galvanized corner connections.
6. Gate frames shall be designed to interlock at the top and bottom horizontal members with the gate track. The gate track shall have semi-enclosed sections securely fastened to the fence framework to ensure smooth and stable back and forth manual operation.
7. Cross-trussing shall be minimum 3/8-inch galvanized steel adjustable rods of the same material as the gate frame.
8. Support gate frame by, self-aligning, 4-wheeled, sealed lubricant, ball-bearing truck assemblies.
9. Provide positive-type latching devices and drop-bar with provisions for padlocking. Supply of padlocks is not required.
 - a. Protect dissimilar metals from galvanic action using coatings and isolators F Other Materials:

10. 1 Post anchorages shall be minimum 4,000 psi 28-day compressive strength concrete, standard ready-mixed concrete from a City of Tacoma approved plant. Air entrainment is not required.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Supply and install fences and gates in accordance with ASTM F 567 by an organization demonstrating at least five (5) years' experience regularly engaging in construction of complete security fencing systems.
- B. Install gates and other components in accordance with the manufacturer's instructions. Install locking bars to seat into keepers that are set into concrete ground anchors, which hold the gate rigidly in position when closed. Provide concrete ground anchors which hold the gate open to the specified arc.
- C. The locations and alignment of fence corners and gates are indicated on the drawings. The Contractor shall locate all intermediate line posts.
- D. Fasten fabric to posts, top rails, and the bottom tension wire with wire tie spacing as indicated on the drawings.
- E. Install top rails continuous. Provide for expansion or contraction of the continuous rail at regular intervals of maximum 100 feet.
- F. Install posts vertically with minimum depth of embedment as indicated on the drawings and at the spacing specified for the type of posts specified. In unpaved areas, strike off the post concrete 2 inches above the surrounding grade. In paved areas, leave the top of post concrete flush with the surrounding paving. Trowel the top of the concrete smooth with a slight slope away from the posts.
- G. Repair minor damage to galvanizing of fabric and fence appurtenances by thoroughly cleaning the damaged surfaces and the applying "GALVACON," or approved equal, in accordance with the manufacturer's recommendations.
- H. Upon completion of the fence, clean the fence of all debris and repair marred or abraded areas as directed by the Engineer.

END OF SECTION

Appendix A:
Construction SWPPP Short Form

CONSTRUCTION SWPPP SHORT FORM

The threshold for using the Port of Tacoma’s (Port) short form is a project that proposes to clear or disturb less than one acre of land. Projects falling within this threshold may use this short form instead of preparing a professionally designed Construction Stormwater Pollution Prevention Plan (SWPPP). If project disturbance quantities exceed this threshold, you must prepare of formal Construction SWPPP as part of your submittal package. If your project is within the threshold and includes—or may affect—a critical area, please contact the Port to determine if the SWPPP short form may be used.

CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN SHORT FORM

Project Name:

Address:

Contact/Owner:

Phone:

Erosion Control Supervisor:

Phone:

Cell:

Pager:

Emergency (After hours) Contact:

Phone:

Permit No.:

Parcel No.:

Required Submittals

A Construction SWPPP consists of both a project narrative and a site plan. The project narrative describes existing conditions on the site, the proposed conditions, and how construction site runoff will be managed until final site stabilization is achieved. Any additional relevant information should be included in the project narrative. All Best Management Practices (BMPs) that will be utilized onsite must be included as part of the project narrative and provided (electronically or hard copy) as part of the submittal package. If additional BMPs beyond those included in the Washington Department of Ecology's (Ecology) Western Washington Stormwater Management Manual (Ecology SWMM) or the City of Tacoma's (City) Stormwater Management Manual (City SWMM) are proposed to be used, a narrative and appropriate details describing the BMP (its function, installation method, and maintenance activities) will be required.

The site plan is a drawing which shows the location of the proposed BMPs to control erosion and sedimentation during and after construction activities.

The City's govMe site (<http://www.govme.org>.) may be used to find much of the information needed to complete this form, such as adjacent areas, topography, critical areas, the downstream drainage path, and information concerning onsite features.

PROJECT NARRATIVE

The Construction SWPPP Short Form narrative must be completed at part of the submittal package. Any information described, as part of the narrative, should also be shown on the site plan.

Note: From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted by special authorization from the Port.

A. Project Description (Check all that apply)

- New Structure Building Addition Grading/Excavation
 Paving Utilities Other:

- Total project area _____ (square feet)
- Total proposed impervious area _____ (square feet)
- Total existing impervious area _____ (square feet)
- Total proposed area to be disturbed _____ (square feet)
- Total volume of cut/fill _____ (cubic yards)

Additional Project Information:

B. Existing Site Conditions (Check all that apply)

- Describe the existing vegetation on the site. (Check all that apply)

Forest Pasture/field grass Pavement Landscaping Brush
 Trees Other:
- Describe how surface water (stormwater) drainage flows across/from the site. (Check all that apply)

Sheet Flow Gutter Catch Basin Ditch/Swale Storm Sewer
 Stream Other:
- Describe any unusual site condition(s) or other features of note.

Steep Grades Large depression Underground tanks Springs
 Easements Existing structures Existing utilities Other:

C. Adjacent Areas (Check all that apply)

- Check any/all adjacent areas that may be affected by site disturbance and fully describe below in item 2:

Streams* Lakes* Wetlands* Steep slopes*
 Residential Areas Roads Ditches, pipes, culverts Other:

** If the site is on or adjacent to a critical area (e.g., waterbody), the Port may require additional information, engineering, and other permits to be submitted with this short form.*

- Describe how and where surface water enters the site from properties located upstream:

N/A

3. Describe the downstream drainage path from the site to the receiving body of water (minimum distance of 0.25 mile [1320 feet]). (E.g., water flows from the site into a curb-line, then to a catch basin at the intersection of X and Y streets. A 10-inch pipe system conveys water another 1000 feet to a wetland.) Include information on the condition of the drainage structures.

=

D. Soils (Check all that apply)

The intent of this section is to identify when additional soils information may be required for applicants using this short form. There are other site-specific issues that may necessitate a soils investigation or more extensive erosion control practices. The Port will determine these situations on a case-by-case basis as part of their review.

1. Does the project propose infiltration? Infiltration systems require prior Port approval.

Yes No

2. Does the project propose construction on or near steep slopes (15% or greater)?

Yes No

If infiltration is proposed for the site or steep slopes (15% or greater) have been identified, the Port will require soils information as part of project design. The applicant must contact a soil professional or civil engineer that specializes in soil analysis and perform an in-depth soils investigation. If the Yes box is checked for either question, the Port may not permit the use of this short form.

E. Construction Sequencing/Phasing

1. Construction sequence: the standard construction sequence is as follows:
 - Mark clearing/grading limits.
 - Install initial erosion control Best Management Practices (BMPs) (e.g., construction entrance, silt fence, catch basin inserts, etc.).

- Clear, grade, and fill project site as outlined in the site plan while implementing and maintaining proper temporary erosion and sediment control BMPs simultaneously.
- Install permanent erosion protection as described in the specifications (e.g., impervious surfaces, landscaping, etc.).
- Remove temporary erosion control methods as permitted. Do not remove temporary erosion control until permanent erosion protection is fully established.

List any changes from the standard construction sequence outlined above:

2. Construction phasing: if construction is going to occur in separate phases, please describe:

F. Construction Schedule

1. Provide a proposed construction schedule (dates construction starts and ends, and dates for any construction phasing.)

Start Date:

End Date:

Interim Phasing Dates:

Wet Season Construction Activities: Wet season occurs from October 1 to April 30. Please describe construction activities that will occur during this time period.

Note: Additional erosion control methods may be required during periods of increased surface water runoff.

2. Site plan

A site plan, to scale, must be included with this checklist that shows the following items:

- a. Address, Parcel Number, Permit Number, and Street Names
- b. North Arrow
- c. Indicate boundaries of existing vegetation (e.g., tree lines, grassy areas, pasture areas, fields, etc.)
- d. Identify any onsite or adjacent critical areas and associated buffers (e.g., wetlands, steep slopes, streams, etc.).
- e. Identify any FEMA base flood boundaries and Shoreline Management boundaries.
- f. Show existing and proposed contours.
- g. Delineate areas that are to be cleared and/or graded.
- h. Show all cut and fill slopes, indicating top and bottom of slope catch lines.
- i. Show locations where upstream run-on enters the site and locations where runoff leaves the site.
- j. Indicate existing surface water flow direction(s).
- k. Label final grade contour and indicate proposed surface water flow direction and surface water conveyance systems (e.g., pipes, catch basins, ditches, etc.).
- l. Show grades, dimensions, and direction of flow in all (existing and proposed) ditches, swales, culverts, and pipes.
- m. Indicate locations and outlets of any dewatering systems (usually to sediment trap).
- n. Identify and locate all erosion control methods to be used during and after construction.

ONSITE FIELD VERIFICATION OF ACTUAL CONDITIONS IS REQUIRED.

Figure 1. (see page 5 for Site Plan requirements)

GUIDELINES FOR EROSION CONTROL ELEMENTS

This SWPPP must contain the 12 required elements, as required by Ecology. Check off each element as it is addressed in the SWPPP short form and/or on your site plan.

- 1. Mark Clearing Limits
- 2. Establish Construction Access
- 3. Control Flow Rates
- 4. Install Sediment Controls
- 5. Stabilize Soils
- 6. Protect Slopes
- 7. Protect Drain Inlets
- 8. Stabilize Channels and Outlets
- 9. Control Pollutants
- 10. Control Dewatering
- 11. Maintain BMPs
- 12. Manage the Project

The following is a brief description of each of the 12 required elements of a SWPPP. If an element does not apply to the proposed project site, please describe why the element does not apply. Applicable BMPs are listed with each element and in Table 1. Please note that this list is not a comprehensive list of BMPs available for small construction projects, but erosion and sediment control techniques most pertinent to small construction sites are included here. More detailed information on construction BMPs can be found in Ecology's SWMM Volume II and the City's SWMM Volume II (Ecology 2019; City of Tacoma 2016). Please provide hard copies of the BMPs that will be used for the project and include as part of this Construction SWPPP. BMPs that may be used if needed can be noted as being contingent in the event additional erosion control is needed. Describe any additional BMPs that will be utilized onsite and add them to the SWPPP short form.

For phased construction projects, clearly indicate erosion control methods to be used for each phase of construction.

Element #1 – Mark Clearing Limits

All construction projects must clearly mark any clearing limits, sensitive areas and their buffers prior to beginning any land disturbing activities, including clearing and grading. Clearly mark the limits both in the field and on the site plans. Limits shall be marked in such a way that any trees or vegetation that is to remain will not be harmed.

Applicable BMPs include:

- BMP C101: Preserving Natural Vegetation
- BMP C102: Buffer Zones
- BMP C103: High Visibility Plastic or Metal Fence
- BMP C104: Stake and Wire Fence

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Element #2 – Establish Construction Access

All construction projects subject to vehicular traffic shall provide a means of preventing vehicle “tracking” soil from the site onto streets or neighboring properties. Limit vehicle traffic on- and off-site to one route if possible. All access points shall be stabilized with a rock pad construction entrance or other Port-approved BMP. The applicant should consider placing the entrance in the area for future driveway(s), as it may be possible to use the rock as a driveway base material. The entrance(s) must be inspected weekly, at a minimum, to ensure no excess sediment buildup or missing rock.

Applicable BMPs include:

- BMP C105: Stabilized Construction Entrance
- BMP C106: Wheel Wash
- BMP C107: Construction Road/Parking Area Stabilization

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Element #3 – Control Flow Rates

Protect properties and waterways downstream of the project site from erosion due to increases in volume, velocity, and peak flow of stormwater runoff from the project site.

Permanent infiltration facilities shall not be used for flow control during construction unless specifically approved by the Environmental Department. Sediment traps can provide flow control for small sites by allowing water to pool and allowing sediment to settle out of the water.

Applicable BMPs include:

- BMP C207: Check Dams
- BMP C240: Sediment Trap

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Element 4 – Install Sediment Controls

Surface water runoff from disturbed areas must pass through an appropriate sediment removal device prior to leaving a construction site or discharging into a waterbody. Sediment barriers are typically used to slow stormwater sheet flow and allow the sediment to settle out behind the barrier.

Sediment controls must be installed/constructed prior to site grading.

Applicable BMPs include:

- BMP C208: Triangular Silt Dike
- BMP C232: Gravel Filter Berm
- BMP C233: Silt Fence
- BMP C235: Straw Wattles

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Element #5 – Stabilize Soils

Stabilize exposed and unworked soils by applying BMPs that protect the soils from raindrop impact, flowing water, and wind.

From October 1 through April 30, no soils shall remain exposed or unworked for more than 2 days. From May 1 to September 30, no soils shall remain exposed or unworked for more than 7 days. This applies to all soils whether at final grade or not.

Applicable BMPs include:

- BMP C120: Temporary and Permanent Seeding
- BMP C121: Mulching
- BMP C122: Nets and Blankets
- BMP C123: Plastic Covering
- BMP C140: Dust Control

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Element #6 – Protect Slopes

Protect slopes by diverting water at the top of the slope. Reduce slope velocities by minimizing the continuous length of the slope.

Applicable BMPs include:

- BMP C200: Interceptor Dike and Swale
- BMP C204: Pipe Slope Drains
- BMP C207: Check Dams

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Element #7 – Protect Drain Inlets

All operable storm drain inlets must be protected during construction so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment. Install catch basin protection on all catch basins within 500 feet downstream of the project.

Applicable BMPs include:

- BMP C220: Storm Drain Inlet Protection

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Element #8 – Stabilize Channels and Outlets

Stabilize all temporary onsite conveyance channels. Provide stabilization to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches at the conveyance system outlets.

Applicable BMPs include:

- BMP C202: Channel Lining
- BMP C209: Outlet Protection

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Element #9 – Control Pollutants

Handle and dispose of all pollutants, including demolition debris and other solid wastes in a manner that does not cause stormwater contamination. Provide cover and containment for all chemicals, liquid products (including paint), petroleum products, and other materials. Handle all concrete and concrete waste appropriately.

Applicable BMPs include:

- BMP C150: Materials on Hand
- BMP C151: Concrete Handling
- BMP C152: Sawcutting and Surface Pollution Prevention
- BMP C153: Material Delivery, Storage and Containment

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Element #10 – Control Dewatering

Clean, non-turbid dewatering water, such as groundwater, can be discharged to the stormwater system provided the dewatering flow does not cause erosion or flooding of receiving waters. All other dewatering water shall be pumped to a settling container and taken offsite or discharged to the City sewer system. All discharges to the City sewer system require City approval, which may include a Special Approved Discharge (SAD) permit.

Applicable BMPs include:

- BMP C150: Materials on Hand

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Element #11 – Maintain BMPs

Maintain and repair temporary erosion and sediment control BMPs as needed. Inspect all BMPs at least weekly and after every storm event.

Remove all temporary erosion and sediment control BMPs within 30 days after final site stabilization or if the BMP is no longer needed. Any sediment trapped during construction activities should be removed or stabilized onsite. No sediment shall be discharged into the stormwater drainage system or any natural conveyance system (e.g., streams).

Applicable BMPs include:

- BMP C160: Certified Erosion and Sediment Control Lead

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Element #12 – Manage the Project

Phase development projects to prevent soil erosion and the transport of sediment from the project site during construction. Coordinate all work prior initial construction with subcontractors and other utilities to ensure no areas are worked prematurely.\

A designated erosion and sediment control person is required for all construction projects. This person is responsible for ensuring that the project’s erosion and sediment control BMPs are appropriate for the site and are functioning properly. They are also responsible for updating the

SWPPP as necessary as site conditions warrant. They must be available 24 hours a day to ensure compliance.

Applicable BMPs include:

- BMP C160: Certified Erosion and Sediment Control Lead
- BMP C162: Scheduling
- BMP C180: Small Project Construction Stormwater Pollution Prevention

The BMP(s) being proposed to meet this element are:

OR

This element is not required for this project because:

Table 1. Applicable BMPs for the 12 Elements of a SWPPP

| Element #1 – Mark Clearing Limits | | |
|--|--|--|
| BMP C101 | Preserving Natural Vegetation | |
| BMP C102 | Buffer Zones | |
| BMP C103 | High Visibility Plastic and Wire Fence | |
| BMP C104 | Stake and Wire Fence | |
| Element #2 – Establish Construction Entrance | | |
| BMP C105 | Stabilized Construction Entrance | |
| BMP C106 | Wheel Wash | |
| BMP C107 | Construction Road/Parking Area Stabilization | |
| Element #3 – Control Flow Rates | | |
| BMP C207 | Check Dams | |
| BMP C240 | Sediment Trap | |
| Element #4 – Install Sediment Controls | | |
| BMP C208 | Triangular Silt Trap | |
| BMP C232 | Gravel Filter Berm | |
| BMP C233 | Silt Fence | |
| BMP C235 | Straw Wattles | |
| Element #5 – Stabilize Soils | | |
| BMP C120 | Temporary and Permanent Seeding | |
| BMP C121 | Mulching | |
| BMP C122 | Nets and Blankets | |
| BMP C123 | Plastic Covering | |
| BMP C140 | Dust Control | |
| Element #6 – Protect Slopes | | |
| BMP C200 | Interceptor Dike and Swale | |
| BMP C204 | Pipe Slope Drains | |
| BMP C207 | Check Dams | |
| Element #7 – Protect Drain Inlets | | |
| BMP C220 | Storm Drain Inlet Protection | |
| Element #8 – Stabilize Channels and Outlets | | |
| BMP C202 | Channel Lining | |
| BMP C209 | Outlet Protection | |
| Element #9 – Control Pollutants | | |
| BMP C150 | Materials on Hand | |

| | | |
|--|--|--|
| Element #9 – Control Pollutants, cont. | | |
| BMP C151 | Concrete Handling | |
| BMP C152 | Sawcutting and Surfacing Pollution Prevention | |
| BMP C153 | Materials, Delivery, Storage and Containment | |
| Element #10 – Control Dewatering | | |
| BMP C150 | Materials on Hand | |
| Element #11 – Maintain BMPs | | |
| BMP C160 | Certified Erosion and Sediment Control Lead | |
| Element #12 – Manage the Project | | |
| BMP C160 | Certified Erosion and Sediment Control Lead | |
| BMP C162 | Scheduling | |
| BMP C180 | Small Project Construction Stormwater Pollution Prevention | |

REFERENCES

City of Tacoma. 2021. Stormwater Management Manual 2021 Edition. Public Works/ Environmental Services, Maintenance Division, Tacoma, Washington.

Washington State Department of Ecology (Ecology). 2019. Stormwater Management Manual for Western Washington. Water Quality Program, Lacey, Washington.

Appendix B:

Initial Investigation Field Report

(Washington State Department of Ecology, 2019)



INITIAL INVESTIGATION FIELD REPORT

Check this box if you have attached any documents to this form (using the paperclip icon on the left).

ERTS #(s):
 Parcel #(s):
 County:
 FSID #:
 CSID #:
 UST #:

| |
|------------------------------------|
| 685699 |
| 8950000121, 8950000050, 8950000081 |
| Pierce |
| 94448 |
| 14950 |

SITE INFORMATION

| | | |
|---|---|------------------------------|
| <u>Site Name (Name over door):</u> POT Basin A | <u>Site Address (including City, State and Zip):</u> 1002 Milwaukee Way Tacoma, WA | <u>Phone</u> <u>Email</u> |
| <u>Site Contact, Title, Business:</u> Port of Tacoma Robert Healy | <u>Site Contact Address (including City, State and Zip):</u> PO Box 1837 Tacoma, WA 98401 | <u>Phone</u> <u>Email</u> |
| <u>Site Owner, Title, Business:</u> Port of Tacoma | <u>Site Owner Address (including City, State and Zip):</u> PO Box 1837 Tacoma, WA | <u>Phone</u> <u>Email</u> |
| <u>Site Owner Contact, Title, Business:</u> | <u>Site Owner Contact Address (including City, State and Zip):</u> | <u>Phone</u> <u>Email</u> |
| <u>Previous Site Owner(s):</u> | <u>Additional Info (for any Site Information Item):</u> | |
| <u>Alternate Site Name(s):</u> | | |

| |
|---|
| <u>Latitude (Decimal Degrees):</u> 47.262468 |
| <u>Longitude (Decimal Degrees):</u> -122.415752 |

INSPECTION INFORMATION

Please check this box if there is relevant inspection information, such as data or photos, in an existing site report for this site.

| | | |
|--|---|---|
| Inspection Conducted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Date/Time: | Entry Notice: Announced <input type="checkbox"/> Unannounced <input type="checkbox"/> |
| Photographs taken? Yes <input type="checkbox"/> No <input type="checkbox"/> | Note: Attach photographs or upload to PIMS | |
| Samples collected? Yes <input type="checkbox"/> No <input type="checkbox"/> | Note: Attach record with media, location, depth, etc. | |

RECOMMENDATION

| | |
|---|---|
| No Further Action (Check appropriate box below): | LIST on Confirmed and Suspected Contaminated Sites List: <input checked="" type="checkbox"/> |
| Release or threatened release does not pose a threat <input type="checkbox"/> | |
| No release or threatened release <input type="checkbox"/> | |
| Refer to program/agency (Name: _____) <input type="checkbox"/> | |
| Independent Cleanup Action Completed (contamination removed) <input type="checkbox"/> | |

COMPLAINT (Brief Summary of ERTS Complaint):

Diesel contaminated groundwater over MTCA Method A cleanup screening levels.

CURRENT SITE STATUS (Brief Summary of why Site is recommended for Listing or NFA):

Groundwater confirmed above MTCA Method A cleanup screening levels even after treatment system was put in place. Soil is contaminated with Polynuclear Aromatic Hydrocarbons (cPAH) above MTCA Method A cleanup screening levels.

| | |
|-----------------------------|--------------------------|
| Investigator: Sean Chisholm | Date Submitted: 2/1/2019 |
|-----------------------------|--------------------------|

OBSERVATIONS Please check this box if you included information on the Supplemental Page at end of report.

Description (If site visit made, please be sure to include the following: site observations, site features and cover, chronology of events, sources/past practices likely responsible for contamination, presence of water supply wells and other potential exposure pathways, etc.):

December 3, 2018, Ecology was contacted by Robert Healy of Port of Tacoma, informing on work that was being conducted at Port of Tacoma. They were working in three different areas named Basins A, B and C.

November 15, 2018, non-aqueous phase liquid (NAPL) entered an excavation in Basin A while uncovering a storm water line. Dewatering of groundwater was required to continue and complete the construction project. Work in and around excavation was stopped until a treatment system could be mobilized to the site. A sample of the liquid in the excavation was collected, and analyzed using method NWTPH-Dx in MTCA Method A cleanup screening levels.

Groundwater sample results were above MTCA Method A cleanup screening levels of 500 µg/L for Diesel at 49,800,000 µg/L, and 500 µg/L for Oil at <25,000,000 µg/L. An elevated detection limit and low/no surrogate recovery were noted in laboratory results due to sample dilution requirements.

Twelve soil samples were collected for analysis. Results indicated Benzo(a)pyrene and cPAH exceedances above MTCA Method A cleanup screening levels of 0.1 m/kg.

It is suggested that this site be listed on the Confirmed and Suspected Contaminated Sites List. The reason is due to the confirmed contaminated soil and groundwater that was never removed. All of the samples were screen sampled. There was no soil remediation on the site. There was water treatment put in place. However, a sample was analyzed at end-of-pipe results showing Diesel levels at 26,400 µg/L. This is still above the MTCA Method A cleanup screening levels.

Documents reviewed:

Department of Ecology, ERTS report 685699, December 3, 2018

Spectra Laboratories, Port of Tacoma soil and groundwater sample analysis, November 15, 2018

| CONTAMINANT GROUP | CONTAMINANT | SOIL | GROUNDWATER | SURFACE WATER | AIR | SEDIMENT | DESCRIPTION |
|--|---|------|-------------|---------------|-----|----------|--|
| Non-Halogenated Organics | Phenolic Compounds | | | | | | Compounds containing phenols (Examples: phenol; 4-methylphenol; 2-methylphenol) |
| | Non-Halogenated Solvents | | | | | | Organic solvents, typically volatile or semi-volatile, not containing any halogens. To determine if a product has halogens, search HSDB (http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB) and look at the Chemical/Physical Properties, and Molecular Formula. If there is not a Cl, I, Br, F in the formula, it's not halogenated. (Examples: acetone, benzene, toluene, xylenes, methyl ethyl ketone, ethyl acetate, methanol, ethanol, isopropanol, formic acid, acetic acid, stoddard solvent, Naptha). Use this when <i>TEX</i> contaminants are present independently of gasoline. |
| | Polynuclear Aromatic Hydrocarbons (PAH) | C | S | | | | Hydrocarbons composed of two or more benzene rings. |
| | Tributyltin | | | | | | The main active ingredients in biocides used to control a broad spectrum of organisms. Found in antifouling marine paint, antifungal action in textiles and industrial water systems. (Examples: Tributyltin; monobutyltin; dibutyltin) |
| | Methyl tertiary-butyl ether | | | | | | MTBE is a volatile oxygen-containing organic compound that was formerly used as a gasoline additive to promote complete combustion and help reduce air pollution. |
| | Benzene | | | | | | Benzene |
| | Other Non-Halogenated Organics | | | | | | TEX |
| | Petroleum Diesel | C | C | | | | Petroleum Diesel |
| | Petroleum Gasoline | | | | | | Petroleum Gasoline |
| | Petroleum Other | C | C | | | | Oil-range organics |
| Halogenated Organics (see notes at bottom) | PBDE | | | | | | Polybrominated di-phenyl ether |
| | Other Halogenated Organics | | | | | | Other organic compounds with halogens (chlorine, fluorine, bromine, iodine). - search HSDB (http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB) and look at the Chemical/Physical Properties, and Molecular Formula. If there is a Cl, I, Br, F in the formula, it is halogenated. (Examples: Hexachlorobutadiene; hexachlorobenzene; pentachlorophenol) |
| | Halogenated solvents | | | | | | PCE, chloroform, EDB, EDC, MTBE |
| | Polychlorinated Biphenyls (PCB) | | | | | | Any of a family of industrial compounds produced by chlorination of biphenyl, noted primarily as an environmental pollutant that accumulates in animal tissue with resultant pathogenic and teratogenic effects |
| | Dioxin/dibenzofuran compounds (see notes at bottom) | | | | | | A family of more than 70 compounds of chlorinated dioxins or furans. (Examples: Dioxin; Furan; Dioxin TEQ; PCDD; PCDF; TCDD; TCDF; OCDD; OCDF). Do not use for 'dibenzofuran', which is a non-chlorinated compound that is detected using the semivolatiles organics analysis 8270 |
| Metals | Metals - Other | | | | | | Cr, Se, Ag, Ba, Cd |
| | Lead | | | | | | Lead |
| | Mercury | | | | | | Mercury |
| | Arsenic | | | | | | Arsenic |
| Pesticides | Non-halogenated pesticides | | | | | | Pesticides without halogens (Examples: parathion, malathion, diazinon, phosmet, carbaryl (sevin), fenoxycarb, aldicarb) |
| | Halogenated pesticides | | | | | | Pesticides with halogens (Examples: DDT; DDE; Chlordane; Heptachlor; alpha-beta and delta BHC; Aldrin; Endosulfan; dieldrin; endrin) |

| CONTAMINANT GROUP | CONTAMINANT | SOIL | GROUNDWATER | SURFACE WATER | AIR | SEDIMENT | DESCRIPTION |
|--------------------|--------------------------------------|------|-------------|---------------|-----|----------|---|
| Other Contaminants | Radioactive Wastes | | | | | | Wastes that emit more than background levels of radiation. |
| | Conventional Contaminants, Organic | | | | | | Unspecified organic matter that imposes an oxygen demand during its decomposition (Example: Total Organic Carbon) |
| | Conventional Contaminants, Inorganic | | | | | | Non-metallic inorganic substances or indicator parameters that may indicate the existence of contamination if present at unusual levels (Examples: Sulfides, ammonia) |
| | Asbestos | | | | | | All forms of Asbestos. Asbestos fibers have been used in products such as building materials, friction products and heat-resistant materials. |
| | Other Deleterious Substances | | | | | | Other contaminants or substances that cause subtle or unexpected harm to sediments (Examples: Wood debris; garbage (e.g., dumped in sediments)) |
| | Benthic Failures | | | | | | Failures of the benthic analysis standards from the Sediment Management Standards. |
| | Bioassay Failures | | | | | | For sediments, a failure to meet bioassay criteria from the Sediment Management Standards. For soils, a failure to meet TEE bioassay criteria for plant, animal or soil biota toxicity. |
| Reactive Wastes | Unexploded Ordnance | | | | | | Weapons that failed to detonate or discarded shells containing volatile material. |
| | Other Reactive Wastes | | | | | | Other Reactive Wastes (Examples: phosphorous, lithium metal, sodium metal) |
| | Corrosive Wastes | | | | | | Corrosive wastes are acidic or alkaline (basic) wastes that can readily corrode or dissolve materials they come into contact with. Wastes that are highly corrosive as defined by the Dangerous Waste Regulation (WAC 173-303-090(6)). (Examples: Hydrochloric acid; sulfuric acid; caustic soda) |

(fill in contaminant matrix above with appropriate status choice from the key below the table)

| Status choices for contaminants | Definition |
|--|--|
| B— Below Cleanup Levels (Confirmed) | The contaminant was tested and found to be below cleanup levels. (Generally, we would not enter each and every contaminant that was tested; for example if an SVOC analysis was done we would not enter each SVOC with a status of "below". We would use this for contaminants that were believed likely to be present but were found to be below standards when tested) |
| S— Suspected | The contaminant is suspected to be present; based on some knowledge about the history of the site, knowledge of regional contaminants, or based on other contaminants known to be present |
| C— Confirmed Above Cleanup Levels | The contaminant is confirmed to be present above any cleanup level. For example—above MTCA method A, B, or C; above Sediment Quality Standards; or above a presumed site-specific cleanup level (such as human health criteria for a sediment contaminant). |
| RA— Remediated - Above | The contaminant was remediated, but remains on site above the cleanup standards (for example—capped area). |
| RB— Remediated - Below | The contaminant was remediated, and no area of the site contains this contaminant above cleanup standards (for example— complete removal of contaminated soils). |

Halogenated chemicals and solvents: Any chemical compound with chloro, bromo, iodo or fluoro is halogenated; those with eight or fewer carbons are generally solvents (e.g. halogenated methane, ethane, propane, butane, pentane, hexane, heptane or octane) and may also be used for or registered as pesticides or fumigants. Most are dangerous wastes, either listed or categorical. Organic compounds with more carbons are almost always halogenated pesticides or a contaminant or derivative. Referral to the HSDB is recommended if you are unfamiliar with a chemical name or compound, as it contains useful information about synonyms, uses, trade names, waste codes, and other regulatory information about most toxic or potentially toxic chemicals.

Dibenzodioxins and dibenzofurans are normalized to a combined equivalent toxicity based on 2,3,7,8-tetrachloro-p-dibenzodioxin as set out in WAC 173-340-708(8)(d) and in the Evaluating the Toxicity and Assessing the Carcinogenic Risk of Environmental Mixtures using Toxicity Equivalency Factors Focus Sheet (<https://fortress.wa.gov/ecy/clarc/FocusSheets/tef.pdf>). Results may be reported as individual compounds and isomers (usually lab results), or as a toxic equivalency value (reports).

Appendix C:

Report of Additional Investigation –
Port of Tacoma, Former Milwaukee Railyard

(Shaw Environmental, 2008)

REPORT OF ADDITIONAL INVESTIGATION
Port of Tacoma
Former Milwaukee Railyard
Tacoma, Washington

Shaw Project No. 111487

September 2008

Submitted to:

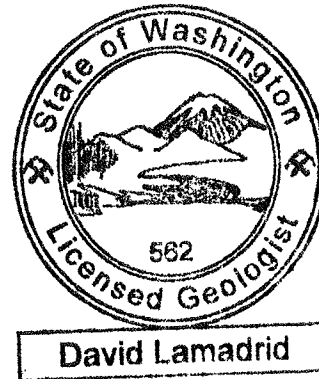
Port of Tacoma
P.O. Box 1837
Tacoma, Washington 98401

Submitted by:



Shaw® Shaw Environmental, Inc.
10300 SW Nimbus Avenue, Suite B
Portland, Oregon 97223-4345

REPORT OF ADDITIONAL INVESTIGATION
Port of Tacoma
Former Milwaukee Railyard
Tacoma, Washington

September 2008

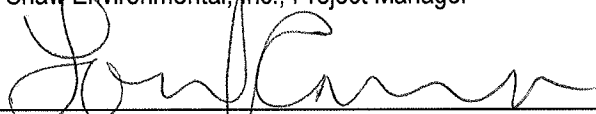


The material and data in this report were prepared under the supervision and direction of the undersigned.



David Lamadrid, L.G.
Shaw Environmental, Inc., Project Manager

Date: 9/3/08



Louis Caruso
Shaw Environmental, Inc., Senior Client Manager

Date: 9/3/08

Executive Summary

Additional investigation activities were performed at the former Milwaukee Railyard Site (Site) in Tacoma, Washington, to evaluate the progress of the cleanup actions and compliance with the groundwater cleanup standards established for the Site as part of a Prospective Purchaser Consent Decree (PPCD). The Port of Tacoma entered into the PPCD with the Washington Department of Ecology (Ecology) in 1994 to conduct cleanup actions at the Site associated with historical releases of petroleum and to resolve the potential liability for petroleum hydrocarbons in the soil and groundwater at the Site.

The historical releases of petroleum hydrocarbons were associated with former railyard operations prior to acquisition of the Site by the Port of Tacoma. Site investigation activities performed in the early 1990s identified concentrations of total petroleum hydrocarbons in soil and groundwater and the presence of nonaqueous phase liquids (NAPL). Site demolition activities have removed all potential sources of NAPL from the Site. The hydrocarbons are comprised predominantly of highly weathered diesel fuel with lesser amounts of heavier lube or fuel oils, located in the east-central portion of the Site. The investigations also showed that the NAPL was not migrating to the nearby Milwaukee Waterway (which was subsequently filled, in 1995) or the Sitcum Waterway. Following the initial investigations, a remediation system consisting of 22 NAPL recovery wells was installed during 1997 in accordance with the PPCD, and a total of approximately 63,700 gallons of NAPL has been recovered through 2007. Since 2004, the recovery rate and volume recovered have declined, and the system produces mostly water.

The additional investigation, as approved by Ecology pursuant to a prepared work plan, included three primary tasks:

- Task 1 consisted of groundwater sampling to measure the concentrations of petroleum hydrocarbons and related constituents for comparison to groundwater cleanup standards listed in the PPCD.
- Task 2 consisted of collecting undisturbed soil core samples within the NAPL zone for direct observation and testing of physical properties (e.g., grain-size distribution, porosity, permeability, air/water/NAPL content).
- Task 3 consisted of collecting NAPL samples for chemical and physical characterization.

The results of the additional investigation demonstrate that the remaining residual NAPL is not impacting groundwater at levels above the established cleanup levels. Additionally, potentially hazardous constituents including benzene, toluene, ethyl benzene, and total xylenes; polynuclear

aromatic hydrocarbons; naphthalene; and polychlorinated biphenyls were not detected in offsite compliance wells MW-21, MW-22, and MW-23, which are located downgradient or crossgradient (at the point of compliance) from the area where NAPL was previously documented. In addition, measurable NAPL accumulations are now present in only two wells (CW-4 and CW-5) since September 2005.

Gas chromatography (GC) testing of NAPL samples collected from select recovery wells and monitoring wells show that residual NAPL at the Site has undergone extensive biological, chemical, and/or physical alteration resulting from exposure to the natural environment (i.e., weathering). The GC analyses indicate that the remaining NAPL is highly weathered diesel and heavier fuel oils that are immobile under non-pumping conditions and have been depleted of water-soluble hazardous substances. Additionally, the results of soil coring observations and testing demonstrate that the residual NAPL at the Site is predominantly restricted to finer-grained soils, which are less amenable to product removal, and that pore fluids are primarily saturated with water with comparatively small amounts of NAPL (2.9 percent to 8.8 percent). The results also show that NAPL is not extractable from the soil-pore throats at the test boring SC-1 location, but is extractable from the soil-pore throats at the test boring SC-2 location.

The remediation system produces mostly water from the coarser-grained soils when it is operated. Recovery data show that the remediation system recovers less than 0.3 percent NAPL by volume.

Table of Contents

| | |
|---|------|
| Signatory Page | |
| Executive Summary..... | ES-1 |
| List of Tables..... | i |
| List of Figures..... | ii |
| List of Appendices..... | ii |
| Acronyms and Abbreviations..... | iii |
| | |
| 1.0 Introduction..... | 1-1 |
| 1.1 Prospective Purchaser Consent Decree..... | 1-1 |
| 1.2 Additional Studies Rationale..... | 1-1 |
| 1.3 Nature of NAPL in the Subsurface..... | 1-2 |
| 1.4 Scope of Work..... | 1-3 |
| 2.0 Background..... | 2-1 |
| 2.1 Site Description and History..... | 2-1 |
| 2.2 Site Geology and Hydrogeology..... | 2-2 |
| 2.3 Previous Investigations..... | 2-2 |
| 3.0 Results..... | 3-1 |
| 3.1 Task 1 – Groundwater Monitoring..... | 3-1 |
| 3.2 Task 2 -Test Boring and Soil Characterization..... | 3-1 |
| 3.2.1 Test Boring SC-1..... | 3-2 |
| 3.2.2 Test Boring SC-2..... | 3-2 |
| 3.3 Task 3 - NAPL Chemical and Physical Characterization..... | 3-3 |
| 4.0 Summary and Conclusions..... | 4-1 |
| 5.0 References..... | 5-1 |
| Limitations..... | L-1 |

List of Tables

Following Report

| | |
|---------|--|
| Table 1 | Groundwater Elevation and NAPL Thickness Monitoring Results |
| Table 2 | Summary of Groundwater Analytical Results |
| Table 3 | Soil Core Physical Properties Data – Grain Size Analysis |
| Table 4 | Soil Core Physical Properties Data – Permeability and Hydraulic Conductivity |
| Table 5 | Soil Core Physical Properties Data – Pore Fluid Saturations |
| Table 6 | Soil Core Physical Properties Data – Free Product Mobility, Initial and Residual Saturations |
| Table 7 | NAPL and Groundwater Geochemical and Physical Properties |

Table of Contents (continued)

List of Figures

Following Report

| | |
|-----------|--|
| Figure 1 | Site Location Map |
| Figure 2 | Site Map with Well and Soil Core Locations |
| Figure 3 | Conceptualization of NAPL within a Monitoring Well |
| Figure 4 | 1969 Site Map with Historical Features |
| Figure 5 | Groundwater Elevation Contour Map and TPH Concentrations – January 2008 |
| Figure 6 | Groundwater Elevation Contour Map and TPH Concentrations – March 2008 |
| Figure 7 | Soil Core SC-1, 8.0 – 10.0 Feet Logs |
| Figure 8 | Soil Core SC-1, 10.0 – 12.0 Feet Logs |
| Figure 9 | Soil Core SC-1, 12.0 – 14.0 Feet Logs |
| Figure 10 | Soil Core SC-1, 14.0 – 16.0 Feet Logs |
| Figure 11 | Soil Core SC-1, 16.0 – 18.0 Feet Logs |
| Figure 12 | Soil Core SC-2, 7.0 – 9.0 Feet Logs |
| Figure 13 | Soil Core SC-2, 9.0 – 11.0 Feet Logs |
| Figure 14 | Soil Core SC-2, 11.0 – 16.0 Feet Logs |
| Figure 15 | Soil Core SC-2, 16.0 – 18.0 Feet Logs |
| Figure 16 | Characteristic and Soil Core Sample Capillary Pressure Curves |
| Figure 17 | Gas Chromatograms of NAPL Sample RW-2L3 and Laboratory Standard for Diesel |

List of Appendices

| | |
|------------|---|
| Appendix A | Behavior of NAPL in the Subsurface |
| Appendix B | Field and Laboratory Testing Methods |
| Appendix C | Borehole Logs for SC-1 and SC-2 |
| Appendix D | PTS Laboratories Soil Core Test Data |
| Appendix E | Soil Core Drilling Photographs |
| Appendix F | Torkelson Geochemistry, Inc. NAPL and Groundwater Test Data |

Acronyms and Abbreviations

| | |
|-----------|--|
| AGI | Applied Geotechnical, Inc. |
| API | American Petroleum Institute |
| bgs | below ground surface |
| BTEX | benzene, toluene, ethyl benzene, and total xylenes |
| cP | centipoise |
| Ecology | Washington Department of Ecology |
| GC | gas chromatography |
| gm/ml | gram(s) per milliliter |
| mg/kg | milligram(s) per kilogram |
| mg/L | milligram(s) per liter |
| NAPL | nonaqueous phase liquid |
| PAH | polynuclear aromatic hydrocarbon |
| PCB | polychlorinated biphenyls |
| PPCD | prospective purchaser consent decree |
| Shaw | Shaw Environmental, Inc. |
| Site | former Milwaukee Railyard site |
| TechSolv | TechSolv Consulting Group, Inc. |
| TGI | Torkelson Geochemistry, Inc. |
| TPH | total petroleum hydrocarbon |
| UPRR | Union Pacific Railroad |
| USPCI | United States Pollution Control Inc. |
| UST | underground storage tank |
| Work Plan | Additional Studies Work Plan |

1.0 Introduction

This report presents the findings and conclusions of additional investigation activities performed at the former Milwaukee Railyard Site in Tacoma, Washington (Site, Figure 1). The Port of Tacoma entered into a Prospective Purchaser Consent Decree (PPCD) with the Washington Department of Ecology (Ecology) in 1994 and conducted cleanup actions at the Site associated with historical releases of petroleum. The objective of this investigation is to evaluate the progress of the cleanup actions and compliance with the groundwater cleanup standards at the points of compliance identified in the PPCD and the associated Cleanup Action Plan.

The objectives and proposed tasks for this investigation were discussed during an August 30, 2007 meeting with the Port of Tacoma, TechSolv Consulting Group, Inc. (TechSolv), Shaw Environmental, Inc. (Shaw), and Ecology. The technical approach was described in a letter from TechSolv to Ecology dated September 9, 2007 (TechSolv, 2007a). TechSolv subsequently prepared an Additional Studies Work Plan (Work Plan), dated October 15, 2007 (TechSolv, 2007b). The Work Plan was approved by Ecology in a comment letter dated October 31, 2007 (Ecology, 2007). The Work Plan and this report were implemented and prepared by Shaw and TechSolv.

1.1 Prospective Purchaser Consent Decree

The purpose of the PPCD is to resolve the potential liability for petroleum hydrocarbons in the soil and groundwater at the Site. The PPCD is also intended to promote the public interest by expediting cleanup activities and site redevelopment.

Cleanup standards for soil and groundwater are identified in the PPCD. The cleanup level for total petroleum hydrocarbons (TPH) in groundwater is based on the protection of adjacent surface waters, and is set at 10 milligrams per liter (mg/L) TPH (for diesel and oil). The cleanup level for TPH in soil was identified as 200 milligrams per kilogram (mg/kg). Alternatively, compliance with the soil cleanup level can be demonstrated empirically by documenting compliance with groundwater cleanup standards. The point of compliance for groundwater is within the nonaqueous phase liquid (NAPL) area, and at the downgradient property boundary. The cleanup actions selected to achieve these cleanup standards included capping the site, installing and operating a groundwater and NAPL recovery system, and monitoring.

1.2 Additional Studies Rationale

The Work Plan was developed to evaluate compliance with the cleanup standards in accordance with the five-year review requirement in the PPCD. Groundwater sampling performed in 2004 showed—with one exception—that TPH concentrations in groundwater were below cleanup

levels. The 2004 groundwater sample from well CW-5 (which also contained NAPL) contained TPH (13 mg/L) above the 10 mg/L cleanup level. Samples from the remediation system effluent have also been below the cleanup level for the last 21 sampling events, and below the laboratory detection limit during August 2007. These data suggest that groundwater cleanup standards under the PPCD may have been reached.

A NAPL recovery system was installed during 1997 and operated through 2007, resulting in a decrease in the number of wells with measurable accumulations of NAPL. Figure 2 shows the current Site, locations of monitoring wells, and also depicts when measurable accumulations of NAPL were last observed. While the extent of measurable NAPL appears to have decreased, measurable NAPL remains in wells CW-4 and CW-5. NAPL recovery data show that the system produces relatively little NAPL compared to the total volume of groundwater pumped (less than 0.3 percent by volume), and since 2004 the recovery rate and volume recovered have substantially declined. The NAPL is black in color and highly viscous, suggesting that the NAPL is depleted of water-soluble constituents, with little potential to migrate further or contaminate groundwater or surface water.

Based on the results of the groundwater monitoring and operation of the remediation system, Ecology agreed that additional data were necessary to assess the progress of remedial action and compliance with PPCD cleanup standards. Direct observation methods were also proposed to document NAPL in subsurface soil, so that NAPL accumulations in monitoring wells could be directly compared to NAPL present in the adjacent soil.

1.3 Nature of NAPL in the Subsurface

The behavior of NAPL in the subsurface is discussed below and is presented in greater detail in Appendix A (from the American Petroleum Institute [API] Interactive LNAPL [light nonaqueous phase liquid] Guide, 2004)

A common misconception among remediation practitioners is that NAPL in the subsurface exists as a homogeneous, separate-phase lens of NAPL at the water table. This “pancake” model led to several inaccurate conclusions about the occurrence, mobility, and recoverability of NAPL in the subsurface, including the following:

- The thickness of NAPL measured in a monitoring well is directly proportional to the amount of NAPL in the surrounding soil.
- Soils directly above the water table contain a uniformly high saturation of NAPL.
- If NAPL accumulations are observed in a well, NAPL in the adjacent formation is easily recoverable, and likely to migrate further.

- Soil and NAPL properties were not considered significant limiting factors in determining the mobility of NAPL.

A better model for NAPL in the subsurface considers the coexistence of NAPL, air, and water in the soil-pore throats. The degree of saturation of NAPL in the soil, and its mobility and recoverability, are highly dependent on the physical properties of the soil (e.g., heterogeneity, grain size, porosity, permeability) and NAPL (e.g., viscosity, composition, degree of weathering). In this multiphase model, NAPL partially fills the soil-pore space, and the degree of NAPL saturation decreases with depth until water fills all the pores (Beckett and Huntley, 1998). Though the NAPL saturation varies with depth, some of this NAPL may migrate into an adjacent monitoring well, with NAPL from the more permeable zones in the impacted soil column displacing water in a monitoring well, resulting in NAPL accumulations in the well that have no direct relationship to the amount of NAPL in the adjacent soil (Figure 3).

1.4 Scope of Work

The fieldwork activities and laboratory testing were performed in accordance with the Work Plan and consisted of three primary tasks:

- Task 1 consisted of groundwater sampling to measure the concentrations of petroleum hydrocarbons and related constituents for comparison to groundwater cleanup standards listed in the PPCD.
- Task 2 consisted of collecting undisturbed soil core samples within the NAPL zone for direct observation under regular and ultraviolet light. Selected soil samples were also tested for certain physical properties (e.g., grain-size distribution, porosity, permeability, air/water/NAPL content).
- Task 3 consisted of collecting NAPL samples for chemical and physical characterization. The purpose of the testing was to characterize the nature and degree of weathering of the petroleum hydrocarbons for comparison with previous results, and to measure the physical characteristics of the NAPL (e.g., density, viscosity, surface tension, and interfacial tension).

Ecology's letter approving the Work Plan contained the following additional requirements:

1. Perform additional groundwater sampling if the extraction system is not operated for more than three months.
2. Evaluate solubility and toxicity as part of the NAPL characterization.
3. Evaluate the potential for downward migration of petroleum compounds to the lower aquifer.

2.0 Background

2.1 Site Description and History

The Site covers approximately 53 acres of industrially-zoned property within the Port of Tacoma (Figure 1). The Site is bordered by East 11th Street on the northwest, Milwaukee Way on the northeast, Lincoln Avenue on the southeast, and Cascade Pole and Lumber Company and the Maersk-Pacific marine terminal on the southwest. The surface topography is essentially even, with about a 5-foot crown near the center of the Site for surface drainage.

The Site was originally a tidal marsh within the Puyallup River delta. The Site was filled with dredged sediment from construction of nearby waterways in approximately 1900. By 1909, the Chicago, Milwaukee, Saint Paul, and Pacific Railroad Company had begun operating the Site as a railyard. The railyard was the West Coast headquarters for train maintenance and repairs. The railyard included maintenance and repair shops, and various other supporting buildings. The Site configuration changed very little between 1918 and 1980. Figure 4 presents a 1969 aerial photograph of the Site with key features noted, and the current monitoring well network added to the photograph. A former river channel west of the Site, shown on the 1969 aerial photograph, was filled in as part of industrialization of the area.

The railyard closed on March 15, 1980, and demolition began thereafter. The Union Pacific Railroad (UPRR) acquired the property in 1981. The Site has undergone redevelopment since the 1980s, including removal of all buildings/structures, underground and above-ground storage tanks and associated piping, and all other appurtenances associated with railyard operations. In 1995, Ecology and the Port of Tacoma entered into the PPCD, and the Port of Tacoma took ownership of the property later that year. A restrictive covenant prohibiting the use of groundwater for domestic purposes was also recorded by the Pierce County Auditor.

The surface water body closest to the Site at the time of the purchase of the UPRR property by the Port of Tacoma in 1995 was the Milwaukee Waterway. The Milwaukee Waterway was subsequently filled with dredged materials from the Sitcum and Blair Waterways, capped, and redeveloped as a marine terminal (the base map for Figure 1 was modified to show the current configuration of the marine terminal). At present, the nearest surface water bodies are the Sitcum Waterway and the Puyallup River.

Redevelopment of the Site was completed by the beginning of 2005. The Site has been capped with asphalt and utilized for vehicle and/or container storage (Figure 2). The Site is fenced in such a way that public access is prohibited and only controlled access is allowed.

2.2 *Site Geology and Hydrogeology*

The Site comprises hydraulically placed fill overlying fluvial and tidal sediments of the Puyallup River Delta. Prior to development, the entire tideflats area, including the Site, was a tidal marsh. The former tideflat surface can be observed in borings and test pits as a silt layer occurring beneath the overlying hydraulic fill. The geology beneath the Site consists of the following units (starting with the uppermost unit):

- The “*Upper Sand*” comprises 5 to 15 feet of fine- to coarse-grained silty sand (hydraulically placed fill), and typically occurs at grade to 10 feet below ground surface (bgs). The Upper Sand also contains areas of construction debris.
- A small portion of the former City of Tacoma landfill at the southeast end of the Site is present at the same depth as the Upper Sand, which covers the remainder of the Site.
- Beneath the Upper Sand, the “*Upper Silt*” represents the former tidal marsh sediments. This unit may range from a few inches to 4 or 5 feet thick, typically occurring at 10 to 12 feet bgs. The Upper Silt is absent along much of the northeast side of the Site.
- Beneath the Upper Silt, the “*Lower Sand*” comprises 15 to 25 feet of fine- to coarse-grained sand. This sand extends to approximately 30 to 35 feet bgs, and is in direct contact with the Upper Sand in areas where the Upper Silt is absent.
- Beneath the Lower Sand, the “*Lower Silt*” occurs at approximately 30 to 35 feet bgs, and is believed to be continuous beneath the Site and adjacent properties.

Groundwater occurs in the Upper Sand under water table (unconfined) conditions and in the Lower Sand under semiconfined conditions (lower aquifer). The Upper Silt is a significant aquitard where present, and the Lower Silt is an aquitard of Site-wide significance. Groundwater in the Upper and Lower Sands is in hydraulic communication where the Upper Silt is absent.

Groundwater recharge occurs from direct stormwater infiltration. Groundwater flow in the Upper Sand appears to be toward the area where the Upper Silt is absent, or towards the Lincoln Avenue ditch at the southeast end of the Site. The Lower Sand receives recharge from the Upper Sand.

2.3 *Previous Investigations*

In 1990, investigations performed on behalf of UPRR found NAPL, comprised predominantly of diesel fuel in the east-central portion of the Site along Milwaukee Way (Applied Geotechnology Inc. [AGI], 1990a; AGI, 1990b). In May 1990, a 6,000-gallon underground storage tank (UST), formerly used for storage of Bunker C fuel, was removed. Soils containing bunker oil were removed from the tank pit and piping trenches as an interim cleanup action.

A hydrologic characterization study was completed for the Site in 1993 (United States Pollution Control Inc. [USPCI], 1993). The results of the study identified concentrations of TPH and NAPL in soil and groundwater. Additional potential source areas identified were two former refueling racks; a product pipeline used to carry bunker fuel oil, and later diesel (abandoned in 1995); the round house area; and various USTs (USPCI, 1993). A study conducted in 1993 concluded that NAPL was not migrating to the Milwaukee Waterway (which was subsequently filled in 1995) or the Sitcum Waterway from the Site (AGI, 1993). A feasibility study was completed in 1994 that identified cleanup approaches for the Site (EMCON, 1994).

A remediation system consisting of 22 recovery wells was installed during 1997, and a total of approximately 63,700 gallons of NAPL has since been recovered (Shaw, 2008a). Since 2004, the recovery rate and volume recovered have declined, and the system produces mostly water. Most of the well-heads for the extraction wells are not accessible from the surface as a result of Site grading and paving that occurred after the system was installed. Water elevations and product thickness measurements are made from other monitoring wells, which were completed at ground surface during paving of the Site.

3.0 Results

This section presents the field and laboratory testing results. The field investigation and laboratory testing methods are described in Appendix B.

3.1 Task 1 – Groundwater Monitoring

Groundwater monitoring and sampling was performed in January and March 2008, and reported to Ecology in the January 2008 and April 2008 monthly progress reports (Shaw, 2008b and 2008c). Groundwater elevations and NAPL thicknesses measured in 2008, along with historical data, are presented in Table 1. Figure 2 also shows monitoring wells that have documented NAPL accumulations since 1993 (CW-1, CW-4, CW-5, CW-8, and MW-29). Measurable NAPL accumulations are now present in only two wells (CW-4 and CW-5) since September 2006.

Groundwater elevations and chemical data measured in January and March 2008, and groundwater elevation contours interpreted from these data, are shown in Figures 5 and 6, respectively. Both figures show groundwater generally flowing toward the north-northeast, with a horizontal hydraulic gradient of approximately 0.002 feet per foot. The gradient and flow direction are consistent with groundwater flow maps developed since the early 1990s.

A summary of the groundwater analytical results for samples collected in January and March 2008, along with results for samples collected in August 2004 (CW-4 and CW-5 were not sampled in 2004), are provided in Table 2. The 2004 and 2008 results indicate that diesel- and oil-range TPH were either not detected or detected at concentrations ranging from 0.13 to 13 mg/L. The detected concentrations are below the TPH cleanup level of 10 mg/L established for the Site under the PPCD, with the exception of a single sample result from well CW-5 (January 2008 sample at 13 mg/L as diesel). Additionally, the January and March 2008 data indicate benzene, toluene, ethyl benzene, and total xylenes (BTEX), polynuclear aromatic hydrocarbons (PAHs), naphthalene, and polychlorinated biphenyls (PCBs) were not detected in offsite compliance wells MW-21, MW-22, and MW-23, which are located downgradient or crossgradient from the area where NAPL was previously documented.

3.2 Task 2 - Test Boring and Soil Characterization

Two test borings (SC-1 and SC-2) were advanced to collect soil samples for physical observation and testing in areas with documented NAPL (Figures 2 and 4). Boring SC-1 was drilled near well CW-8, where NAPL was last observed in 2002. Boring SC-2 was drilled near well CW-5, where measurable accumulations of NAPL were present during this investigation. Soil cores were photographed under natural and ultraviolet light by PTS Laboratories in Santa Fe Springs, California, to identify NAPL. Selected soil samples were also tested for physical properties. The

methodology for collecting and testing the samples is described in Appendix B. Soil boring logs are presented in Appendix C. Laboratory reports and sample chain-of-custody records are included in Appendix D.

Annotated photographic logs divided into 2-foot intervals for SC-1 are provided in Figures 7 through 11, and for SC-2 in Figures 12 through 15. Photographs of the drilling and soil coring activities are provided in Appendix E.

3.2.1 Test Boring SC-1

Fill was encountered to depths of approximately 5 to 6 feet bgs. The fill material was then underlain by the Upper Sand (consisting generally of brown and gray-brown to gray medium dense, very fine to medium sand with some pebbles and rare gravels, trace fines, and occasional sandy silt or sandy silt zones). The Upper Silt was not encountered to the total depth drilled (21 feet bgs).

Grain size testing (Table 3), hydraulic conductivity measurements (Table 4) and capillary pressure curves (Figure 16) are indicative of fine to medium sand material.

The laboratory photographs of the cores (Figures 7 through 11) exhibit fluorescence consistent with the presence of NAPL in finely laminated zones at depths of approximately 8.0 to 8.3, 8.6 to 9.0, and 11 to 12.3 feet bgs (in the photographs, NAPL fluoresces yellowish-green; the intensity of the fluorescence increases with the amount of NAPL present).

Table 5 shows that pore fluid is primarily saturated with water, with comparatively small amounts of NAPL (2.9 percent to 8.8 percent). Table 6 shows that NAPL was not extractable from the soil-pore throats during centrifuging at 1,000 times the acceleration due to gravity.

3.2.2 Test Boring SC-2

The soil profile encountered in Test Boring SC-2 was very similar to SC-1, consisting of fill underlain by the Upper Sand. The Upper Sand consisted generally of fine to medium sand with zones of gravel and coarse-grained sand. The gravel zones decrease with depth and are most abundant to a depth of approximately 12.0 feet bgs. The Upper Silt was not encountered to the total depth drilled (20 feet bgs).

Grain size testing (Table 3), hydraulic conductivity measurements (Table 4) and capillary pressure curves (Figure 16) are consistent with fine to coarse sand.

The laboratory photographs of the cores (Figures 12 through 15) show NAPL from approximately 7.9 feet to the total depth sampled (17 feet bgs). The greatest amount of NAPL (i.e., highest fluorescence) occurs from approximately 15.3 to 17 feet bgs, and is present in the sandy layers and not present in the more permeable gravel interbeds.

Table 5 shows that pore fluid consists primarily of water, except for the samples obtained from a depth interval of 16 to 17 feet bgs where NAPL and water saturations were roughly equivalent. Table 6 suggests that the NAPL is extractable from the soil-pore throats during centrifuging at 1,000 times the acceleration due to gravity.

3.3 Task 3 - NAPL Chemical and Physical Characterization

NAPL and groundwater samples were collected on June 7 and 8, 2007, from five wells (RW2L3, RW5L3, RW2L5, CW-4, and CW-5) and submitted to Torkelson Geochemistry, Inc. (TGI) of Tulsa, Oklahoma, for chemical and physical testing. Geochemical and physical properties test results are summarized on Table 7. TGI's evaluation report, including all gas chromatograms, is provided in Appendix F.

The TGI results show that NAPL at the Site has undergone biological, chemical, and/or physical alteration resulting from exposure to the natural environment (i.e., weathering). Compositions range from weathered diesel (middle distillate) to weathered heavy lube oil-range petroleum hydrocarbons. A chromatogram representative of the NAPL collected from well RW-2L3 and a chromatogram for an unweathered diesel standard are presented in Figure 17. A summary of the effects of NAPL weathering and chromatogram interpretation is presented below.

Gas chromatography (GC) is a primary method for identifying NAPL constituents. NAPL is injected into the GC, and enters a small-diameter coiled capillary tube. As the sample is heated and travels through the capillary tube, NAPL constituents separate by polarity and boiling point. A chromatogram depicts NAPL constituents as they exit the capillary tubing. The chromatograms identify the relative abundance (as peaks depicted on the y-axis) of the individual compounds, and constituents are identified by retention time (depicted as time beneath a peak on the x-axis). Lighter (lower molecular weight) compounds with shorter retention times appear on the left-hand side of a chromatogram. Heavier (higher molecular weight) compounds have longer retention times and appear on the right-hand side of a chromatogram. There are several "marker" compounds that indicate relative degrees of weathering, particularly in diesel-range hydrocarbons. Selected marker compounds are labeled on the chromatogram in Figure 17.

A chromatogram of non-weathered diesel fuel is characterized by an array of repeating peaks of normal alkanes (i.e., a homologous series of compounds including octane [nC8], nonane [nC9], and decane [nC10]). These compounds characteristically appear as the dominant peaks, and are evenly distributed in the middle range of the diesel standard (Figure 17). These compounds are easily weathered and decrease in relative abundance compared to other compounds with increasing weathering. This decrease in normal alkanes accentuates the relative abundance of other marker compounds that are more persistent (i.e., the isoprenoid compounds, labeled as IP12, IP14, etc.). Two specific marker isoprenoids are pristane and phytane, which are located next to nC17 and nC18 alkane peaks. With increasing weathering, these isoprenoid compounds

increase relative to the adjacent normal alkanes (Bruce and Schmidt, 1994). The TGI chromatograms show that all of the NAPL samples are so degraded that the normal alkanes are nearly absent on all the GC chromatograms, and the only dominant identifiable peaks are isoprenoids, particularly pristane and phytane (Figure 17).

TGI's analyses show that the NAPL consists of variable amounts of degraded diesel with some heavier lube-oil range hydrocarbons (see Appendix F). The NAPL sampled from RW-2L3 is primarily degraded diesel, while RW-5L3 contains degraded diesel and heavier lube-oil range hydrocarbons. The remainder of NAPL samples indicated a composition intermediate between RW-2L3 and RW-5L3, and so samples RW-2L3 and RW-5L3 were also tested for density and viscosity (Table 7). The density of the NAPL from RW-2L3 of 0.8803 gram/milliliter (gm/ml) is consistent with weathered diesel (non-degraded diesel has a density of about 0.827 gm/ml; API, 2004). The NAPL sample collected from well RW-5L3 has a density of 0.9498 gm/ml, which is consistent with a heavy lube or fuel oil. The viscosity of the RW2L3 sample (8.34 centipoise [cP]) is comparable to the viscosity of No. 2 fuel oil (4.04 cP), and the viscosity of RW-5L3 (633 cP) is comparable No. 6 fuel oil (Bunker C) and other heavier fuels (122 cP to 3,180 cP) (Beckett and Huntley, 2002).

4.0 *Summary and Conclusions*

Groundwater sampling and NAPL testing indicate the presence of highly weathered petroleum that has been depleted of water-soluble hazardous constituents. Soil testing results also show that the residual NAPL is typically absent from the pore throats of coarser-grained soil, but is present in finer-grained soils which are less amenable to NAPL removal.

Most of the fluid that is pumped by the remediation system consists of water extracted from coarser-grained soils. Recovery data show that the remediation system recovers less than 0.3 percent NAPL by volume.

The results of groundwater monitoring data collected at the Site show that the groundwater cleanup standards have been met and that the remaining residual NAPL is not impacting groundwater. All of the groundwater samples were either non-detect or below the cleanup levels for petroleum compounds, with the exception of one sample from well CW-5, which was marginally above the cleanup level for TPH in January 2008. BTEX, carcinogenic PAHs, naphthalene, and PCBs were not detected in groundwater samples from offsite compliance wells MW-21, MW-22, and MW-23, which are located downgradient or crossgradient from the area that has historically been affected by NAPL. Since dissolved constituents are generally not partitioning from the NAPL to the groundwater in the area downgradient of or below the NAPL, migration to the deeper aquifer is unlikely.

Shaw recommends sampling wells CW-4 and CW-5 for three consecutive quarters to ascertain compliance with the cleanup standards associated with the PPCD. Recommendations for further work should be based on the results of these additional data.

5.0 References

- American Petroleum Institute, 2004, API Interaction LNAPL Guide, Version 2.0.4, August.
- Applied Geotechnology, Inc., 1990a, *Environmental Assessment, Former Milwaukee Railyard*, June 29.
- Applied Geotechnology, Inc., 1990b, *Hydrocarbon Assessment Report, Former Milwaukee Railyard*, July 10.
- Applied Geotechnology, Inc., 1993, *Draft Focused Migration Pathway Investigation, Former Milwaukee Railyard, Tacoma, Washington*, September 8.
- Applied Geotechnology, Inc., 1994, *Draft Engineering Design Report – Interim Action, Passive Hydrocarbon Recovery System, Former Milwaukee Railyard, Tacoma, Washington*, June 23.
- Beckett, G.D. and Huntley, D., 1998, *Soil Properties and Design Factors Influencing Free-Phase Hydrocarbon Cleanup*, Environmental Science and Technology, 1998, Vol. 32, pp. 287-293.
- Beckett, G.D. and Huntley, D., 2002, *Evaluating Hydrocarbon Removal From Source Zones and its Effect on Dissolved Plume Longevity and Magnitude*, American Petroleum Institute (API) publication No. 4715, September.
- Bruce, L.G. and G.W. Schmidt, 1999, *Hydrocarbon Fingerprinting for Application in Forensic Geology: Review with Case Studies*, American Association of Petroleum Geologists, vol. 78/11, November 1994, pp1692-1709.
- Ecology (Washington Department of), 2007, *Former Union Pacific (Milwaukee) Rail Yard Additional Studies Work Plan – Ecology Comments*, October 31.
- EMCON, 1994, *Draft Feasibility Study, Former Milwaukee Railyard, Tacoma, Washington*, November 9.
- Sale, T., 2001, *Methods for Determining Inputs to Environmental Petroleum Hydrocarbon Mobility and Recovery Models*, API Publication No. 4711, API, July.
- Shaw, 2005, *Five Year Review Report, Former Milwaukee Railyard Site, Tacoma, Washington*, March.
- Shaw, 2008a, *Progress Report – December 2007, Former Milwaukee Railyard Site, Tacoma, Washington*, January 29.
- Shaw, 2008b, *Progress Report – January 2008, Former Milwaukee Railyard Site, Tacoma, Washington*, February 13.

Shaw, 2008c, *Progress Report – April 2008, Former Milwaukee Railyard Site, Tacoma, Washington*, May 9.

TechSolv, 2007a, *Former Milwaukee Rail Yard Site, Tacoma, Washington, Consent Decree No. 95 2 02280 0*, September 9.

TechSolv, 2007b, *Additional Studies Work Plan, Former Milwaukee Rail Yard Site, Tacoma, Washington, Consent Decree No. 95 2 02280 0*, October 15.

USPCI Remedial Services, 1993, *Hydrogeologic Characterization Report, Union Pacific Railroad, Parcel “A” Former Milwaukee Railyard, Tacoma, Washington*, April 23.

U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, EPA-530/SW-846, September (update 1, July 1992; update 2a, August 1993; update 2, September 1994; update 2b, January 1995).

Limitations

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of separated portions of this report.

Tables

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| CW-1 | 11/28/96 | 17.81 | 8.06 | NP | 9.75 |
| | 01/27/97 | | 5.46 | 0.04 | 12.39* |
| | 05/22/97 | | 7.30 | 0.05 | 10.55* |
| | 10/10/97 | | 8.04 | 0.08 | 9.84* |
| | 10/31/97 | | 8.42 | 0.10 | 9.48* |
| | 11/07/97 | | 7.86 | 0.25 | 10.17* |
| | 01/14/98 | | 6.38 | 0.07 | 11.49* |
| | 02/26/98 | | 6.26 | 0.43 | 11.93* |
| | 04/02/98 | | 6.68 | Film | 11.13 |
| | 04/30/98 | | 7.52 | 0.01 | 10.30* |
| | 06/02/98 | | 7.81 | 1.58 | 11.41* |
| | 06/30/98 | | 8.36 | 0.22 | 9.65* |
| | 07/23/98 | | 8.65 | 0.30 | 9.43* |
| | 08/31/98 | | 9.11 | 0.45 | 9.10* |
| | 09/30/98 | | 9.31 | 0.45 | 8.90* |
| | 10/29/98 | | 9.40 | 0.42 | 8.78* |
| | 11/30/98 | | 6.24 | NP | 11.57 |
| | 12/30/98 | | 5.48 | NP | 12.33 |
| | 01/29/99 | | 5.21 | NP | 12.60 |
| | 02/25/99 | | 5.41 | NP | 12.40 |
| | 03/31/99 | | 6.42 | NP | 11.39 |
| | 04/30/99 | | 7.34 | Film | 10.47 |
| | 06/02/99 | | 7.89 | NP | 9.92 |
| | 06/30/99 | | 8.04 | NP | 9.77 |
| | 07/14/99 | | 8.13 | NP | 9.68 |
| | 08/18/99 | | 8.39 | NP | 9.42 |
| | 09/15/99 | | 8.66 | Film | 9.15 |
| | 10/28/99 | | 9.18 | 0.08 | 8.70* |
| | 11/24/99 | | 7.00 | NP | 10.81 |
| | 12/21/99 | | 6.64 | NP | 11.17 |
| | 01/18/00 | | 6.94 | 0.22 | 11.07* |
| | 03/01/00 | | 6.56 | NP | 11.25 |
| | 03/30/00 | | 6.88 | NP | 10.93 |
| | 04/26/00 | | 7.58 | Film | 10.23 |
| | 05/31/00 | | 8.02 | NP | 9.79 |
| | 06/29/00 | | 8.16 | NP | 9.65 |
| | 07/25/00 | | 8.38 | NP | 9.43 |
| | 08/15/00 | | 8.59 | NP | 9.22 |
| | 09/12/00 | | 8.84 | NP | 8.97 |
| | 10/17/00 | | 9.24 | 0.22 | 8.77* |
| 11/14/00 | 8.48 | 0.03 | 9.36* | | |
| 12/29/00 | 8.11 | 0.02 | 9.72* | | |
| 01/19/01 | 8.01 | 0.03 | 9.83* | | |
| 02/27/01 | 7.91 | 0.01 | 9.91* | | |
| 03/26/01 | 8.28 | 0.01 | 9.54* | | |
| 04/30/01 | 8.06 | 0.01 | 9.76* | | |
| 05/28/01 | 7.94 | 0.01 | 9.88* | | |
| 06/25/01 | 8.29 | 0.01 | 9.53* | | |
| 07/23/01 | 8.46 | 0.01 | 9.36* | | |
| 08/27/01 | 9.42 | 0.01 | 8.40* | | |
| 09/23/01 | 8.65 | 0.01 | 9.17* | | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| CW-1, cont. | 10/25/01 | | 8.75 | 0.01 | 9.07* |
| | 11/29/01 | | 6.30 | 0.01 | 11.52* |
| | 12/29/01 | | 6.25 | NP | 11.56 |
| | 01/31/02 | | 6.14 | NP | 11.67 |
| | 02/28/02 | | 6.57 | Film | 11.24 |
| | 03/28/02 | | 6.79 | NP | 11.02 |
| | 04/24/02 | | 7.03 | NP | 10.78 |
| | 05/30/02 | | 7.80 | NP | 10.01 |
| | 06/27/02 | | 8.30 | NP | 9.51 |
| | 07/30/02 | | 8.48 | NP | 9.33 |
| | 08/29/02 | | 8.72 | Film | 9.09 |
| | 09/27/02 | | 8.92 | Film | 8.89 |
| | 10/31/02 | | 9.16 | 0.01 | 8.66* |
| | 11/26/02 | | 8.70 | 0.01 | 9.12* |
| | 12/26/02 | | 7.52 | 0.03 | 10.32* |
| | 01/30/03 | | 6.02 | NP | 11.79 |
| | 02/27/03 | | 6.86 | NP | 10.95 |
| | 03/31/03 | | 6.76 | NP | 11.05 |
| | 04/28/03 | | 7.14 | NP | 10.67 |
| | 05/29/03 | | 7.74 | NP | 10.07 |
| | 06/25/03 | | 8.08 | NP | 9.73 |
| | 07/30/03 | | 8.47 | Film | 9.34 |
| | 08/28/03 | | 8.66 | NP | 9.15 |
| | 09/29/03 | | 8.93 | Film | 8.88 |
| | 10/29/03 | | 7.40 | NP | 10.41 |
| | 11/25/03 | | 7.33 | NP | 10.48 |
| | 01/09/04 | | 6.53 | NP | 11.28 |
| | 01/27/04 | | 6.61 | NP | 11.20 |
| | 02/26/04 | | 6.78 | NP | 11.03 |
| | 03/29/04 | | 7.41 | Film | 10.40 |
| | 04/30/04 | | 7.91 | NP | 9.90 |
| | 05/25/04 | | 8.11 | NP | 9.70 |
| | 06/30/04 | | 8.41 | NP | 9.40 |
| | 07/28/04 | | 8.64 | NP | 9.17 |
| | 08/25/04 | | 8.77 | NP | 9.04 |
| | 09/29/04 | | 8.56 | NP | 9.25 |
| | 10/28/04 | | 8.28 | NP | 9.53 |
| | 11/23/04 | | 8.21 | NP | 9.60 |
| | 12/30/04 | | 7.55 | NP | 10.26 |
| | 01/31/05 | | 7.21 | NP | 10.60 |
| | 02/28/05 | | 7.99 | NP | 9.82 |
| | 03/30/05 | | 7.48 | NP | 10.33 |
| 04/27/05 | | 7.51 | NP | 10.30 | |
| 05/26/05 | | 6.88 | NP | 10.93 | |
| 06/28/05 | | 7.22 | NP | 10.59 | |
| 07/26/05 | | 8.02 | NP | 9.79 | |
| 09/08/05 | | 8.50 | 0.01 | 9.31 | |
| 09/30/05 | | 8.71 | NP | 9.10 | |
| 10/28/05 | | 8.48 | NP | 9.33 | |
| 11/30/05 | | 7.85 | NP | 9.96 | |
| 12/28/05 | | 6.85 | NP | 10.96 | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| CW-1, cont. | 01/27/06 | | 6.06 | Film | 11.75 |
| | 02/27/06 | | 6.74 | NP | 11.07 |
| | 03/28/06 | | 7.06 | NP | 10.75 |
| | 04/25/06 | | 7.14 | NP | 10.67 |
| | 05/30/06 | | 7.54 | NP | 10.27 |
| | 06/27/06 | | 7.64 | NP | 10.17 |
| | 07/24/06 | | 8.02 | NP | 9.79 |
| | 08/30/06 | | 8.39 | NP | 9.42 |
| | 09/29/06 | | 8.77 | NP | 9.04 |
| | 10/31/06 | | 8.79 | NP | 9.02 |
| | 11/30/06 | | 6.60 | NP | 11.21 |
| | 12/28/06 | | 5.86 | NP | 11.95 |
| | 01/31/07 | | 6.68 | NP | 11.13 |
| | 02/28/07 | | 6.63 | NP | 11.18 |
| | 03/28/07 | | 6.42 | NP | 11.39 |
| | 04/30/07 | | 7.23 | NP | 10.58 |
| | 05/23/07 | | 7.61 | NP | 10.20 |
| | 06/29/07 | | 7.98 | NP | 9.83 |
| | 07/30/07 | | 8.01 | NP | 9.80 |
| | 08/29/07 | | 8.32 | NP | 9.49 |
| 09/27/07 | | 8.57 | NP | 9.24 | |
| 10/25/07 | | 7.92 | NP | 9.89 | |
| 11/28/07 | | 8.05 | NP | 9.76 | |
| 01/09/08 | | 6.87 | NP | 10.94 | |
| 02/13/08 | | 6.85 | NP | 10.96 | |
| 03/19/08 | | 7.45 | NP | 10.36 | |
| CW-2 | 02/28/07 | 20.44 | 8.61 | NP | 11.83 |
| | 03/28/07 | | 8.27 | NP | 12.17 |
| | 04/30/07 | | 8.87 | NP | 11.57 |
| | 05/23/07 | | 9.28 | NP | 11.16 |
| | 06/29/07 | | 9.82 | NP | 10.62 |
| | 07/30/07 | | 9.95 | NP | 10.49 |
| | 08/29/07 | | 10.23 | NP | 10.21 |
| | 09/27/07 | | 10.53 | NP | 9.91 |
| | 10/25/07 | | 9.97 | NP | 10.47 |
| | 11/28/07 | | 10.00 | NP | 10.44 |
| | 01/09/08 | | 8.95 | NP | 11.49 |
| | 02/13/08 | | 8.58 | NP | 11.86 |
| 03/19/08 | | 9.26 | NP | 11.18 | |
| CW-3 | 02/28/07 | 19.31 | 6.44 | NP | 12.87 |
| | 03/28/07 | | 6.27 | NP | 13.04 |
| | 04/30/07 | | 7.24 | NP | 12.07 |
| | 05/23/07 | | 7.74 | NP | 11.57 |
| | 06/29/07 | | 8.40 | NP | 10.91 |
| | 07/30/07 | | 8.55 | NP | 10.76 |
| | 08/29/07 | | 8.85 | NP | 10.46 |
| | 09/27/07 | | 9.19 | NP | 10.12 |
| | 10/25/07 | | 8.67 | NP | 10.64 |
| | 11/28/07 | | 8.60 | NP | 10.71 |
| | 01/09/08 | | 7.60 | NP | 11.71 |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) | |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|--------|
| CW-3, cont. | 02/13/08 | | 7.30 | NP | 12.01 | |
| | 03/19/08 | | 7.91 | NP | 11.40 | |
| CW-4 | 11/28/96 | 16.50 | 8.14 | 2.28 | 10.39* | |
| | 01/27/97 | | 3.65 | 0.26 | 13.08* | |
| | 05/22/97 | | 5.71 | 0.26 | 11.02* | |
| | 10/10/97 | | 6.67 | 1.06 | 10.77* | |
| | 10/31/97 | | 7.03 | 0.97 | 10.33* | |
| | 11/07/97 | | 6.00 | 0.19 | 10.67* | |
| | 01/14/98 | | 4.35 | Film | 12.15 | |
| | 02/26/98 | | 5.12 | Film | 11.38 | |
| | 04/02/98 | | 5.04 | 0.23 | 11.66* | |
| | 04/30/98 | | 6.77 | 0.96 | 10.58* | |
| | 06/02/98 | | 7.67 | 2.25 | 10.83* | |
| | 06/30/98 | | — | >0.50 | — | |
| | 07/23/98 | | — | >0.50 | — | |
| | 08/31/98 | | | 14.26 | 7.19 | 8.64* |
| | 09/30/98 | | | — | >0.50 | — |
| | 10/29/98 | | | 14.10 | 6.68 | 8.35* |
| | 11/30/98 | | | 8.11 | 2.05 | 10.21* |
| | 12/30/98 | | | 5.01 | 1.32 | 12.66* |
| | 01/29/99 | | | 3.11 | 1.95 | 15.13* |
| | 02/25/99 | | | 4.80 | 1.65 | 13.17* |
| | 03/31/99 | | | 6.80 | 2.35 | 11.79* |
| | 04/30/99 | | | 6.78 | 1.14 | 10.73* |
| | 06/02/99 | | | 9.35 | 3.27 | 10.06* |
| | 06/30/99 | | | — | >5.00 | — |
| | 07/14/99 | | | 11.70 | 5.27 | 9.49* |
| | 08/18/99 | | | 14.00 | 6.70 | 8.46* |
| | 09/15/99 | | | 14.00 | 6.92 | 8.66* |
| | 10/28/99 | | | 14.70 | 6.70 | 7.76* |
| | 11/24/99 | | | 5.42 | Film | 11.08 |
| | 12/21/99 | | | 5.17 | Film | 11.33 |
| | 01/18/00 | | | 5.34 | 0.25 | 11.38* |
| | 03/01/00 | | | 5.33 | 0.80 | 11.88* |
| 03/30/00 | | | 5.50 | 0.37 | 11.33* | |
| 04/26/00 | | | 8.20 | 2.40 | 10.44* | |
| 05/31/00 | | | 9.82 | 3.51 | 9.80* | |
| 06/29/00 | | | 14.10 | 7.64 | 9.20* | |
| 07/25/00 | | | 14.00 | 7.05 | 8.77* | |
| 08/15/00 | | | 13.51 | 6.71 | 8.96* | |
| 09/12/00 | | | 13.60 | 6.61 | 8.78* | |
| 10/17/00 | | | 13.70 | 6.06 | 8.19* | |
| 11/14/00 | | | 13.78 | 6.79 | 8.76* | |
| 12/29/00 | | | 7.65 | 1.39 | 10.09* | |
| 01/19/01 | | | 9.38 | 2.89 | 9.69* | |
| 02/27/01 | | | 14.95 | 8.21 | 8.86* | |
| 03/26/01 | | | NM | NM | NM | |
| 04/30/01 | | | 8.48 | 1.88 | 9.69* | |
| 05/28/01 | | | 15.45 | 8.05 | 8.21* | |
| 06/25/01 | | | 7.99 | 0.91 | 9.32* | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| CW-4, cont. | 07/23/01 | | 7.47 | 0.28 | 9.28* |
| | 08/27/01 | | 9.96 | 0.65 | 7.12* |
| | 09/23/01 | | 8.56 | 1.41 | 9.19* |
| | 10/25/01 | | 7.90 | 0.11 | 8.70* |
| | 11/29/01 | | 5.26 | 0.51 | 11.69* |
| | 12/29/01 | | 6.85 | 0.12 | 9.76* |
| | 01/31/02 | | 7.00 | 0.90 | 10.30* |
| | 02/28/02 | | 5.05 | 0.24 | 11.66* |
| | 03/28/02 | | 5.90 | 0.10 | 10.69* |
| | 04/24/02 | | 7.70 | 1.80 | 10.40* |
| | 05/30/02 | | 8.90 | 0.98 | 8.47* |
| | 06/27/02 | | 11.00 | 3.40 | 8.53* |
| | 07/30/02 | | 7.60 | 0.08 | 8.97* |
| | 08/29/02 | | 9.00 | 0.70 | 8.12* |
| | 09/27/02 | | 8.26 | Film | 8.24 |
| | 10/31/02 | | 8.75 | NP | 7.75 |
| | 11/26/02 | | 8.31 | NP | 8.19 |
| | 12/26/02 | | 11.14 | 4.34 | 9.22* |
| | 01/30/03 | | 6.20 | NP | 10.30 |
| | 02/27/03 | | 7.00 | 1.00 | 10.39* |
| | 03/31/03 | | NM | NM | NM |
| | 04/28/03 | | 8.35 | 2.20 | 10.11* |
| | 05/29/03 | | 8.70 | 1.80 | 9.40* |
| | 06/25/03 | | NM | NM | NM |
| | 07/30/03 | | 7.50 | 0.00 | 9.00 |
| | 08/28/03 | | 8.30 | 0.50 | 8.65* |
| | 09/29/03 | | 7.90 | 0.10 | 8.69* |
| | 10/29/03 | | 7.01 | NP | 9.49 |
| | 11/25/03 | | 6.88 | NP | 9.62 |
| | 01/09/04 | | 5.20 | 0.10 | 11.39* |
| | 01/27/04 | | 5.35 | NP | 11.15 |
| | 02/26/04 | | 7.95 | 2.81 | 11.05* |
| | 03/29/04 | | 6.30 | Film | 10.20 |
| | 04/30/04 | | 7.70 | Film | 8.80 |
| | 05/25/04 | | 7.75 | Film | 8.75 |
| | 06/30/04 | | 9.50 | 1.50 | 8.34* |
| | 07/28/04 | | 8.20 | 0.79 | 9.00* |
| | 08/25/04 | | NM | NM | NM |
| | 09/29/04 | | NM | NM | NM |
| | 10/28/04 | | NM | NM | NM |
| 11/23/04 | | 8.90 | 1.80 | 9.20* | |
| 12/30/04 | | | NM ^{b,c} | NM ^{b,c} | NM |
| 01/31/05 | | | NM ^{b,c} | NM ^{b,c} | NM |
| 02/28/05 | | | NM ^{b,c} | NM ^{b,c} | NM |
| 03/30/05 | | | 10.53 | 0.05 | NA ^b |
| 04/27/05 | | | 10.65 | 0.31 | NA ^b |
| 05/26/05 | | | 10.55 | 0.41 | NA ^b |
| 06/28/05 | | 20.53 | 10.71 | 0.35 | 10.13* |
| 07/26/05 | | | 10.83 | 1.12 | 10.70* |
| 09/08/05 | | | NM ^c | NM ^c | NM ^c |
| 09/30/05 | | | 13.28 | 2.25 | 9.25* |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| CW-4, cont. | 10/28/05 | | 13.48 | 2.17 | 8.98* |
| | 11/30/05 | | 13.85 | 3.13 | 9.47* |
| | 12/28/05 | | NM | NM | NM |
| | 01/27/06 | | NM | NM | NM |
| | 02/27/06 | | NM | NM | NM |
| | 03/28/06 | | 9.96 | 1.81 | 12.18* |
| | 04/25/06 | | 10.18 | 0.10 | 10.44* |
| | 05/30/06 | | 10.37 | 0.09 | 10.24* |
| | 06/27/06 | | 11.30 | 0.86 | 10.00* |
| | 07/24/06 | | 13.23 | 2.38 | 9.42* |
| | 08/30/06 | | 12.10 | 1.01 | 9.33* |
| | 09/29/06 | | 14.30 | 2.93 | 8.84* |
| | 10/31/06 | | 12.54 | 0.88 | 8.77* |
| | 11/30/06 | | 9.59 | 0.01 | 10.95* |
| | 12/28/06 | | 9.35 | 0.13 | 11.30* |
| | 01/31/07 | | 10.02 | 0.38 | 10.85* |
| | 02/28/07 | | 9.74 | 0.06 | 10.84* |
| | 03/28/07 | | 9.03 | 0.06 | 11.55* |
| | 04/30/07 | | 10.29 | 0.28 | 10.49* |
| | 05/23/07 | | 10.39 | 0.16 | 10.28* |
| | 06/29/07 | | 13.38 | 2.58 | 9.45* |
| | 07/30/07 | | 10.25 | 1.46 | 11.58* |
| | 08/29/07 | | 11.58 | 0.67 | 9.55* |
| 09/27/07 | | NM ^c | NM ^c | NM ^c | |
| 10/25/07 | | 13.11 | 2.25 | 9.42* | |
| 11/28/07 | | 11.00 | 1.00 | 10.42* | |
| 01/09/08 | | 16.15 | 5.26 | 9.06* | |
| 02/13/08 | | 10.00 | 0.35 | 10.84* | |
| 03/19/08 | | 13.20 | 3.06 | 10.05* | |
| CW-5 | 11/28/96 | 18.76 | 8.85 | 0.71 | 10.54* |
| | 01/27/97 | | 10.65 | 5.81 | 13.28* |
| | 05/22/97 | | 9.00 | 1.70 | 11.27* |
| | 10/10/97 | | 7.66 | 0.01 | 11.11* |
| | 10/31/97 | | 7.76 | 0.01 | 11.01* |
| | 11/07/97 | | 7.78 | 0.01 | 10.99* |
| | 01/14/98 | | 6.82 | 0.05 | 11.98* |
| | 02/26/98 | | — | >0.84 | — |
| | 04/02/98 | | 7.13 | 0.51 | 12.08* |
| | 04/30/98 | | 7.69 | 0.01 | 11.08* |
| | 06/02/98 | | 8.42 | 0.86 | 11.11* |
| | 06/30/98 | | — | >0.50 | — |
| | 07/23/98 | | — | >0.50 | — |
| | 08/31/98 | | 12.73 | 3.37 | 9.03* |
| | 09/30/98 | | — | >0.50 | — |
| | 10/29/98 | | 13.29 | 3.78 | 8.83* |
| | 11/30/98 | | 5.35 | 1.05 | 14.34* |
| | 12/30/98 | | 5.74 | 0.70 | 13.64* |
| | 01/29/99 | | 5.01 | 0.65 | 14.33* |
| | 02/25/99 | | 5.70 | 1.49 | 14.39* |
| 03/31/99 | | 7.10 | 1.54 | 13.03* | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| CW-5, cont. | 04/30/99 | | 8.20 | 1.34 | 11.75* |
| | 06/02/99 | | 8.29 | 0.78 | 11.16* |
| | 06/30/99 | | 9.65 | 0.95 | 9.96* |
| | 07/14/99 | | 8.32 | 1.88 | 12.11* |
| | 08/18/99 | | 9.95 | 1.13 | 9.82* |
| | 09/15/99 | | 9.92 | 0.71 | 9.47* |
| | 10/28/99 | | 9.89 | 0.17 | 9.02* |
| | 11/24/99 | | 9.90 | 3.09 | 11.61* |
| | 12/21/99 | | 7.69 | 0.79 | 11.77* |
| | 01/18/00 | | 7.80 | 1.19 | 12.02* |
| | 03/01/00 | | 7.42 | 1.24 | 12.44* |
| | 03/30/00 | | 10.80 | 3.70 | 11.25* |
| | 04/26/00 | | 8.30 | 0.25 | 10.68* |
| | 05/31/00 | | 10.45 | 2.01 | 10.10* |
| | 06/29/00 | | 12.65 | 4.20 | 9.85* |
| | 07/25/00 | | 12.70 | 3.12 | 8.84* |
| | 08/15/00 | | 11.47 | 2.02 | 9.09* |
| | 09/12/00 | | 11.61 | 1.73 | 8.69* |
| | 10/17/00 | | 11.65 | 1.68 | 8.61* |
| | 11/14/00 | | 9.06 | Film | 9.70* |
| | 12/29/00 | | 7.84 | 0.08 | 10.99* |
| | 01/19/01 | | 9.32 | 0.91 | 10.25* |
| | 02/27/01 | | 9.51 | 1.79 | 10.84* |
| | 03/26/01 | | 8.99 | 0.04 | 9.81* |
| | 04/30/01 | | 7.73 | 0.12 | 11.14* |
| | 05/28/01 | | 8.85 | 1.26 | 11.03* |
| | 06/25/01 | | 9.24 | 0.21 | 9.71* |
| | 07/23/01 | | 9.40 | 0.07 | 9.42* |
| | 08/27/01 | | 10.13 | 1.34 | 9.82* |
| | 09/23/01 | | 11.90 | 2.84 | 9.39* |
| | 10/25/01 | | 11.09 | 2.86 | 10.22* |
| | 11/29/01 | | 7.90 | 1.69 | 12.36* |
| | 12/29/01 | | 7.59 | 0.88 | 11.95* |
| | 01/31/02 | | 7.05 | 1.44 | 12.99* |
| | 02/28/02 | | 8.90 | 2.57 | 12.15* |
| | 03/28/02 | | 8.10 | 1.70 | 12.17* |
| | 04/24/02 | | 7.50 | 1.15 | 12.28* |
| | 05/30/02 | | 9.80 | 2.27 | 10.98* |
| | 06/27/02 | | 10.91 | 2.59 | 10.16* |
| | 07/30/02 | | 10.60 | 1.85 | 9.81* |
| 08/29/02 | | 11.65 | 2.40 | 9.25* | |
| 09/27/02 | | 11.95 | 2.50 | 9.04* | |
| 10/31/02 | | 12.45 | 2.67 | 8.69* | |
| 11/26/02 | | 11.35 | 2.28 | 9.44* | |
| 12/26/02 | | 10.23 | 2.95 | 11.16* | |
| 01/30/03 | | 7.80 | 2.04 | 12.78* | |
| 02/27/03 | | 11.60 | 4.74 | 11.38* | |
| 03/31/03 | | 9.80 | 3.00 | 11.63* | |
| 04/28/03 | | 10.30 | 3.18 | 11.29* | |
| 05/29/03 | | NM | NM | NM | |
| 06/25/03 | | 10.45 | 1.00 | 9.20* | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| CW-5, cont. | 07/30/03 | 19.32 | 11.80 | 1.90 | 8.65* |
| | 08/28/03 | | 11.80 | 4.53 | 10.99* |
| | 09/29/03 | | 14.10 | 4.35 | 8.53* |
| | 10/29/03 | | 8.57 | 1.13 | 11.20* |
| | 11/25/03 | | 8.34 | 0.95 | 11.27* |
| | 01/09/04 | | 7.90 | 1.30 | 12.02* |
| | 01/27/04 | | 9.76 | 3.35 | 11.98* |
| | 02/26/04 | | 7.70 | 1.05 | 11.99* |
| | 03/29/04 | | 8.85 | 1.57 | 11.31* |
| | 04/30/04 | | 10.30 | 2.31 | 10.52* |
| | 05/25/04 | | 10.23 | 1.63 | 9.98* |
| | 06/30/04 | | 11.40 | 2.58 | 9.66* |
| | 07/28/04 | | 10.70 | 2.10 | 9.93* |
| | 08/25/04 | | 9.90 | 0.85 | 9.62* |
| | 09/29/04 | | 10.91 | 1.46 | 9.15* |
| | 10/28/04 | | 10.20 | 1.65 | 10.03* |
| | 11/23/04 | | 10.20 | 1.60 | 9.98* |
| | 12/30/04 | | NM ^{b,c} | NM ^{b,c} | NM |
| | 01/31/05 | | 14.30 | 1.50 | NA ^b |
| | 02/28/05 | | NM ^{b,c} | NM ^{b,c} | NM |
| | 03/30/05 | | 12.30 | 2.92 | NA ^b |
| | 04/27/05 | | 9.55 | 1.16 | NA ^b |
| | 05/26/05 | | 9.14 | 1.10 | NA ^b |
| | 06/28/05 | | 9.61 | 0.94 | 10.55* |
| | 07/26/05 | | 11.11 | 0.88 | 8.99* |
| | 09/08/05 | | 11.42 | 1.54 | 9.27* |
| | 09/30/05 | | 11.53 | 1.55 | 9.17* |
| | 10/28/05 | | 11.43 | 1.38 | 9.12* |
| | 11/30/05 | | 10.15 | 0.69 | 9.78* |
| | 12/28/05 | | 8.04 | 0.19 | 11.45* |
| | 01/27/06 | | 7.28 | 0.57 | 12.55* |
| | 02/27/06 | | 7.85 | 0.67 | 12.07* |
| | 03/28/06 | | 8.89 | 1.35 | 11.63* |
| | 04/25/06 | | 8.88 | 1.59 | 11.86* |
| | 05/30/06 | | 8.45 | 0.41 | 11.23* |
| | 06/27/06 | | 8.80 | 0.44 | 10.91* |
| | 07/24/06 | | 9.84 | 0.68 | 10.09* |
| | 08/30/06 | | 11.80 | 2.23 | 9.50* |
| | 09/29/06 | | 10.80 | 0.85 | 9.28* |
| | 10/31/06 | | 12.27 | 0.38 | 7.39* |
| | 11/30/06 | | 8.13 | 0.74 | 11.85* |
| | 12/28/06 | | 7.44 | 0.72 | 12.52* |
| 01/31/07 | NA | NA | NA | | |
| 02/28/07 | NA | NA | NA | | |
| 03/28/07 | 7.81 | 0.97 | 12.37* | | |
| 04/30/07 | NA | NA | NA | | |
| 05/23/07 | NA | NA | NA | | |
| 06/29/07 | 10.21 | 0.62 | 9.66* | | |
| 07/30/07 | 11.51 | 2.12 | 9.70* | | |
| 08/29/07 | 10.22 | 0.64 | 9.67* | | |
| 09/27/07 | 11.01 | 0.22 | 8.51* | | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| CW-5, cont. | 10/25/07 | | 10.22 | 0.91 | 9.91* |
| | 11/28/07 | | 9.25 | 0.20 | 10.25* |
| | 01/09/08 | | 10.50 | 2.45 | 11.00* |
| | 02/13/08 | | 11.87 | 4.22 | 11.21* |
| | 03/19/08 | | 11.47 | 3.31 | 10.80* |
| CW-6 | 02/28/07 | 20.52 | 10.22 | NP | 10.30 |
| | 03/28/07 | | 10.24 | NP | 10.28 |
| | 04/30/07 | | 10.89 | NP | 9.63 |
| | 05/23/07 | | 11.04 | NP | 9.48 |
| | 06/29/07 | | 11.21 | NP | 9.31 |
| | 07/30/07 | | 11.22 | NP | 9.30 |
| | 08/29/07 | | 11.52 | NP | 9.00 |
| | 09/27/07 | | 11.74 | NP | 8.78 |
| | 10/25/07 | | 11.38 | NP | 9.14 |
| | 11/28/07 | | 11.25 | NP | 9.27 |
| | 01/09/08 | | 10.32 | NP | 10.20 |
| | 02/13/08 | | 10.59 | NP | 9.93 |
| | 03/19/08 | | 10.99 | NP | 9.53 |
| CW-7 | 02/28/07 | 19.81 | 9.02 | NP | 10.79 |
| | 03/28/07 | | 9.04 | NP | 10.77 |
| | 04/30/07 | | 9.54 | NP | 10.27 |
| | 05/23/07 | | 9.72 | NP | 10.09 |
| | 06/29/07 | | 9.83 | NP | 9.98 |
| | 07/30/07 | | 9.90 | NP | 9.91 |
| | 08/29/07 | | 10.16 | NP | 9.65 |
| | 09/27/07 | | 10.41 | NP | 9.40 |
| | 10/25/07 | | 10.11 | NP | 9.70 |
| | 11/28/07 | | 10.00 | NP | 9.81 |
| | 01/09/08 | | 9.15 | NP | 10.66 |
| | 02/13/08 | | 9.38 | NP | 10.43 |
| | 03/19/08 | | 9.74 | NP | 10.07 |
| CW-8 | 11/28/96 | 18.28 | 8.63 | 0.12 | 9.76* |
| | 01/27/97 | | 7.54 | 2.03 | 12.55* |
| | 05/22/97 | | 8.60 | 0.80 | 10.39* |
| | 10/10/97 | | 8.61 | 0.14 | 9.79* |
| | 10/31/97 | | 8.78 | 0.11 | 9.60* |
| | 11/07/97 | | 8.30 | 0.01 | 9.99* |
| | 01/14/98 | | 7.00 | Film | 11.28 |
| | 02/26/98 | | 7.71 | 0.03 | 10.60* |
| | 04/02/98 | | 7.44 | 0.15 | 10.97* |
| | 04/30/98 | | 8.96 | 0.85 | 10.08* |
| | 06/02/98 | | 8.68 | 0.32 | 9.88* |
| | 06/30/98 | | 9.17 | 0.36 | 9.43* |
| | 07/23/98 | | 9.38 | 0.41 | 9.26* |
| | 08/31/98 | | 9.96 | 0.67 | 8.92* |
| | 09/30/98 | | 10.13 | 0.72 | 8.79* |
| | 10/29/98 | | 10.40 | 0.91 | 8.69* |
| | 11/30/98 | | 6.73 | 0.20 | 11.73* |
| 12/30/98 | | 6.48 | 0.39 | 12.15* | |
| 01/29/99 | | 6.27 | 0.58 | 12.53* | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| CW-8, cont. | 02/25/99 | | 6.50 | 0.75 | 12.45* |
| | 03/31/99 | | 7.39 | 0.68 | 11.50* |
| | 04/30/99 | | 8.48 | 0.46 | 10.21* |
| | 06/02/99 | | 8.68 | 0.15 | 9.73* |
| | 06/30/99 | | 8.81 | 0.13 | 9.59* |
| | 07/14/99 | | 8.91 | 0.04 | 9.41* |
| | 08/18/99 | | 9.20 | 0.06 | 9.13* |
| | 09/15/99 | | 9.41 | 0.03 | 8.90* |
| | 10/28/99 | | 10.75 | 0.15 | 7.66* |
| | 11/24/99 | | 7.83 | 0.10 | 10.54* |
| | 12/21/99 | | 7.78 | 0.57 | 11.01* |
| | 01/18/00 | | 7.92 | 0.82 | 11.09* |
| | 03/01/00 | | 7.79 | 0.38 | 10.83* |
| | 03/30/00 | | 8.53 | 0.74 | 10.41* |
| | 04/26/00 | | 8.96 | 0.59 | 9.85* |
| | 05/31/00 | | 9.20 | 0.41 | 9.44* |
| | 06/29/00 | | 8.95 | 0.10 | 9.42* |
| | 07/25/00 | | 9.39 | 0.21 | 9.08* |
| | 08/15/00 | | 9.61 | 0.32 | 8.95* |
| | 09/12/00 | | 9.81 | 0.40 | 8.83* |
| | 10/17/00 | | 10.64 | 1.20 | 8.71* |
| | 11/14/00 | | 9.88 | 0.57 | 8.91* |
| | 12/29/00 | | 8.96 | 0.09 | 9.40* |
| | 01/19/01 | | 8.85 | 0.09 | 9.51* |
| | 02/27/01 | | 8.82 | 0.09 | 9.54* |
| | 03/26/01 | | 9.41 | 0.15 | 9.00* |
| | 04/30/01 | | 8.80 | 0.09 | 9.56* |
| | 05/28/01 | | 8.70 | 0.09 | 9.66* |
| | 06/25/01 | | 8.70 | 0.09 | 9.66* |
| | 07/23/01 | | 9.18 | 0.03 | 9.13* |
| | 08/27/01 | | 9.20 | 0.05 | 9.12* |
| | 09/23/01 | | 9.37 | 0.08 | 8.98* |
| | 10/25/01 | | 9.67 | 0.22 | 8.81* |
| | 11/29/01 | | 7.21 | 0.02 | 11.09* |
| | 12/29/01 | | 6.95 | 0.03 | 11.36* |
| | 01/31/02 | | 6.72 | NP | 11.56 |
| | 02/28/02 | | 7.10 | 0.01 | 11.19* |
| | 03/28/02 | | 7.35 | 0.01 | 10.94* |
| | 04/24/02 | | 7.67 | 0.02 | 10.63* |
| | 05/30/02 | | 8.38 | NP | 9.90 |
| 06/27/02 | | 8.84 | NP | 9.44 | |
| 07/30/02 | | 9.13 | 0.02 | 9.17* | |
| 08/29/02 | | 9.42 | 0.05 | 8.90* | |
| 09/27/02 | | 9.68 | 0.10 | 8.69* | |
| 10/31/02 | | 9.95 | 0.22 | 8.53* | |
| 11/26/02 | | 9.53 | 0.10 | 8.84* | |
| 12/26/02 | | 8.12 | NP | 10.16 | |
| 01/30/03 | | 6.32 | NP | 11.96 | |
| 02/27/03 | | 7.54 | NP | 10.74 | |
| 03/31/03 | | 7.42 | NP | 10.86 | |
| 04/28/03 | | 7.88 | NP | 10.40 | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| CW-8, cont. | 05/29/03 | 19.61 | 8.63 | NP | 9.65 |
| | 06/25/03 | | 8.97 | NP | 9.31 |
| | 07/30/03 | | 9.20 | Film | 9.08 |
| | 08/28/03 | | 9.31 | NP | 8.97 |
| | 09/29/03 | | 9.55 | Film | 8.73 |
| | 10/29/03 | | 8.12 | NP | 10.16 |
| | 11/25/03 | | 8.17 | NP | 10.11 |
| | 01/09/04 | | 7.51 | NP | 10.77 |
| | 01/27/04 | | 7.29 | NP | 10.99 |
| | 02/26/04 | | 7.51 | Film | 10.77 |
| | 03/29/04 | | 8.20 | NP | 10.08 |
| | 04/30/04 | | 8.72 | NP | 9.56 |
| | 05/25/04 | | 8.82 | NP | 9.46 |
| | 06/30/04 | | 9.00 | NP | 9.28 |
| | 07/28/04 | | 9.12 | NP | 9.16 |
| | 08/25/04 | | 9.24 | NP | 9.04 |
| | 09/29/04 | | 9.18 | NP | 9.10 |
| | 10/28/04 | | 8.80 | NP | 9.48 |
| | 11/23/04 | | 8.95 | NP | 9.33 |
| | 12/30/04 | | 13.05 | NP | NA ^b |
| | 01/31/05 | | 12.72 | Film | NA ^b |
| | 02/28/05 | | 10.49 | NP | NA ^b |
| | 03/30/05 | | 8.98 | NP | NA ^b |
| | 04/27/05 | | 9.88 | NP | NA ^b |
| | 05/26/05 | | 9.17 | NP | NA ^b |
| | 06/28/05 | | 9.55 | NP | 10.06 |
| | 07/26/05 | | 10.22 | NP | 9.39 |
| | 09/08/05 | | 10.66 | NP | 8.95 |
| | 09/30/05 | | 9.73 | Film | 9.88 |
| | 10/28/05 | | 10.67 | Film | 8.94 |
| | 11/30/05 | | 9.99 | Film | 9.62 |
| | 12/28/05 | | 8.72 | NP | 10.89 |
| | 01/27/06 | | 8.16 | Film | 11.45 |
| | 02/27/06 | | 8.91 | NP | 10.70 |
| | 03/28/06 | | 8.94 | NP | 10.67 |
| | 04/25/06 | | 9.33 | NP | 10.28 |
| | 05/30/06 | | 9.59 | NP | 10.02 |
| | 06/27/06 | | 9.97 | NP | 9.64 |
| | 07/24/06 | | 10.19 | NP | 9.42 |
| | 08/30/06 | | 10.56 | NP | 9.05 |
| | 09/29/06 | | 10.86 | NP | 8.75 |
| | 10/31/06 | | 11.02 | NP | 8.59 |
| | 11/30/06 | | 8.95 | NP | 10.66 |
| 12/28/06 | 8.34 | NP | 11.27 | | |
| 01/31/07 | 9.07 | NP | 10.54 | | |
| 02/28/07 | 8.79 | NP | 10.82 | | |
| 03/28/07 | 8.23 | NP | 11.38 | | |
| 04/30/07 | 9.51 | NP | 10.10 | | |
| 05/23/07 | 9.68 | NP | 9.93 | | |
| 06/29/07 | 10.19 | NP | 9.42 | | |
| 07/30/07 | 10.21 | NP | 9.40 | | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| CW-8, cont. | 08/29/07 | | 10.46 | NP | 9.15 |
| | 09/27/07 | | 10.71 | NP | 8.90 |
| | 10/25/07 | | 10.21 | NP | 9.40 |
| | 11/28/07 | | 10.21 | NP | 9.40 |
| | 01/09/08 | | 8.51 | NP | 11.10 |
| | 02/13/08 | | 8.89 | NP | 10.72 |
| | 03/19/08 | | 9.58 | NP | 10.03 |
| CW-9 | 02/28/07 | 18.06 | 9.16 | NP | 8.90 |
| | 03/28/07 | | 9.07 | NP | 8.99 |
| | 04/30/07 | | 9.43 | NP | 8.63 |
| | 05/23/07 | | 9.53 | NP | 8.53 |
| | 06/29/07 | | 9.64 | NP | 8.42 |
| | 07/30/07 | | 9.81 | NP | 8.25 |
| | 08/29/07 | | 9.97 | NP | 8.09 |
| | 09/27/07 | | 10.10 | NP | 7.96 |
| | 10/25/07 | | 9.88 | NP | 8.18 |
| | 11/28/07 | | 9.78 | NP | 8.28 |
| | 01/09/08 | | 9.22 | NP | 8.84 |
| | 02/13/08 | | 9.18 | NP | 8.88 |
| | 03/19/08 | | 9.59 | NP | 8.47 |
| MW-7 | 02/28/07 | 19.85 | 5.87 | NP | 13.98 |
| | 03/28/07 | | 5.67 | NP | 14.18 |
| | 04/30/07 | | 6.76 | NP | 13.09 |
| | 05/23/07 | | 7.25 | NP | 12.60 |
| | 06/29/07 | | 8.10 | NP | 11.75 |
| | 07/30/07 | | 8.21 | NP | 11.64 |
| | 08/29/07 | | 8.49 | NP | 11.36 |
| | 09/27/07 | | 8.78 | NP | 11.07 |
| | 10/25/07 | | 8.04 | NP | 11.81 |
| | 11/28/07 | | 7.05 | NP | 12.80 |
| | 01/09/08 | | 7.18 | NP | 12.67 |
| | 02/13/08 | | 7.92 | NP | 11.93 |
| | 03/19/08 | | 7.40 | NP | 12.45 |
| MW-21 | 02/28/07 | 17.70 | 6.78 | NP | 10.92 |
| | 03/28/07 | | 6.64 | NP | 11.06 |
| | 04/30/07 | | 7.63 | NP | 10.07 |
| | 05/23/07 | | 7.84 | NP | 9.86 |
| | 06/29/07 | | 8.15 | NP | 9.55 |
| | 07/30/07 | | 8.18 | NP | 9.52 |
| | 08/29/07 | | 8.44 | NP | 9.26 |
| | 09/27/07 | | 8.69 | NP | 9.01 |
| | 10/25/07 | | 8.16 | NP | 9.54 |
| | 11/28/07 | | 8.16 | NP | 9.54 |
| | 01/09/08 | | 6.94 | NP | 10.76 |
| | 02/13/08 | | 7.18 | NP | 10.52 |
| | 03/19/08 | | 7.92 | NP | 9.78 |
| MW-22 | 02/28/07 | 17.55 | 6.87 | NP | 10.68 |
| | 03/28/07 | | 6.83 | NP | 10.72 |
| | 04/30/07 | | 7.67 | NP | 9.88 |
| | 05/23/07 | | 7.82 | NP | 9.73 |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|--------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| MW-22, cont. | 06/29/07 | | 8.14 | NP | 9.41 |
| | 07/30/07 | | 8.01 | NP | 9.54 |
| | 08/29/07 | | 8.38 | NP | 9.17 |
| | 09/27/07 | | 8.60 | NP | 8.95 |
| | 10/25/07 | | 8.15 | NP | 9.40 |
| | 11/28/07 | | 8.08 | NP | 9.47 |
| | 01/09/08 | | 6.98 | NP | 10.57 |
| | 02/13/08 | | 7.27 | NP | 10.28 |
| | 03/19/08 | | 7.76 | NP | 9.79 |
| MW-23 | 02/28/07 | 17.36 | 5.53 | NP | 11.83 |
| | 03/28/07 | | 5.26 | NP | 12.10 |
| | 04/30/07 | | 6.45 | NP | 10.91 |
| | 05/23/07 | | 6.84 | NP | 10.52 |
| | 06/29/07 | | 7.41 | NP | 9.95 |
| | 07/30/07 | | 7.50 | NP | 9.86 |
| | 08/29/07 | | 7.69 | NP | 9.67 |
| | 09/27/07 | | 8.14 | NP | 9.22 |
| | 10/25/07 | | 7.36 | NP | 10.00 |
| | 11/28/07 | | 7.33 | NP | 10.03 |
| | 01/09/08 | | 5.92 | NP | 11.44 |
| | 02/13/08 | | 5.91 | NP | 11.45 |
| | 03/19/08 | | 6.91 | NP | 10.45 |
| MW-29 | 11/28/96 | 15.45 | NM | NM | NM |
| | 01/27/97 | | 2.25 | NP | 13.20 |
| | 05/22/97 | | NM | NM | NM |
| | 10/10/97 | | 1.82 | 0.01 | 13.64* |
| | 10/31/97 | | 1.25 | Film | 14.20 |
| | 11/07/97 | | 1.21 | Film | 14.24 |
| | 01/14/98 | | 0.26 | 0.01 | 15.20* |
| | 02/26/98 | | 0.78 | Film | 14.67 |
| | 04/02/98 | | 1.18 | Film | 14.27 |
| | 04/30/98 | | 1.96 | 0.01 | 13.50* |
| | 06/02/98 | | 1.68 | Film | 13.77 |
| | 06/30/98 | | 2.36 | 0.03 | 13.12* |
| | 07/23/98 | | 2.64 | 0.03 | 12.84* |
| | 08/31/98 | | 3.12 | 0.01 | 12.34* |
| | 09/30/98 | | 3.42 | 0.01 | 12.04* |
| | 10/29/98 | | 3.42 | NP | 12.03 |
| | 11/30/98 | | 1.09 | NP | 14.36 |
| | 12/30/98 | | 0.61 | NP | 14.84 |
| | 01/29/99 | | 0.00 | NP | >15.45 |
| | 02/25/99 | | 0.00 | NP | >15.45 |
| | 03/31/99 | | 0.00 | NP | >15.45 |
| 04/30/99 | | 1.08 | NP | 14.37 | |
| 06/02/99 | | 2.02 | Film | 13.43 | |
| 06/30/99 | | 2.26 | NP | 13.19 | |
| 07/14/99 | | 2.51 | Film | 12.94 | |
| 08/18/99 | | 2.85 | NP | 12.60 | |
| 09/15/99 | | 3.18 | NP | 12.27 | |
| 10/28/99 | | 3.42 | NP | 12.03 | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|--------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| MW-29, cont. | 11/24/99 | | 1.80 | NP | 13.65 |
| | 12/21/99 | | 0.99 | Film | 14.46 |
| | 01/18/00 | | 1.22 | Film | 14.23 |
| | 03/01/00 | | 0.00 | NP | >15.45 |
| | 03/30/00 | | 0.41 | Film | 15.04 |
| | 04/26/00 | | 1.21 | Film | 14.24 |
| | 05/31/00 | | 2.18 | Film | 13.27 |
| | 06/29/00 | | 2.56 | NP | 12.89 |
| | 07/25/00 | | 2.80 | NP | 12.65 |
| | 08/15/00 | | 3.06 | NP | 12.39 |
| | 09/12/00 | | 3.10 | NP | 12.35 |
| | 10/17/00 | | 3.22 | NP | 12.23 |
| | 11/14/00 | | 2.78 | NP | 12.67 |
| | 12/29/00 | | 2.61 | NP | 12.84 |
| | 01/19/01 | | 2.79 | NP | 12.66 |
| | 02/27/01 | | 2.42 | NP | 13.03 |
| | 03/26/01 | | 2.26 | NP | 13.19 |
| | 04/30/01 | | 1.80 | NP | 13.65 |
| | 05/28/01 | | 2.71 | NP | 12.74 |
| | 06/25/01 | | 2.69 | NP | 12.76 |
| | 07/23/01 | | 2.98 | NP | 12.47 |
| | 08/27/01 | | 2.97 | NP | 12.48 |
| | 09/23/01 | | 3.51 | NP | 11.94 |
| | 10/25/01 | | 3.29 | NP | 12.16 |
| | 11/29/01 | | 0.73 | NP | 14.72 |
| | 12/29/01 | | 0.21 | NP | 15.24 |
| | 01/31/02 | | 0.27 | Film | 15.18 |
| | 02/28/02 | | 0.60 | NP | 14.85 |
| | 03/28/02 | | 0.48 | Sheen | 14.97 |
| | 04/24/02 | | 1.41 | NP | 14.04 |
| | 05/30/02 | | 2.26 | NP | 13.19 |
| | 06/27/02 | | 2.53 | NP | 12.92 |
| | 07/30/02 | | 2.90 | NP | 12.55 |
| | 08/29/02 | | 3.21 | NP | 12.24 |
| | 09/27/02 | | 3.49 | NP | 11.96 |
| | 10/31/02 | | 3.74 | NP | 11.71 |
| | 11/26/02 | | 3.33 | NP | 12.12 |
| | 12/26/02 | | 2.37 | NP | 13.08 |
| | 01/30/03 | | 0.72 | NP | 14.73 |
| | 02/27/03 | | 1.74 | Film | 13.71 |
| | 03/31/03 | | 1.12 | Film | 14.33 |
| | 04/28/03 | | 1.33 | Film | 14.12 |
| 05/29/03 | | 2.28 | NP | 13.17 | |
| 06/25/03 | | 2.70 | NP | 12.75 | |
| 07/30/03 | | 3.12 | Film | 12.33 | |
| 08/28/03 | | 3.42 | NP | 12.03 | |
| 09/29/03 | | 3.62 | NP | 11.83 | |
| 10/29/03 | | 2.11 | NP | 13.34 | |
| 11/25/03 | | 1.38 | NP | 14.07 | |
| 01/09/04 | | 0.51 | NP | 14.94 | |
| 01/27/04 | | 0.59 | Film | 14.86 | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|--------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| MW-29, cont. | 02/26/04 | 18.01 | 0.61 | Film | 14.84 |
| | 03/29/04 | | 1.25 | Film | 14.20 |
| | 04/30/04 | | 2.22 | 0.01 | 13.23 |
| | 05/25/04 | | 2.60 | 0.02 | 12.87* |
| | 06/30/04 | | 2.88 | NP | 12.57 |
| | 07/28/04 | | 3.23 | NP | 12.22 |
| | 08/25/04 | | 3.11 | NP | 12.34 |
| | 09/29/04 | | 3.10 | Film | 12.35 |
| | 10/28/04 | | 2.82 | NP | 12.63 |
| | 11/23/04 | | 3.05 | NP | 12.40 |
| | 12/30/04 | | 9.36 | NP | NA ^b |
| | 01/31/05 | | 9.06 | 0.01 | NA ^b |
| | 02/28/05 | | 5.36 | NP | NA ^b |
| | 03/30/05 | | 4.56 | NP | NA ^b |
| | 04/27/05 | | 4.52 | NP | NA ^b |
| | 05/26/05 | | 4.39 | NP | NA ^b |
| | 06/28/05 | | 5.12 | NP | 12.89 |
| | 07/26/05 | | 5.55 | NP | 12.46 |
| | 09/08/05 | | 6.14 | 0.01 | 11.87 |
| | 09/30/05 | | 6.30 | Film | 11.71 |
| | 10/28/05 | | 6.38 | Heavy Sheen | 11.63 |
| | 11/30/05 | | 4.98 | Film | 13.03 |
| | 12/28/05 | | 3.92 | NP | 14.09 |
| | 01/27/06 | | 3.61 | Film | 14.40 |
| | 02/27/06 | | 4.22 | Sheen | 13.79 |
| | 03/28/06 | | 4.57 | Sheen | 13.44 |
| | 04/25/06 | | 4.74 | NP | 13.27 |
| | 05/30/06 | | 4.91 | NP | 13.10 |
| | 06/27/06 | | 5.22 | Sheen | 12.79 |
| | 07/24/06 | | 5.54 | NP | 12.47 |
| | 08/30/06 | | 6.00 | 0.01 | 12.01 |
| | 09/29/06 | | 6.37 | 0.01 | 11.64 |
| | 10/31/06 | | 6.48 | Sheen | 11.53 |
| | 11/30/06 | | 4.35 | NP | 13.66 |
| | 12/28/06 | | 3.41 | NP | 14.60 |
| | 01/31/07 | | 3.99 | NP | 14.02 |
| | 02/28/07 | | 3.72 | NP | 14.29 |
| | 03/28/07 | | 3.24 | NP | 14.77 |
| | 04/30/07 | | 4.49 | NP | 13.52 |
| | 05/23/07 | | 4.76 | NP | 13.25 |
| 06/29/07 | 5.55 | Sheen | 12.46 | | |
| 07/30/07 | 5.60 | Sheen | 12.41 | | |
| 08/29/07 | 5.96 | Sheen | 12.05 | | |
| 09/27/07 | 6.20 | Sheen | 11.81 | | |
| 10/25/07 | 4.32 | NP | 13.69 | | |
| 11/28/07 | 5.50 | NP | 12.51 | | |
| 01/09/08 | 4.45 | NP | 13.56 | | |
| 02/13/08 | 4.55 | NP | 13.46 | | |
| 03/19/08 | 4.89 | NP | 13.12 | | |

Table 1
Groundwater Elevation and NAPL Thickness Monitoring Results
Port of Tacoma Former Milwaukie Railyard Site
Tacoma, WA

| Well Number | Date Collected | Top of Casing Elevation ^a (feet) | Depth to Groundwater (feet) | Product Thickness (feet) | Groundwater Elevation (feet) |
|-------------|----------------|---|-----------------------------|--------------------------|------------------------------|
| OB-2 | 02/28/07 | 18.95 | 4.63 | NP | 14.32 |
| | 03/28/07 | | 4.53 | NP | 14.42 |
| | 04/30/07 | | 6.05 | NP | 12.90 |
| | 05/23/07 | | 6.52 | NP | 12.43 |
| | 06/29/07 | | 7.12 | NP | 11.83 |
| | 07/30/07 | | 7.23 | NP | 11.72 |
| | 08/29/07 | | 7.67 | NP | 11.28 |
| | 09/27/07 | | 7.95 | NP | 11.00 |
| | 10/25/07 | | 7.33 | NP | 11.62 |
| | 11/28/07 | | 7.13 | NP | 11.82 |
| | 01/09/08 | | 6.57 | NP | 12.38 |
| | 02/13/08 | | 6.27 | NP | 12.68 |
| | 03/19/08 | | 6.81 | NP | 12.14 |

Notes:

NA = not available.
NAPL = Nonaqueous phase liquid
NM = depths to groundwater and free product were not measured.
NP = free product was not detected in the well.
— = not sampled.

* = Groundwater elevation corrected for product thickness by the equation: TOC - (DTW)-[PT x 0.89]; where TOC = top of casing elevation, DTW = depth to groundwater, PT = product thickness, and 0.89 = specific gravity of product.
To minimize table length and still provide seasonal data, this table contains the last 13 months of groundwater monitoring data for wells that have never contained free product.
This table contains all of the monitoring data collected since November 1996 for wells that have contained product.
Observation well OB-N was removed in December 2004 during site development activities.

^a Top of casing elevations are based on 1997 survey results.
Top of casing elevations for CW-2, CW-6, and CW-7 were resurveyed on January 9, 2004.
Top of casing elevations for CW-2, CW-3, CW-4, CW-5, CW-8, OB-S and MW-29 were resurveyed on June 10, 2005.

b Casing has been altered due to site development work; groundwater elevations are not available.
c Viscosity of product did not allow for accurate measurement of product thickness or groundwater depth.

Table 2
 Summary of Goundwater Analytical Results
 Port of Tacoma Former Milwaukee Railyard Site
 Tacoma, Washington

| Well Number | Date Sampled | NWTPH-Dx (Diesel) | NWTPH-Dx (Oil) | Benzene | Toluene | Ethylbenzene | Total Xyenes | Benzo(a)anthracene | Chrysene | Benzo(a)pyrene | Indeno(1,2,3-cd)pyrene | Dibenzo(a,h)anthracene | Benzo(b)fluoranthene | Benzo(k)fluoranthene | Naphthalene | PCBs ^a |
|-------------|--------------|-------------------|----------------|-------------|---------|--------------|--------------|-----------------------------|----------|----------------|------------------------|------------------------|----------------------|----------------------|-------------|-------------------|
| | | TPH (mg/L) | | BTEX (µg/L) | | | | c-PAHs + Naphthalene (µg/L) | | | | | | | | PCBs (µg/L) |
| CW-1 | 7/28/04 | 2.93 | 2.27 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/10/08 | 0.48 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3/20/08 | 2.4 | 2.4 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CW-2 | 7/28/04 | <0.118 | <0.237 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/11/08 | <0.13 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3/20/08 | <0.13 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CW-3 | 7/29/04 | <0.12 | <0.24 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/11/08 | 0.46 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3/20/08 | 0.23 | <0.25 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CW-4 | 1/10/08 | 1.9 | 0.62 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3/20/08 | 2.3 | 1.2 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CW-5 | 1/10/08 | 13 | 2.8 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3/20/08 | 4.7 | 2.0 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CW-6 | 7/28/04 | <0.119 | <0.239 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/11/08 | <0.13 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3/20/08 | <0.13 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CW-7 | 7/28/04 | <0.12 | <0.241 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/11/08 | <0.13 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3/19/08 | <0.13 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CW-8 | 7/28/04 | 8.46 | 1.29 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/11/08 | 0.62 | 0.31 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3/20/08 | 0.93 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CW-9 | 7/28/04 | <0.121 | <0.242 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/9/08 | <0.13 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3/19/08 | <0.13 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

Table 2
 Summary of Goundwater Analytical Results
 Port of Tacoma Former Milwaukee Railyard Site
 Tacoma, Washington

| Well Number | Date Sampled | NWTPH-Dx (Diesel) | NWTPH-Dx (Oil) | Benzene | Toluene | Ethylbenzene | Total Xylenes | Benzo(a)anthracene | Chrysene | Benzo(e)pyrene | Indeno(1,2,3-cd)pyrene | Dibenzo(a,h)anthracene | Benzo(b)fluoranthene | Benzo(k)fluoranthene | Naphthalene | PCBs ^a |
|-------------|--------------|-------------------|----------------|-------------|---------|--------------|---------------|-----------------------------|----------|----------------|------------------------|------------------------|----------------------|----------------------|-------------|-------------------|
| | | TPH (mg/L) | | BTEX (µg/L) | | | | c-PAHs + Naphthalene (µg/L) | | | | | | | | |
| MW-7 | 7/29/04 | <0.12 | <0.239 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/10/08 | 0.33 | 0.52 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3/19/08 | <0.13 | <0.26 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MW-21 | 7/29/04 | <0.12 | <0.24 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/11/08 | <0.13 | <0.26 | <1.0 | <1.0 | <1.0 | <3.0 | <0.31 | <0.21 | <0.21 | <0.31 | <0.31 | <0.42 | <0.31 | <2.1 | <0.53 |
| | 3/21/08 | <0.13 | <0.26 | <1.0 | <1.0 | <1.0 | <3.0 | <0.30 | <0.20 | <0.20 | <0.30 | <0.30 | <0.40 | <0.30 | <2.0 | <0.51 |
| MW-22 | 7/29/04 | <0.12 | <0.241 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/11/08 | 0.13 | <0.26 | <1.0 | <1.0 | <1.0 | <3.0 | <0.31 | <0.20 | <0.20 | <0.31 | <0.31 | <0.41 | <0.31 | <2.0 | <0.50 |
| | 3/21/08 | <0.13 | <0.25 | <1.0 | <1.0 | <1.0 | <3.0 | <0.31 | <0.20 | <0.20 | <0.31 | <0.31 | <0.41 | <0.31 | <2.0 | <0.50 |
| MW-23 | 7/28/04 | <0.124 | <0.248 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/11/08 | <0.13 | <0.25 | <1.0 | <1.0 | <1.0 | <3.0 | <0.31 | <0.21 | <0.21 | <0.31 | <0.31 | <0.42 | <0.31 | <2.1 | <0.50 |
| | 3/21/08 | <0.13 | <0.26 | <1.0 | <1.0 | <1.0 | <3.0 | <0.31 | <0.20 | <0.20 | <0.31 | <0.31 | <0.41 | 0.31 | <2.0 | <0.50 |
| MW-29 | 7/29/04 | 0.453 | 0.716 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1/10/08 | <0.13 | <0.25 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 3/19/08 | 0.33 | 0.66 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

Notes:

BTEX = Benzene, toluene, ethylbenzene, and total xylenes (analyzed by EPA Method 8260B)

c-PAHs = Carcinogenic PAHs (analyzed by EPA Method 8270C)

NWTPH-Dx = Northwest test Method NWTPH-Dx

PAHs = Polynuclear aromatic hydrocarbons

PCBs = Polychlorinated biphenyls (analyzed by EPA Method 8082)

TPH = Total petroleum hydrocarbons (analyzed by Northwest Test Method NWTPH-Dx)

<1.0 = Constituent was not detected at or above the method reporting limit listed.

mg/L = Milligrams per liter (or parts per million)

µg/L = Micrograms per liter (or parts per billion)

--- = Not analyzed

^a Individual PCB arochlors were not detected at the method reporting limit listed.

Table 3
Soil core Physical Properties Data - Grain Size Analysis
Port of Tacoma Former Milwaukee Railyard Site
Tacoma, Washington

| Boring Number | Date Sampled | Sample Depth (feet bgs) | Particle Size Data | | | | | | | | |
|---------------|--------------|-------------------------|--|----------------------|---------------------------------------|-----------|--------|-------|------|------|---------------|
| | | | Mean Grain Size Description ^a | Mean Grain Size (mm) | Particle Size Distribution (% weight) | | | | | | |
| | | | | | Gravel | Sand Size | | | Silt | Clay | Silt and Clay |
| | | | | | | Coarse | Medium | Fine | | | |
| SC-1 | 6/14/2008 | 8.9 | fine sand | 0.335 | 0.00 | 0.00 | 40.06 | 54.75 | 3.80 | 1.39 | 5.19 |
| SC-1 | 6/14/2008 | 11.65 | fine sand | 0.215 | 0.00 | 0.00 | 15.20 | 75.59 | 7.24 | 1.97 | 9.21 |
| SC-1 | 6/14/2008 | 12.2 | fine sand | 0.348 | 0.00 | 0.00 | 41.22 | 53.86 | 3.67 | 1.25 | 4.92 |
| SC-2 | 6/14/2008 | 8.7 | medium sand | 1.061 | 2.43 | 27.92 | 40.33 | 19.71 | b | b | 9.61 |
| SC-2 | 6/14/2008 | 10.7 | coarse sand | 0.41 | 33.14 | 3.00 | 13.11 | 39.43 | b | b | 11.32 |
| SC-2 | 6/14/2008 | 16.1 | medium sand | 0.504 | 0.00 | 0.00 | 62.03 | 34.30 | 2.85 | 0.81 | 3.66 |
| SC-2 | 6/14/2008 | 16.6 | fine sand | 0.389 | 0.00 | 0.00 | 45.91 | 49.51 | 3.43 | 1.15 | 4.58 |

Notes:
bgs = below ground surface
mm = millimeter

^a Based on mean from Trask.
^b Mechanical sieve does not differentiate silt/clay fractions.

Table 4
Soil Core Physical Properties Data - Permeability and Hydraulic Conductivity
Port of Tacoma Former Milwaukee Railyard Site
Tacoma, Washington

| Boring Number | Date Sampled | Soil Core Identification | Sample Depth (feet bgs) | Sample Orientation | 25 psi Confining Stress ^a | | |
|---------------|--------------|--------------------------|-------------------------|--------------------|--|--|---|
| | | | | | Specific Permeability to Air ^b (millidarcy) | Effective Permeability to Water ^{c, d} (millidarcy) | Hydraulic Conductivity ^{c, d} (cm/s) |
| SC-1 | 6/14/2008 | SC-1-10.5'-13.0' | 11.8 | Horizontal | 5,346 | 2,410 | 0.00221 |
| SC-2 | 6/14/2008 | SC-2-15.0'-17.5' | 15.95 | Horizontal | 4,841 | 2,178 | 0.00198 |
| SC-2 | 6/14/2008 | SC-2-15.0'-17.5' | 16.75 | Horizontal | 6,139 | 3,858 | 0.00353 |

Notes:
bgs = below ground surface
cm/s = centimeters per second
psi = pounds per square inch

^a Test Methods API 40/EPA 9100.
^b Specific = no pore fluids in place.
^c Native state or effective = with as-received pore fluids in place.
^d Permeability to water and hydraulic conductivity measured at saturated conditions.

Table 5
Soil Core Physical Properties Data - Pore Fluid Saturations
Port of Tacoma Former Milwaukee Railyard Site
Tacoma, Washington

| Boring Number | Date Sampled | Soil Core Identification | Sample Depth (feet bgs) | Sample Orientation | Moisture Content ^a (% weight) | Density ^b | | Porosity ^{b, c} | | Pore Fluid Saturation ^{b, d} | |
|---------------|--------------|--------------------------|-------------------------|--------------------|--|----------------------|--------------|--------------------------|-------------------|---------------------------------------|--------------|
| | | | | | | Bulk (g/cc) | Grain (g/cc) | Total (% Vb) | Air Filled (% Vb) | Water (% Pv) | LNAPL (% Pv) |
| SC-1 | 6/14/2008 | SC-1-8.0'-10.5' | 8.9 | Horizontal | 25.8 | 1.49 | 2.70 | 44.8 | 5.7 | 79.1 | 8.1 |
| SC-1 | 6/14/2008 | SC-1-10.5'-13.0' | 11.65 | Horizontal | 24.1 | 1.46 | 2.69 | 45.6 | 9.8 | 69.6 | 8.8 |
| SC-1 | 6/14/2008 | SC-1-10.5'-13.0' | 12.2 | Horizontal | 16.0 | 1.50 | 2.69 | 44.3 | 20.2 | 51.5 | 2.9 |
| SC-2 | 6/14/2008 | SC-2-7.5'-10.0' | 8.7 | Horizontal | 67.4 | 0.82 | 2.07 | 60.5 | 4.7 | 64.2 | 28.1 |
| SC-2 | 6/14/2008 | SC-2-10.0'-12.5' | 10.7 | Horizontal | 10.4 | 2.00 | 2.70 | 26.1 | 4.8 | 57.0 | 24.6 |
| SC-2 | 6/14/2008 | SC-2-15.0'-17.5' | 16.1 | Horizontal | 24.2 | 1.53 | 2.73 | 44.0 | 6.0 | 40.1 | 46.3 |
| SC-2 | 6/14/2008 | SC-2-15.0'-17.5' | 16.6 | Horizontal | 27.9 | 1.46 | 2.70 | 45.9 | 4.0 | 46.0 | 45.3 |

Notes:
bgs = below ground surface
g/cc = grams per cubic centimeter
Pv = pore volume
Vb = bulk volume

^a Test Methods API RP40/ASTM D2216.
^b Test Method API RP 40.
^c Total porosity = no pore fluids in place, all interconnected pore channels. Air filled porosity = pore channels not occupied by pore fluids.
^d Water = 0.9996 g/cc, SC-1 hydrocarbon = 0.8803 g/cc, SC-2 hydrocarbon = 0.9498 g/cc.

Table 6
Soil Core Physical Properties Data - NAPL Mobility, Initial and Residual Saturations
Port of Tacoma Former Milwaukee Railyard Site
Tacoma, Washington

| Boring Number | Date Sampled | Soil Core Identification | Sample Depth (feet bgs) | Sample Orientation | Density ^a | | Total Porosity ^a (% Vb) | Pore Fluid Saturations ^{b, c} (% Pv) | | | |
|--|--------------|--------------------------|-------------------------|--------------------|----------------------|--------------|------------------------------------|---|--------------|----------------------------|-------------|
| | | | | | Bulk (g/cc) | Grain (g/cc) | | Initial Fluid Saturations | | After Centrifuge at 1000xG | |
| | | | | | | | | Water (Swi) | LNAPL (Soil) | Water (Srw) | LNAPL (Sor) |
| SC-1 | 6/14/2008 | SC-1-10.5'-13.0' | 11.9 | Horizontal | 1.53 | 2.67 | 42.6 | 79.7 | 2.0 | 11.1 | 2.0 |
| Note: No visible NAPL produced. Produced water slightly cloudy with strong hydrocarbon odor. | | | | | | | | | | | |
| SC-2 | 6/14/2008 | SC-2-15.0'-17.5' | 15.9 | Horizontal | 1.51 | 2.68 | 43.7 | 63.9 | 23.9 | 11.4 | 9.3 |
| Note: Black NAPL produced. Produced clear water. | | | | | | | | | | | |
| SC-2 | 6/14/2008 | SC-2-15.0'-17.5' | 16.9 | Horizontal | 1.58 | 2.73 | 42 | 48.7 | 46.1 | 9.1 | 15.0 |
| Note: Dark brown NAPL produced. Produced clear water. | | | | | | | | | | | |
| <p>Notes:</p> <p>1000xG = one thousand times the force of gravity. bgs = below ground surface g/cc = grams per cubic centimeter NAPL = Nonaqueous phase liquid Pv = pore volume Soi = Initial NAPL saturation as received prior to centrifuging at 1000xG Sor = Residual NAPL saturation after centrifuging at 1000xG Srw = Residual water saturation after centrifuging at 1000xG Swi = Initial water saturation as received prior to centrifuging at 1000xG Vb = bulk volume</p> <p>^a Test Method API RP40. ^b Test Method ASTM D425M, Dean-Stark. ^c Water = 0.9996 g/cc, SC-1 LNAPL = 0.8803 g/cc, SC-2 LNAPL = 0.9498 g/cc.</p> | | | | | | | | | | | |

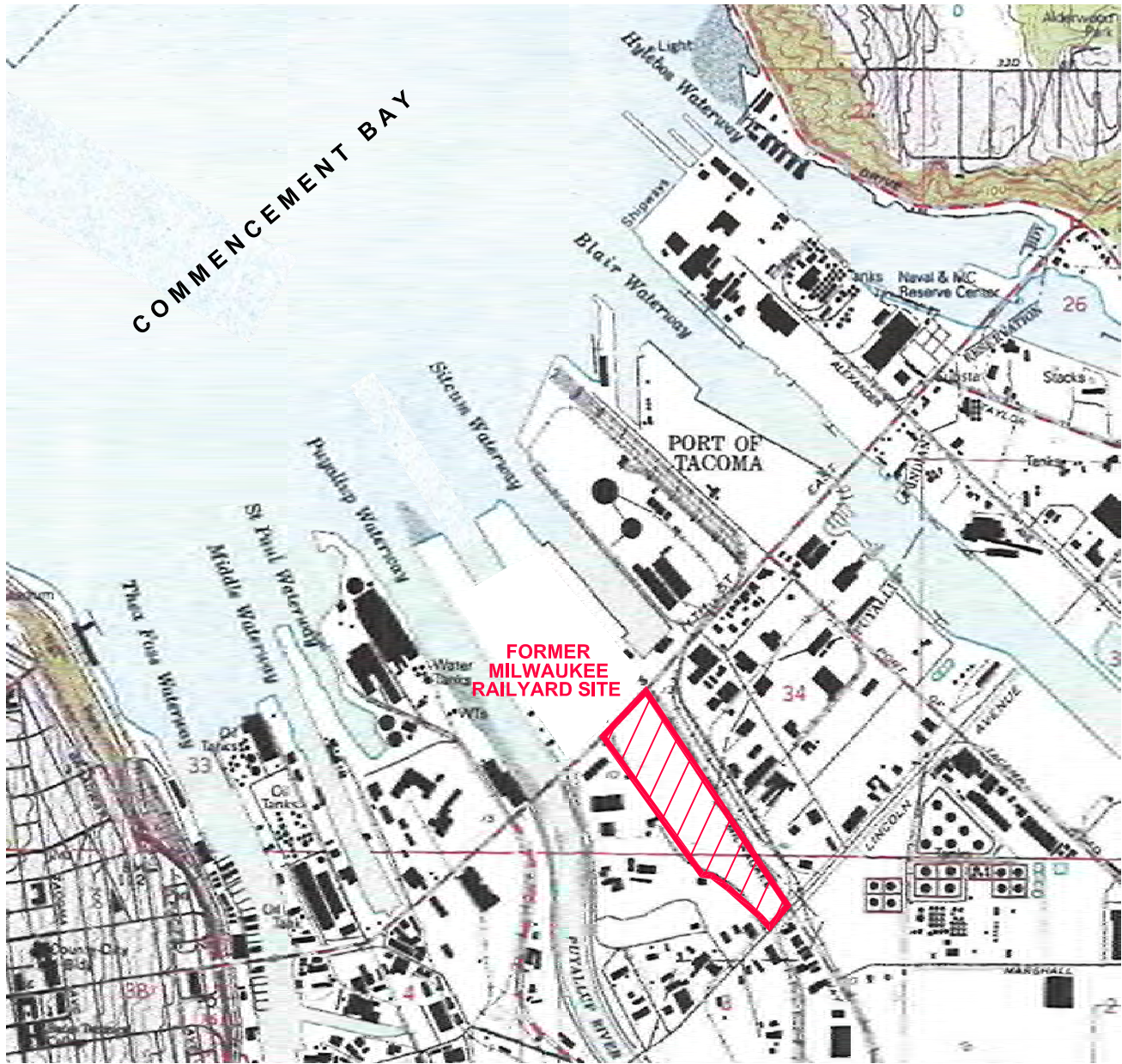
Table 7
 NAPL and Groundwater Geochemical and Physical Properties
 Port of Tacoma Former Milwaukee Railyard Site
 Tacoma, Washington

| Well Number | Date Sampled | Geochemical Characterization ^a | Density (gm/ml) | Viscosity (centipoise) | Surface Tension Air/Water (dynes/cm) | Surface Tension NAPL/Water (dynes/cm) | Interfacial Tension Air/NAPL (dynes/cm) | Temperature of Measurements (°F) |
|------------------------|--------------|---|-----------------|------------------------|--------------------------------------|---------------------------------------|---|----------------------------------|
| CW-4 (NAPL) | 6/8/2007 | Extremely weathered middle distillate and a heavier material | --- | --- | --- | --- | --- | --- |
| CW-5 (NAPL) | 6/7/2007 | Extremely weathered middle distillate and a heavier material | --- | --- | --- | --- | --- | --- |
| RW-2L3 (NAPL) | 6/8/2007 | Extremely weathered middle distillate and perhaps a very small amount of heavier material | 0.8803 | 8.34 | 58.4 | 7.1 | 24.6 | 60 |
| RW-2L5 (NAPL) | 6/7/2007 | Extremely weathered middle distillate and perhaps a very small amount of heavier material | --- | --- | --- | --- | --- | --- |
| RW-5L3 (NAPL) | 6/7/2007 | Extremely weathered middle distillate and a heavier material | 0.9498 | 633.00 | 56.5 | 13.7 | 29.6 | 60 |
| RW-5L3 (water extract) | 6/7/2007 | Extremely weathered middle distillate and perhaps a small amount of heavier material | --- | --- | --- | --- | --- | --- |

Notes:
 °F = degrees fahrenheit
 dynes/cm = dynes per centimeter
 gm/ml = grams per milliliter
 NAPL = nonaqueous phase liquid
 --- = not tested

^a Based on hydrocarbon characterization using gas chromatography (GC) to characterize the composition of petroleum hydrocarbons and the degree of weathering.

COMMENCEMENT BAY



FORMER MILWAUKEE RAILYARD SITE



NOT TO SCALE

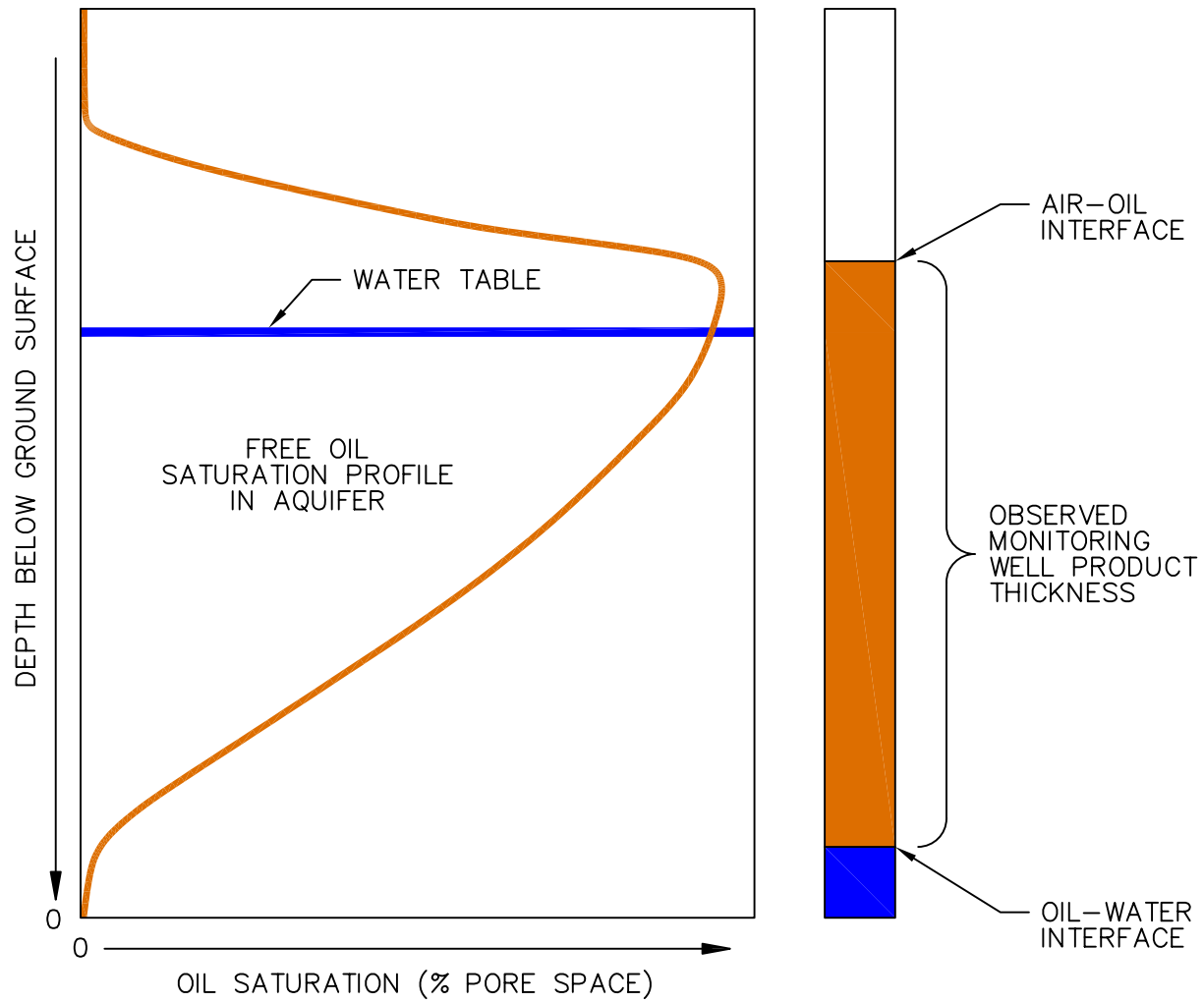
MODIFIED FROM U.S.G.S 7.5 MINUTE TOPOGRAPHY MAP, TACOMA NORTH, WASHINGTON, 1994



This drawing represents intellectual property of Shaw, Inc. Any modification to the original by other than Shaw, Inc. personnel violates its original purpose and as such is rendered void. Shaw, Inc. will not be held liable for any changes made to this document without express written consent of the originator.

DATE 8/08
 DWN JC
 APP DL
 REV _____
 PROJECT NO. 130415

FIGURE 1
 SITE LOCATION MAP
 PORT OF TACOMA
 FORMER MILWAUKEE RAILYARD SITE
 TACOMA, WASHINGTON



SOURCE: API, 2004, API INTERACTIVE LNAPL GUIDE, AUGUST 2004



This drawing represents intellectual property of Shaw, Inc. Any modification to the original by other than Shaw, Inc. personnel violates its original purpose and as such is rendered void. Shaw, Inc. will not be held liable for any changes made to this document without express written consent of the originator.

DATE 8/08
 DWN JC
 APP DL
 REV _____
 PROJECT NO.
 111487

FIGURE 3
CONCEPTUALIZATION OF NAPL WITHIN A MONITORING WELL
PORT OF TACOMA
FORMER MILWAUKEE RAILYARD SITE
TACOMA, WASHINGTON



FET BELOW
GROUND SURFACE

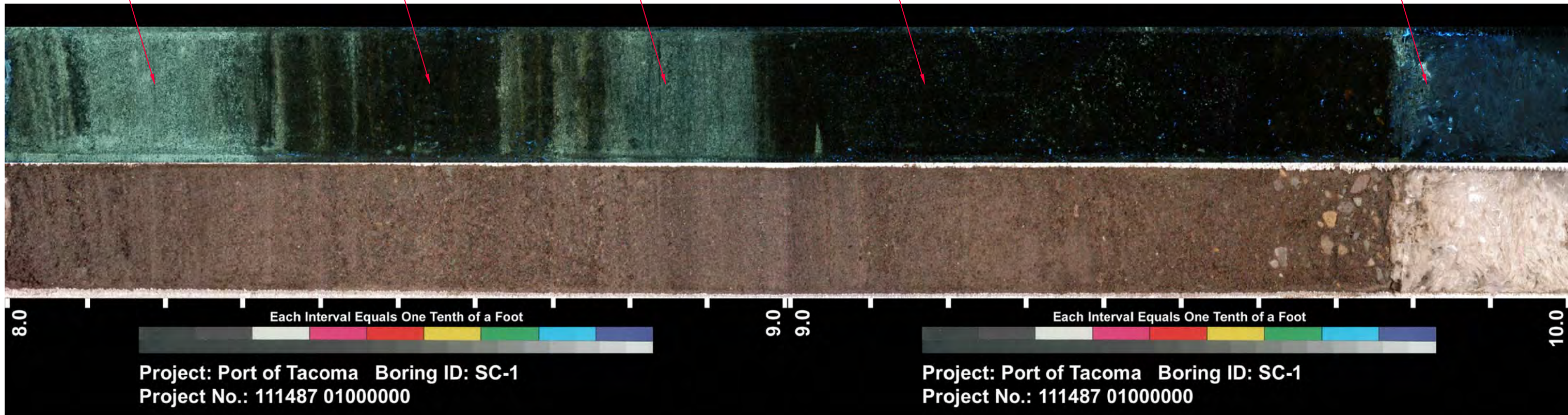
FINE GRAINED SANDS FROM 8.0 TO 8.3 FEET BGS; LIGHT YELLOWISH GREEN UV FLUORESCENCE INDICATES SMALL AMOUNT OF STRATIGRAPHICALLY BOUND NAPL

FINE GRAINED SANDS FROM 8.3 TO 8.6 FEET BGS; LITTLE RESPONSE UNDER UV FLUORESCENCE INDICATES LITTLE IF ANY NAPL

FINE GRAINED SANDS FROM 8.6 TO 9.0 FEET BGS; LIGHT YELLOWISH GREEN UV FLUORESCENCE INDICATES SMALL AMOUNT OF STRATIGRAPHICALLY BOUND NAPL. SAMPLE AT 8.9 FEET BGS SELECTED FOR GRAIN SIZE AND OTHER PHYSICAL ANALYSES; WATER AND NAPL SATURATIONS = 79.1% AND 8.1% RESPECTIVELY

FINE GRAINED SANDS FROM 9.0 TO 9.8 FEET BGS; DARK RESPONSE UNDER UV FLUORESCENCE INDICATES NO NAPL (OCCASIONAL GREENISH SPECS ARE FLUORESCENT MINERALS SUCH AS CALCITE) SOME GRAVEL AT 9.6 TO 9.8 FEET BGS

COMMERCIAL SARAN WRAP USED TO PLUG OPEN VOIDS AT END OF CORE



NOTE:
PHOTOGRAPHS DEPICT COLOR (WHITE LIGHT, BOTTOM HALF OF CORE) AND ULTRAVIOLET IMAGES (TOP HALF OF CORE). YELLOWISH GREEN AREAS INDICATE THE PRESENCE OF NAPL. BLUE AREAS INDICATE PRESENCE OF SARAN WRAP USED TO KEEP CORE INTACT

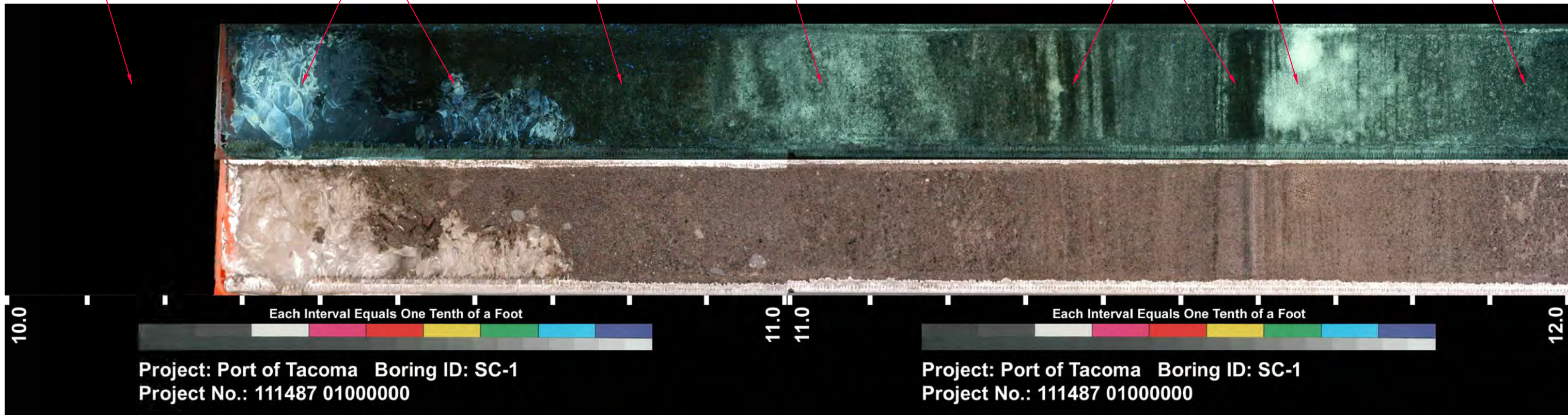
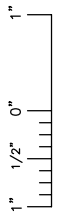
| REV | DATE | DESCRIPTION | DWN BY | DES BY | CHK BY | APP BY |
|---------------|------|-------------|--------|--------|--------|--------|
| | | | | | | |
| DATE OF ISSUE | | DWN BY | DES BY | CHK BY | APP BY | |
| 8/08 | | JC | DL | | | |

Shaw Environmental, Inc.

This drawing represents intellectual property of Shaw, Inc. Any modification to the original by other than Shaw, Inc. personnel violates its original purpose and as such is rendered void. Shaw, Inc. will not be held liable for any changes made to this document without express written consent of the originator.

FIGURE 7
SOIL CORE SC-1, 8.0 - 10.0 FEET LOGS
PORT OF TACOMA
FORMER MILWAUKEE RAILYARD SITE
TACOMA, WASHINGTON

PROJECT NO.
111487



NO RECOVERY FROM 10.0 TO 10.3 FEET BGS

COMMERCIAL SARAN WRAP USED TO PLUG OPEN VOIDS AT END OF CORE

FINE GRAINED SANDS FROM 10.7 TO 11.0 FEET BGS; LITTLE RESPONSE UNDER UV FLUORESCENCE INDICATES LITTLE NAPL

FINE GRAINED SANDS WITH LIGHT YELLOWISH GREEN FLUORESCENCE INDICATES SMALL AMOUNT OF STRATIGRAPHICALLY BOUND NAPL

FINE GRAINED SANDS AT 11.4 AND 11.6 FEET BGS CONTAIN NO FLUORESCENCE OR NAPL

FINE GRAINED SANDS FROM 11.6 TO 11.8 FEET BGS CONTAIN THE HIGHEST LEVELS OF FLUORESCENCE AND THEREFORE NAPL. SAMPLE FROM 11.65 FEET BGS WAS SELECTED FOR GRAIN SIZE AND OTHER PHYSICAL ANALYSES. WATER AND NAPL SATURATIONS = 69.6% AND 8.8%, RESPECTIVELY

FINE GRAINED SANDS CONTAINED FAINT UV FLUORESCENCE INDICATING VERY LITTLE NAPL

10.0 Each Interval Equals One Tenth of a Foot 11.0 11.0 Each Interval Equals One Tenth of a Foot 12.0
 Project: Port of Tacoma Boring ID: SC-1
 Project No.: 111487 0100000

FEET BELOW GROUND SURFACE

NOTE:
 PHOTOGRAPHS DEPICT COLOR (WHITE LIGHT, BOTTOM HALF OF CORE) AND ULTRAVIOLET IMAGES (TOP HALF OF CORE). YELLOWISH GREEN AREAS INDICATE THE PRESENCE OF NAPL. BLUE AREAS INDICATE PRESENCE OF SARAN WRAP USED TO KEEP CORE INTACT

| REV | DATE | DESCRIPTION | DWN BY | DES BY | CHK BY | APP BY |
|---------------|------|-------------|--------|--------|--------|--------|
| | | | | | | |
| DATE OF ISSUE | | DWN BY | DES BY | CHK BY | APP BY | |
| 8/08 | | JC | DL | | | |

Shaw Environmental, Inc.
This drawing represents intellectual property of Shaw, Inc. Any modification to the original by other than Shaw, Inc. personnel violates its original purpose and as such is rendered void. Shaw, Inc. will not be held liable for any changes made to this document without express written consent of the originator.

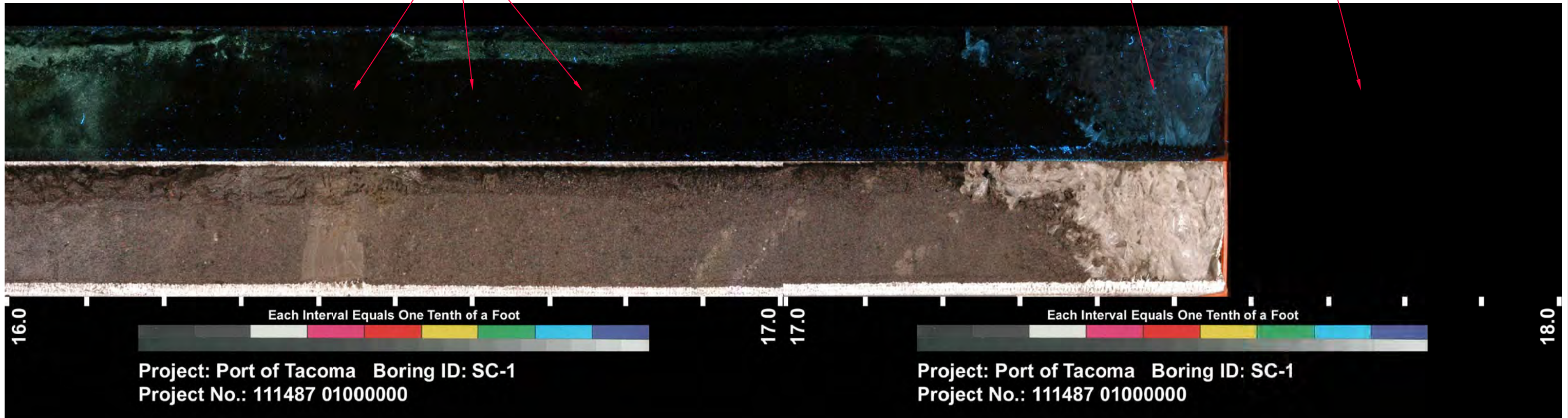
FIGURE 8
SOIL CORE SC-1, 10.0 - 12.0 FEET LOGS
 PORT OF TACOMA
 FORMER MILWAUKEE RAILYARD SITE
 TACOMA, WASHINGTON

PROJECT NO.
 111487

File: N:\Cad\Drawings\Port of Tacoma\August 2008\Core Figures\Figure 11.dwg Layout User: jaecha.coeddington Sep 04, 2008 - 11:20am



FET
BELOW
GROUND
SURFACE



FINE GRAINED SANDS CONTAIN VERY
LITTLE UV FLUORESCENCE OR NAPL;
PROBABLE "SLOUGH" FROM ABOVE AS
EVIDENCED BY LACK OF STRATIFICATION
IN THE SOILS UNDER WHITE LIGHT

COMMERCIAL SARAN WRAP USED TO
PLUG OPEN VOIDS AT END OF CORE

NO RECOVERY FROM 17.6
TO 18.0 FEET BGS

Project: Port of Tacoma Boring ID: SC-1
Project No.: 111487 0100000

Project: Port of Tacoma Boring ID: SC-1
Project No.: 111487 0100000

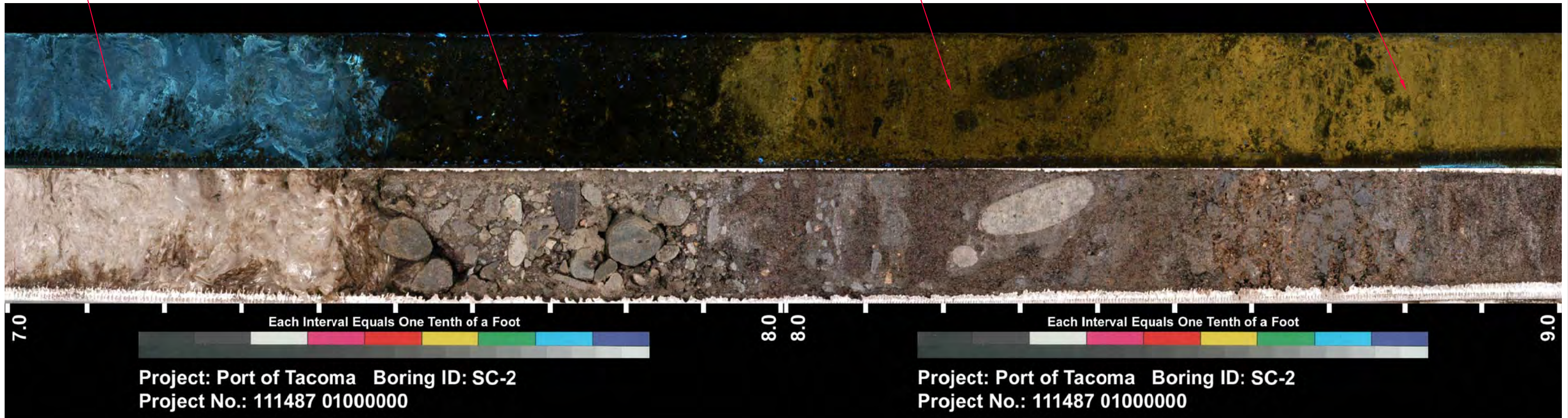
NOTE:
PHOTOGRAPHS DEPICT COLOR (WHITE LIGHT,
BOTTOM HALF OF CORE) AND ULTRAVIOLET
IMAGES (TOP HALF OF CORE). YELLOWISH
GREEN AREAS INDICATE THE PRESENCE OF
NAPL. BLUE AREAS INDICATE PRESENCE OF
SARAN WRAP USED TO KEEP CORE INTACT

| REV | DATE | DESCRIPTION | DWN BY | DES BY | CHK BY | APP BY |
|---------------|------|-------------|------------------|--------|--------------|--------|
| DATE OF ISSUE | | | DWN BY <u>JC</u> | | CHK BY _____ | |
| <u>8/08</u> | | | DES BY <u>DL</u> | | APP BY _____ | |

This drawing represents intellectual property of Shaw, Inc. Any modification to the original by other than Shaw, Inc. personnel violates its original purpose and as such is rendered void. Shaw, Inc. will not be held liable for any changes made to this document without express written consent of the originator.

FIGURE 11
SOIL CORE SC-1, 16.0 - 18.0 FEET LOGS
PORT OF TACOMA
FORMER MILWAUKEE RAILYARD SITE
TACOMA, WASHINGTON

PROJECT NO.
111487



COMMERCIAL SARAN WRAP USED TO PLUG OPEN VOIDS AT END OF CORE

SANDY GRAVEL; LACK OF YELLOWISH GREEN UV FLUORESCENCE INDICATES NO NAPL

GRAVELLY FINE TO MEDIUM GRAINED SANDS; MODERATE UV FLUORESCENCE INDICATES MODERATE NAPL. SAMPLE AT 8.7 FEET BGS SELECTED FOR GRAIN SIZE AND OTHER PHYSICAL ANALYSES. WATER AND NAPL SATURATIONS = 64.2% AND 28.1% RESPECTIVELY

FINE GRAINED SANDS; MODERATE UV FLUORESCENCE INDICATES MODERATE NAPL

7.0 Each Interval Equals One Tenth of a Foot 8.0 8.0 Each Interval Equals One Tenth of a Foot 9.0

Project: Port of Tacoma Boring ID: SC-2
Project No.: 111487 0100000

Project: Port of Tacoma Boring ID: SC-2
Project No.: 111487 0100000

FEET BELOW GROUND SURFACE

NOTE:
PHOTOGRAPHS DEPICT COLOR (WHITE LIGHT, BOTTOM HALF OF CORE) AND ULTRAVIOLET IMAGES (TOP HALF OF CORE). YELLOW AREAS INDICATE THE PRESENCE OF NAPL. BLUE AREAS INDICATE PRESENCE OF SARAN WRAP USED TO KEEP CORE INTACT

| REV | DATE | DESCRIPTION | DWN BY | DES BY | CHK BY | APP BY |
|---------------|------|-------------|--------|--------|--------|--------|
| | | | | | | |
| DATE OF ISSUE | | | DWN BY | | CHK BY | |
| 8/08 | | | JC | | | |
| | | | DES BY | | APP BY | |
| | | | DL | | | |

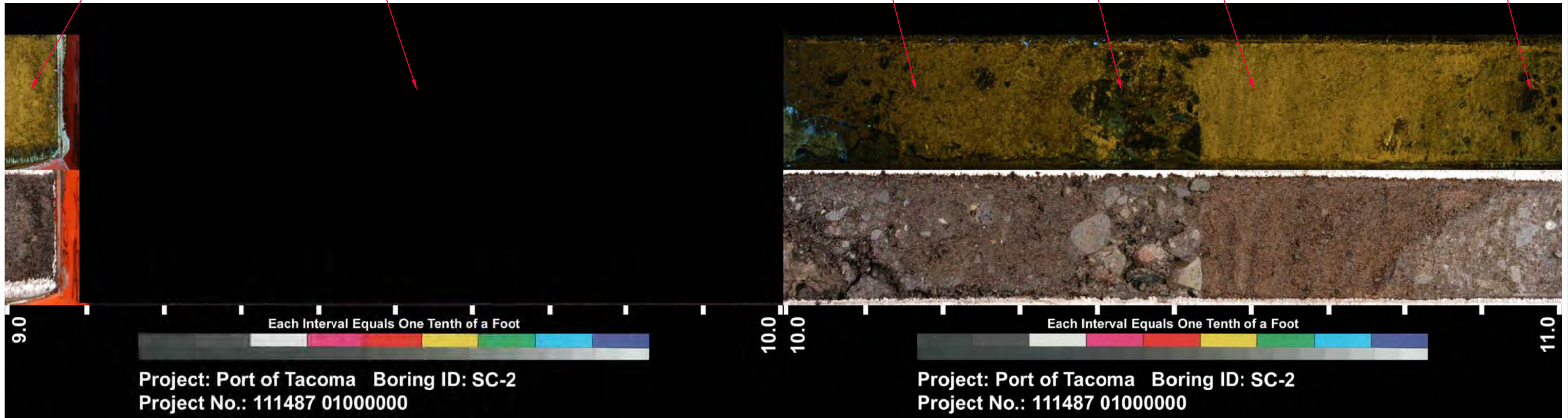
Shaw Environmental, Inc.

This drawing represents intellectual property of Shaw, Inc. Any modification to the original by other than Shaw, Inc. personnel violates its original purpose and as such is rendered void. Shaw, Inc. will not be held liable for any changes made to this document without express written consent of the originator.

FIGURE 12
SOIL CORE SC-2, 7.0 - 9.0 FEET LOGS
PORT OF TACOMA
FORMER MILWAUKEE RAILYARD SITE
TACOMA, WASHINGTON

PROJECT NO.
111487

FET
BELOW
GROUND
SURFACE



FINE GRAINED SANDS;
MODERATE UV FLUORESCENCE
INDICATES MODERATE NAPL

NO RECOVERY FROM 9.1
TO 10.0 FEET BGS

FINE TO MEDIUM GRAINED SANDS
WITH SOME GRAVELS; LIGHT
YELLOWISH GREEN FLUORESCENCE
INDICATES SMALL OF NAPL


SANDY GRAVELS, LITTLE TO NO
FLUORESCENCE OR NAPL

FINE TO COARSE GRAINED SANDS;
MODERATE UV FLUORESCENCE
INDICATES MODERATE NAPL. SAMPLE AT
10.7 FEET BGS SELECTED FOR GRAIN
SIZE AND OTHER PHYSICAL ANALYSES.
WATER AND NAPL SATURATIONS =
57.0% AND 24.6% RESPECTIVELY

SANDY GRAVELS, LITTLE TO NO
FLUORESCENCE OR NAPL

NOTE:
PHOTOGRAPHS DEPICT COLOR (WHITE LIGHT,
BOTTOM HALF OF CORE) AND ULTRAVIOLET
IMAGES (TOP HALF OF CORE). YELLOW
AREAS INDICATE THE PRESENCE OF NAPL.
BLUE AREAS INDICATE PRESENCE OF SARAN
WRAP USED TO KEEP CORE INTACT

| REV | DATE | DESCRIPTION | DWN BY | DES BY | CHK BY | APP BY |
|---------------|------|-------------|--------|--------|--------|--------|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| DATE OF ISSUE | | | DWN BY | CHK BY | | |
| 8/08 | | | JC | | | |
| | | | DES BY | APP BY | | |
| | | | DL | | | |



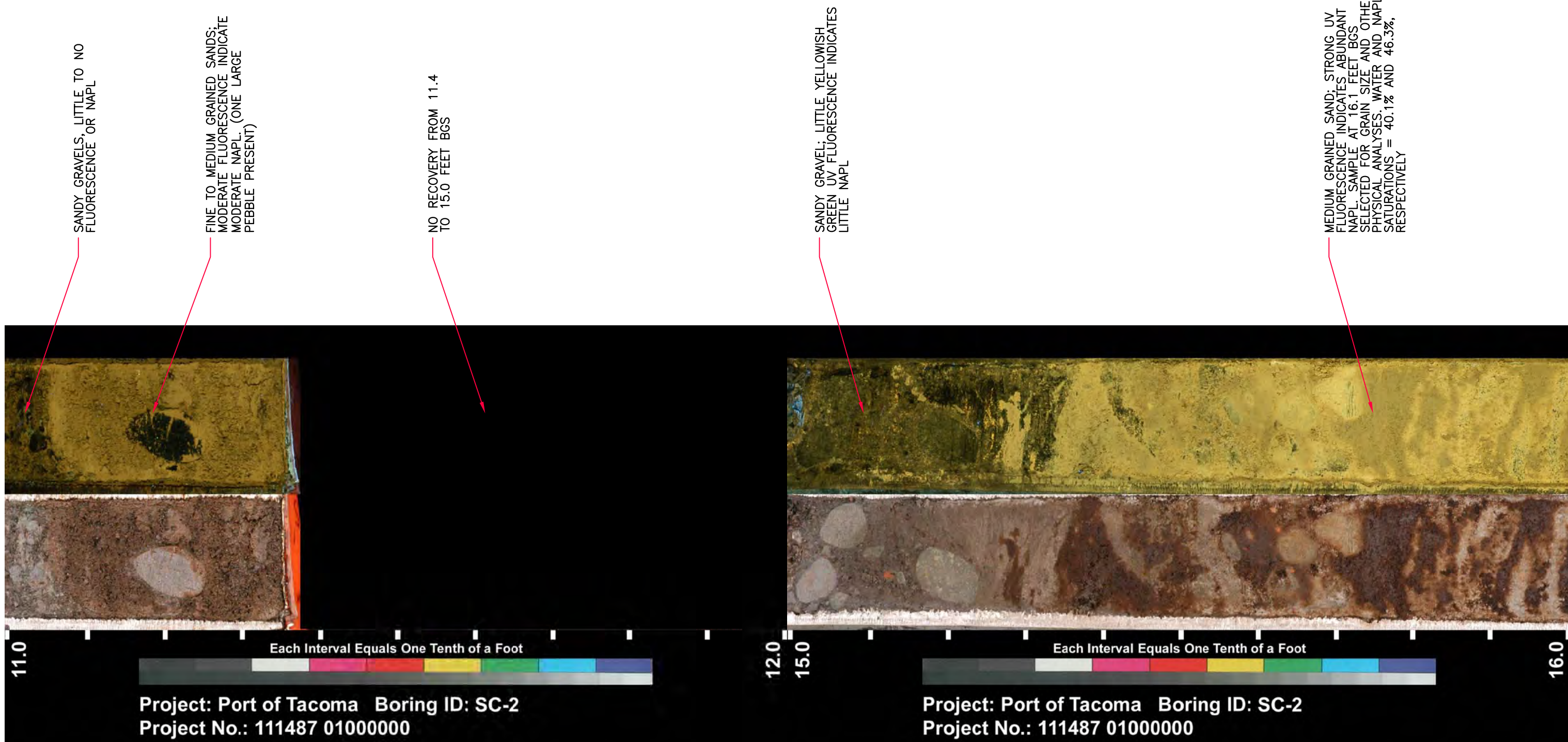
Shaw® Shaw Environmental, Inc.

This drawing represents intellectual property of Shaw, Inc. Any modification to the original by other than Shaw, Inc. personnel violates its original purpose and as such is rendered void. Shaw, Inc. will not be held liable for any changes made to this document without express written consent of the originator.

FIGURE 13
SOIL CORE SC-2, 9.0 - 11.0 FEET LOGS
PORT OF TACOMA
FORMER MILWAUKEE RAILYARD SITE
TACOMA, WASHINGTON

PROJECT NO.
111487

FEET BELOW
GROUND SURFACE



SANDY GRAVELS, LITTLE TO NO FLUORESCENCE OR NAPL

FINE TO MEDIUM GRAINED SANDS, MODERATE FLUORESCENCE INDICATE MODERATE NAPL. (ONE LARGE PEBBLE PRESENT)


NO RECOVERY FROM 11.4 TO 15.0 FEET BGS

SANDY GRAVEL; LITTLE YELLOWISH GREEN UV FLUORESCENCE INDICATES LITTLE NAPL

MEDIUM GRAINED SAND; STRONG UV FLUORESCENCE INDICATES ABUNDANT NAPL. SAMPLE AT 16.1 FEET BGS SELECTED FOR GRAIN SIZE AND OTHER PHYSICAL ANALYSES. WATER AND NAPL SATURATIONS = 40.1% AND 46.3%, RESPECTIVELY

NOTE:
PHOTOGRAPHS DEPICT COLOR (WHITE LIGHT, BOTTOM HALF OF CORE) AND ULTRAVIOLET IMAGES (TOP HALF OF CORE). YELLOW AREAS INDICATE THE PRESENCE OF NAPL. BLUE AREAS INDICATE PRESENCE OF SARAN WRAP USED TO KEEP CORE INTACT

| REV | DATE | DESCRIPTION | DWN BY | DES BY | CHK BY | APP BY |
|---------------|------|-------------|--------|--------|--------|--------|
| | | | | | | |
| DATE OF ISSUE | | DWN BY | CHK BY | | | |
| 8/08 | | DES BY | APP BY | | | |
| | | JC | | | | |
| | | DL | | | | |



Shaw® Shaw Environmental, Inc.

This drawing represents intellectual property of Shaw, Inc. Any modification to the original by other than Shaw, Inc. personnel violates its original purpose and as such is rendered void. Shaw, Inc. will not be held liable for any changes made to this document without express written consent of the originator.

FIGURE 14
SOIL CORE SC-2, 11.0 - 16.0 FEET LOGS
 PORT OF TACOMA
 FORMER MILWAUKEE RAILYARD SITE
 TACOMA, WASHINGTON

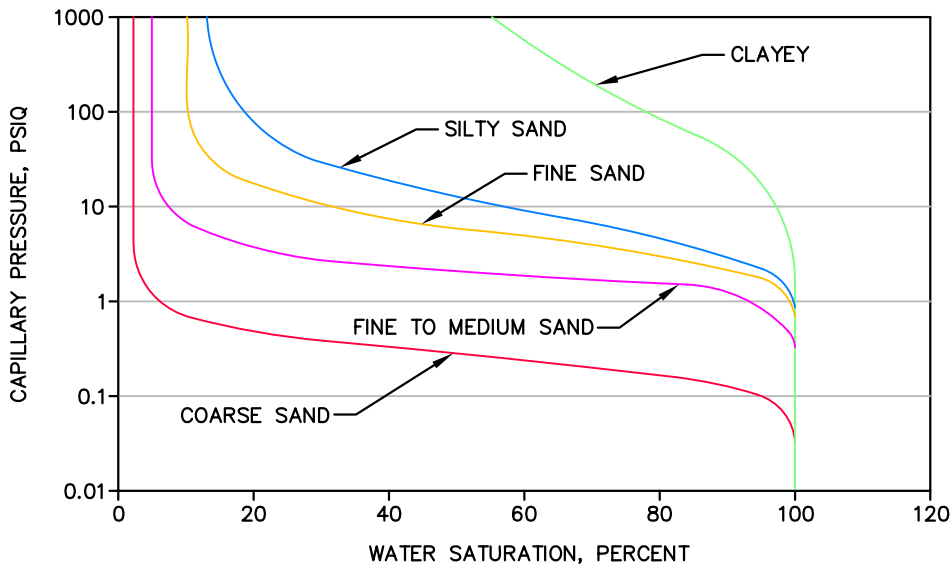
PROJECT NO.
111487

SC-1 @ 11.8 feet BGS



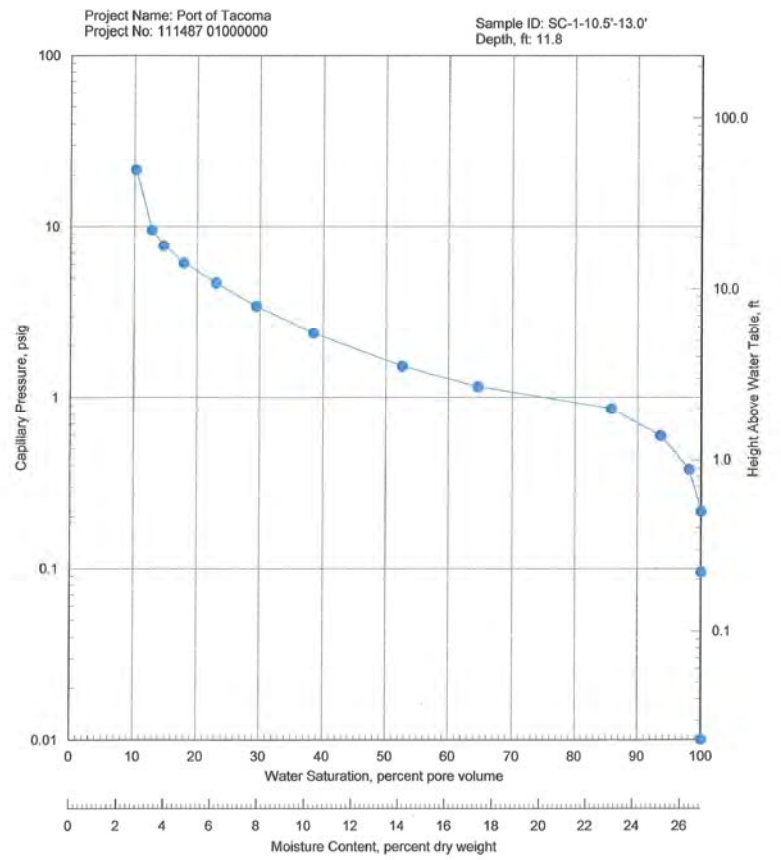
Shaw Environmental
File No.: 38090

Characteristic Capillary Pressure Curves



SOURCE: ADAPTED FROM BECKETT, G.D. AND HUNTLY, D.,
EVALUATING HYDROCARBON REMOVAL FROM SOURCE
ZONES AND ITS EFFECT ON DISSOLVED PLUME
LONGEVITY AND MAGNITUDE, API PUBLICATION NO.
4715, SEPTEMBER 2002

CAPILLARY PRESSURE
Centrifugal Method
Air Displacing Water System - ASTM D6836

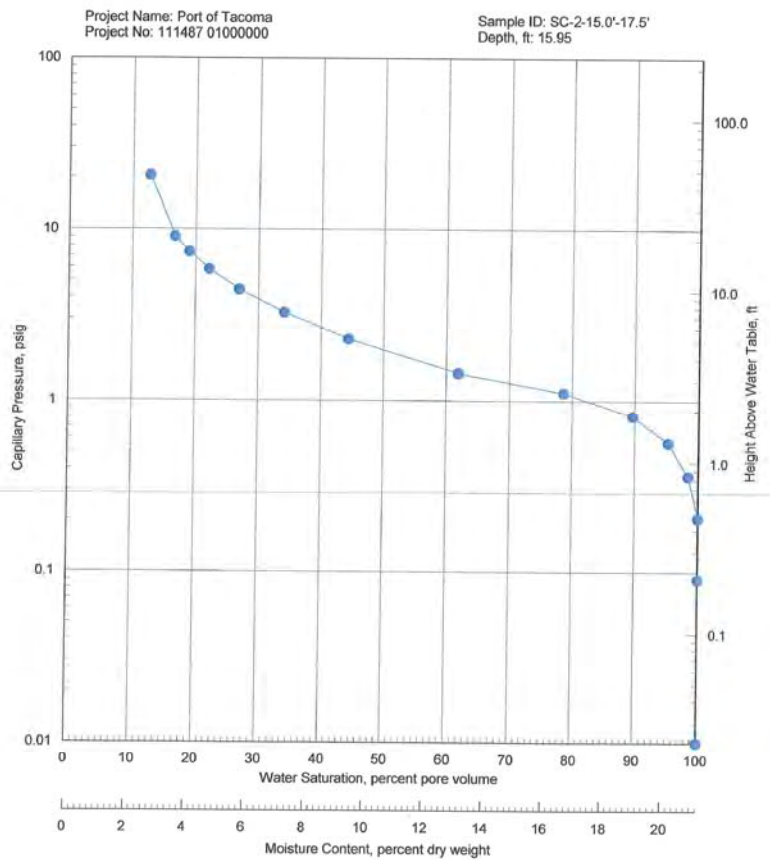


SC-2 @ 15.95 feet BGS



Shaw Environmental
File No.: 38090

CAPILLARY PRESSURE
Centrifugal Method
Air Displacing Water System - ASTM D6836

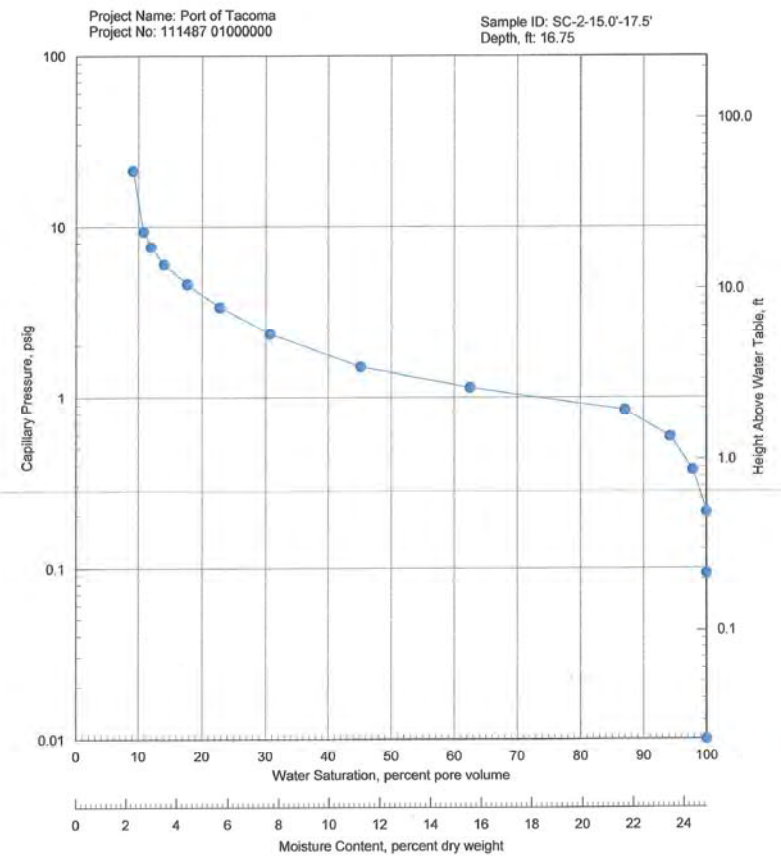


SC-2 @ 16.75 feet BGS



Shaw Environmental
File No.: 38090

CAPILLARY PRESSURE
Centrifugal Method
Air Displacing Water System - ASTM D6836



| REV | DATE | DESCRIPTION | DWN BY | DES BY | CHK BY | APP BY |
|---------------|------|-------------|--------|--------|--------|--------|
| DATE OF ISSUE | 8/08 | | JC | DL | | |
| | | | | | | |

This drawing represents intellectual property of Shaw, Inc. Any modification to the original by other than Shaw, Inc. personnel violates its original purpose and as such is rendered void. Shaw, Inc. will not be held liable for any changes made to this document without express written consent of the originator.

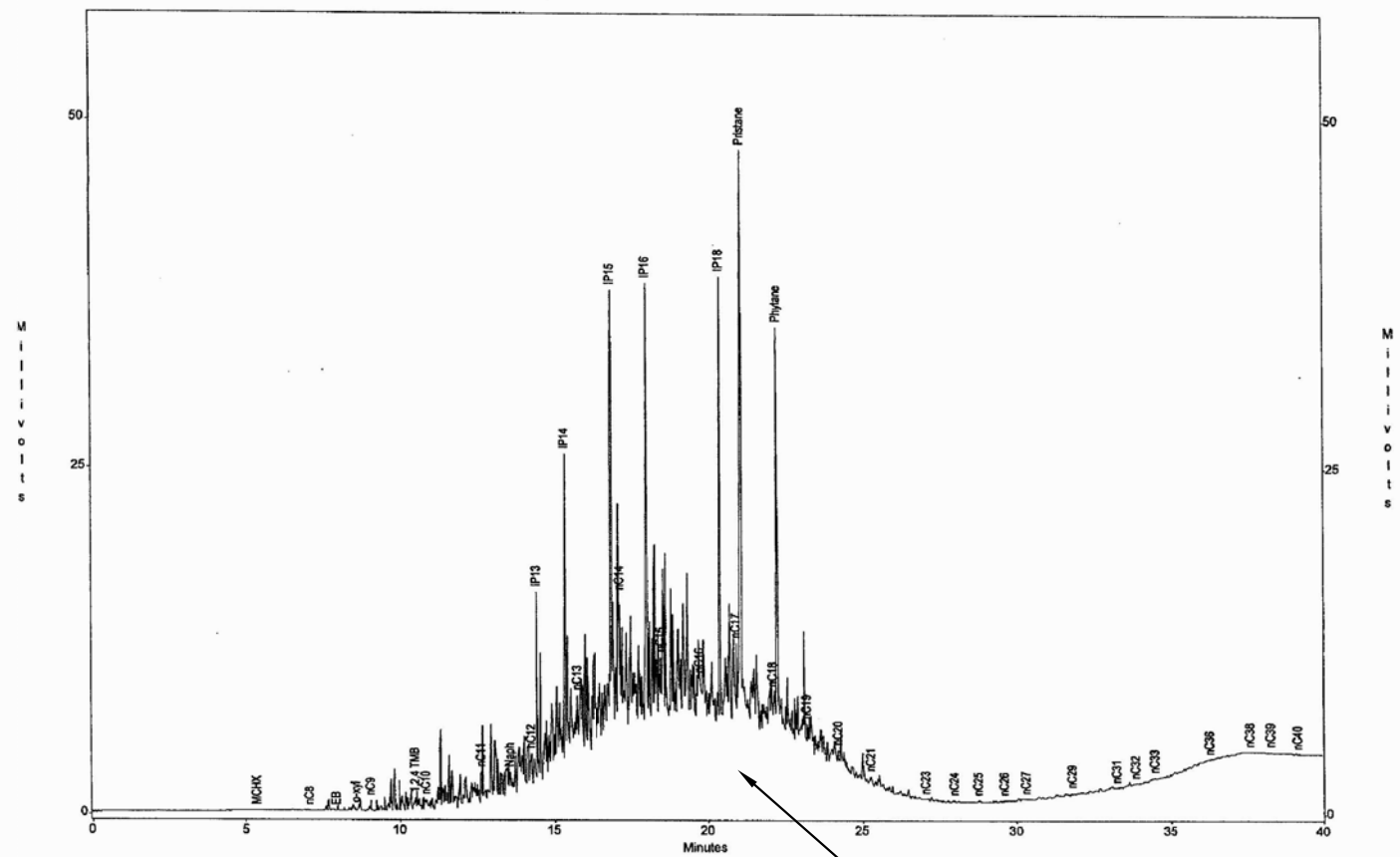
FIGURE 16
CHARACTERISTIC AND SOIL CORE
SAMPLE CAPILLARY PRESSURE
CURVES
PORT OF TACOMA
FORMER MILWAUKEE RAILYARD SITE
TACOMA, WASHINGTON

NAPL Sample RW-2L3

Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA
 Sample ID : RW2L3-Product
 Acquired : Jun 26, 2007 16:49:41

c:\ezchrom\chrom\070911rw-2l3 - Channel A



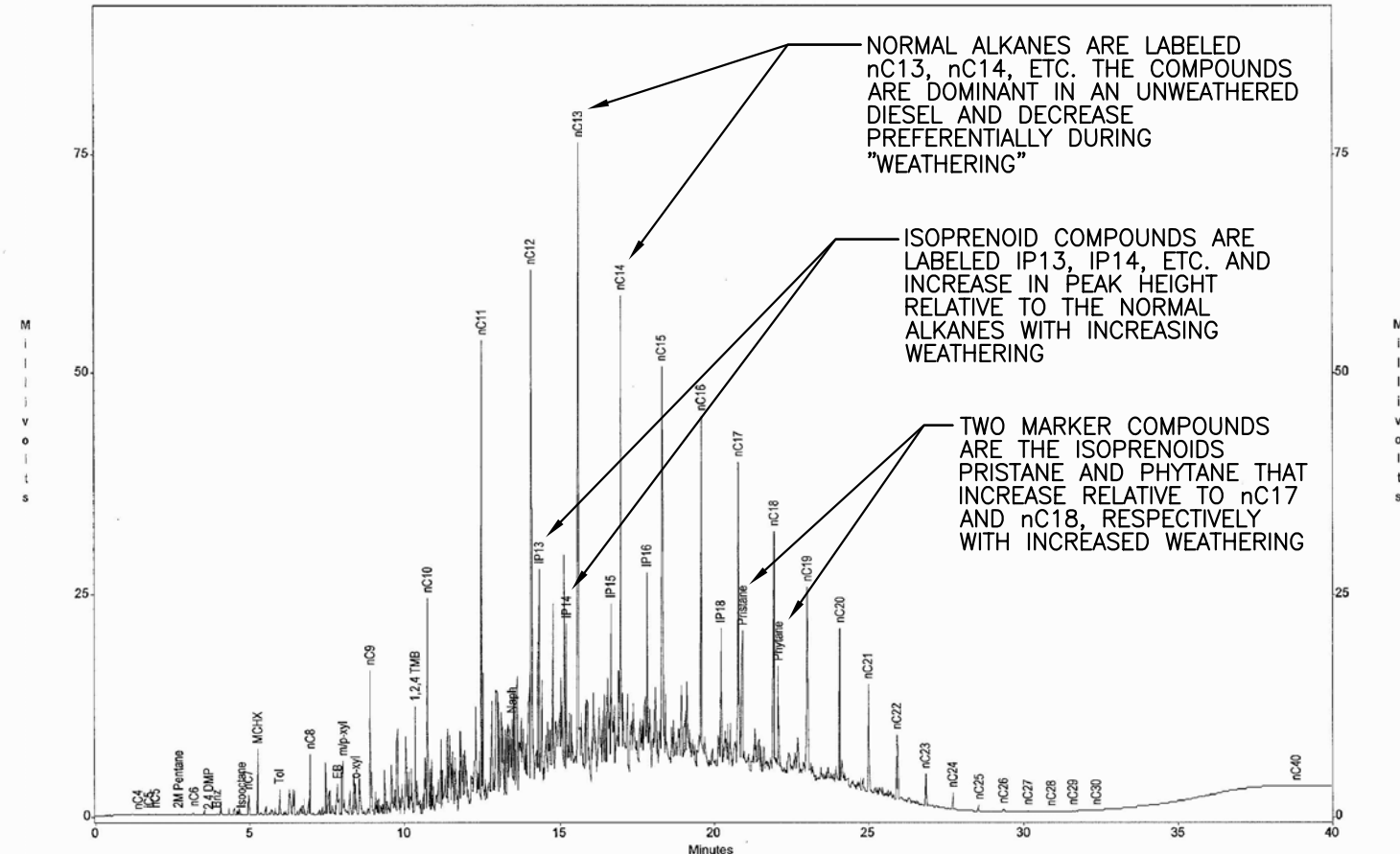
THE "HUMP" AT THE BASELINE IS THOUSANDS OF UNRESOLVABLE COMPOUNDS. THIS HUMP IS ACCENTUATED AS THE MORE DEGRADABLE NORMAL ALKANES AND EVENTUALLY ISOPRENOIDS DEGRADE

Diesel Standard

Torkelson Geochemistry, Inc.

Sample ID : Diesel
 Acquired : Aug 20, 2007 16:18:02

c:\ezchrom\chrom\07133\diesel.2 - Channel A



NORMAL ALKANES ARE LABELED nC13, nC14, ETC. THE COMPOUNDS ARE DOMINANT IN AN UNWEATHERED DIESEL AND DECREASE PREFERENTIALLY DURING "WEATHERING"

ISOPRENOID COMPOUNDS ARE LABELED IP13, IP14, ETC. AND INCREASE IN PEAK HEIGHT RELATIVE TO THE NORMAL ALKANES WITH INCREASING WEATHERING

TWO MARKER COMPOUNDS ARE THE ISOPRENOIDS PRISTANE AND PHYTANE THAT INCREASE RELATIVE TO nC17 AND nC18, RESPECTIVELY WITH INCREASED WEATHERING

1" 1/2" 0" 1"

File: N:\Cad\Drawings\Port of Tacoma\August 2008\Figure 17.dwg Layout: layout User: jaecha.codington Sep 04, 2008 - 11:04am

| REV | DATE | DESCRIPTION | DWN BY | DES BY | CHK BY | APP BY | |
|---------------|------|-------------|--------|--------|--------|--------|--------|
| DATE OF ISSUE | 8/08 | DWN BY | JC | DES BY | DL | CHK BY | APP BY |

Shaw Environmental, Inc.
 This drawing represents intellectual property of Shaw, Inc. Any modification to the original by other than Shaw, Inc. personnel violates its original purpose and as such is rendered void. Shaw, Inc. will not be held liable for any changes made to this document without express written consent of the originator.

FIGURE 17
 GAS CHROMATOGRAM OF NAPL
 SAMPLE RW-2L3 AND LABORATORY
 STANDARD FOR DIESEL
 PORT OF TACOMA
 FORMER MILWAUKEE RAILYARD SITE
 TACOMA, WASHINGTON

PROJECT NO.
 111487

Appendix A

Behavior of NAPL in the Subsurface

Introduction

A nonaqueous phase liquid results from the physical and chemical differences between liquid hydrocarbon and water, such that a physical interface exists between the two liquids. Hence, nonaqueous phase liquids act as a distinct fluid within the subsurface. Nonaqueous phase liquids, which are commonly referred to by the acronym "NAPL," have typically been divided into two general categories, light and dense. These terms describe the specific gravity or the density of the NAPL with respect to water. Light nonaqueous phase liquids, termed "L" NAPLs, have a specific gravity less than water and dense nonaqueous phase liquids, termed "D" NAPLs, have a specific gravity greater than water. Examples of LNAPLs include most fuels (gasoline, diesel, jet A, heating oil) and lubricants. DNAPLs include chlorinated solvents, creosote based wood-treating oils, coal tar wastes, and pesticides. Although many of the same principles and concerns apply to both LNAPLs and DNAPLs, the focus of this guide is on LNAPLs since these compounds comprise the most common type of contaminants at petroleum retail, storage, distribution and refining sites.

LNAPL contamination poses one of the most significant issues faced by the environmental industry. In particular, LNAPL contamination has typically been perceived as a significant environmental threat by the general public and the regulatory community, and as a result, LNAPL cleanup standards are generally very conservative. Technically, the remediation of LNAPL is difficult because it is significantly influenced by the physical character of the product, the nature of the soil conditions, and the hydrologic setting. LNAPL acts as a source of volatile and dissolved contaminants that may require remediation. Additionally, if sufficient volume exists, LNAPL may migrate posing significant environmental and legal concerns. To effectively manage the various and difficult aspects of LNAPL contamination, one must conceptually and technically understand the sometimes complex issues posed by LNAPL contamination. It is only through this understanding that appropriate management decisions can be made.

The management of LNAPL contaminated sites is a scientific and an engineering challenge. The focus of this primer is to present general fundamental concepts in understanding how subsurface processes and conditions influence the movement and retention of LNAPL in the subsurface. Specifically, these processes require knowledge of chemistry, geology, hydrology, soil science, biology, and engineering. The objective of this primer will be to provide general information on key factors to consider and recognize when managing a LNAPL site. This *NAPL Basics* primer will form the basis of more technical discussions presented in other primers.

LNAPL Movement in the Subsurface

Products typically produced, stored, and distributed include gasoline, middle distillates (diesel, kerosene), and heavy fuel and lubricating oils. These products vary in chemical composition and physical properties. The characteristics of these product types in conjunction with the hydrogeologic conditions at the site and the manner in which the product is released are the primary factors that influence the movement and distribution of LNAPL in the subsurface. When oil is accidentally released at the surface or from an underground pipe or storage tank, oil migrates vertically downward under the force of gravity. When the volume of the release is sufficient, the LNAPL will migrate through the unsaturated zone to the capillary fringe and water table (Figure 1). The increasing water content in the capillary fringe and the effects of buoyancy will impede the vertical movement of the LNAPL near the water table. As a result, the less dense oil will begin to migrate laterally along the water table. In general, the lateral oil migration will preferentially flow with the water table gradient. However, if the rate of downward vertical LNAPL movement from the surface is greater than the lateral migration, the oil will begin to mound vertically and oil flow may become radial. In addition, downward migration into the aquifer will increase displacing water from the aquifer pore space.

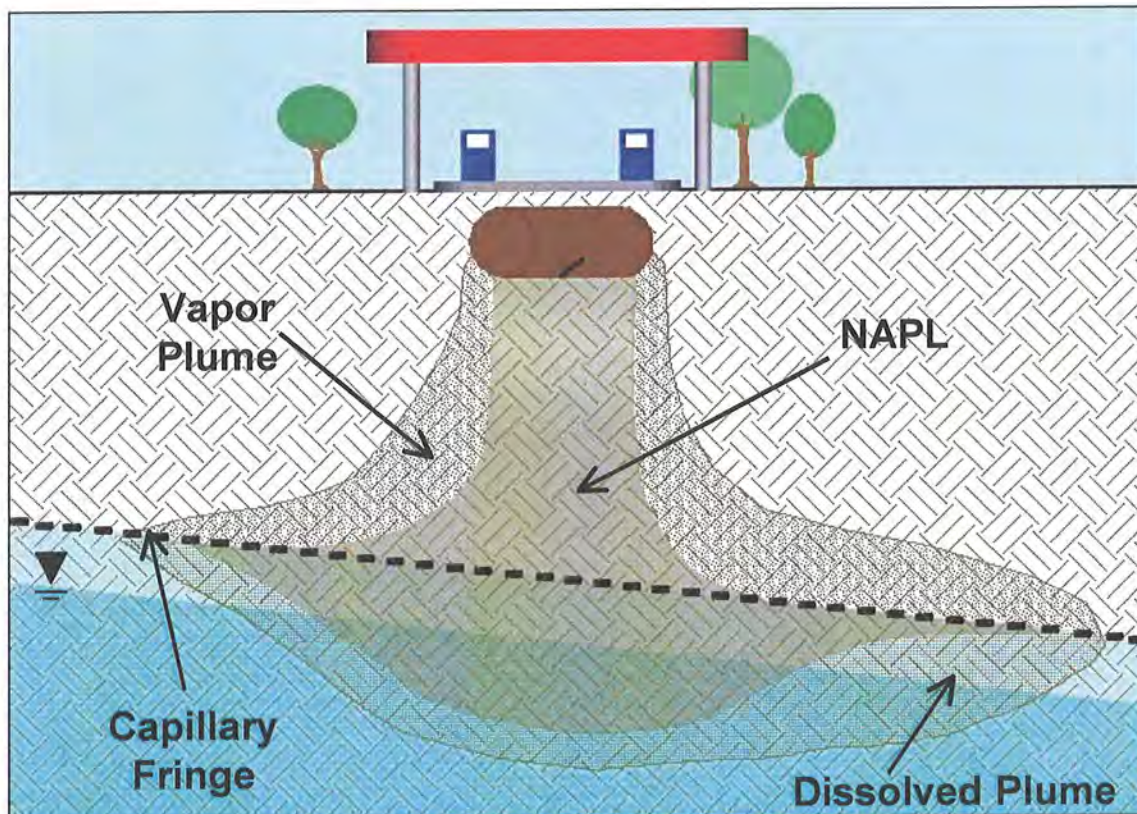
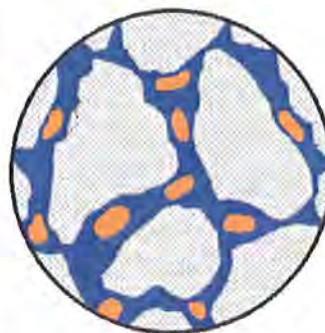


Figure 1. Representation of a LNAPL Release to the Subsurface.

In the aquifer, LNAPL coexists with water in the soil pores. The percentage of LNAPL filling the total pore space is termed the oil saturation. Due to the presence of water in the soil, LNAPL saturations are never 100 percent but may range from as little as 5 percent to over 70 percent (Figure 2). The percent saturation and distribution of LNAPL within the pore network will change over time as oil initially displaces water and is then subsequently displaced as water refills pore spaces when water levels rise.

In the past, a common misconception of the vertical distribution of free product at the water table was based on the idea that LNAPL occurs as a distinct lens in which the drainable pore space is completely saturated with LNAPL. This was often referred to as the “pancake layer” conceptualization (Figure 3). Under the pancake layer paradigm LNAPL saturations are 100 percent. This paradigm predicts large free oil volumes, high mobilities, and large recoverable volumes. Most importantly, the paradigm does not inherently consider soil and product properties as significant. An updated paradigm that is more representative of typical soil capillarity is referred to as the “multiphase” conceptualization, in which LNAPL saturation decreases continuously with depth (Figure 3). In the aquifer, LNAPL coexists in the soil pores with water over a given thickness. An examination of the impacted aquifer indicates that the LNAPL produces a profile with decreasing LNAPL saturation with depth. Specifically, the oil phase will displace the water by pushing into the pore spaces of the upper portions of the profile. With depth, the amount of oil pushing into the pores becomes less and less until at some depth no water is displaced and the pores remain completely filled with water (100 percent water saturation). Field studies have indicated that the multiphase conceptualization provides a good representation for both coarse and fine grained soils.

Low Saturation
(Residual LNAPL in Pore Network Beneath Mobile LNAPL zone)



High Saturation
(Mobile LNAPL Near Air-Oil Table)

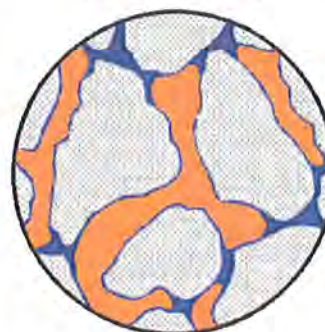


Figure 2. Representation of LNAPL Saturations in the Soil Pore Space.

When a well penetrates LNAPL saturated soil, oil and water will migrate into the well bore and reach equilibrium relative to the atmospheric conditions. As a result, a distinct layer of oil will develop in the well above the water. The thickness of oil in the well will reflect the thickness of the aquifer in which some amount of mobile oil saturation is present (Figure 4). The upper surface of the oil layer in the well is termed the air-oil interface and the lower surface of the oil is termed the oil-water interface. The actual water potentiometric level cannot be physically measured in the well. This interface must be calculated using the density of the oil (ρ_o), the elevation of the water-oil interface (Z_{ow}), and the LNAPL thickness measured in the well (H_o). The following equation is utilized in determining the theoretical air-water interface (Z_{aw}) in a well containing LNAPL.

$$Z_{aw} = Z_{ow} + (\rho_o H_o) \tag{1}$$

The volume of LNAPL per area of aquifer is primarily dependent upon the properties of the soil and the LNAPL. Since water remains in some of the pore spaces (for some soils, the majority of the pore spaces), the amount of oil in the formation is less than the monitoring well might suggest. In general, for a given observed well product thickness, the mobile LNAPL volume is greater for coarse-grained aquifer material than for soils composed of silt and clay. The importance of grain size is discussed in the primer *Soil Properties*.

Similarly, the volume of mobile oil will vary depending on product composition for a given observed well product thickness. The nature and properties of LNAPLs are discussed in the primer *Product Types*.

Due to capillary forces, some LNAPL is always retained in the soil pores as residual or immobile LNAPL. The remaining "untrapped" LNAPL is mobile and may continue to migrate. As LNAPL moves within the subsurface, the volume of mobile or "free" product continually decreases as LNAPL becomes trapped as isolated droplets within the soil pore network. In particular, it becomes difficult for the oil

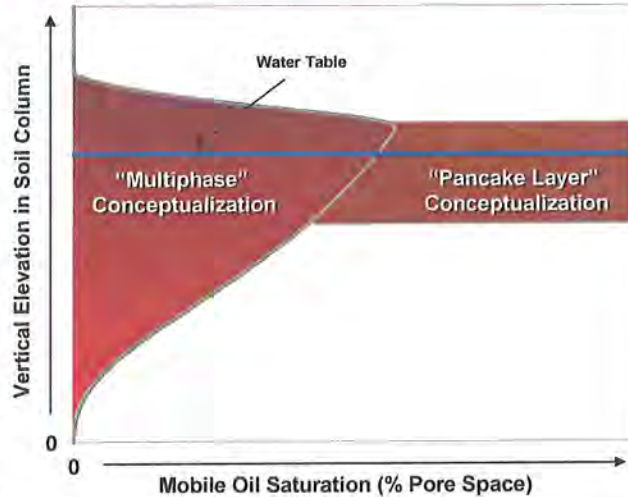


Figure 3. Conceptualization of LNAPL Vertical Distribution in Soil Profile.

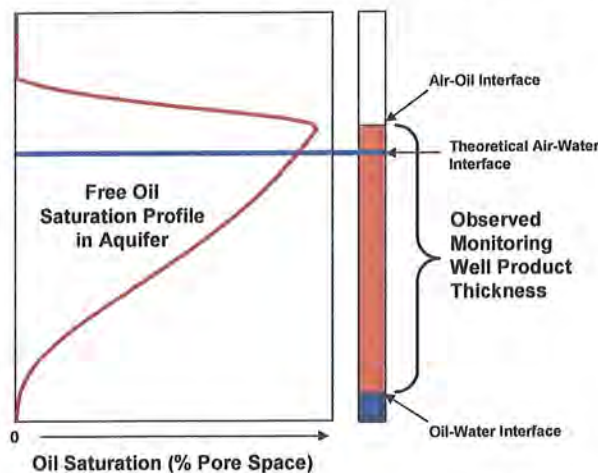


Figure 4. Conceptualization of LNAPL within a Monitoring Well.

to coalesce into a consistent plume of any significant thickness. Hence, LNAPL plumes, unless continually supplied from an on-going release, are "spatially self-limiting." This important concept distinguishes LNAPLs from dissolved and vapor plumes that may migrate significant distances.

Other Considerations

The dynamic and heterogeneous character of the subsurface influences LNAPL conditions. For example, slight differences in soil texture may promote preferential pathways within the aquifer, or conversely, may inhibit product migration causing LNAPL to pool as a stratigraphic trap. Similarly, fractures may create anisotropic conditions that cause product to flow in a direction not directly downgradient. In addition, LNAPL is significantly influenced by vertical fluctuations in the water table. These fluctuations enhance the development of residual LNAPL, which in many cases stabilizes the LNAPL movement. The primers on *Water Table Fluctuations* and *Heterogeneous Conditions* discuss how transient and spatial conditions may influence LNAPL migration.

In the subsurface, constituents composing the LNAPL will begin to transfer from the oil phase to the vapor and liquid phases (Figure 1). The transfer of volatile components to the soil air creates a vapor phase in the unsaturated zone above and adjacent to the LNAPL. Similarly, the transfer of soluble components to the water creates a dissolved plume in the saturated zone. The resulting vapor and dissolved plumes may readily migrate away from the LNAPL plume. In many cases, these plumes contain toxic components that may pose human health and environmental risks. As such, an understanding of the mass transfer between the LNAPL and vapor/water phases is important in managing LNAPL plumes. The concepts of dissolution and volatilization are discussed in the primers *Dissolution* and *Volatilization*.

Because LNAPL may act as a continuing source of dissolved and volatile contamination, numerous technologies have been developed to facilitate recovery of both mobile and residual product. The applicability of the technology depends upon site-specific hydrogeologic conditions, the nature and distribution of the LNAPL, and the remedial objectives. Although remediation techniques are continuing to improve, most technologies remain limited in removing LNAPL from the subsurface. In particular, the extraction of residual LNAPL is problematic and retention of approximately 40 to 70 percent of the LNAPL mass within the aquifer may occur. Furthermore, the application and operation of some technologies may increase the retention of LNAPL. As such, the proper selection and appropriate operation of corrective measures is very important and may significantly influence long-term conditions at a site. These concepts are discussed in greater detail in the primer *Remediation Technologies*.

Since the effectiveness of current remedial efforts for residual phase product is limited, LNAPL contaminated sites need to be managed in a different manner. Perspectives of producing rapid clean-ups to background conditions are impracticable and generally not possible. LNAPL contaminated sites must be understood in terms of risk and managed appropriately. Hence, understanding must be gained in terms of LNAPL plume stability and recoverability as well as a source of contaminant mass transfer to the water and vapor phases. It is from this technical basis that LNAPL risk can be determined.

References

Abdul, A.S., S.F. Kia, and T.L. Gibson. 1989. Limitations of monitoring wells for the detection and qualification of petroleum products in soils and aquifers, *Ground Water Monitoring Report*, Spring 1989: 90-99.

API. 1996. *A Guide to the Assessment and Remediation of Underground Petroleum Releases*, 3rd Edition, Publication Number 1628, American Petroleum Institute, Washington, DC.

Brost, E.J. and G.E. DeVauil. 2000. Non-aqueous phase liquid (NAPL) mobility limits in soil, *Soil and Groundwater Research Bulletin*, No. 9, American Petroleum Institute.

Charbeneau, R.J., R.T. Johns, L.W. Lake, and M.J. McAdams. 1999. *Free-Product Recovery of Petroleum Hydrocarbon Liquids*, Publication Number 4682, American Petroleum Institute, Health and Environmental Sciences Department.

Farr, A.M., R.J. Houghtalen, and D.B. McWhorter. 1990. Volume Estimation of Light Nonaqueous Phase Liquids in Porous Media, *Ground Water*, 28(1): 48-56.

Fetter, C.W. 1993. *Contaminant Hydrogeology*, Macmillan Publishing Company, New York, NY.

Huntley, D. and G.D. Beckett. 2002. *Evaluating Hydrocarbon Removal from Source Zones and its Effect on Dissolved Plume Longevity and Magnitude*, Publication Number 4715, American Petroleum Institute, Regulatory Analysis and Scientific Affairs Department.

Huntley, D., R.N. Hawk, and H.P. Corley. 1994. Nonaqueous phase hydrocarbon in a fine-grained sandstone: 1. comparison between measured and predicted saturations and mobility, *Ground Water*, 32(4): 626-634.

Huntley, D., J.W. Wallace, and R.N. Hawk. 1994. Nonaqueous phase hydrocarbon in a fine-grained sandstone: 2. effect of local sediment variability on the estimation of hydrocarbon volumes, *Ground Water*, 32(5): 778-783.

Kemblowski, M.W. and C.Y. Chiang. 1990. Hydrocarbon thickness fluctuations in monitoring wells, *Ground Water*, 28(2): 244-252.

Lenhard, R.J., T.G. Johnson, and J.C. Parker. 1993. Experimental observations of nonaqueous-phase liquid subsurface movement, *Journal of Contaminant Hydrology*, 12: 79-101, Elsevier Science Publishers B.V., Amsterdam, The Netherlands.

Lenhard, R.J. and J.C. Parker. 1990a. Estimation of free hydrocarbon volume from fluid levels in monitoring wells, *Ground Water*, 28(1): 57-67.

Lenhard, R.J. and J.C. Parker. 1990b. Discussion of estimation of free hydrocarbon volume from fluid levels in monitoring wells, *Ground Water*, 28(5): 800-801.

Lenhard, R.J., T.G. Johnson, and J.C. Parker. 1993. Experimental observations of nonaqueous-phase liquid subsurface movement, *Journal of Contaminant Hydrology*, 12: 79-101, Elsevier Science Publishers B.V., Amsterdam, The Netherlands.

Lundegard, P.D. and B. Mudford. 1995. A modified approach to free product volume estimation, In: *Proceedings of the Petroleum Hydrocarbons and Organic Chemicals in*

Ground Water: Prevention, Detection, and Remediation Conference, Houston, TX, November 29 – December 1, pp. 423-437, Ground Water Publishing Company.

Lundegard, P.D. and B.S. Mudford. 1998. LNAPL volume calculation: Parameter estimation by nonlinear regression of saturation profiles, *Ground Water and Remediation*, 18(3): 88-93.

Lyman, W.J., P.J. Reidy, and B. Levy. 1991. *Assessing UST Corrective Action Technology: A Scientific Evaluation of the Mobility and Degradability of Organic Contaminants in Subsurface Environments*, EPA/600/2-91/053, United States Environmental Protection Agency, Office of Research and Development, Washington, DC.

Mercer, J.W. and R.M. Cohen. 1990. A review of immiscible fluids in the subsurface: Properties, models, characterization, and remediation, *Journal of Contaminant Hydrology*, 6(2): 107-163.

Newell, C.J., S.D. Acree, R.R. Ross, and S.G. Huling. 1995. *Light Non-aqueous Phase Liquids*, EPA-540-5-95-500, United States Environmental Protection Agency, Office of Research and Development, Robert S. Kerr Laboratory, Ada, OK.

Parker, J.C., D.W. Waddill, J.A. Johnson. 1995. *UST Corrective Action Technologies: Engineering Design of Free Product Recovery Systems*, United States Environmental Protection Agency, Risk Reduction Engineering Laboratory Report, Contract No. 68-C2-0108, p.82.

Sale, T. 2001. *Methods for Determining Inputs to Environmental Petroleum Hydrocarbon Mobility and Volume Models*, API Publication 4711, American Petroleum Institute.

U.S. EPA. 1996. *How to Effectively Recover Free Product at Leaking Underground Storage Tank Sites: A Guide for State Regulators*, EPA 510-R-96-001, Office of Solid Waste and Emergency Response, United States Environmental Protection Agency, Washington, DC, and National Risk Management Research Laboratory, United States Environmental Protection Agency, Cincinnati, OH.

Appendix B

Field and Laboratory Methods

APPENDIX B

Field and Laboratory Testing Methods

1.0 Introduction

This appendix describes the field and laboratory testing methods implemented for Tasks 1, 2, and 3 of the additional investigation performed at the former Milwaukee Railyard Site in Tacoma, Washington (referred to herein as the Site). The field and laboratory testing methods were performed in accordance with the Additional Studies Work Plan (Work Plan) dated October 15, 2007 (TechSolv, 2007b) that was approved by the Washington State Department of Ecology (Ecology). The locations of boreholes and wells referenced in this appendix are shown in Figure 2 of the report text.

2.0 Task 1 - Groundwater Monitoring

Task 1 consisted of groundwater monitoring. Groundwater analytical testing was performed in accordance with U.S. Environmental Protection Agency (EPA) or Ecology approved test methods.

Field Methods

Groundwater monitoring activities were performed in January and March 2008. Results of the January and March 2008 groundwater monitoring events were previously reported to Ecology in the January 2008 and April 2008 monthly progress reports (Shaw, 2008b and 2008c). The monthly progress reports included the field sampling data sheets (FSDSs) and laboratory analytical data reports; therefore, these documents are not included in this report. Similar field methods were employed for both monitoring events and are briefly described below.

For each groundwater monitoring event, Shaw personnel initially measured the depths to groundwater and any nonaqueous phase liquid (NAPL) in 14 monitoring wells (CW-1 through CW-8, MW-22, MW-21, MW-23, CW-9, MW-7, and MW-29) and piezometer OB-2. An electronic oil-water interface probe was used to collect the measurements.

After measuring the depths to groundwater and NAPL, Shaw personnel collected groundwater samples from the same 14 monitoring wells described above (i.e., CW-1 through CW-8, MW-22, MW-21, MW-23, CW-9, MW-7, and MW-29). Monitoring wells with NAPL (CW-4 and CW-5) were sampled by first removing NAPL from the wells. The following describes the procedures used to remove the NAPL:

- A diaphragm pump (an air compressor and generator were used to supply air to the diaphragm pump) was used to facilitate NAPL removal. Flex hose tubing fitted to the

diaphragm pump was lowered into the 2-inch diameter well casing to a depth of approximately 2 to 3 feet below the level of the NAPL-groundwater interface. The wells were purged of NAPL by pumping with the diaphragm pump until NAPL was no longer observed discharging from the tubing (i.e., all of the NAPL encountered was removed from each well). Less than 1 gallon of NAPL was recovered from each well.

- A 1-inch-diameter, polyvinyl chloride (PVC) pipe fitted with a PVC end cap was then quickly lowered into the well casing to approximately 2 to 3 feet above the bottom of the well casing before any NAPL could re-enter back into the well casing. The PVC pipe was held in place using a clamp. Approximately 0.5 gallon of deionized water was poured into the PVC pipe to create a positive head in the pipe. A ½-inch diameter, PVC rod was then used to push the end cap off of the PVC pipe (the end cap was attached to a string and removed from the well after sampling was completed).
- Groundwater purging and sampling was facilitated using the 1-inch-diameter PVC pipe and a peristaltic pump. At least three casing volumes of groundwater were purged from the monitoring wells well prior to additional purging and sampling using low-flow sampling procedures as described below.

The monitoring wells were purged and sampled using a peristaltic pump fitted with new, disposable polyethylene tubing replaced for each well. Low-flow purging and sampling techniques were used. The discharge stream was directed into a flow-through cell during well purging for direct measurement of field parameters including temperature, pH, specific conductance, dissolved oxygen (DO), and oxidation-reduction potential (redox). After field parameter measurements stabilized, the pumping rate was reduced and the discharge tubing was disconnected from the flow-through cell. Groundwater samples were then collected directly into laboratory-supplied sampling containers.

Testing Methods

The groundwater samples were submitted under chain-of-custody to TestAmerica in Tacoma, Washington, for analytical testing. All samples were analyzed for diesel- and oil-range TPH by Northwest Test Method NWTPH-Dx using silica gel cleanup before testing. Samples collected from offsite compliance wells MW-21, MW-22, and MW-23 were also analyzed for Ecology-recommended parameters related to diesel-range organics and heavy oils as specified in Table 830-1 of the MTCA cleanup regulations. The parameters analyzed included benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8260B, carcinogenic polynuclear aromatic hydrocarbons (PAHs) and naphthalene by EPA Method 8270C, and polychlorinated biphenyls (PCBs) by EPA Method 8082.

3.0 Task 2 – Test Boring and Soil Characterization

Task 2 consisted of collecting NAPL and undisturbed soil core samples within the NAPL zone for physical characterization. The characterization methodology was conducted in accordance

with NAPL guidance provided by the American Petroleum Institute (API, Interactive NAPL Guide Release 2.0.4, and supporting API document *Methods for Determining Inputs to Environmental Petroleum Hydrocarbon Mobility and Recovery Models* [Sale, 2001]). Soil core physical testing was performed in accordance API and ASTM test methods.

Field Methods

On February 14, 2008, two boreholes (SC-1 and SC-2) were advanced to collect soil cores in the NAPL impacted area using a CME-75, hollow-stem auger drill rig operated by Cascade Drilling of Woodinville, Washington. At each borehole location, Cascade Drilling utilized an air knife vacuum excavation system to remove soil to a depth of 5 feet bgs to prevent the potential for damage to possible subsurface utilities. Initially, a pilot borehole was drilled at each location to collect soil samples for visual observation and logging purposes, and to determine the target depths of cores to be sent to the laboratory for physical analyses. The pilot boreholes for SC-1 and SC-2 were advanced to total depths of 21 and 20 feet below ground surface (bgs), respectively. Soil samples were collected continuously in 18-inch long split spoon samplers. Sample blow counts were recorded every 6 inches for qualitative assessment of soil density. Soils were classified according to the Unified Soil Classification System. Logs of the pilot boreholes are provided in Appendix C. Photographs of the sampling activities are provided in Appendix F.

Upon completion of each pilot borehole, a second borehole was advanced within 10 to 15 feet of the pilot boreholes to collect undisturbed soil cores from the NAPL zone (based on observations from the pilot boreholes) for laboratory testing. The coring depths were selected to include the first depth interval where evidence of NAPL was encountered, and to ensure coring from above and below the water table.

Soil core borehole SC-1 was sampled from 8 to 18 feet bgs, and soil core borehole SC-2 was sampled from 5 to 20 feet bgs. An Osterberg fixed-piston sampler was used to enhance sample recovery due to the loose, granular nature of the subsurface soils, and because it prevents soil from entering the sample tube before the sampling depth is reached. The Osterberg sampler contains an activated fixed piston contained in an outer thin-walled, 2.5-foot-long, Shelby Tube sampler. The sampler assembly was lowered to the desired depth, and then the inner sampler piston was withdrawn while the outer thin-walled tube was forced into the sample interval for undisturbed soil collection. The method develops suction within the Shelby Tube sampler thereby minimizing the potential for soil loss through the open end of the sampler.

Soil core sampling using the Osterberg sampler did not allow for sample observation or logging in the field because the sampler was immediately sealed for shipment to the laboratory. Geologic logging of the cores was subsequently possible based on the core photographs and laboratory testing results. Records of the soil core recovery are provided in the borehole logs.

Sample recoveries from ranged from 60 to 85 percent for individual sample intervals. Core recovery was mostly complete in borehole SC-1. SC-2 had no recovery from sample intervals 5.0 to 7.5 feet, 9.1 to 10.0, 11.4 to 15.0 feet, and 17.5 to 20 feet bgs. Some of the poor recovery was due to sampler damage by occasional gravels and boulders within the formation (see Photos 2 and 3, Appendix E), and due to the inherent loose and granular nature of the soils.

Soil core handling and preservation were performed in accordance with recommendations by the testing laboratory (PTS Laboratories) and guidance described by the American Petroleum Institute (Sale, 2001) specifically for collection and handling of soil cores for NAPL investigation. Portions of the Shelby Tube that did not retain the soil cores were filled with commercially available Saran wrap to minimize core movement (and does not interact with the NAPL). Plastic end caps (provided with the Shelby Tubes) were then placed over the ends of the tubes and taped securely to the tubes. The soil cores were labeled with the sampler number, depth interval, arrows to show top and bottom, and were immediately placed in coolers frozen with dry ice so that migration of NAPL or groundwater within the cores was minimized and fluid saturation was preserved. The samples remained frozen with dry ice during storage and transportation to the laboratory.

Testing Methods

The soil cores were submitted under chain-of-custody to PTS Laboratories in Santa Fe Springs, California, for physical testing. The soil cores were tested to evaluate the porous media physical parameters that affect NAPL distribution and recoverability from the subsurface. The testing methods were conducted in accordance with ASTM and API methods specified in *Methods for Determining Inputs to Environmental Petroleum Hydrocarbon Mobility and Recovery Models* (Sale, 2001).

Soil core physical testing was performed in a phased and iterative approach. Initially, the cores were photographed using standard white light and also ultraviolet light to record NAPL fluorescence and visually assess NAPL distribution. Based on assessment of the core photographs (as discussed in the following sections), discreet soil samples were selected from core borehole SC-1 at 8.9, 11.65, and 12.2 feet bgs, and from core borehole SC-2 at 8.7, 10.7, 16.1, and 16.6 feet bgs) for testing of grain size analysis and pore fluid saturation properties. The testing included the following parameters:

- Grain (particle) size analysis by ASTM Method D422/D4464M
- Moisture content by API RP Method 40 and ASTM Method D42216
- Bulk and grain density, total and air-filled porosity, and water and NAPL pore fluid saturations by APR RP Method 40.

Results of the pore fluid saturation testing were used to select additional samples for testing of air/water drainage capillarity properties and NAPL mobility properties. Composite sample intervals were then collected from core borehole SC-1 at 11.7 to 11.9 feet bgs, and from core borehole SC-2 at 15.9 to 16.1 and 16.7 to 16.9 feet bgs. The testing included the following parameters:

- Intrinsic Permeability (Water): Includes specific permeability to water (intrinsic permeability) and hydraulic conductivity, by API RP40 and ASTM D5084.
- Intrinsic Permeability (NAPL): Includes specific permeability to NAPL (intrinsic permeability), by API RP40.
- Drainage Capillary Pressure Data (centrifugal method; air/water). Includes initial and residual fluid saturations, final water production vs. capillary pressure, effective (total) porosity, bulk density, air permeability and hydraulic conductivity, by API 40, ASTM D425M, and EPA 9100.
- NAPL Mobility (centrifugal method): Apply centrifugal force of 1000 times gravity for one hour to demonstrate product mobility. Includes initial and residual pore fluid saturations, porosity and bulk density, by ASTM D425.

A copy of the laboratory test data prepared by PTS Laboratories (excluding soil core photographs), and a copy of the chain-of-custody form, are provided in Appendix D.

4.0 Task 3 - NAPL Chemical and Physical Characterization

Task 3 consisted of collecting light nonaqueous phase liquid (NAPL) and groundwater samples for chemical and/or physical characterization. Chemical testing (hydrocarbon fingerprinting analysis) was performed by capillary gas chromatography (GC) methods, and physical testing was performed in accordance with American Society for Testing and Materials [ASTM] methods.

Field Methods

NAPL samples were collected on June 7 and 8, 2007, from five recovery or compliance wells (RW2L3, RW5L3, RW2L5, CW-4, and CW-5). The samples were collected using a peristaltic pump. NAPL was pumped directly into laboratory-supplied containers that were immediately placed in coolers chilled with ice. The samples remained chilled with ice during storage and transportation to the laboratory. Groundwater samples were also collected concurrently from these wells and submitted to the laboratory testing for physical analyses (e.g., NAPL/water interfacial tension); however, only selected groundwater samples were analyzed.

Testing Methods

The NAPL and groundwater samples were submitted under chain-of-custody to Torkelson Geochemistry, Inc. of Tulsa, Oklahoma, for chemical testing. The NAPL samples were initially analyzed for hydrocarbon characterization using capillary GC to characterize the range in composition of petroleum hydrocarbons that are present and the degree of weathering. These data were then used to select NAPL samples (and the associated groundwater samples) from two recovery wells, RW2L3 and RW5L3, for physical testing. The samples from these wells were selected for analyses based on the GC results that indicated they represented end-members in the range of NAPL compositions (i.e., diesel and heavy lube oil-range hydrocarbons). The NAPL physical tests included the following:

- NAPL Density (ASTM Method 4052)
- NAPL Viscosity (Brookfield DV-II instrumentation)
- Surface Tension of Air/Water (ASTM Method D971)
- Surface Tension of Air/NAPL (ASTM Method D971)
- Interfacial Tension of NAPL/Water (ASTM Method D971)

One of the groundwater samples, collected from RW-5L3, was also analyzed by GC to evaluate the potential for the NAPL to partition to groundwater.

A copy of the NAPL evaluation report, including the GC chromatograms and NAPL physical properties test data, prepared by Torkelson Geochemistry, Inc., and a copy of the chain-of-custody form, are provided Appendix F.

Appendix C

Borehole Logs for SC-1 and SC-2



Drilling Log

SC-1

Soil Boring (Pilot Borehole)

Page: 1 of 1

Project Former Milwaukee RR Site Owner Port of Tacoma
 Location Tacoma, Washington Proj. No. 111487
 Surface Elev. NA Total Hole Depth 21.0 ft. North _____ East _____
 Top of Casing NA Water Level Initial ▽ 9.5 ft. Static NA Diameter _____
 Screen: Dia NA Length NA Type/Size NA
 Casing: Dia NA Length NA Type NA
 Fill Material Bentonite Chips Rig/Core CME-75
 Drill Co. Cascade Drilling Method Hollow Stem Auger
 Driller _____ Log By David Lamadrid (Shaw) Date 2/14/08 Permit # NA
 Checked By _____ License No. _____

COMMENTS
 Used 18-inch-long, stainless steel Dames and Moore split-spoon sampler. Depth to groundwater and LNAPL measured at 10.00 and 9.65 feet below top of casing, respectively, in nearby well CW-4 on 2/13/08.

| Depth (ft.) | PID (ppm) | Sample ID % Recovery | Blow Count Recovery | Graphic Log | USCS Class. | Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS. |
|-------------|-----------|-------------------------|------------------------|----------------|----------------|---|
| 0 | | | | | | Utilized Air Knife to 6' below ground surface for utility clearance. |
| 0-0.5' | | | | | | @ 0-0.5' : Asphalt |
| 0.5-6' | | | | | | @ 0.5-6' : FILL, gravelly sand with some fines (SW), some cobbles to 3-inch diameter, some concrete chunks, very wet in upper 2' to 3'. |
| 6 | | PH-1-1 95% | 6 | | SP | UPPER SAND, Very fine to medium sand (SP), brown, moist, medium dense, trace fines, predominantly very fine grained, some pebbles, rare gravel to 1-inch diameter, no hydrocarbon odor. |
| 8 | | PH-1-2 100% | 10 | | SP | @ 7' : Becomes gray-brown, faint hydrocarbon odor. |
| 10 | | PH-1-3 100% | 14 | | SP | @ 8.5' : 1/2-inch thick lens of slightly silty fine sand (SM) |
| 10 | | PH-1-4 100% | 6 | | SP | @ 9.3' : Same as at 7', becomes wet then quickly saturated with depth, strong hydrocarbon odor, grades to brown-gray. |
| 12 | | PH-1-5 100% | 10 | | SP | Hydrocarbon odor decreases with depth (moderate odor). |
| 12 | | PH-1-6 100% | 12 | | SP | @ 11.8' : 1-inch thick sandy silt lens. |
| 14 | | PH-1-7 100% | 6 | | SP | @ 12' : Becomes loose to medium dense. |
| 14 | | PH-1-8 100% | 9 | | SP | Rare pebbles, still predominantly very fine sand but greater percentage of fine and medium sand. |
| 16 | | PH-1-9 100% | 6 | | SP | Sheen on saturated soil, becomes medium dense. |
| 16 | | PH-1-10 100% | 4 | | SP | |
| 17-17.4' | | | 7 | | SM | @ 17-17.4' : Slightly silty, very fine to fine sand (SM), brown-gray, saturated silt approximately 10 to 15 percent. |
| 17.4' | | | 7 | | SP | @ 17.4' : Very fine to medium sand (SP), gray-brown, saturated, medium dense, trace fines, some pebbles. |
| 18.8' | | | 9 | | SP | @ 18.8' Sharp contact with very fine to fine sand (SP), gray, saturated, medium dense, no fines, trace to some medium grained sand, becomes slightly finer grained with depth. |
| 21 | | | 11 | | SP | Total depth = 21 feet bgs; Groundwater encountered at approx. 9.5' bgs. Backfilled with bentonite chips. |

DRILLING LOG Rev: 12/20/06 FORMER MILWAUKEE RR SITE GPJ SHAW/T.GDT 5/29/08



Drilling Log

Soil Boring **SC-1**
(Soil Core Borehole)
Page: 1 of 1

Project Former Milwaukee RR Site Owner Port of Tacoma
 Location Tacoma, Washington Proj. No. 111487
 Surface Elev. NA Total Hole Depth 18.0 ft. North _____ East _____
 Top of Casing NA Water Level Initial NA Static NA Diameter _____
 Screen: Dia NA Length NA Type/Size NA
 Casing: Dia NA Length NA Type NA
 Fill Material Bentonite Chips Rig/Core CME-75
 Drill Co. Cascade Drilling Method Hollow Stem Auger
 Driller _____ Log By David Lamadrid (Shaw) Date 2/14/08 Permit # NA
 Checked By _____ License No. _____

COMMENTS
 SC-1 (Pilot Borehole) drilled adjacent to SC-1 (Core Borehole). Use Osterberg Shelby Tube system to collect soil cores. Core borehole log based on soil core photograph interpretation and grain size analysis.

| Depth (ft.) | PID (ppm) | Sample ID % Recovery | Blow Count Recovery | Graphic Log | USCS Class. | Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS. |
|-------------|-----------|-------------------------|------------------------|----------------|-------------|--|
| 0 | | | | | | Air Knife Excavation to 5 feet below ground surface. |
| 2 | | | | | | |
| 4 | | | | | | |
| 6 | | | | | | Auger drill out to 8 feet below ground surface. |
| 8 | | | | | SP | UPPER SAND @ 8' : Fine to medium sand (SP), gray, wet, trace to 10 percent fines, fine laminae, minor to moderate LNAPL from 8.0' to 8.3', 8.6', to 9.0' and 11.0' to 12.3'. |
| 10 | | SC-1 8'-10.5' 80% | | | SPG | @ 9.6' : scattered pebbles and gravels. |
| 12 | | SC-1 10.5'-13' 80% | | | SP | Some layers with apparent fine to coarse sand (SW, 11.2' to 11.3', 11.9' to 12.1') |
| 12.3 | | | | | SM/MS | 12.3' - 12.5' : Apparent silty fine sand or fine sandy silt layer. |
| 12.5 | | | | | SP | @ 12.5' - 13.0' : No recovery |
| 14 | | SC-1 13'-15.5' 60% | | | | @ 13' : fine to medium sand (SP), gray, wet, scattered pebbles and gravels, stratification not apparent, minor LNAPL at 13.0' to 14.0', and 15.5' to 16.2', potential sloughing soils based on lack of stratification. |
| 16 | | SC-1 15.5'-18' 80% | | | | |
| 18 | | | | | | Total Depth = 18' Backfilled with bentonite chips |
| 20 | | | | | | |
| 22 | | | | | | |
| 24 | | | | | | |

DRILLING LOG Rev. 12/20/06 FORMER MILWAUKEE RR SITE.GPJ, SHAW.IT, GDT, 5/29/08



Drilling Log

SC-2

Soil Boring (Pilot Borehole)

Page: 1 of 1

Project Former Milwaukee RR Site Owner Port of Tacoma
 Location Tacoma, Washington Proj. No. 111487
 Surface Elev. NA Total Hole Depth 20.0 ft. North _____ East _____
 Top of Casing NA Water Level Initial NA Static NA Diameter _____
 Screen: Dia NA Length NA Type/Size NA
 Casing: Dia NA Length NA Type NA
 Fill Material Bentonite Chips Rig/Core CME-75
 Drill Co. Cascade Drilling Method Hollow Stem Auger
 Driller _____ Log By David Lamadrid (Shaw) Date 2/14/08 Permit # NA
 Checked By _____ License No. _____

COMMENTS
 Used 18-inch-long, stainless steel Dames and Moore split-spoon sampler. Depth to groundwater and LNAPL measured at 11.87 and 7.65 feet below top of casing, respectively, in nearby well CW-5 on 2/13/08.

| Depth (ft.) | PID (ppm) | Sample ID % Recovery | Blow Count Recovery | Graphic Log | USCS Class. | Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS. |
|-------------|-----------|-------------------------|------------------------|----------------|----------------|---|
| 0 | | | | | | Utilized Air Knife to 5' below ground surface for utility clearance. @ 0-0.4': Asphalt |
| 2 | | | | | | @ 0.4-5.3': FILL, slightly silty sand (SM), fine to medium sand, brown, moist, some gravels, some cobbles to 8-inch diameter, rare wood chunks. |
| 4 | | | | | | |
| 6 | | PH-2-1 100% | 4 | | SM | @ 5.3': 1.5-inch thick lens of wood chip debris. |
| 8 | | PH-2-2 100% | 6 | | SM | @ 5.5': UPPER SAND, slightly silty, fine to medium sand (SM), brown-gray, wet, loose to medium dense, silt 5 to 15 percent, strong hydrocarbon odor. |
| 10 | | PH-2-3 100% | 4 | | SM | @ 6': 1.5" thick sandy gravel layer, wet, sheen |
| 12 | | PH-2-4 35% | 7 | | ML | @ 6.2': Same as 5.5', minor gravel to 1-inch diameter, slightly more silt increasing with depth. |
| 14 | | PH-2-5 55% | 12 | | SM | @ 7': Slightly sandy silt (ML), green-gray, wet, loose to medium dense, abundant fine gravel, fine sand 5-15 percent, strong hydrocarbon odor. |
| 16 | | PH-2-6 100% | 8 | | GW | @ 7.8': Slightly silty, very fine to medium sand (SM), brown-gray, wet, silt 5 to 15 percent, predominantly fine grained sand, some rounded fine gravel, strong hydrocarbon odor. |
| 18 | | PH-2-7 65% | 7 | | SP | @ 9': silt increases to 10 to 20 percent, abundant LNAPL residue, some gravel. |
| 20 | | PH-2-8 65% | 5 | | SP | @ 10.5': Fine to coarse sandy gravel (GW), gray, saturated, medium dense, rounded gravel to 1-inch diameter some fines, abundant LNAPL/sheen, rare wood chunks. |
| 22 | | PH-2-9 100% | 12 | | SP | @ 12.3': Very fine to medium sand (SP), saturated, gray, medium dense, trace fines, moderate LNAPL residue. |
| 24 | | PH-2-10 85% | 16 | | SP | Slightly more silt with depth. @ 16.7': trace fines, pockets of LNAPL. |
| | | | 7 | | SP | @ 19': moderate LNAPL residue. |
| | | | 9 | | SP | Total depth = 20' bgs; LNAPL encountered at approximately 9' bgs. Backfilled with bentonite chips. |

DRILLING LOG Rev: 12/20/06 FORMER MILWAUKEE RR SITE.GPJ SHAW.IT.GDT 5/29/08



Drilling Log

Soil Boring **SC-2**
(Soil Core Borehole)
 Page: 1 of 1

Project Former Milwaukee RR Site Owner Port of Tacoma
 Location Tacoma, Washington Proj. No. 111487
 Surface Elev. NA Total Hole Depth 20.0 ft. North _____ East _____
 Top of Casing NA Water Level Initial NA Static NA Diameter _____
 Screen: Dia NA Length NA Type/Size NA
 Casing: Dia NA Length NA Type NA
 Fill Material Bentonite Chips Rig/Core CME-75
 Drill Co. Cascade Drilling Method Hollow Stem Auger
 Driller _____ Log By David Lamadrid (Shaw) Date 2/14/08 Permit # NA
 Checked By _____ License No. _____

COMMENTS
 SC-1 (Pilot Borehole) drilled adjacent to SC-1 (Core Borehole) for lithology. Use Osterberg Shelby Tube system to collect soil cores. Core borehole log based on soil core photograph interpretation and grain size analysis.

| Depth (ft.) | PID (ppm) | Sample ID % Recovery | Blow Count Recovery | Graphic Log | USCS Class. | Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS. |
|-------------|-----------|-------------------------|------------------------|----------------|----------------|--|
| 0 | | | | | | Air Knife Excavation to 5 feet below ground surface. |
| 2 | | | | | | |
| 4 | | | | | | |
| 6 | | SC-2 5'-7.5' 0% | | | | @ 5' - 7.5' : No Recovery |
| 8 | | SC-2 7.5'-10' 65% | | | GW SW | @ 7.5' : UPPER SAND, Fine to coarse sandy gravel (GW), wet, no LNAPL. @ 7.9' : Fine to coarse sand (SW), wet, 5 to 10 percent fines, few gravels up to 1.5 inch diameter, minor LNAPL. |
| 10 | | SC-2 10'-12.5' 55% | | | W/SV | @ 8.8' : Fine to medium sand, wet, trace fines, no gravel, minor LNAPL. @ 9.1' - 10.0' : No recovery |
| 12 | | SC-2 12.5'-15' 0% | | | | @ 10' : Interbedded sandy gravel (GW) and gravelly sand (SW), beds up to 3" thick, wet, little or no LNAPL in gravel layers, moderate LNAPL in sandy layers. @ 11.4' - 15.0' : No recovery |
| 14 | | SC-2 15'-17.5' 85% | | | SW SW | @ 15' : Fine to coarse sand (SW) wet, some gravels up to 1.5 inch diameter, very minor LNAPL. @ 15.3' : Fine to medium sand (SW), wet, minor pebbles or gravels decreasing with depth, trace fines, abundant LNAPL. |
| 16 | | SC-2 17.5'-20' 0% | | | | @ 17.1' - 20' : No recovery |
| 18 | | | | | | |
| 20 | | | | | | Total Depth = 20' Backfilled with bentonite chips |
| 22 | | | | | | |
| 24 | | | | | | |

DRILLING LOG Rev. 12/20/05 FORMER MILWAKEE RR SITE.GPJ SHAW IT.GDT 5/29/08

Appendix D

PTS Laboratories Soil Core Test Data



May 20, 2008

David Lamadrid
Shaw Environmental
10300 S.W. Nimbus Avenue, Suite B
Portland, Oregon 97223

Re: PTS File No: 38090
Port of Tacoma
111487 01000000

Dear Mr. Lamadrid:

Please find enclosed report for Physical Properties analyses conducted upon cores received from your Port of Tacoma; 111487 01000000 project. All analyses were performed by applicable ASTM, EPA, or API methodologies. An electronic version of the report has previously been sent to your attention via the internet. The samples are currently in storage and will be retained for thirty days past completion of testing at no charge. Please note that the samples will be disposed of at that time. You may contact me regarding storage, disposal, or return of the samples.

PTS Laboratories appreciates the opportunity to be of service. If you have any questions or require additional information, please give me a call at (562) 907-3607.

Sincerely,
PTS Laboratories

Michael Mark Brady, P.G.
Project Manager

Encl.

PTS Laboratories

Project Name: Port of Tacoma
 Project Number: 111487 01000000

PTS File No: 38090
 Client: Shaw Environmental

TEST PROGRAM

| CORE ID | Depth ft. | Core Recovery ft. | Slab and Core Photo | Pore Fluid Saturation Package | Grain Size Anal. | AW Drng. Capillarity Pkg. | Free Product Mobility | Calculate VG Params. | Fluid Properties Package | Notes |
|------------------|----------------|-------------------|---------------------|-------------------------------|------------------|---------------------------|-----------------------|----------------------|--------------------------|------------------|
| | | | | | | | | | | |
| | | Plugs: | 1/4:3/4 | Hor. 1.5" | Grab | Hor. 1" | Hor. 1.5" | | | Keep core frozen |
| SC-1-8'-10.5' | 8-10.5 | 1.8 | 2 | 8.9 | X | | | | | |
| SC-1-10.5'-13.0' | 10.5-13 | 2 | 3 | 11.65, 12.2 | X, X | 11.7-11.9 | 11.7-11.9 | | | |
| SC-1-13.0'-15.5' | 13-15.5 | 1.5 | 2 | | | | | | | |
| SC-1-15.5'-18.0' | 15.5-18 | 1.9 | 3 | | | | | | | |
| SC-2-7.5'-10.0' | 7.5-10 | 1.55 | 3 | 8.7 | X | | | | | |
| SC-2-10.0'-12.5' | 10-12.5 | 1.35 | 2 | 10.7 | X | | | | | |
| SC-2-15.0'-17.5' | 15-17.5 | 2.05 | 3 | 16.1, 16.6 | X, X | 15.9-16.1, 16.7-16.9 | 15.9-16.1, 16.7-16.9 | | | |
| TOTALS: | 7 cores | 12.15 | 18 | 7 | 7 | 3 | 3 | 0 | 0 | 0 |

Laboratory Test Program Notes

Copy Larry Roberts/TechSolv Consulting on all project communication per D. Lamadrid/Shaw Environmental.
 Sample locations to be selected by Shaw Environmental and TechSolv personnel from core photography.
 Take Grain Size Analysis samples from adjacent to Pore Fluid Saturation Pkg. sample locations.
 Take Free Product Mobility from adjacent to AW Drng. Capillarity Pkg. sample locations.

| | | | | | | | | | | | | | | | | | |
|---|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|-------------------------------------|--|
| COMPANY <i>Shaw Environmental</i> CITY ZIP CODE 10300 Summibus Ave, Ste. R, Portland, Oregon PROJECT MANAGER David Lamadrid PROJECT NAME PHONE NUMBER Port of Tacoma (503)603-1067 PROJECT NUMBER FAX NUMBER 111487 0100000 (503)603-1001 SITE LOCATION Former Milwaukee Railway site SAMPLER SIGNATURE <i>D. Lamadrid</i> | | | | ANALYSIS REQUEST NUMBER OF SAMPLES SOIL PROPERTIES PACKAGE HYDRAULIC CONDUCTIVITY PACKAGE PORE FLUID SATURATIONS PACKAGE TCE/THM/PC PROPERTIES PACKAGE CAPILLARITY PACKAGE FLUID PROPERTIES PACKAGE PHOTOLOG: CORE PHOTOGRAPHY MOISTURE CONTENT, ASTM D2216 POROSITY: TOTAL, API RP40 POROSITY: EFFECTIVE, ASTM D425M SPECIFIC GRAVITY, ASTM D854 BULK DENSITY (DRY), API RP40 or ASTM D2937 AIR PERMEABILITY, API RP40 HYDRAULIC CONDUCTIVITY, EPA9100, API RP40, D5084 GRAIN SIZE DISTRIBUTION, ASTM D422/4464M TOC: WALKLEY-BLACK ATTERBERG LIMITS, ASTM D4318 | | | | | | | | | | | | PO# | |
| TURNAROUND TIME 24 HOURS <input type="checkbox"/> 5 DAYS <input type="checkbox"/> 48 HOURS <input type="checkbox"/> NORMAL <input type="checkbox"/> 72 HOURS <input type="checkbox"/> OTHER: _____ SAMPLE INTEGRITY (CHECK): INTACT _____ ON ICE _____ PTS QUOTE NO. _____ PTS FILE: 38090 | | | | COMMENTS Coordinate Testing with Larry Roberts of Techserv 11/14/08 (125) 402-8277 | | | | | | | | | | | | | |
| SAMPLE ID NUMBER DATE TIME DEPTH, FT ✓ SC-1 - 8.0' - 10.5' 11/14/08 1245 8.0 - 10.5 ✓ SC-1 - 10.5' - 13.0' 11/14/08 1250 10.5 - 13.0 ✓ SC-1 - 13.0' - 15.5' 11/14/08 1255 13.0 - 15.5 ✓ SC-1 - 15.5' - 18.0' 11/14/08 1305 15.5 - 18.0 | | | | 3. RELINQUISHED BY COMPANY DATE TIME Shaw Environmental PTS 2-16-08 0940 | | | | | | | | | | | | 4. RECEIVED BY COMPANY DATE TIME | |

PHYSICAL PROPERTIES DATA - PORE FLUID SATURATIONS

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000

| SAMPLE ID. | DEPTH, ft. | METHODS: SAMPLE ORIENTATION (1) | API RP 40 / | API RP 40 | | API RP 40 | | API RP 40 | |
|----------------|------------|---------------------------------|----------------------------|------------|-------------|-------------------|------------|----------------------------------|------|
| | | | ASTM D2216 | DENSITY | | POROSITY, %Vb (2) | | PORE FLUID SATURATIONS, % Pv (3) | |
| | | | MOISTURE CONTENT, % weight | BULK, g/cc | GRAIN, g/cc | TOTAL | AIR FILLED | WATER | NAPL |
| SC-1-8-10.5 | 8.9 | H | 25.8 | 1.49 | 2.70 | 44.8 | 5.7 | 79.1 | 8.1 |
| SC-1-10.5-13.0 | 11.65 | H | 24.1 | 1.46 | 2.69 | 45.6 | 9.8 | 69.6 | 8.8 |
| SC-1-10.5-13.0 | 12.2 | H | 16.0 | 1.50 | 2.69 | 44.3 | 20.2 | 51.5 | 2.9 |
| SC-2-7.5-10.0 | 8.7 | H | 67.4 | 0.82 | 2.07 | 60.5 | 4.7 | 64.2 | 28.1 |
| SC-2-10.0-12.5 | 10.7 | H | 10.4 | 2.00 | 2.70 | 26.1 | 4.8 | 57.0 | 24.6 |
| SC-2-15.0-17.5 | 16.1 | H | 24.2 | 1.53 | 2.73 | 44.0 | 6.0 | 40.1 | 46.3 |
| SC-2-15.0-17.5 | 16.6 | H | 27.9 | 1.46 | 2.70 | 45.9 | 4.0 | 46.0 | 45.3 |

(1) Sample Orientation: H = horizontal; V = vertical (2) Total Porosity = no pore fluids in place; all interconnected pore channels; Air Filled = pore channels not occupied by pore fluids (3) Water = 0.9996 g/cc, SC-1 Hydrocarbon = 0.8803 g/cc, SC-2 Hydrocarbon = 0.9498 g/cc; Vb = Bulk Volume, cc; Pv = Pore Volume, cc; ND = Not Detected

PTS File No: 38090
 Client: Shaw Environmental

PHYSICAL PROPERTIES DATA - AIR/WATER CAPILLARY PRESSURE

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000

| SAMPLE ID. | DEPTH, ft. | METHODS: SAMPLE ORIENTATION (1) | API RP 40 / ASTM D2216 | API RP 40 | | API RP 40 | | API RP 40 | |
|------------------|------------|---------------------------------|----------------------------|------------|-------------|-------------------------------|------------|--|------|
| | | | MOISTURE CONTENT, % weight | DENSITY | | POROSITY, %V _b (2) | | PORE FLUID SATURATIONS, % P _v (3) | |
| | | | | BULK, g/cc | GRAIN, g/cc | TOTAL | AIR FILLED | WATER | NAPL |
| SC-1-10.5'-13.0' | 11.8 | H | 24.8 | 1.46 | 2.67 | 45.4 | 8.5 | 68.4 | 13.0 |
| SC-2-15.0'-17.5' | 15.95 | H | 20.9 | 1.66 | 2.79 | 40.6 | 5.1 | 60.2 | 27.3 |
| SC-2-15.0'-17.5' | 16.75 | H | 26.7 | 1.47 | 2.68 | 45.2 | 4.6 | 38.5 | 51.2 |

PHYSICAL PROPERTIES DATA - AIR/WATER CAPILLARY PRESSURE

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000

| | | METHODS: | | API RP 40 / ASTM D2216 | API RP 40 | | API RP 40 | | API RP 40 | |
|---------------|---------------|------------------------------|----------------------------------|---------------------------|----------------|-------------------|---------------|-------------------------------------|-----------|--|
| SAMPLE ID. | DEPTH, ft. | SAMPLE ORIENTATION (1) | MOISTURE CONTENT, % weight | DENSITY | | POROSITY, %Vb (2) | | PORE FLUID SATURATIONS, % Pv (3) | | |
| | | | | BULK, g/cc | GRAIN, g/cc | TOTAL | AIR FILLED | WATER | NAPL | |

(1) Sample Orientation: H = horizontal; V = vertical (2) Total Porosity = no pore fluids in place; all interconnected pore channels; Air Filled = pore channels not occupied by pore fluids (3) Water = 0.9996 g/cc, SC-1 Hydrocarbon = 0.8803 g/cc, SC-2 Hydrocarbon = 0.9498 g/cc; Vb = Bulk Volume, cc; Pv = Pore Volume, cc; ND = Not Detected

PTS File No: 38090
 Client: Shaw Environmental

PERMEABILITY DATA

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000

METHODS: API RP 40; EPA 9100

| SAMPLE ID. | DEPTH, ft. | SAMPLE ORIENTATION (1) | 25 PSI CONFINING STRESS | | |
|------------------|------------|------------------------|---|---|------------------------------------|
| | | | SPECIFIC (2) PERMEABILITY TO AIR millidarcy | EFFECTIVE (3,4) PERMEABILITY TO WATER, millidarcy | HYDRAULIC CONDUCTIVITY (3,4), cm/s |
| SC-1-10.5'-13.0' | 11.8 | H | 5346 | 2410 | 2.21E-03 |
| SC-2-15.0'-17.5' | 15.95 | H | 4841 | 2178 | 1.98E-03 |
| SC-2-15.0'-17.5' | 16.75 | H | 6139 | 3858 | 3.53E-03 |

PERMEABILITY DATA

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000

METHODS:

API RP 40; EPA 9100

| SAMPLE ID. | DEPTH, ft. | SAMPLE ORIENTATION (1) | SPECIFIC (2) PERMEABILITY TO AIR millidarcy | EFFECTIVE (3,4) PERMEABILITY TO WATER, millidarcy | HYDRAULIC CONDUCTIVITY (3,4), cm/s |
|------------|------------|------------------------|--|--|---------------------------------------|
| | | | 25 PSI CONFINING STRESS | | |

(1) Sample Orientation: H = horizontal; V = vertical (2) Specific = No pore fluids in place (3) Native State or Effective = With as-received pore fluids in place (4) Permeability to water and hydraulic conductivity measured at saturated conditions

PTS File No:

38090

Client: Shaw Environmental

FREE PRODUCT MOBILITY: INITIAL AND RESIDUAL SATURATIONS

PROJECT NAME: Port of Tacoma
PROJECT NO: 111487 01000000

| SAMPLE ID. | DEPTH, ft. | SAMPLE ORIENTATION (1) | DENSITY | | TOTAL POROSITY, %Vb | ASTM D425M DEAN-STARK | | | | |
|---|------------|------------------------|------------|-------------|---------------------|------------------------|-----------------------|----------------------------|-----------------------|--|
| | | | BULK, g/cc | GRAIN, g/cc | | PORE FLUID SATURATIONS | | After Centrifuge at 1000xG | | |
| | | | | | | WATER (Swi) SATURATION | NAPL (Soi) SATURATION | WATER (Srw) SATURATION | NAPL (Sor) SATURATION | |
| SC-1-10.5'-13.0' | 11.9 | H | 1.53 | 2.67 | 42.6 | 79.7 | 2.0 | 11.1 | 2.0 | |
| NOTE: No visible NAPL produced. Produced water slightly cloudy with strong hydrocarbon odor. | | | | | | | | | | |
| SC-2-15.0'-17.5' | 15.9 | H | 1.51 | 2.68 | 43.7 | 63.9 | 23.9 | 11.4 | 9.3 | |
| NOTE: Black DNAPL produced. Produced water clear. | | | | | | | | | | |
| SC-2-15.0'-17.5' | 16.9 | H | 1.58 | 2.73 | 42.0 | 48.7 | 46.1 | 9.1 | 15.0 | |
| NOTE: Dark brown DNAPL produced. Produced water clear. | | | | | | | | | | |

N/A = Not Analyzed. Vb = Bulk Volume, Pv = Pore Volume. (1) H = horizontal, V = vertical
 Soi = Initial NAPL Saturation as received prior to centrifuging at 1000xG, Swi = Initial Water Saturation as received prior to centrifuging at 1000xG
 Sor = Residual NAPL Saturation after centrifuging at 1000xG, Srw = Residual Water Saturation after centrifuging at 1000xG

FREE PRODUCT MOBILITY: INITIAL AND RESIDUAL SATURATIONS

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000

| SAMPLE ID. | DEPTH, ft. | SAMPLE ORIENTATION (1) | METHODS: API RP 40 | | ASTM D425M, DEAN-STARK | | | | | |
|------------|------------|------------------------|--------------------|-------------|---------------------------------|-----------------------|---------------------------|-----------------------|----------------------------|--|
| | | | API RP 40 | | PORE FLUID SATURATIONS, % Pv | | Initial Fluid Saturations | | After Centrifuge at 1000xG | |
| | | | BULK, g/cc | GRAIN, g/cc | WATER SATURATION | NAPL (Sol) SATURATION | WATER (Str) SATURATION | NAPL (Sor) SATURATION | | |
| | | | | | TOTAL POROSITY, %v _b | | | | | |

Water = 0.9996 g/cc, SC-1 NAPL = 0.8803 g/cc, SC-2 NAPL = 0.9498 g/cc.

PTS File No: 38090
 Client: Shaw Environmental

PHYSICAL PROPERTIES DATA - AIR/WATER CAPILLARY PRESSURE

(ASTM D6836; Centrifugal Method: air displacing water)

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000

| Capillary Pressure | | Height Above Water Table, ft | Sample ID | |
|--------------------|----------|------------------------------------|---------------------------------------|---------------------------|
| psi | cm water | | SC-1 (10.5'-13.0') at 11.8 ft. | |
| | | | Saturation, % pore volume | Moisture, % dry weight |
| 0.000 | 0.00 | 0.000 | 100.0 | 26.9 |
| 0.095 | 6.68 | 0.220 | 100.0 | 26.9 |
| 0.214 | 15.0 | 0.495 | 100.0 | 26.9 |
| 0.380 | 26.7 | 0.880 | 98.1 | 26.4 |
| 0.594 | 41.8 | 1.37 | 93.6 | 25.2 |
| 0.855 | 60.1 | 1.98 | 85.9 | 23.1 |
| 1.16 | 81.8 | 2.69 | 64.7 | 17.4 |
| 1.52 | 107 | 3.52 | 52.6 | 14.2 |
| 2.38 | 167 | 5.50 | 38.5 | 10.4 |
| 3.42 | 241 | 7.92 | 29.5 | 7.9 |
| 4.66 | 327 | 10.8 | 23.1 | 6.2 |
| 6.08 | 428 | 14.1 | 17.9 | 4.8 |
| 7.70 | 541 | 17.8 | 14.7 | 4.0 |
| 9.50 | 668 | 22.0 | 12.8 | 3.5 |
| 21.4 | 1503 | 49.5 | 10.3 | 2.8 |



CAPILLARY PRESSURE Centrifugal Method Air Displacing Water System - ASTM D6836

Project Name: Port of Tacoma
Project No: 111487 01000000

Sample ID: SC-1-10.5'-13.0'
Depth, ft: 11.8

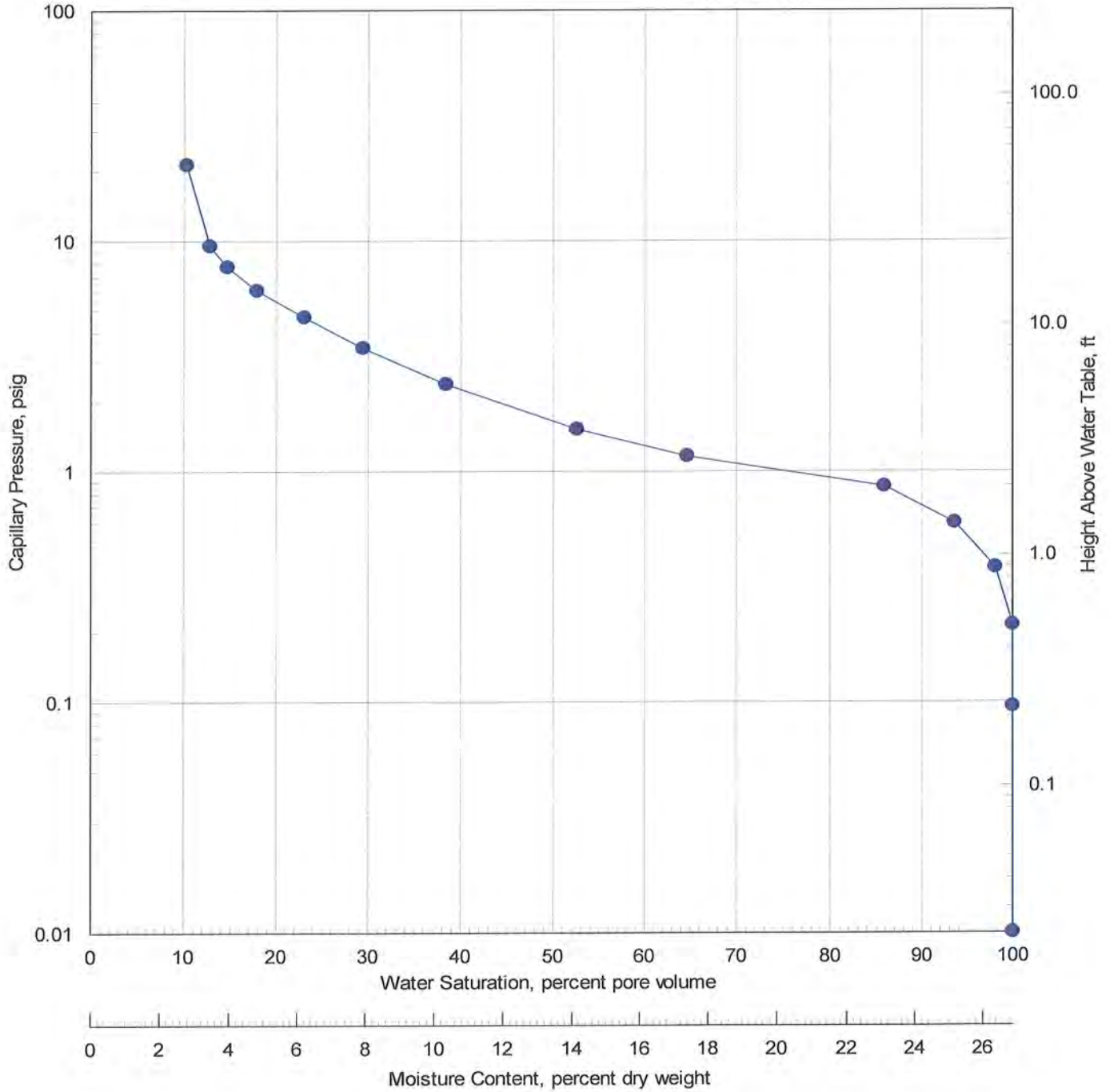


TABLE 1

**SOIL MOISTURE RETENTION CURVE FITTING FOR QUANTIFYING
 THE HYDRAULIC FUNCTIONS OF UNSATURATED SOILS**

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-1 (10.5'-13.0') at 11.8 ft.

van Genuchten Parameters

| | |
|-----------------|-----------|
| alpha (1/cm) | 1.160E-02 |
| n | 2.602 |
| residual water | 0.095 |
| total water | 1.000 |
| m | 0.616 |
| Water Perm (mD) | 2410 |
| Air Perm (mD) | 5346 |
| R ² | 0.99491 |

Notes: alpha, n, and residual saturation are capillary parameters defined by the following equation (van Genuchten, 1980), with $m = 1-1/n$, S = water saturation, and h = capillary head (cm):

$$S_r + [(S_s - S_r) / (1 + (\alpha h)^n)^m]$$

Laboratory Measured Data

| Capillary Head (cm) | SC-1 (10.5'-13.0') at 11.8 ft. Volumetric Moisture | Predicted Moisture by Curve Fit | RPD (%) |
|---------------------|--|---------------------------------|---------|
| 0.00 | 1.000 | 1.000 | 0.00% |
| 6.68 | 1.000 | 0.999 | -0.07% |
| 15.03 | 1.000 | 0.994 | -0.59% |
| 26.72 | 0.981 | 0.975 | -0.64% |
| 41.76 | 0.936 | 0.925 | -1.20% |
| 60.13 | 0.859 | 0.833 | -2.98% |
| 81.84 | 0.647 | 0.710 | 9.64% |
| 106.89 | 0.526 | 0.580 | 10.43% |
| 167.02 | 0.385 | 0.379 | -1.59% |
| 240.51 | 0.295 | 0.263 | -10.85% |
| 327.36 | 0.231 | 0.200 | -13.43% |
| 427.57 | 0.179 | 0.164 | -8.66% |
| 541.15 | 0.147 | 0.142 | -3.36% |
| 668.08 | 0.128 | 0.129 | 0.58% |
| 1503.19 | 0.103 | 0.104 | 1.68% |

TABLE 2

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-1 (10.5'-13.0') at 11.8 ft.

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

| Capillary Head (cm) | (van Genuchten, 1980) Volumetric Moisture | (Mualem, 1976) Effective Water Perm. | (Mualem, 1976) Effective Air Perm. |
|---------------------|--|---|---------------------------------------|
| 0.001 | 1.000 | 2.41E+03 | 2.46E-19 |
| 0.02 | 1.000 | 2.41E+03 | 1.78E-13 |
| 0.04 | 1.000 | 2.41E+03 | 4.05E-12 |
| 0.05 | 1.000 | 2.41E+03 | 1.11E-11 |
| 0.08 | 1.000 | 2.41E+03 | 9.18E-11 |
| 0.09 | 1.000 | 2.41E+03 | 1.56E-10 |
| 1 | 1.000 | 2.41E+03 | 8.02E-06 |
| 1.2 | 1.000 | 2.40E+03 | 1.82E-05 |
| 1.3 | 1.000 | 2.40E+03 | 2.61E-05 |
| 1.5 | 1.000 | 2.40E+03 | 4.98E-05 |
| 2 | 1.000 | 2.40E+03 | 1.82E-04 |
| 3 | 1.000 | 2.39E+03 | 1.13E-03 |
| 5 | 1.000 | 2.36E+03 | 1.13E-02 |
| 7 | 0.999 | 2.32E+03 | 5.13E-02 |
| 9 | 0.998 | 2.28E+03 | 1.59E-01 |
| 11 | 0.997 | 2.23E+03 | 3.91E-01 |
| 15 | 0.994 | 2.12E+03 | 1.56E+00 |
| 20 | 0.988 | 1.96E+03 | 5.61E+00 |
| 25 | 0.978 | 1.78E+03 | 1.49E+01 |
| 30 | 0.966 | 1.60E+03 | 3.26E+01 |
| 35 | 0.950 | 1.41E+03 | 6.23E+01 |
| 40 | 0.932 | 1.23E+03 | 1.07E+02 |
| 45 | 0.911 | 1.06E+03 | 1.70E+02 |
| 50 | 0.887 | 9.07E+02 | 2.53E+02 |
| 60 | 0.834 | 6.42E+02 | 4.78E+02 |
| 70 | 0.777 | 4.42E+02 | 7.74E+02 |
| 75 | 0.749 | 3.65E+02 | 9.41E+02 |
| 80 | 0.720 | 3.00E+02 | 1.12E+03 |
| 85 | 0.692 | 2.46E+02 | 1.30E+03 |
| 90 | 0.665 | 2.02E+02 | 1.48E+03 |
| 95 | 0.639 | 1.66E+02 | 1.66E+03 |
| 100 | 0.613 | 1.36E+02 | 1.85E+03 |
| 120 | 0.524 | 6.32E+01 | 2.51E+03 |
| 140 | 0.452 | 3.07E+01 | 3.06E+03 |
| 160 | 0.395 | 1.57E+01 | 3.49E+03 |
| 180 | 0.351 | 8.43E+00 | 3.82E+03 |
| 200 | 0.315 | 4.76E+00 | 4.08E+03 |
| 220 | 0.287 | 2.80E+00 | 4.28E+03 |
| 240 | 0.263 | 1.72E+00 | 4.44E+03 |
| 260 | 0.244 | 1.09E+00 | 4.57E+03 |

TABLE 2

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-1 (10.5'-13.0') at 11.8 ft.

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

| Capillary Head (cm) | (van Genuchten, 1980) Volumetric Moisture | (Mualem, 1976) Effective Water Perm. | (Mualem, 1976) Effective Air Perm. |
|---------------------|--|---|---------------------------------------|
| 280 | 0.228 | 7.09E-01 | 4.67E+03 |
| 300 | 0.215 | 4.75E-01 | 4.75E+03 |
| 320 | 0.204 | 3.26E-01 | 4.82E+03 |
| 340 | 0.194 | 2.29E-01 | 4.88E+03 |
| 360 | 0.185 | 1.63E-01 | 4.92E+03 |
| 380 | 0.178 | 1.19E-01 | 4.97E+03 |
| 400 | 0.172 | 8.78E-02 | 5.00E+03 |
| 420 | 0.166 | 6.57E-02 | 5.03E+03 |
| 440 | 0.161 | 4.99E-02 | 5.06E+03 |
| 460 | 0.156 | 3.83E-02 | 5.08E+03 |
| 480 | 0.152 | 2.98E-02 | 5.10E+03 |
| 500 | 0.149 | 2.33E-02 | 5.12E+03 |
| 550 | 0.141 | 1.32E-02 | 5.16E+03 |
| 600 | 0.135 | 7.87E-03 | 5.18E+03 |
| 650 | 0.130 | 4.88E-03 | 5.21E+03 |
| 700 | 0.127 | 3.13E-03 | 5.22E+03 |
| 750 | 0.123 | 2.07E-03 | 5.24E+03 |
| 800 | 0.120 | 1.41E-03 | 5.25E+03 |
| 850 | 0.118 | 9.79E-04 | 5.26E+03 |
| 900 | 0.116 | 6.95E-04 | 5.27E+03 |
| 950 | 0.114 | 5.03E-04 | 5.28E+03 |
| 1000 | 0.113 | 3.70E-04 | 5.28E+03 |
| 1050 | 0.111 | 2.76E-04 | 5.29E+03 |
| 1100 | 0.110 | 2.09E-04 | 5.29E+03 |
| 1150 | 0.109 | 1.60E-04 | 5.30E+03 |
| 1200 | 0.108 | 1.24E-04 | 5.30E+03 |
| 1250 | 0.107 | 9.69E-05 | 5.30E+03 |
| 1300 | 0.107 | 7.66E-05 | 5.31E+03 |
| 1350 | 0.106 | 6.11E-05 | 5.31E+03 |
| 1400 | 0.105 | 4.91E-05 | 5.31E+03 |
| 1450 | 0.105 | 3.98E-05 | 5.31E+03 |
| 1500 | 0.104 | 3.25E-05 | 5.31E+03 |
| 1550 | 0.104 | 2.67E-05 | 5.32E+03 |
| 1600 | 0.103 | 2.20E-05 | 5.32E+03 |
| 1650 | 0.103 | 1.83E-05 | 5.32E+03 |
| 1700 | 0.103 | 1.53E-05 | 5.32E+03 |
| 1750 | 0.102 | 1.29E-05 | 5.32E+03 |
| 1800 | 0.102 | 1.09E-05 | 5.32E+03 |
| 1850 | 0.102 | 9.22E-06 | 5.32E+03 |
| 1900 | 0.101 | 7.85E-06 | 5.33E+03 |

TABLE 2

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

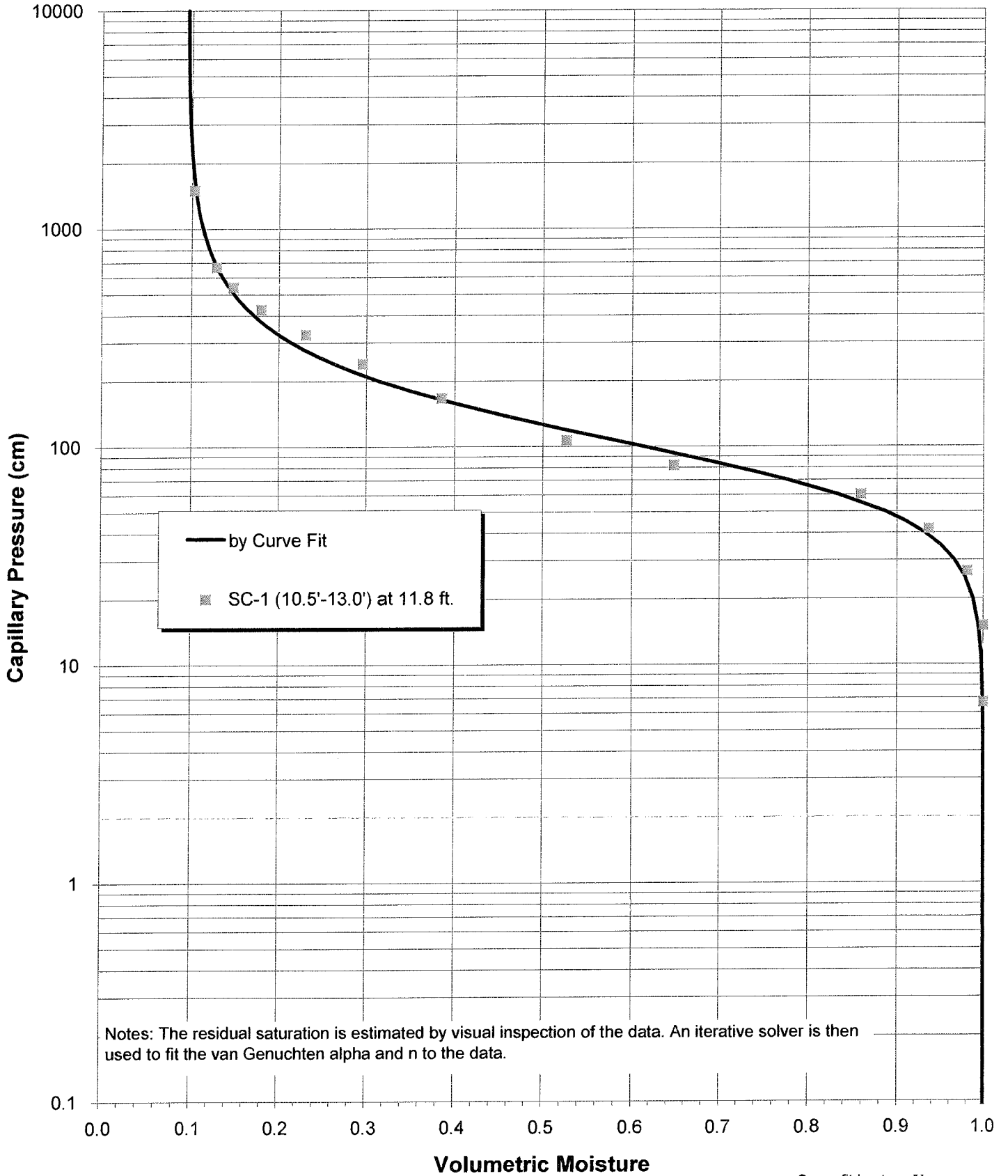
PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-1 (10.5'-13.0') at 11.8 ft.

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

| Capillary Head (cm) | (van Genuchten, 1980) Volumetric Moisture | (Mualem, 1976) Effective Water Perm. | (Mualem, 1976) Effective Air Perm. |
|---------------------|--|---|---------------------------------------|
| 1950 | 0.101 | 6.72E-06 | 5.33E+03 |
| 2000 | 0.101 | 5.77E-06 | 5.33E+03 |
| 2200 | 0.100 | 3.26E-06 | 5.33E+03 |
| 2400 | 0.099 | 1.93E-06 | 5.33E+03 |
| 2600 | 0.099 | 1.19E-06 | 5.33E+03 |
| 2800 | 0.098 | 7.66E-07 | 5.34E+03 |
| 3000 | 0.098 | 5.06E-07 | 5.34E+03 |
| 3200 | 0.098 | 3.43E-07 | 5.34E+03 |
| 3400 | 0.098 | 2.39E-07 | 5.34E+03 |
| 3600 | 0.097 | 1.69E-07 | 5.34E+03 |
| 3800 | 0.097 | 1.22E-07 | 5.34E+03 |
| 4000 | 0.097 | 9.00E-08 | 5.34E+03 |
| 4200 | 0.097 | 6.71E-08 | 5.34E+03 |
| 4400 | 0.097 | 5.08E-08 | 5.34E+03 |
| 4600 | 0.097 | 3.89E-08 | 5.34E+03 |
| 4800 | 0.096 | 3.01E-08 | 5.34E+03 |
| 5000 | 0.096 | 2.36E-08 | 5.34E+03 |
| 5200 | 0.096 | 1.86E-08 | 5.34E+03 |
| 5400 | 0.096 | 1.48E-08 | 5.34E+03 |
| 5600 | 0.096 | 1.19E-08 | 5.34E+03 |
| 5800 | 0.096 | 9.66E-09 | 5.34E+03 |
| 6000 | 0.096 | 7.88E-09 | 5.34E+03 |
| 6500 | 0.096 | 4.88E-09 | 5.34E+03 |
| 7000 | 0.096 | 3.12E-09 | 5.34E+03 |
| 7500 | 0.096 | 2.06E-09 | 5.34E+03 |
| 8000 | 0.096 | 1.40E-09 | 5.34E+03 |
| 8500 | 0.096 | 9.74E-10 | 5.34E+03 |
| 9000 | 0.096 | 6.91E-10 | 5.34E+03 |
| 9500 | 0.095 | 4.99E-10 | 5.34E+03 |
| 10000 | 0.095 | 3.67E-10 | 5.35E+03 |

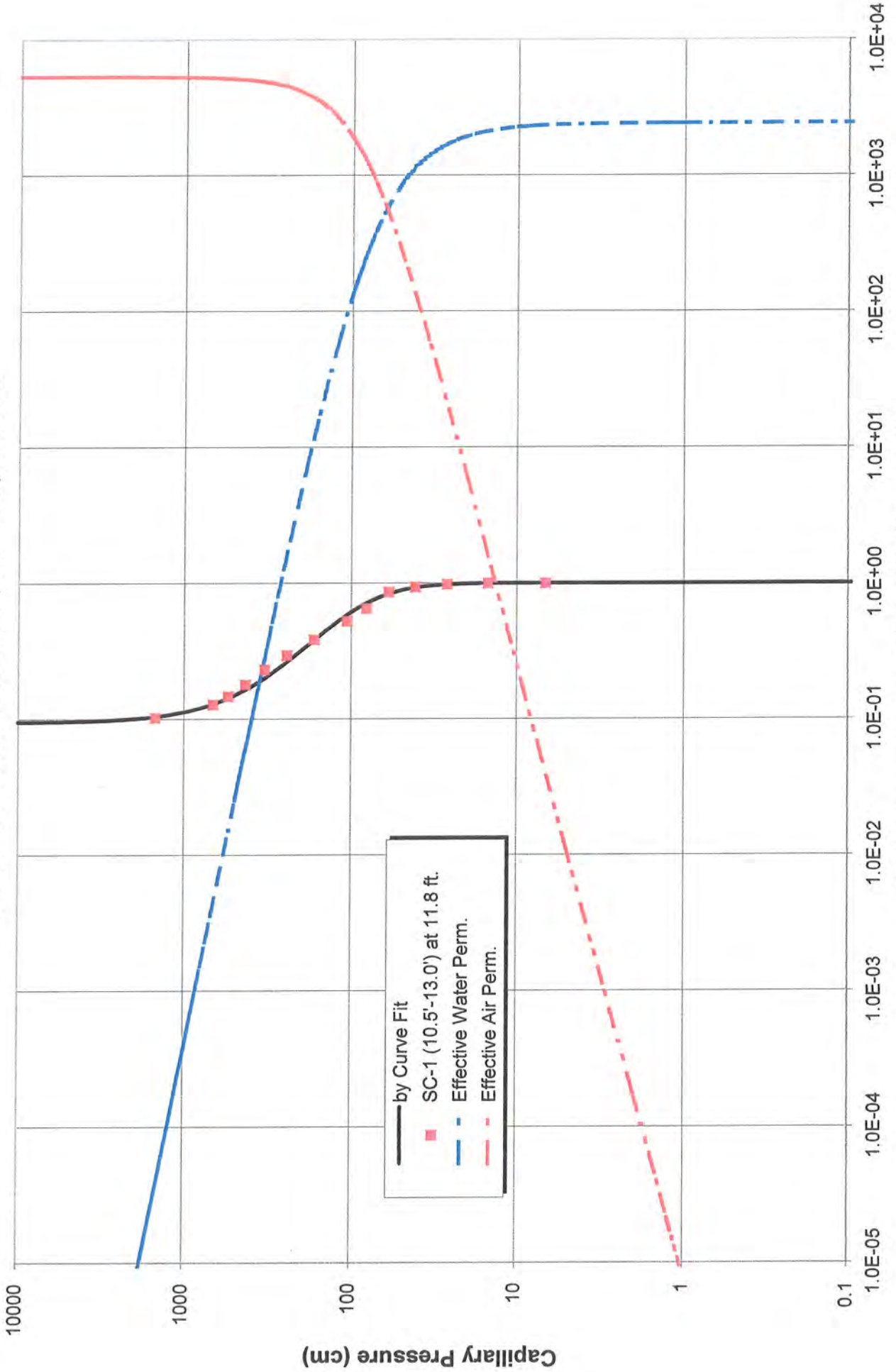
PTS File No: 38090
 Client: Shaw Environmental

CAPILLARY CURVE FIT: SC-1 (10.5'-13.0') at 11.8 ft.



Notes: The residual saturation is estimated by visual inspection of the data. An iterative solver is then used to fit the van Genuchten alpha and n to the data.

CAPILLARY CURVE FIT: SC-1 (10.5'-13.0') at 11.8 ft.



Volumetric Moisture or Effective Permeability

PTS File No: 38090
 Client: Shaw Environmental

PHYSICAL PROPERTIES DATA - AIR/WATER CAPILLARY PRESSURE

(ASTM D6836; Centrifugal Method: air displacing water)

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000

| Capillary Pressure | | Height Above Water Table, ft | Sample ID | |
|--------------------|----------|------------------------------------|---------------------------------|---------------------------|
| | | | SC-2 (15.0'-17.5') at 15.95 ft. | |
| psi | cm water | | Saturation, % pore volume | Moisture, % dry weight |
| 0.000 | 0.00 | 0.000 | 100.0 | 21.2 |
| 0.090 | 6.35 | 0.209 | 100.0 | 21.2 |
| 0.203 | 14.3 | 0.470 | 100.0 | 21.2 |
| 0.361 | 25.4 | 0.836 | 98.4 | 20.9 |
| 0.564 | 39.7 | 1.31 | 95.2 | 20.2 |
| 0.812 | 57.1 | 1.88 | 89.7 | 19.1 |
| 1.11 | 77.7 | 2.56 | 78.6 | 16.7 |
| 1.44 | 102 | 3.34 | 61.9 | 13.2 |
| 2.26 | 159 | 5.22 | 44.4 | 9.4 |
| 3.25 | 228 | 7.52 | 34.1 | 7.3 |
| 4.42 | 311 | 10.2 | 27.0 | 5.7 |
| 5.78 | 406 | 13.4 | 22.2 | 4.7 |
| 7.31 | 514 | 16.9 | 19.0 | 4.1 |
| 9.03 | 635 | 20.9 | 16.7 | 3.5 |
| 20.3 | 1428 | 47.0 | 12.7 | 2.7 |

CAPILLARY PRESSURE
Centrifugal Method
Air Displacing Water System - ASTM D6836

Project Name: Port of Tacoma
Project No: 111487 01000000

Sample ID: SC-2-15.0'-17.5'
Depth, ft: 15.95

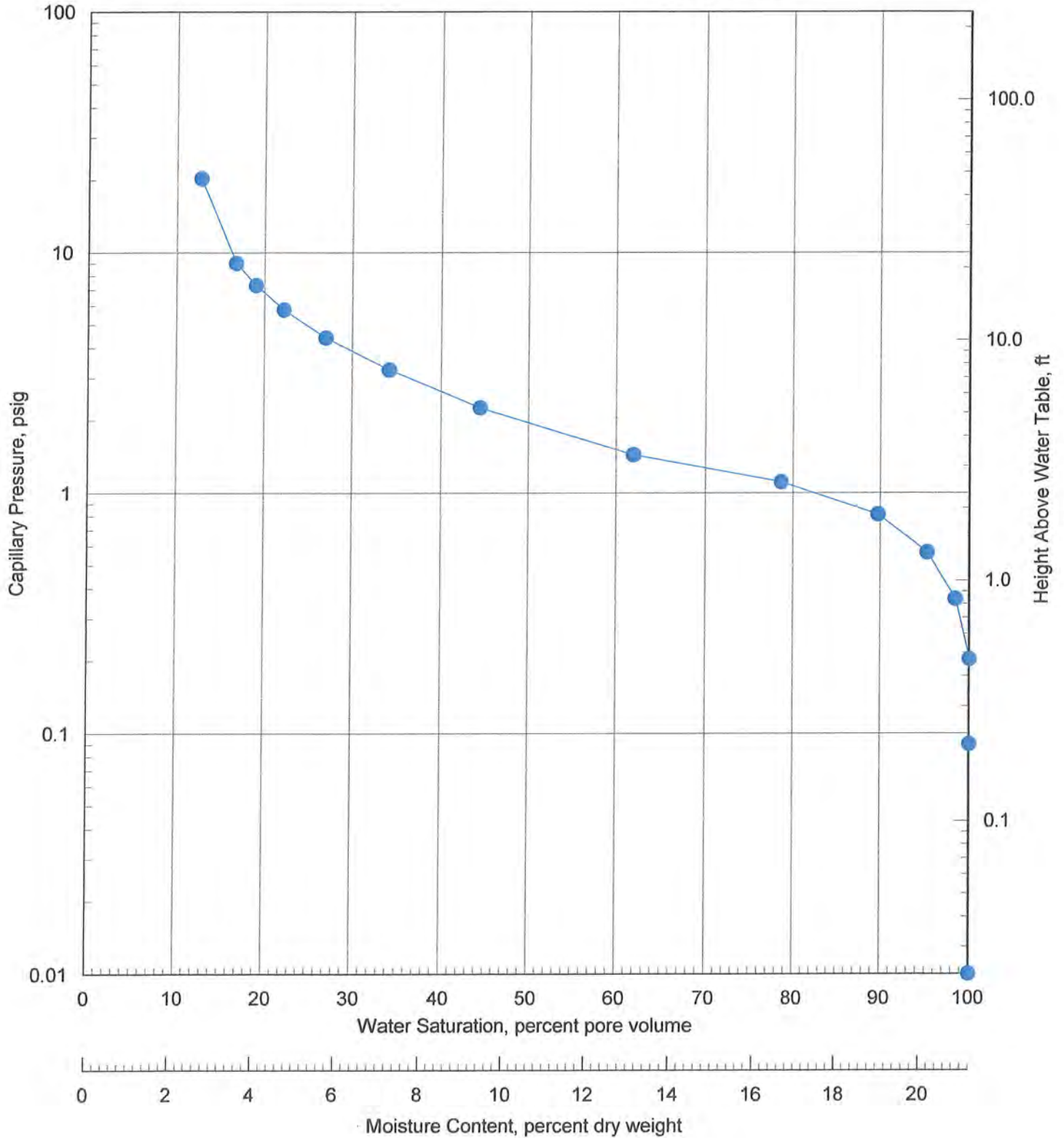


TABLE 1

**SOIL MOISTURE RETENTION CURVE FITTING FOR QUANTIFYING
 THE HYDRAULIC FUNCTIONS OF UNSATURATED SOILS**

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-2 (15.0'-17.5') at 15.95 ft.

van Genuchten Parameters

| | |
|-----------------|-----------|
| alpha (1/cm) | 1.046E-02 |
| n | 2.516 |
| residual water | 0.110 |
| total water | 1.000 |
| m | 0.603 |
| Water Perm (mD) | 2178 |
| Air Perm (mD) | 4841 |
| R ² | 0.99781 |

Notes: alpha, n, and residual saturation are capillary parameters defined by the following equation (van Genuchten, 1980), with $m = 1 - 1/n$, S = water saturation, and h = capillary head (cm):

$$S_r + [(S_s - S_r) / (1 + (\alpha h)^n)^m]$$

Laboratory Measured Data

| Capillary Head (cm) | SC-2 (15.0'-17.5') at 15.95 ft. Volumetric Moisture | Predicted Moisture by Curve Fit | RPD (%) |
|---------------------|---|---------------------------------|---------|
| 0.00 | 1.000 | 1.000 | 0.00% |
| 6.35 | 1.000 | 0.999 | -0.06% |
| 14.28 | 1.000 | 0.996 | -0.45% |
| 25.38 | 0.984 | 0.981 | -0.27% |
| 39.66 | 0.952 | 0.946 | -0.66% |
| 57.11 | 0.897 | 0.879 | -1.96% |
| 77.74 | 0.786 | 0.782 | -0.49% |
| 101.53 | 0.619 | 0.669 | 8.06% |
| 158.65 | 0.444 | 0.466 | 4.82% |
| 228.45 | 0.341 | 0.333 | -2.47% |
| 310.95 | 0.270 | 0.254 | -5.72% |
| 406.13 | 0.222 | 0.208 | -6.51% |
| 514.01 | 0.190 | 0.179 | -6.09% |
| 634.58 | 0.167 | 0.160 | -3.87% |
| 1427.81 | 0.127 | 0.125 | -1.76% |

TABLE 2

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-2 (15.0'-17.5') at 15.95 ft.

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

| Capillary Head (cm) | (van Genuchten, 1980) Volumetric Moisture | (Mualem, 1976) Effective Water Perm. | (Mualem, 1976) Effective Air Perm. |
|---------------------|--|---|---------------------------------------|
| 0.001 | 1.000 | 2.18E+03 | 1.62E-18 |
| 0.02 | 1.000 | 2.18E+03 | 6.16E-13 |
| 0.04 | 1.000 | 2.18E+03 | 1.21E-11 |
| 0.05 | 1.000 | 2.18E+03 | 3.14E-11 |
| 0.08 | 1.000 | 2.18E+03 | 2.36E-10 |
| 0.09 | 1.000 | 2.18E+03 | 3.91E-10 |
| 1 | 1.000 | 2.17E+03 | 1.20E-05 |
| 1.2 | 1.000 | 2.17E+03 | 2.62E-05 |
| 1.3 | 1.000 | 2.17E+03 | 3.69E-05 |
| 1.5 | 1.000 | 2.17E+03 | 6.83E-05 |
| 2 | 1.000 | 2.17E+03 | 2.35E-04 |
| 3 | 1.000 | 2.16E+03 | 1.34E-03 |
| 5 | 1.000 | 2.13E+03 | 1.19E-02 |
| 7 | 0.999 | 2.10E+03 | 5.05E-02 |
| 9 | 0.999 | 2.06E+03 | 1.48E-01 |
| 11 | 0.998 | 2.01E+03 | 3.50E-01 |
| 15 | 0.995 | 1.92E+03 | 1.31E+00 |
| 20 | 0.990 | 1.78E+03 | 4.43E+00 |
| 25 | 0.982 | 1.64E+03 | 1.13E+01 |
| 30 | 0.972 | 1.49E+03 | 2.39E+01 |
| 35 | 0.960 | 1.33E+03 | 4.46E+01 |
| 40 | 0.945 | 1.19E+03 | 7.55E+01 |
| 45 | 0.928 | 1.04E+03 | 1.18E+02 |
| 50 | 0.909 | 9.10E+02 | 1.75E+02 |
| 60 | 0.866 | 6.77E+02 | 3.30E+02 |
| 70 | 0.820 | 4.92E+02 | 5.39E+02 |
| 75 | 0.795 | 4.17E+02 | 6.60E+02 |
| 80 | 0.771 | 3.52E+02 | 7.89E+02 |
| 85 | 0.747 | 2.97E+02 | 9.26E+02 |
| 90 | 0.722 | 2.50E+02 | 1.07E+03 |
| 95 | 0.699 | 2.10E+02 | 1.21E+03 |
| 100 | 0.676 | 1.77E+02 | 1.35E+03 |
| 120 | 0.591 | 8.95E+01 | 1.91E+03 |
| 140 | 0.520 | 4.66E+01 | 2.40E+03 |
| 160 | 0.462 | 2.52E+01 | 2.81E+03 |
| 180 | 0.415 | 1.42E+01 | 3.14E+03 |
| 200 | 0.376 | 8.34E+00 | 3.40E+03 |
| 220 | 0.345 | 5.08E+00 | 3.61E+03 |
| 240 | 0.318 | 3.20E+00 | 3.78E+03 |
| 260 | 0.296 | 2.08E+00 | 3.92E+03 |

TABLE 2

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-2 (15.0'-17.5') at 15.95 ft.

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

| Capillary Head (cm) | (van Genuchten, 1980) Volumetric Moisture | (Mualem, 1976) Effective Water Perm. | (Mualem, 1976) Effective Air Perm. |
|---------------------|--|---|---------------------------------------|
| 280 | 0.278 | 1.39E+00 | 4.03E+03 |
| 300 | 0.262 | 9.48E-01 | 4.13E+03 |
| 320 | 0.249 | 6.62E-01 | 4.21E+03 |
| 340 | 0.237 | 4.72E-01 | 4.27E+03 |
| 360 | 0.227 | 3.42E-01 | 4.33E+03 |
| 380 | 0.218 | 2.53E-01 | 4.37E+03 |
| 400 | 0.210 | 1.89E-01 | 4.42E+03 |
| 420 | 0.203 | 1.43E-01 | 4.45E+03 |
| 440 | 0.197 | 1.10E-01 | 4.48E+03 |
| 460 | 0.191 | 8.54E-02 | 4.51E+03 |
| 480 | 0.186 | 6.70E-02 | 4.53E+03 |
| 500 | 0.182 | 5.31E-02 | 4.56E+03 |
| 550 | 0.172 | 3.07E-02 | 4.60E+03 |
| 600 | 0.165 | 1.87E-02 | 4.64E+03 |
| 650 | 0.158 | 1.18E-02 | 4.66E+03 |
| 700 | 0.153 | 7.69E-03 | 4.68E+03 |
| 750 | 0.149 | 5.17E-03 | 4.70E+03 |
| 800 | 0.145 | 3.56E-03 | 4.72E+03 |
| 850 | 0.142 | 2.51E-03 | 4.73E+03 |
| 900 | 0.140 | 1.81E-03 | 4.74E+03 |
| 950 | 0.137 | 1.32E-03 | 4.75E+03 |
| 1000 | 0.135 | 9.82E-04 | 4.76E+03 |
| 1050 | 0.133 | 7.41E-04 | 4.76E+03 |
| 1100 | 0.132 | 5.66E-04 | 4.77E+03 |
| 1150 | 0.130 | 4.38E-04 | 4.77E+03 |
| 1200 | 0.129 | 3.42E-04 | 4.78E+03 |
| 1250 | 0.128 | 2.70E-04 | 4.78E+03 |
| 1300 | 0.127 | 2.16E-04 | 4.79E+03 |
| 1350 | 0.126 | 1.73E-04 | 4.79E+03 |
| 1400 | 0.125 | 1.40E-04 | 4.79E+03 |
| 1450 | 0.124 | 1.15E-04 | 4.80E+03 |
| 1500 | 0.124 | 9.42E-05 | 4.80E+03 |
| 1550 | 0.123 | 7.79E-05 | 4.80E+03 |
| 1600 | 0.122 | 6.48E-05 | 4.80E+03 |
| 1650 | 0.122 | 5.43E-05 | 4.80E+03 |
| 1700 | 0.121 | 4.57E-05 | 4.81E+03 |
| 1750 | 0.121 | 3.86E-05 | 4.81E+03 |
| 1800 | 0.120 | 3.28E-05 | 4.81E+03 |
| 1850 | 0.120 | 2.80E-05 | 4.81E+03 |
| 1900 | 0.120 | 2.40E-05 | 4.81E+03 |

TABLE 2

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

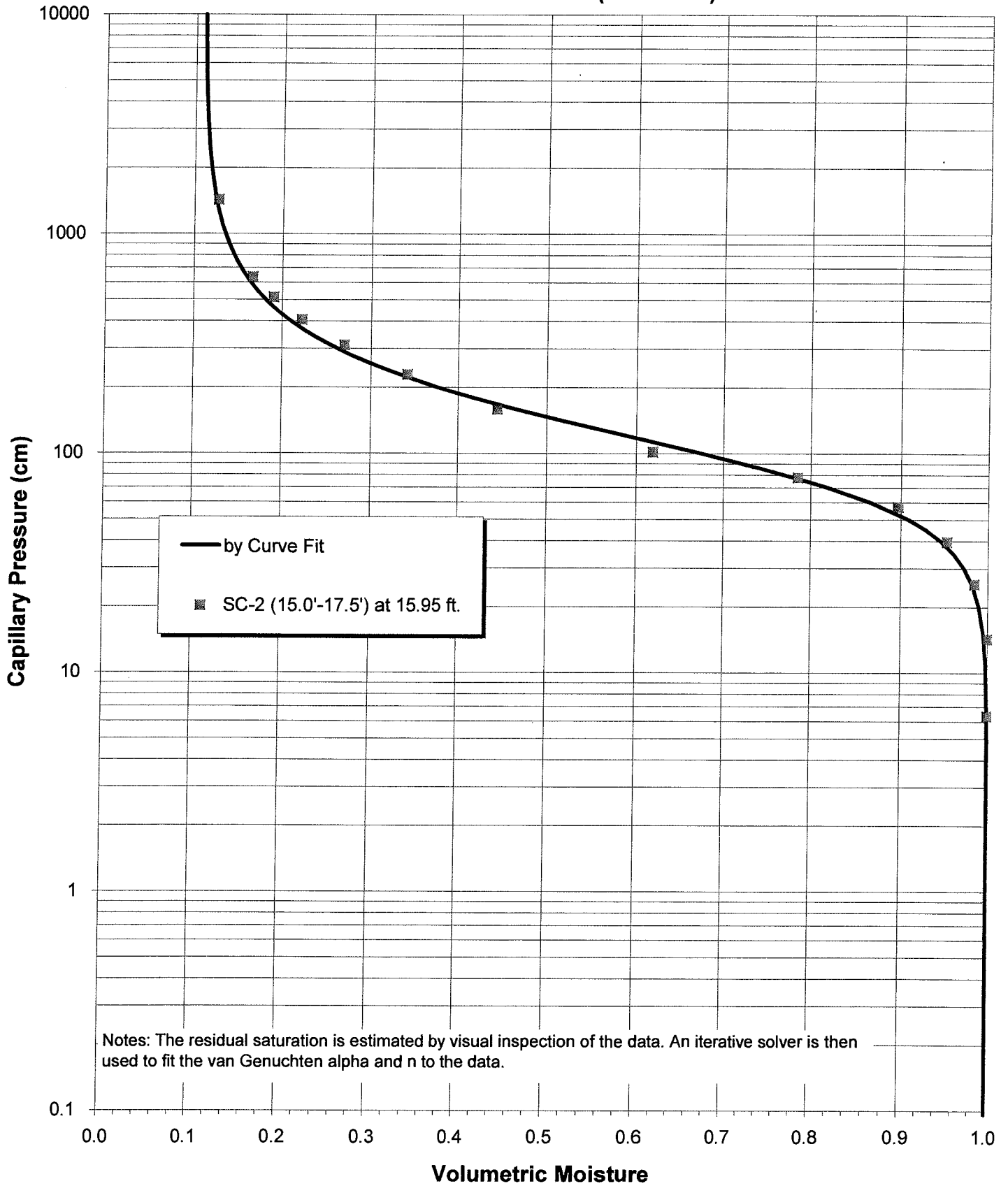
PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-2 (15.0'-17.5') at 15.95 ft.

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

| Capillary Head (cm) | (van Genuchten, 1980) Volumetric Moisture | (Mualem, 1976) Effective Water Perm. | (Mualem, 1976) Effective Air Perm. |
|---------------------|--|---|---------------------------------------|
| 1950 | 0.119 | 2.06E-05 | 4.81E+03 |
| 2000 | 0.119 | 1.78E-05 | 4.81E+03 |
| 2200 | 0.118 | 1.03E-05 | 4.82E+03 |
| 2400 | 0.117 | 6.20E-06 | 4.82E+03 |
| 2600 | 0.116 | 3.90E-06 | 4.82E+03 |
| 2800 | 0.115 | 2.54E-06 | 4.83E+03 |
| 3000 | 0.115 | 1.70E-06 | 4.83E+03 |
| 3200 | 0.114 | 1.17E-06 | 4.83E+03 |
| 3400 | 0.114 | 8.26E-07 | 4.83E+03 |
| 3600 | 0.114 | 5.93E-07 | 4.83E+03 |
| 3800 | 0.113 | 4.34E-07 | 4.83E+03 |
| 4000 | 0.113 | 3.22E-07 | 4.83E+03 |
| 4200 | 0.113 | 2.43E-07 | 4.83E+03 |
| 4400 | 0.113 | 1.86E-07 | 4.83E+03 |
| 4600 | 0.113 | 1.44E-07 | 4.83E+03 |
| 4800 | 0.112 | 1.12E-07 | 4.83E+03 |
| 5000 | 0.112 | 8.86E-08 | 4.84E+03 |
| 5200 | 0.112 | 7.06E-08 | 4.84E+03 |
| 5400 | 0.112 | 5.67E-08 | 4.84E+03 |
| 5600 | 0.112 | 4.60E-08 | 4.84E+03 |
| 5800 | 0.112 | 3.75E-08 | 4.84E+03 |
| 6000 | 0.112 | 3.08E-08 | 4.84E+03 |
| 6500 | 0.111 | 1.94E-08 | 4.84E+03 |
| 7000 | 0.111 | 1.26E-08 | 4.84E+03 |
| 7500 | 0.111 | 8.47E-09 | 4.84E+03 |
| 8000 | 0.111 | 5.83E-09 | 4.84E+03 |
| 8500 | 0.111 | 4.10E-09 | 4.84E+03 |
| 9000 | 0.111 | 2.95E-09 | 4.84E+03 |
| 9500 | 0.111 | 2.15E-09 | 4.84E+03 |
| 10000 | 0.111 | 1.60E-09 | 4.84E+03 |

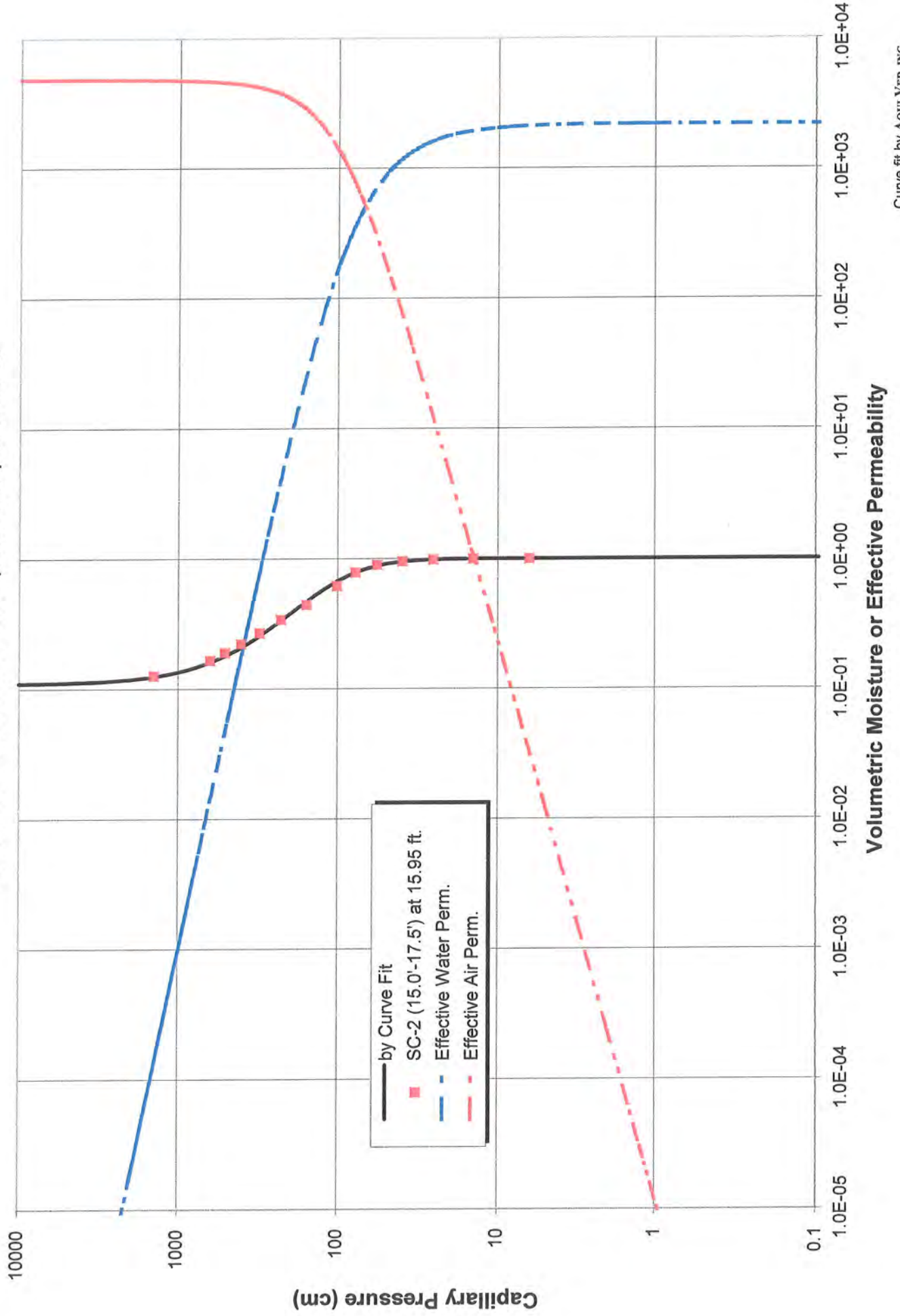
PTS File No: 38090
 Client: Shaw Environmental

CAPILLARY CURVE FIT: SC-2 (15.0'-17.5') at 15.95 ft.



Notes: The residual saturation is estimated by visual inspection of the data. An iterative solver is then used to fit the van Genuchten alpha and n to the data.

CAPILLARY CURVE FIT: SC-2 (15.0'-17.5') at 15.95 ft.



PTS File No: 38090
 Client: Shaw Environmental

PHYSICAL PROPERTIES DATA - AIR/WATER CAPILLARY PRESSURE

(ASTM D6836; Centrifugal Method: air displacing water)

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000

| Capillary Pressure | | Height Above Water Table, ft | Sample ID | |
|--------------------|----------|------------------------------------|---------------------------------|---------------------------|
| | | | SC-2 (15.0'-17.5') at 16.75 ft. | |
| psi | cm water | | Saturation, % pore volume | Moisture, % dry weight |
| 0.000 | 0.00 | 0.000 | 100.0 | 24.9 |
| 0.093 | 6.57 | 0.216 | 100.0 | 24.9 |
| 0.210 | 14.8 | 0.487 | 100.0 | 24.9 |
| 0.374 | 26.3 | 0.865 | 97.8 | 24.4 |
| 0.584 | 41.1 | 1.35 | 94.2 | 23.5 |
| 0.841 | 59.1 | 1.95 | 87.0 | 21.7 |
| 1.14 | 80.5 | 2.65 | 62.5 | 15.6 |
| 1.50 | 105 | 3.46 | 45.2 | 11.3 |
| 2.34 | 164 | 5.41 | 30.7 | 7.7 |
| 3.36 | 237 | 7.79 | 22.8 | 5.7 |
| 4.58 | 322 | 10.6 | 17.7 | 4.4 |
| 5.98 | 420 | 13.8 | 14.1 | 3.5 |
| 7.57 | 532 | 17.5 | 12.0 | 3.0 |
| 9.34 | 657 | 21.6 | 10.8 | 2.7 |
| 21.0 | 1478 | 48.7 | 9.1 | 2.3 |

CAPILLARY PRESSURE
Centrifugal Method
Air Displacing Water System - ASTM D6836

Project Name: Port of Tacoma
Project No: 111487 01000000

Sample ID: SC-2-15.0'-17.5'
Depth, ft: 16.75

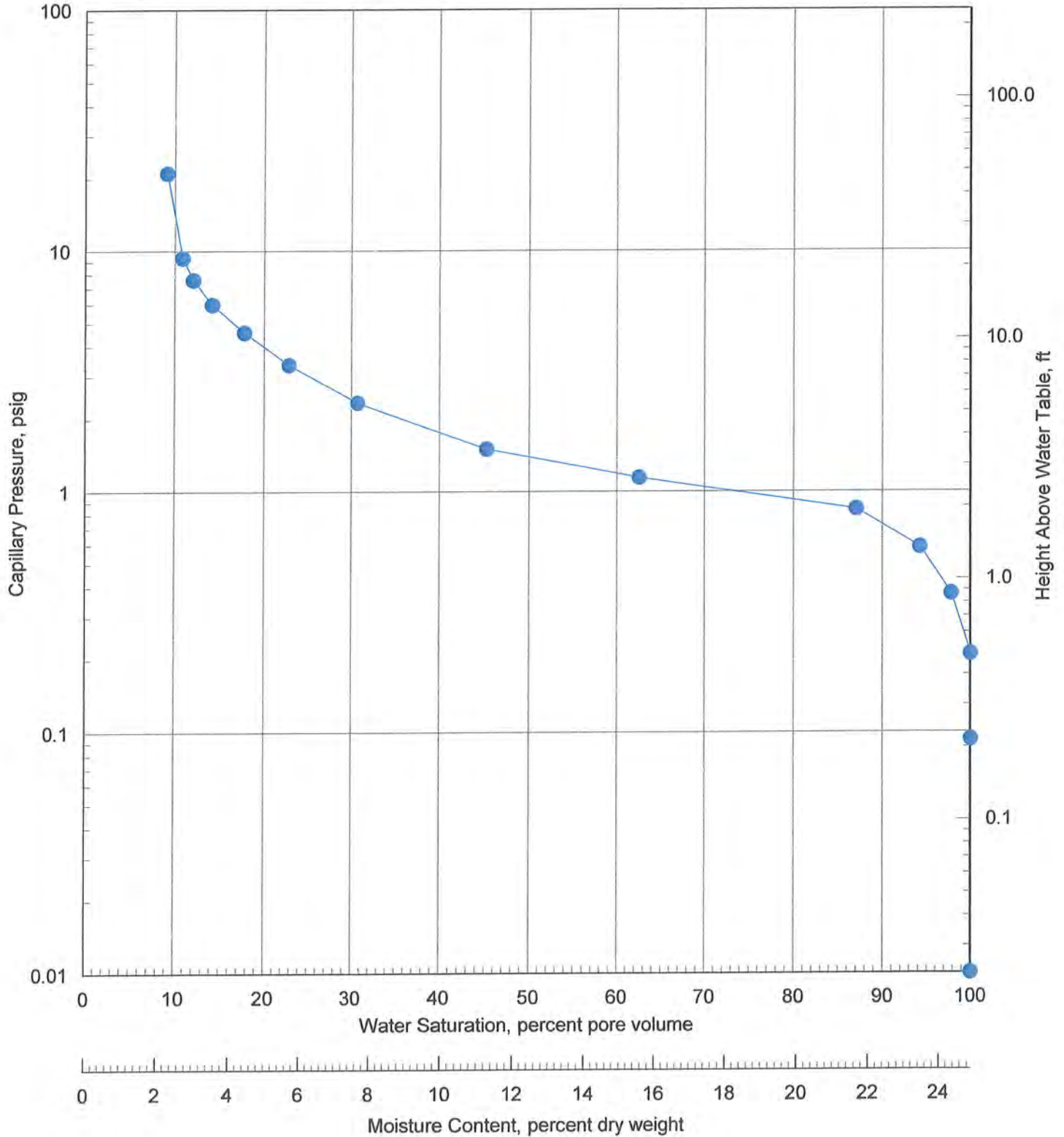


TABLE 1

**SOIL MOISTURE RETENTION CURVE FITTING FOR QUANTIFYING
 THE HYDRAULIC FUNCTIONS OF UNSATURATED SOILS**

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-2 (15.0'-17.5') at 16.75 ft.

van Genuchten Parameters

| | |
|-----------------|-----------|
| alpha (1/cm) | 1.266E-02 |
| n | 3.172 |
| residual water | 0.091 |
| total water | 1.000 |
| m | 0.685 |
| Water Perm (mD) | 3858 |
| Air Perm (mD) | 6139 |
| R ² | 0.99608 |

Notes: alpha, n, and residual saturation are capillary parameters defined by the following equation (van Genuchten, 1980), with m = 1-1/n, S = water saturation, and h = capillary head (cm):

$$S_r + [(S_s - S_r) / (1 + (\alpha h)^n)^m]$$

Laboratory Measured Data

| Capillary Head (cm) | SC-2 (15.0'-17.5') at 16.75 ft. Volumetric Moisture | Predicted Moisture by Curve Fit | RPD (%) |
|---------------------|---|---------------------------------|---------|
| 0.00 | 1.000 | 1.000 | 0.00% |
| 6.57 | 1.000 | 1.000 | -0.02% |
| 14.78 | 1.000 | 0.997 | -0.30% |
| 26.28 | 0.978 | 0.982 | 0.32% |
| 41.06 | 0.942 | 0.929 | -1.37% |
| 59.13 | 0.870 | 0.813 | -6.52% |
| 80.48 | 0.625 | 0.645 | 3.26% |
| 105.12 | 0.452 | 0.479 | 5.96% |
| 164.25 | 0.307 | 0.265 | -13.78% |
| 236.52 | 0.228 | 0.173 | -23.98% |
| 321.92 | 0.177 | 0.134 | -24.68% |
| 420.47 | 0.141 | 0.115 | -18.67% |
| 532.16 | 0.120 | 0.105 | -11.98% |
| 656.99 | 0.108 | 0.100 | -7.48% |
| 1478.22 | 0.091 | 0.093 | 1.83% |

TABLE 2

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-2 (15.0'-17.5') at 16.75 ft.

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

| Capillary Head (cm) | (van Genuchten, 1980) Volumetric Moisture | (Mualem, 1976) Effective Water Perm. | (Mualem, 1976) Effective Air Perm. |
|---------------------|--|---|---------------------------------------|
| 0.001 | 1.000 | 3.86E+03 | 5.84E-26 |
| 0.02 | 1.000 | 3.86E+03 | 2.41E-18 |
| 0.04 | 1.000 | 3.86E+03 | 1.47E-16 |
| 0.05 | 1.000 | 3.86E+03 | 5.51E-16 |
| 0.08 | 1.000 | 3.86E+03 | 8.93E-15 |
| 0.09 | 1.000 | 3.86E+03 | 1.80E-14 |
| 1 | 1.000 | 3.86E+03 | 2.85E-08 |
| 1.2 | 1.000 | 3.86E+03 | 8.39E-08 |
| 1.3 | 1.000 | 3.86E+03 | 1.35E-07 |
| 1.5 | 1.000 | 3.86E+03 | 3.15E-07 |
| 2 | 1.000 | 3.86E+03 | 1.74E-06 |
| 3 | 1.000 | 3.85E+03 | 1.92E-05 |
| 5 | 1.000 | 3.84E+03 | 3.97E-04 |
| 7 | 1.000 | 3.82E+03 | 2.92E-03 |
| 9 | 0.999 | 3.79E+03 | 1.29E-02 |
| 11 | 0.999 | 3.75E+03 | 4.24E-02 |
| 15 | 0.997 | 3.65E+03 | 2.65E-01 |
| 20 | 0.992 | 3.47E+03 | 1.44E+00 |
| 25 | 0.984 | 3.23E+03 | 5.28E+00 |
| 30 | 0.972 | 2.95E+03 | 1.50E+01 |
| 35 | 0.956 | 2.64E+03 | 3.57E+01 |
| 40 | 0.934 | 2.31E+03 | 7.38E+01 |
| 45 | 0.908 | 1.98E+03 | 1.37E+02 |
| 50 | 0.878 | 1.66E+03 | 2.31E+02 |
| 60 | 0.807 | 1.10E+03 | 5.31E+02 |
| 70 | 0.728 | 6.87E+02 | 9.75E+02 |
| 75 | 0.688 | 5.34E+02 | 1.24E+03 |
| 80 | 0.649 | 4.13E+02 | 1.52E+03 |
| 85 | 0.611 | 3.17E+02 | 1.80E+03 |
| 90 | 0.575 | 2.43E+02 | 2.09E+03 |
| 95 | 0.541 | 1.86E+02 | 2.38E+03 |
| 100 | 0.509 | 1.42E+02 | 2.65E+03 |
| 120 | 0.403 | 5.02E+01 | 3.60E+03 |
| 140 | 0.328 | 1.90E+01 | 4.29E+03 |
| 160 | 0.274 | 7.79E+00 | 4.77E+03 |
| 180 | 0.236 | 3.45E+00 | 5.11E+03 |
| 200 | 0.208 | 1.64E+00 | 5.34E+03 |
| 220 | 0.187 | 8.32E-01 | 5.51E+03 |
| 240 | 0.171 | 4.44E-01 | 5.63E+03 |
| 260 | 0.158 | 2.48E-01 | 5.73E+03 |

TABLE 2

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-2 (15.0'-17.5') at 16.75 ft.

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

| Capillary Head (cm) | (van Genuchten, 1980) Volumetric Moisture | (Mualem, 1976) Effective Water Perm. | (Mualem, 1976) Effective Air Perm. |
|---------------------|--|---|---------------------------------------|
| 280 | 0.149 | 1.44E-01 | 5.80E+03 |
| 300 | 0.141 | 8.71E-02 | 5.85E+03 |
| 320 | 0.134 | 5.42E-02 | 5.90E+03 |
| 340 | 0.129 | 3.47E-02 | 5.93E+03 |
| 360 | 0.125 | 2.28E-02 | 5.96E+03 |
| 380 | 0.121 | 1.53E-02 | 5.98E+03 |
| 400 | 0.118 | 1.05E-02 | 6.00E+03 |
| 420 | 0.115 | 7.29E-03 | 6.02E+03 |
| 440 | 0.113 | 5.17E-03 | 6.03E+03 |
| 460 | 0.111 | 3.72E-03 | 6.04E+03 |
| 480 | 0.109 | 2.71E-03 | 6.05E+03 |
| 500 | 0.108 | 2.01E-03 | 6.06E+03 |
| 550 | 0.104 | 9.89E-04 | 6.08E+03 |
| 600 | 0.102 | 5.19E-04 | 6.09E+03 |
| 650 | 0.100 | 2.87E-04 | 6.10E+03 |
| 700 | 0.099 | 1.65E-04 | 6.10E+03 |
| 750 | 0.098 | 9.90E-05 | 6.11E+03 |
| 800 | 0.097 | 6.13E-05 | 6.11E+03 |
| 850 | 0.096 | 3.91E-05 | 6.12E+03 |
| 900 | 0.096 | 2.56E-05 | 6.12E+03 |
| 950 | 0.095 | 1.71E-05 | 6.12E+03 |
| 1000 | 0.095 | 1.17E-05 | 6.12E+03 |
| 1050 | 0.094 | 8.14E-06 | 6.13E+03 |
| 1100 | 0.094 | 5.76E-06 | 6.13E+03 |
| 1150 | 0.094 | 4.14E-06 | 6.13E+03 |
| 1200 | 0.093 | 3.02E-06 | 6.13E+03 |
| 1250 | 0.093 | 2.23E-06 | 6.13E+03 |
| 1300 | 0.093 | 1.67E-06 | 6.13E+03 |
| 1350 | 0.093 | 1.26E-06 | 6.13E+03 |
| 1400 | 0.093 | 9.61E-07 | 6.13E+03 |
| 1450 | 0.093 | 7.40E-07 | 6.13E+03 |
| 1500 | 0.093 | 5.76E-07 | 6.13E+03 |
| 1550 | 0.092 | 4.51E-07 | 6.13E+03 |
| 1600 | 0.092 | 3.56E-07 | 6.13E+03 |
| 1650 | 0.092 | 2.84E-07 | 6.13E+03 |
| 1700 | 0.092 | 2.27E-07 | 6.13E+03 |
| 1750 | 0.092 | 1.83E-07 | 6.13E+03 |
| 1800 | 0.092 | 1.49E-07 | 6.13E+03 |
| 1850 | 0.092 | 1.21E-07 | 6.14E+03 |
| 1900 | 0.092 | 9.94E-08 | 6.14E+03 |

TABLE 2

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

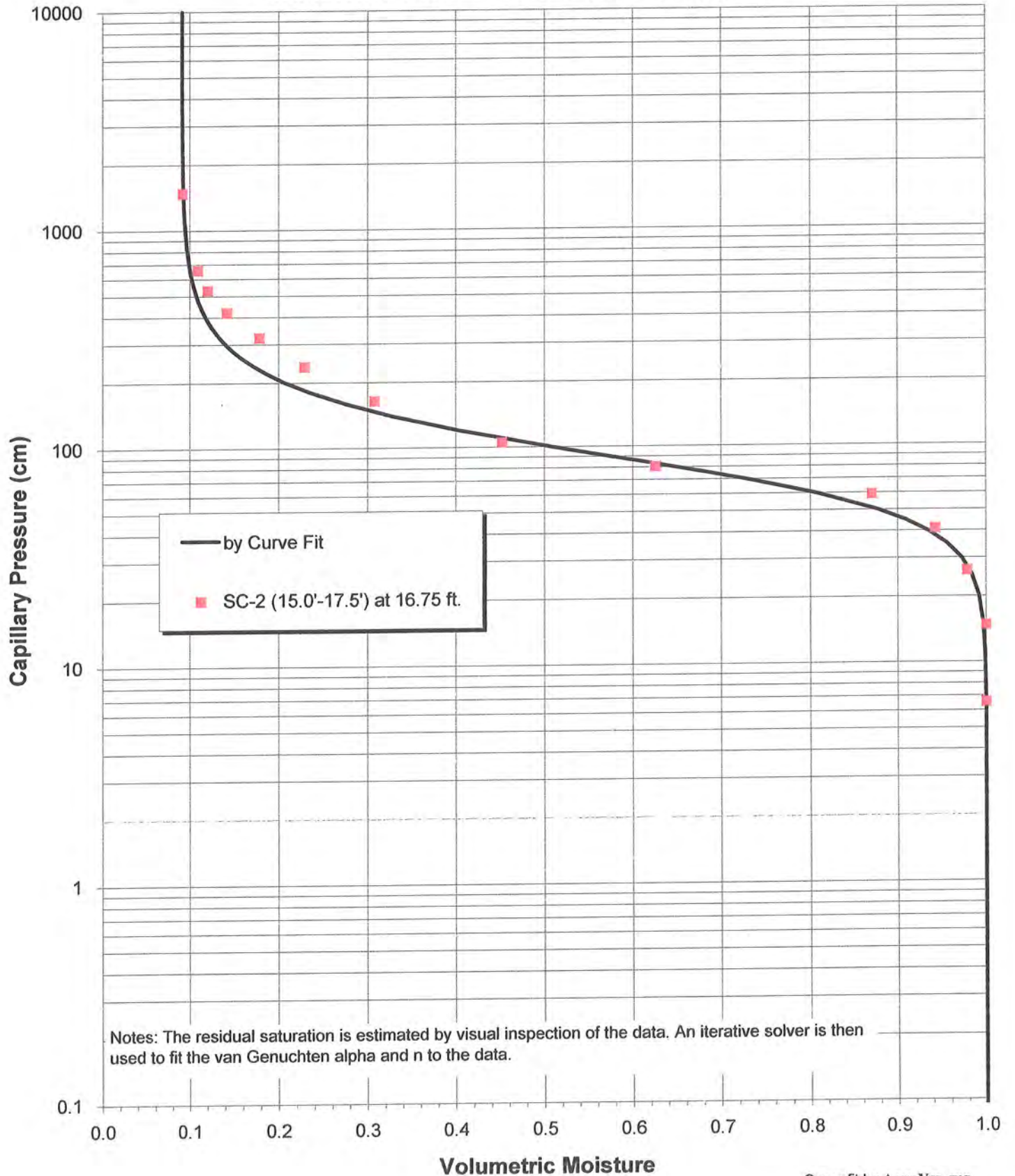
PROJECT NAME: Port of Tacoma
 PROJECT NO: 111487 01000000
 SAMPLE ID: SC-2 (15.0'-17.5') at 16.75 ft.

FUNCTIONAL RELATIONSHIPS BASED ON DERIVED CAPILLARY PARAMETERS

| Capillary Head (cm) | (van Genuchten, 1980) Volumetric Moisture | (Mualem, 1976) Effective Water Perm. | (Mualem, 1976) Effective Air Perm. |
|---------------------|--|---|---------------------------------------|
| 1950 | 0.092 | 8.20E-08 | 6.14E+03 |
| 2000 | 0.092 | 6.79E-08 | 6.14E+03 |
| 2200 | 0.092 | 3.35E-08 | 6.14E+03 |
| 2400 | 0.092 | 1.75E-08 | 6.14E+03 |
| 2600 | 0.091 | 9.67E-09 | 6.14E+03 |
| 2800 | 0.091 | 5.58E-09 | 6.14E+03 |
| 3000 | 0.091 | 3.34E-09 | 6.14E+03 |
| 3200 | 0.091 | 2.07E-09 | 6.14E+03 |
| 3400 | 0.091 | 1.32E-09 | 6.14E+03 |
| 3600 | 0.091 | 8.62E-10 | 6.14E+03 |
| 3800 | 0.091 | 5.77E-10 | 6.14E+03 |
| 4000 | 0.091 | 3.94E-10 | 6.14E+03 |
| 4200 | 0.091 | 2.74E-10 | 6.14E+03 |
| 4400 | 0.091 | 1.94E-10 | 6.14E+03 |
| 4600 | 0.091 | 1.40E-10 | 6.14E+03 |
| 4800 | 0.091 | 1.02E-10 | 6.14E+03 |
| 5000 | 0.091 | 7.51E-11 | 6.14E+03 |
| 5200 | 0.091 | 5.61E-11 | 6.14E+03 |
| 5400 | 0.091 | 4.24E-11 | 6.14E+03 |
| 5600 | 0.091 | 3.24E-11 | 6.14E+03 |
| 5800 | 0.091 | 2.49E-11 | 6.14E+03 |
| 6000 | 0.091 | 1.94E-11 | 6.14E+03 |
| 6500 | 0.091 | 1.07E-11 | 6.14E+03 |
| 7000 | 0.091 | 6.17E-12 | 6.14E+03 |
| 7500 | 0.091 | 3.69E-12 | 6.14E+03 |
| 8000 | 0.091 | 2.29E-12 | 6.14E+03 |
| 8500 | 0.091 | 1.46E-12 | 6.14E+03 |
| 9000 | 0.091 | 9.54E-13 | 6.14E+03 |
| 9500 | 0.091 | 6.38E-13 | 6.14E+03 |
| 10000 | 0.091 | 4.36E-13 | 6.14E+03 |

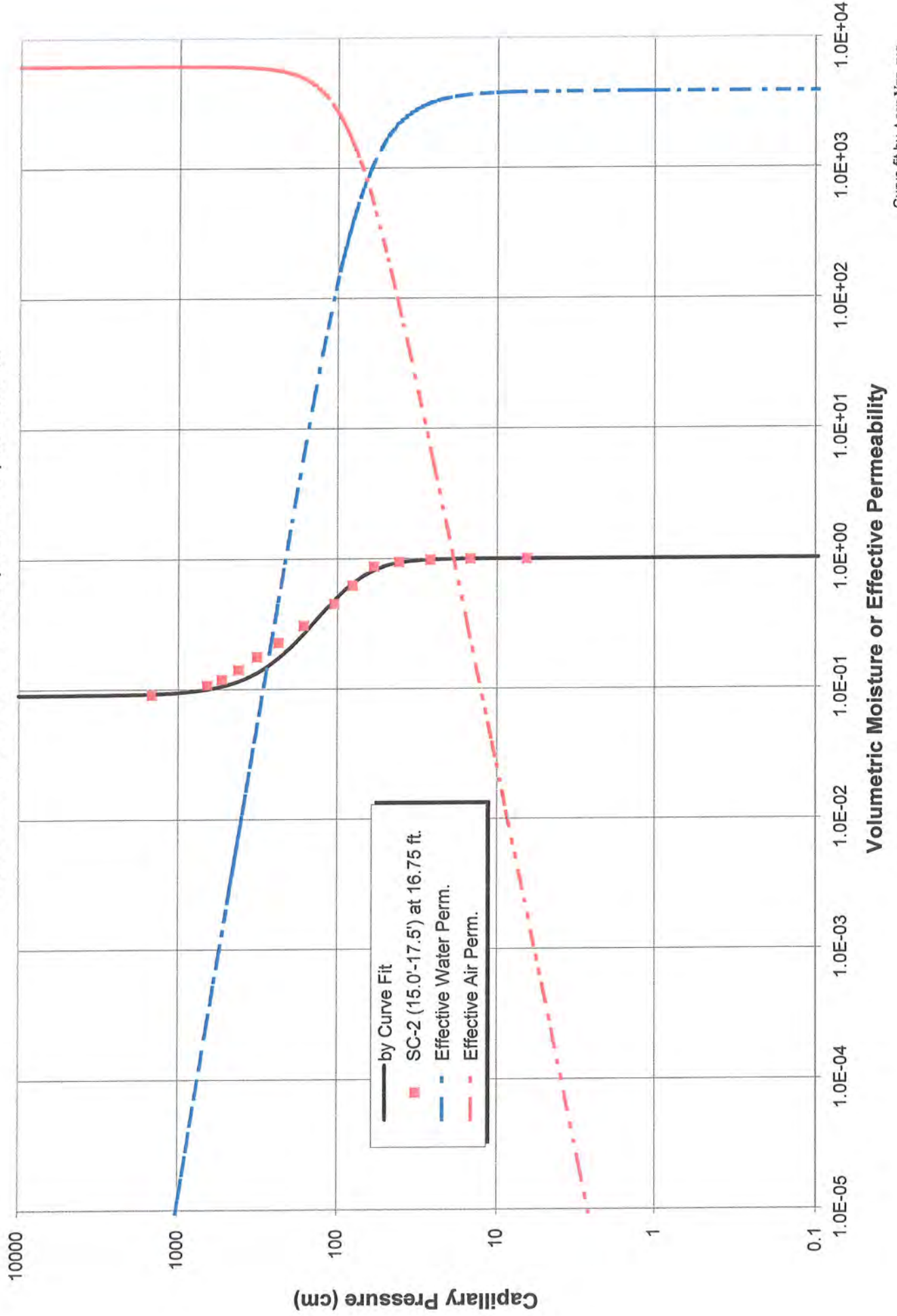
PTS File No: 38090
Client: Shaw Environmental

CAPILLARY CURVE FIT: SC-2 (15.0'-17.5') at 16.75 ft.



Notes: The residual saturation is estimated by visual inspection of the data. An iterative solver is then used to fit the van Genuchten alpha and n to the data.

CAPILLARY CURVE FIT: SC-2 (15.0'-17.5') at 16.75 ft.



PARTICLE SIZE SUMMARY
(METHODOLOGY: ASTM D422/D4464M)

PROJECT NAME: Port of Tacoma
PROJECT NO: 111487 01000000

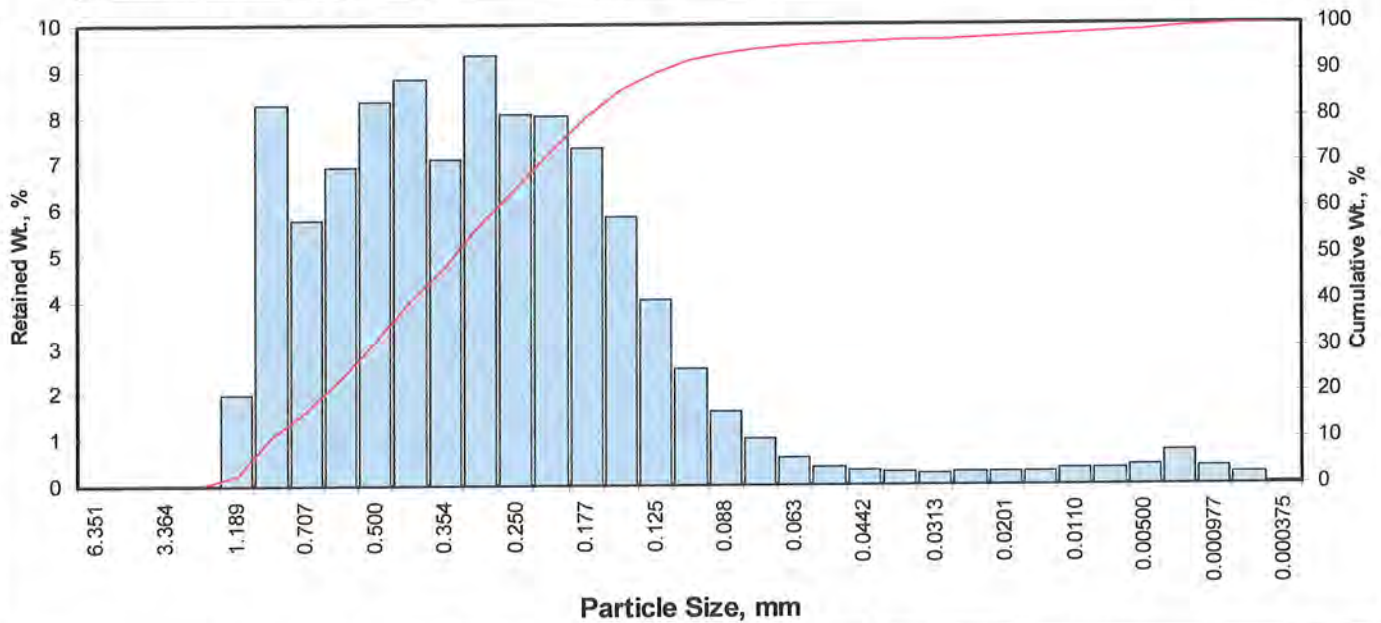
| Sample ID | Depth, ft. | Mean Grain Size Description (1) | Median Grain Size mm | Particle Size Distribution, wt. percent | | | | | Silt & Clay | |
|------------------|------------|---------------------------------|----------------------|---|-----------|--------|------|------|-------------|------|
| | | | | Gravel | Sand Size | | | Silt | | Clay |
| | | | | | Coarse | Medium | Fine | | | |
| SC-1-8'-10.5' | 8.9 | Fine sand | 0.335 | 0.00 | 40.06 | 54.75 | 3.80 | 1.39 | 5.19 | |
| SC-1-10.5'-13.0' | 11.65 | Fine sand | 0.215 | 0.00 | 15.20 | 75.59 | 7.24 | 1.97 | 9.21 | |
| SC-1-10.5'-13.0' | 12.2 | Fine sand | 0.348 | 0.00 | 41.22 | 53.86 | 3.67 | 1.25 | 4.92 | |
| SC-2-7.5'-10.0 | 8.7 | Medium sand | 1.061 | 2.43 | 27.92 | 19.71 | (2) | (2) | 9.61 | |
| SC-2-10.0'-12.5 | 10.7 | Coarse sand | 0.410 | 33.14 | 3.00 | 39.43 | (2) | (2) | 11.32 | |
| SC-2-15.0'-17.5' | 16.1 | Medium sand | 0.504 | 0.00 | 62.03 | 34.30 | 2.85 | 0.81 | 3.66 | |
| SC-2-15.0'-17.5' | 16.6 | Fine sand | 0.389 | 0.00 | 45.91 | 49.51 | 3.43 | 1.15 | 4.58 | |

(1) Based on Mean from Trask
(2) Mechanical sieve does not differentiate silt/clay fractions.

Client: Shaw Environmental
 Project: Port of Tacoma
 Project No: 111487 01000000

PTS File No: 38090
 Sample ID: SC-1-8'-10.5'
 Depth, ft: 8.9

| | | | | | |
|-----|-----------|--------|------|------|------|
| Grv | Sand Size | | | Silt | Clay |
| | crs | medium | fine | | |



| Opening | | Phi of Screen | U.S. No. | Sample Weight, grams | Increment Weight, percent | Cumulative Weight, percent |
|---------------|-------------|---------------|----------|----------------------|---------------------------|----------------------------|
| Inches | Millimeters | | | | | |
| 0.2500 | 6.351 | -2.67 | 1/4 | 0.00 | 0.00 | 0.00 |
| 0.1873 | 4.757 | -2.25 | 4 | 0.00 | 0.00 | 0.00 |
| 0.1324 | 3.364 | -1.75 | 6 | 0.00 | 0.00 | 0.00 |
| 0.0787 | 2.000 | -1.00 | 10 | 0.00 | 0.00 | 0.00 |
| 0.0468 | 1.189 | -0.25 | 16 | 1.99 | 1.99 | 1.99 |
| 0.0331 | 0.841 | 0.25 | 20 | 8.26 | 8.26 | 10.25 |
| 0.0278 | 0.707 | 0.50 | 25 | 5.76 | 5.76 | 16.01 |
| 0.0234 | 0.595 | 0.75 | 30 | 6.90 | 6.90 | 22.91 |
| 0.0197 | 0.500 | 1.00 | 35 | 8.34 | 8.34 | 31.25 |
| 0.0166 | 0.420 | 1.25 | 40 | 8.81 | 8.81 | 40.06 |
| 0.0139 | 0.354 | 1.50 | 45 | 7.07 | 7.07 | 47.14 |
| 0.0117 | 0.297 | 1.75 | 50 | 9.34 | 9.34 | 56.48 |
| 0.0098 | 0.250 | 2.00 | 60 | 8.04 | 8.04 | 64.52 |
| 0.0083 | 0.210 | 2.25 | 70 | 8.02 | 8.02 | 72.54 |
| 0.0070 | 0.177 | 2.50 | 80 | 7.31 | 7.31 | 79.85 |
| 0.0059 | 0.149 | 2.75 | 100 | 5.82 | 5.82 | 85.67 |
| 0.0049 | 0.125 | 3.00 | 120 | 4.03 | 4.03 | 89.70 |
| 0.0041 | 0.105 | 3.25 | 140 | 2.53 | 2.53 | 92.23 |
| 0.0035 | 0.088 | 3.50 | 170 | 1.59 | 1.59 | 93.82 |
| 0.0029 | 0.074 | 3.75 | 200 | 0.99 | 0.99 | 94.81 |
| 0.0025 | 0.063 | 4.00 | 230 | 0.59 | 0.59 | 95.40 |
| 0.0021 | 0.053 | 4.25 | 270 | 0.39 | 0.39 | 95.79 |
| 0.00174 | 0.0442 | 4.50 | 325 | 0.31 | 0.31 | 96.10 |
| 0.00146 | 0.0372 | 4.75 | 400 | 0.28 | 0.28 | 96.38 |
| 0.00123 | 0.0313 | 5.00 | 450 | 0.25 | 0.25 | 96.63 |
| 0.000986 | 0.0250 | 5.32 | 500 | 0.29 | 0.29 | 96.92 |
| 0.000790 | 0.0201 | 5.64 | 635 | 0.28 | 0.28 | 97.20 |
| 0.000615 | 0.0156 | 6.00 | | 0.28 | 0.28 | 97.48 |
| 0.000435 | 0.0110 | 6.50 | | 0.36 | 0.36 | 97.84 |
| 0.000308 | 0.00781 | 7.00 | | 0.35 | 0.35 | 98.19 |
| 0.000197 | 0.00500 | 7.65 | | 0.42 | 0.42 | 98.61 |
| 0.000077 | 0.00195 | 9.00 | | 0.72 | 0.72 | 99.33 |
| 0.000038 | 0.000977 | 10.00 | | 0.38 | 0.38 | 99.71 |
| 0.000019 | 0.000488 | 11.00 | | 0.26 | 0.26 | 99.97 |
| 0.000015 | 0.000375 | 11.38 | | 0.03 | 0.03 | 100.00 |
| TOTALS | | | | 100.00 | 100.00 | 100.00 |

| Cumulative Weight Percent greater than | | | |
|--|-----------|---------------|-------------|
| Weight percent | Phi Value | Particle Size | |
| | | Inches | Millimeters |
| 5 | -0.07 | 0.0413 | 1.048 |
| 10 | 0.23 | 0.0335 | 0.850 |
| 16 | 0.50 | 0.0278 | 0.707 |
| 25 | 0.81 | 0.0224 | 0.569 |
| 40 | 1.25 | 0.0166 | 0.421 |
| 50 | 1.58 | 0.0132 | 0.335 |
| 60 | 1.86 | 0.0108 | 0.276 |
| 75 | 2.33 | 0.0078 | 0.198 |
| 84 | 2.68 | 0.0062 | 0.156 |
| 90 | 3.03 | 0.0048 | 0.122 |
| 95 | 3.83 | 0.0028 | 0.070 |

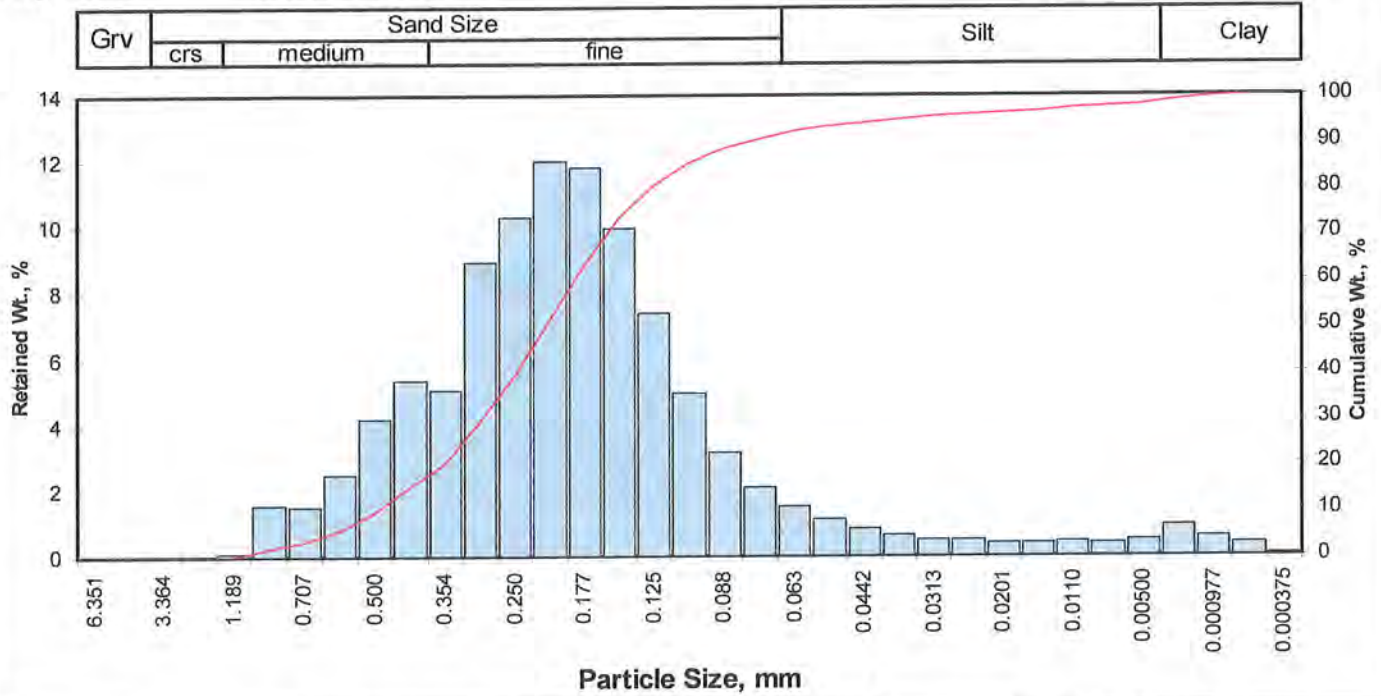
| Measure | Trask | Inman | Folk-Ward |
|-------------|--------|--------|-----------|
| Median, phi | 1.58 | 1.58 | 1.58 |
| Median, in. | 0.0132 | 0.0132 | 0.0132 |
| Median, mm | 0.335 | 0.335 | 0.335 |
| Mean, phi | 1.38 | 1.59 | 1.58 |
| Mean, in. | 0.0151 | 0.0131 | 0.0131 |
| Mean, mm | 0.384 | 0.332 | 0.333 |
| Sorting | 1.694 | 1.089 | 1.135 |
| Skewness | 1.002 | 0.011 | 0.084 |
| Kurtosis | 0.255 | 0.789 | 1.050 |

Grain Size Description (ASTM-USCS Scale) Fine sand (based on Mean from Trask)

| Description | Retained on Sieve # | Weight Percent |
|--------------|---------------------|----------------|
| Gravel | 4 | 0.00 |
| Coarse Sand | 10 | 0.00 |
| Medium Sand | 40 | 40.06 |
| Fine Sand | 200 | 54.75 |
| Silt | >0.005 mm | 3.80 |
| Clay | <0.005 mm | 1.39 |
| Total | | 100 |

Client: Shaw Environmental
 Project: Port of Tacoma
 Project No: 111487 01000000

PTS File No: 38090
 Sample ID: SC-1-10.5'-13.0'
 Depth, ft: 11.65



| Opening | | Phi of Screen | U.S. No. | Sample Weight, grams | Increment Weight, percent | Cumulative Weight, percent |
|---------------|-------------|---------------|----------|----------------------|---------------------------|----------------------------|
| Inches | Millimeters | | | | | |
| 0.2500 | 6.351 | -2.67 | 1/4 | 0.00 | 0.00 | 0.00 |
| 0.1873 | 4.757 | -2.25 | 4 | 0.00 | 0.00 | 0.00 |
| 0.1324 | 3.364 | -1.75 | 6 | 0.00 | 0.00 | 0.00 |
| 0.0787 | 2.000 | -1.00 | 10 | 0.00 | 0.00 | 0.00 |
| 0.0468 | 1.189 | -0.25 | 16 | 0.11 | 0.11 | 0.11 |
| 0.0331 | 0.841 | 0.25 | 20 | 1.57 | 1.57 | 1.68 |
| 0.0278 | 0.707 | 0.50 | 25 | 1.50 | 1.50 | 3.18 |
| 0.0234 | 0.595 | 0.75 | 30 | 2.50 | 2.50 | 5.68 |
| 0.0197 | 0.500 | 1.00 | 35 | 4.20 | 4.20 | 9.87 |
| 0.0166 | 0.420 | 1.25 | 40 | 5.33 | 5.33 | 15.20 |
| 0.0139 | 0.354 | 1.50 | 45 | 5.08 | 5.08 | 20.28 |
| 0.0117 | 0.297 | 1.75 | 50 | 8.93 | 8.93 | 29.20 |
| 0.0098 | 0.250 | 2.00 | 60 | 10.30 | 10.29 | 39.50 |
| 0.0083 | 0.210 | 2.25 | 70 | 12.00 | 11.99 | 51.49 |
| 0.0070 | 0.177 | 2.50 | 80 | 11.80 | 11.79 | 63.29 |
| 0.0059 | 0.149 | 2.75 | 100 | 9.95 | 9.94 | 73.23 |
| 0.0049 | 0.125 | 3.00 | 120 | 7.37 | 7.37 | 80.60 |
| 0.0041 | 0.105 | 3.25 | 140 | 4.95 | 4.95 | 85.54 |
| 0.0035 | 0.088 | 3.50 | 170 | 3.17 | 3.17 | 88.71 |
| 0.0029 | 0.074 | 3.75 | 200 | 2.08 | 2.08 | 90.79 |
| 0.0025 | 0.063 | 4.00 | 230 | 1.51 | 1.51 | 92.30 |
| 0.0021 | 0.053 | 4.25 | 270 | 1.14 | 1.14 | 93.44 |
| 0.00174 | 0.0442 | 4.50 | 325 | 0.83 | 0.83 | 94.27 |
| 0.00146 | 0.0372 | 4.75 | 400 | 0.62 | 0.62 | 94.89 |
| 0.00123 | 0.0313 | 5.00 | 450 | 0.49 | 0.49 | 95.38 |
| 0.000986 | 0.0250 | 5.32 | 500 | 0.51 | 0.51 | 95.89 |
| 0.000790 | 0.0201 | 5.64 | 635 | 0.41 | 0.41 | 96.30 |
| 0.000615 | 0.0156 | 6.00 | | 0.38 | 0.38 | 96.68 |
| 0.000435 | 0.0110 | 6.50 | | 0.44 | 0.44 | 97.12 |
| 0.000308 | 0.00781 | 7.00 | | 0.41 | 0.41 | 97.53 |
| 0.000197 | 0.00500 | 7.65 | | 0.50 | 0.50 | 98.03 |
| 0.000077 | 0.00195 | 9.00 | | 0.94 | 0.94 | 98.97 |
| 0.000038 | 0.000977 | 10.00 | | 0.58 | 0.58 | 99.55 |
| 0.000019 | 0.000488 | 11.00 | | 0.41 | 0.41 | 99.96 |
| 0.000015 | 0.000375 | 11.38 | | 0.05 | 0.04 | 100.00 |
| TOTALS | | | | 100.10 | 100.00 | 100.00 |

| Cumulative Weight Percent greater than | | | |
|--|-----------|---------------|-------------|
| Weight percent | Phi Value | Particle Size | |
| | | Inches | Millimeters |
| 5 | 0.68 | 0.0245 | 0.623 |
| 10 | 1.01 | 0.0196 | 0.498 |
| 16 | 1.29 | 0.0161 | 0.409 |
| 25 | 1.63 | 0.0127 | 0.323 |
| 40 | 2.01 | 0.0098 | 0.248 |
| 50 | 2.22 | 0.0085 | 0.215 |
| 60 | 2.43 | 0.0073 | 0.186 |
| 75 | 2.81 | 0.0056 | 0.143 |
| 84 | 3.17 | 0.0044 | 0.111 |
| 90 | 3.65 | 0.0031 | 0.079 |
| 95 | 4.81 | 0.0014 | 0.036 |

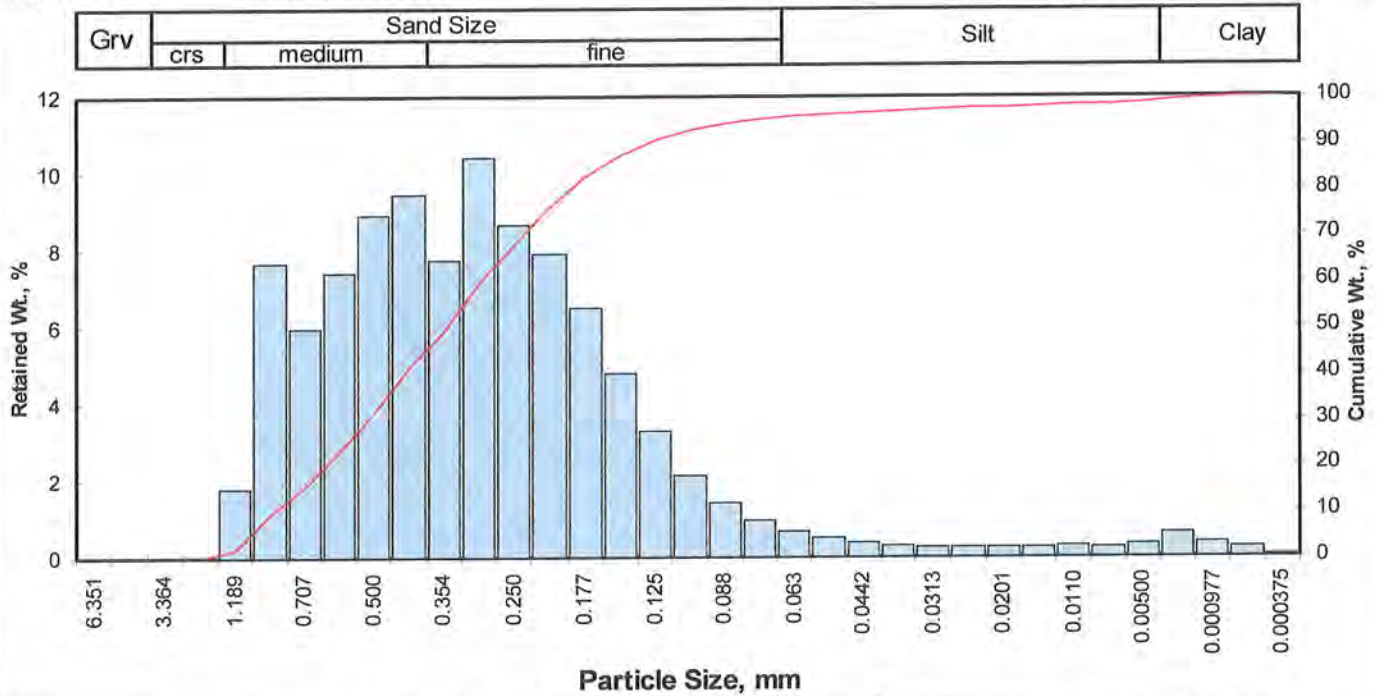
| Measure | Trask | Inman | Folk-Ward |
|-------------|--------|--------|-----------|
| Median, phi | 2.22 | 2.22 | 2.22 |
| Median, in. | 0.0085 | 0.0085 | 0.0085 |
| Median, mm | 0.215 | 0.215 | 0.215 |
| Mean, phi | 2.10 | 2.23 | 2.23 |
| Mean, in. | 0.0092 | 0.0084 | 0.0084 |
| Mean, mm | 0.233 | 0.213 | 0.214 |
| Sorting | 1.504 | 0.941 | 1.096 |
| Skewness | 0.998 | 0.012 | 0.134 |
| Kurtosis | 0.215 | 1.191 | 1.435 |

Grain Size Description (ASTM-USCS Scale) Fine sand (based on Mean from Trask)

| Description | Retained on Sieve # | Weight Percent |
|--------------|---------------------|----------------|
| Gravel | 4 | 0.00 |
| Coarse Sand | 10 | 0.00 |
| Medium Sand | 40 | 15.20 |
| Fine Sand | 200 | 75.59 |
| Silt | >0.005 mm | 7.24 |
| Clay | <0.005 mm | 1.97 |
| Total | | 100 |

Client: Shaw Environmental
 Project: Port of Tacoma
 Project No: 111487 01000000

PTS File No: 38090
 Sample ID: SC-1-10.5'-13.0'
 Depth, ft: 12.2



| Opening | | Phi of Screen | U.S. No. | Sample Weight, grams | Increment Weight, percent | Cumulative Weight, percent |
|---------------|-------------|---------------|----------|----------------------|---------------------------|----------------------------|
| Inches | Millimeters | | | | | |
| 0.2500 | 6.351 | -2.67 | 1/4 | 0.00 | 0.00 | 0.00 |
| 0.1873 | 4.757 | -2.25 | 4 | 0.00 | 0.00 | 0.00 |
| 0.1324 | 3.364 | -1.75 | 6 | 0.00 | 0.00 | 0.00 |
| 0.0787 | 2.000 | -1.00 | 10 | 0.00 | 0.00 | 0.00 |
| 0.0468 | 1.189 | -0.25 | 16 | 1.79 | 1.79 | 1.79 |
| 0.0331 | 0.841 | 0.25 | 20 | 7.65 | 7.65 | 9.44 |
| 0.0278 | 0.707 | 0.50 | 25 | 5.96 | 5.96 | 15.41 |
| 0.0234 | 0.595 | 0.75 | 30 | 7.43 | 7.43 | 22.84 |
| 0.0197 | 0.500 | 1.00 | 35 | 8.92 | 8.92 | 31.76 |
| 0.0166 | 0.420 | 1.25 | 40 | 9.45 | 9.45 | 41.22 |
| 0.0139 | 0.354 | 1.50 | 45 | 7.76 | 7.76 | 48.98 |
| 0.0117 | 0.297 | 1.75 | 50 | 10.40 | 10.40 | 59.39 |
| 0.0098 | 0.250 | 2.00 | 60 | 8.66 | 8.66 | 68.05 |
| 0.0083 | 0.210 | 2.25 | 70 | 7.92 | 7.92 | 75.97 |
| 0.0070 | 0.177 | 2.50 | 80 | 6.51 | 6.51 | 82.49 |
| 0.0059 | 0.149 | 2.75 | 100 | 4.81 | 4.81 | 87.30 |
| 0.0049 | 0.125 | 3.00 | 120 | 3.29 | 3.29 | 90.59 |
| 0.0041 | 0.105 | 3.25 | 140 | 2.13 | 2.13 | 92.72 |
| 0.0035 | 0.088 | 3.50 | 170 | 1.40 | 1.40 | 94.12 |
| 0.0029 | 0.074 | 3.75 | 200 | 0.96 | 0.96 | 95.08 |
| 0.0025 | 0.063 | 4.00 | 230 | 0.67 | 0.67 | 95.75 |
| 0.0021 | 0.053 | 4.25 | 270 | 0.48 | 0.48 | 96.23 |
| 0.00174 | 0.0442 | 4.50 | 325 | 0.37 | 0.37 | 96.60 |
| 0.00146 | 0.0372 | 4.75 | 400 | 0.30 | 0.30 | 96.90 |
| 0.00123 | 0.0313 | 5.00 | 450 | 0.25 | 0.25 | 97.15 |
| 0.000986 | 0.0250 | 5.32 | 500 | 0.27 | 0.27 | 97.42 |
| 0.000790 | 0.0201 | 5.64 | 635 | 0.24 | 0.24 | 97.66 |
| 0.000615 | 0.0156 | 6.00 | | 0.23 | 0.23 | 97.89 |
| 0.000435 | 0.0110 | 6.50 | | 0.28 | 0.28 | 98.17 |
| 0.000308 | 0.00781 | 7.00 | | 0.26 | 0.26 | 98.43 |
| 0.000197 | 0.00500 | 7.65 | | 0.32 | 0.32 | 98.75 |
| 0.000077 | 0.00195 | 9.00 | | 0.61 | 0.61 | 99.36 |
| 0.000038 | 0.000977 | 10.00 | | 0.36 | 0.36 | 99.72 |
| 0.000019 | 0.000488 | 11.00 | | 0.25 | 0.25 | 99.97 |
| 0.000015 | 0.000375 | 11.38 | | 0.03 | 0.03 | 100.00 |
| TOTALS | | | | 100.00 | 100.00 | 100.00 |

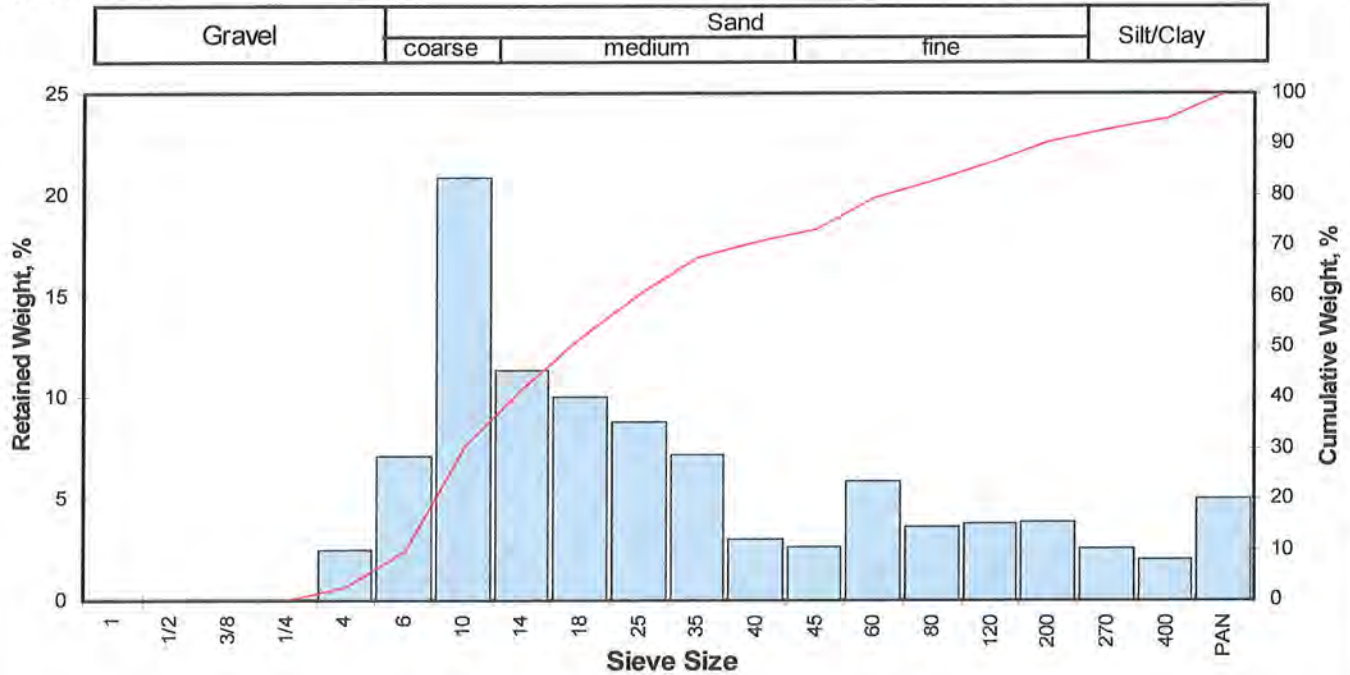
| Cumulative Weight Percent greater than | | | |
|--|-----------|---------------|-------------|
| Weight percent | Phi Value | Particle Size | |
| | | Inches | Millimeters |
| 5 | -0.04 | 0.0405 | 1.028 |
| 10 | 0.27 | 0.0326 | 0.827 |
| 16 | 0.52 | 0.0275 | 0.697 |
| 25 | 0.81 | 0.0224 | 0.570 |
| 40 | 1.22 | 0.0169 | 0.430 |
| 50 | 1.52 | 0.0137 | 0.348 |
| 60 | 1.77 | 0.0116 | 0.294 |
| 75 | 2.22 | 0.0085 | 0.215 |
| 84 | 2.58 | 0.0066 | 0.167 |
| 90 | 2.96 | 0.0051 | 0.129 |
| 95 | 3.73 | 0.0030 | 0.075 |

| Measure | Trask | Inman | Folk-Ward |
|-------------------------------|--------|----------------------------|-----------|
| Median, phi | 1.52 | 1.52 | 1.52 |
| Median, in. | 0.0137 | 0.0137 | 0.0137 |
| Median, mm | 0.348 | 0.348 | 0.348 |
| Mean, phi | 1.35 | 1.55 | 1.54 |
| Mean, in. | 0.0155 | 0.0135 | 0.0135 |
| Mean, mm | 0.392 | 0.342 | 0.344 |
| Sorting | 1.629 | 1.029 | 1.086 |
| Skewness | 1.007 | 0.024 | 0.097 |
| Kurtosis | 0.254 | 0.831 | 1.097 |
| Grain Size Description | | Fine sand | |
| (ASTM-USCS Scale) | | (based on Mean from Trask) | |

| Description | Retained on Sieve # | Weight Percent |
|--------------|---------------------|----------------|
| Gravel | 4 | 0.00 |
| Coarse Sand | 10 | 0.00 |
| Medium Sand | 40 | 41.22 |
| Fine Sand | 200 | 53.86 |
| Silt | >0.005 mm | 3.67 |
| Clay | <0.005 mm | 1.25 |
| Total | | 100 |

Client: Shaw Environmental
 Project: Port of Tacoma
 Project No: 111487 01000000

PTS File No: 38090
 Sample ID: SC-2-7.5-10.0
 Depth, ft: 8.7



| Opening | | Phi of Screen | U.S. Sieve No. | Sample Weight grams | Incremental Weight, percent | Cumulative Weight, percent |
|---------------|-------------|---------------|----------------|---------------------|-----------------------------|----------------------------|
| Inches | Millimeters | | | | | |
| 0.9844 | 25.002 | -4.64 | 1 | 0.00 | 0.00 | 0.00 |
| 0.4922 | 12.501 | -3.64 | 1/2 | 0.00 | 0.00 | 0.00 |
| 0.3740 | 9.500 | -3.25 | 3/8 | 0.00 | 0.00 | 0.00 |
| 0.2500 | 6.351 | -2.67 | 1/4 | 0.00 | 0.00 | 0.00 |
| 0.1873 | 4.757 | -2.25 | 4 | 0.40 | 2.43 | 2.43 |
| 0.1324 | 3.364 | -1.75 | 6 | 1.17 | 7.12 | 9.55 |
| 0.0787 | 2.000 | -1.00 | 10 | 3.42 | 20.80 | 30.35 |
| 0.0557 | 1.414 | -0.50 | 14 | 1.86 | 11.31 | 41.67 |
| 0.0394 | 1.000 | 0.00 | 18 | 1.65 | 10.04 | 51.70 |
| 0.0278 | 0.707 | 0.50 | 25 | 1.44 | 8.76 | 60.46 |
| 0.0197 | 0.500 | 1.00 | 35 | 1.18 | 7.18 | 67.64 |
| 0.0166 | 0.420 | 1.25 | 40 | 0.50 | 3.04 | 70.68 |
| 0.0139 | 0.354 | 1.50 | 45 | 0.43 | 2.62 | 73.30 |
| 0.0098 | 0.250 | 2.00 | 60 | 0.97 | 5.90 | 79.20 |
| 0.0070 | 0.177 | 2.50 | 80 | 0.59 | 3.59 | 82.79 |
| 0.0049 | 0.125 | 3.00 | 120 | 0.62 | 3.77 | 86.56 |
| 0.0029 | 0.074 | 3.75 | 200 | 0.63 | 3.83 | 90.39 |
| 0.0021 | 0.053 | 4.25 | 270 | 0.42 | 2.55 | 92.94 |
| 0.0015 | 0.037 | 4.75 | 400 | 0.33 | 2.01 | 94.95 |
| | | | PAN | 0.83 | 5.05 | 100.00 |
| TOTALS | | | | 16.44 | 100.00 | 100.00 |

| Cumulative Weight Percent greater than | | | |
|--|-----------|---------------|-------------|
| Weight percent | Phi Value | Particle Size | |
| | | Inches | Millimeters |
| 5 | -2.07 | 0.1653 | 4.198 |
| 10 | -1.73 | 0.1309 | 3.326 |
| 16 | -1.52 | 0.1127 | 2.863 |
| 25 | -1.19 | 0.0900 | 2.286 |
| 40 | -0.57 | 0.0586 | 1.488 |
| 50 | -0.08 | 0.0418 | 1.061 |
| 60 | 0.47 | 0.0284 | 0.720 |
| 75 | 1.64 | 0.0126 | 0.320 |
| 84 | 2.66 | 0.0062 | 0.158 |
| 90 | 3.67 | 0.0031 | 0.078 |
| 95 | 4.70 | 0.0015 | 0.038 |

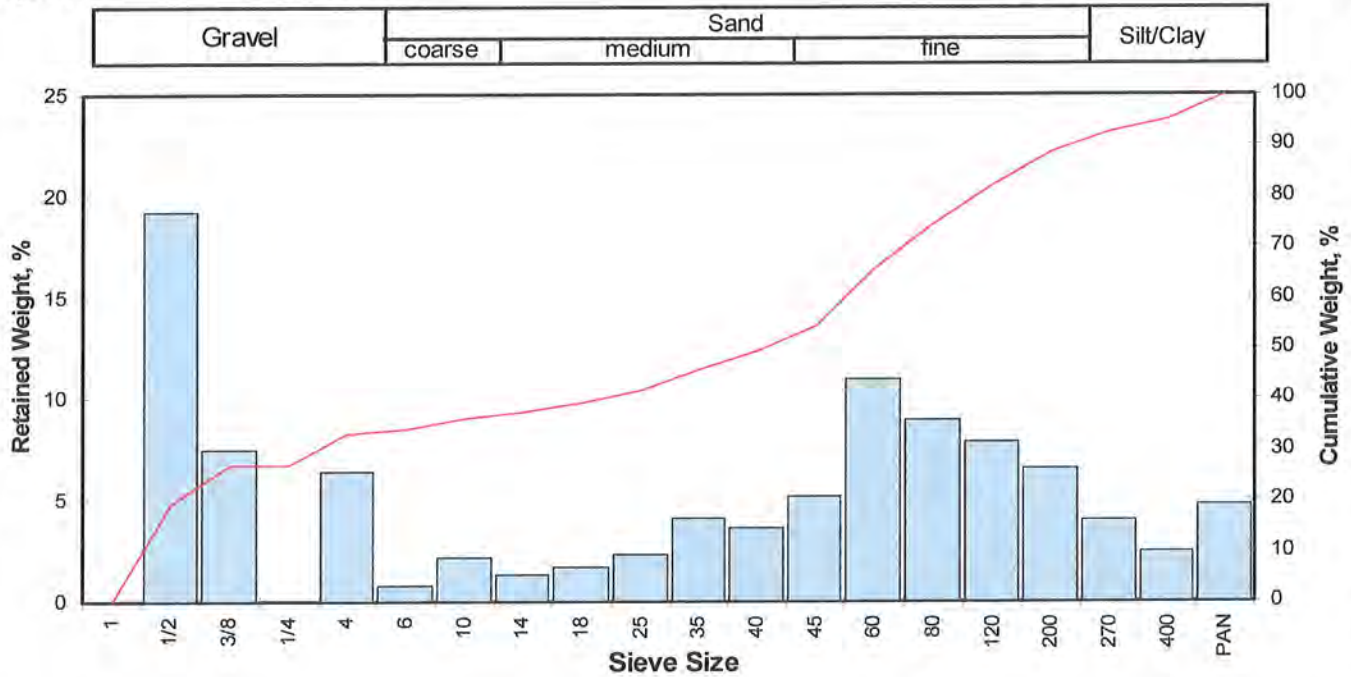
| Measure | Trask | Inman | Folk-Ward |
|-------------|--------|--------|-----------|
| Median, phi | -0.08 | -0.08 | -0.08 |
| Median, in. | 0.0418 | 0.0418 | 0.0418 |
| Median, mm | 1.061 | 1.061 | 1.061 |
| Mean, phi | -0.38 | 0.57 | 0.35 |
| Mean, in. | 0.0513 | 0.0265 | 0.0308 |
| Mean, mm | 1.303 | 0.673 | 0.783 |
| Sorting | 2.673 | 2.089 | 2.071 |
| Skewness | 0.806 | 0.314 | 0.364 |
| Kurtosis | 0.303 | 0.621 | 0.978 |

Grain Size Description (ASTM-USCS Scale) **Medium sand** (based on Mean from Trask)

| Description | Retained on Sieve # | Weight Percent |
|--------------|---------------------|----------------|
| Gravel | 4 | 2.43 |
| Coarse Sand | 10 | 27.92 |
| Medium Sand | 40 | 40.33 |
| Fine Sand | 200 | 19.71 |
| Silt/Clay | <200 | 9.61 |
| Total | | 100 |

Client: Shaw Environmental
 Project: Port of Tacoma
 Project No: 111487 01000000

PTS File No: 38090
 Sample ID: SC-2-10.0-12.5
 Depth, ft: 10.7



| Opening | | Phi of Screen | U.S. Sieve No. | Sample Weight grams | Incremental Weight, percent | Cumulative Weight, percent |
|---------------|-------------|---------------|----------------|---------------------|-----------------------------|----------------------------|
| Inches | Millimeters | | | | | |
| 0.9844 | 25.002 | -4.64 | 1 | 0.00 | 0.00 | 0.00 |
| 0.4922 | 12.501 | -3.64 | 1/2 | 3.33 | 19.23 | 19.23 |
| 0.3740 | 9.500 | -3.25 | 3/8 | 1.30 | 7.51 | 26.73 |
| 0.2500 | 6.351 | -2.67 | 1/4 | 0.00 | 0.00 | 26.73 |
| 0.1873 | 4.757 | -2.25 | 4 | 1.11 | 6.41 | 33.14 |
| 0.1324 | 3.364 | -1.75 | 6 | 0.14 | 0.81 | 33.95 |
| 0.0787 | 2.000 | -1.00 | 10 | 0.38 | 2.19 | 36.14 |
| 0.0557 | 1.414 | -0.50 | 14 | 0.23 | 1.33 | 37.47 |
| 0.0394 | 1.000 | 0.00 | 18 | 0.30 | 1.73 | 39.20 |
| 0.0278 | 0.707 | 0.50 | 25 | 0.40 | 2.31 | 41.51 |
| 0.0197 | 0.500 | 1.00 | 35 | 0.71 | 4.10 | 45.61 |
| 0.0166 | 0.420 | 1.25 | 40 | 0.63 | 3.64 | 49.25 |
| 0.0139 | 0.354 | 1.50 | 45 | 0.89 | 5.14 | 54.39 |
| 0.0098 | 0.250 | 2.00 | 60 | 1.90 | 10.97 | 65.36 |
| 0.0070 | 0.177 | 2.50 | 80 | 1.55 | 8.95 | 74.31 |
| 0.0049 | 0.125 | 3.00 | 120 | 1.36 | 7.85 | 82.16 |
| 0.0029 | 0.074 | 3.75 | 200 | 1.13 | 6.52 | 88.68 |
| 0.0021 | 0.053 | 4.25 | 270 | 0.70 | 4.04 | 92.73 |
| 0.0015 | 0.037 | 4.75 | 400 | 0.43 | 2.48 | 95.21 |
| | | | PAN | 0.83 | 4.79 | 100.00 |
| TOTALS | | | | 17.32 | 100.00 | 100.00 |

| Cumulative Weight Percent greater than | | | |
|--|-----------|---------------|-------------|
| Weight percent | Phi Value | Particle Size | |
| | | Inches | Millimeters |
| 5 | -4.38 | 0.8220 | 20.878 |
| 10 | -4.12 | 0.6864 | 17.435 |
| 16 | -3.81 | 0.5529 | 14.043 |
| 25 | -2.89 | 0.2923 | 7.425 |
| 40 | 0.17 | 0.0349 | 0.887 |
| 50 | 1.29 | 0.0161 | 0.410 |
| 60 | 1.76 | 0.0117 | 0.296 |
| 75 | 2.54 | 0.0068 | 0.171 |
| 84 | 3.21 | 0.0042 | 0.108 |
| 90 | 3.91 | 0.0026 | 0.066 |
| 95 | 4.71 | 0.0015 | 0.038 |

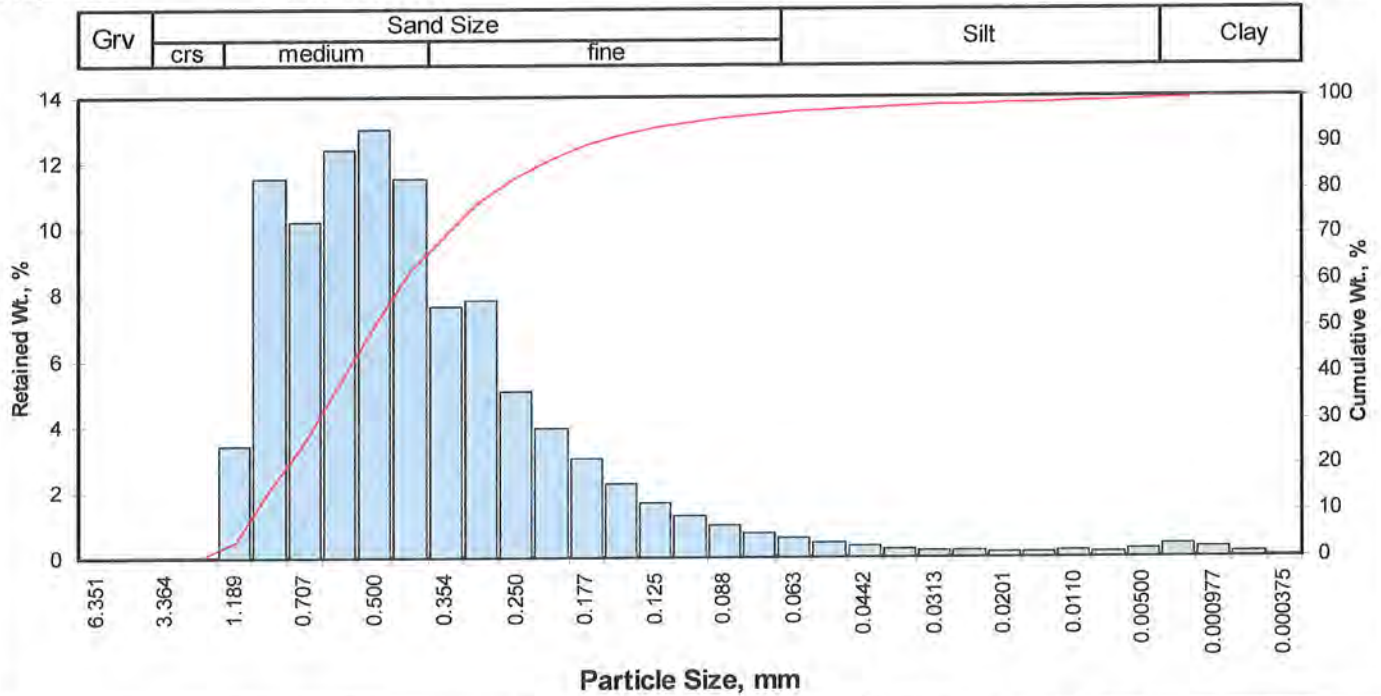
| Measure | Trask | Inman | Folk-Ward |
|-------------|--------|--------|-----------|
| Median, phi | 1.29 | 1.29 | 1.29 |
| Median, in. | 0.0161 | 0.0161 | 0.0161 |
| Median, mm | 0.410 | 0.410 | 0.410 |
| Mean, phi | -1.93 | -0.30 | 0.23 |
| Mean, in. | 0.1495 | 0.0485 | 0.0336 |
| Mean, mm | 3.798 | 1.231 | 0.853 |
| Sorting | 6.581 | 3.512 | 3.133 |
| Skewness | 2.752 | -0.452 | -0.350 |
| Kurtosis | 0.209 | 0.295 | 0.685 |

Grain Size Description (ASTM-USCS Scale) Coarse sand (based on Mean from Trask)

| Description | Retained on Sieve # | Weight Percent |
|-------------|---------------------|----------------|
| Gravel | 4 | 33.14 |
| Coarse Sand | 10 | 3.00 |
| Medium Sand | 40 | 13.11 |
| Fine Sand | 200 | 39.43 |
| Silt/Clay | <200 | 11.32 |
| Total | | 100 |

Client: Shaw Environmental
 Project: Port of Tacoma
 Project No: 111487 01000000

PTS File No: 38090
 Sample ID: SC-2-15.0'-17.5'
 Depth, ft: 16.1



| Opening | | Phi of Screen | U.S. No. | Sample Weight, grams | Increment Weight, percent | Cumulative Weight, percent |
|---------------|-------------|---------------|----------|----------------------|---------------------------|----------------------------|
| Inches | Millimeters | | | | | |
| 0.2500 | 6.351 | -2.67 | 1/4 | 0.00 | 0.00 | 0.00 |
| 0.1873 | 4.757 | -2.25 | 4 | 0.00 | 0.00 | 0.00 |
| 0.1324 | 3.364 | -1.75 | 6 | 0.00 | 0.00 | 0.00 |
| 0.0787 | 2.000 | -1.00 | 10 | 0.00 | 0.00 | 0.00 |
| 0.0468 | 1.189 | -0.25 | 16 | 3.41 | 3.41 | 3.41 |
| 0.0331 | 0.841 | 0.25 | 20 | 11.50 | 11.50 | 14.92 |
| 0.0278 | 0.707 | 0.50 | 25 | 10.20 | 10.20 | 25.12 |
| 0.0234 | 0.595 | 0.75 | 30 | 12.40 | 12.40 | 37.53 |
| 0.0197 | 0.500 | 1.00 | 35 | 13.00 | 13.01 | 50.53 |
| 0.0166 | 0.420 | 1.25 | 40 | 11.50 | 11.50 | 62.03 |
| 0.0139 | 0.354 | 1.50 | 45 | 7.63 | 7.63 | 69.67 |
| 0.0117 | 0.297 | 1.75 | 50 | 7.84 | 7.84 | 77.51 |
| 0.0098 | 0.250 | 2.00 | 60 | 5.03 | 5.03 | 82.54 |
| 0.0083 | 0.210 | 2.25 | 70 | 3.92 | 3.92 | 86.46 |
| 0.0070 | 0.177 | 2.50 | 80 | 2.99 | 2.99 | 89.46 |
| 0.0059 | 0.149 | 2.75 | 100 | 2.23 | 2.23 | 91.69 |
| 0.0049 | 0.125 | 3.00 | 120 | 1.66 | 1.66 | 93.35 |
| 0.0041 | 0.105 | 3.25 | 140 | 1.26 | 1.26 | 94.61 |
| 0.0035 | 0.088 | 3.50 | 170 | 0.99 | 0.99 | 95.60 |
| 0.0029 | 0.074 | 3.75 | 200 | 0.74 | 0.74 | 96.34 |
| 0.0025 | 0.063 | 4.00 | 230 | 0.57 | 0.57 | 96.91 |
| 0.0021 | 0.053 | 4.25 | 270 | 0.45 | 0.45 | 97.36 |
| 0.00174 | 0.0442 | 4.50 | 325 | 0.32 | 0.32 | 97.68 |
| 0.00146 | 0.0372 | 4.75 | 400 | 0.24 | 0.24 | 97.92 |
| 0.00123 | 0.0313 | 5.00 | 450 | 0.19 | 0.19 | 98.11 |
| 0.000986 | 0.0250 | 5.32 | 500 | 0.20 | 0.20 | 98.31 |
| 0.000790 | 0.0201 | 5.64 | 635 | 0.16 | 0.16 | 98.47 |
| 0.000615 | 0.0156 | 6.00 | | 0.15 | 0.15 | 98.62 |
| 0.000435 | 0.0110 | 6.50 | | 0.18 | 0.18 | 98.80 |
| 0.000308 | 0.00781 | 7.00 | | 0.17 | 0.17 | 98.97 |
| 0.000197 | 0.00500 | 7.65 | | 0.22 | 0.22 | 99.19 |
| 0.000077 | 0.00195 | 9.00 | | 0.40 | 0.40 | 99.59 |
| 0.000038 | 0.000977 | 10.00 | | 0.28 | 0.28 | 99.87 |
| 0.000019 | 0.000488 | 11.00 | | 0.13 | 0.13 | 100.00 |
| 0.000015 | 0.000375 | 11.38 | | 0.00 | 0.00 | 100.00 |
| TOTALS | | | | 100.00 | 100.00 | 100.00 |

| Cumulative Weight Percent greater than | | | |
|--|-----------|---------------|-------------|
| Weight percent | Phi Value | Particle Size | |
| | | Inches | Millimeters |
| 5 | -0.18 | 0.0446 | 1.134 |
| 10 | 0.04 | 0.0384 | 0.975 |
| 16 | 0.28 | 0.0325 | 0.826 |
| 25 | 0.50 | 0.0279 | 0.709 |
| 40 | 0.80 | 0.0227 | 0.575 |
| 50 | 0.99 | 0.0198 | 0.504 |
| 60 | 1.21 | 0.0171 | 0.434 |
| 75 | 1.67 | 0.0124 | 0.314 |
| 84 | 2.09 | 0.0092 | 0.234 |
| 90 | 2.56 | 0.0067 | 0.169 |
| 95 | 3.35 | 0.0039 | 0.098 |

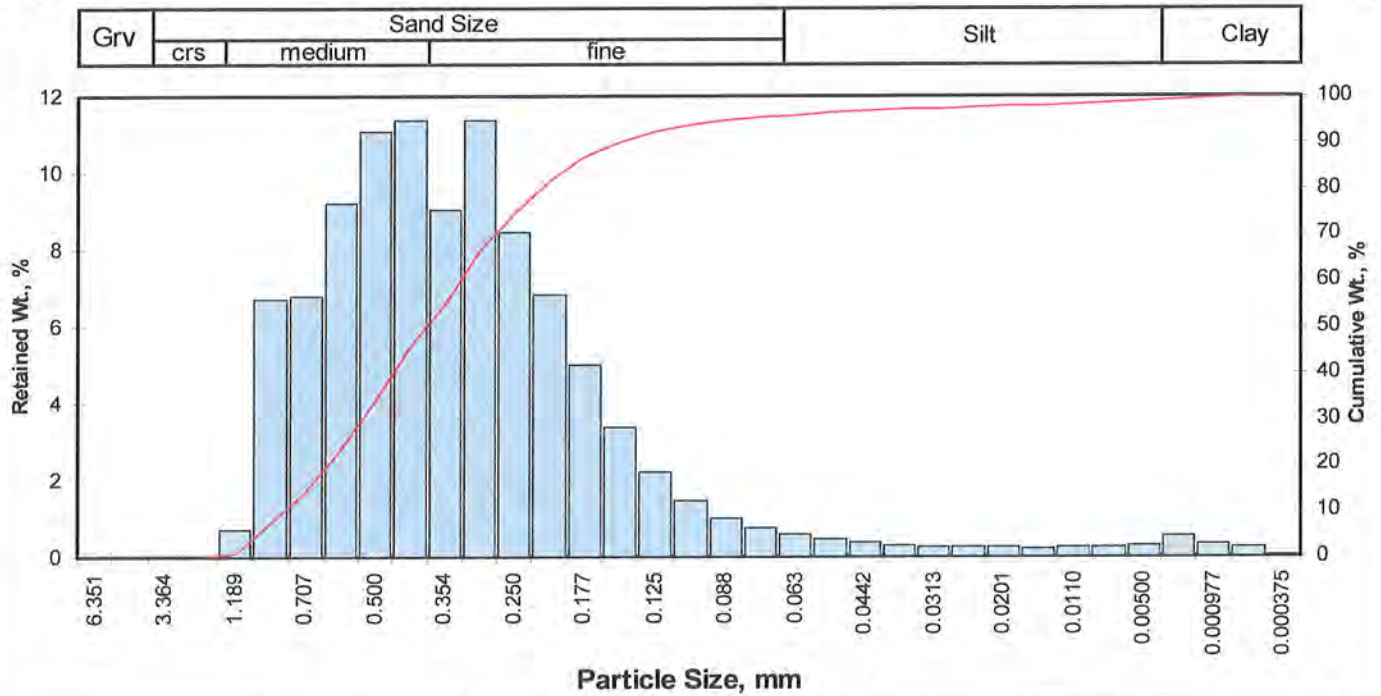
| Measure | Trask | Inman | Folk-Ward |
|-------------|--------|--------|-----------|
| Median, phi | 0.99 | 0.99 | 0.99 |
| Median, in. | 0.0198 | 0.0198 | 0.0198 |
| Median, mm | 0.504 | 0.504 | 0.504 |
| Mean, phi | 0.97 | 1.18 | 1.12 |
| Mean, in. | 0.0201 | 0.0173 | 0.0181 |
| Mean, mm | 0.511 | 0.440 | 0.460 |
| Sorting | 1.502 | 0.908 | 0.989 |
| Skewness | 0.937 | 0.215 | 0.276 |
| Kurtosis | 0.245 | 0.943 | 1.233 |

Grain Size Description: Medium sand (ASTM-USCS Scale) (based on Mean from Trask)

| Description | Retained on Sieve # | Weight Percent |
|--------------|---------------------|----------------|
| Gravel | 4 | 0.00 |
| Coarse Sand | 10 | 0.00 |
| Medium Sand | 40 | 62.03 |
| Fine Sand | 200 | 34.30 |
| Silt | >0.005 mm | 2.85 |
| Clay | <0.005 mm | 0.81 |
| Total | | 100 |

Client: Shaw Environmental
 Project: Port of Tacoma
 Project No: 111487 01000000

PTS File No: 38090
 Sample ID: SC-2-15.0'-17.5'
 Depth, ft: 16.6



| Opening | | Phi of Screen | U.S. No. | Sample Weight, grams | Increment Weight, percent | Cumulative Weight, percent |
|---------------|-------------|---------------|----------|----------------------|---------------------------|----------------------------|
| Inches | Millimeters | | | | | |
| 0.2500 | 6.351 | -2.67 | 1/4 | 0.00 | 0.00 | 0.00 |
| 0.1873 | 4.757 | -2.25 | 4 | 0.00 | 0.00 | 0.00 |
| 0.1324 | 3.364 | -1.75 | 6 | 0.00 | 0.00 | 0.00 |
| 0.0787 | 2.000 | -1.00 | 10 | 0.00 | 0.00 | 0.00 |
| 0.0468 | 1.189 | -0.25 | 16 | 0.72 | 0.72 | 0.72 |
| 0.0331 | 0.841 | 0.25 | 20 | 6.73 | 6.73 | 7.45 |
| 0.0278 | 0.707 | 0.50 | 25 | 6.78 | 6.78 | 14.22 |
| 0.0234 | 0.595 | 0.75 | 30 | 9.21 | 9.20 | 23.42 |
| 0.0197 | 0.500 | 1.00 | 35 | 11.10 | 11.09 | 34.52 |
| 0.0166 | 0.420 | 1.25 | 40 | 11.40 | 11.39 | 45.91 |
| 0.0139 | 0.354 | 1.50 | 45 | 9.04 | 9.03 | 54.94 |
| 0.0117 | 0.297 | 1.75 | 50 | 11.40 | 11.39 | 66.34 |
| 0.0098 | 0.250 | 2.00 | 60 | 8.47 | 8.46 | 74.80 |
| 0.0083 | 0.210 | 2.25 | 70 | 6.85 | 6.85 | 81.65 |
| 0.0070 | 0.177 | 2.50 | 80 | 5.00 | 5.00 | 86.64 |
| 0.0059 | 0.149 | 2.75 | 100 | 3.36 | 3.36 | 90.00 |
| 0.0049 | 0.125 | 3.00 | 120 | 2.22 | 2.22 | 92.22 |
| 0.0041 | 0.105 | 3.25 | 140 | 1.47 | 1.47 | 93.69 |
| 0.0035 | 0.088 | 3.50 | 170 | 1.00 | 1.00 | 94.69 |
| 0.0029 | 0.074 | 3.75 | 200 | 0.73 | 0.73 | 95.42 |
| 0.0025 | 0.063 | 4.00 | 230 | 0.57 | 0.57 | 95.99 |
| 0.0021 | 0.053 | 4.25 | 270 | 0.47 | 0.47 | 96.46 |
| 0.00174 | 0.0442 | 4.50 | 325 | 0.36 | 0.36 | 96.82 |
| 0.00146 | 0.0372 | 4.75 | 400 | 0.29 | 0.29 | 97.11 |
| 0.00123 | 0.0313 | 5.00 | 450 | 0.24 | 0.24 | 97.35 |
| 0.000986 | 0.0250 | 5.32 | 500 | 0.26 | 0.26 | 97.61 |
| 0.000790 | 0.0201 | 5.64 | 635 | 0.23 | 0.23 | 97.84 |
| 0.000615 | 0.0156 | 6.00 | | 0.21 | 0.21 | 98.05 |
| 0.000435 | 0.0110 | 6.50 | | 0.26 | 0.26 | 98.31 |
| 0.000308 | 0.00781 | 7.00 | | 0.24 | 0.24 | 98.55 |
| 0.000197 | 0.00500 | 7.65 | | 0.30 | 0.30 | 98.85 |
| 0.000077 | 0.00195 | 9.00 | | 0.56 | 0.56 | 99.41 |
| 0.000038 | 0.000977 | 10.00 | | 0.34 | 0.34 | 99.75 |
| 0.000019 | 0.000488 | 11.00 | | 0.23 | 0.23 | 99.98 |
| 0.000015 | 0.000375 | 11.38 | | 0.03 | 0.02 | 100.00 |
| TOTALS | | | | 100.10 | 100.00 | 100.00 |

| Cumulative Weight Percent greater than | | | |
|--|-----------|---------------|-------------|
| Weight percent | Phi Value | Particle Size | |
| | | Inches | Millimeters |
| 5 | 0.07 | 0.0376 | 0.954 |
| 10 | 0.34 | 0.0310 | 0.788 |
| 16 | 0.55 | 0.0269 | 0.684 |
| 25 | 0.79 | 0.0228 | 0.580 |
| 40 | 1.12 | 0.0181 | 0.460 |
| 50 | 1.36 | 0.0153 | 0.389 |
| 60 | 1.61 | 0.0129 | 0.327 |
| 75 | 2.01 | 0.0098 | 0.249 |
| 84 | 2.37 | 0.0076 | 0.194 |
| 90 | 2.75 | 0.0059 | 0.149 |
| 95 | 3.61 | 0.0032 | 0.082 |

| Measure | Trask | Inman | Folk-Ward |
|-------------------------------|--------|----------------------------|-----------|
| Median, phi | 1.36 | 1.36 | 1.36 |
| Median, in. | 0.0153 | 0.0153 | 0.0153 |
| Median, mm | 0.389 | 0.389 | 0.389 |
| Mean, phi | 1.27 | 1.46 | 1.43 |
| Mean, in. | 0.0163 | 0.0143 | 0.0146 |
| Mean, mm | 0.414 | 0.364 | 0.372 |
| Sorting | 1.527 | 0.910 | 0.991 |
| Skewness | 0.977 | 0.104 | 0.186 |
| Kurtosis | 0.259 | 0.945 | 1.187 |
| Grain Size Description | | Fine sand | |
| (ASTM-USCS Scale) | | (based on Mean from Trask) | |

| Description | Retained on Sieve # | Weight Percent |
|--------------|---------------------|----------------|
| Gravel | 4 | 0.00 |
| Coarse Sand | 10 | 0.00 |
| Medium Sand | 40 | 45.91 |
| Fine Sand | 200 | 49.51 |
| Silt | >0.005 mm | 3.43 |
| Clay | <0.005 mm | 1.15 |
| Total | | 100 |

Appendix E

Soil Core Drilling Photographs



Photo 1. Drilling boring SC-1.



Photo 2. New Osterberg soil coring device (top) and sampler damaged by subsurface rocks.




Photo 3. Core sampler damaged by subsurface rocks.



Photo 4. Soil filled core sampler prior to capping for shipment to the laboratory.

File: N:\Cad\Drawings\Port of Tacoma\August 2008\Figure 11x17.dwg Layout: layout User: jasha.coddington Sep 04, 2008 - 11:01am
 1" 1/2" 0" 1"

| REV | DATE | DESCRIPTION | DWN BY | DES BY | CHK BY | APP BY | |
|---------------|------|-------------|--------|--------|--------|--------|--------|
| DATE OF ISSUE | 5/08 | DWN BY | JC | DES BY | DL | CHK BY | APP BY |



Shaw® Shaw Environmental, Inc.

This drawing represents intellectual property of Shaw, Inc. Any modification to the original by other than Shaw, Inc. personnel violates its original purpose and as such is rendered void. Shaw, Inc. will not be held liable for any changes made to this document without express written consent of the originator.

**SOIL CORE DRILLING
PHOTOGRAPHS**

 PORT OF TACOMA
 FORMER MILWAUKEE RAILYARD SITE
 TACOMA, WASHINGTON

PROJECT NO.
111487

Appendix F

***Torkelson Geochemistry, Inc. NAPL
and Groundwater Test Data***



Torkelson Geochemistry, Inc.

2528 South Columbia Place, Tulsa, Oklahoma 74114-3233
Voice 918-749-8441, Fax 918-749-6005

May 19, 2008

Larry Roberts
TechSolv Consulting Group, Inc.
7518 NE 169th Street
Kenmore, WA 98028

Subject: Analysis and evaluation of five product and two water samples from Port of Tacoma, Former Millwaukee Rail Yard, Tacoma, Washington.

Introduction

Five product/water sample pairs were submitted to Torkelson Geochemistry by TechSolv for hydrocarbon fingerprint (capillary gas chromatography) analysis of the five product samples and one of the water samples, physical property analysis of two of the product/water pairs and evaluation of the results, see chain of custody (Figure 1).

The following are my interpretations of the data. Please keep in mind that these interpretations are made without any specific knowledge of the site, location from which the samples came, or other analyses done on the samples. In addition, the samples have probably been weathered which makes an accurate interpretation of product type somewhat more difficult since some of the key features of the product have been altered or removed by the evaporation, water washing or bacterial processes.

Discussion of Results

Sample CW-4 appears to be a mixture of extremely weathered middle distillate and a heavier material. The chromatogram of CW-4 (Figures 2 and 11) shows a series of peaks starting at about methylcyclohexane (MCHX) and continuing to the end of the chromatogram and one unresolved hump that starts at about nC10, reaches a maximum at about nC17 and continues to about nC24 and a second unresolved hump that starts at about nC24 reaches a maximum at about nC36 and continues to the end of the chromatogram. This includes the ranges typical of middle distillate from about nC8 to nC24 and heavier materials beyond the middle distillate range. The types and proportions of the peaks in the middle distillate range are typical of an extremely weathered diesel fuel or fuel oil. Weathering is primarily biodegradation which has preferentially decreased the size of the normal paraffin peaks (labeled nC8 to nC25) relative to the more biodegradation resistant compounds such as the isoprenoid peaks (labeled IP13 to IP18, Pristane and Phytane). The heavier material beyond the middle distillate range could be a heavy fuel oil, perhaps a lubricating oil or some other heavy material. CW-4 is quite similar to CW-5 and RW-5L3.

Sample CW-5 appears to be a mixture of extremely weathered middle distillate and a heavier material. The chromatogram of CW-5 (Figures 3 and 12) shows a series of peaks starting at about methylcyclohexane (MCHX) and continuing to the end of the chromatogram and one unresolved hump that starts at about nC10, reaches a maximum at about nC17 and continues to about nC24 and a second unresolved hump that starts at about nC24 reaches a maximum at about nC36 and continues to the end of the chromatogram. This includes the ranges typical of middle distillate from about nC8 to nC24 and heavier materials beyond the middle distillate range. The types and proportions of the peaks in the middle distillate range are typical of an extremely weathered diesel fuel or fuel oil. Weathering is primarily biodegradation which has preferentially decreased the size of the normal paraffin peaks (labeled nC8 to nC25) relative to the more biodegradation resistant compounds such as the isoprenoid peaks (labeled IP13 to IP18, Pristane and Phytane). The heavier material beyond the middle distillate range could be a heavy fuel oil, perhaps a lubricating oil or some other heavy material. CW-5 is quite similar to CW-4 and RW-5L3.

Sample RW-2L3 appears to be a mixture of extremely weathered middle distillate and perhaps a very small amount of heavier material. The chromatogram of RW-2L3 (Figures 4 and 13) shows a series of peaks starting at about normal octane (nC8) and continuing to near the end of the chromatogram and one unresolved hump that starts at about nC10, reaches a maximum at about nC15 or nC16 and continues to about nC24 and a small amount of unresolved material that starts at about nC24 and continues to the end of the chromatogram. This includes the ranges typical of middle distillate from about nC8 to nC24 and heavier materials beyond the middle distillate range. The types and proportions of the peaks in the middle distillate range are typical of an extremely weathered diesel fuel or fuel oil. Weathering is primarily biodegradation which has preferentially decreased the size of the normal paraffin peaks (labeled nC8 to nC25) relative to the more biodegradation resistant compounds such as the isoprenoid peaks (labeled IP13 to IP18, Pristane and Phytane). The heavier material beyond the middle distillate range could be a heavy fuel oil, perhaps a lubricating oil or some other heavy material. RW-2L3 is quite similar to RW-2L5 and fairly similar to RW-5L3. The results of the physical property analyses are given in Table 1.

Sample RW-2L5 appears to be a mixture of extremely weathered middle distillate and perhaps a very small amount of heavier material. The chromatogram of RW-2L5 (Figures 5 and 14) shows a series of peaks starting at about normal nonane (nC9) and continuing to near the end of the chromatogram and one unresolved hump that starts at about nC10, reaches a maximum at about nC15 or nC16 and continues to about nC24 and a small amount of unresolved material that starts at about nC24 and continues to the end of the chromatogram. This includes the ranges typical of middle distillate from about nC8 to nC24 and heavier materials beyond the middle distillate range. The types and proportions of the peaks in the middle distillate range are typical of an extremely weathered diesel fuel or fuel oil. Weathering is primarily biodegradation which has preferentially decreased the size of the normal paraffin peaks (labeled nC8 to nC25) relative to the more biodegradation resistant compounds such as the isoprenoid peaks (labeled IP13 to IP18, Pristane and Phytane). The heavier material beyond the middle distillate range could be a heavy fuel oil, perhaps a lubricating oil or some other heavy material. RW-2L5 is quite similar to RW-2L3 and fairly similar to RW-5L3.

Sample RW-5L3 appears to be a mixture of extremely weathered middle distillate and a heavier material. The chromatogram of RW-5L3 (Figures 6 and 15) shows a series of peaks starting at about methylcyclohexane (MCHX) and continuing to the end of the chromatogram and one unresolved hump that starts at about nC10, reaches a maximum at about nC17 and continues to about nC24 and a second unresolved hump that starts at about nC24 reaches a maximum at about nC36 and continues to the end of the chromatogram. This includes the ranges typical of middle distillate from about nC8 to nC24 and heavier materials beyond the middle distillate range. The types and proportions of the peaks in the middle distillate range are typical of an extremely weathered diesel fuel or fuel oil. Weathering is primarily biodegradation which has preferentially decreased the size of the normal paraffin peaks (labeled nC8 to nC25) relative to the more biodegradation resistant compounds such as the isoprenoid peaks (labeled IP13 to IP18, Pristane and Phytane). The heavier material beyond the middle distillate range could be a heavy fuel oil, perhaps a lubricating oil or some other heavy material. RW-5L3 is quite similar to CW-4 and CW-5. The results of the physical property analyses are given in Table 1.

The material extracted from water sample RW-5L3 appears to be a mixture of extremely weathered middle distillate and perhaps a small amount of heavier material. The chromatogram of RW-5L3 extract (Figures 7 and 16) shows a series of peaks starting at about normal nonane (nC9) and continuing to near the end of the chromatogram and one unresolved hump that starts at about nC10, reaches a maximum at about nC16 and continues to about nC24 and a small amount of unresolved material that starts at about nC24 and continues to the end of the chromatogram. This includes the ranges typical of middle distillate from about nC8 to nC24 and heavier materials beyond the middle distillate range. The types and proportions of the peaks in the middle distillate range are typical of an extremely weathered diesel fuel or fuel oil. Weathering is primarily biodegradation which has preferentially decreased the size of the normal paraffin peaks (labeled nC8 to nC25) relative to the more biodegradation resistant compounds such as the isoprenoid peaks (labeled IP13 to IP18, Pristane and Phytane). The heavier material beyond the middle distillate range could be a heavy fuel oil, perhaps a lubricating oil or some other heavy material. RW-5L3 is fairly similar to RW-2L3 and RW-2L5.

Please let me know if you have any questions regarding this interpretation.



Bruce Torkelson

Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA
Sample ID : CW-4-Product
Acquired : Jun 26, 2007 14:04:34

c:\ezchrom\chrom\07\091\cw-4 -- Channel A

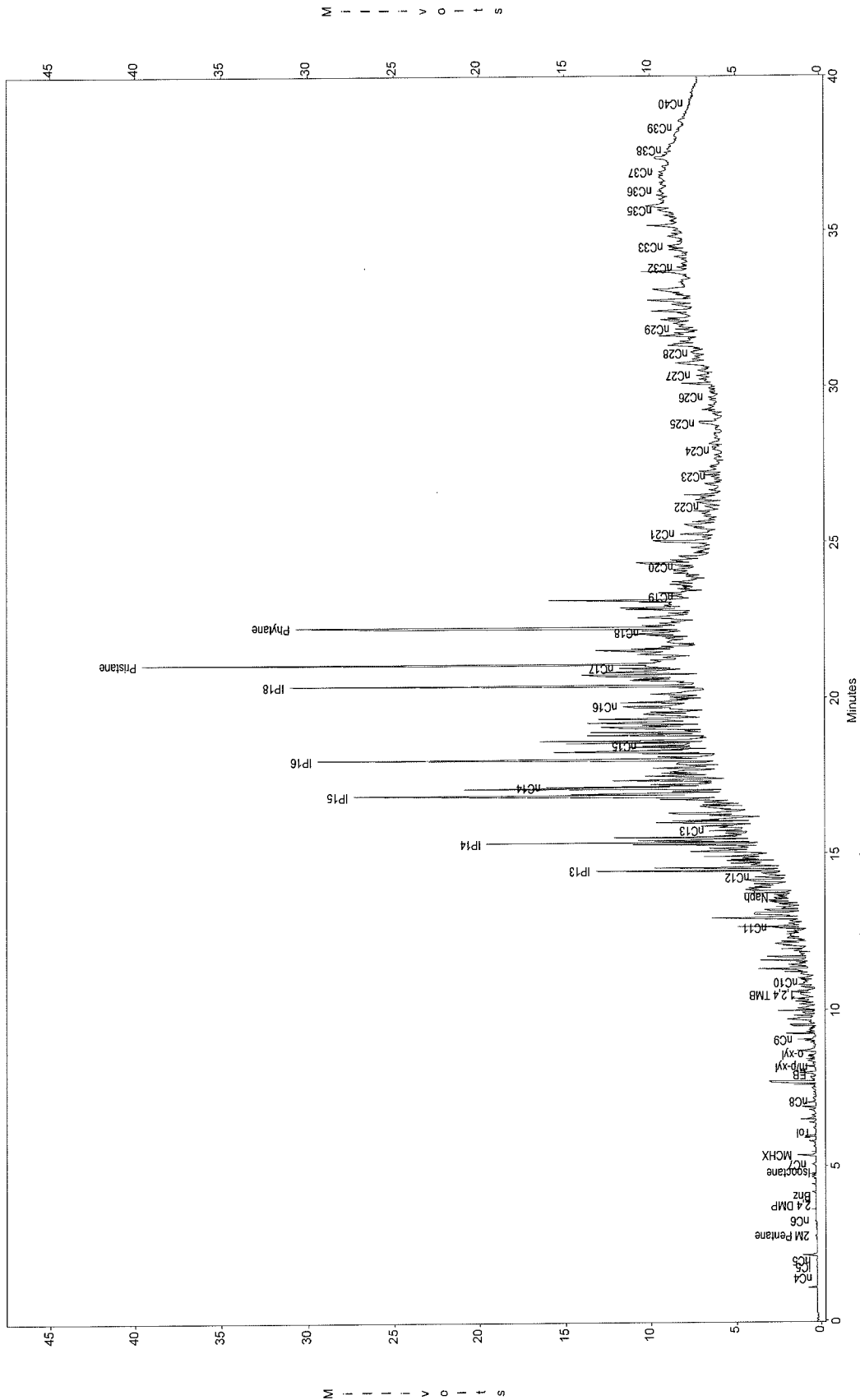


Figure 2, Gas chromatogram of the CW-4 product sample.

Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA

Sample ID : CW-5-Product

Acquired : Jun 26, 2007 13:08:42

c:\ezchrom\chrom\07091\cw-5 -- Channel A

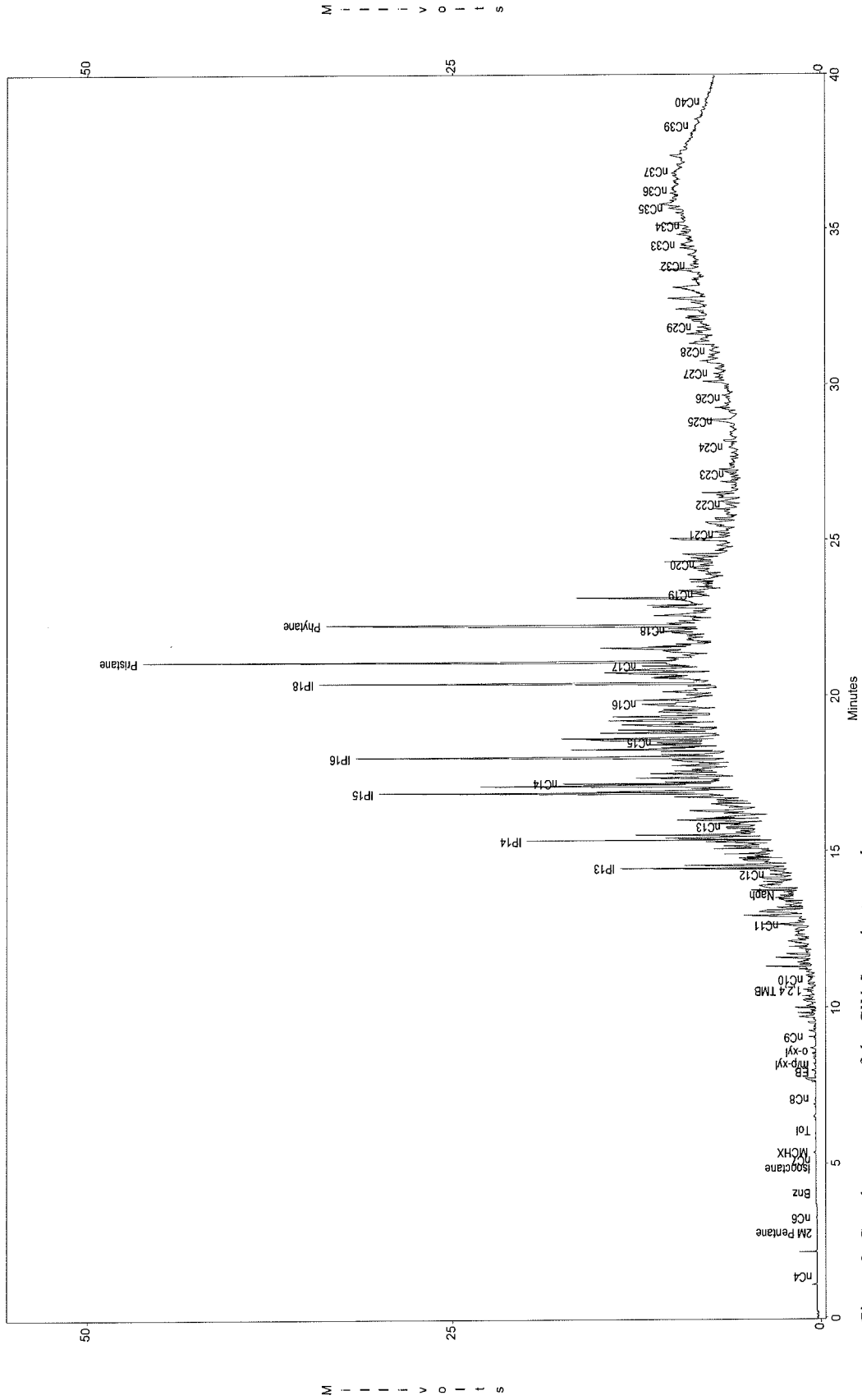


Figure 3, Gas chromatogram of the CW-5 product sample.

Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA
Sample ID : RW2L3-Product
Acquired : Jun 26, 2007 16:49:41

c:\ezchrom\chrom07091rw-2l3 -- Channel A

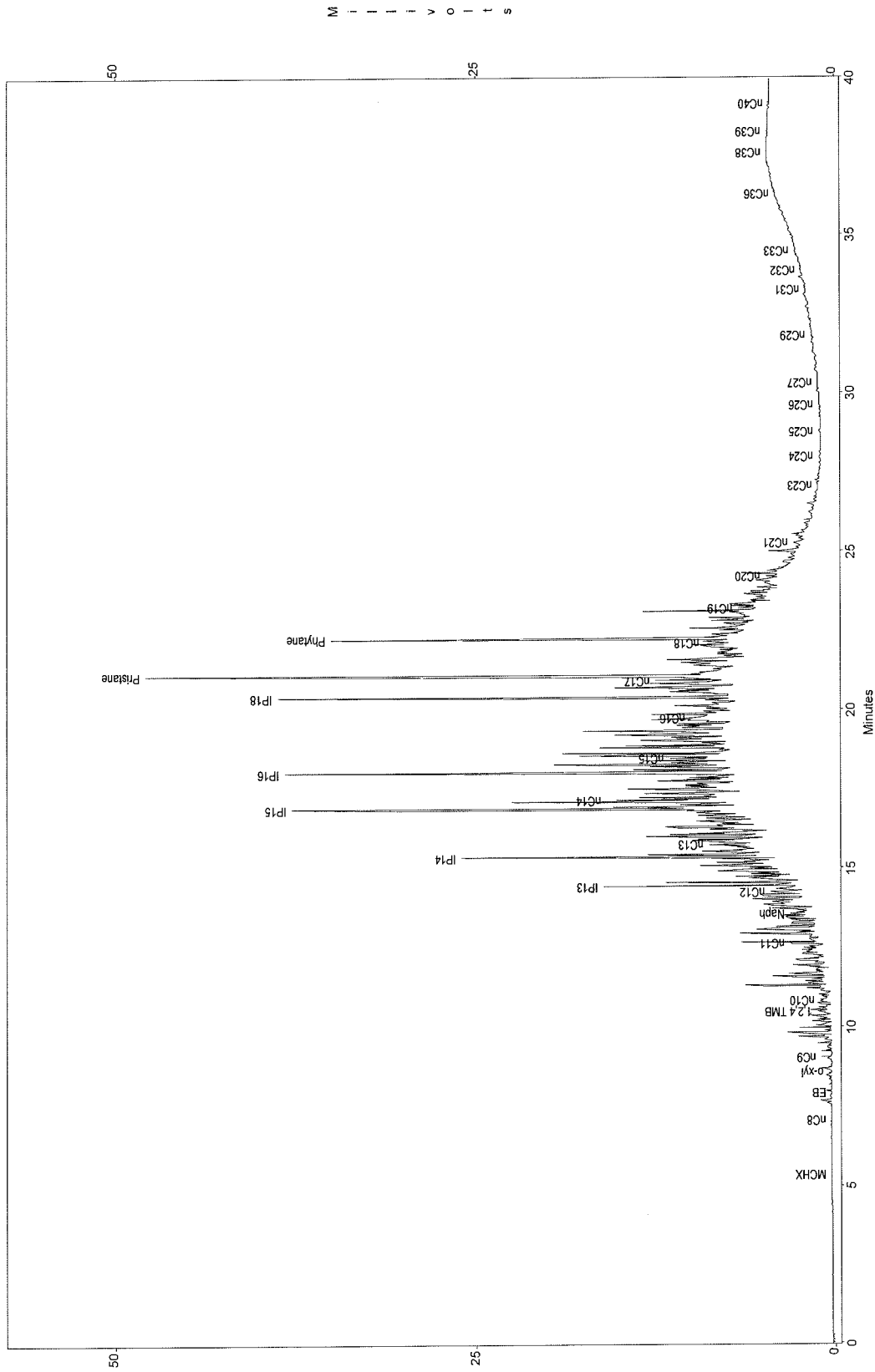


Figure 4, Gas chromatogram of the RW-2L3 product sample.

Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukie Rail Yard, Tacoma, WA
Sample ID : RW2L5-Product
Acquired : Jun 26, 2007 15:57:58

c:\ezchrom\chrom\07091rw-2l5.2 - Channel A

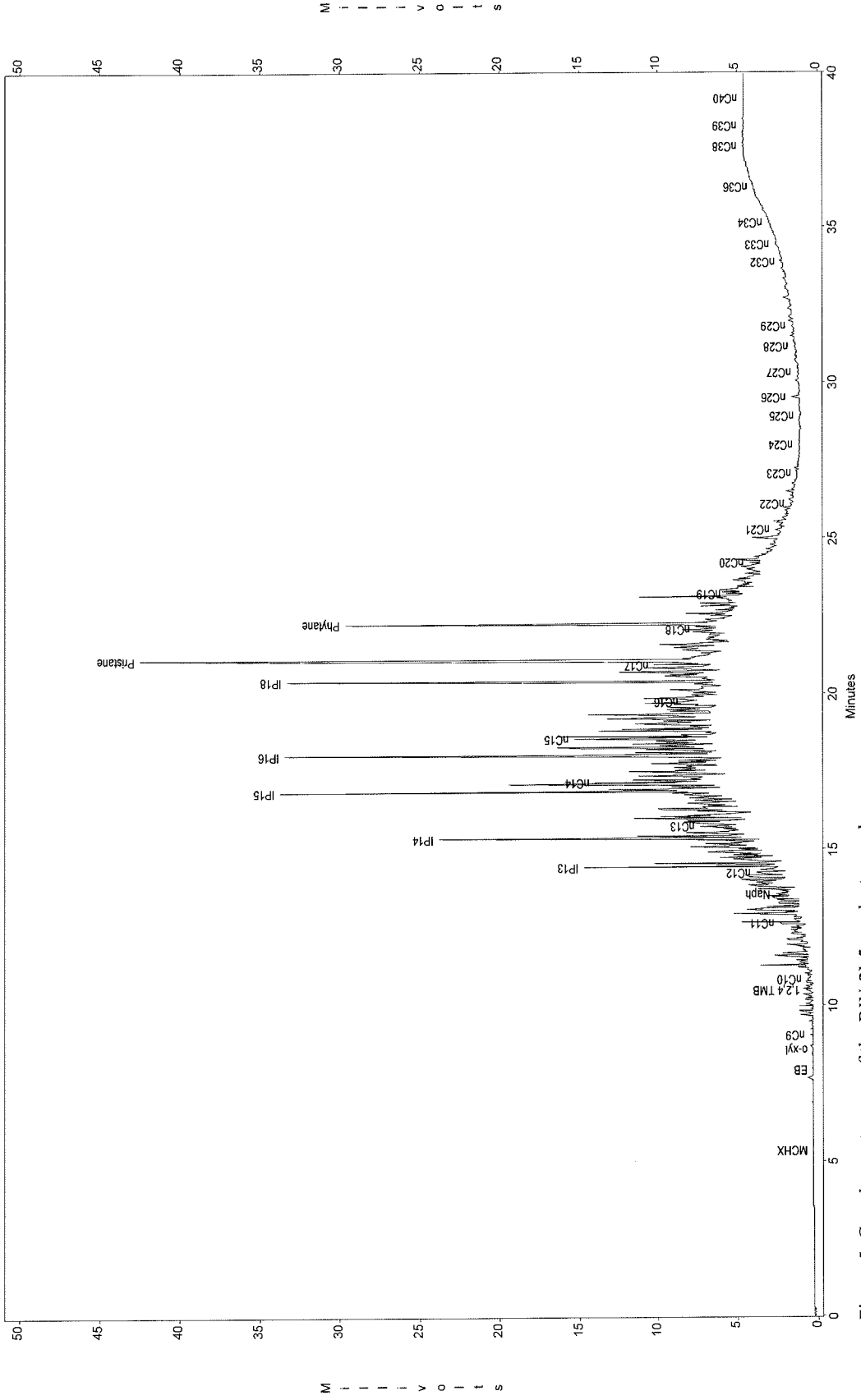


Figure 5, Gas chromatogram of the RW-2L5 product sample.

Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukie Rail Yard, Tacoma, WA
Sample ID : RW5L3-Product
Acquired : Jun 26, 2007 12:15:29

c:\ezchrom\chrom\07091\w-518 -- Channel A

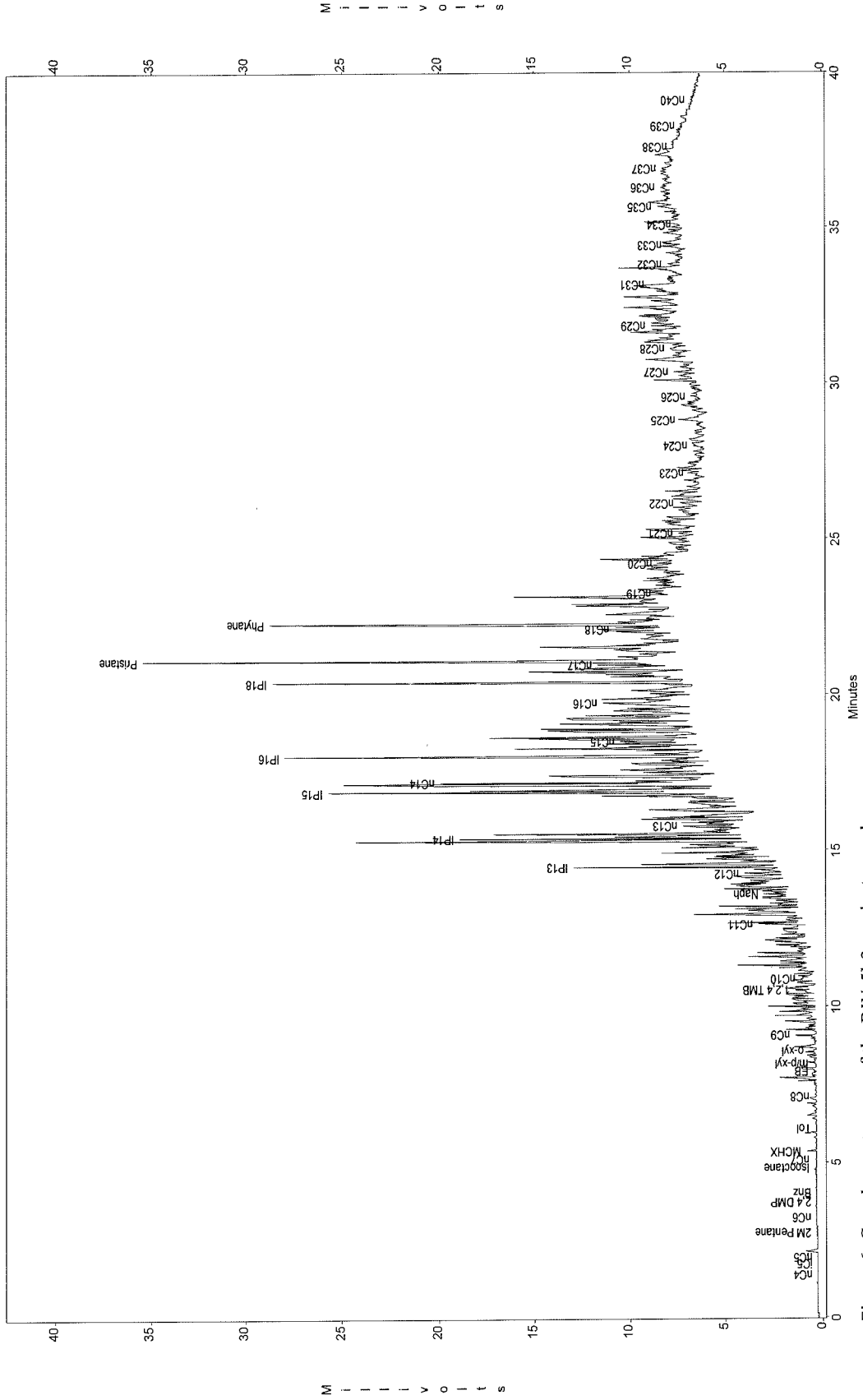


Figure 6, Gas chromatogram of the RW-5L3 product sample.

Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA

Sample ID : RW5L3 Water Extract

Acquired : Jul 11, 2007 13:43:29

c:\ezchrom\chrom107091\rv5l3.sl -- Channel A

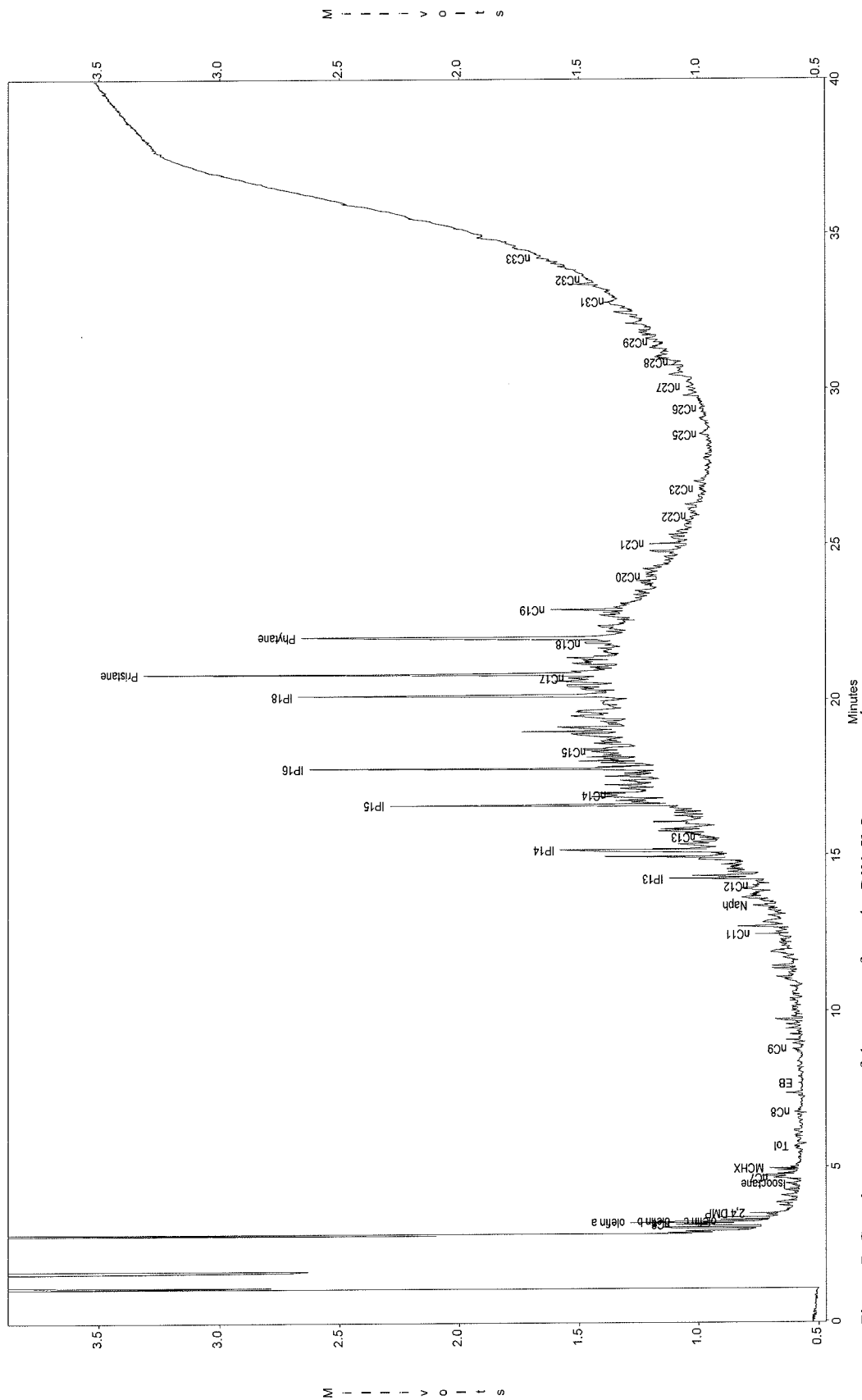


Figure 7, Gas chromatogram of the extract from the RW-5L3 water sample.

Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA

Sample ID : Gas/Dies/Wax std

Acquired : Jun 26, 2007 09:44:39

c:\ezchrom\chrom\07091\gasdiwax2 - Channel A

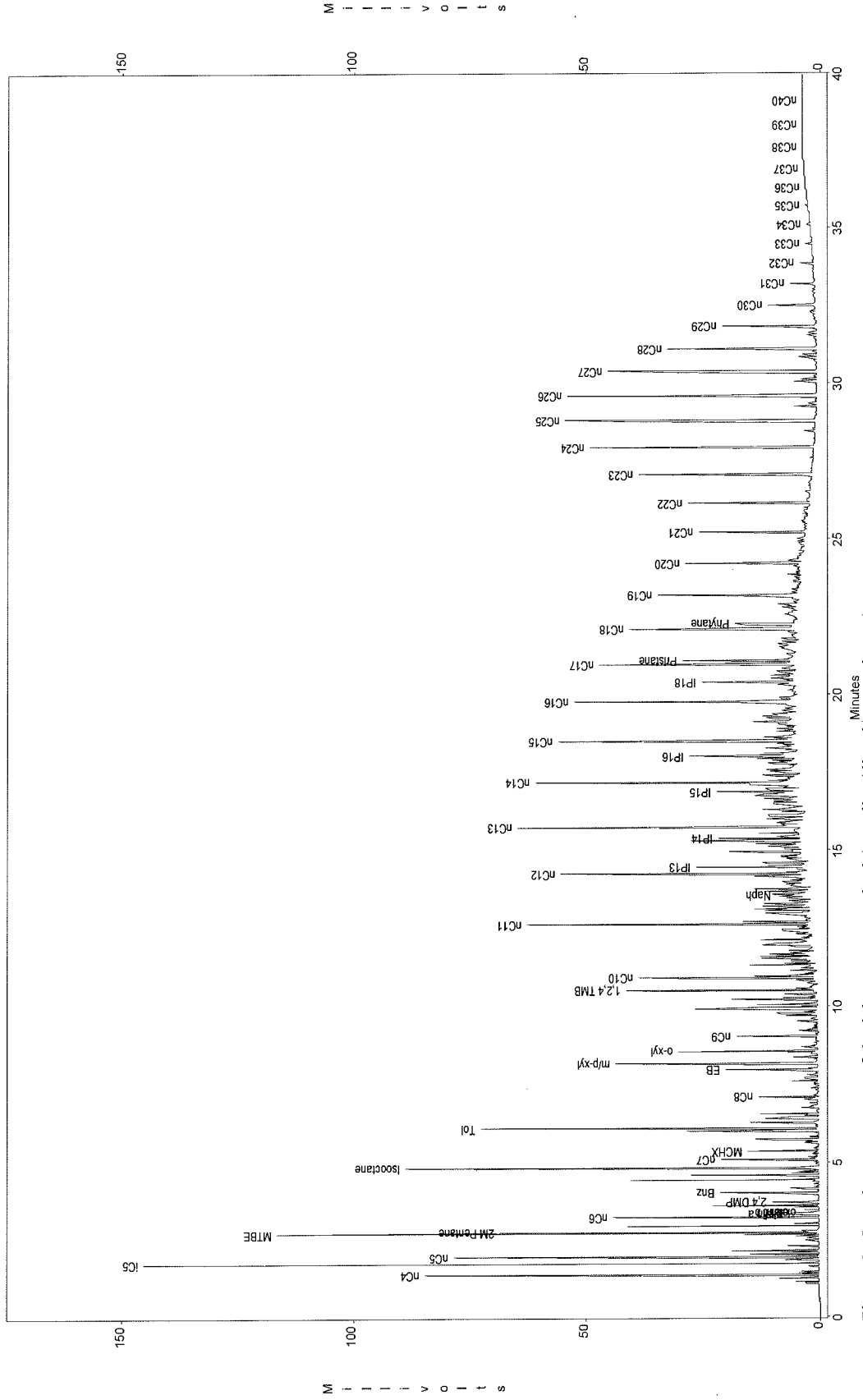


Figure 8, Gas chromatogram of the laboratory standard (gasoline/diesel/wax mixture).

Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukie Rail Yard, Tacoma, WA

Sample ID : Gas/Dies/Wax std

Acquired : Jul 11, 2007 15:23:07

c:\ezchrom\chrom\07091\gadiwax.sl - Channel A

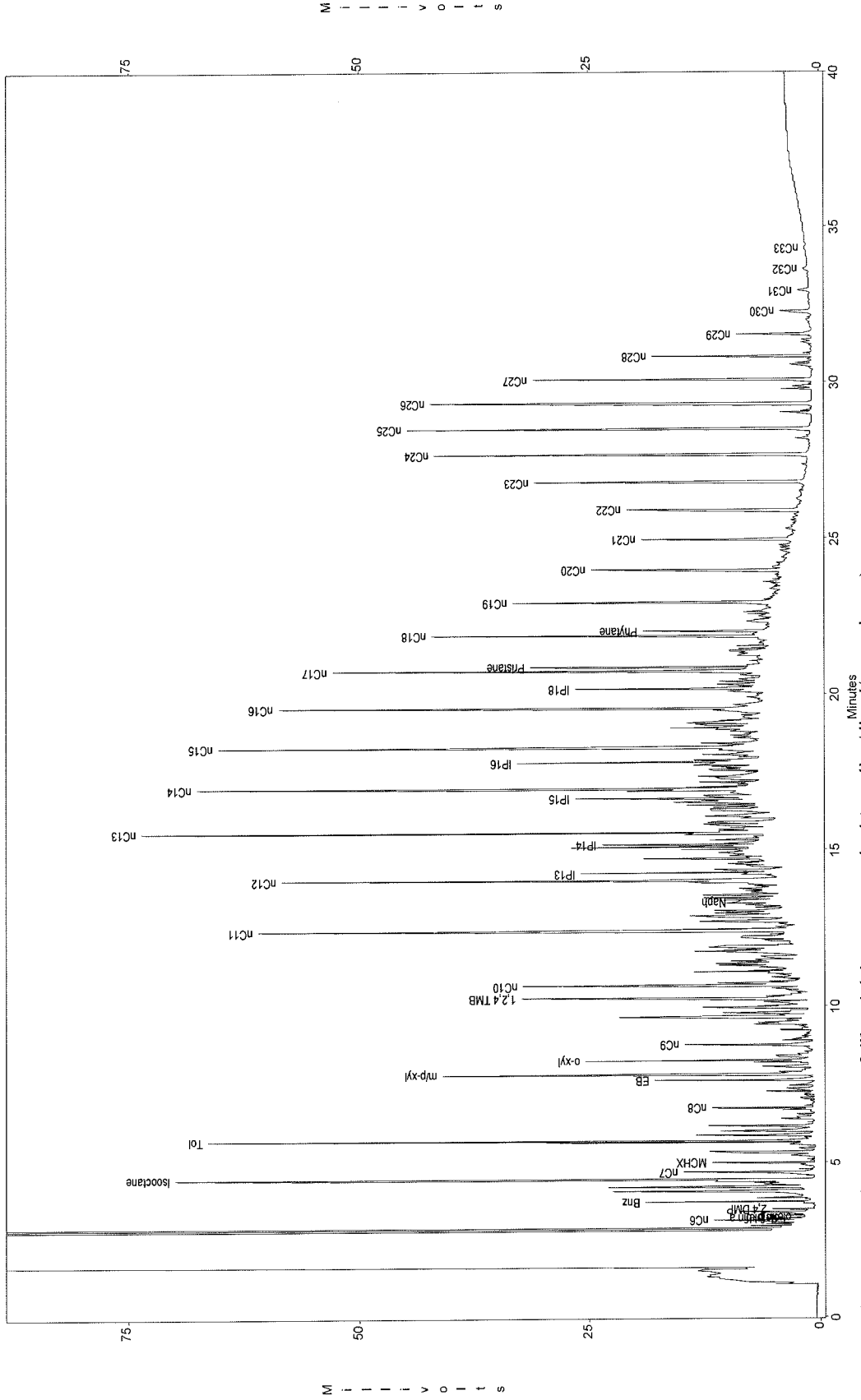
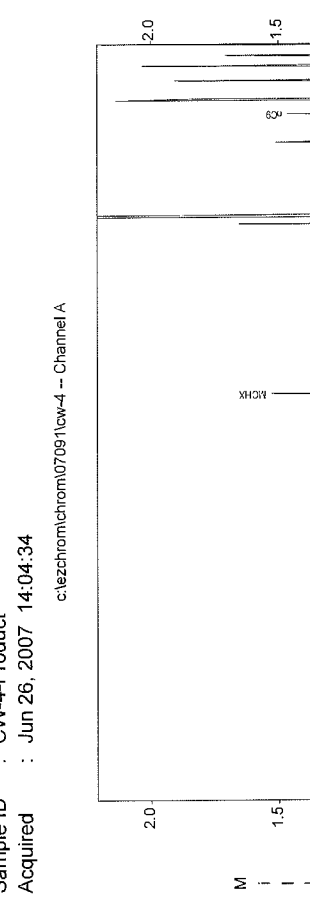
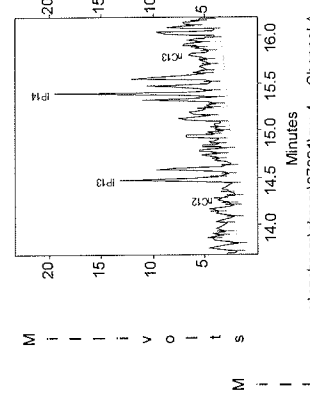


Figure 9, Gas chromatogram of diluted laboratory standard (gasoline/diesel/wax mixture).

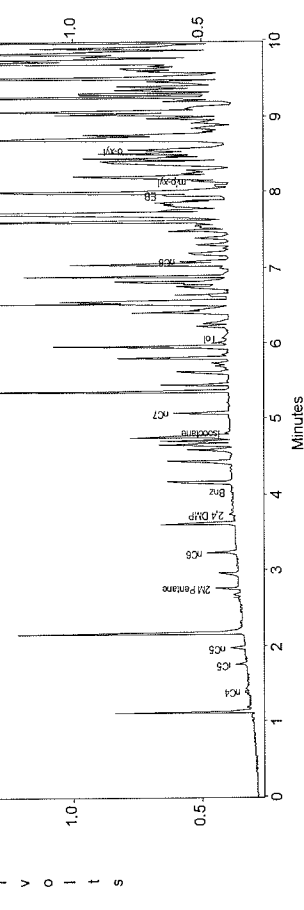
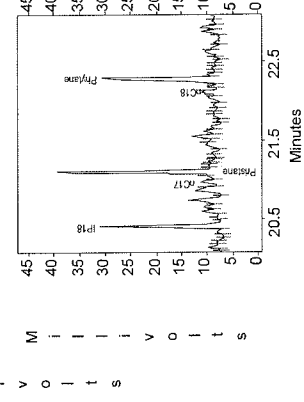
Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA
 Sample ID : CW-4-Product
 Acquired : Jun 26, 2007 14:04:34

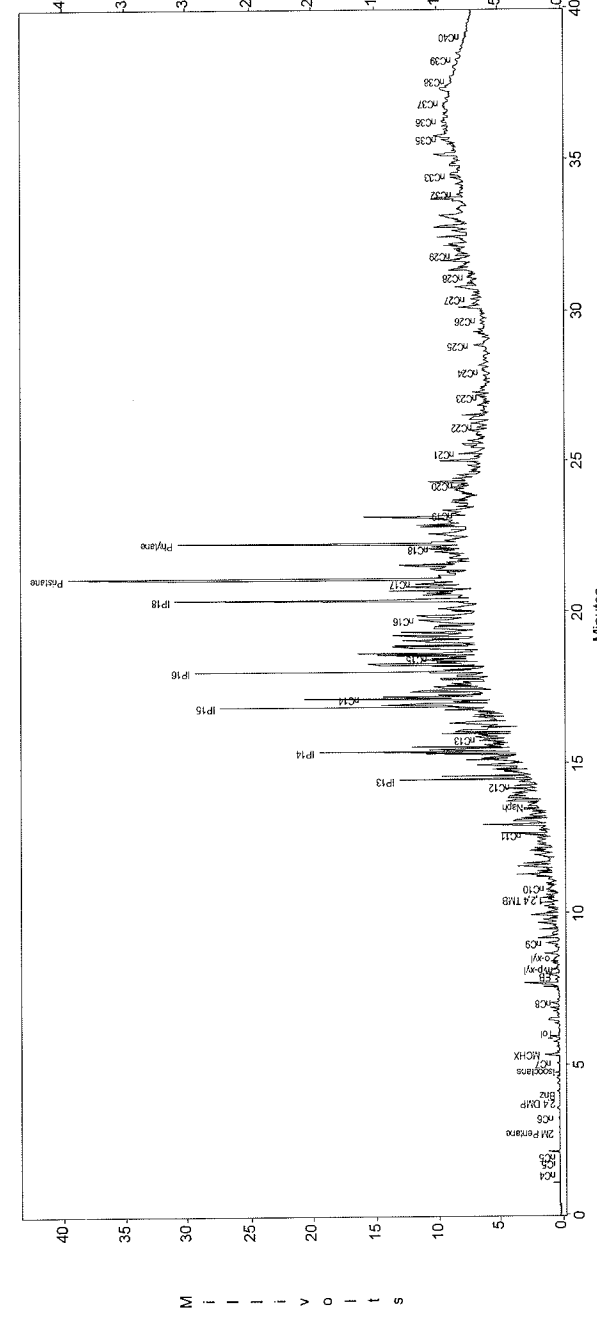
c:\ezchrom\chrom07091\cw-4 -- Channel A



c:\ezchrom\chrom07091\cw-4 -- Channel A



c:\ezchrom\chrom07091\cw-4 -- Channel A



Channel A Results

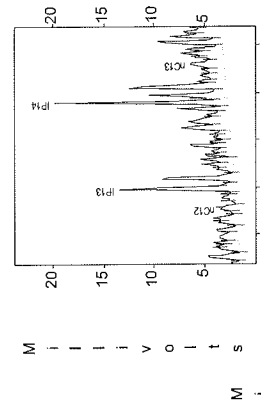
| Peak | Area | Height |
|------------|-------|--------|
| nC4 | 13 | 16 |
| nC5 | 36 | 46 |
| nC6 | 47 | 58 |
| MIBK | 0 | 0 |
| 2M Pentane | 85 | 92 |
| nC5 | 120 | 118 |
| olefin a | 0 | 0 |
| olefin b | 0 | 0 |
| olefin c | 0 | 0 |
| 2,4 DMP | 29 | 25 |
| Hex | 10 | 8 |
| Isocetane | 26 | 22 |
| nC7 | 564 | 229 |
| nC8 | 1375 | 1144 |
| Tol | 54 | 28 |
| nC9 | 241 | 188 |
| nC10 | 379 | 267 |
| m/p-xyl | 266 | 154 |
| o-xyl | 910 | 398 |
| nC9 | 1704 | 1080 |
| 1,2,4 THS | 410 | 399 |
| nC10 | 1691 | 617 |
| nC11 | 4107 | 1939 |
| Naph | 3422 | 1328 |
| nC12 | 3222 | 1845 |
| PF13 | 16985 | 11018 |
| PF14 | 24635 | 16647 |
| nC13 | 11999 | 3388 |
| PF15 | 37281 | 2592 |
| nC14 | 22403 | 10742 |
| PF16 | 45379 | 23247 |
| nC15 | 13718 | 4234 |
| nC16 | 15130 | 4853 |
| PF18 | 50114 | 23750 |
| nC17 | 11226 | 4514 |
| Priztane | 76923 | 32551 |
| nC18 | 4984 | 3189 |
| Phylene | 55713 | 23560 |
| nC19 | 3154 | 1363 |
| nC20 | 6486 | 1463 |
| nC21 | 6444 | 2485 |
| nC22 | 3976 | 909 |
| nC23 | 2444 | 627 |
| nC24 | 2161 | 445 |
| nC25 | 7049 | 1759 |
| nC26 | 2480 | 566 |
| nC27 | 2826 | 953 |
| nC28 | 1641 | 502 |
| nC29 | 2518 | 1170 |
| nC30 | 0 | 0 |
| nC31 | 0 | 0 |
| nC32 | 2184 | 542 |
| nC33 | 1129 | 645 |
| nC34 | 0 | 0 |
| nC35 | 2565 | 773 |
| nC36 | 295 | 197 |
| nC37 | 247 | 184 |
| nC38 | 116 | 135 |
| nC39 | 123 | 137 |
| nC40 | 172 | 102 |

Figure 11. Multipanel display of gas chromatogram of the CW-4 product sample.

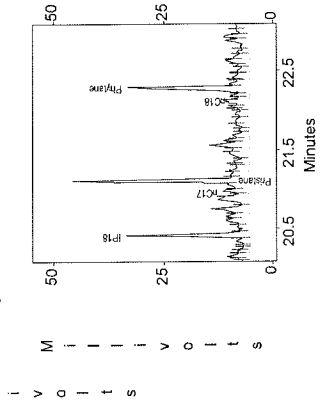
Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA
 Sample ID : CW-5-Product
 Acquired : Jun 26, 2007 13:08:42

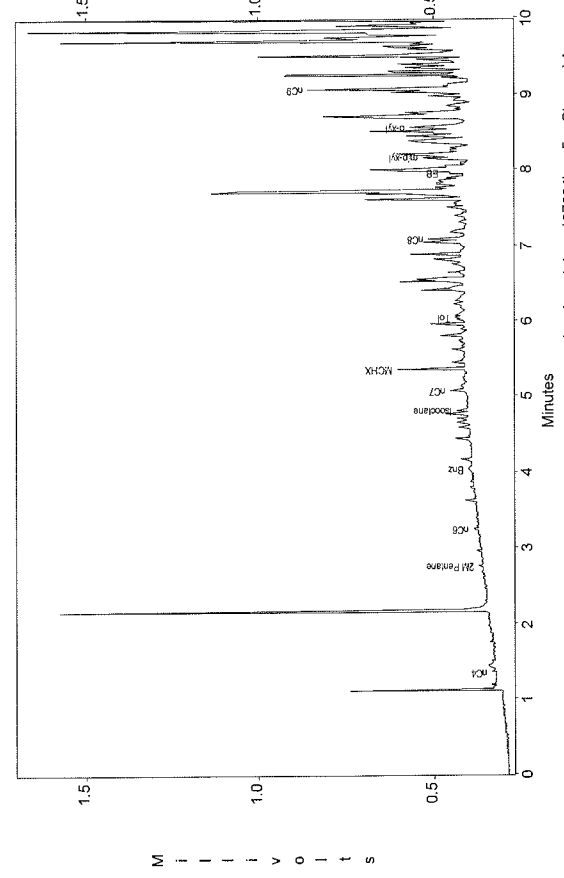
c:\ezchrom\chrom\07091\cw-5 - Channel A



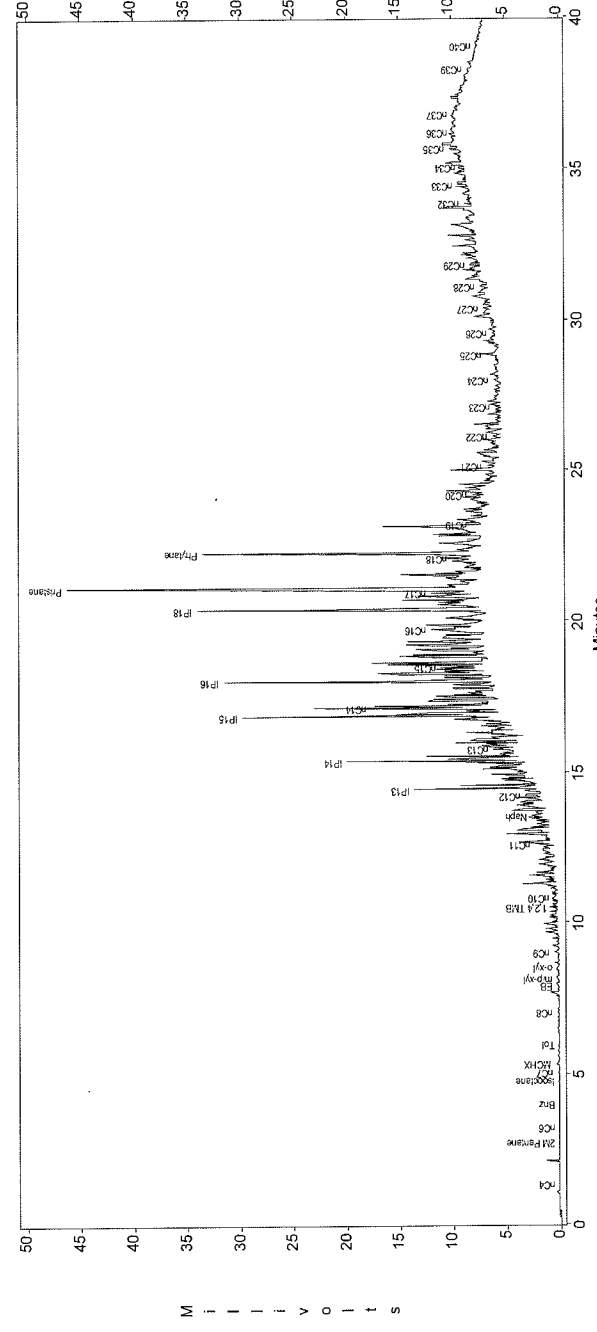
c:\ezchrom\chrom\07091\cw-5 - Channel A



c:\ezchrom\chrom\07091\cw-5 - Channel A



c:\ezchrom\chrom\07091\cw-5 - Channel A



Channel A Results

| Peak | Area | Height |
|------|-------|--------|
| nC4 | 18 | 15 |
| nC5 | 0 | 0 |
| nC6 | 0 | 0 |
| nC7 | 0 | 0 |
| nC8 | 19 | 13 |
| nC9 | 18 | 15 |
| nC10 | 0 | 0 |
| nC11 | 0 | 0 |
| nC12 | 0 | 0 |
| nC13 | 14 | 8 |
| nC14 | 46 | 32 |
| nC15 | 91 | 51 |
| nC16 | 240 | 188 |
| nC17 | 46 | 30 |
| nC18 | 352 | 188 |
| nC19 | 194 | 70 |
| nC20 | 222 | 128 |
| nC21 | 427 | 166 |
| nC22 | 576 | 462 |
| nC23 | 669 | 502 |
| nC24 | 901 | 377 |
| nC25 | 3289 | 1653 |
| nC26 | 3482 | 1433 |
| nC27 | 707 | 622 |
| nC28 | 18253 | 11580 |
| nC29 | 26807 | 17688 |
| nC30 | 12339 | 3195 |
| nC31 | 40355 | 2547 |
| nC32 | 24827 | 12178 |
| nC33 | 50100 | 25392 |
| nC34 | 16002 | 4932 |
| nC35 | 17909 | 6067 |
| nC36 | 64379 | 23115 |
| nC37 | 17144 | 6152 |
| nC38 | 97006 | 40830 |
| nC39 | 7376 | 4213 |
| nC40 | 71482 | 27663 |
| nC41 | 5627 | 2593 |
| nC42 | 7316 | 2529 |
| nC43 | 4982 | 1391 |
| nC44 | 3887 | 929 |
| nC45 | 1962 | 665 |
| nC46 | 3355 | 679 |
| nC47 | 3337 | 1271 |
| nC48 | 2462 | 519 |
| nC49 | 3724 | 517 |
| nC50 | 1453 | 445 |
| nC51 | 2054 | 886 |
| nC52 | 0 | 0 |
| nC53 | 0 | 0 |
| nC54 | 2961 | 507 |
| nC55 | 966 | 570 |
| nC56 | 745 | 760 |
| nC57 | 1188 | 555 |
| nC58 | 158 | 185 |
| nC59 | 73 | 119 |
| nC60 | 0 | 0 |
| nC61 | 239 | 78 |
| nC62 | 239 | 78 |
| nC63 | 198 | 156 |

Figure 12. Multipanel display of gas chromatogram of the CW-5 product sample.

Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA
 Sample ID : RW2L3-Product
 Acquired : Jun 26, 2007 16:49:41

Channel A Result:

| Peak | Area | Height |
|------------|-------|--------|
| nC4 | 0 | 0 |
| nC5 | 0 | 0 |
| nC6 | 0 | 0 |
| nC7 | 0 | 0 |
| 2M Picture | 0 | 0 |
| nC8 | 0 | 0 |
| stetio a | 0 | 0 |
| olefin b | 0 | 0 |
| olefin c | 0 | 0 |
| 2,4 DM | 0 | 0 |
| Sox | 0 | 0 |
| Isocetane | 0 | 0 |
| nC9 | 0 | 0 |
| MEOW | 76 | 58 |
| DI | 0 | 0 |
| nC10 | 16 | 11 |
| EB | 119 | 76 |
| BPVO | 0 | 0 |
| o-xyl | 424 | 224 |
| nC9 | 1186 | 788 |
| 1,2,4 THN | 1346 | 904 |
| nC10 | 1481 | 894 |
| nC11 | 4613 | 2381 |
| NBP | 3993 | 1668 |
| nC12 | 6778 | 2370 |
| PIB | 22767 | 13549 |
| PI4 | 33390 | 21450 |
| nC13 | 10971 | 3313 |
| PI5 | 54769 | 24422 |
| nC14 | 25376 | 10326 |
| PI6 | 64052 | 32208 |
| nC15 | 23150 | 5156 |
| nC16 | 4610 | 2843 |
| PI8 | 69498 | 21897 |
| nC17 | 55246 | 5041 |
| Pr-1,6Di | 93420 | 41530 |
| nC18 | 1555 | 3542 |
| Rivane | 73974 | 36574 |
| VCU | 4282 | 2669 |
| nC19 | 3413 | 1137 |
| nC20 | 2828 | 620 |
| nC22 | 0 | 0 |
| nC23 | 161 | 24 |
| nC24 | 703 | 118 |
| nC25 | 784 | 135 |
| nC26 | 335 | 66 |
| nC27 | 337 | 99 |
| nC28 | 0 | 0 |
| nC29 | 177 | 96 |
| nC30 | 0 | 0 |
| nC31 | 162 | 68 |
| nC32 | 158 | 27 |
| nC33 | 201 | 82 |
| nC34 | 0 | 0 |
| nC35 | 0 | 0 |
| nC36 | 160 | 33 |
| nC37 | 0 | 0 |
| nC38 | 175 | 42 |
| nC39 | 138 | 36 |
| nC40 | 12 | 10 |

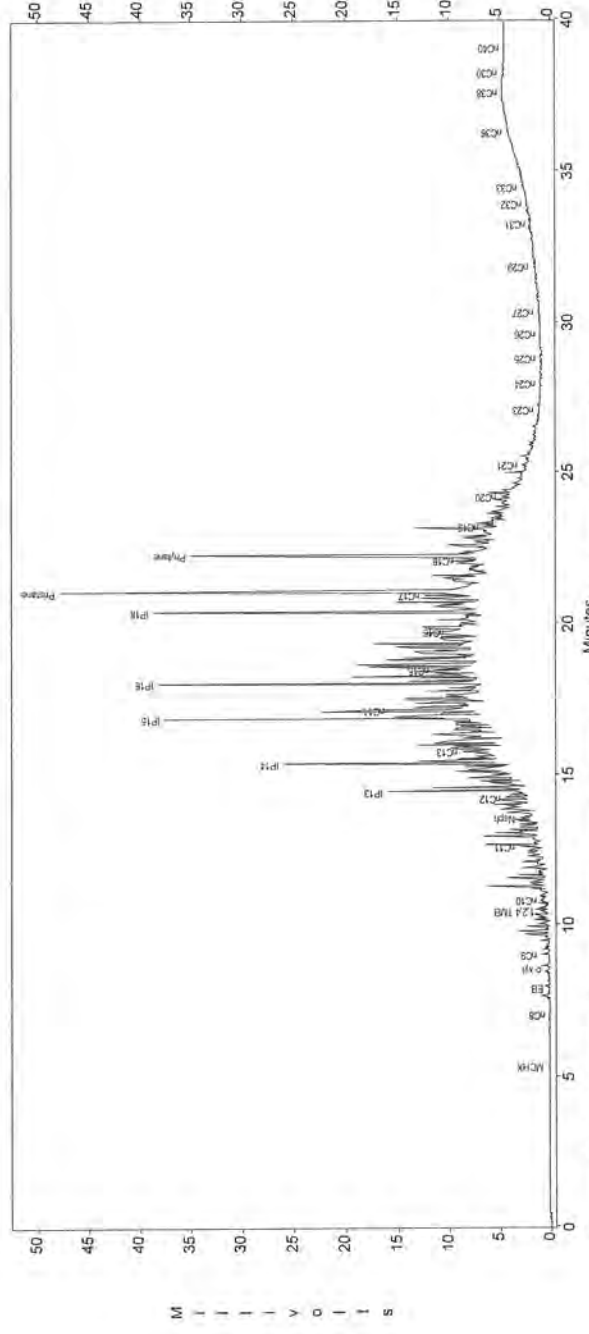
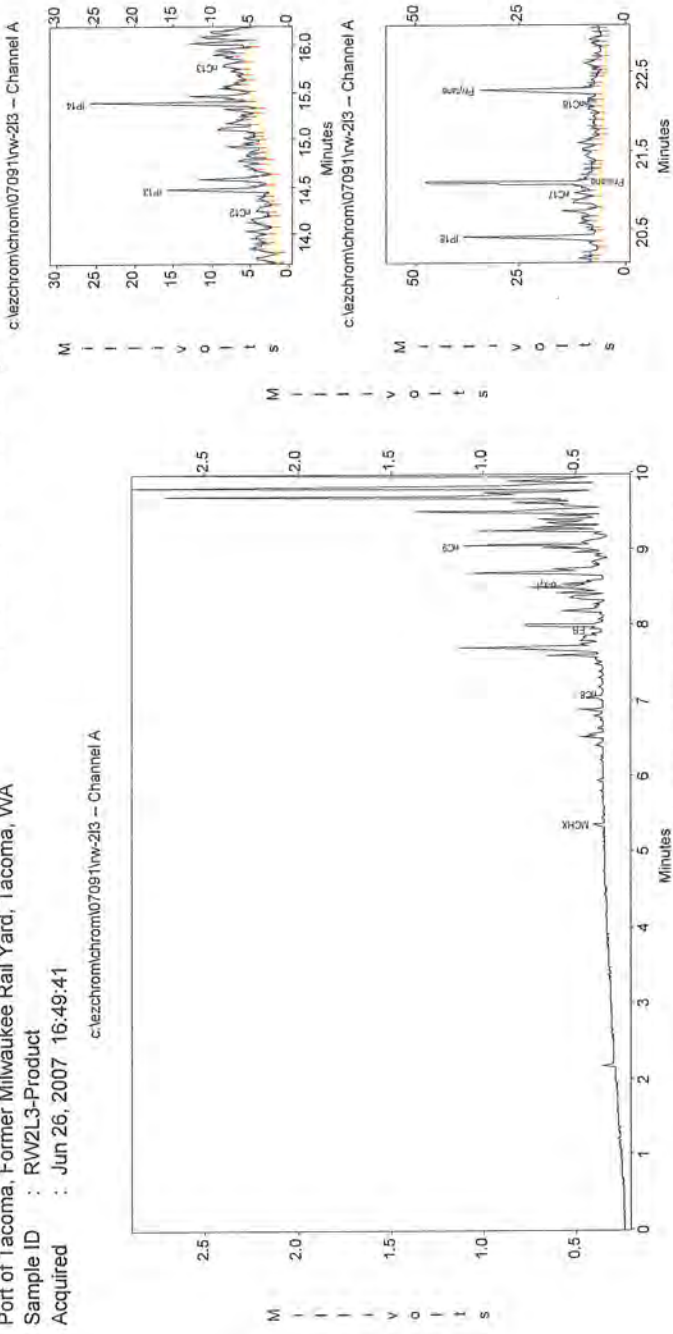
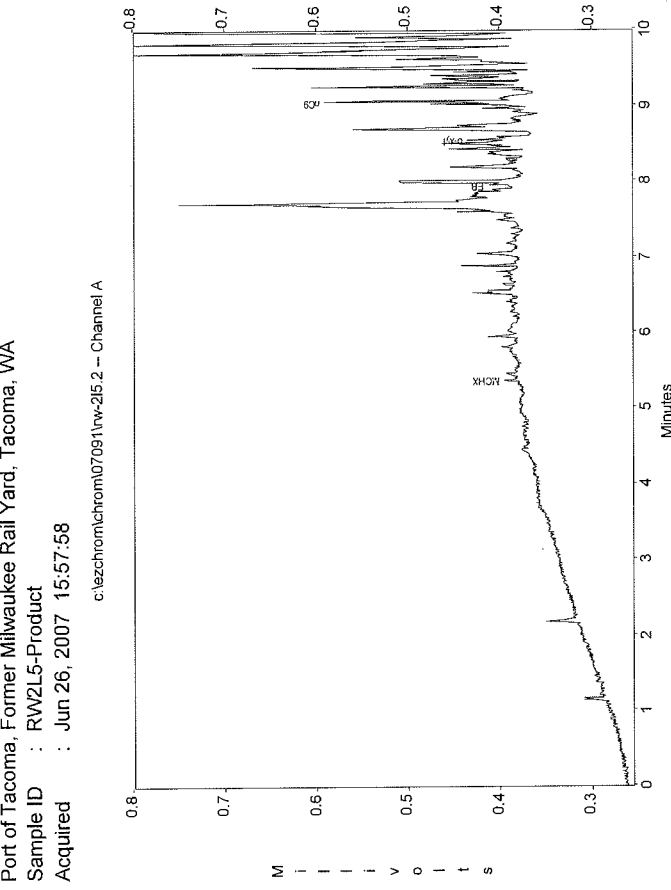
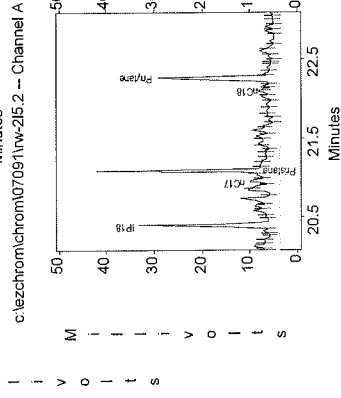
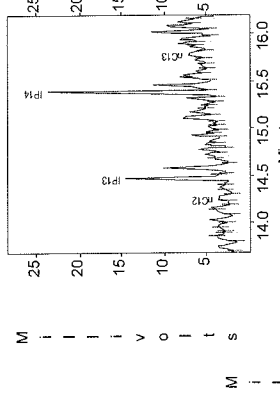


Figure 13. Multipanel display of gas chromatogram of the RW-2L3 product sample.

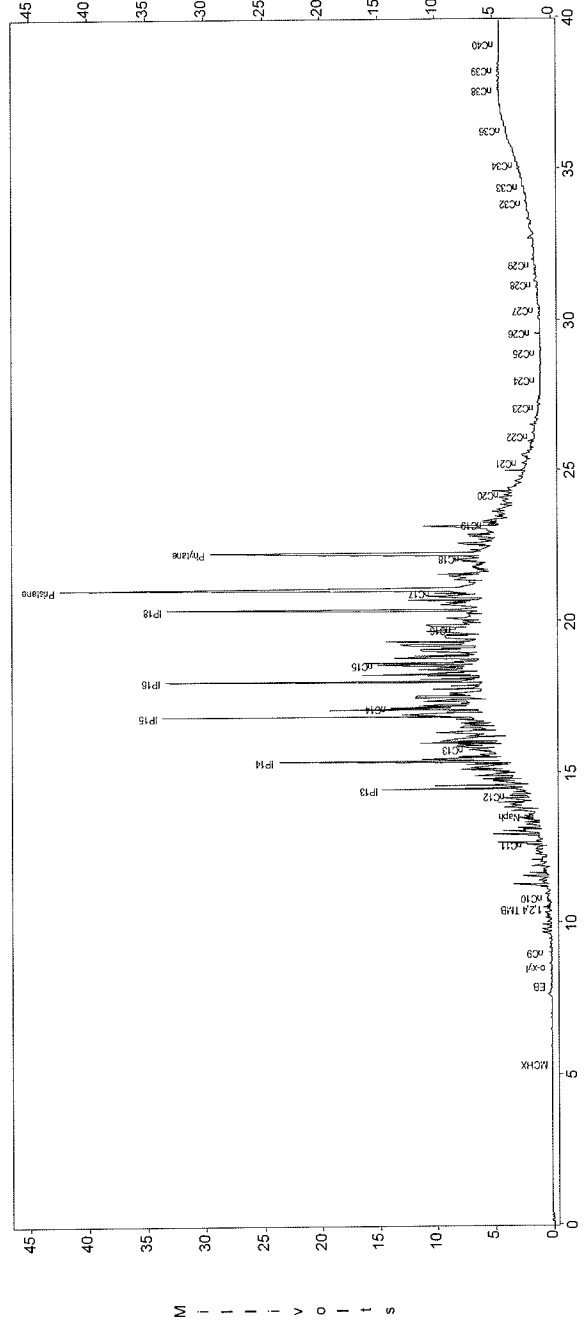
Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA
 Sample ID : RW2L5-Product
 Acquired : Jun 26, 2007 15:57:58

c:\ezchrom\chrom07091\rw-2l5.2 -- Channel A



c:\ezchrom\chrom07091\rw-2l5.2 -- Channel A



Channel A Results

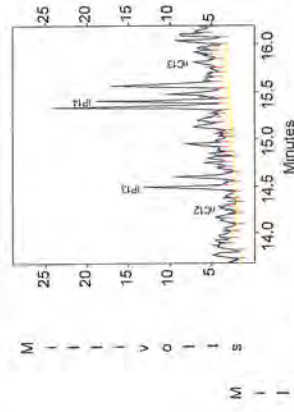
| Peak | Area | Height |
|------------|-------|--------|
| IC4 | 0 | 0 |
| IC5 | 0 | 0 |
| IC6 | 0 | 0 |
| MTBE | 0 | 0 |
| 2M Pentane | 0 | 0 |
| IC6 | 0 | 0 |
| olefin a | 0 | 0 |
| olefin b | 0 | 0 |
| olefin c | 0 | 0 |
| 2,4 DMP | 0 | 0 |
| Sox | 0 | 0 |
| Leotane | 0 | 0 |
| IC7 | 0 | 0 |
| MOX | 17 | 13 |
| IC8 | 0 | 0 |
| IC9 | 72 | 43 |
| EB | 0 | 0 |
| IP-xy1 | 0 | 0 |
| IC9 | 175 | 73 |
| 1,2,4 THS | 463 | 230 |
| IC10 | 592 | 496 |
| IC11 | 705 | 324 |
| IC12 | 3195 | 1585 |
| Naph | 3266 | 1294 |
| IC13 | 5489 | 1907 |
| IP13 | 21527 | 12628 |
| IP14 | 29920 | 19666 |
| IC13 | 8734 | 2669 |
| IP15 | 46597 | 28645 |
| IC14 | 24310 | 9933 |
| IP16 | 61825 | 29285 |
| IC15 | 26824 | 11216 |
| IC16 | 10712 | 4334 |
| IP18 | 75528 | 29397 |
| IC17 | 18672 | 6248 |
| Pyrene | 92448 | 38449 |
| IC18 | 7161 | 3546 |
| Pyrene | 64144 | 25551 |
| IC19 | 3669 | 1712 |
| IC20 | 2481 | 882 |
| IC21 | 2084 | 471 |
| IC22 | 1511 | 333 |
| IC23 | 185 | 60 |
| IC24 | 714 | 99 |
| IC25 | 187 | 38 |
| IC26 | 1062 | 531 |
| IC27 | 232 | 91 |
| IC28 | 568 | 125 |
| IC29 | 261 | 104 |
| IC30 | 0 | 0 |
| IC31 | 0 | 0 |
| IC32 | 231 | 111 |
| IC33 | 181 | 81 |
| IC34 | 239 | 77 |
| IC35 | 0 | 0 |
| IC36 | 235 | 26 |
| IC37 | 0 | 0 |
| IC38 | 50 | 26 |
| IC39 | 65 | 24 |
| IC40 | 107 | 14 |

Figure 14, Multipanel display of gas chromatogram of the RW-2L5 product sample.

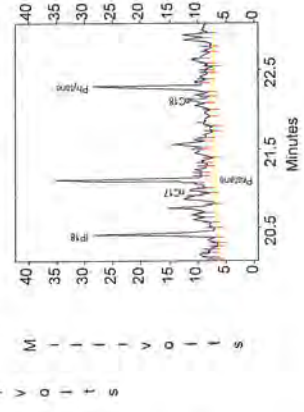
Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA
 Sample ID : RW5L3-Product
 Acquired : Jun 26, 2007 12:15:29

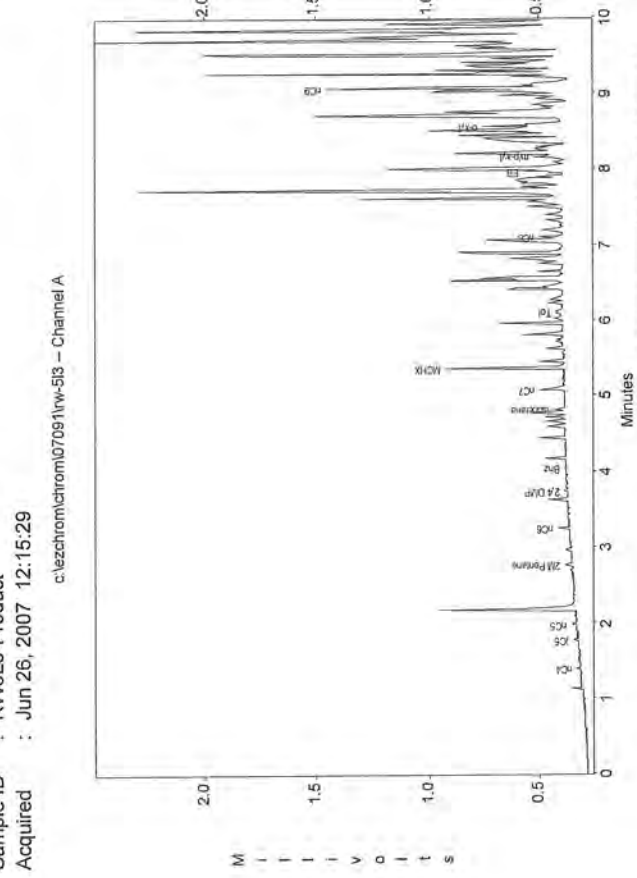
c:\ezchrom\chrom07091rw-5l3 - Channel A



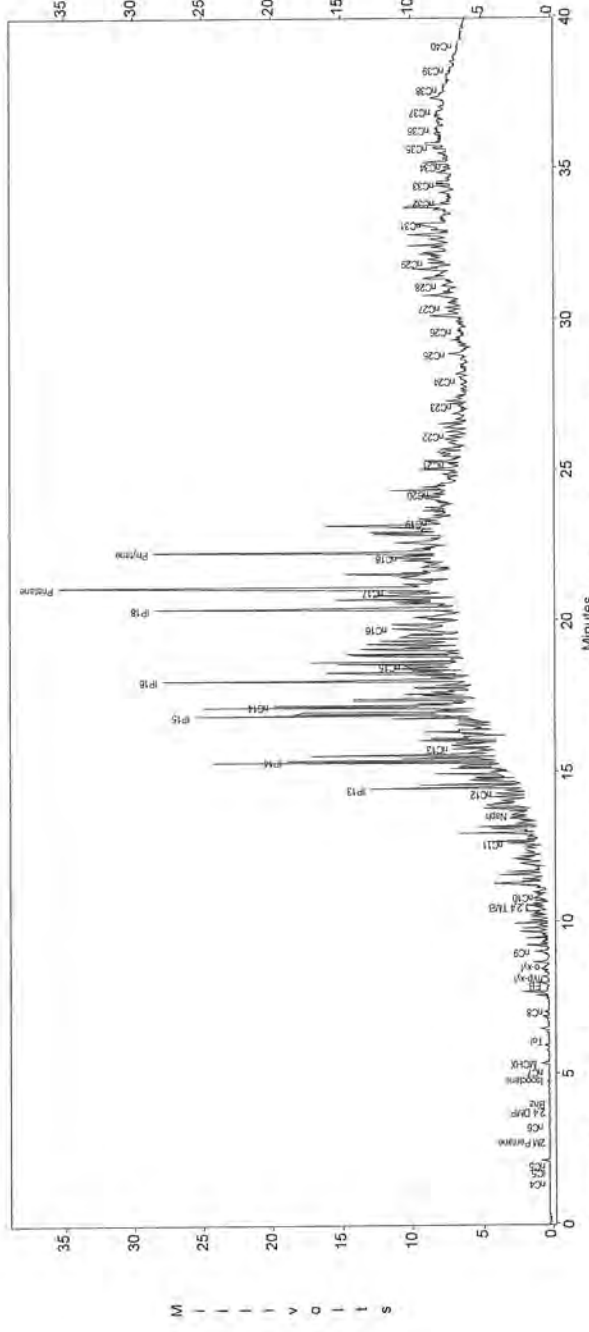
c:\ezchrom\chrom07091rw-5l3 - Channel A



c:\ezchrom\chrom07091rw-5l3 - Channel A



c:\ezchrom\chrom07091rw-5l3 - Channel A



Channel A Results

| Peak | Area | Height |
|------|-------|--------|
| 16.4 | 57 | 16 |
| 16.5 | 30 | 26 |
| 16.5 | 23 | 32 |
| 16.5 | 0 | 0 |
| 16.5 | 0 | 0 |
| 16.5 | 40 | 35 |
| 16.5 | 58 | 51 |
| 16.5 | 0 | 0 |
| 16.5 | 0 | 0 |
| 16.5 | 0 | 0 |
| 16.5 | 0 | 0 |
| 16.5 | 13 | 12 |
| 16.5 | 10 | 10 |
| 16.5 | 58 | 46 |
| 16.5 | 137 | 112 |
| 16.5 | 137 | 112 |
| 16.5 | 1079 | 844 |
| 16.5 | 103 | 37 |
| 16.5 | 144 | 110 |
| 16.5 | 110 | 104 |
| 16.5 | 278 | 187 |
| 16.5 | 245 | 137 |
| 16.5 | 812 | 371 |
| 16.5 | 1669 | 1079 |
| 16.5 | 1319 | 998 |
| 16.5 | 1751 | 674 |
| 16.5 | 4840 | 3374 |
| 16.5 | 3523 | 1502 |
| 16.5 | 3622 | 1979 |
| 16.5 | 17374 | 10801 |
| 16.5 | 24973 | 16466 |
| 16.5 | 13124 | 3999 |
| 16.5 | 32745 | 20807 |
| 16.5 | 29521 | 14726 |
| 16.5 | 41005 | 21612 |
| 16.5 | 13265 | 4219 |
| 16.5 | 16685 | 4857 |
| 16.5 | 17395 | 21841 |
| 16.5 | 11346 | 4679 |
| 16.5 | 84722 | 23231 |
| 16.5 | 4458 | 2525 |
| 16.5 | 48202 | 20976 |
| 16.5 | 2489 | 1235 |
| 16.5 | 3744 | 1079 |
| 16.5 | 3525 | 791 |
| 16.5 | 4964 | 1594 |
| 16.5 | 3150 | 739 |
| 16.5 | 3312 | 692 |
| 16.5 | 4005 | 1186 |
| 16.5 | 2437 | 533 |
| 16.5 | 2363 | 1158 |
| 16.5 | 3549 | 925 |
| 16.5 | 2932 | 1491 |
| 16.5 | 0 | 0 |
| 16.5 | 368 | 263 |
| 16.5 | 2178 | 822 |
| 16.5 | 350 | 412 |
| 16.5 | 70 | 181 |
| 16.5 | 2488 | 782 |
| 16.5 | 343 | 240 |
| 16.5 | 120 | 126 |
| 16.5 | 63 | 118 |
| 16.5 | 112 | 88 |
| 16.5 | 72 | 54 |

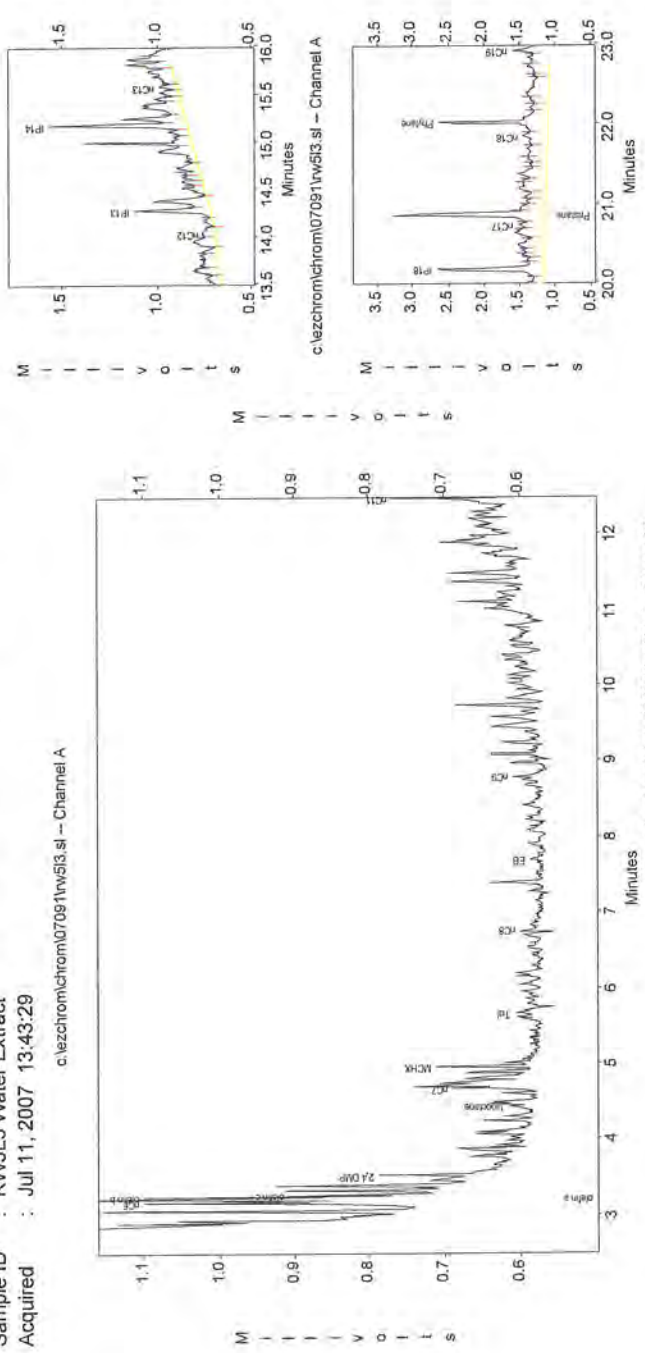
Figure 15, Multipanel display of gas chromatogram of the RW-5L3 product sample.

Channel A Result

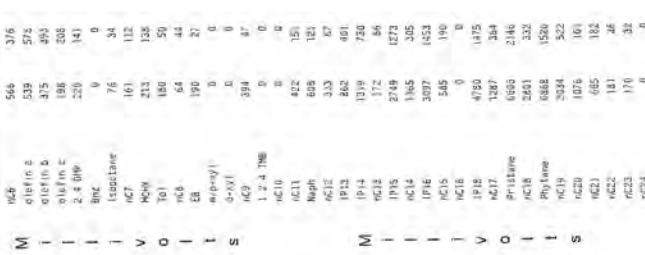
Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA
 Sample ID : RW5L3 Water Extract
 Acquired : Jul 11, 2007 13:43:29

Torkelson Geochemistry, Inc.

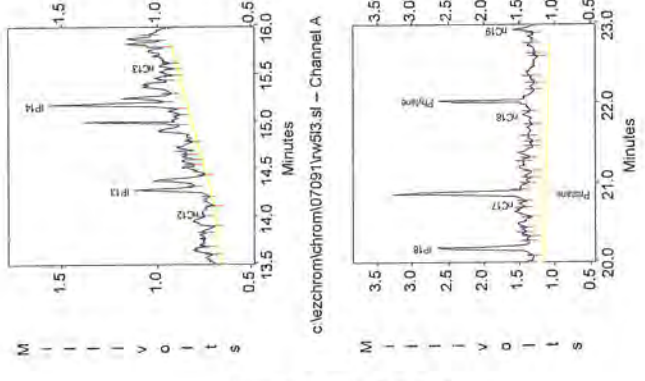
c:\ezchrom\chrom\07091rv5l3.sl -- Channel A



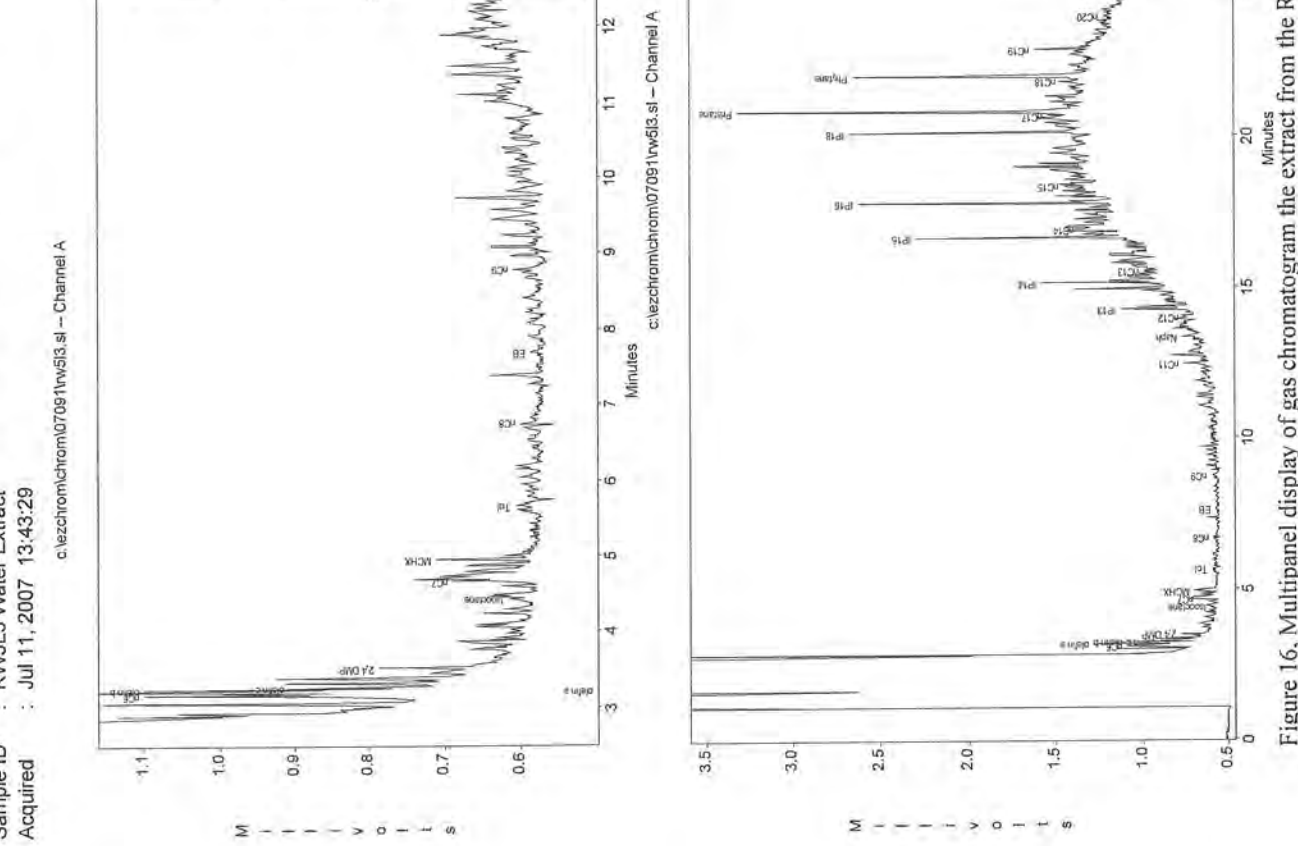
c:\ezchrom\chrom\07091rv5l3.sl -- Channel A



c:\ezchrom\chrom\07091rv5l3.sl -- Channel A



c:\ezchrom\chrom\07091rv5l3.sl -- Channel A



Channel A Result

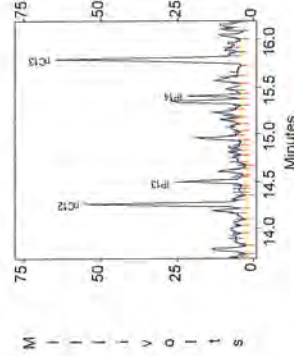
| Peak | Area | Height |
|--------------|------|--------|
| MSB | 566 | 376 |
| dibutyltin d | 539 | 573 |
| dibutyltin b | 475 | 493 |
| dibutyltin c | 186 | 208 |
| 2,4-DMP | 220 | 141 |
| Bnz | 0 | 0 |
| Isocytane | 76 | 34 |
| nc7 | 161 | 112 |
| MCM | 232 | 138 |
| Tol | 189 | 50 |
| nc5a | 64 | 44 |
| EB | 190 | 37 |
| nc9 | 0 | 0 |
| nc10 | 0 | 0 |
| nc11 | 422 | 151 |
| nc12 | 699 | 121 |
| nc13 | 320 | 57 |
| nc14 | 862 | 491 |
| nc15 | 1319 | 730 |
| nc16 | 172 | 86 |
| nc17 | 2749 | 1273 |
| nc18 | 1365 | 395 |
| nc19 | 3097 | 1453 |
| nc20 | 545 | 190 |
| nc21 | 0 | 0 |
| nc22 | 4790 | 1475 |
| nc23 | 1287 | 364 |
| nc24 | 6569 | 2148 |
| nc25 | 2451 | 332 |
| nc26 | 6868 | 1520 |
| nc27 | 2034 | 522 |
| nc28 | 1076 | 161 |
| nc29 | 685 | 102 |
| nc30 | 181 | 26 |
| nc31 | 176 | 34 |
| nc32 | 0 | 0 |
| nc33 | 474 | 37 |
| nc34 | 70 | 13 |
| nc35 | 103 | 38 |
| nc36 | 72 | 33 |
| nc37 | 102 | 29 |
| nc38 | 0 | 0 |
| nc39 | 136 | 46 |
| nc40 | 41 | 17 |
| nc41 | 84 | 36 |
| nc42 | 0 | 0 |
| nc43 | 0 | 0 |
| nc44 | 0 | 0 |
| nc45 | 0 | 0 |
| nc46 | 0 | 0 |
| nc47 | 0 | 0 |
| nc48 | 0 | 0 |
| nc49 | 0 | 0 |
| nc50 | 0 | 0 |

Figure 16. Multipanel display of gas chromatogram the extract from the RW-5L3 water sample.

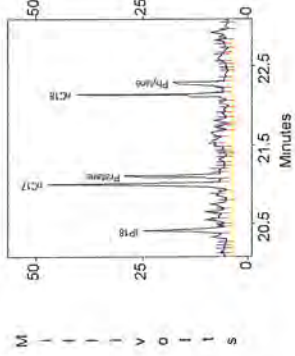
Torkelson Geochemistry, Inc.

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA
 Sample ID : Gas/Dies/Wax std
 Acquired : Jun 26, 2007 09:44:39

c:\ezchrom\chrom07091\gadiwax2 - Channel A



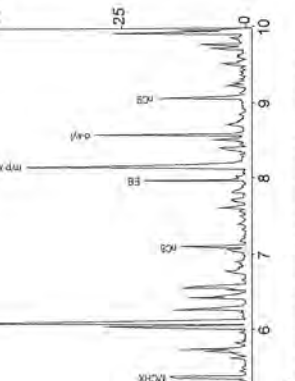
c:\ezchrom\chrom07091\gadiwax2 - Channel A



c:\ezchrom\chrom07091\gadiwax2 - Channel A



c:\ezchrom\chrom07091\gadiwax2 - Channel A



Channel A Results

| PKL | Area | Height |
|------|--------|--------|
| nC4 | 50157 | 84951 |
| nC5 | 100320 | 145240 |
| nC6 | 57964 | 76690 |
| MTBE | 603127 | 110398 |
| nC8 | 61644 | 88571 |
| nC9 | 45533 | 43890 |
| nC10 | 7845 | 6885 |
| nC11 | 5349 | 5264 |
| nC12 | 4288 | 4013 |
| nC13 | 18523 | 10123 |
| nC14 | 28714 | 21538 |
| nC15 | 32571 | 24402 |
| nC16 | 18801 | 15869 |
| nC17 | 102221 | 72723 |
| nC18 | 15533 | 13002 |
| nC19 | 21881 | 20023 |
| nC20 | 90730 | 43132 |
| nC21 | 43091 | 28991 |
| nC22 | 25737 | 17467 |
| nC23 | 67354 | 40597 |
| nC24 | 55647 | 37873 |
| nC25 | 102162 | 61182 |
| nC26 | 24456 | 7338 |
| nC27 | 55135 | 53295 |
| nC28 | 39549 | 23735 |
| nC29 | 24122 | 17803 |
| nC30 | 121205 | 80925 |
| nC31 | 33378 | 18694 |
| nC32 | 11855 | 57517 |
| nC33 | 51660 | 24555 |
| nC34 | 11197 | 52550 |
| nC35 | 106558 | 48012 |
| nC36 | 59953 | 21415 |
| nC37 | 93428 | 43544 |
| nC38 | 58115 | 25555 |
| nC39 | 75940 | 38867 |
| nC40 | 33534 | 14221 |
| nC41 | 74514 | 93315 |
| nC42 | 63553 | 24168 |
| nC43 | 97912 | 22549 |
| nC44 | 48573 | 25713 |
| nC45 | 74297 | 36712 |
| nC46 | 11100 | 47938 |
| nC47 | 131559 | 53894 |
| nC48 | 124948 | 53357 |
| nC49 | 102248 | 46594 |
| nC50 | 65447 | 31504 |
| nC51 | 36523 | 19910 |
| nC52 | 10259 | 10044 |
| nC53 | 9225 | 5263 |
| nC54 | 4832 | 2766 |
| nC55 | 2648 | 1514 |
| nC56 | 1456 | 801 |
| nC57 | 833 | 464 |
| nC58 | 1074 | 248 |
| nC59 | 945 | 141 |
| nC60 | 1233 | 92 |
| nC61 | 141 | 50 |
| nC62 | 102 | 34 |

Figure 17. Multipanel display of gas chromatogram the laboratory standard (gasoline/diesel/wax mixture).

Channel A Results

| Peak # | Area | Height |
|--------|--------|--------|
| 1 | 11844 | 1926 |
| 2 | 7899 | 2702 |
| 3 | 1907 | 2190 |
| 4 | 1147 | 1014 |
| 5 | 5472 | 4476 |
| 6 | 28823 | 18414 |
| 7 | 100603 | 69231 |
| 8 | 19181 | 18294 |
| 9 | 16404 | 11248 |
| 10 | 101827 | 65841 |
| 11 | 15366 | 11146 |
| 12 | 95389 | 17260 |
| 13 | 49208 | 24200 |
| 14 | 35776 | 13489 |
| 15 | 66385 | 30265 |
| 16 | 30842 | 18411 |
| 17 | 11830 | 5706 |
| 18 | 23113 | 8172 |
| 19 | 117605 | 59554 |
| 20 | 51751 | 22008 |
| 21 | 29579 | 17956 |
| 22 | 155302 | 66310 |
| 23 | 48951 | 20944 |
| 24 | 127210 | 61888 |
| 25 | 52469 | 25707 |
| 26 | 130394 | 54446 |
| 27 | 111250 | 52246 |
| 28 | 52381 | 26241 |
| 29 | 97131 | 47119 |
| 30 | 53329 | 25718 |
| 31 | 78214 | 36669 |
| 32 | 30919 | 14007 |
| 33 | 65181 | 29785 |
| 34 | 40406 | 21084 |
| 35 | 30549 | 16411 |
| 36 | 35335 | 18655 |
| 37 | 56980 | 29460 |
| 38 | 89522 | 40989 |
| 39 | 84653 | 43077 |
| 40 | 24664 | 41513 |
| 41 | 60164 | 30333 |
| 42 | 35241 | 17329 |
| 43 | 10974 | 8125 |
| 44 | 3337 | 3177 |
| 45 | 4608 | 1222 |
| 46 | 3262 | 515 |
| 47 | 1071 | 166 |
| 48 | 0 | 0 |
| 49 | 0 | 0 |
| 50 | 0 | 0 |
| 51 | 0 | 0 |
| 52 | 0 | 0 |
| 53 | 0 | 0 |
| 54 | 0 | 0 |
| 55 | 0 | 0 |

Torkelson Geochemistry, Inc.

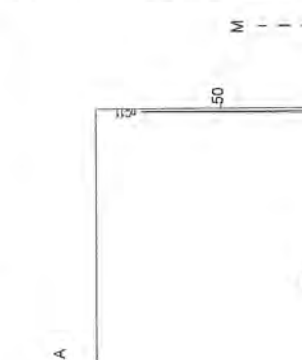
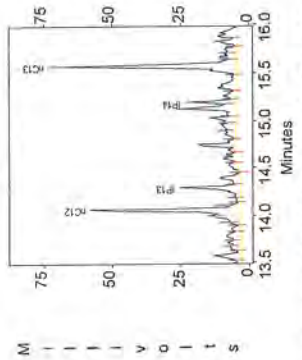
c:\ezchrom\chrom07091\gadlwax.sl - Channel A

Port of Tacoma, Former Milwaukee Rail Yard, Tacoma, WA

Sample ID : Gas/Dies/Wax std

Acquired : Jul 11, 2007 15:23:07

c:\ezchrom\chrom07091\gadlwax.sl - Channel A



c:\ezchrom\chrom07091\gadlwax.sl - Channel A

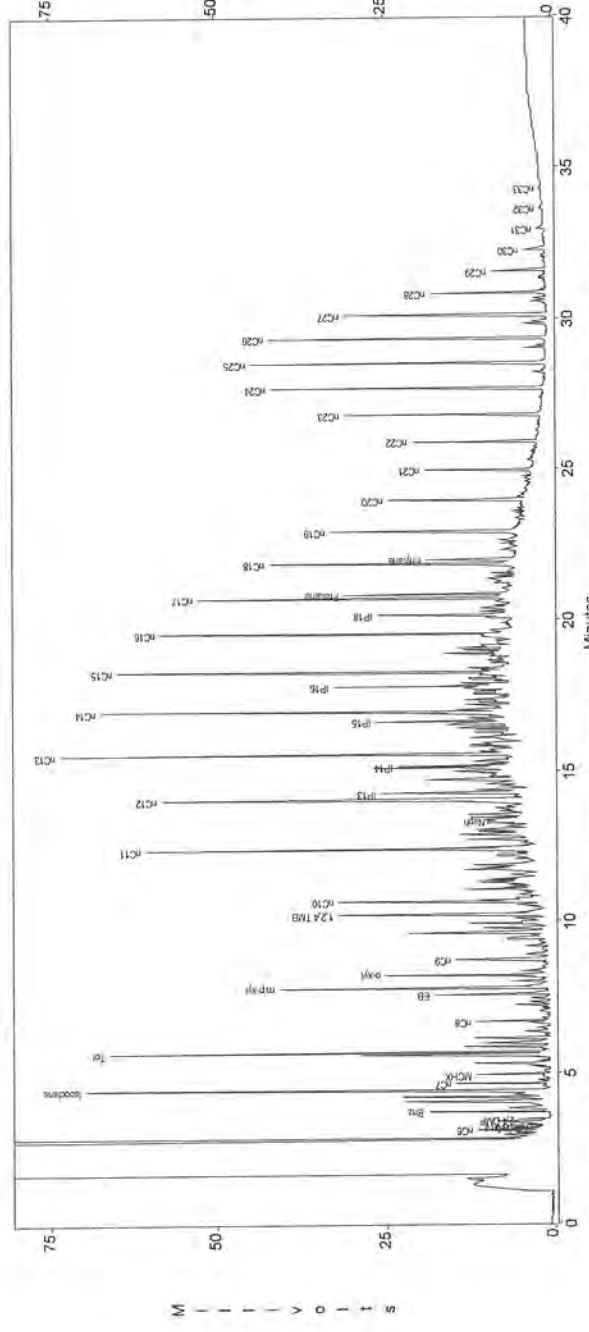


Figure 18, Multipanel display of gas chromatogram diluted laboratory standard (gasoline/diesel/wax mixture).

Table 1, Physical Properties

| Torkelson Geochemistry, Inc. | | | | | | | | |
|----------------------------------|---------|-----------------|------------------------|--------------------------------------|---|-------------------------------------|--|--|
| Physical Properties Measurements | | | | | | | | |
| Sample | TGI Job | Density (gm/ml) | Viscosity (centipoise) | Surface Tension Air/Water (dynes/cm) | Interfacial Tension NAPL/Water (dynes/cm) | Surface Tension Air/NAPL (dynes/cm) | Temperature of Measurements (Fahrenheit) | |
| RW2L3 | 07091 | 0.8803 | 8.34 | 58.4 | 7.1 | 24.6 | 60 | |
| RW5L3 | 07091 | 0.9498 | 633 | 56.5 | 13.7 | 29.6 | 60 | |

Appendix D:

City of Tacoma Site Development Permit

#SDEV25-0257



CITY OF TACOMA

Planning and Development Services
(253) 591-5030

747 Market St. 3rd Floor
Tacoma, WA 98402
Inspections (253) 573-2587

Site Development Permit #SDEV25-0257

Issued Date: 04/10/2026

Expiration Date: 10/07/2026

SITE INFORMATION

Address: 1002 MILWAUKEE WAY

Parcel: 8950000061

PERMIT ISSUED TO

PORT OF TACOMA
REAL ESTATE DEPT
TACOMA, WA 98401

LICENSED CONTRACTOR

PROPERTY OWNER

PORT OF TACOMA
REAL ESTATE DEPT
TACOMA, WA 98401

PERMIT INFORMATION

Project Description: Minor onsite surface improvements to the site for terminal operations and then turn the site over to SSAT to be included in their existing terminal, as part of the Port's lease agreement with SSAT and the right-of-way occupancy permit (ROCC22-0042) previously granted by the City of Tacoma. *(Assoc. w/ROCC22-0042)** The proposed improvements include replacing the existing 0.16 acres of gravel surface with asphalt pavement, installing stormwater controls consisting of (2) Type 1 catch basins, one (1) subgrade stormwater treatment structure (Oil-Water separator), and installing approximately 150 linear ft of storm drainage piping

Permit Fee: \$7,581.60

Project Coordinator: Noah Yacker

Related Site Record: N/A

Related Land Use Record: N/A

CONDITIONS OF APPROVAL

Discovery of archaeological/cultural sites during construction

In the event of an unanticipated discovery of suspected archaeological materials or human remains during the course of construction, all work within 30 feet of the discovery site shall cease immediately and the project management personnel must follow procedures outlined in the City of Tacoma standard Unanticipated Discovery Plan (UDP). All project management personnel should access and familiarize themselves with the UDP steps and requirements prior to the start of construction, and shall inform workers and equipment operators of the UDP as well.

The UDP can be accessed here: <https://cityoftacoma.org/culturalResources/>

PRINTED PERMIT AND APPROVED PLANS MUST BE KEPT ON SITE DURING CONSTRUCTION

All plumbing, heating, and electrical work will be performed by either the home owner or by a contractor licensed to do the same. Separate permits are required for other work, including but not limited to, sanitary and storm sewer, sidewalk, curb and gutter, driveways, parking lot paving, street improvements, fire protection, and signs. Plumbing and mechanical permits can be incorporated into some permits.

Page 2 of 6



CITY OF TACOMA

Planning and Development Services
(253) 591-5030

747 Market St. 3rd Floor
Tacoma, WA 98402
Inspections (253) 573-2587

Site Development Permit #SDEV25-0257

Issued Date: 04/10/2026

Expiration Date: 10/07/2026

VALUATIONS

Estimated Valuation:

\$150,000

PROJECT DETAILS

Night or Weekend Work:

NO



CITY OF TACOMA

Planning and Development Services
(253) 591-5030

747 Market St. 3rd Floor
Tacoma, WA 98402
Inspections (253) 573-2587

Site Development Permit #SDEV25-0257

Issued Date: 04/10/2026

Expiration Date: 10/07/2026

Row

APPROVED REVIEWERS

| Category | Approved By | Email | Phone Number |
|-------------------------|--------------------|----------------------------|---------------------|
| Critical Areas Review | Dori Tolbert | dtolbert@tacoma.gov | |
| Document Review | Adam Barnett | abarnett2@tacoma.gov | 253-290-1979 |
| Fire Protection Review | Shawn Bliss | sbliss@tacoma.gov | 253-345-8357 |
| Flood Hazard Review | Quyen Thai | qthai@tacoma.gov | 253-254-8796 |
| Land Use Review | Shirley Schultz | shirley.schultz@tacoma.gov | 253-345-0879 |
| Real Property Review | Carleen Bruner | cbruner@tacoma.gov | 253-591-5570 |
| Site Development Review | Adam Barnett | abarnett2@tacoma.gov | 253-290-1979 |
| Tacoma Power Review | Justin Hang | jhang@tacoma.gov | 253-502-8164 |
| Tacoma Water Review | Katherine Belin | kbelin@cityoftacoma.org | 253-651-2331 |
| Traffic Review | Bobby Cheung | bcheung@tacoma.gov | |
| Water Quality Review | Scott Hallenberg | shallenb@tacoma.gov | 253-502-8215 |

GENERAL:

PERMISSION IS HEREBY GIVEN TO DO THE DESCRIBED WORK, AS NOTED ON THE REVERSE SIDE, ACCORDING TO THE CONDITIONS HEREON AND ACCORDING TO THE APPROVED PLANS AND SPECIFICATIONS PERTAINING THERETO, SUBJECT TO COMPLIANCE WITH THE ORDINANCES OF THE CITY OF TACOMA.,

YOUR ATTENTION IS CALLED TO THE FACT THAT IT SHALL BE THE DUTY OF THE PERMITEE (General Contractor) to assure that all necessary inspections are called for and approved by the City Inspectors.

YOUR ATTENTION IS CALLED to the fact that in addition to the called for inspections specified by the applicable codes, the Building Official may make or require any other inspections of any construction work necessary to ascertain compliance with the provisions of City Codes and other laws which are enforced by the City of Tacoma.

YOUR ATTENTION IS CALLED to the fact that in addition to regularly scheduled inspections during construction there shall be a final inspection and approval on all buildings or structures when completed and ready for occupancy. AU required off-site improvements (curbs, sidewalks, storm sewers, etc.) must be completed at time a final inspection and prior to occupancy of building. Construction of off-site improvements requires scheduled inspections during construction in addition to the final inspection.

SPECIAL PERMITS

The holder of Special Permits agrees to the following stipulations:

1. To complete the work encompassed by the Special Permit in accordance with the current edition of the WSDOTIAFWA Standard Specifications as amended by the City of Tacoma General Special Provisions and in accordance with any special provisions or conditions set forth before final acceptance as required by the provisions of the Street Obstruction Bond.
2. To indemnify and hold the City of Tacoma harmless from any and all damages done to any person or property which may arise from the construction encompassed by the Special Permit.
3. To submit for review and approval to the Traffic Engineer a traffic control plan developed in accordance with the "Manual on Uniform Traffic Control Devices" {MUTCD}. The traffic control plan shall show pedestrian access through the work zone.
4. To protect the public by placing adequate barricades, signs, cones, lights or other traffic control devices in accordance with the approved traffic control plan. It is understood that traffic lane closures and or sidewalk closures are limited to that which is specifically permitted herein. No other closures will be allowed without prior written approval of the City Engineer.
5. To provide and maintain protected pedestrian and ADA compliant disability access on walkways at all times.
6. The City of Tacoma does not guarantee sewer location or depth information. It shall be the permittee's responsibility to verify sewer and sewer stub locations and depths.
7. To restore Rights-of-Way in accordance with the City's Rights-of-Way Restoration Policy and City of Tacoma Standard Plans
8. Trench backfill within all improved streets or streets proposed for improvement shall be full depth bank run gravel or approved equal by the Construction Division.
9. All cuts in arterial streets shall be patched and maintained with Hot Mix Asphalt until permanent repairs are completed. All cuts in residential streets or alleys shall be patched and maintained with cold mix asphalt until permanent repairs are made. Permanent repairs shall be per current City of Tacoma Standard Plans. Streets and alleys shall be permanently repaired within 30 days.
10. To be responsible for the preservation of any utilities within the construction area.

CALL TOLL FREE BEFORE YOU DIG -1-800-424-5555 (Utilities Underground Location Center)

11. 24 Hour notice is required prior to any inspection. Construction Division 253-591-5760, Traffic SignaVStreetlight 253-591-5287.
12. The Special Permit Expiration date is 30 days from the issue date unless otherwise noted.

9.08.070 Revocation of permits and removal of development.

All permits and/or development granted under the provisions of this chapter may, in any case, be revoked by the Director of Planning and Development Services, or designee, upon 30 days' notice, or without notice in case any such use or occupation shall become dangerous or any structure or obstruction permitted shall become insecure or unsafe, or shall not be constructed, maintained, or used in accordance with the provisions of this chapter. The development shall be removed at the expense of the permittee and/or adjacent property owner.

If any such structure, obstruction, use, or occupancy is not discontinued on notice to do so by the Director of Planning and Development Services, the City may forthwith remove such structure or obstruction from such place, or make such repairs upon such structure or obstruction as may be necessary to render the same secure and safe, at the expense of the permittee or successor, and such expense, together with the cost of its collection, may be collected in the manner provided by law. As an alternative, the City may enforce under Title 8.

(Ord. 28501 Ex. A; passed Apr. 10, 2018; Ord. 22865 § 1; passed Jan. 18, 1983; Ord. 21035 § 1; passed Apr. 5, 1977)