APPENDIX A

List of Preparers

CONTRIBUTORS TO THE TACOMA LNG PROJECT DEIS

Name	Role	Degree/Credentials	Experience (yrs)
City of Tacoma			
Shirley Shultz	Project Manager Principal Planner, Planning and Development Services	M.A. Planning	20 yrs
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Ryan Erickson, P.E. Tacoma Fire Department	Tacoma Fire Department , Fire Code Official	B.S Civil Engineering	18 yrs
Ecology and Environment, Inc.			
Jim Thornton	Project Manager	B.A., Psychology	40 yrs
Bill Richards	SEPA Coordination	B.S., Environmental Science	29 yrs
Pasquale Franzese, Ph.D	Air Quality	Ph.D., Aerospace Engineering M.S., Mechanical Engineering	20 yrs
Jonathan Reeves	Earth	M.S., Geology B.A., Geology	11 yrs
Janice Gardner	Plants & Animals	M.S., Ecology and Environmental Science B.S., Wildlife Management	7 yrs
Louise Flynn	Health & Safety	M.P.H., Public Health M.E.S., Environmental Studies B.A., Biology and Society	28 yrs
Tom Siener	Noise	B.S., Biology	42 yrs
Dan Costantino	Land Use & Recreation	M.U.R.P., Urban and Regional Planning Grad Cert., Urban Design Diploma, Arabic B.A., Geography	6 yrs
Joseph Donaldson, AICP	Aesthetics, Light and Glare	M.L.A., Landscape Architecture B.A., Architecture	38 yrs
Jim Thornton	Cultural Resources	B.A., Psychology	40 yrs
Carl Sadowski	Transportation	M.U.P., Urban Planning B.A., Environmental Design	6 yrs
Dan Costantino	Public Services & Utilities	M.U.R.P., Urban and Regional Planning Grad Cert., Urban Design Diploma, Arabic B.A., Geography	6 yrs
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Jim Thornton	Cumulative Impacts	B.A., Psychology	40 yrs

CONTRIBUTORS TO THE TACOMA LNG PROJECT DEIS

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Alan Hatfield, P.E.	LNG Engineering/Risk Analysis	B.S. Engineering, P.E. License Georgia, North Carolina, Texas, Oregon	35 yrs

APPENDIX B

Distribution List

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2006 KIST LLC
2014-1 IH BORROWER LP
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APPENDIX C

Soil and Groundwater Data Summary

GeoEngineers

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Memorandum

To:	Greg Andrina and John Rork – Puget Sound Energy
From:	Rob Leet and Steve Woodward
Date:	September 5, 2014
File:	0186-914-02-0400
Subject:	Soil and Groundwater Data Summary – Limited Environmental Site Assessment PSE Tacoma LNG Project

INTRODUCTION

This memorandum presents soil and groundwater analytical results obtained as part of a limited environmental site assessment (ESA) conducted for Puget Sound Energy's Tacoma Liquefied Natural Gas (LNG) Project. The soil and groundwater sampling was completed between May 20 and June 2, 2014 in general accordance with the April 24, 2014 sampling and analysis plan (SAP). The SAP provides details about the project background, field methods, and the analytical testing program.

In this document and the SAP, project-specific cardinal directions are used when describing locations of site features and sampling locations. Consistent with past projects conducted on the Blair-Hylebos Peninsula by the Port of Tacoma (Port) and others, "project north" corresponds approximately to true northwest (Figure 1).

DEVIATIONS FROM THE SAMPLING AND ANALYSIS PLAN

Borings logs for the ESA soil borings are attached. The following deviations from the SAP occurred during the ESA soil and groundwater sampling:

- A sonic drilling rig was used to complete six of the nine borings inside the warehouse (Building 50; borings B-9 and B-12 through B-16) and one boring outside the warehouse (boring B-19). Initial attempts to complete the subject borings in the warehouse with a direct-push rig were unsuccessful due to repeated drilling refusals encountered within the structural fill beneath the building.
- For the borings completed inside the warehouse, "ground surface" was defined as the warehouse floor. In these borings, the soil samples that were originally planned to be collected at depths of 2 feet below ground surface (bgs) and 8 feet bgs were instead collected at depths between 6 and 8 feet bgs and 11 and 13 feet bgs to account for the warehouse floor being elevated approximately 5 feet above the surrounding site grade. The warehouse floor appeared to be constructed on structural fill. A similar adjustment was not made to groundwater sampling depths.
- Four samples of the apparent structural fill pad beneath the warehouse were collected for analytical testing. These samples were not originally scoped in the SAP.
- A groundwater sample was not obtained from 25 feet bgs in boring B-15 (Figure 1) due to low groundwater yield.

- Groundwater was not purged from the temporary well casing and water quality field parameters were not measured prior to collecting the 25-foot bgs groundwater sample in boring B-12 and the 50-foot bgs groundwater sample in boring B-16 due to low groundwater yield at the target depth interval. Consequently, these groundwater samples may not be representative of the targeted intervals.
- Soil and groundwater samples originally planned to be analyzed for total petroleum hydrocarbons as gasoline (TPH-G) and benzene, toluene, ethylbenzene, and xylenes (BTEX) by Methods NWTPH-Gx and 8021 (per SAP Table 2) were analyzed for BTEX by Method 8021 only if the samples were not analyzed by Method 8260 (BTEX compounds are included on the Method 8260 target analyte list).

ANALYTICAL RESULTS

The analytical results for the soil and groundwater samples are presented in Tables 1 and 2. The results are compared to potentially applicable risk-based screening levels developed for the Alexander Avenue Petroleum Tank Facilities Site Remedial Investigation/Feasibility Study Work Plan (Port Work Plan; Aspect Consulting, 2014). These screening levels consider protection of marine surface water, Model Toxics Control Act (MTCA) cleanup levels for industrial sites, and MTCA Method C groundwater screening levels published in the Washington Department of Ecology's current vapor intrusion guidance (Ecology Publication no. 09-09-047; October 2009), and reflect current toxicological information provided in Ecology's Cleanup Levels and Risk Calculations (CLARC) database. The soil screening levels for lead and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) published in the Port Work Plan have been adjusted in Table 1, based on discussions with the Port, to account for an empirical demonstration (based on existing groundwater data) that concentrations of these constituents in soil are protective of the soil-to-groundwater-to-surface water pathway. Additionally, the Federal drinking water Maximum Contaminant Level (MCL) for arsenic is included in Table 2 for comparison; the arsenic MCL has been proposed as a potential surface water cleanup level (Ecology, 2014).

Further evaluation of the data may be completed as necessary, including comparison of the soil analytical results to appropriate criteria for determining reuse and/or disposal options for soil that may be excavated during future construction activities.

The quality of the laboratory analytical data was reviewed in accordance with United States Environmental Protection Agency guidelines for Stage 2A data validation. The laboratory data quality review is summarized in the attached data validation report. The results of the data quality review indicate that the analytical data are useable for their intended purpose. However, based on a review of sampling procedures and field observations, some of the analytical data may not be representative of site conditions. These suspect data are identified below in the discussion of analytical results.

Soil Analytical Results

The soil analytical results are presented in Table 1. The following analytes were detected in soil at concentrations exceeding Port screening levels:

- Total petroleum hydrocarbons as diesel (TPH-D)
- Bis(2-ethylhexyl)phthalate (BEHP)

BEHP slightly exceeded the associated screening level in a soil sample obtained from 8 feet bgs in boring B-18, and TPH-D exceeded the associated screening level in a sample obtained from 8 feet bgs in boring B-20 (Table 1, Figure 1). The BEHP detection in boring B-18 was the only detection of BEHP reported in soil. This detection may reflect laboratory contamination of the sample, as BEHP is a common laboratory contaminant.

The estimated southerly extent of soil contamination (screening level exceedances) inferred to be related to the former petroleum bulk storage facility based on the ESA results is shown in Figure 1.

Groundwater Analytical Results

The groundwater analytical results are presented in Table 2. The following analytes were detected in groundwater at concentrations exceeding Port screening levels:

- TPH-D
- Total petroleum hydrocarbons as lube oil (TPH-LO)
- Benzene
- Metals (arsenic, chromium, copper, and lead)
- BEHP
- pH

Concentrations of one or more of these analytes exceeded screening levels in groundwater samples obtained from six borings completed in the warehouse (B-10, B-12, B-13, B-14, B-15, and B-16), two borings completed north of the warehouse (B-21 and B-24), and two borings completed near the Hylebos Waterway embankment (B-17 and B-19) (Table 2, Figure 1). The samples with exceedances were collected at depths ranging from approximately 11 feet to 51 feet bgs. Chlorinated volatile organic compounds, which are the primary constituents of concern in groundwater beneath the Occidental Chemical Corporation (OCC) Site north of Parcel 2, were not detected in the ESA groundwater samples.

The results for constituents detected above screening levels are summarized as follows:

- Metals (arsenic, chromium, copper, and lead) were the most prevalent analytes that exceeded screening levels. The groundwater samples submitted for metals analysis were filtered in the field (using a disposable 0.45-micron filter) to reduce potential high bias of results from suspended particulates. The highest metal concentrations were detected in the samples obtained from approximately 23 feet and 50 feet bgs in boring B-16. However, some of the metals data may not be representative of groundwater conditions, as discussed below.
    - Solids were observed at the bottom of the 23- and 50-foot bgs filtered samples obtained from boring B-16, suggesting that filter breakthrough occurred. Consequently, the metals results for these samples may be biased high.
    - As previously noted, the 25-foot bgs sample from B-12 and the 50-foot bgs sample from B-16 may not be representative of the targeted depth interval because groundwater was not purged from the temporary well casing prior to collecting these samples (due to low groundwater yield).

    - Elevated electrical conductivity (greater than 0.750 millisiemens per centimeter [mS/cm]) was observed in all but one of the samples in which metals exceeded screening levels. High conductivity can indicate elevated salinity, which can cause analytical interferences and high bias of metals analyses (Port, personal communication). Four of the samples (B-10 at 50 feet, B-13 at 15 feet, B-15 at 15 feet, and B-17 at 25 feet) exceeded the Port Work Plan criterion of 1.0 mS/cm for triggering laboratory sample preparation using the reductive precipitation procedure, which can reduce salinity-related interferences. Reductive precipitation was not used in this limited ESA. Consequently, based on discussions with the Port, the metals results for the subject samples obtained from borings B-10, B-13, B-15, and B-17 may be biased high due to elevated salinity in these samples.

- BEHP was detected slightly above the screening level in a groundwater sample obtained from boring B-17. Like the single BEHP detection in soil, this single BEHP detection in groundwater may reflect laboratory contamination.
- Groundwater exceedances of TPH-D and/or TPH-LO were detected at borings B-12 (27 feet bgs: TPH-LO only), B-14 (26 feet bgs: TPH-D and TPH-LO), and B-24 (11 feet bgs: TPH-LO only). These detections are not contiguous with previously reported detections of TPH-D or TPH-LO in soil or groundwater beneath the former petroleum bulk storage facility in the northern portion of Parcel 2 (Port, personal communication). TPH-D and TPH-LO are subject to high bias in unfiltered groundwater grab samples. Additionally, due to low groundwater yield at 27 feet bgs in boring B-12, this sample was collected without first purging the temporary well casing. Therefore, the TPH-D and TPH-LO data may not be representative of groundwater conditions.
- Groundwater exceedances of benzene were detected at borings B-12 (27 feet bgs), B-13 (25 feet bgs), B-21 (26 feet bgs), and B-24 (11 feet and 28 feet bgs). These exceedances are consistent with previously reported detections of petroleum constituents in groundwater beneath the former petroleum bulk storage facility in the northern portion of Parcel 2.
- Three pH exceedances (values greater than 8.5) were detected, at borings B-16, B-19, and B-24. These exceedances range between 8.60 and 8.90, which is only slightly higher than the typical pH range of marine waters, and are not contiguous with exceedances of pH in groundwater beneath the OCC Site (Port, personal communication).

The previously estimated (in the SAP) southerly extent of groundwater contamination (screening level exceedances) inferred to be related to the OCC Site and/or the former petroleum bulk storage facility has been revised based on the ESA results; the revised extent is shown in Figure 1.

References

Aspect Consulting, 2014. Work Plan For Remedial Investigation/Feasibility Study, Alexander Avenue Petroleum Tank Facilities Site, Tacoma, Washington, Ecology Facility Site No. 1377/Cleanup Site No. 743. Prepared for Port of Tacoma and Mariana Properties Inc.

Washington Department of Ecology, 2009. Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action (Review Draft). Publication No. 09-09-047. October 2009.

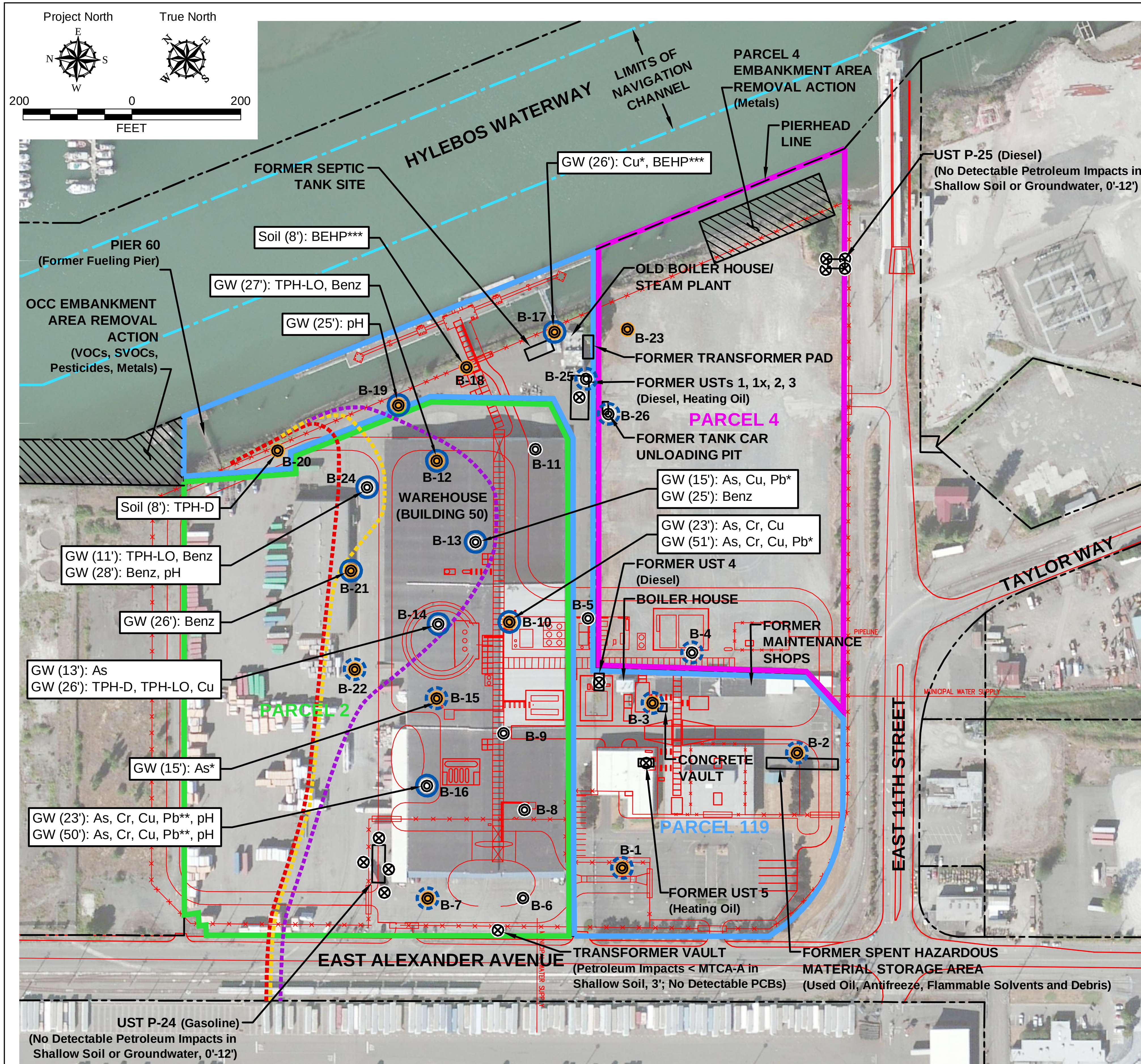
Washington Department of Ecology, 2014. Washington Human Health Criteria Review Documents (Draft). Revised August 8, 2014.

Attachments:

Figure 1 – Site Plan Showing Constituents Exceeding Screening Levels in ESA Samples
Table 1 – Soil Analytical Data Summary
Table 2 – Groundwater Analytical Data Summary
Data Validation Report
Boring Logs

RCL:rcl

P:\0\0186914\02\CAD\Task 400 Soil GW Evaluation\018691402 Fig 1 Site Plan W_May-June 2014 Sampling Results.dwg\TAB:Landscape (2) modified by tmichaud on Sep 04, 2014 - 13:53



Legend

Previous Sampling Locations

- ⊗ Previous Soil and/or Groundwater Grab Sample Locations (represents one or more samples collected at locations shown)

May-June 2014 ESA Sampling Locations

- Soil Boring
- Soil Boring with Soil Samples Tested for Full Analytical Suite
- Shallow (11') Groundwater Sample
- Shallow (11') and Deep (25' and/or 50') Groundwater Samples
- Estimated Extent of Soil Contamination Inferred to be Related to Former Petroleum Bulk Storage Facility
- Estimated Extent of Groundwater Contamination Inferred to be Related to OCC Site and/or Former Petroleum Bulk Storage Facility - 10-15 Foot Depth Zone (May-June 2014; Metals and pH Data Not Used in Delineating Extent)
- Estimated Extent of Groundwater Contamination Inferred to be Related to OCC Site and/or Former Petroleum Bulk Storage Facility - 20-30 Foot Depth Zone (May-June 2014; Metals and pH Data Not Used in Delineating Extent)

GW = Groundwater
(28') = 28 Feet Below Ground Surface (example)
UST = Underground Storage Tank
OCC = Occidental Chemical Corporation
VOCs = Volatile Organic Compounds
SVOCs = Semivolatile Organic Compounds
PCBs = Polychlorinated Biphenyls
MTCA-A = Model Toxics Control Act Method A Cleanup Levels
As = Arsenic
Cr = Chromium
Cu = Copper
Pb = Lead
Benz = Benzene
TPH-D = Total Petroleum Hydrocarbons as Diesel
TPH-LO = Total Petroleum Hydrocarbons as Lube Oil
BEHP = Bis(2-ethylhexyl)phthalate
* = Metals results for this sample may be biased high due to elevated salinity.
** = Metals results for this sample may be biased high due to the presence of solids in the filtered sample.
*** = Possible laboratory contaminant

Notes

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Preliminary Plot Plan by CH-IV International dated 1/29/14.

Site Plan Showing Constituents Exceeding Screening Levels in ESA Samples

Puget Sound Energy
Tacoma LNG Project
Tacoma, Washington

GEOENGINEERS

Figure 1

TABLE C-1

SOIL ANALYTICAL DATA SUMMARY

May-June 2014

Puget Sound Energy LNG Project

Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	B-1-2.0 2-3 ft	B-1-8.0 7-8 ft	B-2-2.0 1.5-2.5 ft	B-2-8.0 8-9 ft	B-3-2.0 1.5-2.5 ft	B-3-8.0 7-8.5 ft	B-4-2.0 1.5-2.5 ft	B-4-8.0 7-8 ft	B-5-2.0 2-3 ft	B-5-8.0 7.5-8.5 ft	B-6-2.0 2-3 ft	B-6-8.0 7-8 ft	B-7-2.0 1.5-2.5 ft	B-7-8.0 8-9 ft	B-8-6.0 5.5-6.5 ft	B-8-11.0 10.5-11.5 ft	B-9-7.0 6-7.5 ft	B-9-13.0 13-14 ft	B-10-2.0 1.5-2.5 ft (fill)	B-10-7.0 6.5-7.5 ft	B-10-13.0 12-13.5 ft	B-11-8.0 8-9 ft	B-11-12.0 11.5-13 ft	B-12-2.0 2 ft (fill)	B-12-7.0 7 ft	B-12-13.0 13 ft	B-13-7.0 7-8 ft
BTEX	5035A/8021	Benzene	mg/Kg	0.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	5035A/8021	Ethylbenzene	mg/Kg	0.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	5035A/8021	Toluene	mg/Kg	6.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	5035A/8021	Xylene, m-,p-	mg/Kg	9.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	5035A/8021	Xylene, o-	mg/Kg	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fuels	NWTPH-Gx	Total petroleum hydrocarbons as gasoline	mg/Kg	30	6.6 U	8.7 U	6.8 U	7.3 U	5.4 U	6.8 U	7.9 U	8.2 U	--	--	--	--	6.7 U	8.2 U	--	--	--	--	5.6 U	5.3 U	6.6 U	--	--	6.7 U	7.3 U	6.9 U	--
Fuels	NWTPH-Dx	**Total petroleum hydrocarbons as diesel**	mg/Kg	2000	150 U	35 U	29 U	32 U	27 U	32 U	34 U	37 U	27 U	32 U	27 U	30 U	27 U	32 U	26 U	34 U	27 U	34 U	27 U	26 U	36 U	40 U	35 U	30 U	31 U	31 U	26 U
Fuels	NWTPH-Dx	**Total petroleum hydrocarbons as lube oil**	mg/Kg	2000	**1800**	71 U	59 U	63 U	54 U	65 U	67 U	73 U	55 U	64 U	53 U	59 U	54 U	65 U	53 U	68 U	54 U	67 U	54 U	52 U	72 U	79 U	70 U	61 U	62 U	61 U	52 U
Metals	6010/6020	Arsenic	mg/Kg	20	12 U	14 U	12 U	13 U	11 U	13 U	13 U	15 U	11 U	13 U	11 U	12 U	11 U	13 U	11 U	14 U	11 U	13 U	11 U	10 U	14 U	16 U	14 U	12 U	12 U	12 U	10 U
Metals	6010/6020	Cadmium	mg/Kg	--	0.60 U	0.71 U	0.59 U	0.63 U	0.54 U	0.64 U	0.67 U	0.73 U	0.55 U	0.64 U	0.53 U	0.59 U	0.54 U	0.65 U	0.53 U	0.68 U	0.54 U	0.67 U	0.54 U	0.52 U	0.72 U	0.79 U	0.70 U	0.61 U	0.62 U	0.61 U	0.52 U
Metals	6010/6020	**Chromium**	mg/Kg	1000	**11**	**8.5**	**14**	**11**	**18**	**11**	**7.9**	**20**	**9.5**	**9.5**	**8.2**	**7.5**	**14**	**9.5**	**7.8**	**12**	**8.6**	**13**	**33**	**7.6**	**18**	**16**	**8.1**	**30**	**7.6**	**9.7**	**11**
Metals	6010/6020	**Copper**	mg/Kg	36	**12**	**7.9**	**9.5**	**7.3**	**14**	**11**	**12**	**30**	**12**	**11**	**8.6**	**6.7**	**10**	**9.6**	**8.1**	**20**	**9.4**	**13**	**11**	**9.1**	**33**	**20**	**11**	**11**	**7.7**	**8.4**	**13**
Metals	6010/6020	**Lead**	mg/Kg	1000 (a)	6.0 U	7.1 U	5.9 U	6.3 U	**69**	**7.4**	6.7 U	7.3 U	5.5 U	6.4 U	5.3 U	5.9 U	5.4 U	6.5 U	5.3 U	6.8 U	5.4 U	6.7 U	5.4 U	5.2 U	7.2 U	7.9 U	7.0 U	6.1 U	6.2 U	6.1 U	5.2 U
Metals	7471	Mercury	mg/Kg	--	0.30 U	0.35 U	0.29 U	0.32 U	0.27 U	0.32 U	0.34 U	0.37 U	0.27 U	0.32 U	0.27 U	0.30 U	0.27 U	0.32 U	0.26 U	0.34 U	0.27 U	0.34 U	0.27 U	0.26 U	0.36 U	0.40 U	0.35 U	0.30 U	0.31 U	0.31 U	0.26 U
PCBs	8082	PCB-aroclor 1016	mg/Kg	--	0.0030 U	0.0035 U	0.0029 U	0.0032 U	0.0027 U	0.0032 U	0.0034 U	0.0037 U	--	--	--	--	0.0027 U	0.0032 U	--	--	--	--	0.0025 U	0.0026 U	0.0036 U	--	--	0.0030 U	0.0031 U	0.0031 U	--
PCBs	8082	PCB-aroclor 1221	mg/Kg	--	0.0030 U	0.0035 U	0.0029 U	0.0032 U	0.0027 U	0.0032 U	0.0034 U	0.0037 U	--	--	--	--	0.0027 U	0.0032 U	--	--	--	--	0.0025 U	0.0026 U	0.0036 U	--	--	0.0030 U	0.0031 U	0.0031 U	--
PCBs	8082	PCB-aroclor 1232	mg/Kg	--	0.0030 U	0.0035 U	0.0029 U	0.0032 U	0.0027 U	0.0032 U	0.0034 U	0.0037 U	--	--	--	--	0.0027 U	0.0032 U	--	--	--	--	0.0025 U	0.0026 U	0.0036 U	--	--	0.0030 U	0.0031 U	0.0031 U	--
PCBs	8082	PCB-aroclor 1242	mg/Kg	--	0.0030 U	0.0035 U	0.0029 U	0.0032 U	0.0027 U	0.0032 U	0.0034 U	0.0037 U	--	--	--	--	0.0027 U	0.0032 U	--	--	--	--	0.0025 U	0.0026 U	0.0036 U	--	--	0.0030 U	0.0031 U	0.0031 U	--
PCBs	8082	PCB-aroclor 1248	mg/Kg	--	0.0030 U	0.0035 U	0.0029 U	0.0032 U	0.0027 U	0.0032 U	0.0034 U	0.0037 U	--	--	--	--	0.0027 U	0.0032 U	--	--	--	--	0.0025 U	0.0026 U	0.0036 U	--	--	0.0030 U	0.0031 U	0.0031 U	--
PCBs	8082	PCB-aroclor 1254	mg/Kg	--	0.0030 U	0.0035 U	0.0029 U	0.0032 U	0.0027 U	0.0032 U	0.0034 U	0.0037 U	--	--	--	--	0.0027 U	0.0032 U	--	--	--	--	0.0025 U	0.0026 U	0.0036 U	--	--	0.0030 U	0.0031 U	0.0031 U	--
PCBs	8082	**PCB-aroclor 1260**	mg/Kg	--	0.0030 U	0.0035 U	0.0029 U	0.0032 U	0.0027 U	0.0032 U	0.0034 U	0.0037 U	--	--	--	--	0.0027 U	0.0032 U	--	--	--	--	0.0025 U	0.0026 U	0.0036 U	--	--	0.0030 U	0.0031 U	0.0031 U	--
PAHs	8270	**1-Methylnaphthalene**	mg/Kg	--	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
PAHs	8270	**2-Methylnaphthalene**	mg/Kg	320	0.040 U	0.0094 U	0.0078 U	0.0084 U	**0.0074**	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
PAHs	8270	**Acenaphthene**	mg/Kg	0.5	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
PAHs	8270	**Acenaphthylene**	mg/Kg	--	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
PAHs	8270	**Anthracene**	mg/Kg	1	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
PAHs	8270	**Benzo(g,h,i)perylene**	mg/Kg	--	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
PAHs	8270	**Fluoranthene**	mg/Kg	2.5	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
PAHs	8270	**Fluorene**	mg/Kg	0.6	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
PAHs	8270	**Naphthalene**	mg/Kg	2.6	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
PAHs	8270	**Phenanthrene**	mg/Kg	--	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
PAHs	8270	**Pyrene**	mg/Kg	3.3	0.040 U	0.0094 U	0.0078 U	0.0084 U	**0.0089**	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
cPAHs	8270-SIM	**Benzo(a)anthracene**	mg/Kg	--	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
cPAHs	8270-SIM	**Benzo(a)pyrene**	mg/Kg	--	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
cPAHs	8270-SIM	**Benzo(b)fluoranthene**	mg/Kg	--	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
cPAHs	8270-SIM	**Benzo(j,k)fluoranthene**	mg/Kg	--	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
cPAHs	8270-SIM	**Chrysene**	mg/Kg	--	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
cPAHs	8270-SIM	Dibenzo(a,h)anthracene	mg/Kg	--	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
cPAHs	8270-SIM	**Indeno(1,2,3-cd)pyrene**	mg/Kg	--	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
cPAHs	8270-SIM	**Total cPAHs TEC (ND=0.5MRL)**	mg/Kg	18 (a)	0.030 U	0.0071 U	0.0059 U	0.0063 U	0.0054 U	0.0065 U	0.0068 U	0.0073 U	--	--	--	--	0.0054 U	0.0065 U	--	--	--	--	0.0054 U	0.0052 U	0.0072 U	--	--	0.0061 U	0.0063 U	0.0062 U	--
SVOCs	8270	1,2,4-Trichlorobenzene	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	1,2-Diphenylhydrazine	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	1,3-Dichlorobenzene (m-Dichlorobenzene)	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	1,3-Dinitrobenzene	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2,3,4,6-Tetrachlorophenol	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2,3,5,6-Tetrachlorophenol	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2,3-DICHLOROANILINE	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2,4,5-Trichlorophenol	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2,4,6-Trichlorophenol	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2,4-Dichlorophenol	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2,4-Dimethylphenol	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2,4-Dinitrophenol	mg/Kg	--	1.0 U	0.24 U	0.20 U	0.21 U	0.18 U	0.21 U	0.22 U	0.24 U	--	--	--	--	0.18 U	0.22 U	--	--	--	--	0.18 U	0.17 U	0.24 U	--	--	0.20 U	0.21 U	0.20 U	--
SVOCs	8270	2,4-Dinitrotoluene	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2,6-Dinitrotoluene	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2-Chloronaphthalene	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2-Chlorophenol	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2-Nitroaniline	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	2-Nitrophenol	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	3,3'-Dichlorobenzidine	mg/Kg	--	1.0 U	0.24 U	0.20 U	0.21 U	0.18 U	0.21 U	0.22 U	0.24 U	--	--	--	--	0.18 U	0.22 U	--	--	--	--	0.18 U	0.17 U	0.24 U	--	--	0.20 U	0.21 U	0.20 U	--
SVOCs	8270	3-Nitroaniline	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	4,6-Dinitro-2-Methylphenol	mg/Kg	--	1.0 U	0.24 U	0.20 U	0.21 U	0.18 U	0.21 U	0.22 U	0.24 U	--	--	--	--	0.18 U	0.22 U	--	--	--	--	0.18 U	0.17 U	0.24 U	--	--	0.20 U	0.21 U	0.20 U	--
SVOCs	8270	4-Bromophenyl phenyl ether	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	4-Chloro-3-Methylphenol	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	4-Chloroaniline	mg/Kg	--	1.0 U	0.24 U	0.20 U	0.21 U	0.18 U	0.21 U	0.22 U	0.24 U	--	--	--	--	0.18 U	0.22 U	--	--	--	--	0.18 U	0.17 U	0.24 U	--	--	0.20 U	0.21 U	0.20 U	--
SVOCs	8270	4-Chlorophenyl-Phenylether	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	4-Nitroaniline	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	4-Nitrophenol (p-Nitrophenol)	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Aniline	mg/Kg	--	1.0 U	0.24 U	0.20 U	0.21 U	0.18 U	0.21 U	0.22 U	0.24 U	--	--	--	--	0.18 U	0.22 U	--	--	--	--	0.18 U	0.17 U	0.24 U	--	--	0.20 U	0.21 U	0.20 U	--

TABLE C-1

SOIL ANALYTICAL DATA SUMMARY
May-June 2014
Puget Sound Energy LNG Project
Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	B-1-2.0 2-3 ft	B-1-8.0 7-8 ft	B-2-2.0 1.5-2.5 ft	B-2-8.0 8-9 ft	B-3-2.0 1.5-2.5 ft	B-3-8.0 7-8.5 ft	B-4-2.0 1.5-2.5 ft	B-4-8.0 7-8 ft	B-5-2.0 2-3 ft	B-5-8.0 7.5-8.5 ft	B-6-2.0 2-3 ft	B-6-8.0 7-8 ft	B-7-2.0 1.5-2.5 ft	B-7-8.0 8-9 ft	B-8-6.0 5.5-6.5 ft	B-8-11.0 10.5-11.5 ft	B-9-7.0 6-7.5 ft	B-9-13.0 13-14 ft	B-10-2.0 1.5-2.5 ft (fill)	B-10-7.0 6.5-7.5 ft	B-10-13.0 12-13.5 ft	B-11-8.0 8-9 ft	B-11-12.0 11.5-13 ft	B-12-2.0 2 ft (fill)	B-12-7.0 7 ft	B-12-13.0 13 ft	B-13-7.0 7-8 ft
SVOCs	8270	Benzene, 1,4-Dinitro-	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Benzidine	mg/Kg	--	2.0 U	0.47 U	0.39 U	0.42 U	0.36 U	0.43 U	0.45 U	0.49 U	--	--	--	--	0.36 U	0.43 U	--	--	--	--	0.36 U	0.35 U	0.48 U	--	--	0.40 U	0.41 U	0.41 U	--
SVOCs	8270	Benzyl Alcohol	mg/Kg	--	1.0 U	0.24 U	0.20 U	0.21 U	0.18 U	0.21 U	0.22 U	0.24 U	--	--	--	--	0.18 U	0.22 U	--	--	--	--	0.18 U	0.17 U	0.24 U	--	--	0.20 U	0.21 U	0.20 U	--
SVOCs	8270	Bis(2-chloroethoxy)methane	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Bis(2-chloroethyl)ether	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Bis(2-chloroisopropyl)ether	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	**Bis(2-ethylhexyl)phthalate (BEHP)**	mg/Kg	0.13	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Butyl benzyl phthalate	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Carbazole	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Di-N-Octyl Phthalate	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Dibenzofuran	mg/Kg	160	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Dibutyl phthalate	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Diethyl phthalate	mg/Kg	0.9	1.0 U	0.24 U	0.20 U	0.21 U	0.18 U	0.21 U	0.22 U	0.24 U	--	--	--	--	0.18 U	0.22 U	--	--	--	--	0.18 U	0.17 U	0.24 U	--	--	0.20 U	0.21 U	0.20 U	--
SVOCs	8270	Dimethyl phthalate	mg/Kg	80000	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Hexachlorobenzene	mg/Kg	0.01	0.040 U	0.0094 U	0.0078 U	0.0084 U	0.0072 U	0.0086 U	0.0090 U	0.0097 U	--	--	--	--	0.0072 U	0.0086 U	--	--	--	--	0.0071 U	0.0069 U	0.0096 U	--	--	0.0081 U	0.0083 U	0.0082 U	--
SVOCs	8270	Hexachlorobutadiene	mg/Kg	0.01	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Hexachlorocyclopentadiene	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Hexachloroethane	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Hexanedioic Acid, Bis(2-Ethylhexyl) Ester	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Isophorone	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	m,p-Cresol	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	N-Nitrosodi-n-propylamine	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	N-Nitrosodimethylamine	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	N-Nitrosodiphenylamine (as diphenylamine)	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Nitrobenzene	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	o-Cresol (2-methylphenol)	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	O-DINITROBENZENE	mg/Kg	--	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Pentachlorophenol	mg/Kg	0.1	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Phenol	mg/Kg	4.6	0.20 U	0.047 U	0.039 U	0.042 U	0.036 U	0.043 U	0.045 U	0.049 U	--	--	--	--	0.036 U	0.043 U	--	--	--	--	0.036 U	0.035 U	0.048 U	--	--	0.040 U	0.041 U	0.041 U	--
SVOCs	8270	Pyridine	mg/Kg	--	2.0 U	0.47 U	0.39 U	0.42 U	0.36 U	0.43 U	0.45 U	0.49 U	--	--	--	--	0.36 U	0.43 U	--	--	--	--	0.36 U	0.35 U	0.48 U	--	--	0.40 U	0.41 U	0.41 U	--
VOCs	5035A/8260	1,1,1,2-Tetrachloroethane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,1,1-Trichloroethane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,1,2,2-Tetrachloroethane	mg/Kg	0.005	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,1,2-Trichloroethane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,1-Dichloroethane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,1-Dichloroethene	mg/Kg	0.005	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,1-Dichloropropene	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,2,3-Trichlorobenzene	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,2,3-Trichloropropane	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,2,4-Trichlorobenzene	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**1,2,4-Trimethylbenzene**	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	**0.027**	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,2-Dibromo-3-Chloropropane	mg/Kg	--	0.34 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	0.0050 U	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	0.0075 U	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	1,2-dibromoethane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,2-Dichloroethane	mg/Kg	0.012	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,2-Dichloropropane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**1,3,5-Trimethylbenzene**	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	**0.0082**	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,3-Dichlorobenzene (m-Dichlorobenzene)	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,3-Dichloropropane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	2,2-Dichloropropane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**2-Butanone (MEK)**	mg/Kg	--	0.0079 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	**0.0088**	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	**0.0093**	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	2-Chloroethyl vinyl ether	mg/Kg	--	0.0079 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	0.0050 U	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	0.0075 U	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	2-Chlorotoluene	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	2-Hexanone	mg/Kg	--	0.0079 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	0.0050 U	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	0.0075 U	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	4-Chlorotoluene	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	4-Methyl-2-Pentanone (Methyl isobutyl ketone)	mg/Kg	--	0.0079 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	0.0050 U	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	0.0075 U	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	**Acetone**	mg/Kg	72000	0.0079 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	**0.038**	0.0079 U	**0.020**	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	**0.036**	--	--	0.0050 U	0.0064 U	**0.015**	--
VOCs	5035A/8260	**Benzene**	mg/Kg	0.02	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Bromobenzene	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Bromochloromethane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Bromodichloromethane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Bromoform (Tribromomethane)	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Bromomethane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**Carbon Disulfide**	mg/Kg	--	0.0016 U	**0.0015**	0.0016 U	**0.0030**	0.0012 U	**0.011**	0.0016 U	**0.0061**	--	--	--	--	0.0012 U	**0.0031**	--	--	--	--	0.00097 U	0.0012 U	**0.0076**	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Carbon Tetrachloride	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Chlorobenzene	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Chloroethane	mg/Kg	--	0.0079 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	0.0050 U	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	0.0075 U	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	Chloroform	mg/Kg	0.16	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Chloromethane	mg/Kg	--	0.0079 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	0.0050 U	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	0.0075 U	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	cis-1,2-Dichloroethene	mg/Kg	800	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--

TABLE C-1
SOIL ANALYTICAL DATA SUMMARY
May-June 2014
Puget Sound Energy LNG Project
Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	B-1-2.0 2-3 ft	B-1-8.0 7-8 ft	B-2-2.0 1.5-2.5 ft	B-2-8.0 8-9 ft	B-3-2.0 1.5-2.5 ft	B-3-8.0 7-8.5 ft	B-4-2.0 1.5-2.5 ft	B-4-8.0 7-8 ft	B-5-2.0 2-3 ft	B-5-8.0 7.5-8.5 ft	B-6-2.0 2-3 ft	B-6-8.0 7-8 ft	B-7-2.0 1.5-2.5 ft	B-7-8.0 8-9 ft	B-8-6.0 5.5-6.5 ft	B-8-11.0 10.5-11.5 ft	B-9-7.0 6-7.5 ft	B-9-13.0 13-14 ft	B-10-2.0 1.5-2.5 ft (fill)	B-10-7.0 6.5-7.5 ft	B-10-13.0 12-13.5 ft	B-11-8.0 8-9 ft	B-11-12.0 11.5-13 ft	B-12-2.0 2 ft (fill)	B-12-7.0 7 ft	B-12-13.0 13 ft	B-13-7.0 7-8 ft
VOCs	5035A/8260	Cis-1,3-Dichloropropene	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Dibromochloromethane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Dibromomethane	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Dichlorodifluoromethane (CFC-12)	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**Ethylbenzene**	mg/Kg	0.02	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	**0.0031**	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Hexachlorobutadiene	mg/Kg	0.01	0.34 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	0.0050 U	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	0.0075 U	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	**Isopropylbenzene (Cumene)**	mg/Kg	8000	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	**0.0019**	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Methyl Iodide (Iodomethane)	mg/Kg	--	0.0079 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	0.0050 U	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	0.0075 U	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	Methyl t-butyl ether	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**Methylene Chloride**	mg/Kg	0.18	**0.0080**	0.0067 U	0.0079 U	0.0082 U	0.0061 U	0.0050 U	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	0.0075 U	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	**n-Butylbenzene**	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	**0.0085**	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**n-Propylbenzene**	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	**0.0047**	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**Naphthalene**	mg/Kg	2.6	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**p-Isopropyltoluene**	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	**0.0036**	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**Sec-Butylbenzene**	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	**0.0048**	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Styrene	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Tert-Butylbenzene	mg/Kg	--	0.067 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**Tetrachloroethene**	mg/Kg	0.005	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Toluene	mg/Kg	6.4	0.0079 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	0.0050 U	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	0.0075 U	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	Trans-1,2-Dichloroethene	mg/Kg	3.2	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Trans-1,3-Dichloropropene	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Trichloroethene	mg/Kg	0.01	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Trichlorofluoromethane (CFC-11)	mg/Kg	--	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	Vinyl Acetate	mg/Kg	--	0.0079 U	0.0067 U	0.0079 U	0.0082 U	0.0061 U	0.0050 U	0.0079 U	0.0089 U	--	--	--	--	0.0058 U	0.0065 U	--	--	--	--	0.0048 U	0.0058 U	0.0075 U	--	--	0.0050 U	0.0064 U	0.0044 U	--
VOCs	5035A/8260	Vinyl Chloride	mg/Kg	0.005	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	0.00097 U	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--
VOCs	5035A/8260	**Xylene, m-,p-**	mg/Kg	9.0	0.0031 U	0.0027 U	0.0032 U	0.0033 U	0.0025 U	0.0020 U	0.0032 U	0.0036 U	--	--	--	--	0.0023 U	0.0026 U	--	--	--	--	**0.012**	0.0023 U	0.0030 U	--	--	0.0020 U	0.0026 U	0.0018 U	--
VOCs	5035A/8260	**Xylene, o-**	mg/Kg	0.1	0.0016 U	0.0013 U	0.0016 U	0.0016 U	0.0012 U	0.00099 U	0.0016 U	0.0018 U	--	--	--	--	0.0012 U	0.0013 U	--	--	--	--	**0.0054**	0.0012 U	0.0015 U	--	--	0.0010 U	0.0013 U	0.00088 U	--

TABLE C-1

SOIL ANALYTICAL DATA SUMMARY

May-June 2014

Puget Sound Energy LNG Project

Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	B-13-13.0 12.5-13.5 ft	B-14-7.0 7 ft	B-14-13.0 13 ft	B-15-2.0 2-2.5 ft (fill)	B-15-7.0 7-7.5 ft	B-15-13.0 12.5-13 ft	B-16-2.0 2-3 ft (fill)	B-16-7.0 7-8 ft	B-16-13.0 12.5-13.5 ft	B-17-2.0 2 ft	B-17-8.0 8 ft	B-18-2.0 1.5-2.5 ft	B-18-8.0 7.5-8.5 ft	B-19-2.0 1.5-2.5 ft	B-19-8.0 8 ft	B-20-2.0 2-3 ft	B-20-8.0 7-8 ft	B-21-2.0 2 ft	B-21-8.0 8 ft	B-22-2.0 2-3 ft	B-22-8.0 7-8 ft	B-23-2.0 2-3 ft	B-23-8.0 7-8 ft	B-24-2.0 1.5-2.5 ft	B-24-8.0 7.5-8.5 ft	B-26-2.0 2-3 ft	B-26-8.0 8-9 ft
BTEX	5035A/8021	Benzene	mg/Kg	0.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.020 U	0.020 U
BTEX	5035A/8021	Ethylbenzene	mg/Kg	0.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.067 U	0.053 U
BTEX	5035A/8021	Toluene	mg/Kg	6.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.067 U	0.053 U
BTEX	5035A/8021	Xylene, m-,p-	mg/Kg	9.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.067 U	0.053 U
BTEX	5035A/8021	Xylene, o-	mg/Kg	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.067 U	0.053 U
Fuels	NWTPH-Gx	Total petroleum hydrocarbons as gasoline	mg/Kg	30	--	--	--	5.3 U	5.8 U	7.5 U	5.3 U	--	--	5.8 U	6.6 U	5.8 U	5.1 U	4.7 U	6.9 U	5.6 U	12 U	7.1 U	7.9 U	5.9 U	7.5 U	5.8 U	7.6 U	8.5 U	7.0 U	6.7 U	5.3 U
Fuels	NWTPH-Dx	**Total petroleum hydrocarbons as diesel**	mg/Kg	2000	36 U	33 U	32 U	26 U	27 U	36 U	27 U	26 U	33 U	28 U	29 U	27 U	27 U	29 U	31 U	27 U	**5900**	32 U	33 U	**32**	32 U	27 U	33 U	32 U	30 U	30 U	27 U
Fuels	NWTPH-Dx	**Total petroleum hydrocarbons as lube oil**	mg/Kg	2000	72 U	66 U	63 U	53 U	54 U	72 U	54 U	52 U	66 U	57 U	58 U	53 U	54 U	57 U	61 U	53 U	**740 J**	63 U	66 U	**76**	65 U	55 U	66 U	64 U	61 U	59 U	54 U
Metals	6010/6020	Arsenic	mg/Kg	20	14 U	13 U	13 U	11 U	11 U	14 U	11 U	10 U	13 U	11 U	12 U	11 U	11 U	11 U	12 U	11 U	12 U	13 U	13 U	11 U	13 U	11 U	13 U	13 U	12 U	--	--
Metals	6010/6020	Cadmium	mg/Kg	--	0.72 U	0.66 U	0.63 U	0.53 U	0.54 U	0.72 U	0.54 U	0.52 U	0.66 U	0.57 U	0.58 U	0.53 U	0.54 U	0.57 U	0.61 U	0.53 U	0.58 U	0.63 U	0.66 U	0.54 U	0.65 U	0.55 U	0.66 U	0.64 U	0.61 U	--	--
Metals	6010/6020	**Chromium**	mg/Kg	1000	**15**	**12**	**9.7**	**28**	**9.2**	**13**	**36**	**8.6**	**10**	**25**	**9.6**	**22**	**14**	**11**	**12**	**12**	**12**	**11**	**9.9**	**8.5**	**7.6**	**8.5**	**11**	**12**	**11**	--	--
Metals	6010/6020	**Copper**	mg/Kg	36	**25**	**10**	**9.7**	**11**	**9**	**19**	**10**	**8.1**	**11**	**13**	**12**	**12**	**11**	**11**	**11**	**21**	**13**	**10**	**9.2**	**9.1**	**8.4**	**36**	**18**	**11**	**11**	--	--
Metals	6010/6020	**Lead**	mg/Kg	1000 (a)	7.2 U	6.6 U	6.3 U	5.3 U	5.4 U	7.2 U	5.4 U	5.2 U	6.6 U	5.7 U	5.8 U	5.3 U	**35**	5.7 U	6.1 U	**28**	**35**	6.3 U	6.6 U	5.4 U	6.5 U	**160**	**18**	6.4 U	6.1 U	--	--
Metals	7471	Mercury	mg/Kg	--	0.36 U	0.33 U	0.32 U	0.26 U	0.27 U	0.36 U	0.27 U	0.26 U	0.33 U	0.28 U	0.29 U	0.27 U	0.27 U	0.29 U	0.31 U	0.27 U	0.29 U	0.32 U	0.33 U	0.27 U	0.32 U	0.27 U	0.33 U	0.32 U	0.30 U	--	--
PCBs	8082	PCB-aroclor 1016	mg/Kg	--	--	--	--	0.0026 U	0.0027 U	0.0036 U	0.0027 U	--	--	0.0028 U	0.0029 U	0.0027 U	0.0027 U	0.0029 U	0.0031 U	0.0027 U	0.0029 U	0.0032 U	0.0033 U	0.0027 U	0.0032 U	0.0027 U	0.0033 U	--	--	--	--
PCBs	8082	PCB-aroclor 1221	mg/Kg	--	--	--	--	0.0026 U	0.0027 U	0.0036 U	0.0027 U	--	--	0.0028 U	0.0029 U	0.0027 U	0.0027 U	0.0029 U	0.0031 U	0.0027 U	0.0029 U	0.0032 U	0.0033 U	0.0027 U	0.0032 U	0.0027 U	0.0033 U	--	--	--	--
PCBs	8082	PCB-aroclor 1232	mg/Kg	--	--	--	--	0.0026 U	0.0027 U	0.0036 U	0.0027 U	--	--	0.0028 U	0.0029 U	0.0027 U	0.0027 U	0.0029 U	0.0031 U	0.0027 U	0.0029 U	0.0032 U	0.0033 U	0.0027 U	0.0032 U	0.0027 U	0.0033 U	--	--	--	--
PCBs	8082	PCB-aroclor 1242	mg/Kg	--	--	--	--	0.0026 U	0.0027 U	0.0036 U	0.0027 U	--	--	0.0028 U	0.0029 U	0.0027 U	0.0027 U	0.0029 U	0.0031 U	0.0027 U	0.0029 U	0.0032 U	0.0033 U	0.0027 U	0.0032 U	0.0027 U	0.0033 U	--	--	--	--
PCBs	8082	PCB-aroclor 1248	mg/Kg	--	--	--	--	0.0026 U	0.0027 U	0.0036 U	0.0027 U	--	--	0.0028 U	0.0029 U	0.0027 U	0.0027 U	0.0029 U	0.0031 U	0.0027 U	0.0029 U	0.0032 U	0.0033 U	0.0027 U	0.0032 U	0.0027 U	0.0033 U	--	--	--	--
PCBs	8082	PCB-aroclor 1254	mg/Kg	--	--	--	--	0.0026 U	0.0027 U	0.0036 U	0.0027 U	--	--	0.0028 U	0.0029 U	0.0027 U	0.0027 U	0.0029 U	0.0031 U	0.0027 U	0.0029 U	0.0032 U	0.0033 U	0.0027 U	0.0032 U	0.0027 U	0.0033 U	--	--	--	--
PCBs	8082	**PCB-aroclor 1260**	mg/Kg	--	--	--	--	0.0026 U	0.0027 U	0.0036 U	0.0027 U	--	--	0.0028 U	0.0029 U	0.0027 U	0.0027 U	0.0029 U	0.0031 U	**0.017**	**0.0038**	0.0032 U	0.0033 U	0.0027 U	0.0032 U	0.0027 U	0.0033 U	--	--	--	--
PAHs	8270	**1-Methylnaphthalene**	mg/Kg	--	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	**0.20**	0.0084 U	0.0088 U	**0.0076**	0.0086 U	0.0073 U	0.0087 U	--	--	--	--
PAHs	8270	**2-Methylnaphthalene**	mg/Kg	320	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	**0.19**	0.0084 U	0.0088 U	0.0072 U	0.0086 U	0.0073 U	0.0087 U	--	--	--	--
PAHs	8270	**Acenaphthene**	mg/Kg	0.5	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	**0.024**	0.0084 U	0.0088 U	0.0072 U	0.0086 U	0.0073 U	0.0087 U	--	--	--	--
PAHs	8270	**Acenaphthylene**	mg/Kg	--	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	**0.058**	0.0084 U	0.0088 U	0.0072 U	0.0086 U	0.0073 U	0.0087 U	--	--	--	--
PAHs	8270	**Anthracene**	mg/Kg	1	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	**0.016**	0.0084 U	0.0088 U	0.0072 U	0.0086 U	0.0073 U	0.0087 U	--	--	--	--
PAHs	8270	**Benzo(g,h,i)perylene**	mg/Kg	--	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	0.015 U	0.0084 U	0.0088 U	0.0072 U	0.0086 U	**0.016**	0.0087 U	--	--	--	--
PAHs	8270	**Fluoranthene**	mg/Kg	2.5	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	**0.011**	0.0072 U	0.0076 U	0.0082 U	0.0071 U	0.015 U	0.0084 U	0.0088 U	0.0072 U	0.0086 U	**0.012**	0.0087 U	--	--	--	--
PAHs	8270	**Fluorene**	mg/Kg	0.6	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	**0.033**	0.0084 U	0.0088 U	0.0072 U	0.0086 U	0.0073 U	0.0087 U	--	--	--	--
PAHs	8270	**Naphthalene**	mg/Kg	2.6	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	**0.099**	0.0084 U	0.0088 U	0.0072 U	0.0086 U	0.0073 U	0.0087 U	--	--	--	--
PAHs	8270	**Phenanthrene**	mg/Kg	--	--	--	--	0.0070 U	0.0073 U	**0.015**	0.0071 U	--	--	0.0075 U	0.0078 U	**0.0088**	0.0072 U	0.0076 U	0.0082 U	0.0071 U	**0.015**	0.0084 U	0.0088 U	**0.011**	0.0086 U	**0.0088**	0.0087 U	--	--	--	--
PAHs	8270	**Pyrene**	mg/Kg	3.3	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	**0.015**	0.0072 U	**0.013**	**0.0096**	0.0071 U	**0.034**	0.0084 U	0.0088 U	0.0072 U	0.0086 U	**0.015**	0.0087 U	--	--	--	--
cPAHs	8270-SIM	**Benzo(a)anthracene**	mg/Kg	--	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	**0.0084**	0.0072 U	0.0076 U	0.0082 U	0.0071 U	0.015 U	0.0084 U	0.0088 U	0.0072 U	0.0086 U	**0.010**	0.0087 U	--	--	--	--
cPAHs	8270-SIM	**Benzo(a)pyrene**	mg/Kg	--	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	**0.0085**	0.0072 U	0.0076 U	0.0082 U	0.0071 U	0.015 U	0.0084 U	0.0088 U	0.0072 U	0.0086 U	**0.014**	0.0087 U	--	--	--	--
cPAHs	8270-SIM	**Benzo(b)fluoranthene**	mg/Kg	--	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	0.015 U	0.0084 U	0.0088 U	0.0072 U	0.0086 U	**0.013**	**0.0099**	--	--	--	--
cPAHs	8270-SIM	**Benzo(j,k)fluoranthene**	mg/Kg	--	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	0.015 U	0.0084 U	0.0088 U	0.0072 U	0.0086 U	**0.012**	0.0087 U	--	--	--	--
cPAHs	8270-SIM	**Chrysene**	mg/Kg	--	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	**0.0081**	0.0072 U	0.0076 U	0.0082 U	0.0071 U	**0.022**	0.0084 U	0.0088 U	0.0072 U	0.0086 U	**0.012**	0.0087 U	--	--	--	--
cPAHs	8270-SIM	Dibenzo(a,h)anthracene	mg/Kg	--	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	0.015 U	0.0084 U	0.0088 U	0.0072 U	0.0086 U	0.0073 U	0.0087 U	--	--	--	--
cPAHs	8270-SIM	**Indeno(1,2,3-cd)pyrene**	mg/Kg	--	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	0.015 U	0.0084 U	0.0088 U	0.0072 U	0.0086 U	**0.011**	0.0087 U	--	--	--	--
cPAHs	8270-SIM	**Total cPAHs TEC (ND=0.5MRL)**	mg/Kg	18 (a)	--	--	--	0.0053 U	0.0055 U	0.0072 U	0.0054 U	--	--	0.0057 U	0.0059 U	**0.011**	0.0054 U	0.0057 U	0.0062 U	0.0054 U	**0.011**	0.0063 U	0.0066 U	0.0054 U	0.0065 U	**0.019**	**0.0071**	--	--	--	--
SVOCs	8270	1,2,4-Trichlorobenzene	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	1,2-Diphenylhydrazine	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	1,3-Dichlorobenzene (m-Dichlorobenzene)	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	1,3-Dinitrobenzene	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2,3,4,6-Tetrachlorophenol	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2,3,5,6-Tetrachlorophenol	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2,3-DICHLOROANILINE	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2,4,5-Trichlorophenol	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2,4,6-Trichlorophenol	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2,4-Dichlorophenol	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2,4-Dimethylphenol	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2,4-Dinitrophenol	mg/Kg	--	--	--	--	0.18 U	0.18 U	0.24 U	0.18 U	--	--	0.19 U	0.19 U	0.18 U	0.18 U	0.19 U	0.20 U	0.18 U	0.96 U	0.21 U	0.22 U	0.18 U	0.22 U	0.18 U	0.22 U	--	--	--	--
SVOCs	8270	2,4-Dinitrotoluene	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2,6-Dinitrotoluene	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2-Chloronaphthalene	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2-Chlorophenol	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2-Nitroaniline	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	2-Nitrophenol	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	3,3'-Dichlorobenzidine	mg/Kg	--	--	--	--	0.18 U	0.18 U	0.24 U	0.18 U	--	--	0.19 U	0.19 U	0.18 U	0.18 U	0.19 U	0.20 U	0.18 U	0.96 U	0.21 U	0.22 U	0.18 U	0.22 U	0.18 U	0.22 U	--	--	--	--
SVOCs	8270	3-Nitroaniline	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	4,6-Dinitro-2-Methylphenol	mg/Kg	--	--	--	--	0.18 U	0.18 U	0.24 U	0.18 U	--	--	0.19 U	0.19 U	0.18 U	0.18 U	0.19 U	0.20 U	0.18 U	0.96 U	0.21 U	0.22 U	0.18 U	0.22 U	0.18 U	0.22 U	--	--	--	--
SVOCs	8270	4-Bromophenyl phenyl ether	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	4-Chloro-3-Methylphenol	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	4-Chloroaniline	mg/Kg	--	--	--	--	0.18 U	0.18 U	0.24 U	0.18 U	--	--	0.19 U	0.19 U	0.18 U	0.18 U	0.19 U	0.20 U	0.18 U	0.96 U	0.21 U	0.22 U	0.18 U	0.22 U	0.18 U	0.22 U	--	--	--	--
SVOCs	8270	4-Chlorophenyl-Phenylether	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	4-Nitroaniline	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	4-Nitrophenol (p-Nitrophenol)	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Aniline	mg/Kg	--	--	--	--	0.18 U	0.18 U	0.24 U	0.18 U	--	--	0.19 U	0.19 U	0.18 U	0.18 U	0.19 U	0.20 U	0.18 U	0.96 U	0.21 U	0.22 U	0.18 U	0.22 U	0.18 U	0.22 U	--	--	--	--

TABLE C-1

SOIL ANALYTICAL DATA SUMMARY
May-June 2014
Puget Sound Energy LNG Project
Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	B-13-13.0 12.5-13.5 ft	B-14-7.0 7 ft	B-14-13.0 13 ft	B-15-2.0 2-2.5 ft (fill)	B-15-7.0 7-7.5 ft	B-15-13.0 12.5-13 ft	B-16-2.0 2-3 ft (fill)	B-16-7.0 7-8 ft	B-16-13.0 12.5-13.5 ft	B-17-2.0 2 ft	B-17-8.0 8 ft	B-18-2.0 1.5-2.5 ft	B-18-8.0 7.5-8.5 ft	B-19-2.0 1.5-2.5 ft	B-19-8.0 8 ft	B-20-2.0 2-3 ft	B-20-8.0 7-8 ft	B-21-2.0 2 ft	B-21-8.0 8 ft	B-22-2.0 2-3 ft	B-22-8.0 7-8 ft	B-23-2.0 2-3 ft	B-23-8.0 7-8 ft	B-24-2.0 1.5-2.5 ft	B-24-8.0 7.5-8.5 ft	B-26-2.0 2-3 ft	B-26-8.0 8-9 ft
SVOCs	8270	Benzene, 1,4-Dinitro-	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Benzidine	mg/Kg	--	--	--	--	0.35 U	0.36 U	0.48 U	0.36 U	--	--	0.38 U	0.39 U	0.35 U	0.36 U	0.38 U	0.41 U	0.36 U	1.9 U	0.42 U	0.44 U	0.36 U	0.43 U	0.36 U	0.44 U	--	--	--	--
SVOCs	8270	Benzyl Alcohol	mg/Kg	--	--	--	--	0.18 U	0.18 U	0.24 U	0.18 U	--	--	0.19 U	0.19 U	0.18 U	0.18 U	0.19 U	0.20 U	0.18 U	0.96 U	0.21 U	0.22 U	0.18 U	0.22 U	0.18 U	0.22 U	--	--	--	--
SVOCs	8270	Bis(2-chloroethoxy)methane	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Bis(2-chloroethyl)ether	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Bis(2-chloroisopropyl)ether	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	**Bis(2-ethylhexyl)phthalate (BEHP)**	mg/Kg	0.13	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	**0.16***	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Butyl benzyl phthalate	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Carbazole	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Di-N-Octyl Phthalate	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Dibenzofuran	mg/Kg	160	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Dibutyl phthalate	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Diethyl phthalate	mg/Kg	0.9	--	--	--	0.18 U	0.18 U	0.24 U	0.18 U	--	--	0.19 U	0.19 U	0.18 U	0.18 U	0.19 U	0.20 U	0.18 U	0.96 U	0.21 U	0.22 U	0.18 U	0.22 U	0.18 U	0.22 U	--	--	--	--
SVOCs	8270	Dimethyl phthalate	mg/Kg	80000	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Hexachlorobenzene	mg/Kg	0.01	--	--	--	0.0070 U	0.0073 U	0.0096 U	0.0071 U	--	--	0.0075 U	0.0078 U	0.0071 U	0.0072 U	0.0076 U	0.0082 U	0.0071 U	0.039 U	0.0084 U	0.0088 U	0.0072 U	0.0086 U	0.0073 U	0.0087 U	--	--	--	--
SVOCs	8270	Hexachlorobutadiene	mg/Kg	0.01	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Hexachlorocyclopentadiene	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Hexachloroethane	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Hexanedioic Acid, Bis(2-Ethylhexyl) Ester	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Isophorone	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	m,p-Cresol	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	N-Nitrosodi-n-propylamine	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	N-Nitrosodimethylamine	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	N-Nitrosodiphenylamine (as diphenylamine)	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Nitrobenzene	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	o-Cresol (2-methylphenol)	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	O-DINITROBENZENE	mg/Kg	--	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Pentachlorophenol	mg/Kg	0.1	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Phenol	mg/Kg	4.6	--	--	--	0.035 U	0.036 U	0.048 U	0.036 U	--	--	0.038 U	0.039 U	0.035 U	0.036 U	0.038 U	0.041 U	0.036 U	0.19 U	0.042 U	0.044 U	0.036 U	0.043 U	0.036 U	0.044 U	--	--	--	--
SVOCs	8270	Pyridine	mg/Kg	--	--	--	--	0.35 U	0.36 U	0.48 U	0.36 U	--	--	0.38 U	0.39 U	0.35 U	0.36 U	0.38 U	0.41 U	0.36 U	1.9 U	0.42 U	0.44 U	0.36 U	0.43 U	0.36 U	0.44 U	--	--	--	--
VOCs	5035A/8260	1,1,1,2-Tetrachloroethane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,1,1-Trichloroethane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,1,2,2-Tetrachloroethane	mg/Kg	0.005	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,1,2-Trichloroethane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,1-Dichloroethane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,1-Dichloroethene	mg/Kg	0.005	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,1-Dichloropropene	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,2,3-Trichlorobenzene	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,2,3-Trichloropropane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,2,4-Trichlorobenzene	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	**1,2,4-Trimethylbenzene**	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,2-Dibromo-3-Chloropropane	mg/Kg	--	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	0.0069 U	0.0060 U	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	0.0056 U	--	--
VOCs	5035A/8260	1,2-dibromoethane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,2-Dichloroethane	mg/Kg	0.012	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,2-Dichloropropane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	**1,3,5-Trimethylbenzene**	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,3-Dichlorobenzene (m-Dichlorobenzene)	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,3-Dichloropropane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	2,2-Dichloropropane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	**2-Butanone (MEK)**	mg/Kg	--	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	0.0069 U	0.0060 U	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	**0.0090**	--	--
VOCs	5035A/8260	2-Chloroethyl vinyl ether	mg/Kg	--	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	0.0069 U	0.0060 U	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	0.0056 U	--	--
VOCs	5035A/8260	2-Chlorotoluene	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	2-Hexanone	mg/Kg	--	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	0.0069 U	0.0060 U	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	0.0056 U	--	--
VOCs	5035A/8260	4-Chlorotoluene	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	4-Methyl-2-Pentanone (Methyl isobutyl ketone)	mg/Kg	--	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	0.0069 U	0.0060 U	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	0.0056 U	--	--
VOCs	5035A/8260	**Acetone**	mg/Kg	72000	--	--	--	0.0050 U	0.0061 U	**0.017**	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	**0.0098**	**0.010**	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	**0.043**	--	--
VOCs	5035A/8260	**Benzene**	mg/Kg	0.02	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	**0.019**	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	**0.014**	--	--
VOCs	5035A/8260	Bromobenzene	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Bromochloromethane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Bromodichloromethane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Bromoform (Tribromomethane)	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Bromomethane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	**Carbon Disulfide**	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	**0.0040**	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	**0.0040**	0.0012 U	0.065 U	0.0014 U	**0.0040**	0.059 U	**0.0017**	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Carbon Tetrachloride	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Chlorobenzene	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Chloroethane	mg/Kg	--	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	0.0069 U	0.0060 U	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	0.0056 U	--	--
VOCs	5035A/8260	Chloroform	mg/Kg	0.16	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Chloromethane	mg/Kg	--	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	0.0069 U	0.0060 U	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	0.0056 U	--	--
VOCs	5035A/8260	cis-1,2-Dichloroethene	mg/Kg	800	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--

TABLE C-1

SOIL ANALYTICAL DATA SUMMARY

May-June 2014

Puget Sound Energy LNG Project

Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	B-13-13.0 12.5-13.5 ft	B-14-7.0 7 ft	B-14-13.0 13 ft	B-15-2.0 2-2.5 ft (fill)	B-15-7.0 7-7.5 ft	B-15-13.0 12.5-13 ft	B-16-2.0 2-3 ft (fill)	B-16-7.0 7-8 ft	B-16-13.0 12.5-13.5 ft	B-17-2.0 2 ft	B-17-8.0 8 ft	B-18-2.0 1.5-2.5 ft	B-18-8.0 7.5-8.5 ft	B-19-2.0 1.5-2.5 ft	B-19-8.0 8 ft	B-20-2.0 2-3 ft	B-20-8.0 7-8 ft	B-21-2.0 2 ft	B-21-8.0 8 ft	B-22-2.0 2-3 ft	B-22-8.0 7-8 ft	B-23-2.0 2-3 ft	B-23-8.0 7-8 ft	B-24-2.0 1.5-2.5 ft	B-24-8.0 7.5-8.5 ft	B-26-2.0 2-3 ft	B-26-8.0 8-9 ft
VOCs	5035A/8260	Cis-1,3-Dichloropropene	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Dibromochloromethane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Dibromomethane	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Dichlorodifluoromethane (CFC-12)	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	**Ethylbenzene**	mg/Kg	0.02	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	**0.0021**	--	--
VOCs	5035A/8260	Hexachlorobutadiene	mg/Kg	0.01	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	0.0069 U	0.0060 U	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	0.0056 U	--	--
VOCs	5035A/8260	**Isopropylbenzene (Cumene)**	mg/Kg	8000	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	**0.043**	--	--
VOCs	5035A/8260	Methyl Iodide (Iodomethane)	mg/Kg	--	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	0.0069 U	0.0060 U	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	0.0056 U	--	--
VOCs	5035A/8260	Methyl t-butyl ether	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	**Methylene Chloride**	mg/Kg	0.18	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	**0.0083**	**0.0095**	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	0.0056 U	--	--
VOCs	5035A/8260	**n-Butylbenzene**	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	**0.38**	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	**0.030**	--	--
VOCs	5035A/8260	**n-Propylbenzene**	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	**0.067**	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	**0.11**	--	--
VOCs	5035A/8260	**Naphthalene**	mg/Kg	2.6	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	**0.0034**	--	--
VOCs	5035A/8260	**p-Isopropyltoluene**	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	**0.0019**	--	--
VOCs	5035A/8260	**Sec-Butylbenzene**	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	**0.071**	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	**0.018**	--	--
VOCs	5035A/8260	Styrene	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Tert-Butylbenzene	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	**Tetrachloroethene**	mg/Kg	0.005	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	**0.0026**	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	**0.0029**	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Toluene	mg/Kg	6.4	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	0.0069 U	0.0060 U	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	0.0056 U	--	--
VOCs	5035A/8260	Trans-1,2-Dichloroethene	mg/Kg	3.2	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Trans-1,3-Dichloropropene	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Trichloroethene	mg/Kg	0.01	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Trichlorofluoromethane (CFC-11)	mg/Kg	--	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	Vinyl Acetate	mg/Kg	--	--	--	--	0.0050 U	0.0061 U	0.0062 U	0.0053 U	--	--	0.0057 U	0.0050 U	0.0061 U	0.0073 U	0.0069 U	0.0060 U	0.0060 U	0.33 U	0.0068 U	0.0066 U	0.29 U	0.0076 U	0.0078 U	0.0066 U	0.0068 U	0.0056 U	--	--
VOCs	5035A/8260	Vinyl Chloride	mg/Kg	0.005	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--
VOCs	5035A/8260	**Xylene, m-,p-**	mg/Kg	9.0	--	--	--	0.0020 U	0.0024 U	0.0025 U	0.0021 U	--	--	0.0023 U	0.0020 U	0.0024 U	0.0029 U	0.0027 U	0.0024 U	0.0024 U	0.13 U	0.0027 U	0.0026 U	0.12 U	0.0030 U	0.0031 U	0.0026 U	0.0027 U	0.0023 U	--	--
VOCs	5035A/8260	**Xylene, o-**	mg/Kg	0.1	--	--	--	0.0010 U	0.0012 U	0.0012 U	0.0011 U	--	--	0.0011 U	0.0010 U	0.0012 U	0.0015 U	0.0014 U	0.0012 U	0.0012 U	0.065 U	0.0014 U	0.0013 U	0.059 U	0.0015 U	0.0016 U	0.0013 U	0.0014 U	0.0011 U	--	--

Notes:

ft = Feet below ground surface
mg/Kg = Milligrams per kilogram
ND = Non-detect result
MRL = Method reporting limit
TEC = Toxic equivalent concentration
U = Not detected above the listed method reporting limit
J = Estimated concentration
BOLD typeface = Analyte/concentration detected above method reporting limit
(shaded) = Analyte/sample/concentration exceeds screening level
-- = No value available or not analyzed
* Result may reflect laboratory contamination (BEHP is a common laboratory contaminant).
(a) Port screening levels for lead and total cPAHs TEC are based on an empirical demonstration that the soil-to-groundwater-to-surface water pathway is incomplete.

TABLE C-2

GROUNDWATER ANALYTICAL DATA SUMMARY[1]

May-June 2014

Puget Sound Energy LNG Project

Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	Other Potentially Applicable Screening Levels (a)	B-1-11.0-WATER 6-11 ft	B-2-11.0-WATER 8-13 ft	B-3-11.0-WATER 6-11 ft	B-4-11.0-WATER 7-11 ft	B-7-11.0-WATER 8-13 ft	B-10-11.0-WATER 10-13 ft	B-10-25.0-WATER 21-25 ft	B-10-50.0-WATER 49-53 ft	B-12-11.0-WATER 10-15 ft	B-12-25.0-WATER[2] 26-28 ft	B-13-15.0-WATER 10-15 ft (b)	B-13-25.0-WATER 20-25 ft (b)
BTEX	8021	Benzene	mg/L	0.024	0.024	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	8021	Ethylbenzene	mg/L	0.049	6.1	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	8021	Toluene	mg/L	15	33	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	8021	Xylene, m-,p-	mg/L	15	0.67	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	8021	Xylene, o-	mg/L	0.166	0.96	--	--	--	--	--	--	--	--	--	--	--	--
Fuels	NWTPH-Gx	**Total petroleum hydrocarbons as gasoline**	mg/L	0.80	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	--	--	0.1 U	0.1 U	0.1 U	**0.15**
Fuels	NWTPH-Dx	**Total petroleum hydrocarbons as diesel**	mg/L	0.50	--	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	--	--	0.26 U	**0.48**	0.24 U	0.24 U
Fuels	NWTPH-Dx	**Total petroleum hydrocarbons as lube oil**	mg/L	0.50	--	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	--	--	0.41 U	**0.88**	0.39 U	0.39 U
Dissolved Metals	200.8	**Arsenic**	mg/L	0.0050	0.010 (c)	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	**0.0060**	**0.0093***	0.0030 U	0.0030 U	**0.0083***	0.0030 U
Dissolved Metals	200.8	**Cadmium**	mg/L	0.0090	--	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
Dissolved Metals	200.8	**Chromium**	mg/L	0.050	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.059**	**0.10***	0.01 U	0.01 U	**0.039***	0.01 U
Dissolved Metals	200.8	**Copper**	mg/L	0.0031	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.045**	**0.052***	0.01 U	0.01 U	**0.054***	0.01 U
Dissolved Metals	200.8	**Lead**	mg/L	0.0081	--	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	**0.0047**	**0.0091***	0.0010 U	0.0010 U	**0.0085***	0.0010 U
Dissolved Metals	7470	Mercury	mg/L	0.00020	0.0019	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U
PCBs	8082	PCB-aroclor 1016	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1221	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1232	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1242	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1248	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1254	mg/L	0.0000017	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1260	mg/L	0.000020	--	--	--	--	--	--	--	--	--	--	--	--	--
PAHs	8270	1-Methylnaphthalene	mg/L	--	--	--	0.000098 U	0.000098 U	--	0.000095 U	--	--	--	--	--	--	--
PAHs	8270	2-Methylnaphthalene	mg/L	--	--	--	0.000098 U	0.000098 U	--	0.000095 U	--	--	--	--	--	--	--
PAHs	8270	Acenaphthene	mg/L	0.102	--	--	0.000098 U	0.000098 U	--	0.000095 U	--	--	--	--	--	--	--
PAHs	8270	Acenaphthylene	mg/L	--	--	--	0.000098 U	0.000098 U	--	0.000095 U	--	--	--	--	--	--	--
PAHs	8270	Anthracene	mg/L	0.041	--	--	0.000098 U	0.000098 U	--	0.000095 U	--	--	--	--	--	--	--
PAHs	8270	**Benzo(g,h,i)perylene**	mg/L	--	--	--	0.0000098 U	0.0000098 U	--	**0.000013**	--	--	--	--	--	--	--
PAHs	8270	Fluoranthene	mg/L	0.051	--	--	0.000098 U	0.000098 U	--	0.000095 U	--	--	--	--	--	--	--
PAHs	8270	Fluorene	mg/L	0.070	--	--	0.000098 U	0.000098 U	--	0.000095 U	--	--	--	--	--	--	--
PAHs	8270	Naphthalene	mg/L	0.36	--	--	0.000098 U	0.000098 U	--	0.000095 U	--	--	--	--	--	--	--
PAHs	8270	Phenanthrene	mg/L	--	--	--	0.000098 U	0.000098 U	--	0.000095 U	--	--	--	--	--	--	--
PAHs	8270	Pyrene	mg/L	0.049	--	--	0.000098 U	0.000098 U	--	0.000095 U	--	--	--	--	--	--	--
cPAHs	8270-SIM	**Benzo(a)anthracene**	mg/L	0.00002	--	--	**0.000010**	0.0000098 U	--	**0.000015**	--	--	--	--	--	--	--
cPAHs	8270-SIM	Benzo(a)pyrene	mg/L	0.00002	--	--	0.0000098 U	0.0000098 U	--	0.0000095 U	--	--	--	--	--	--	--
cPAHs	8270-SIM	**Benzo(b)fluoranthene**	mg/L	0.00002	--	--	0.0000098 U	0.0000098 U	--	**0.000010**	--	--	--	--	--	--	--
cPAHs	8270-SIM	Benzo(j,k)fluoranthene	mg/L	0.00002	--	--	0.0000098 U	0.0000098 U	--	0.0000095 U	--	--	--	--	--	--	--
cPAHs	8270-SIM	**Chrysene**	mg/L	0.00002	--	--	0.0000098 U	0.0000098 U	--	**0.000019**	--	--	--	--	--	--	--
cPAHs	8270-SIM	Dibenzo(a,h)anthracene	mg/L	0.00002	--	--	0.0000098 U	0.0000098 U	--	0.0000095 U	--	--	--	--	--	--	--
cPAHs	8270-SIM	Indeno(1,2,3-cd)pyrene	mg/L	0.00002	--	--	0.0000098 U	0.0000098 U	--	0.0000095 U	--	--	--	--	--	--	--
cPAHs	8270-SIM	**Total cPAHs TEC (ND=0.5MRL)**	mg/L	0.00002	--	--	**0.0000079**	0.0000074 U	--	**0.0000089**	--	--	--	--	--	--	--
SVOCs	8270	1,2,4-Trichlorobenzene	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	1,2-Diphenylhydrazine	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	1,3-Dichlorobenzene (m-Dichlorobenzene)	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	1,3-Dinitrobenzene	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2,3,4,6-Tetrachlorophenol	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2,3,5,6-Tetrachlorophenol	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2,3-DICHLOROANILINE	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2,4,5-Trichlorophenol	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2,4,6-Trichlorophenol	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2,4-Dichlorophenol	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2,4-Dimethylphenol	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2,4-Dinitrophenol	mg/L	--	--	--	0.0049 U	0.0049 U	--	0.0047 U	--	--	--	--	--	--	--
SVOCs	8270	2,4-Dinitrotoluene	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2,6-Dinitrotoluene	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2-Chloronaphthalene	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2-Chlorophenol	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2-Nitroaniline	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	2-Nitrophenol	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	3,3'-Dichlorobenzidine	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	3-Nitroaniline	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	4,6-Dinitro-2-Methylphenol	mg/L	--	--	--	0.0049 U	0.0049 U	--	0.0047 U	--	--	--	--	--	--	--
SVOCs	8270	4-Bromophenyl phenyl ether	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	4-Chloro-3-Methylphenol	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	4-Chloroaniline	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	4-Chlorophenyl-Phenylether	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	4-Nitroaniline	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	4-Nitrophenol (p-Nitrophenol)	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--

TABLE C-2

GROUNDWATER ANALYTICAL DATA SUMMARY[1]

May-June 2014

Puget Sound Energy LNG Project

Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	Other Potentially Applicable Screening Levels (a)	B-1-11.0-WATER 6-11 ft	B-2-11.0-WATER 8-13 ft	B-3-11.0-WATER 6-11 ft	B-4-11.0-WATER 7-11 ft	B-7-11.0-WATER 8-13 ft	B-10-11.0-WATER 10-13 ft	B-10-25.0-WATER 21-25 ft	B-10-50.0-WATER 49-53 ft	B-12-11.0-WATER 10-15 ft	B-12-25.0-WATER[2] 26-28 ft	B-13-15.0-WATER 10-15 ft (b)	B-13-25.0-WATER 20-25 ft (b)
SVOCs	8270	Aniline	mg/L	--	--	--	0.0049 U	0.0049 U	--	0.0047 U	--	--	--	--	--	--	--
SVOCs	8270	Benzene, 1,4-Dinitro-	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Benzidine	mg/L	--	--	--	0.0049 U	0.0049 U	--	0.0047 U	--	--	--	--	--	--	--
SVOCs	8270	Benzyl Alcohol	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Bis(2-chloroethoxy)methane	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Bis(2-chloroethyl)ether	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Bis(2-chloroisopropyl)ether	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	**Bis(2-ethylhexyl)phthalate (BEHP)**	mg/L	0.0012	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Butyl benzyl phthalate	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Carbazole	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Di-N-Octyl Phthalate	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Dibenzofuran	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Dibutyl phthalate	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Diethyl phthalate	mg/L	0.903	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Dimethyl phthalate	mg/L	72.016	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Hexachlorobenzene	mg/L	0.0002	--	--	0.00020 U	0.00020 U	--	0.00019 U	--	--	--	--	--	--	--
SVOCs	8270	Hexachlorobutadiene	mg/L	0.0002	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Hexachlorocyclopentadiene	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Hexachloroethane	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Hexanedioic Acid, Bis(2-Ethylhexyl) Ester	mg/L	--	--	--	0.0049 U	0.0049 U	--	0.0047 U	--	--	--	--	--	--	--
SVOCs	8270	Isophorone	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	m,p-Cresol	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	N-Nitrosodi-n-propylamine	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	N-Nitrosodimethylamine	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	N-Nitrosodiphenylamine (as diphenylamine)	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Nitrobenzene	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	o-Cresol (2-methylphenol)	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	O-DINITROBENZENE	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Pentachlorophenol	mg/L	0.0030	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	**Phenol**	mg/L	5.401	--	--	**0.0034**	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
SVOCs	8270	Pyridine	mg/L	--	--	--	0.00098 U	0.00098 U	--	0.00095 U	--	--	--	--	--	--	--
VOCs	8260	1,1,1,2-Tetrachloroethane	mg/L	--	0.074	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,1,1-Trichloroethane	mg/L	--	25	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,1,2,2-Tetrachloroethane	mg/L	0.0040	0.062	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,1,2-Trichloroethane	mg/L	--	0.079	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,1-Dichloroethane	mg/L	--	5.0	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,1-Dichloroethene	mg/L	0.0032	0.28	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,1-Dichloropropene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,2,3-Trichlorobenzene	mg/L	--	--	0.00031 U	0.00031 U	0.00031 U	0.00031 U	0.00030 U	0.00031 U	0.00031 U	0.00031 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,2,3-Trichloropropane	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00025 U	0.0050 U
VOCs	8260	1,2,4-Trichlorobenzene	mg/L	--	8.4	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,2,4-Trimethylbenzene	mg/L	0.061	0.052	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,2-Dibromo-3-Chloropropane	mg/L	--	--	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.02 U
VOCs	8260	1,2-dibromoethane	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/L	--	4.0	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,2-Dichloroethane	mg/L	0.037	0.042	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,2-Dichloropropane	mg/L	--	0.062	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,3,5-Trimethylbenzene	mg/L	--	0.054	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,3-Dichlorobenzene (m-Dichlorobenzene)	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,3-Dichloropropane	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/L	--	17	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	2,2-Dichloropropane	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	2-Butanone (MEK)	mg/L	--	760	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.1 U
VOCs	8260	2-Chloroethyl vinyl ether	mg/L	--	--	0.0016 U	0.0032 U	0.0032 U	0.0032 U	0.0043 U	0.0013 U	0.0013 U	0.0013 U	0.0010 U	0.0010 U	0.0010 U	0.02 U
VOCs	8260	2-Chlorotoluene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	**2-Hexanone**	mg/L	--	--	0.0026 U	0.0026 U	0.0026 U	0.0026 U	0.0020 U	0.0026 U	0.0026 U	0.0026 U	0.0020 U	0.0020 U	0.0020 U	0.04 U
VOCs	8260	4-Chlorotoluene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	4-Methyl-2-Pentanone (Methyl isobutyl ketone)	mg/L	--	24	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.04 U
VOCs	8260	**Acetone**	mg/L	--	--	0.0077 U	0.0077 U	0.0077 U	0.0077 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.1 U
VOCs	8260	**Benzene**	mg/L	0.024	0.024	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	**0.064**	0.00020 U	**0.51**
VOCs	8260	Bromobenzene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Bromochloromethane	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Bromodichloromethane	mg/L	--	0.0009	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Bromoform (Tribromomethane)	mg/L	--	2.0	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.02 U
VOCs	8260	Bromomethane	mg/L	--	0.028	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	**Carbon Disulfide**	mg/L	--	0.87	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	**0.00028**	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Carbon Tetrachloride	mg/L	--	0.0022	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Chlorobenzene	mg/L	--	0.22	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Chloroethane	mg/L	--	--	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.02 U
VOCs	8260	Chloroform	mg/L	0.012	0.012	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Chloromethane	mg/L	--	0.052	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.02 U
VOCs	8260	cis-1,2-Dichloroethene	mg/L	--	0.35	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U

TABLE C-2

GROUNDWATER ANALYTICAL DATA SUMMARY[1]

May-June 2014

Puget Sound Energy LNG Project

Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	Other Potentially Applicable Screening Levels (a)	B-1-11.0-WATER 6-11 ft	B-2-11.0-WATER 8-13 ft	B-3-11.0-WATER 6-11 ft	B-4-11.0-WATER 7-11 ft	B-7-11.0-WATER 8-13 ft	B-10-11.0-WATER 10-13 ft	B-10-25.0-WATER 21-25 ft	B-10-50.0-WATER 49-53 ft	B-12-11.0-WATER 10-15 ft	B-12-25.0-WATER[2] 26-28 ft	B-13-15.0-WATER 10-15 ft (b)	B-13-25.0-WATER 20-25 ft (b)
VOCs	8260	Cis-1,3-Dichloropropene	mg/L	--	0.016	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Dibromochloromethane	mg/L	--	0.0022	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Dibromomethane	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Dichlorodifluoromethane (CFC-12)	mg/L	--	0.022	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Ethylbenzene	mg/L	0.049	6.1	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Hexachlorobutadiene	mg/L	0.0002	0.0081	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	**Isopropylbenzene (Cumene)**	mg/L	1.6	1.6	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Methyl Iodide (Iodomethane)	mg/L	--	--	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.02 U
VOCs	8260	Methyl t-butyl ether	mg/L	--	6.1	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Methylene Chloride	mg/L	0.59	0.94	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.02 U
VOCs	8260	n-Butylbenzene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	**n-Propylbenzene**	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Naphthalene	mg/L	0.36	0.36	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0010 U	0.0010 U	0.0010 U	0.02 U
VOCs	8260	p-Isopropyltoluene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Sec-Butylbenzene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Styrene	mg/L	--	0.78	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Tert-Butylbenzene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Tetrachloroethene	mg/L	0.0033	0.010	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	**Toluene**	mg/L	15	33	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	**0.0014**	0.0010 U	0.02 U
VOCs	8260	Trans-1,2-Dichloroethene	mg/L	0.25	0.29	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Trans-1,3-Dichloropropene	mg/L	--	0.016	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Trichloroethene	mg/L	0.0084	0.0042	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Trichlorofluoromethane (CFC-11)	mg/L	--	0.26	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Vinyl Acetate	mg/L	--	17	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.02 U
VOCs	8260	Vinyl Chloride	mg/L	0.0024	0.0035	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
VOCs	8260	Xylene, m-,p-	mg/L	15	0.67	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.0080 U
VOCs	8260	Xylene, o-	mg/L	0.166	0.96	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0040 U
pH	FP/4500 HB	pH (lab measurement except as noted)	SU	6-8.5	--	7.20	8.20	7.90	7.90	7.50	8.00	7.68 (d)	8.43 (d)	7.54 (d)	--	8.10	8.30
Salinity	2520B	Salinity (lab measurement)	g/Kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Salinity	(d)	Salinity (field measurement)	g/Kg	--	--	0.3	0.1	0.3	0.5	0.1	0.8	--	1.9	1.5	--	0.7	0.1
Conductivity	(d)	Electrical conductivity	mS/cm	--	--	0.606	0.291	0.580	0.977	0.298	1.57	0.300	3.65	2.96	--	1.09	0.174
Turbidity	(d)	Turbidity (unfiltered sample)	NTU	--	--	387	0 (e)	536	96	287	462	296	690	288	--	>1,000	>1,000

TABLE C-2

GROUNDWATER ANALYTICAL DATA SUMMARY[1]
May-June 2014
Puget Sound Energy LNG Project
Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	Other Potentially Applicable Screening Levels (a)	B-14-11.0-WATER 10-15 ft	B-14-25.0-WATER 25-27 ft	B-15-11.0-WATER 10-20 ft	B-16-11.0-WATER 15-20 ft	B-16-25.0-WATER 20-25 ft	B-16-50.0-WATER[2] 48-52 ft (b)	B-17-11.0-WATER 10-15 ft (b)	B-17-25.0-WATER 24.5-28.5 ft	B-19-11.0-WATER 5.5-10.5 ft	B-19-25.0-WATER 23-25 ft (b)	B-19-50.0-WATER 47-49 ft	B-21-11.0-WATER 7-12 ft
BTEX	8021	Benzene	mg/L	0.024	0.024	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	8021	Ethylbenzene	mg/L	0.049	6.1	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	8021	Toluene	mg/L	15	33	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	8021	Xylene, m-,p-	mg/L	15	0.67	--	--	--	--	--	--	--	--	--	--	--	--
BTEX	8021	Xylene, o-	mg/L	0.166	0.96	--	--	--	--	--	--	--	--	--	--	--	--
Fuels	NWTPH-Gx	**Total petroleum hydrocarbons as gasoline**	mg/L	0.80	--	0.1 U	0.1 U	0.1 U	0.1 U	--	--	0.1 U	0.1 U	0.1 U	0.1 U	--	0.1 U
Fuels	NWTPH-Dx	**Total petroleum hydrocarbons as diesel**	mg/L	0.50	--	0.26 U	**0.78**	0.26 U	0.27 U	--	--	0.26 U	0.29 U	0.26 U	0.28 U	--	0.26 U
Fuels	NWTPH-Dx	**Total petroleum hydrocarbons as lube oil**	mg/L	0.50	--	0.41 U	**1.3**	0.41 U	0.42 U	--	--	0.42 U	0.47 U	0.41 U	0.45 U	--	0.41 U
Dissolved Metals	200.8	**Arsenic**	mg/L	0.0050	0.010 (c)	**0.0063**	0.0030 U	**0.011***	0.0030 U	**0.022****	**0.27****	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U
Dissolved Metals	200.8	**Cadmium**	mg/L	0.0090	--	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	**0.0042****	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
Dissolved Metals	200.8	**Chromium**	mg/L	0.050	--	0.01 U	0.01 U	0.01 U	0.01 U	**0.11****	**12****	0.01 U	**0.037***	0.01 U	0.01 U	0.01 U	0.01 U
Dissolved Metals	200.8	**Copper**	mg/L	0.0031	--	0.01 U	**0.012**	0.01 U	0.01 U	**0.15****	**2.6****	0.01 U	**0.019***	0.01 U	0.01 U	0.01 U	0.01 U
Dissolved Metals	200.8	**Lead**	mg/L	0.0081	--	0.0010 U	**0.002**	0.0010 U	0.0010 U	**0.018****	**0.27****	0.0010 U	**0.0015***	0.0010 U	0.0010 U	0.0010 U	0.0010 U
Dissolved Metals	7470	Mercury	mg/L	0.00020	0.0019	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	**0.0018****	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U
PCBs	8082	PCB-aroclor 1016	mg/L	--	--	--	--	--	--	--	--	0.000047 U	0.000047 U	--	--	--	--
PCBs	8082	PCB-aroclor 1221	mg/L	--	--	--	--	--	--	--	--	0.000047 U	0.000047 U	--	--	--	--
PCBs	8082	PCB-aroclor 1232	mg/L	--	--	--	--	--	--	--	--	0.000047 U	0.000047 U	--	--	--	--
PCBs	8082	PCB-aroclor 1242	mg/L	--	--	--	--	--	--	--	--	0.000047 U	0.000047 U	--	--	--	--
PCBs	8082	PCB-aroclor 1248	mg/L	--	--	--	--	--	--	--	--	0.000047 U	0.000047 U	--	--	--	--
PCBs	8082	PCB-aroclor 1254	mg/L	0.0000017	--	--	--	--	--	--	--	0.000047 U	0.000047 U	--	--	--	--
PCBs	8082	PCB-aroclor 1260	mg/L	0.000020	--	--	--	--	--	--	--	0.000047 U	0.000047 U	--	--	--	--
PAHs	8270	1-Methylnaphthalene	mg/L	--	--	0.00010 U	--	--	--	--	--	0.000094 U	0.000095 U	0.000095 U	--	--	--
PAHs	8270	2-Methylnaphthalene	mg/L	--	--	0.00010 U	--	--	--	--	--	0.000094 U	0.000095 U	0.000095 U	--	--	--
PAHs	8270	Acenaphthene	mg/L	0.102	--	0.00010 U	--	--	--	--	--	0.000094 U	0.000095 U	0.000095 U	--	--	--
PAHs	8270	Acenaphthylene	mg/L	--	--	0.00010 U	--	--	--	--	--	0.000094 U	0.000095 U	0.000095 U	--	--	--
PAHs	8270	Anthracene	mg/L	0.041	--	0.00010 U	--	--	--	--	--	0.000094 U	0.000095 U	0.000095 U	--	--	--
PAHs	8270	**Benzo(g,h,i)perylene**	mg/L	--	--	0.000010 U	--	--	--	--	--	0.0000094 U	0.0000095 U	0.0000095 U	--	--	--
PAHs	8270	Fluoranthene	mg/L	0.051	--	0.00010 U	--	--	--	--	--	0.000094 U	0.000095 U	0.000095 U	--	--	--
PAHs	8270	Fluorene	mg/L	0.070	--	0.00010 U	--	--	--	--	--	0.000094 U	0.000095 U	0.000095 U	--	--	--
PAHs	8270	Naphthalene	mg/L	0.36	--	0.00010 U	--	--	--	--	--	0.000094 U	0.000095 U	0.000095 U	--	--	--
PAHs	8270	Phenanthrene	mg/L	--	--	0.00010 U	--	--	--	--	--	0.000094 U	0.000095 U	0.000095 U	--	--	--
PAHs	8270	Pyrene	mg/L	0.049	--	0.00010 U	--	--	--	--	--	0.000094 U	0.000095 U	0.000095 U	--	--	--
cPAHs	8270-SIM	**Benzo(a)anthracene**	mg/L	0.00002	--	**0.000011**	--	--	--	--	--	0.0000094 U	**0.000012**	0.0000095 U	--	--	--
cPAHs	8270-SIM	Benzo(a)pyrene	mg/L	0.00002	--	0.000010 U	--	--	--	--	--	0.0000094 U	0.0000095 U	0.0000095 U	--	--	--
cPAHs	8270-SIM	**Benzo(b)fluoranthene**	mg/L	0.00002	--	0.000010 U	--	--	--	--	--	0.0000094 U	0.0000095 U	0.0000095 U	--	--	--
cPAHs	8270-SIM	Benzo(j,k)fluoranthene	mg/L	0.00002	--	0.000010 U	--	--	--	--	--	0.0000094 U	0.0000095 U	0.0000095 U	--	--	--
cPAHs	8270-SIM	**Chrysene**	mg/L	0.00002	--	0.000010 U	--	--	--	--	--	0.0000094 U	0.0000095 U	0.0000095 U	--	--	--
cPAHs	8270-SIM	Dibenzo(a,h)anthracene	mg/L	0.00002	--	0.000010 U	--	--	--	--	--	0.0000094 U	0.0000095 U	0.0000095 U	--	--	--
cPAHs	8270-SIM	Indeno(1,2,3-cd)pyrene	mg/L	0.00002	--	0.000010 U	--	--	--	--	--	0.0000094 U	0.0000095 U	0.0000095 U	--	--	--
cPAHs	8270-SIM	**Total cPAHs TEC (ND=0.5MRL)**	mg/L	0.00002	--	**0.0000082**	--	--	--	--	--	0.0000071 U	**0.0000079**	0.0000072 U	--	--	--
SVOCs	8270	1,2,4-Trichlorobenzene	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	1,2-Diphenylhydrazine	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	1,3-Dichlorobenzene (m-Dichlorobenzene)	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	1,3-Dinitrobenzene	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2,3,4,6-Tetrachlorophenol	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2,3,5,6-Tetrachlorophenol	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2,3-DICHLOROANILINE	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2,4,5-Trichlorophenol	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2,4,6-Trichlorophenol	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2,4-Dichlorophenol	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2,4-Dimethylphenol	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2,4-Dinitrophenol	mg/L	--	--	0.0051 U	--	--	--	--	--	0.0047 U	0.0047 U	0.0047 U	--	--	--
SVOCs	8270	2,4-Dinitrotoluene	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2,6-Dinitrotoluene	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2-Chloronaphthalene	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2-Chlorophenol	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2-Nitroaniline	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	2-Nitrophenol	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	3,3'-Dichlorobenzidine	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	3-Nitroaniline	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	4,6-Dinitro-2-Methylphenol	mg/L	--	--	0.0051 U	--	--	--	--	--	0.0047 U	0.0047 U	0.0047 U	--	--	--
SVOCs	8270	4-Bromophenyl phenyl ether	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	4-Chloro-3-Methylphenol	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	4-Chloroaniline	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	4-Chlorophenyl-Phenylether	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	4-Nitroaniline	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	4-Nitrophenol (p-Nitrophenol)	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--

TABLE C-2

GROUNDWATER ANALYTICAL DATA SUMMARY[1]

May-June 2014

Puget Sound Energy LNG Project

Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	Other Potentially Applicable Screening Levels (a)	B-14-11.0-WATER 10-15 ft	B-14-25.0-WATER 25-27 ft	B-15-11.0-WATER 10-20 ft	B-16-11.0-WATER 15-20 ft	B-16-25.0-WATER 20-25 ft	B-16-50.0-WATER[2] 48-52 ft (b)	B-17-11.0-WATER 10-15 ft (b)	B-17-25.0-WATER 24.5-28.5 ft	B-19-11.0-WATER 5.5-10.5 ft	B-19-25.0-WATER 23-25 ft (b)	B-19-50.0-WATER 47-49 ft	B-21-11.0-WATER 7-12 ft
SVOCs	8270	Aniline	mg/L	--	--	0.0051 U	--	--	--	--	--	0.0047 U	0.0047 U	0.0047 U	--	--	--
SVOCs	8270	Benzene, 1,4-Dinitro-	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Benzidine	mg/L	--	--	0.0051 U	--	--	--	--	--	0.0047 U	0.0047 U	0.0047 U	--	--	--
SVOCs	8270	Benzyl Alcohol	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Bis(2-chloroethoxy)methane	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Bis(2-chloroethyl)ether	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Bis(2-chloroisopropyl)ether	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	**Bis(2-ethylhexyl)phthalate (BEHP)**	mg/L	0.0012	--	0.0010 U	--	--	--	--	--	0.00094 U	**0.0024*** **	0.00095 U	--	--	--
SVOCs	8270	Butyl benzyl phthalate	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Carbazole	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Di-N-Octyl Phthalate	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Dibenzofuran	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Dibutyl phthalate	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Diethyl phthalate	mg/L	0.903	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Dimethyl phthalate	mg/L	72.016	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Hexachlorobenzene	mg/L	0.0002	--	0.00020 U	--	--	--	--	--	0.00019 U	0.00019 U	0.00019 U	--	--	--
SVOCs	8270	Hexachlorobutadiene	mg/L	0.0002	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Hexachlorocyclopentadiene	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Hexachloroethane	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Hexanedioic Acid, Bis(2-Ethylhexyl) Ester	mg/L	--	--	0.0051 U	--	--	--	--	--	0.0047 U	0.0047 U	0.0047 U	--	--	--
SVOCs	8270	Isophorone	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	m,p-Cresol	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	N-Nitrosodi-n-propylamine	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	N-Nitrosodimethylamine	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	N-Nitrosodiphenylamine (as diphenylamine)	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Nitrobenzene	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	o-Cresol (2-methylphenol)	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	O-DINITROBENZENE	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Pentachlorophenol	mg/L	0.0030	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	**Phenol**	mg/L	5.401	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
SVOCs	8270	Pyridine	mg/L	--	--	0.0010 U	--	--	--	--	--	0.00094 U	0.00095 U	0.00095 U	--	--	--
VOCs	8260	1,1,1,2-Tetrachloroethane	mg/L	--	0.074	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,1,1-Trichloroethane	mg/L	--	25	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,1,2,2-Tetrachloroethane	mg/L	0.0040	0.062	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,1,2-Trichloroethane	mg/L	--	0.079	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,1-Dichloroethane	mg/L	--	5.0	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,1-Dichloroethene	mg/L	0.0032	0.28	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,1-Dichloropropene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,2,3-Trichlorobenzene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,2,3-Trichloropropane	mg/L	--	--	0.00025 U	0.00025 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00025 U	0.00025 U	0.00020 U	0.00020 U	0.00020 U	0.00025 U
VOCs	8260	1,2,4-Trichlorobenzene	mg/L	--	8.4	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,2,4-Trimethylbenzene	mg/L	0.061	0.052	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,2-Dibromo-3-Chloropropane	mg/L	--	--	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U
VOCs	8260	1,2-dibromoethane	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/L	--	4.0	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,2-Dichloroethane	mg/L	0.037	0.042	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.0010 U	0.0010 U	0.0010 U	0.00020 U
VOCs	8260	1,2-Dichloropropane	mg/L	--	0.062	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,3,5-Trimethylbenzene	mg/L	--	0.054	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,3-Dichlorobenzene (m-Dichlorobenzene)	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,3-Dichloropropane	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/L	--	17	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	2,2-Dichloropropane	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	2-Butanone (MEK)	mg/L	--	760	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U
VOCs	8260	2-Chloroethyl vinyl ether	mg/L	--	--	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U
VOCs	8260	2-Chlorotoluene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	**2-Hexanone**	mg/L	--	--	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	**0.0026**	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
VOCs	8260	4-Chlorotoluene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	4-Methyl-2-Pentanone (Methyl isobutyl ketone)	mg/L	--	24	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
VOCs	8260	**Acetone**	mg/L	--	--	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	**0.0050**	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U
VOCs	8260	**Benzene**	mg/L	0.024	0.024	0.00020 U	**0.015**	0.00020 U	0.00020 U	**0.0064**	**0.00080**	0.00020 U	0.00020 U	**0.0077**	0.00020 U	0.00020 U	**0.010**
VOCs	8260	Bromobenzene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Bromochloromethane	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Bromodichloromethane	mg/L	--	0.0009	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Bromoform (Tribromomethane)	mg/L	--	2.0	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U
VOCs	8260	Bromomethane	mg/L	--	0.028	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	**Carbon Disulfide**	mg/L	--	0.87	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	**0.0012**	0.00020 U	0.00020 U	0.00020 U	0.00020 U	**0.00026**	0.00020 U
VOCs	8260	Carbon Tetrachloride	mg/L	--	0.0022	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Chlorobenzene	mg/L	--	0.22	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Chloroethane	mg/L	--	--	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U
VOCs	8260	Chloroform	mg/L	0.012	0.012	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Chloromethane	mg/L	--	0.052	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U
VOCs	8260	cis-1,2-Dichloroethene	mg/L	--	0.35	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U

TABLE C-2

GROUNDWATER ANALYTICAL DATA SUMMARY[1]

May-June 2014
Puget Sound Energy LNG Project
Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	Other Potentially Applicable Screening Levels (a)	B-14-11.0-WATER 10-15 ft	B-14-25.0-WATER 25-27 ft	B-15-11.0-WATER 10-20 ft	B-16-11.0-WATER 15-20 ft	B-16-25.0-WATER 20-25 ft	B-16-50.0-WATER[2] 48-52 ft (b)	B-17-11.0-WATER 10-15 ft (b)	B-17-25.0-WATER 24.5-28.5 ft	B-19-11.0-WATER 5.5-10.5 ft	B-19-25.0-WATER 23-25 ft (b)	B-19-50.0-WATER 47-49 ft	B-21-11.0-WATER 7-12 ft
VOCs	8260	Cis-1,3-Dichloropropene	mg/L	--	0.016	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Dibromochloromethane	mg/L	--	0.0022	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Dibromomethane	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Dichlorodifluoromethane (CFC-12)	mg/L	--	0.022	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Ethylbenzene	mg/L	0.049	6.1	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Hexachlorobutadiene	mg/L	0.0002	0.0081	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	**Isopropylbenzene (Cumene)**	mg/L	1.6	1.6	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	**0.00029**
VOCs	8260	Methyl Iodide (Iodomethane)	mg/L	--	--	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U
VOCs	8260	Methyl t-butyl ether	mg/L	--	6.1	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Methylene Chloride	mg/L	0.59	0.94	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U
VOCs	8260	n-Butylbenzene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	**n-Propylbenzene**	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Naphthalene	mg/L	0.36	0.36	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U
VOCs	8260	p-Isopropyltoluene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Sec-Butylbenzene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Styrene	mg/L	--	0.78	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Tert-Butylbenzene	mg/L	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Tetrachloroethene	mg/L	0.0033	0.010	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	**Toluene**	mg/L	15	33	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	**0.0025**	0.0010 U
VOCs	8260	Trans-1,2-Dichloroethene	mg/L	0.25	0.29	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Trans-1,3-Dichloropropene	mg/L	--	0.016	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Trichloroethene	mg/L	0.0084	0.0042	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Trichlorofluoromethane (CFC-11)	mg/L	--	0.26	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Vinyl Acetate	mg/L	--	17	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U
VOCs	8260	Vinyl Chloride	mg/L	0.0024	0.0035	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
VOCs	8260	Xylene, m-,p-	mg/L	15	0.67	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U	0.00040 U
VOCs	8260	Xylene, o-	mg/L	0.166	0.96	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
pH	FP/4500 HB	pH (lab measurement except as noted)	SU	6-8.5	--	8.30	8.40	8.50	7.90	8.60	8.70	7.00	8.50	7.30	8.90	8.20	7.40
Salinity	2520B	Salinity (lab measurement)	g/Kg	--	--	--	--	--	--	--	--	0.09	0.86	0.52	0.77	9.66	--
Salinity	(d)	Salinity (field measurement)	g/Kg	--	--	0.5	0.4	0.6	0.3	0.4	--	0.1	0.9	0.6	0.8	11.3	0.2
Conductivity	(d)	Electrical conductivity	mS/cm	--	--	0.958	0.786	1.20	0.688	0.773	--	0.170	1.74	1.11	1.58	19.1	0.408
Turbidity	(d)	Turbidity (unfiltered sample)	NTU	--	--	278	276	386	1,000	>1,000	--	237	769	>1,000	>1,000	529	164

TABLE C-2

GROUNDWATER ANALYTICAL DATA SUMMARY[1]
May-June 2014
Puget Sound Energy LNG Project
Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	Other Potentially Applicable Screening Levels (a)	B-21-25.0-WATER 24-28 ft	B-21-50.0-WATER 46-50 ft (b)	B-22-11.0-WATER 6-11 ft	B-24-11.0-WATER 7-11 ft (b)	B-24-25.0-WATER 26-30 ft	B-25-11.0-WATER 8-12 ft	B-26-11.0-WATER 7-12 ft
BTEX	8021	Benzene	mg/L	0.024	0.024	--	--	--	--	--	0.0010 U	0.0010 U
BTEX	8021	Ethylbenzene	mg/L	0.049	6.1	--	--	--	--	--	0.0010 U	0.0010 U
BTEX	8021	Toluene	mg/L	15	33	--	--	--	--	--	0.0010 U	0.0010 U
BTEX	8021	Xylene, m-,p-	mg/L	15	0.67	--	--	--	--	--	0.0010 U	0.0010 U
BTEX	8021	Xylene, o-	mg/L	0.166	0.96	--	--	--	--	--	0.0010 U	0.0010 U
Fuels	NWTPH-Gx	**Total petroleum hydrocarbons as gasoline**	mg/L	0.80	--	0.4 U	--	0.1 U	**0.61**	0.1 U	0.1 U	0.1 U
Fuels	NWTPH-Dx	**Total petroleum hydrocarbons as diesel**	mg/L	0.50	--	0.26 U	--	0.26 U	**0.46 J**	0.26 U	0.27 U	0.26 U
Fuels	NWTPH-Dx	**Total petroleum hydrocarbons as lube oil**	mg/L	0.50	--	0.42 U	--	0.41 U	**0.60**	0.41 U	0.43 U	0.41 U
Dissolved Metals	200.8	**Arsenic**	mg/L	0.0050	0.010 (c)	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	--	--
Dissolved Metals	200.8	**Cadmium**	mg/L	0.0090	--	0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U	--	--
Dissolved Metals	200.8	**Chromium**	mg/L	0.050	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	--	--
Dissolved Metals	200.8	**Copper**	mg/L	0.0031	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	--	--
Dissolved Metals	200.8	**Lead**	mg/L	0.0081	--	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	--	--
Dissolved Metals	7470	Mercury	mg/L	0.00020	0.0019	0.00050 U	0.00050 U	0.00050 U	0.00050 U	0.00050 U	--	--
PCBs	8082	PCB-aroclor 1016	mg/L	--	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1221	mg/L	--	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1232	mg/L	--	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1242	mg/L	--	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1248	mg/L	--	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1254	mg/L	0.0000017	--	--	--	--	--	--	--	--
PCBs	8082	PCB-aroclor 1260	mg/L	0.000020	--	--	--	--	--	--	--	--
PAHs	8270	1-Methylnaphthalene	mg/L	--	--	--	--	--	--	--	--	--
PAHs	8270	2-Methylnaphthalene	mg/L	--	--	--	--	--	--	--	--	--
PAHs	8270	Acenaphthene	mg/L	0.102	--	--	--	--	--	--	--	--
PAHs	8270	Acenaphthylene	mg/L	--	--	--	--	--	--	--	--	--
PAHs	8270	Anthracene	mg/L	0.041	--	--	--	--	--	--	--	--
PAHs	8270	**Benzo(g,h,i)perylene**	mg/L	--	--	--	--	--	--	--	--	--
PAHs	8270	Fluoranthene	mg/L	0.051	--	--	--	--	--	--	--	--
PAHs	8270	Fluorene	mg/L	0.070	--	--	--	--	--	--	--	--
PAHs	8270	Naphthalene	mg/L	0.36	--	--	--	--	--	--	--	--
PAHs	8270	Phenanthrene	mg/L	--	--	--	--	--	--	--	--	--
PAHs	8270	Pyrene	mg/L	0.049	--	--	--	--	--	--	--	--
cPAHs	8270-SIM	**Benzo(a)anthracene**	mg/L	0.00002	--	--	--	--	--	--	--	--
cPAHs	8270-SIM	Benzo(a)pyrene	mg/L	0.00002	--	--	--	--	--	--	--	--
cPAHs	8270-SIM	**Benzo(b)fluoranthene**	mg/L	0.00002	--	--	--	--	--	--	--	--
cPAHs	8270-SIM	Benzo(j,k)fluoranthene	mg/L	0.00002	--	--	--	--	--	--	--	--
cPAHs	8270-SIM	**Chrysene**	mg/L	0.00002	--	--	--	--	--	--	--	--
cPAHs	8270-SIM	Dibenzo(a,h)anthracene	mg/L	0.00002	--	--	--	--	--	--	--	--
cPAHs	8270-SIM	Indeno(1,2,3-cd)pyrene	mg/L	0.00002	--	--	--	--	--	--	--	--
cPAHs	8270-SIM	**Total cPAHs TEC (ND=0.5MRL)**	mg/L	0.00002	--	--	--	--	--	--	--	--
SVOCs	8270	1,2,4-Trichlorobenzene	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	1,2-Diphenylhydrazine	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	1,3-Dichlorobenzene (m-Dichlorobenzene)	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	1,3-Dinitrobenzene	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2,3,4,6-Tetrachlorophenol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2,3,5,6-Tetrachlorophenol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2,3-DICHLOROANILINE	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2,4,5-Trichlorophenol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2,4,6-Trichlorophenol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2,4-Dichlorophenol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2,4-Dimethylphenol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2,4-Dinitrophenol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2,4-Dinitrotoluene	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2,6-Dinitrotoluene	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2-Chloronaphthalene	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2-Chlorophenol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2-Nitroaniline	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	2-Nitrophenol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	3,3'-Dichlorobenzidine	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	3-Nitroaniline	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	4,6-Dinitro-2-Methylphenol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	4-Bromophenyl phenyl ether	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	4-Chloro-3-Methylphenol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	4-Chloroaniline	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	4-Chlorophenyl-Phenylether	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	4-Nitroaniline	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	4-Nitrophenol (p-Nitrophenol)	mg/L	--	--	--	--	--	--	--	--	--

TABLE C-2

GROUNDWATER ANALYTICAL DATA SUMMARY[1]
May-June 2014
Puget Sound Energy LNG Project
Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	Other Potentially Applicable Screening Levels (a)	B-21-25.0-WATER 24-28 ft	B-21-50.0-WATER 46-50 ft (b)	B-22-11.0-WATER 6-11 ft	B-24-11.0-WATER 7-11 ft (b)	B-24-25.0-WATER 26-30 ft	B-25-11.0-WATER 8-12 ft	B-26-11.0-WATER 7-12 ft
SVOCs	8270	Aniline	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Benzene, 1,4-Dinitro-	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Benzidine	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Benzyl Alcohol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Bis(2-chloroethoxy)methane	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Bis(2-chloroethyl)ether	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Bis(2-chloroisopropyl)ether	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	**Bis(2-ethylhexyl)phthalate (BEHP)**	mg/L	0.0012	--	--	--	--	--	--	--	--
SVOCs	8270	Butyl benzyl phthalate	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Carbazole	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Di-N-Octyl Phthalate	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Dibenzofuran	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Dibutyl phthalate	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Diethyl phthalate	mg/L	0.903	--	--	--	--	--	--	--	--
SVOCs	8270	Dimethyl phthalate	mg/L	72.016	--	--	--	--	--	--	--	--
SVOCs	8270	Hexachlorobenzene	mg/L	0.0002	--	--	--	--	--	--	--	--
SVOCs	8270	Hexachlorobutadiene	mg/L	0.0002	--	--	--	--	--	--	--	--
SVOCs	8270	Hexachlorocyclopentadiene	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Hexachloroethane	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Hexanedioic Acid, Bis(2-Ethylhexyl) Ester	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Isophorone	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	m,p-Cresol	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	N-Nitrosodi-n-propylamine	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	N-Nitrosodimethylamine	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	N-Nitrosodiphenylamine (as diphenylamine)	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Nitrobenzene	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	o-Cresol (2-methylphenol)	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	O-DINITROBENZENE	mg/L	--	--	--	--	--	--	--	--	--
SVOCs	8270	Pentachlorophenol	mg/L	0.0030	--	--	--	--	--	--	--	--
SVOCs	8270	**Phenol**	mg/L	5.401	--	--	--	--	--	--	--	--
SVOCs	8270	Pyridine	mg/L	--	--	--	--	--	--	--	--	--
VOCs	8260	1,1,1,2-Tetrachloroethane	mg/L	--	0.074	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,1,1-Trichloroethane	mg/L	--	25	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,1,2,2-Tetrachloroethane	mg/L	0.0040	0.062	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,1,2-Trichloroethane	mg/L	--	0.079	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,1-Dichloroethane	mg/L	--	5.0	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,1-Dichloroethene	mg/L	0.0032	0.28	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,1-Dichloropropene	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,2,3-Trichlorobenzene	mg/L	--	--	0.0020 U	0.00020 U	0.00031 U	0.0030 U	0.00060 U	--	--
VOCs	8260	1,2,3-Trichloropropane	mg/L	--	--	0.0025 U	0.00025 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,2,4-Trichlorobenzene	mg/L	--	8.4	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,2,4-Trimethylbenzene	mg/L	0.061	0.052	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,2-Dibromo-3-Chloropropane	mg/L	--	--	0.01 U	0.0010 U	0.0010 U	0.01 U	0.0020 U	--	--
VOCs	8260	1,2-dibromoethane	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/L	--	4.0	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,2-Dichloroethane	mg/L	0.037	0.042	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,2-Dichloropropane	mg/L	--	0.062	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,3,5-Trimethylbenzene	mg/L	--	0.054	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,3-Dichlorobenzene (m-Dichlorobenzene)	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,3-Dichloropropane	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/L	--	17	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	2,2-Dichloropropane	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	2-Butanone (MEK)	mg/L	--	760	0.05 U	0.0050 U	0.0066 U	0.05 U	0.01 U	--	--
VOCs	8260	2-Chloroethyl vinyl ether	mg/L	--	--	0.01 U	0.0010 U	0.0016 U	0.043 U	0.0086 U	--	--
VOCs	8260	2-Chlorotoluene	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	**2-Hexanone**	mg/L	--	--	0.02 U	0.0020 U	0.0026 U	0.02 U	0.0040 U	--	--
VOCs	8260	4-Chlorotoluene	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	4-Methyl-2-Pentanone (Methyl isobutyl ketone)	mg/L	--	24	0.02 U	0.0020 U	0.0025 U	0.02 U	0.0040 U	--	--
VOCs	8260	**Acetone**	mg/L	--	--	0.05 U	0.0050 U	0.0077 U	0.05 U	0.01 U	--	--
VOCs	8260	**Benzene**	mg/L	0.024	0.024	**0.39**	**0.0014**	0.00020 U	**0.27**	**0.078**	--	--
VOCs	8260	Bromobenzene	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Bromochloromethane	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Bromodichloromethane	mg/L	--	0.0009	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Bromoform (Tribromomethane)	mg/L	--	2.0	0.01 U	0.0010 U	0.0010 U	0.01 U	0.0020 U	--	--
VOCs	8260	Bromomethane	mg/L	--	0.028	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	**Carbon Disulfide**	mg/L	--	0.87	0.0020 U	**0.00045**	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Carbon Tetrachloride	mg/L	--	0.0022	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Chlorobenzene	mg/L	--	0.22	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Chloroethane	mg/L	--	--	0.01 U	0.0010 U	0.0010 U	0.01 U	0.0020 U	--	--
VOCs	8260	Chloroform	mg/L	0.012	0.012	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Chloromethane	mg/L	--	0.052	0.01 U	0.0010 U	0.0010 U	0.01 U	0.0020 U	--	--
VOCs	8260	cis-1,2-Dichloroethene	mg/L	--	0.35	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--

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May-June 2014
Puget Sound Energy LNG Project
Tacoma, WA

Group	Analytical Method	Analyte	Units	Port Screening Level	Other Potentially Applicable Screening Levels (a)	B-21-25.0-WATER 24-28 ft	B-21-50.0-WATER 46-50 ft (b)	B-22-11.0-WATER 6-11 ft	B-24-11.0-WATER 7-11 ft (b)	B-24-25.0-WATER 26-30 ft	B-25-11.0-WATER 8-12 ft	B-26-11.0-WATER 7-12 ft
VOCs	8260	Cis-1,3-Dichloropropene	mg/L	--	0.016	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Dibromochloromethane	mg/L	--	0.0022	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Dibromomethane	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Dichlorodifluoromethane (CFC-12)	mg/L	--	0.022	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Ethylbenzene	mg/L	0.049	6.1	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Hexachlorobutadiene	mg/L	0.0002	0.0081	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	**Isopropylbenzene (Cumene)**	mg/L	1.6	1.6	0.0020 U	0.00020 U	0.00020 U	**0.010**	0.00040 U	--	--
VOCs	8260	Methyl Iodide (Iodomethane)	mg/L	--	--	0.01 U	0.0010 U	0.0010 U	0.01 U	0.0020 U	--	--
VOCs	8260	Methyl t-butyl ether	mg/L	--	6.1	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Methylene Chloride	mg/L	0.59	0.94	0.01 U	0.0010 U	0.0010 U	0.01 U	0.0020 U	--	--
VOCs	8260	n-Butylbenzene	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	**n-Propylbenzene**	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	**0.011**	0.00040 U	--	--
VOCs	8260	Naphthalene	mg/L	0.36	0.36	0.01 U	0.0010 U	0.0016 U	0.016 U	0.0032 U	--	--
VOCs	8260	p-Isopropyltoluene	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Sec-Butylbenzene	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Styrene	mg/L	--	0.78	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Tert-Butylbenzene	mg/L	--	--	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Tetrachloroethene	mg/L	0.0033	0.010	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	**Toluene**	mg/L	15	33	0.01 U	0.0010 U	0.0010 U	0.01 U	**0.0025**	--	--
VOCs	8260	Trans-1,2-Dichloroethene	mg/L	0.25	0.29	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Trans-1,3-Dichloropropene	mg/L	--	0.016	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Trichloroethene	mg/L	0.0084	0.0042	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Trichlorofluoromethane (CFC-11)	mg/L	--	0.26	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Vinyl Acetate	mg/L	--	17	0.01 U	0.0010 U	0.0010 U	0.01 U	0.0020 U	--	--
VOCs	8260	Vinyl Chloride	mg/L	0.0024	0.0035	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
VOCs	8260	Xylene, m-,p-	mg/L	15	0.67	0.0040 U	0.00040 U	0.00040 U	0.0040 U	0.00080 U	--	--
VOCs	8260	Xylene, o-	mg/L	0.166	0.96	0.0020 U	0.00020 U	0.00020 U	0.0020 U	0.00040 U	--	--
pH	FP/4500 HB	pH (lab measurement except as noted)	SU	6-8.5	--	8.20	8.00	7.60	7.00	8.60	6.90	6.70
Salinity	2520B	Salinity (lab measurement)	g/Kg	--	--	--	--	--	--	--	0.15	0.14
Salinity	(d)	Salinity (field measurement)	g/Kg	--	--	1.0	6.9	0.2	0.3	0.6	0.2	0.1
Conductivity	(d)	Electrical conductivity	mS/cm	--	--	2.04	11.8	0.326	0.586	1.17	0.317	0.278
Turbidity	(d)	Turbidity (unfiltered sample)	NTU	--	--	>1,000	>1,000	530	172	152	789	305

[1] The groundwater grab samples analyzed for this investigation were obtained using direct-push and sonic drilling methods; consequently, the tabulated data are considered screening-level data rather than definitive data.
[2] Temporary well casing was not purged prior to collecting sample due to low groundwater yield; sample may not be representative of the targeted depth interval.
ft = Feet below ground surface
mg/L = Milligrams per liter (parts per million)
g/Kg = Grams per kilogram (parts per thousand)
mS/cm = Millisiemens per centimeter
SU = pH standard units
NTU = Nephelometric turbidity units
VI = Vapor intrusion
ND = Non-detect result
MRL = Method reporting limit
TEC = Toxic equivalent concentration
U = Not detected above the listed method reporting limit
J = Estimated concentration
BOLD typeface = Analyte/concentration detected above method reporting limit
[shaded] = Analyte/sample/concentration exceeds screening level
-- = No value available or not analyzed
* Per discussion with the Port of Tacoma, result may be biased high due to analytical interference from elevated salinity in the sample (as indicated by conductivity values >1 mS/cm).
** Result may be biased high based on the observed presence of solids at bottom of field-filtered sample (filtering did not remove all suspended particulates).
*** Result may reflect laboratory contamination (BEHP is a common laboratory contaminant).
(a) Listed values are Ecology Method C vapor intrusion screening levels (Ecology, 2009) unless otherwise indicated.
(b) A single depth was recorded on the field sampling form; the listed depth range (temporary well casing screened interval) was estimated based on the depth range of other samples collected on the same date and/or in the same vicinity.
(c) Federal Drinking Water Maximum Contaminant Level (MCL) (proposed surface water protection standard; Ecology, 2014)
(d) Field measurement
(e) Measurement is suspect based on measured turbidities of other samples and the fact that the sample was visibly cloudy.

Data Validation Report

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Project: PSE Tacoma LNG – Environmental Site Assessment
GEI File No: 00186-914-02

Date: July 12, 2014

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2A data validation (USEPA Document 540-R-08-005; USEPA, 2009) of analytical data from the analyses of samples collected as part of the Environmental Site Assessment conducted in May and June 2014, and the associated laboratory and field quality control (QC) samples. The samples were collected at the Puget Sound Energy (PSE) Tacoma LNG Property of Interest located on the Blair-Hylebos Peninsula in Tacoma, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (National Functional Guidelines; USEPA, 2008) and USEPA Contract Laboratory Program National Functional Guidelines for Superfund Inorganic Methods Data Review (National Functional Guidelines; USEPA, 2010) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining whether:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

The data validation included review of the following quality control (QC) elements, as applicable:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method, Trip, and Rinsate Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Field Duplicates
- Reporting Limits

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory SDG	Samples Validated (Bold typeface indicates one or more analytical results associated with the sample were qualified)
1405-178	(Soil Samples) B-2-2.0, B-2-8.0, B-3-2.0, B-3-8.0, B-4-2.0, B-4-8.0, B-23-2.0, B-23-8.0, B-26-2.0, and B-26-8.0
	(Water Samples) B-2-11.0-WATER, B-3-11.0-WATER, B-4-11.0-WATER, and B-26-11.0-WATER
1405-184	(Soil Samples) B-1-2.0, B-1-8.0, B-5-2.0, B-5-8.0, B-6-2.0, B-6-8.0, B-8-6.0, B-8-11.0, B-11-8.0, B-11-12.0, B-20-2.0, **B-20-8.0**, B-22-2.0, and B-22-8.0
	(Water Samples) B-1-11.0-WATER, and B-22-11.0-WATER
1405-193	(Soil Samples) B-10-2.0, B-10-7.0, and B-10-13.0
	(Water Samples) B-10-11.0-WATER, B-10-25.0-WATER, and B-10-50.0-WATER
1405-209	(Soil Samples) B-7-2.0, B-7-8.0, B-18-2.0, B-18-8.0, B-24-2.0, and B-24-8.0
	(Water Samples) B-7-11.0-WATER, **B-24-11.0-WATER**, and B-24-25.0-WATER
1405-229	(Soil Samples) B-17-2.0, B-17-8.0, B-21-2.0, and B-21-8.0
	(Water Samples) B-17-11.0-WATER, B-17-25.0-WATER, B-21-11.0-WATER, B-21-25.0-WATER, B-21-50.0-WATER, and B-25-11.0-WATER
1405-249	(Soil Samples) B-9-7.0, B-9-13.0, B-19-2.0, and B-19-8.0,
	(Water Samples) B-19-11.0-WATER, B-19-25.0-WATER, and B-19-50.0-WATER
1405-253	(Soil Samples) B-13-7.0, B-13-13.0, B-14-7.0, and B-14-13.0,

1405-253	(Water Samples) B-13-15.0-WATER, B-13-25.0-WATER, B-14-11.0-WATER, B-14-25.0-WATER
1405-255	(Soil Samples) B-12-2.0, B-12-7.0, and B-12-13.0
	(Water Samples) B-12-11.0-WATER and B-12-25.0-WATER
1406-007	(Soil Samples) B-15-2.0, B-15-7.0, B-15-13.0, B-16-2.0, B-16-7.0, and B-16-13.0
	(Water Samples) B-15-11.0-WATER, B-16-11.0-WATER, B-16-25.0-WATER, and B-16-50.0-WATER

CHEMICAL ANALYSIS PERFORMED

Onsite Environmental, Inc. in Redmond, Washington (OnSite), performed laboratory analysis on the soil and water samples using the following methods:

- Gasoline-Range Hydrocarbons by Method NWTPH-Gx
- Diesel- and Lube Oil-Range Hydrocarbons by Method NWTPH-Dx (with sulfuric acid and silica gel clean-up)
- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by USEPA Method SW8021B
- Volatile Organic Compounds (VOCs) by USEPA Method SW8260B
- Semi-Volatile Organic Compounds (SVOCs) by USEPA Methods SW8270C/SW8270-SIM
- Polychlorinated Biphenyls (PCBs) by USEPA Method SW8082A
- Total and Dissolved Metals by USEPA Methods SW6010C/200.8 and SW7470A/7471B
- pH by SM 4500 HB

AmTest Inc. in Kirkland, Washington (AmTest), performed laboratory analysis on the water samples using the following methods:

- Salinity by SM 2520B

DATA VALIDATION SUMMARY

Data Package Completeness

Onsite was the primary laboratory that analyzed the soil and water samples. OnSite subcontracted the salinity analyses to AmTest. Both laboratories provided all required deliverables for this assessment. The laboratories followed adequate corrective action procedures and all identified anomalies were discussed in the case narratives.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COC forms were accurate and complete when submitted to and received from the laboratory.

Sample Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recovery (%R) values are calculated following analysis. All surrogate %R values for the field samples were within the laboratory control limits, with the exceptions listed below.

SDG 1405-178: (SVOCs) The %R value for 2,4,6-tribromophenol was less than the control limit in Sample B-3-8.0. Also, the %R value for phenol-d6 was greater than the control limit is Sample B-4-2.0. These samples were spiked with three acidic fraction surrogates, and in all cases at least two of these surrogates exhibited recoveries that were within the required control limits. No action was required for these surrogate outliers.

The %R value for terphenyl-d14 was greater than the control limit in Sample B-3-11.0-WATER. This sample was spiked with three base-neutral fraction surrogates, and in this case at least two of these surrogates exhibited recoveries that were within the required control limits. No action was required for this surrogate outlier.

SDG 1405-184: (SVOCs) The %R values for 2-fluorobiphenyl were greater than the control limits in Samples B-1-2.0 and B-20-8.0. These samples were spiked with three base-neutral fraction surrogates, and in all cases at least two of these surrogates exhibited recoveries that were within the required control limits. No action was required for these surrogate outliers.

SDG 1405-193: (VOCs) The %R value for dibromofluoromethane was greater than the control limit in Sample B-10-11.0-WATER. There were no positive results for any target analytes in this sample. No action was required for this surrogate outlier.

(SVOCs) The %R values for phenol-d6 were greater than the control limits in Samples B-10-2.0 and B-10-13.0. These samples were spiked with three acidic fraction surrogates, and in all cases at least two of these surrogates exhibited recoveries that were within the required control limits. No action was required for these surrogate outliers.

SDG 1405-209: (VOCs) The %R value for dibromofluoromethane was greater than the control limit in Sample B-24-11.0-WATER. There were no positive results for any target analytes in this sample. No action was required for this surrogate outlier.

SDG 1406-007: (SVOCs) The %R value for 2,4,6-tribromophenol was less than the control limits in Sample B-15-13.0. This sample was spiked with three acidic fraction surrogates, and in all cases at least two of these surrogates exhibited recoveries that were within the required control limits. No action was required for this surrogate outlier.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. Method blanks were analyzed with each batch of field samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks for all applicable methods were analyzed at the required frequency. None of the analytes of interest were detected above the reporting limits in any of the method blanks.

Matrix Spikes/Matrix Spike Duplicates

Because the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis. One aliquot of sample is analyzed in the normal manner, and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R value is calculated. In the event that a %R value for a particular analyte is outside the associated control limits in the MS sample, the laboratory is required to analyze a "post-spiked" sample in to further isolate any potential QC issues with the given analyte.

MS analyses should be performed once per analytical batch or every 20 field samples, whichever is more frequent. The control limits for MS samples are 75% to 125% for all of the analytes of interest for this study.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample is a blank sample that is spiked with a known amount of analyte concentration and analyzed. It is treated much like an MS sample, without the possibility of matrix interference. As there is no actual sample matrix (such as soil or groundwater) in the analysis, the analytical expectations for accuracy and precision are usually more rigorous, and qualification would apply to all samples in the batch.

Laboratory control sample analyses should be performed once per analytical batch or every 20 field samples, whichever is more frequent. The control limits for laboratory control samples are specified in the laboratory documents as are the relative percent difference (RPD) values. The frequency requirements were met for all analyses, and the %R/RPD values were within the control limits.

Field Duplicates

No field duplicates were collected during this sampling event.

Reporting Limits and Miscellaneous

The contract required quantitation limits (CRQL) were met by the laboratory for all target analytes, with the exceptions listed below.

SDG 1405-184: (NWTPH-Dx) The contract-required reporting limits were not met for Diesel-Range Hydrocarbons in Sample B-1-2.0. The reporting limits were elevated because of the high concentration of Lube Oil-Range Hydrocarbons in the sample. Consequently, no action was taken.

Also, the laboratory recognized that the chromatogram for Lube Oil-Range Hydrocarbons in Sample B-20-8.0 did not match that of the calibration standard. For this reason, the positive result for Lube Oil-Range Hydrocarbons was qualified as estimated (J) in this sample.

SDG 1405-209: The laboratory recognized that the chromatogram for Diesel-Range Hydrocarbons in Sample B-24-11.0-WATER did not match that of the calibration standard. For this reason, the positive result for Diesel-Range Hydrocarbons was qualified as estimated (J) in this sample.

OVERALL ASSESSMENT

The laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values. Precision was also acceptable, as demonstrated by the laboratory duplicate, LCS/LCSD, and MS/MSD RPD or absolute difference values.

Selected data were qualified as estimated (J) because chromatograms did not match those of the calibration standards.

All data, as qualified, are considered acceptable for their intended use.

REFERENCES

U.S. Environmental Protection Agency (USEPA). “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use,” EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA). “Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review,” EPA-540-R-08-01. June 2008.

U.S. Environmental Protection Agency (USEPA). “Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review,” EPA 540-R-10-011. January 2010.

GeoEngineers, Inc., “Sampling and Analysis Plan”, prepared for Puget Sound Energy, April 24, 2014.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS: GRAPH	SYMBOLS: LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS: GRAPH	SYMBOLS: LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Material Description Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PP	Pocket penetrometer
PPM	Parts per million
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS

GEOENGINEERS

FIGURE A-1

Drilled	Start 5/21/2014	End 5/21/2014	Total Depth (ft) 15	Logged By BL/GH Checked By MM	Driller Holocene Drilling, Inc.	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum	Undetermined		Hammer Data		Drilling Equipment	Power Probe 9500D
Latitude Longitude	47.27523 -122.4004		System Datum	Geographic WGS84	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	See Remarks
Notes:						

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		24						AC	2 inches asphalt concrete			
									SP-SM	Brown fine to coarse sand with silt and gravel (medium dense, moist) (fill)			
						E1							
									SP	Gray fine to medium sand with trace silt (loose, moist) (fill)			
			48										
	5												
									SP-SM	Gray fine to medium sand with silt (loose, wet) (Till)			Groundwater observed at approximately 6 feet at the time of drilling
						E2							
			48										
	10								SM	Gray silty fine to medium sanbd with occasional organics (shells and wood)			
			36										
						G3			ML	Gray silt with occasional fine sand			
	15												

Note: See Figure A-1 for explanation of symbols.

Tacoma: Date:9/5/14 Path:\\TAC\PROJECTS\0\0186914\02\GINT\018691402 GEOTECH SAMPLES.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Log of Boring B-1

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-2
Sheet 1 of 1

Drilled	Start 5/20/2014	End 5/20/2014	Total Depth (ft) 15	Logged By BL/GH Checked By MM	Driller Holocene Drilling, Inc.	Drilling Method Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Drilling Equipment: Power Probe 9500D
Latitude Longitude	47.27506 -122.39887	System: Geographic Datum: WGS84	Groundwater — Date Measured / Depth to Water (ft) / Elevation (ft): See Remarks
Notes:			

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		36						AC	2 inches asphalt concrete			
									SP-SM	Brown fine to coarse sand with silt and gravel (medium dense, moist) (fill)			
						E1							
									SP-SM	Gray fine to medium sand with silt (medium dense, moist) (fill)			
						E2							
			48										
	5												
									ML	Gray silt with occasional fine sand and organics (wood) (soft, wet)			Groundwater observed at approximately 7 feet at the time of drilling
						G3							
			48			E4			SP	Gray fine to medium sand with trace silt and occasional organics (shells) (loose, moist to wet)			
	10												
			36										
	15												

Note: See Figure A-1 for explanation of symbols.

Tacoma: Date:9/5/14 Path:\\TAC\PROJECTS\0\0186914\02\GINT\018691402 GEOTECH SAMPLES.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Log of Boring B-2

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Drilled	Start 5/20/2014	End 5/20/2014	Total Depth (ft)	15	Logged By BL/GH Checked By MM	Driller Holocene Drilling, Inc.	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum	Undetermined		Hammer Data				Drilling Equipment	Power Probe 9500D
Latitude Longitude	47.27574 -122.39941		System Datum	Geographic WGS84			Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	See Remarks
Notes:								

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		42						SM	Brown silty fine to coarse sand with gravel (medium dense, moist) (fill)			
						E1							
									SP-SM	Gray fine to medium sand with silt (loose, moist) (fill)			
			48			G2							
	5												
									ML	Gray silt (soft, wet) (fill)			
						G3							
									SM	Gray silty fine sand (loose, wet) (fill)			Groundwater observed at approximately 7 feet at the time of drilling
			48			E4							
									ML	Gray silt with occasional fine sand (very soft, wet)			
	10					G5							
									SM	Gray silty fine sand with occasional organics (shells) (loose, wet)			
			36										
									ML	Gray silt with occasional fine sand (very soft, wet)			
						G6							
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-3

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-4
Sheet 1 of 1

Drilled	Start 5/20/2014	End 5/20/2014	Total Depth (ft)	15	Logged By BL/GH Checked By MM	Driller	Holocene Drilling, Inc.	Drilling Method	Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	
Latitude Longitude	47.27579 -122.39894	System Datum	Geographic WGS84
Notes:			

Drilling Equipment	Power Probe 9500D	
Groundwater		
Date Measured	Depth to Water (ft)	Elevation (ft)
	See Remarks	

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		42						SM	Brown fine to coarse sand with silt and gravel (medium dense, moist) (fill)			
									SP-SM	Gray fine to medium sand with silt (loose, moist) (fill)			
					↕	E1							
			48										
	5								ML/SM	Interbedded gray silt and gray silty fine sand (loose/soft, wet) (fill)			Groundwater observed at approximately 5.5 feet at the time of drilling
			48		↕	E2							
									ML	Gray silt with occasional fine sand (loose, wet)			
	10				↕	G3							
									SM	Gray silty fine sand (loose, wet)			
			36										
									ML	Gray silt with occasional fine sand (soft, wet)			
					↕	G4							
	15												

Note: See Figure A-1 for explanation of symbols.

Tacoma: Date:9/5/14 Path:\\TAC\PROJECTS\0\0186914\02\GINT\018691402 GEOTECH SAMPLES.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Log of Boring B-4

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Drilled	Start 5/21/2014	End 5/21/2014	Total Depth (ft)	15	Logged By BL/GH, Checked By MM	Driller	Holocene Drilling, Inc.	Drilling Method	Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data		Drilling Equipment	Power Probe 9500D
Latitude Longitude	47.27632 -122.39938	System Datum	Geographic WGS84	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft): See Remarks
Notes:					

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		24						AC	3 inches asphalt concrete			
									SP-SM	Brown fine to coarse sand with silt and gravel (medium dense, moist) (fill)			
					X	E1							
			12										
	5								SP-SM	Gray fine to medium sand with silt (loose, moist) (fill)			
			48		X	E2							
										Grades to wet at 9 feet			Groundwater observed at approximately 9 feet at the time of drilling
	10								ML	Gray silt with occasional fine sand (very soft, wet)			
					X	G3							
			36										
									SM	Gray silty fine sand (loose, wet)			
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-5

GEOENGINEERS

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Drilled	Start	End	Total Depth (ft)	Logged By	Driller	Drilling Method
	5/21/2014	5/21/2014	15	BL/GH; Checked By MM	Holocene Drilling, Inc.	Direct Push

Surface Elevation (ft) / Vertical Datum	Undetermined	Hammer Data	
Drilling Equipment	Power Probe 9500D		
Latitude / Longitude	47.27545 / -122.40109	System / Datum	Geographic / WGS84
Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	See Remarks		
Notes:			

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		42						AC	2 inches asphalt concrete			
									SP-SM	Brown fine to coarse sand with silt and gravel (medium dense, moist) (fill)			
					⟷	E1							
									SP-SM	Gray fine to medium sand with silt (medium dense, moist) (fill)			
			48										
	5												
										Grades to wet at 7 feet			Groundwater observed at approximately 7 feet at the time of drilling
			48		⟷	E2							
	10												
									SM	Gray silty fine to medium sand with occasional organics (shells) (loose, wet)			
			36										
									SM/ML	Interbedded silty fine to medium sand and gray silt with occasional sand, with occasional organics (wood and shells) (loose/very soft, wet)			
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-6

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Drilled — Start: 5/27/2014 — End: 5/27/2014	Total Depth (ft): 15	Logged By: BL/GH Checked By: MM	Driller: Holocene Drilling, Inc.	Drilling Method: Direct Push
Surface Elevation (ft) / Vertical Datum: Undetermined	Hammer Data		Drilling Equipment: Power Probe 9500D	
Latitude: 47.27578 Longitude: -122.40161	System: Geographic Datum: WGS84		Groundwater — Date Measured / Depth to Water (ft) / Elevation (ft): See Remarks	
Notes:				

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		48						AC	2 inches asphalt concrete			
									SM	Brown silty fine to medium sand with gravel (loose, moist) (fill)			
					↕								
									SP-SM	Gray fine to medium sand with silt (medium dense, moist)			
			48										
	5									Becomes dark gray			
			48		↕					Becomes wet at 8 feet			Groundwater observed at approximately 8 feet at the time of drilling
	10												
			36										
	15												

Note: See Figure A-1 for explanation of symbols.

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Log of Boring B-7

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-8
Sheet 1 of 1

Drilled	Start 5/21/2014	End 5/21/2014	Total Depth (ft) 20	Logged By BL/GH Checked By MM	Driller Holocene Drilling, Inc.	Drilling Method Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Drilling Equipment: Power Probe 9500D
Latitude 47.27578 Longitude -122.40064	System Geographic Datum WGS84	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	See Remarks
Notes:			

FIELD DATA

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0	48				AC	6 inches asphalt concrete			
						SP-SM	Brown fine to coarse sand with silt and gravel (medium dense, moist) (fill)			
				E1						
		48				SM	Gray silty fine to medium sand (loose to medium dense, moist)			
	5									
				E2						
		48					Grades to wet			
	10					ML	Gray silt with fine sand (very stiff, wet)			Groundwater observed at approximately 10 feet at the time of drilling
				E3		SM	Gray silty fine to medium sand (loose, moist)			
		48								
						SP-SM	Gray fine to medium sand with silt and occasional organics (shells) (loose, wet)			
						SM	Gray silty fine to medium sand (loose, wet)			
	15									
		48				ML/SM	Gray silt with occasional fine sand with interbedded silty fine to medium sand lenses (very stiff/loose, wet)			
				G4						
	20									

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-8

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-9
Sheet 1 of 1

Drilled — Start: 5/29/2014, End: 5/29/2014	Total Depth (ft): 20	Logged By: BL/GH; Checked By: MM	Driller: Cascade Drilling, Inc. — Drilling Method: Sonic
Surface Elevation (ft): Undetermined; Vertical Datum	Hammer Data		Drilling Equipment: Geoprobe 8/40LS
Latitude: 47.27613; Longitude: -122.40039	System: Geographic; Datum: WGS84		Groundwater — Date Measured / Depth to Water (ft) / Elevation (ft): See Remarks
Notes:			

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		60						CC	4 inches concrete			
									SM	Brown silty fine to medium sand with occasional gravel (medium dense, moist) (fill)			
	~2					E1				Grades to with gravel			
	5		36						SP-SM	Gray fine to medium sand with silt (loose, moist) (fill)			
	~7					E2							
	~8.5								ML	Gray silt with occasional sand and organics (wood) (soft, wet)			
	10		60						SM	Gray silty fine to medium sand (loose, wet) (fill)			Groundwater observed at approximately 10 feet at the time of drilling
	~13					E3							
	15		60						ML	Gray silt with occasional fine sand (very soft, wet)			
	~17								SM	Gray silty fine to medium sand (loose, wet)			
	20												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-9

GEOENGINEERS

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-10
Sheet 1 of 1

Drilled	Start 5/22/2014	End 5/22/2014	Total Depth (ft)	20	Logged By BL/GH Checked By MM	Driller	Holocene Drilling, Inc.	Drilling Method	Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data		Drilling Equipment	Power Probe 9500D
Latitude Longitude	47.27651 -122.39979	System Datum	Geographic WGS84	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)
Notes:					See Remarks

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		48						AC	4 inches asphalt concrete			
									SP-SM	Brown fine to coarse sand with silt and gravel (medium dense, moist) (fill)			
						E1							
			48										
	5								SP-SM	Gray fine to medium sand with silt (loose, moist) (fill)			
						E2							
			48										
						G3			ML	Gray silt (very soft, wet) (fill)			Groundwater observed at approximately 9.5 feet at the time of drilling
	10								SM	Gray silt fine to medium sand with occasional organics (wood) (loose, wet)			
			48						ML	Gray silt with occasional fine sand (very stiff, wet)			
						E4							
									SM	Gray silty fine to medium sand (loose, wet)			
	15												
			48						ML	Gray silt with occasional fine sand (very stiff, wet)			
						G5							
									SM/ML	Interbedded gray silty fine sand and gray silt (loose/very stiff, wet)			
	20												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-10

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-11
Sheet 1 of 1

Drilled	Start 5/21/2014	End 5/21/2014	Total Depth (ft) 20	Logged By BL/GH Checked By MM	Driller Holocene Drilling, Inc.	Drilling Method Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Drilling Equipment: Power Probe 9500D
Latitude Longitude	47.27708 -122.39877	System Geographic Datum WGS84	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft): See Remarks
Notes:			

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		24						CC	6 inches concrete			
									SP-SM	Brown fine to coarse sand with silt and gravel (dense, moist) (fill)			
					✓	E1							
			36										
	5												
									ML	Brown silt with occasional fine sand (soft, moist) (fill)			
									SP-SM	Gray fine to medium sand with silt (loose, moist) (fill)			
			48		✓	E2							
	10								SP	Gray fine to medium sand with trace silt (loose, moist) (fill)			
													Groundwater observed at approximately 11 feet at the time of drilling
			48		✓	E3							
	15												
			48										
									ML	Gray silt with occasional fine sand (very soft, wet)			
									SP-SM	Gray fine to medium sand with silt (loose, wet)			
	20												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-11

GEOENGINEERS

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Drilled	Start 5/30/2014	End 5/30/2014	Total Depth (ft) 15	Logged By BL/GH Checked By MM	Driller Cascade Drilling, Inc.	Drilling Method Sonic

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Drilling Equipment: Geoprobe 8/40LS
Latitude Longitude	47.27737 -122.39937	System Datum: Geographic WGS84	Groundwater — Date Measured / Depth to Water (ft) / Elevation (ft): See Remarks

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		60						SM	Brown silty fine to coarse sand with gravel (medium dense, moist)			
						E1							
	5		60						SP-SM	Gray silty fine to medium sand (loose, moist)			
						E2							
	10		60										
										Becomes wet			
						E3							
									ML	Gray sandy silt (soft, wet)			
									SM	Gray silty fine to medium sand with organics (shells) (soft, wet)			
	15												

Note: See Figure A-1 for explanation of symbols.

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Log of Boring B-12

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-13
Sheet 1 of 1

Drilled	Start 5/30/2014	End 5/30/2014	Total Depth (ft) 15	Logged By BL/GH Checked By MM	Driller Cascade Drilling, Inc.	Drilling Method Sonic

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Drilling Equipment: Geoprobe 8/40LS
Latitude Longitude	47.27702 -122.39966	System: Geographic Datum: WGS84	Groundwater — Date Measured / Depth to Water (ft) / Elevation (ft): See Remarks
Notes:			

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		60						CC	4 inches concrete			
									SM	Brown silty fine to coarse sand with gravel (medium dense, moist) (fill)			
						E1							
	4								SP-SM	Gray fine to medium sand with silt (loose, moist) (fill)			
	5		60										
						E2							
	9								SM	Gray silty fine to medium sand with occasional organics (shells) (loose, moist) (fill)			
	10		60										Groundwater observed at approximately 10 feet at the time of drilling
	11									Grades to wet at 11 feet			
						E3							
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-13

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-14
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	Logged By	Driller	Drilling Method
	5/30/2014	5/30/2014	15	BL/GH Checked By MM	Cascade Drilling, Inc.	Sonic

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data		Drilling Equipment	Geoprobe 8/40LS
Latitude Longitude	47.27686 -122.40009	System Datum	Geographic WGS84	Groundwater	

Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)
	See Remarks	

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		60						AC	7 inches asphalt concrete			
									SM	Brown silty fine to coarse sand with gravel (medium dense, moist)			
						E1							
	5		60						SP-SM	Gray fine to medium sand with silt (loose, moist)			
						E2							
	10		60						SM	Gray silty sand (soft, wet)			
						E3							
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-14

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Drilled	Start 6/2/2014	End 6/2/2014	Total Depth (ft)	20	Logged By BL/GH Checked By MM	Driller	Cascade Drilling, Inc.	Drilling Method	Sonic

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	
Drilling Equipment	Geoprobe 8/40LS		
Latitude Longitude	47.27651 -122.40055	System Datum	Geographic WGS84
Notes:			

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
	See Remarks	

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		60						CC	6 inches concrete			
									SM	Brown silty fine to coarse sand with occasional gravel (medium dense, moist)			
						E1				With gravel			
	5		60						SP-SM	Gray fine to medium sand with silt (loose, moist)			
						E2							
	10		60										
									SM	Gray silty fine to coarse sand with gravel (loose, wet)			
						E3			ML	Gray silt with sand (soft, wet)			
									SM	Gray silty fine to coarse sand with gravel (loose, wet)			
	15		60										
	20												

Note: See Figure A-1 for explanation of symbols.

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Log of Boring B-15

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-16
Sheet 1 of 1

Drilled	Start 6/2/2014	End 6/2/2014	Total Depth (ft)	20	Logged By BL/GH Checked By MM	Driller Cascade Drilling, Inc.	Drilling Method	Sonic

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data		Drilling Equipment: Geoprobe 8/40LS
Latitude Longitude	47.2762 -122.40105	System Datum	Geographic WGS84	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft) — See Remarks
Notes:				

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		36						CC	4 inches concrete			
									SM	Brown silty fine to coarse sand with gravel (medium dense, moist) (fill)			
						E1							
	5		60										
									SP-SM	Gray fine to medium sand with silt and occasional gravel and organics (shells) (loose, moist) (fill)			
						E2							
	10		60										
										Grades to wet at 12 feet			Groundwater observed at approximately 12 feet at the time of drilling
						E3							
	15		60						SM	Gray silty fine to medium sand with occasional organics (shells, grass) (loose, wet)			
	20												

Note: See Figure A-1 for explanation of symbols.

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Log of Boring B-16

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-17
Sheet 1 of 1

Drilled	Start 5/28/2014	End 5/28/2014	Total Depth (ft)	15	Logged By BL/GH Checked By MM	Driller Holocene Drilling, Inc.	Drilling Method	Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	
Drilling Equipment	Power Probe 9500D		
Latitude Longitude	47.27745 -122.39808	System Datum	Geographic WGS84
Notes:			

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
	See Remarks	

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		28						AC	3 inches asphalt concrete			
									SM	Brown silty sand with gravel (medium dense, moist)			
						E2			SP-SM	Gray fine to medium sand with silt (loose, moist)			
			42										
	5												
						E1				Becomes wet at 7 feet			Groundwater observed at approximately 6.6 feet at the time of drilling
			48										
	10												
			36										
									ML	Gray silt with sand (soft, wet0			
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-17

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Drilled	Start 5/27/2014	End 5/27/2014	Total Depth (ft) 15	Logged By BL/GH Checked By MM	Driller Holocene Drilling, Inc.	Drilling Method Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Drilling Equipment: Power Probe 9500D
Latitude Longitude	47.27761 -122.3987	System: Geographic Datum: WGS84	Groundwater — Date Measured / Depth to Water (ft) / Elevation (ft): See Remarks
Notes:			

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		48						AC	5 inches asphalt concrete			
									SM	Brown silty fine to coarse sand with gravel			
									SP-SM	Gray fine to medium sand with silt (loose, moist)			
					I	E1							
			42										
	5												
										Grades to brown			
			42		I	E2							
										Becomes wet at 9 feet			
	10												
									SP-SM	Black sand with silt and trace gravel (gravel subangular up to 2 inches in diamter) (loose, wet)			
			36										
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-18

GEOENGINEERS

Project: PSE Tacoma LNG

Project Location: Tacoma, Washington

Project Number: 0186-914-02

Drilled	Start 5/29/2014	End 5/29/2014	Total Depth (ft) 20	Logged By BL/GH Checked By MM	Driller Cascade Drilling, Inc.	Drilling Method Sonic

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Drilling Equipment: Geoprobe 8/40LS
Latitude Longitude	47.27651 -122.39978	System Datum: Geographic WGS84	Groundwater — Date Measured / Depth to Water (ft) / Elevation (ft): See Remarks
Notes:			

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		48						AC	5 inches asphalt concrete			
									SM	Brown silty fine to coarse sand with gravel (medium dense, moist) (fill)			
						E1							
									SP-SM	Gray fine to medium sand with silt and occasional organics (shells) (loose, moist) (fill)			
	5		60										
						E2				Grades to wet at 8 feet			
	10		96										
	15								SM	Gray silty fine to medium sand with occasional organics (shells and wood) (loose, wet)			
									SP-SM	Gray fine to medium sand with silt (loose, wet)			
	20												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-19

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-20
Sheet 1 of 1

Drilled	Start 5/21/2014	End 5/21/2014	Total Depth (ft) 15	Logged By BL/GH Checked By MM	Driller Holocene Drilling, Inc.	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum	Undetermined		Hammer Data		Drilling Equipment	Power Probe 9500D
Latitude Longitude	47.27792 -122.40019		System Geographic Datum WGS84		Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	See Remarks
Notes:						

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		42						AC	2 inches asphalt concrete			
									SP-SM	Brown fine to coarse sand with silt and gravel (medium dense, moist) (fill)			
									SP-SM	Gray fine to medium sand with silt (loose, moist) (fill)			
						E1							
			48										
	5												
										Grades to wet at 7 feet			Groundwater observed at approximately 7 feet at the time of drilling
			48			E2							
	10												
			36										
						E3			SM	Gray silty fine to medium sand with occasional organics (shells) (loose, wet)			
									ML	Gray silt (very soft, wet)			
	15								SM	Gray silty fine to medium sand (loose, wet)			

Note: See Figure A-1 for explanation of symbols.

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Log of Boring B-20

GEOENGINEERS

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Drilled	Start 5/28/2014	End 5/28/2014	Total Depth (ft) 15	Logged By BL/GH Checked By MM	Driller Holocene Drilling, Inc.	Drilling Method Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Drilling Equipment: Power Probe 9500D
Latitude 47.27726 Longitude -122.40038	System Geographic Datum WGS84		Groundwater Date Measured / Depth to Water (ft) / Elevation (ft) See Remarks
Notes:			

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		42						AC	2 inches asphalt concrete			
									SM	Brown silty sand with gravel			
						E1			SP-SM	Gray fine to medium sand with silt (medium dense, moist)			
			48										
	5												
									ML	Gray silt with sand (soft, moist to wet)			
									SP-SM	Dark gray to black fine to medium sand with silt (loose, wet)			Groundwater observed at approximately 6.5 feet at the time of drilling
			48			E2							
	10												
			36										
									ML/SM	Interbedded gray silt and gray silty sand (loose/soft, wet)			
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-21

GEOENGINEERS

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Drilled	Start 5/21/2014	End 5/21/2014	Total Depth (ft)	15	Logged By BL/GH Checked By MM	Driller	Holocene Drilling, Inc.	Drilling Method	Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Drilling Equipment: Power Probe 9500D
Latitude 47.27682 Longitude -122.40075		System Geographic Datum WGS84	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft) — See Remarks
Notes:			

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		42						AC	2 inches asphalt concrete			
									SP-SM	Brown fine to coarse sand with silt and gravel (medium dense, moist) (fill)			
						E1			SP-SM	Brown fine to medium sand with silt (loose, moist) (fill)			
			48			E2							
	5								SM	Gray silty fine to medium sand (loose, moist)			
									ML	Gray silt (very soft, wet) (fill)			
									SM	Gray silty fine to medium sand (loose, wet) (fill)			
			48			E3							
	10								ML	Gray silt (very soft, wet)			
									SP-SM	Gray fine to medium sand with silt (loose, wet)			
			36										
										Grades to with occasional organics (shells)			
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-22

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Drilled	Start 5/20/2014	End 5/20/2014	Total Depth (ft) 15	Logged By BL/GH Checked By MM	Driller Holocene Drilling, Inc.	Drilling Method Direct Push

Surface Elevation (ft) Vertical Datum: Undetermined	Hammer Data	Drilling Equipment: Power Probe 9500D	
Latitude: 47.27721 Longitude: -122.39767	System: Geographic Datum: WGS84	Groundwater — Date Measured / Depth to Water (ft) / Elevation (ft): See Remarks	
Notes:			

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		30						GP-GM	Brown gravel with sand and silt (dense, moist) (fill)			
									SP-SM	Gray fine to medium sand with silt (medium dense, moist) (fill)			
						E1							
			42										
	5												
										Grades to wet at 6.5 feet			
			48			E2							
									SM	Gray silty fine to medium sand (medium dense, wet) (fill)			
	10												
			36						ML	Gray sandy silt (medium stiff, wet)			
	15												

Note: See Figure A-1 for explanation of symbols.

Tacoma: Date:9/5/14 Path:\\TAC\PROJECTS\0\0186914\02\GINT\018691402 GEOTECH SAMPLES.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Log of Boring B-23

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Figure A-24
Sheet 1 of 1

Drilled	Start 5/27/2014	End 5/27/2014	Total Depth (ft)	15	Logged By BL/GH Checked By MM	Driller	Holocene Drilling, Inc.	Drilling Method	Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data		Drilling Equipment	Power Probe 9500D
Latitude Longitude	47.27761 -122.39989	System Datum	Geographic WGS84	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	See Remarks
Notes:					

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		48						AC	2 inches asphalt concrete			
									SM	Brown silty fine to medium sand (very loose, moist)			
						E1			SP-SM	Gray fine to medium sand with silt (loose, moist)			
			48										
	5												
										Becomes wet at 6.5 feet			
			48			E2			SP-SM	Black fine to medium sand with silt (loose, wet)			Petroleum odor
	10												
			36										Petroleum odor
	15												

Note: See Figure A-1 for explanation of symbols.

Tacoma: Date:9/5/14 Path:\\TAC\PROJECTS\0\0186914\02\GINT\018691402 GEOTECH SAMPLES.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_STANDARD

Log of Boring B-24

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Drilled	Start 5/20/2014	End 5/20/2014	Total Depth (ft)	12	Logged By BL/GH Checked By MM	Driller	Holocene Drilling, Inc.	Drilling Method	Direct Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data		Drilling Equipment	Power Probe 9500D
Latitude Longitude	47.27695 -122.39822	System Datum	Geographic WGS84	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft): See Remarks
Notes:					

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		36						GP-GM	Brown gravel with silt and sand (medium dense, moist) (fill)			
						E1			SP	Gray fine to medium sand with trace silt (medium dense, moist) (fill)			
			48										
	5								SP-SM	Gray fine to medium sand with silt (medium dense, moist) (fill)			
			48			E2							
	10					E3							
													4 feet of heave at 12 feet

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-26

GeoEngineers

Project: PSE Tacoma LNG
Project Location: Tacoma, Washington
Project Number: 0186-914-02

Appendix D-1: Construction Emissions

Summary of Terminal Construction Emissions - Criteria Pollutants
PSE LNG

Equipment	NOx (tons/year)	CO (tons/year)	SO_2 (tons/year)	VOC (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
2015 - Construction Equipment	11.5	6.84	0.43	1.07	0.88	0.88
2015 - Road Vehicles/Commuting	0.02	0.004	2.13E-05	7.29E-04	1.10E-03	9.88E-04
2015 - Fugitive Dust					8.29	0.83
2015 - Total Emissions	11.5	6.84	0.43	1.07	9.17	1.71
2016 - Construction Equipment	15.8	8.92	0.11	2.02	1.31	1.31
2016 - Road Vehicles/Commuting	0.36	1.54	4.03E-03	2.86E-02	2.94E-02	1.94E-02
2016 - Fugitive Dust					0.73	0.18
2016 - Total Emissions	16.1	10.5	0.12	2.05	2.08	1.51
2017 - Construction Equipment	11.1	6.24	0.02	1.54	0.93	0.93
2017 - Road Vehicles/Commuting	0.30	1.96	5.66E-03	3.03E-02	3.06E-02	1.70E-02
2017 - Fugitive Dust					1.08	0.26
2017 - Total Emissions	11.4	8.20	0.02	1.57	2.04	1.21
2018 - Construction Equipment	5.74	3.27	0.01	0.84	0.48	0.48
2018 - Road Vehicles/Commuting	0.008	0.002	1.23E-05	3.34E-04	4.72E-04	4.08E-04
2018 - Fugitive Dust					8.83E-04	2.17E-04
2018 - Total Emissions	5.75	3.27	0.01	0.84	0.48	0.48
Project TOTAL:	**44.8**	**28.8**	**0.58**	**5.53**	**13.8**	**4.91**

Summary of Terminal Construction Emissions - GHG
PSE LNG

Equipment	CO_2 (metric ton/year)	CH_4 (metric ton/year)	N_2O (metric ton/year)	CO2e (metric ton/year)
2015 - Construction Equipment	2,061	2.58E-02	4.06E-02	2,074
2015 - Road Vehicles/Commuting	2.54	3.51E-05	2.60E-06	2.55
2015 - Fugitive Dust				
2015 - Total Emissions	2,063	0.03	0.04	2,076
2016 - Construction Equipment	3,778	5.49E-02	3.84E-02	3,791
2016 - Road Vehicles/Commuting	224	2.54E-03	9.25E-04	225
2016 - Fugitive Dust				
2016 - Total Emissions	4,003	0.06	0.04	4,016
2017 - Construction Equipment	2,910	4.71E-02	2.87E-02	2,920
2017 - Road Vehicles/Commuting	305	3.27E-03	1.22E-03	305
2017 - Fugitive Dust				
2017 - Total Emissions	3,214	0.05	0.03	3,225
2018 - Construction Equipment	1,698	2.75E-02	1.67E-02	1,703
2018 - Road Vehicles/Commuting	1.50	2.58E-05	1.57E-06	1.50
2018 - Fugitive Dust				
2018 - Total Emissions	1,699	0.028	0.017	1,705
Project TOTAL:	**10,980**	**0.16**	**0.13**	**11,021**

Equipment List	No.	Equipment Use Duration (months)	Horsepower	Utilization	Load Factor	NOx Emission Factor (g/hp-hr)	CO Emission Factor (g/hp-hr)	SO_2 Emission Factor (g/hp-hr)	VOC Emisson Factor (g/hp-hr)	PM_{10} Emission Factor (g/hp-hr)	$PM_{2.5}$ Emission Factor (g/hp-hr)	NOx (tons/year)	CO (tons/year)	SO_2 (tons/year)	VOC (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Upland Construction (demo, soil, utilities)																	
Cat 345 Backhoe 4 cy	1	6	165	75%	21%	4.373	2.600	0.004	0.664	0.501	0.501	0.154	0.092	0.000	0.023	0.018	0.018
100 Ton Crawler Crane	1	6	250	85%	43%	2.271	0.491	0.003	0.188	0.098	0.098	0.282	0.061	0.000	0.023	0.012	0.012
200 Ton Crawler Crane	1	6	300	85%	43%	2.271	0.491	0.003	0.188	0.098	0.098	0.338	0.073	0.000	0.028	0.015	0.015
22 Ton Hydrocrane	1	6	85	85%	43%	2.951	1.733	0.004	0.255	0.251	0.251	0.125	0.073	0.000	0.011	0.011	0.011
30 Ton Hydrocrane	1	6	100	85%	43%	2.951	1.733	0.004	0.255	0.251	0.251	0.147	0.086	0.000	0.013	0.012	0.012
Air Compressor	2	6	55	100%	59%	4.058	1.090	0.004	0.227	0.181	0.181	0.358	0.096	0.000	0.020	0.016	0.016
Cat Compactor	2	6	65	85%	59%	4.373	2.600	0.004	0.664	0.501	0.501	0.387	0.230	0.000	0.059	0.044	0.044
Cat D6 Dozer	2	6	65	85%	59%	3.866	2.663	0.004	0.309	0.327	0.327	0.342	0.236	0.000	0.027	0.029	0.029
Crew Truck, 3/4 ton	2	6	250	85%	59%	3.356	2.090	0.004	0.216	0.219	0.219	1.143	0.712	0.001	0.074	0.075	0.075
Dump Trucks 15 cy	2	6	285	75%	59%	1.135	0.274	0.003	0.141	0.045	0.045	0.389	0.094	0.001	0.048	0.015	0.015
Flatbed Truck (Matl. Handling)	1	6	200	85%	59%	1.317	0.519	0.003	0.150	0.121	0.121	0.179	0.071	0.000	0.020	0.017	0.017
Forklift, 8,000 lbs	1	6	85	50%	59%	3.734	2.535	0.004	0.284	0.294	0.294	0.127	0.086	0.000	0.010	0.010	0.010
Fuel Truck	2	6	200	85%	59%	1.317	0.519	0.003	0.150	0.121	0.121	0.359	0.142	0.001	0.041	0.033	0.033
Loader, Cat 966, 4 cy	2	6	100	85%	59%	4.645	5.700	0.004	0.924	0.832	0.832	0.633	0.777	0.001	0.126	0.113	0.113
Manlifts	1	6	50	85%	59%	5.594	6.316	0.004	1.643	0.907	0.907	0.191	0.215	0.000	0.056	0.031	0.031
In-water Construction																	
Forklift, 8,000 lbs	2	6	65	75%	59%	3.734	2.535	0.004	0.284	0.294	0.294	0.292	0.198	0.000	0.022	0.023	0.023
Air Compressor	4	6	55	100%	59%	4.058	1.090	0.004	0.227	0.181	0.181	0.716	0.192	0.001	0.040	0.032	0.032
Crane, 60 ton	3	6	290	85%	43%	2.271	0.491	0.003	0.188	0.098	0.098	0.981	0.212	0.001	0.081	0.042	0.042
Crew Truck, 3/4 ton	3	6	250	25%	59%	3.356	2.090	0.004	0.216	0.219	0.219	0.504	0.314	0.001	0.032	0.033	0.033
Diesel Pile Driver Hammer	3	6	85	85%	43%	3.866	2.663	0.004	0.309	0.327	0.327	0.490	0.337	0.000	0.039	0.041	0.041
Flatbed Truck (Matl. Handling)	3	6	200	85%	59%	1.317	0.519	0.003	0.150	0.121	0.121	0.538	0.212	0.001	0.061	0.050	0.050
Fuel Truck	2	6	200	25%	59%	1.317	0.519	0.003	0.150	0.121	0.121	0.106	0.042	0.000	0.012	0.010	0.010
Loader, Cat 966, 4 cy	2	6	100	75%	59%	4.645	5.700	0.004	0.924	0.832	0.832	0.559	0.685	0.001	0.111	0.100	0.100
Personnel Work Boat	1	6	63	75%	45%	6.800	5.000	1.300	0.270	0.400	0.388	0.196	0.144	0.038	0.008	0.012	0.011
Tug/Work Barge w/crane	1	6	560	85%	45%	6.800	5.000	1.300	0.270	0.300	0.291	1.979	1.455	0.378	0.079	0.087	0.085
											Annual Total	**11.52**	**6.84**	**0.43**	**1.07**	**0.88**	**0.88**

Notes:

- Emission factors for NOx, CO, SOx, VOC, PM10, PM2.5 and CO2 are average NONROAD emission rates for the State of Washington.
- Emission factors for CH4 and N2O are from the Climate Registry 2014 Default Emission Factors, Table 13.7.
- Assume 48 hours per week; 4.28 weeks per month = 205 hrs/month
- Tugboat, Workboat, and Personnel Boat Emissions factors from U.S. Environmental Protection Agency Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report April 2009, Table 3-8: Harbor Craft Emission Factors (g/kWh)
- Tugboat and Work barge EFs are in 'g/kWh' - engine size listed for these boats are in 'kWh' not 'hp'
- Work Boat and Tug Load Factor: Table 3-3: EPA Load Factors for Harbor Craft

Equipment List	No.	Equipment Use Duration[a] (months)	Horsepower	Utilization	Load Factor	NOx Emission Factor (g/hp-hr)	CO Emission Factor (g/hp-hr)	SO_2 Emission Factor (g/hp-hr)	VOC Emisson Factor (g/hp-hr)	PM_{10} Emission Factor (g/hp-hr)	$PM_{2.5}$ Emission Factor (g/hp-hr)	NOx (tons/year)	CO (tons/year)	SO_2 (tons/year)	VOC (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Upland Construction (demo, soil, utilities)																	
Cat 345 Backhoe 4 cy	1	6	165	75%	21%	3.992	2.330	0.004	0.606	0.462	0.462	0.141	0.082	0.000	0.021	0.016	0.016
100 Ton Crawler Crane	1	6	250	85%	43%	1.945	0.429	0.003	0.175	0.086	0.086	0.242	0.053	0.000	0.022	0.011	0.011
200 Ton Crawler Crane	1	6	300	85%	43%	1.945	0.429	0.003	0.175	0.086	0.086	0.290	0.064	0.000	0.026	0.013	0.013
22 Ton Hydrocrane	1	6	85	85%	43%	2.558	1.542	0.003	0.230	0.221	0.221	0.108	0.065	0.000	0.010	0.009	0.009
30 Ton Hydrocrane	1	6	100	85%	43%	2.558	1.542	0.003	0.230	0.221	0.221	0.127	0.077	0.000	0.011	0.011	0.011
Air Compressor	2	6	55	100%	59%	3.846	0.908	0.003	0.207	0.150	0.150	0.339	0.080	0.000	0.018	0.013	0.013
Cat Compactor	2	6	65	85%	59%	3.719	2.408	0.004	0.280	0.286	0.286	0.329	0.213	0.000	0.025	0.025	0.025
Cat D6 Dozer	2	6	65	85%	59%	3.230	1.769	0.003	0.192	0.183	0.183	0.286	0.157	0.000	0.017	0.016	0.016
Crew Truck, 3/4 ton	2	6	250	85%	59%	0.859	0.203	0.003	0.137	0.029	0.029	0.293	0.069	0.001	0.047	0.010	0.010
Dump Trucks 15 cy	2	6	285	75%	59%	0.859	0.203	0.003	0.137	0.029	0.029	0.294	0.070	0.001	0.047	0.010	0.010
Flatbed Truck (Matl. Handling)	1	6	200	85%	59%	0.933	0.322	0.003	0.141	0.063	0.063	0.127	0.044	0.000	0.019	0.009	0.009
Forklift, 8,000 lbs	1	6	85	50%	59%	3.595	2.265	0.004	0.257	0.256	0.256	0.122	0.077	0.000	0.009	0.009	0.009
Fuel Truck	2	6	200	85%	59%	0.933	0.322	0.003	0.141	0.063	0.063	0.254	0.088	0.001	0.038	0.017	0.017
Loader, Cat 966, 4 cy	2	6	100	85%	59%	4.285	5.288	0.004	0.839	0.764	0.764	0.584	0.721	0.001	0.114	0.104	0.104
Manlifts	1	6	50	85%	59%	5.423	5.873	0.004	1.516	0.848	0.848	0.185	0.200	0.000	0.052	0.029	0.029
In-water Construction																	
Forklift, 8,000 lbs	2	1	65	75%	59%	3.595	2.265	0.004	0.257	0.256	0.256	0.047	0.030	0.000	0.003	0.003	0.003
Air Compressor	4	1	55	100%	59%	3.846	0.908	0.003	0.207	0.150	0.150	0.113	0.027	0.000	0.006	0.004	0.004
Crane, 60 ton	3	1	290	85%	43%	1.945	0.429	0.003	0.175	0.086	0.086	0.140	0.031	0.000	0.013	0.006	0.006
Crew Truck, 3/4 ton	3	1	250	25%	59%	0.859	0.203	0.003	0.137	0.029	0.029	0.022	0.005	0.000	0.003	0.001	0.001
Diesel Pile Driver Hammer	3	1	85	85%	43%	3.719	2.408	0.004	0.280	0.286	0.286	0.078	0.051	0.000	0.006	0.006	0.006
Flatbed Truck (Matl. Handling)	3	1	200	85%	59%	0.933	0.322	0.003	0.141	0.063	0.063	0.064	0.022	0.000	0.010	0.004	0.004
Fuel Truck	2	1	200	25%	59%	0.933	0.322	0.003	0.141	0.063	0.063	0.012	0.004	0.000	0.002	0.001	0.001
Loader, Cat 966, 4 cy	2	1	100	75%	59%	4.285	5.288	0.004	0.839	0.764	0.764	0.086	0.106	0.000	0.017	0.015	0.015
Personnel Work Boat	1	1	63	75%	59%	6.800	5.000	1.300	0.270	0.400	0.388	0.043	0.032	0.008	0.002	0.003	0.002
Tug/Work Barge w/crane	1	1	560	85%	59%	6.800	5.000	1.300	0.270	0.300	0.291	0.432	0.318	0.083	0.017	0.019	0.019
LNG Facility Construction (including Storage Tank)																	
Cat 345 Backhoe 4 cy	1	7	165	85%	21%	3.992	2.330	0.004	0.606	0.462	0.462	0.186	0.109	0.000	0.028	0.022	0.022
100 Ton Crawler Crane	2	7	250	85%	43%	1.945	0.429	0.003	0.175	0.086	0.086	0.564	0.124	0.001	0.051	0.025	0.025
200 Ton Crawler Crane	3	7	300	85%	43%	1.945	0.429	0.003	0.175	0.086	0.086	1.014	0.224	0.002	0.091	0.045	0.045
22 Ton Hydrocrane	4	7	85	85%	43%	2.558	1.542	0.003	0.230	0.221	0.221	0.504	0.304	0.001	0.045	0.044	0.044
30 Ton Hydrocrane	3	7	100	85%	43%	2.558	1.542	0.003	0.230	0.221	0.221	0.445	0.268	0.001	0.040	0.038	0.038
Air Compressor	4	7	55	85%	59%	3.846	0.908	0.003	0.207	0.150	0.150	0.673	0.159	0.001	0.036	0.026	0.026
Cat Compactor	3	7	65	85%	59%	3.719	2.408	0.004	0.280	0.286	0.286	0.577	0.373	0.001	0.043	0.044	0.044
Cat D6 Dozer	3	7	65	85%	59%	3.230	1.769	0.003	0.192	0.183	0.183	0.501	0.274	0.001	0.030	0.028	0.028
Concrete Pump	3	7	150	85%	59%	4.245	2.355	0.004	0.473	0.426	0.426	1.519	0.843	0.001	0.169	0.152	0.152
Crane, 60 ton	1	7	290	50%	43%	1.945	0.429	0.003	0.175	0.086	0.086	0.192	0.042	0.000	0.017	0.008	0.008
Crew Truck, 3/4 ton	6	7	250	85%	59%	0.859	0.203	0.003	0.137	0.029	0.029	1.024	0.242	0.003	0.163	0.034	0.034
Dump Trucks 15 cy	1	7	285	75%	59%	0.859	0.203	0.003	0.137	0.029	0.029	0.172	0.041	0.001	0.027	0.006	0.006
Flatbed Truck (Matl. Handling)	3	7	200	85%	59%	0.933	0.322	0.003	0.141	0.063	0.063	0.445	0.154	0.001	0.067	0.030	0.030
Forklift, 8,000 lbs	3	7	85	50%	59%	3.595	2.265	0.004	0.257	0.256	0.256	0.429	0.270	0.000	0.031	0.031	0.031
Fuel Truck	3	7	200	85%	59%	0.933	0.322	0.003	0.141	0.063	0.063	0.445	0.154	0.001	0.067	0.030	0.030
Loader, Cat 966, 4 cy	3	7	100	85%	59%	4.285	5.288	0.004	0.839	0.764	0.764	1.022	1.261	0.001	0.200	0.182	0.182
Manlifts	6	7	50	85%	59%	5.423	5.873	0.004	1.516	0.848	0.848	1.293	1.401	0.001	0.362	0.202	0.202
											Annual Total	**15.8**	**8.92**	**0.11**	**2.02**	**1.31**	**1.31**

Notes:

- Emission factors for NOx, CO, SOx, VOC, PM10, PM2.5 and CO2 are average NONROAD emission rates for the State of Washington.
- Emission factors for CH4 and N2O are from the Climate Registry 2014 Default Emission Factors, Table 13.7.
- Assume 48 hours per week; 4.28 weeks per month 205 hrs/month
- Tugboat, Workboat, and Personnel Boat Emissions factors from U.S. Environmental Protection Agency Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report April 2009, Table 3-8: Harbor Craft Emission Factors (g/kWh)
- Tugboat and Work barge EFs are in 'g/kWh' - engine size listed for these boats are in 'kWh' not 'hp'
- Work Boat and Tug Load Factor: Table 3-3: EPA Load Factors for Harbor Craft

Equipment List	No.	Equipment Use Duration (months)	Horsepower	Utilization	Load Factor	NOx Emission Factor (g/hp-hr)	CO Emission Factor (g/hp-hr)	SO_2 Emission Factor (g/hp-hr)	VOC Emisson Factor (g/hp-hr)	PM_{10} Emission Factor (g/hp-hr)	$PM_{2.5}$ Emission Factor (g/hp-hr)	NOx (tons/year)	CO (tons/year)	SO_2 (tons/year)	VOC (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
LNG Facility Construction (no Storage Tank Construction)																	
100 Ton Crawler Crane	2	12	250	85%	43%	1.672	0.371	0.003	0.166	0.074	0.074	0.830	0.184	0.001	0.082	0.037	0.037
200 Ton Crawler Crane	2	12	300	85%	43%	1.672	0.371	0.003	0.166	0.074	0.074	0.996	0.221	0.002	0.099	0.044	0.044
22 Ton Hydrocrane	3	12	85	85%	43%	2.191	1.359	0.003	0.208	0.193	0.193	0.555	0.344	0.001	0.053	0.049	0.049
30 Ton Hydrocrane	2	12	100	85%	43%	2.191	1.359	0.003	0.208	0.193	0.193	0.435	0.270	0.001	0.041	0.038	0.038
Air Compressor	3	12	55	85%	59%	3.647	0.734	0.003	0.189	0.120	0.120	0.820	0.165	0.001	0.042	0.027	0.027
Cat Compactor	2	12	65	85%	59%	3.585	2.163	0.004	0.254	0.248	0.248	0.635	0.383	0.001	0.045	0.044	0.044
Cat D6 Dozer	2	12	65	85%	59%	3.162	1.503	0.003	0.177	0.151	0.151	0.560	0.266	0.001	0.031	0.027	0.027
Concrete Pump	2	12	150	85%	59%	3.981	2.214	0.004	0.445	0.397	0.397	1.628	0.905	0.001	0.182	0.162	0.162
Crane, 60 ton	1	12	290	50%	43%	1.672	0.371	0.003	0.166	0.074	0.074	0.283	0.063	0.001	0.028	0.013	0.013
Crew Truck, 3/4 ton	4	12	250	85%	59%	0.633	0.163	0.003	0.135	0.020	0.020	0.863	0.222	0.004	0.183	0.027	0.027
Flatbed Truck (Matl. Ha	2	12	200	85%	59%	0.675	0.239	0.003	0.137	0.039	0.039	0.368	0.130	0.001	0.074	0.021	0.021
Forklift, 8,000 lbs	2	12	85	25%	59%	3.471	2.007	0.004	0.233	0.223	0.223	0.237	0.137	0.000	0.016	0.015	0.015
Fuel Truck	2	12	200	85%	59%	0.675	0.239	0.003	0.137	0.039	0.039	0.368	0.130	0.001	0.074	0.021	0.021
Loader, Cat 966, 4 cy	2	12	100	85%	59%	3.941	4.895	0.004	0.759	0.698	0.698	1.074	1.334	0.001	0.207	0.190	0.190
Manlifts	4	12	50	85%	59%	5.256	5.441	0.004	1.393	0.790	0.790	1.433	1.483	0.001	0.380	0.215	0.215
											Annual Total	**11.1**	**6.24**	**0.02**	**1.54**	**0.93**	**0.93**

Notes:

- Emission factors for NOx, CO, SOx, VOC, PM10, PM2.5 and CO2 are average NONROAD emission rates for the State of Washington.
- Emission factors for CH4 and N2O are from the Climate Registry 2014 Default Emission Factors, Table 13.7.
- Assume 48 hours per week; 4.28 weeks per month 205 hrs/month

Equipment List	No.	Equipment Use Duration (months)	Horsepower	Utilization	Load Factor	NOx Emission Factor (g/hp-hr)	CO Emission Factor (g/hp-hr)	SO_2 Emission Factor (g/hp-hr)	VOC Emisson Factor (g/hp-hr)	PM_{10} Emission Factor (g/hp-hr)	$PM_{2.5}$ Emission Factor (g/hp-hr)	NOx (tons/year)	CO (tons/year)	SO_2 (tons/year)	VOC (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
LNG Facility Construction (no Storage Tank Construction)																	
100 Ton Crawler Crane	2	7	250	85%	43%	1.432	0.317	0.003	0.159	0.062	0.062	0.415	0.092	0.001	0.046	0.018	0.018
200 Ton Crawler Crane	2	7	300	85%	43%	1.432	0.317	0.003	0.159	0.062	0.062	0.498	0.110	0.001	0.055	0.022	0.022
22 Ton Hydrocrane	3	7	85	85%	43%	1.849	1.183	0.003	0.188	0.167	0.167	0.273	0.175	0.000	0.028	0.025	0.025
30 Ton Hydrocrane	2	7	100	85%	43%	1.849	1.183	0.003	0.188	0.167	0.167	0.214	0.137	0.000	0.022	0.019	0.019
Air Compressor	3	7	55	85%	59%	3.465	0.572	0.003	0.172	0.092	0.092	0.454	0.075	0.000	0.023	0.012	0.012
Cat Compactor	2	7	65	85%	59%	3.473	1.930	0.003	0.232	0.216	0.216	0.359	0.199	0.000	0.024	0.022	0.022
Cat D6 Dozer	2	7	65	85%	59%	3.110	1.257	0.003	0.164	0.121	0.121	0.321	0.130	0.000	0.017	0.012	0.012
Concrete Pump	2	7	150	85%	59%	3.726	2.078	0.004	0.417	0.370	0.370	0.889	0.496	0.001	0.099	0.088	0.088
Crane, 60 ton	1	7	290	50%	43%	1.432	0.317	0.003	0.159	0.062	0.062	0.141	0.031	0.000	0.016	0.006	0.006
Crew Truck, 3/4 ton	4	7	250	85%	59%	0.446	0.139	0.003	0.133	0.015	0.015	0.355	0.110	0.002	0.106	0.012	0.012
Flatbed Truck (Matl. Ha	2	7	200	85%	59%	0.472	0.192	0.003	0.134	0.025	0.025	0.150	0.061	0.001	0.043	0.008	0.008
Forklift, 8,000 lbs	2	7	85	25%	59%	3.361	1.762	0.003	0.211	0.192	0.192	0.134	0.070	0.000	0.008	0.008	0.008
Fuel Truck	2	7	200	85%	59%	0.472	0.192	0.003	0.134	0.025	0.025	0.150	0.061	0.001	0.043	0.008	0.008
Loader, Cat 966, 4 cy	2	7	100	85%	59%	3.625	4.557	0.004	0.694	0.641	0.641	0.576	0.725	0.001	0.110	0.102	0.102
Manlifts	4	7	50	85%	59%	5.096	5.021	0.004	1.273	0.734	0.734	0.810	0.798	0.001	0.202	0.117	0.117
											Annual Total	**5.74**	**3.27**	**0.01**	**0.84**	**0.48**	**0.48**

Notes:

- Emission factors for NOx, CO, SOx, VOC, PM10, PM2.5 and CO2 are average NONROAD emission rates for the State of Washington.
- Emission factors for CH4 and N2O are from the Climate Registry 2014 Default Emission Factors, Table 13.7.
- Assume 48 hours per week; 4.28 weeks per month 205 hrs/month

Equipment List	No.	Equipment Use Duration (months)	Horsepower	Utilization	Load Factor	Fuel Use Rate (gal/hr)	CO_2 Emission Factor (g/hp-hr)	CH_4 Emission Factor (g/gal)	N_2O Emission Factor (g/gal)	CO_2 (metric ton/year)	CH_4 (metric ton/year)	N_2O (metric ton/year)	CO2e (metric ton/year)
Upland Construction (demo, soil, utilities)													
Cat 345 Backhoe 4 cy	1	6	165	75%	21%	0.518	624	0.740	0.450	22	3.9E-04	2.4E-04	22
100 Ton Crawler Crane	1	6	250	85%	43%	0.174	530	0.740	0.450	66	1.5E-04	9.0E-05	66
200 Ton Crawler Crane	1	6	300	85%	43%	0.174	530	0.740	0.450	79	1.5E-04	9.0E-05	79
22 Ton Hydrocrane	1	6	85	85%	43%	0.422	590	0.740	0.450	25	3.6E-04	2.2E-04	25
30 Ton Hydrocrane	1	6	100	85%	43%	0.422	590	0.740	0.450	29	3.6E-04	2.2E-04	29
Air Compressor	2	6	55	100%	43%	1.020	590	0.740	0.450	38	2.1E-03	1.2E-03	38
Cat Compactor	2	6	65	85%	59%	0.732	595	0.740	0.450	53	1.3E-03	7.6E-04	53
Cat D6 Dozer	2	6	65	85%	59%	0.489	595	0.740	0.450	53	8.4E-04	5.1E-04	53
Crew Truck, 3/4 ton	2	6	250	85%	59%	0.074	536	0.740	0.450	183	1.3E-04	7.6E-05	183
Dump Trucks 15 cy	2	6	285	75%	59%	0.074	536	0.740	0.450	184	1.1E-04	6.7E-05	184
Flatbed Truck (Matl. Handling)	1	6	200	85%	59%	0.112	536	0.740	0.450	73	9.6E-05	5.8E-05	73
Forklift, 8,000 lbs	1	6	85	50%	59%	0.653	595	0.740	0.450	20	3.3E-04	2.0E-04	20
Fuel Truck	2	6	200	85%	59%	0.112	536	0.740	0.450	146	1.9E-04	1.2E-04	146
Loader, Cat 966, 4 cy	2	6	100	85%	21%	0.646	693	0.740	0.450	34	1.1E-03	6.7E-04	34
Manlifts	1	6	50	85%	21%	3.661	691	0.740	0.450	8	3.1E-03	1.9E-03	9
In-water Construction													
Forklift, 8,000 lbs	2	6	65	75%	59%	0.653	595	0.740	0.450	47	9.8E-04	6.0E-04	47
Air Compressor	4	6	55	100%	43%	1.020	590	0.740	0.450	76	4.1E-03	2.5E-03	77
Crane, 60 ton	3	6	290	85%	43%	0.174	530	0.740	0.450	229	4.5E-04	2.7E-04	229
Crew Truck, 3/4 ton	3	6	250	25%	59%	0.074	536	0.740	0.450	81	5.5E-05	3.4E-05	81
Diesel Pile Driver Hammer	3	6	85	85%	59%	0.732	595	0.740	0.450	103	1.9E-03	1.1E-03	104
Flatbed Truck (Matl. Handling)	3	6	200	85%	59%	0.112	536	0.740	0.450	219	2.9E-04	1.7E-04	219
Fuel Truck	2	6	200	25%	59%	0.112	536	0.740	0.450	43	5.6E-05	3.4E-05	43
Loader, Cat 966, 4 cy	2	6	100	75%	21%	0.646	693	0.740	0.450	30	9.7E-04	5.9E-04	30
Personnel Work Boat	1	6	63	75%	45%	--	690	0.020	0.090	20	5.8E-04	2.6E-03	21
Tug/Work Barge w/crane	1	6	560	85%	45%	--	690	0.020	0.090	201	5.8E-03	2.6E-02	209
									Annual Total	**2,061**	**2.58E-02**	**4.06E-02**	**2,074**

Notes:

- Assume 48 hours per week; 4.28 weeks per month 205 hrs/month
- Emission factors for NOx, CO, SOx, VOC, PM10, PM2.5 and CO2 are average NONROAD emission rates for the State of Washington.
- Emission factors for CH4 and N2O are from the Climate Registry 2014 Default Emission Factors, Table 13.7.
- Tugboat, Workboat, and Personnel Boat Emissions factors from U.S. Environmental Protection Agency Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report April 2009, Table 3-8: Harbor Craft Emission Factors (g/kWh)
- Tugboat and Work barge EFs are in 'g/kWh' - engine size listed for these boats are in 'kWh' not 'hp'
- Work Boat and Tug Load Factor: Table 3-3: EPA Load Factors for Harbor Craft
- Global Warming Potential (GWP) for Selected GHG - 40 CFR 98 Subpart A, Table A-1

GWP CO_2 = 1

GWP CH_4 = 25

GWP N_2O = 298

Equipment List	No.	Equipment Use Duration (months)	Horsepower	Utilization	Load Factor	Fuel Use Rate (gal/hr)	CO_2 Emission Factor (g/hp-hr)	CH_4 Emission Factor (g/gal)	N_2O Emission Factor (g/gal)	CO_2 (metric ton/year)	CH_4 (metric ton/year)	N_2O (metric ton/year)	CO2e (metric ton/year)
Upland Construction (demo, soil, utilities)													
Cat 345 Backhoe 4 cy	1	6	165	75%	21%	0.52	625	0.740	0.450	22	3.9E-04	2.4E-04	22
100 Ton Crawler Crane	1	6	250	85%	43%	0.17	530	0.740	0.450	66	1.5E-04	9.0E-05	66
200 Ton Crawler Crane	1	6	300	85%	43%	0.17	530	0.740	0.450	79	1.5E-04	9.0E-05	79
22 Ton Hydrocrane	1	6	85	85%	43%	0.42	590	0.740	0.450	25	3.6E-04	2.2E-04	25
30 Ton Hydrocrane	1	6	100	85%	43%	0.42	590	0.740	0.450	29	3.6E-04	2.2E-04	29
Air Compressor	2	6	55	100%	43%	1.02	590	0.740	0.450	38	2.1E-03	1.2E-03	38
Cat Compactor	2	6	65	85%	59%	0.73	595	0.740	0.450	53	1.3E-03	7.6E-04	53
Cat D6 Dozer	2	6	65	85%	59%	0.49	596	0.740	0.450	53	8.4E-04	5.1E-04	53
Crew Truck, 3/4 ton	2	6	250	85%	59%	0.07	536	0.740	0.450	183	1.3E-04	7.6E-05	183
Dump Trucks 15 cy	2	6	285	75%	59%	0.07	536	0.740	0.450	184	1.1E-04	6.7E-05	184
Flatbed Truck (Matl. Handling)	1	6	200	85%	59%	0.11	536	0.740	0.450	73	9.6E-05	5.8E-05	73
Forklift, 8,000 lbs	1	6	85	50%	59%	0.65	595	0.740	0.450	20	3.3E-04	2.0E-04	20
Fuel Truck	2	6	200	85%	59%	0.11	536	0.740	0.450	146	1.9E-04	1.2E-04	146
Loader, Cat 966, 4 cy	2	6	100	85%	21%	0.65	693	0.740	0.450	34	1.1E-03	6.7E-04	34
Manlifts	1	6	50	85%	21%	3.66	691	0.740	0.450	8	3.1E-03	1.9E-03	9
In-water Construction													
Forklift, 8,000 lbs	2	1	65	75%	59%	0.65	595	0.740	0.450	8	1.6E-04	1.0E-04	8
Air Compressor	4	1	55	100%	43%	1.02	590	0.740	0.450	13	6.8E-04	4.2E-04	13
Crane, 60 ton	3	1	290	85%	43%	0.17	530	0.740	0.450	38	7.4E-05	4.5E-05	38
Crew Truck, 3/4 ton	3	1	250	25%	59%	0.07	536	0.740	0.450	13	9.2E-06	5.6E-06	13
Diesel Pile Driver Hammer	3	1	85	85%	59%	0.73	595	0.740	0.450	17	3.1E-04	1.9E-04	17
Flatbed Truck (Matl. Handling)	3	1	200	85%	59%	0.11	536	0.740	0.450	37	4.8E-05	2.9E-05	37
Fuel Truck	2	1	200	25%	59%	0.11	536	0.740	0.450	7	9.4E-06	5.7E-06	7
Loader, Cat 966, 4 cy	2	1	100	75%	21%	0.65	693	0.740	0.450	5	1.6E-04	9.9E-05	5
Personnel Work Boat	1	1	63	75%	45%	--	690	0.020	0.090	3	1.2E-04	5.3E-04	3
Tug/Work Barge w/crane	1	1	560	85%	45%	--	690	0.020	0.090	33	1.2E-03	5.3E-03	35
LNG Facility Construction (including Storage Tank)													
Cat 345 Backhoe 4 cy	1	7	165	85%	21%	0.52	625	0.740	0.450	29	5.2E-04	3.1E-04	29
100 Ton Crawler Crane	2	7	250	85%	43%	0.17	530	0.740	0.450	154	3.5E-04	2.1E-04	154
200 Ton Crawler Crane	3	7	300	85%	43%	0.17	530	0.740	0.450	277	5.2E-04	3.2E-04	277
22 Ton Hydrocrane	4	7	85	85%	43%	0.42	590	0.740	0.450	116	1.7E-03	1.0E-03	117
30 Ton Hydrocrane	3	7	100	85%	43%	0.42	590	0.740	0.450	102	1.3E-03	7.7E-04	103
Air Compressor	4	7	55	85%	43%	1.02	590	0.740	0.450	75	4.1E-03	2.5E-03	76
Cat Compactor	3	7	65	85%	59%	0.73	595	0.740	0.450	92	2.2E-03	1.3E-03	93
Cat D6 Dozer	3	7	65	85%	59%	0.49	596	0.740	0.450	92	1.5E-03	8.9E-04	93
Concrete Pump	3	7	150	85%	43%	1.06	589	0.74	0.45	154	3.2E-03	1.9E-03	154
Crane, 60 ton	1	7	290	50%	43%	0.17	530	0.740	0.450	52	1.0E-04	6.2E-05	52
Crew Truck, 3/4 ton	6	7	250	85%	59%	0.07	536	0.740	0.450	640	4.4E-04	2.7E-04	640
Dump Trucks 15 cy	1	7	285	75%	59%	0.07	536	0.740	0.450	107	6.5E-05	3.9E-05	107
Flatbed Truck (Matl. Handling)	3	7	200	85%	59%	0.11	536	0.740	0.450	256	3.3E-04	2.0E-04	256
Forklift, 8,000 lbs	3	7	85	50%	59%	0.65	595	0.740	0.450	71	1.1E-03	7.0E-04	71
Fuel Truck	3	7	200	85%	59%	0.11	536	0.740	0.450	256	3.3E-04	2.0E-04	256
Loader, Cat 966, 4 cy	3	7	100	85%	21%	0.65	693	0.740	0.450	59	1.9E-03	1.2E-03	59
Manlifts	6	7	50	85%	21%	3.66	691	0.740	0.450	59	2.2E-02	1.3E-02	63
									Annual Total	**3,778**	**5.49E-02**	**3.84E-02**	**3,791**

Notes:

- Assume 48 hours per week; 4.28 weeks per month 205 hrs/month
- Emission factors for NOx, CO, SOx, VOC, PM10, PM2.5 and CO2 are average NONROAD emission rates for the State of Washington.
- Emission factors for CH4 and N2O are from the Climate Registry 2014 Default Emission Factors, Table 13.7.
- Tugboat, Workboat, and Personnel Boat Emissions factors from U.S. Environmental Protection Agency Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report April 2009, Table 3-8: Harbor Craft Emission Factors (g/kWh)
- Tugboat and Work barge EFs are in 'g/kWh' - engine size listed for these boats are in 'kWh' not 'hp'
- Work Boat and Tug Load Factor: Table 3-3: EPA Load Factors for Harbor Craft
- Global Warming Potential (GWP) for Selected GHG - 40 CFR 98 Subpart A, Table A-1

GWP CO_2 = 1

GWP CH_4 = 25

GWP N_2O = 298

Equipment List	No.	Equipment Use Duration (months)	Horsepower	Utilization	Load Factor	Fuel Use Rate (gal/hr)	CO_2 Emission Factor (g/hp-hr)	CH_4 Emission Factor (g/gal)	N_2O Emission Factor (g/gal)	CO_2 (metric ton/year)	CH_4 (metric ton/year)	N_2O (metric ton/year)	CO2e (metric ton/year)
LNG Facility Construction (no Storage Tank Construction)													
100 Ton Crawler Crane	2	12	250	85%	43%	0.174	531	0.740	0.450	263	5.9E-04	3.6E-04	264
200 Ton Crawler Crane	2	12	300	85%	43%	0.174	531	0.740	0.450	316	5.9E-04	3.6E-04	316
22 Ton Hydrocrane	3	12	85	85%	43%	0.422	590	0.740	0.450	149	2.2E-03	1.3E-03	150
30 Ton Hydrocrane	2	12	100	85%	43%	0.422	590	0.740	0.450	117	1.4E-03	8.8E-04	117
Air Compressor	3	12	55	85%	43%	1.020	590	0.740	0.450	97	5.2E-03	3.2E-03	98
Cat Compactor	2	12	65	85%	59%	0.732	595	0.740	0.450	105	2.5E-03	1.5E-03	106
Cat D6 Dozer	2	12	65	85%	59%	0.489	596	0.740	0.450	106	1.7E-03	1.0E-03	106
Concrete Pump	2	12	150	85%	43%	1.058	589	0.740	0.450	175	3.6E-03	2.2E-03	176
Crane, 60 ton	1	12	290	50%	43%	0.174	531	0.740	0.450	90	1.7E-04	1.1E-04	90
Crew Truck, 3/4 ton	4	12	250	85%	59%	0.074	536	0.740	0.450	731	5.0E-04	3.1E-04	731
Flatbed Truck (Matl. Handling)	2	12	200	85%	59%	0.112	536	0.740	0.450	292	3.8E-04	2.3E-04	292
Forklift, 8,000 lbs	2	12	85	25%	59%	0.653	595	0.740	0.450	41	6.6E-04	4.0E-04	41
Fuel Truck	2	12	200	85%	59%	0.112	536	0.740	0.450	292	3.8E-04	2.3E-04	292
Loader, Cat 966, 4 cy	2	12	100	85%	21%	0.646	694	0.740	0.450	67	2.2E-03	1.3E-03	68
Manlifts	4	12	50	85%	21%	3.661	692	0.740	0.450	67	2.5E-02	1.5E-02	72
									Annual Total	**2,910**	**4.71E-02**	**2.87E-02**	**2,920**

Notes:

- Assume 48 hours per week; 4.28 weeks per month 205 hrs/month
- Emission factors for NOx, CO, SOx, VOC, PM10, PM2.5 and CO2 are average NONROAD emission rates for the State of Washington.
- Emission factors for CH4 and N2O are from the Climate Registry 2014 Default Emission Factors, Table 13.7.
- Global Warming Potential (GWP) for Selected GHG - 40 CFR 98 Subpart A, Table A-1

GWP CO_2 = 1
GWP CH_4 = 25
GWP N_2O = 298

Equipment List	No.	Equipment Use Duration (months)	Horsepower	Utilization	Load Factor	Fuel Use Rate (gal/hr)	CO_2 Emission Factor (g/hp-hr)	CH_4 Emission Factor (g/gal)	N_2O Emission Factor (g/gal)	CO_2 (metric ton/year)	CH_4 (metric ton/year)	N_2O (metric ton/year)	CO2e (metric ton/year)
LNG Facility Construction (no Storage Tank Construction)													
100 Ton Crawler Crane	2	7	250	85%	43%	0.174	531	0.740	0.450	154	3.5E-04	2.1E-04	154
200 Ton Crawler Crane	2	7	300	85%	43%	0.174	531	0.740	0.450	184	3.5E-04	2.1E-04	185
22 Ton Hydrocrane	3	7	85	85%	43%	0.422	590	0.740	0.450	87	1.3E-03	7.7E-04	87
30 Ton Hydrocrane	2	7	100	85%	43%	0.422	590	0.740	0.450	68	8.4E-04	5.1E-04	69
Air Compressor	3	7	55	85%	43%	1.020	590	0.740	0.450	56	3.1E-03	1.9E-03	57
Cat Compactor	2	7	65	85%	59%	0.732	595	0.740	0.450	62	1.5E-03	8.9E-04	62
Cat D6 Dozer	2	7	65	85%	59%	0.489	596	0.740	0.450	62	9.8E-04	5.9E-04	62
Concrete Pump	2	7	150	85%	43%	1.058	589	0.740	0.450	102	2.1E-03	1.3E-03	103
Crane, 60 ton	1	7	290	50%	43%	0.174	531	0.740	0.450	52	1.0E-04	6.2E-05	52
Crew Truck, 3/4 ton	4	7	250	85%	59%	0.074	536	0.740	0.450	426	2.9E-04	1.8E-04	426
Flatbed Truck (Matl. Handling)	2	7	200	85%	59%	0.112	536	0.740	0.450	171	2.2E-04	1.4E-04	171
Forklift, 8,000 lbs	2	7	85	25%	59%	0.653	595	0.740	0.450	24	3.8E-04	2.3E-04	24
Fuel Truck	2	7	200	85%	59%	0.112	536	0.740	0.450	171	2.2E-04	1.4E-04	171
Loader, Cat 966, 4 cy	2	7	100	85%	21%	0.646	694	0.740	0.450	39	1.3E-03	7.8E-04	40
Manlifts	4	7	50	85%	21%	3.661	692	0.740	0.450	39	1.5E-02	8.9E-03	42
									Annual Total	**1,698**	**2.75E-02**	**1.67E-02**	**1,703**

Notes:

- Assume 48 hours per week; 4.28 weeks per month 205 hrs/month
- Emission factors for NOx, CO, SOx, VOC, PM10, PM2.5 and CO2 are average NONROAD emission rates for the State of Washington.
- Emission factors for CH4 and N2O are from the Climate Registry 2014 Default Emission Factors, Table 13.7.
- Global Warming Potential (GWP) for Selected GHG - 40 CFR 98 Subpart A, Table A-1

GWP CO_2 = 1

GWP CH_4 = 25

GWP N_2O = 298

Road Vehicle Terminal Construction Criteria Pollutant Emissions
PSE LNG

Construction Vehicle Emissions - Winter 2015

Vehicle Class	Area From Which Workers Commute	VMT	NOx Running Exhaust (g/mi)	CO Running Exhaust (g/mi)	SOx Running Exhaust (g/mi)	VOCs Running Exhaust (g/mi)	PM_{10} Running Exhaust (g/mi)	$PM_{2.5}$ Running Exhaust (g/mi)	NOx (tons/year)	CO (tons/year)	SOx (tons/year)	VOCs (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Construction Workers	Seattle-Tacoma	0	0.262	2.826	0.006	0.036	0.030	0.017	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Heavy Duty Delivery Trucks		38	14.1	3.11	0.01	0.524	0.793	0.710	6.0E-04	1.3E-04	6.2E-07	2.2E-05	3.3E-05	3.0E-05
									6.0E-04	**1.3E-04**	**6.2E-07**	**2.2E-05**	**3.3E-05**	**3.0E-05**

Construction Vehicle Emissions - Summer 2015

Vehicle Class	Area From Which Workers Commute	VMT	NOx Running Exhaust (g/mi)	CO Running Exhaust (g/mi)	SOx Running Exhaust (g/mi)	VOCs Running Exhaust (g/mi)	PM_{10} Running Exhaust (g/mi)	$PM_{2.5}$ Running Exhaust (g/mi)	NOx (tons/year)	CO (tons/year)	SOx (tons/year)	VOCs (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Construction Workers	Seattle-Tacoma	0	0.233	1.827	0.006	0.036	0.020	0.008	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Heavy Duty Delivery Trucks		1,224	12.7	3.11	0.02	0.524	0.793	0.710	1.7E-02	4.2E-03	2.1E-05	7.1E-04	1.1E-03	9.6E-04
									1.7E-02	**4.2E-03**	**2.1E-05**	**7.1E-04**	**1.1E-03**	**9.6E-04**
									1.8E-02	**4.3E-03**	**2.1E-05**	**7.3E-04**	**1.1E-03**	**9.9E-04**

Construction Vehicle Emissions - Winter 2016

Vehicle Class	Area From Which Workers Commute	VMT	NOx Running Exhaust (g/mi)	CO Running Exhaust (g/mi)	SOx Running Exhaust (g/mi)	VOCs Running Exhaust (g/mi)	PM_{10} Running Exhaust (g/mi)	$PM_{2.5}$ Running Exhaust (g/mi)	NOx (tons/year)	CO (tons/year)	SOx (tons/year)	VOCs (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Construction Workers	Seattle-Tacoma	309,120	0.219	2.676	0.006	0.030	0.030	0.017	7.5E-02	9.1E-01	1.9E-03	1.0E-02	1.0E-02	5.6E-03
Heavy Duty Delivery Trucks		9,999	12.8	2.86	0.01	0.480	0.718	0.637	1.4E-01	3.2E-02	1.6E-04	5.3E-03	7.9E-03	7.0E-03
									2.2E-01	**9.4E-01**	**2.1E-03**	**1.5E-02**	**1.8E-02**	**1.3E-02**

Construction Vehicle Emissions - Summer 2016

Vehicle Class	Area From Which Workers Commute	VMT	NOx Running Exhaust (g/mi)	CO Running Exhaust (g/mi)	SOx Running Exhaust (g/mi)	VOCs Running Exhaust (g/mi)	PM_{10} Running Exhaust (g/mi)	$PM_{2.5}$ Running Exhaust (g/mi)	NOx (tons/year)	CO (tons/year)	SOx (tons/year)	VOCs (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Construction Workers	Seattle-Tacoma	309,120	0.196	1.695	0.006	0.030	0.020	0.008	0.067	0.578	0.002	0.010	0.007	0.003
Heavy Duty Delivery Trucks		5,789	11.6	2.86	0.02	0.480	0.718	0.637	0.074	0.018	0.000	0.003	0.005	0.004
									0.141	**0.596**	**0.002**	**0.013**	**0.011**	**0.007**
									0.356	**1.539**	**0.004**	**0.029**	**0.029**	**0.019**

Construction Vehicle Emissions - Winter 2017

Vehicle Class	Area From Which Workers Commute	VMT	NOx Running Exhaust (g/mi)	CO Running Exhaust (g/mi)	SOx Running Exhaust (g/mi)	VOCs Running Exhaust (g/mi)	PM_{10} Running Exhaust (g/mi)	$PM_{2.5}$ Running Exhaust (g/mi)	NOx (tons/year)	CO (tons/year)	SOx (tons/year)	VOCs (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Construction Workers	Seattle-Tacoma	302,400	0.184	2.559	0.005	0.025	0.029	0.016	0.061	0.853	0.002	0.008	0.010	0.005
Heavy Duty Delivery Trucks		6,355	11.5	2.62	0.01	0.439	0.640	0.562	0.081	0.018	0.000	0.003	0.004	0.004
									0.142	**0.871**	**0.002**	**0.011**	**0.014**	**0.009**

Construction Vehicle Emissions - Summer 2017

Vehicle Class	Area From Which Workers Commute	VMT	NOx Running Exhaust (g/mi)	CO Running Exhaust (g/mi)	SOx Running Exhaust (g/mi)	VOCs Running Exhaust (g/mi)	PM_{10} Running Exhaust (g/mi)	$PM_{2.5}$ Running Exhaust (g/mi)	NOx (tons/year)	CO (tons/year)	SOx (tons/year)	VOCs (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Construction Workers	Seattle-Tacoma	614,880	0.166	1.593	0.005	0.025	0.020	0.008	0.112	1.080	0.004	0.017	0.013	0.005
Heavy Duty Delivery Trucks		4,161	10.4	2.62	0.02	0.439	0.640	0.562	0.048	0.012	0.000	0.002	0.003	0.003
									0.160	**1.092**	**0.004**	**0.019**	**0.016**	**0.008**
									0.302	**1.963**	**0.006**	**0.030**	**0.031**	**0.017**

Construction Vehicle Emissions - Winter 2018

Vehicle Class	Area From Which Workers Commute	VMT	NOx Running Exhaust (g/mi)	CO Running Exhaust (g/mi)	SOx Running Exhaust (g/mi)	VOCs Running Exhaust (g/mi)	PM_{10} Running Exhaust (g/mi)	$PM_{2.5}$ Running Exhaust (g/mi)	NOx (tons/year)	CO (tons/year)	SOx (tons/year)	VOCs (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Construction Workers	Seattle-Tacoma	0	0.156	2.464	0.005	0.021	0.029	0.016	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Heavy Duty Delivery Trucks		456	10.3	2.38	0.01	0.397	0.561	0.485	5.19E-03	1.20E-03	7.25E-06	2.00E-04	2.82E-04	2.44E-04
									5.19E-03	**1.20E-03**	**7.25E-06**	**2.00E-04**	**2.82E-04**	**2.44E-04**

Construction Vehicle Emissions - Summer 2018

Vehicle Class	Area From Which Workers Commute	VMT	NOx Running Exhaust (g/mi)	CO Running Exhaust (g/mi)	SOx Running Exhaust (g/mi)	VOCs Running Exhaust (g/mi)	PM_{10} Running Exhaust (g/mi)	$PM_{2.5}$ Running Exhaust (g/mi)	NOx (tons/year)	CO (tons/year)	SOx (tons/year)	VOCs (tons/year)	PM_{10} (tons/year)	$PM_{2.5}$ (tons/year)
Construction Workers	Seattle-Tacoma	0	0.141	1.512	0.005	0.021	0.020	0.007	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Heavy Duty Delivery Trucks		306	9.3	2.38	0.01	0.397	0.561	0.485	3.1E-03	8.0E-04	5.1E-06	1.3E-04	1.9E-04	1.6E-04
									3.1E-03	**8.0E-04**	**5.1E-06**	**1.3E-04**	**1.9E-04**	**1.6E-04**
									8.3E-03	**2.0E-03**	**1.2E-05**	**3.3E-04**	**4.7E-04**	**4.1E-04**

Notes:
EFs from EPA MOVES model.
Construction Worker vehicles assumed to be ID 21 - Passenger Car. Heavy-Duty Delivery trucks assumed to be 61 - Combination Short-haul truck.
Assume 48 hours per week; 4.28 weeks per month

Month/Year	Season	# work days/month	# of Cars/day	# cars/month	Car VMT/month[a]	# of Trucks/month	Truck VMT/month[a]	Total On-Site VMT/month (Car and Truck)
Jan-15	Winter 2015	26.6	0	0	0	0	0	0
Feb-15		24.0	0	0	0	0	0	0
Mar-15		26.6	0	0	0	0	0	0
Apr-15	Summer 2015	25.7	0	0	0	0	0	0
May-15		26.6	0	0	0	0	0	0
Jun-15		25.7	0	0	0	85	331	331
Jul-15		26.6	0	0	0	85	320	320
Aug-15		26.6	0	0	0	75	282	282
Sep-15		25.7	0	0	0	75	292	292
Oct-15	Winter 2015	26.6	0	0	0	5	19	19
Nov-15		25.7	0	0	0	5	19	19
Dec-15		26.6	0	0	0	0	0	0
Jan-16	Winter 2016	26.6	0	0	0	0	0	0
Feb-16		24.9	0	0	0	0	0	0
Mar-16		26.6	0	0	0	0	0	0
Apr-16	Summer 2016	25.7	0	0	0	0	0	0
May-16		26.6	0	0	0	0	0	0
Jun-16		25.7	0	0	0	174	677	677
Jul-16		26.6	98	2,604	104,160	244	918	105,078
Aug-16		26.6	98	2,604	104,160	294	1,106	105,266
Sep-16		25.7	98	2,520	100,800	794	3,088	103,888
Oct-16	Winter 2016	26.6	98	2,604	104,160	844	3,176	107,336
Nov-16		25.7	98	2,520	100,800	894	3,477	104,277
Dec-16		26.6	98	2,604	104,160	889	3,346	107,506
Jan-17	Winter 2017	26.6	98	2,604	104,160	888	3,342	107,502
Feb-17		24.0	98	2,352	94,080	329	1,371	95,451
Mar-17		26.6	98	2,604	104,160	279	1,050	105,210
Apr-17	Summer 2017	25.7	98	2,520	100,800	279	1,085	101,885
May-17		26.6	98	2,604	104,160	252	948	105,108
Jun-17		25.7	98	2,520	100,800	189	735	101,535
Jul-17		26.6	98	2,604	104,160	139	523	104,683
Aug-17		26.6	98	2,604	104,160	139	523	104,683
Sep-17		25.7	98	2,520	100,800	89	346	101,146
Oct-17	Winter 2017	26.6	0	0	0	78	294	294
Nov-17		25.7	0	0	0	39	152	152
Dec-17		26.6	0	0	0	39	147	147
Jan-18	Winter 2018	26.6	0	0	0	39	147	147
Feb-18		24.0	0	0	0	39	163	163
Mar-18		26.6	0	0	0	39	147	147
Apr-18	Summer 2018	25.7	0	0	0	41	159	159
May-18		26.6	0	0	0	39	147	147
Jun-18		25.7	0	0	0	0	0	0
Jul-18		26.6	0	0	0	0	0	0
Aug-18		26.6	0	0	0	0	0	0
Sep-18		25.7	0	0	0	0	0	0
Oct-18	Winter 2018	26.6	0	0	0	0	0	0
Nov-18		25.7	0	0	0	0	0	0
Dec-18		26.6	0	0	0	0	0	0

Base on info from

Cars VMT round trip	40	mi/day
Truck VMT round trip	100	mi/day

Note: Commute round-trip distance was assumed

Road Vehicle Terminal Construction Criteria Pollutant Emissions
PSE LNG

Construction Vehicle Emissions - Winter 2015									
Vehicle Class	Area From Which Workers Commute	VMT	CO_2 Running Exhaust (g/mi)	CH4 (g/mi)	N_2O (g/mi)	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO2e (metric tons/year)
Construction Workers	Seattle-Tacoma	0	311	0.004	0.002	0.000	0.0E+00	0.0E+00	0.000
Heavy Duty Delivery Trucks		38	1,942	0.028	0.002	0.074	1.1E-06	7.9E-08	0.074
					Total	**0.074**	**1.1E-06**	**7.9E-08**	**0.074**

Construction Vehicle Emissions - Summer 2015									
Vehicle Class	Area From Which Workers Commute	VMT	CO_2 Running Exhaust (g/mi)	CH4 (g/mi)	N_2O (g/mi)	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO2e (metric tons/year)
Construction Workers	Seattle-Tacoma	0	325.206	0.004	0.002	0.00	0.0E+00	0.0E+00	0.00
Heavy Duty Delivery Trucks		1,224	2,017	0.028	0.002	2.47	3.4E-05	2.5E-06	2.47
					Total	**2.47**	**3.4E-05**	**2.5E-06**	**2.47**
					Annual Total	**2.54**	**3.5E-05**	**2.6E-06**	**2.55**

Construction Vehicle Emissions - Winter 2016									
Vehicle Class	Area From Which Workers Commute	VMT	CO_2 Running Exhaust (g/mi)	CH4 (g/mi)	N_2O (g/mi)	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO2e (metric tons/year)
Construction Workers	Seattle-Tacoma	309,120	306	0.003	0.001	95	1.0E-03	4.5E-04	95
Heavy Duty Delivery Trucks		9,999	1,942	0.030	0.002	19.4	3.0E-04	2.1E-05	19.4
					Total	**114**	**0.001**	**4.7E-04**	**114**

Construction Vehicle Emissions - Summer 2016									
Vehicle Class	Area From Which Workers Commute	VMT	CO_2 Running Exhaust (g/mi)	CH4 (g/mi)	N_2O (g/mi)	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO2e (metric tons/year)
Construction Workers	Seattle-Tacoma	309,120	319.323	0.003	0.001	99	1.0E-03	4.5E-04	99
Heavy Duty Delivery Trucks		5,789	2,018	0.030	0.002	11.68	1.7E-04	1.2E-05	11.69
					Total	**110**	**0.001**	**4.6E-04**	**111**
					Annual Total	**224**	**0.003**	**0.001**	**225**

Construction Vehicle Emissions - Winter 2017									
Vehicle Class	Area From Which Workers Commute	VMT	CO_2 Running Exhaust (g/mi)	CH4 (g/mi)	N_2O (g/mi)	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO2e (metric tons/year)
Construction Workers	Seattle-Tacoma	302,400	300	0.003	0.001	91	9.5E-04	4.0E-04	91
Heavy Duty Delivery Trucks		6,355	1,942	0.032	0.002	12.34	2.0E-04	1.3E-05	12.35
					Total	**103**	**0.001**	**4.1E-04**	**103**

Construction Vehicle Emissions - Summer 2017									
Vehicle Class	Area From Which Workers Commute	VMT	CO_2 Running Exhaust (g/mi)	CH4 (g/mi)	N_2O (g/mi)	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO2e (metric tons/year)
Construction Workers	Seattle-Tacoma	614,880	313.79	0.003	0.001	193	2.0E-03	8.1E-04	193
Heavy Duty Delivery Trucks		4,161	2,018	0.032	0.002	8.40	1.3E-04	8.6E-06	8.40
					Total	**201**	**0.002**	**0.001**	**202**
					Annual Total	**305**	**0.003**	**0.001**	**305**

Construction Vehicle Emissions - Winter 2018									
Vehicle Class	Area From Which Workers Commute	VMT	CO_2 Running Exhaust (g/mi)	CH4 (g/mi)	N_2O (g/mi)	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO2e (metric tons/year)
Construction	Seattle-Tacoma	0	295	0.003	0.001	0.000	0.0E+00	0.0E+00	0.000
Heavy Duty Delivery Trucks		456	1,942	0.034	0.002	0.885	1.5E-05	9.4E-07	0.886
					Total	**0.885**	**1.5E-05**	**9.4E-07**	**0.886**

Construction Vehicle Emissions - Summer 2018									
Vehicle Class	Area From Which Workers Commute	VMT	CO_2 Running Exhaust (g/mi)	CH4 (g/mi)	N_2O (g/mi)	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO2e (metric tons/year)
Construction Workers	Seattle-Tacoma	0	308.46	0.003	0.001	0.000	0.0E+00	0.0E+00	0.000
Heavy Duty Delivery Trucks		306	2,019	0.034	0.002	0.618	1.0E-05	6.3E-07	0.619
					Total	**0.618**	**1.0E-05**	**6.3E-07**	**0.619**
					Annual Total	**1.50**	**2.6E-05**	**1.6E-06**	**1.50**

Notes:
EFs from EPA MOVES model.
Construction Worker vehicles assumed to be ID 21 - Passenger Car. Heavy-Duty Delivery trucks assumed to be 61 - Combination Short-haul truck.
Assume 48 hours per week; 4.28 weeks per month
Global Warming Potential (GWP) for Selected GHG - 40 CFR 98 Subpart A, Table A-1
GWP CO_2 = 1
GWP CH_4 = 21
GWP N_2O = 310

Month/Year	Season	# work days/month	# of Cars/day	# cars/month	Car VMT/month	# of Trucks/month	Truck VMT/month	Total On-Site VMT/month (Car and Truck)
Jan-15	Winter 2015	26.6	0	0	0	0	0	0
Feb-15		24.0	0	0	0	0	0	0
Mar-15		26.6	0	0	0	0	0	0
Apr-15	Summer 2015	25.7	0	0	0	0	0	0
May-15		26.6	0	0	0	0	0	0
Jun-15		25.7	0	0	0	85	331	331
Jul-15		26.6	0	0	0	85	320	320
Aug-15		26.6	0	0	0	75	282	282
Sep-15		25.7	0	0	0	75	292	292
Oct-15	Winter 2015	26.6	0	0	0	5	19	19
Nov-15		25.7	0	0	0	5	19	19
Dec-15		26.6	0	0	0	0	0	0
Jan-16	Winter 2016	26.6	0	0	0	0	0	0
Feb-16		24.9	0	0	0	0	0	0
Mar-16		26.6	0	0	0	0	0	0
Apr-16	Summer 2016	25.7	0	0	0	0	0	0
May-16		26.6	0	0	0	0	0	0
Jun-16		25.7	0	0	0	174	677	677
Jul-16		26.6	98	2,604	104,160	244	918	105,078
Aug-16		26.6	98	2,604	104,160	294	1,106	105,266
Sep-16		25.7	98	2,520	100,800	794	3,088	103,888
Oct-16	Winter 2016	26.6	98	2,604	104,160	844	3,176	107,336
Nov-16		25.7	98	2,520	100,800	894	3,477	104,277
Dec-16		26.6	98	2,604	104,160	889	3,346	107,506
Jan-17	Winter 2017	26.6	98	2,604	104,160	888	3,342	107,502
Feb-17		24.0	98	2,352	94,080	329	1,371	95,451
Mar-17		26.6	98	2,604	104,160	279	1,050	105,210
Apr-17	Summer 2017	25.7	98	2,520	100,800	279	1,085	101,885
May-17		26.6	98	2,604	104,160	252	948	105,108
Jun-17		25.7	98	2,520	100,800	189	735	101,535
Jul-17		26.6	98	2,604	104,160	139	523	104,683
Aug-17		26.6	98	2,604	104,160	139	523	104,683
Sep-17		25.7	98	2,520	100,800	89	346	101,146
Oct-17	Winter 2017	26.6	0	0	0	78	294	294
Nov-17		25.7	0	0	0	39	152	152
Dec-17		26.6	0	0	0	39	147	147
Jan-18	Winter 2018	26.6	0	0	0	39	147	147
Feb-18		24.0	0	0	0	39	163	163
Mar-18		26.6	0	0	0	39	147	147
Apr-18	Summer 2018	25.7	0	0	0	41	159	159
May-18		26.6	0	0	0	39	147	147
Jun-18		25.7	0	0	0	0	0	0
Jul-18		26.6	0	0	0	0	0	0
Aug-18		26.6	0	0	0	0	0	0
Sep-18		25.7	0	0	0	0	0	0
Oct-18	Winter 2018	26.6	0	0	0	0	0	0
Nov-18		25.7	0	0	0	0	0	0
Dec-18		26.6	0	0	0	0	0	0

Cars VMT round trip 40 mi/day
Truck VMT round trip 100 mi/day
Note: Commute round-trip distance was assumed

Fugitive Dust Terminal Construction Emissions
PSE LNG

I. Site grading fugitive emissions

Site Prep/Disturbance	PM_{10} Tons/ Acre-month[1]	Acres worked	Months	Uncontrolled PM_{10} Emissions (tons)	Uncontrolled $PM_{2.5}$ Emissions (Ton)[4]	Seasonal Controls	Controlled PM_{10} Emissions (tons)	Controlled $PM_{2.5}$ Emissions (Ton)
Tacoma LNG Facility	0.11	32.2	6.0	21.25	2.13	61%	8.29	0.83

Notes:

(1) Emission factors from WRAP Fugitive Dust Handbook, September 2006, Table 3-2.

(2) Acres worked from Chapter 2, Project Description, Draft EIS.

(4) The PM2.5/PM10 ratio for fugitive dust from construction and demolition activities is 0.1.(WRAP, section 3.4.1)

(5) Table 3-6. Control Efficiencies for Control Measures for Construction/Demolition: Construction site watering: MRI, April 2001, test series 701. 3.2-hour watering interval

(6) Site grading assumed to occur in 2015.

II. On-site on-road car/truck travel fugitive emissions

Operation- Car/Truck Travel onsite	Annual VMTs	PM_{10} Emission Factor (lb/VMT)	PM2.5 Emission Factor (lb/VMT)	PM_{10} Emissions (ton/year)	$PM_{2.5}$ Emissions (tons/year)
Year 2015	1,263	0.002	0.001	1.46E-03	3.59E-04
Year 2016	634,028	0.002	0.001	7.35E-01	1.80E-01
Year 2017	927,795	0.002	0.001	1.08E+00	2.64E-01
Year 2018	762	0.002	0.001	8.83E-04	2.17E-04

Notes:

- PM10 and PM2.5 emission factors for paved surface from AP-42, 13.2.1.3, Equation 2: E = k (sL)^0.91 x W^1.02 x (1 - P/4N)

Where,

k = particle size multiplier_PM10	0.0022	lb/VMT
k = particle size multiplier_PM2.5	0.00054	lb/VMT
sL = road silt loading	0.2	g/m2
W = average fleet vehicle weight	4.91	tons
P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period,	147	days
N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly)	365	days

- Road surface silt loading taken from "Urban area local roads" category used in Dept of Ecology - Washington State 2011 County Emissions Inventory (April 25, 2014), Table 3-5
- Wet days source: U.S. National Oceanic and Atmospheric Administration, Comparative Climatic Data, annual. Table 382. Mean Number of Days With precipitaion of .01 Inch or More -- Selected Cities (Seattle-Tacoma) http://www.ncdc.noaa.gov/oa/climate/climateproducts.html
- Other miscellaneous data used to calculate on-road fugitive emissions:

Average Vehicle Weight		
Cars avg weight	2	tons
Heavy Duty Truck avg weight	20	tons
# of Cars in project	38,388	# veh
# of HD Trucks in project	7,399	# veh
Total # Vehicles	45,787	# veh
Avg Veh. Weight (weighted average)	4.91	tons

Notes:
- Number of cars and trucks comes from 'Road Vehicle' calculation tab
- Cars assumed to be 2 tons on average, Heavy Duty trucks assumed to be HD Vehicle Class 7 (~20 tons)

Total VMT Traveled (Cars and Truck)		
Year 2015	1,263	VMT/yr
Year 2016	634,028	VMT/yr
Year 2017	927,795	VMT/yr
Year 2018	762	VMT/yr

Notes:
- VMT data comes from 'Road Vehicle' calculation tab
- Assumed 1 mile traveld on-site per day per heavy-duty deliery truck and commuting car.

III. Total fugitive emissions

Construction Year	PM_{10} Emissions (ton/yr)	$PM_{2.5}$ Emissions (tons/year)
Year 2015	8.29	0.83
Year 2016	0.73	0.18
Year 2017	1.08	0.26
Year 2018	8.83E-04	2.17E-04

Appendix D-2: Operations Emissions

Air Emissions Summary

Tacoma LNG Project

Source	Potential to Emit (lb/hour)									Potential to Emit (ton/year)												
Description	**PM_{10}**	**$PM_{2.5}$**	**NOx**	**CO**	**SO_2**	**VOC**	**H_2SO_4**	**TAPS**	**HAPS**	**PM_{10}**	**$PM_{2.5}$**	**NOx**	**CO**	**SO_2**	**VOC**	**H_2SO_4**	**TAPS**	**HAPS**	**CO_2**	**CH_4**	**N_2O**	**CO2e (metric)**
Emission Units																						
Pretreatment Heater	0.06	0.06	0.31	0.63	0.007	0.18	3.46E-04	0.95	1.58E-02	0.28	0.28	1.36	2.75	0.03	0.79	1.52E-03	4.14	6.90E-02	4,343	8.19E-02	8.19E-03	3,952
Enclosed Ground Flare (pilot and vent gas)	0.10	0.10	1.44	2.93	1.24	1.65	0.06	5.62	6.29E-02	0.46	0.46	6.32	12.8	5.45	7.23	2.73E-01	24.6	2.75E-01	16,113	1.02E-01	1.02E-02	14,654
Emergency Flare	3.8E-03	3.8E-03	0.04	0.09	4.20E-04	0.03	2.10E-05	0.13	9.52E-04	0.02	0.02	0.19	0.39	0.002	0.11	9.21E-05	0.58	4.17E-03	199	3.76E-03	3.76E-04	181
LNG Vaporizer (Back-Up)	0.21	0.21	1.04	2.11	0.02	0.60	1.16E-03	3.17	5.28E-02	0.11	0.11	0.52	1.05	0.01	0.30	5.80E-04	1.59	2.64E-02	979	3.14E-02	3.14E-03	981
1600 KW Emergency Diesel Generator	0.71	0.71	21.4	12.3	0.02	1.13	-	34.6	0.0	0.18	0.18	5.36	3.09	0.01	0.28	-	8.65	5.90E-03	612	2.48E-02	4.96E-03	614
Total	**1.09**	**1.09**	**24.3**	**18.1**	**1.30**	**3.59**	**0.06**	**44.5**	**0.16**	**1.03**	**1.03**	**13.8**	**20.1**	**5.50**	**8.72**	**0.27**	**39.6**	**0.38**	**22,246**	**2.44E-01**	**2.69E-02**	**20,381**
Fugitives - Pretreatment, Liquefaction, Regasification, and Marine																						
Tacoma LNG Processes	-	-	-	-	-	6.6E-04	-		-	-	-	-	-	-	2.89E-03	-	-	-	-	2.1	-	51.2
Refrigerant losses						17.6									77.0					14		318
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**17.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**77.0**	**0.0**	**0.0**	**0.0**	**0.0**	**16.1**	**0.0**	**369**
Summary																						
Total for Permit (Pretreatment, Terminal, and Fugitives)	**1.09**	**1.09**	**24.3**	**18.1**	**1.30**	**21.2**	**0.06**	**44.46**	**0.16**	**1.03**	**1.03**	**13.8**	**20.1**	**5.50**	**85.7**	**0.27**	**39.6**	**0.38**	**22,246**	**16.3**	**0.03**	**20,751**
Grand Total																						

Description	**Threshold**											
Title V Permit	100	100	100	100	100	100	100		10 individual or 25 combined	100	100	100	100,000
PSD	250	250	250	250	250	250	250		10 individual or 25 combined	250	250	250	100,000

HAP Summary
Tacoma LNG Project

Hazardous Air Pollutant	PTE (tons/year)					
	Pretreatment Heater	LNG Vaporizer (Back-Up)	Enclosed Flare	Emergency Flare	Terminal Emergency Generator	Total
2-Methylnaphthalene	8.78E-07	3.4E-07	3.5E-06	5.3E-08		**4.8E-06**
2,2,4-Trimethylpentane						**0.0E+00**
3-Methylchloranthrene	6.58E-08	2.5E-08	2.6E-07	4.0E-09		**3.6E-07**
7,12-Dimethylbenz(a)anthracene	5.85E-07	2.2E-07	2.3E-06	3.5E-08		**3.2E-06**
1,2,4-Trimethylbenzene						**0.0E+00**
Acenaphthene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	1.8E-05	**1.8E-05**
Acenaphthylene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	3.5E-05	**3.5E-05**
Acetaldehyde					9.5E-05	**9.5E-05**
Acrolein					3.0E-05	**3.0E-05**
Anthracene	8.78E-08	3.4E-08	3.5E-07	5.3E-09	4.6E-06	**5.1E-06**
Benzo(a)anthracene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	2.3E-06	**2.7E-06**
Benzene	7.68E-05	2.9E-05	3.1E-04	4.7E-06	2.9E-03	**3.3E-03**
Benzo(a)pyrene	4.39E-08	1.7E-08	1.8E-07	2.7E-09	9.6E-07	**1.2E-06**
Benzo(b)fluoranthene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	4.2E-06	**4.5E-06**
Benzo(g,h,i)perylene	4.39E-08	1.7E-08	1.8E-07	2.7E-09	2.1E-06	**2.3E-06**
Benzo(k)fluoranthene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	8.2E-07	**1.2E-06**
Chrysene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	5.7E-06	**6.1E-06**
Dibenz(a,h)anthracene	4.39E-08	1.7E-08	1.8E-07	2.7E-09	1.3E-06	**1.5E-06**
Dichlorobenzene	4.39E-05	1.7E-05	1.8E-04	2.7E-06		**2.4E-04**
Ethylbenzene						**0.0E+00**
Fluoranthene	1.10E-07	4.2E-08	4.4E-07	6.6E-09	1.5E-05	**1.6E-05**
Fluorene	1.02E-07	3.9E-08	4.1E-07	6.2E-09	4.8E-05	**4.9E-05**
Formaldehyde	2.74E-03	1.0E-03	1.1E-02	1.7E-04	3.0E-04	**1.5E-02**
Hexane	6.58E-02	2.5E-02	2.6E-01	4.0E-03		**3.6E-01**
Indeno(1,2,3-cd)pyrene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	1.6E-06	**1.9E-06**
Naphthalene	2.23E-05	8.5E-06	8.9E-05	1.4E-06	4.9E-04	**6.1E-04**
Propylene Oxide						**0.0E+00**
Phenanthrene	6.22E-07	2.4E-07	2.5E-06	3.8E-08	1.5E-04	**1.6E-04**
Pyrene	1.83E-07	7.0E-08	7.3E-07	1.1E-08	1.4E-05	**1.5E-05**
Toluene	1.24E-04	4.8E-05	5.0E-04	7.5E-06	1.1E-03	**1.7E-03**
Xylenes					7.2E-04	**7.2E-04**
Arsenic	7.31E-06	2.8E-06				**1.0E-05**
Beryllium	4.39E-07	1.7E-07				**6.1E-07**
Cadmium	4.02E-05	1.5E-05				**5.6E-05**
Chromium	5.12E-05	2.0E-05				**7.1E-05**
Cobalt	3.07E-06	1.2E-06				**4.2E-06**
Manganese	1.39E-05	5.3E-06				**1.9E-05**
Mercury	9.51E-06	3.6E-06				**1.3E-05**
Nickel	7.68E-05	2.9E-05				**1.1E-04**
Selenium	8.78E-07	3.4E-07				**1.2E-06**
Total	**6.90E-02**	**2.64E-02**	**2.75E-01**	**4.17E-03**	**5.90E-03**	**0.38**

PTE: Potential to Emit

TAP Summary

Tacoma LNG Project

Toxic Air Pollutant	PTE (tons/year)					
	Pretreatment Heater	LNG Vaporizer (Back-Up)	Enclosed Flare	Emergency Flare	Diesel Emergency Generator	Total
3-Methylchloranthrene	6.58E-08	2.5E-08	2.6E-07	4.0E-09		**3.6E-07**
7,12-Dimethylbenz(a)anthracene	5.85E-07	2.2E-07	2.3E-06	3.5E-08		**3.2E-06**
Acetaldehyde					9.5E-05	**9.5E-05**
Acrolein					3.0E-05	**3.0E-05**
Benzo(a)anthracene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	2.3E-06	**2.7E-06**
Benzene	7.68E-05	2.9E-05	3.1E-04	4.7E-06	2.9E-03	**3.3E-03**
Benzo(a)pyrene	4.39E-08	1.7E-08	1.8E-07	2.7E-09	9.6E-07	**1.2E-06**
Benzo(b)fluoranthene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	4.2E-06	**4.5E-06**
Benzo(k)fluoranthene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	8.2E-07	**1.2E-06**
Chrysene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	5.7E-06	**6.1E-06**
Dibenz(a,h)anthracene	4.39E-08	1.7E-08	1.8E-07	2.7E-09	1.3E-06	**1.5E-06**
Formaldehyde	2.74E-03	1.0E-03	1.1E-02	1.7E-04	3.0E-04	**1.5E-02**
hydrogen sulfide			2.1E-02	0.0E+00		**2.1E-02**
Indeno(1,2,3-cd)pyrene	6.58E-08	2.5E-08	2.6E-07	4.0E-09	1.6E-06	**1.9E-06**
Naphthalene	2.23E-05	8.5E-06	8.9E-05	1.4E-06	4.9E-04	**6.1E-04**
Propylene					1.0E-02	**1.0E-02**
Toluene	1.24E-04	4.8E-05	5.0E-04	7.5E-06	1.1E-03	**1.7E-03**
Xylenes					7.2E-04	**7.2E-04**
Arsenic	7.31E-06	2.8E-06				**1.0E-05**
Beryllium	4.39E-07	1.7E-07				**6.1E-07**
Cadmium	4.02E-05	1.5E-05				**5.6E-05**
Cobalt	3.07E-06	1.2E-06				**4.2E-06**
Copper	3.11E-05	1.2E-05				**4.3E-05**
Manganese	1.39E-05	5.3E-06				**1.9E-05**
Mercury	9.51E-06	3.6E-06				**1.3E-05**
Selenium	8.78E-07	3.4E-07				**1.2E-06**
Vanadium	8.41E-05	3.2E-05				**1.2E-04**
Carbon monoxide (CO)	2.75E+00	1.1E+00	1.3E+01	3.9E-01	3.1E+00	**2.0E+01**
Diesel Particulate Matter	0.00E+00	0.0E+00	0.0E+00	0.0E+00	1.8E-01	**1.8E-01**
Nitrogen dioxide (NO2)	1.36E+00	5.2E-01	6.3E+00	1.9E-01	5.4E+00	**1.4E+01**
Sulfur dioxide (SO2)	3.03E-02	1.2E-02	5.5E+00	1.8E-03	5.8E-03	**5.5E+00**
Total	**4.14**	**1.59**	**24.6**	**0.58**	**8.65**	**39.6**

PTE: Potential to Emit

Common Name	CAS#	Averaging Period	ASIL (µg/m3)	SQER (lb/averaging period)	De Minimis (lb/averaging period)
3-Methylchloranthrene	56-49-5	year	0.00016	0.0305	0.00153
7,12-Dimethylbenz(a)anthracene	57-97-6	Year	1.41E-05	0.00271	0.000135
Acetaldehyde	75-07-0	Year	0.37	71	3.55
Acrolein	107-02-8	24-hour	0.06	0.00789	0.000394
Benzo(a)anthracene	56-55-3	Year	0.00909	1.74	0.0872
Benzene	71-43-2	Year	0.0345	6.62	0.331
Benzo(a)pyrene	50-32-8	Year	0.00091	0.174	0.00872
Benzo(b)fluoranthene	205-99-2	Year	0.00909	1.74	0.0872
Benzo(k)fluoranthene	207-08-9	Year	0.00909	1.74	0.0872
Chrysene	218-01-9	Year	0.00909	1.74	0.0872
Dibenz(a,h)anthracene	53-70-3	Year	0.00083	0.16	0.00799
Formaldehyde	50-00-0	Year	0.167	32	1.6
hydrogen sulfide	7783-06-4	24-hour	2	0.263	0.0131
Indeno(1,2,3-cd)pyrene	193-39-5	Year	0.00909	1.74	0.0872
Naphthalene	91-20-3	Year	0.0294	5.64	0.282
Propylene	115-07-1	24-hour	3000	394	19.7
Toluene	108-88-3	24-hour	5000	657	32.9
Xylenes	(multiple)	24-hour	221	29	1.45
Arsenic	--	Year	0.0003	0.0581	0.00291
Beryllium	--	Year	0.00042	0.08	0.004
Cadmium	7440-43-9	Year	0.00024	0.0457	0.00228
Cobalt	7440-48-4	24-hour	0.1	0.013	0.000657
Copper	--	1-hour	100	0.219	0.011
Manganese	--	24-hour	0.04	0.00526	0.000263
Mercury	7439-97-6	24-hour	0.09	0.0118	0.000591
Selenium	--	24-hour	20	2.63	0.131
Vanadium	7440-62-2	24-hour	0.2	0.0263	0.00131
Carbon monoxide (CO)	630-08-0	1-hr	23000	50.4	1.14
Diesel Particulate Matter	--	year	0.00333	0.639	0.032
Nitrogen dioxide (NO2)	10102-44-0	1-hr	470	1.03	0.457
Sulfur dioxide (SO2)	7446-09-05	1-hr	660	1.45	0.457

Pretreatment Natural Gas Heater for Dehydrator Regeneration and Amine Reboiler
Tacoma LNG Project

Fuel	Natural Gas/BOG	
Heat Content	1018	Btu/scf
Annual Operation for PTE	8760	hours/year
Total Heater Capacity	8.5	MMBTU/hour
Number of Heaters	1 or 2	
Fd	8710	dscf/MMBtu
Sulfur Content of Fuel	5	ppm
Exhaust percent O2	3	%
Exhaust flow rate	1441	dscf/min
NOx Emission Limit	30	ppm
CO Emission Limit	100	ppm
VOC Emissions as methane	50	ppm

	Emission Factor		Heater PTE	
Pollutant	**(lb/MMSCF)**	**(lb/MMBTU)**	**(lb/hour)**	**(tons/year)**
NO_x[a]		0.036	0.31	1.36
CO[a]		0.074	0.63	2.75
VOC[a]		0.021	0.18	0.79
SO_2[b]		8.1E-04	0.01	0.03
PM_{10}[c]	7.6	7.5E-03	0.06	0.28
$PM_{2.5}$[c]	7.6	7.5E-03	0.06	0.28
H_2SO_4 Mist[b]	3.46E-04	4.1E-05	3.46E-04	1.52E-03
Total TAPs			0.95	4.14
Total HAPs[d]			0.02	0.07

	Emission Factor[d]		Each Heater PTE			
Speciated Organic Compounds	**(lb/MMSCF)**	**(lb/MMBTU)**	**(lb/hour)**	**(tons/year)**	**HAPS**	**TAPS**
2-Methylnaphthalene	2.4E-05	2.4E-08	2.0E-07	8.8E-07	x	
3-Methylchloranthrene	1.8E-06	1.8E-09	1.5E-08	6.6E-08	x	x
7,12-Dimethylbenz(a)anthracene	1.6E-05	1.6E-08	1.3E-07	5.9E-07	x	x
Acenaphthene	1.8E-06	1.8E-09	1.5E-08	6.6E-08	x	
Acenaphthylene	1.8E-06	1.8E-09	1.5E-08	6.6E-08	x	
Anthracene	2.4E-06	2.4E-09	2.0E-08	8.8E-08	x	
Benzo(a)anthracene	1.8E-06	1.8E-09	1.5E-08	6.6E-08	x	x
Benzene	2.1E-03	2.1E-06	1.8E-05	7.7E-05	x	x
Benzo(a)pyrene	1.2E-06	1.2E-09	1.0E-08	4.4E-08	x	x
Benzo(b)fluoranthene	1.8E-06	1.8E-09	1.5E-08	6.6E-08	x	x
Benzo(g,h,i)perylene	1.2E-06	1.2E-09	1.0E-08	4.4E-08	x	
Benzo(k)fluoranthene	1.8E-06	1.8E-09	1.5E-08	6.6E-08	x	x
Chrysene	1.8E-06	1.8E-09	1.5E-08	6.6E-08	x	x
Dibenz(a,h)anthracene	1.2E-06	1.2E-09	1.0E-08	4.4E-08	x	x
Dichlorobenzene	1.2E-03	1.2E-06	1.0E-05	4.4E-05	x	
Fluoranthene	3.0E-06	2.9E-09	2.5E-08	1.1E-07	x	
Fluorene	2.8E-06	2.8E-09	2.3E-08	1.0E-07	x	
Formaldehyde	7.5E-02	7.4E-05	6.3E-04	2.7E-03	x	x
Hexane	1.8E+00	1.8E-03	1.5E-02	6.6E-02	x	
Indeno(1,2,3-cd)pyrene	1.8E-06	1.8E-09	1.5E-08	6.6E-08	x	x
Naphthalene	6.1E-04	6.0E-07	5.1E-06	2.2E-05	x	x
Phenanthrene	1.7E-05	1.7E-08	1.4E-07	6.2E-07	x	
Pyrene	5.0E-06	4.9E-09	4.2E-08	1.8E-07	x	
Toluene	3.4E-03	3.3E-06	2.8E-05	1.2E-04	x	x
Arsenic	2.0E-04	2.0E-07	1.7E-06	7.3E-06	x	x
Beryllium	1.2E-05	1.2E-08	1.0E-07	4.4E-07	x	x
Cadmium	1.1E-03	1.1E-06	9.2E-06	4.0E-05	x	x
Chromium	1.4E-03	1.4E-06	1.2E-05	5.1E-05	x	
Cobalt	8.4E-05	8.3E-08	7.0E-07	3.1E-06	x	x
Copper	8.5E-04	8.3E-07	7.1E-06	3.1E-05		x
Manganese	3.8E-04	3.7E-07	3.2E-06	1.4E-05	x	x
Mercury	2.6E-04	2.6E-07	2.2E-06	9.5E-06	x	x
Nickel	2.1E-03	2.1E-06	1.8E-05	7.7E-05	x	
Selenium	2.4E-05	2.4E-08	2.0E-07	8.8E-07	x	x
Vanadium	2.3E-03	2.3E-06	1.9E-05	8.4E-05		x

Notes:
Chromium emissions assumed to be Chromium 3+ (CrO3) and are not a TAP

Greenhouse Gases	Emission Factor (Natural Gas) kg/MMBtu	Reference	Capacity (MMBTU/year)	PTE (metric ton/yr)	PTE (ton/yr)
CO_2	53.02	40 CFR 98 Subpart C Equation C-1(b) (Tier 1)	74,460	3,948	4.3E+03
N_2O[e]	1.0E-04	40 CFR 98 Subpart C Equation C-8(b) Tiers (1 & 3)	74,460	0.0074	8.2E-03
CH_4[e]	1.0E-03	40 CFR 98 Subpart C Equation C-8(b) (Tiers 1 & 3)	74,460	0.074	0.1
CO_2e[f]		40 CFR 98 Part A		3,951.9	4,347.1

Notes:
PTE: Potential to Emit

[a] NOx, CO and VOC emissions based on CBI design specification.

[b] SO_2 emission factors based on treated gas maximum design concentration of 5 ppm S.

[c] Emission Factor from Table 1.4-2: Compilation of Air Pollutant Emission Factors (AP-42), July 1998. U.S. Environmental Protection Agency, from EPA's TTN web site as of January 7, 2012. lb/MMSCF to lb/MMBTU conversion 1,020 MMBTU/MMSCF

[d] Emission Factor from Table 1.4-3,4: Compilation of Air Pollutant Emission Factors (AP-42), July 1998. U.S. Environmental Protection Agency, from EPA's TTN web site as of January 7, 2012 Conversion from lb/MMSCF to lb/MMBTU assumes natural gas HHV of 1,020 MMBTU/MMSCF.

[e] Eqn C-8(b): CH_4 or N_2O = 1×10^{-3} x Fuel x EF
Fuel =Annual Natural Gas Combusted, (MMBTU/Year)
EF = Fuel-specific default CH_4 or N_2O emission factor for natural gas, from Table C-2 of 40 CFR Part 98 Subpart C (kg CH_4 or N_2O/MMBTU)
1×10^{-3} = Conversion Factor from Kilograms to Metric Tons

[f] CO_2e = (GWP CO_2 x CO_2 metric ton/yr) + (GWP CH4 x CH4 metric ton/yr) + (GWP N_2O x N_2O metric ton/yr)
Global Warming Potential (GWP) for Selected GHG - 40 CFR 98 Subpart A, Table A-1
GWP CO_2 = 1 GWP CH_4 = 25 GWP N_2O = 298

LNG Vaporizer (Back-Up)
Tacoma LNG Project

Fuel	Natural Gas/BOG	
Heat Content	926	btu/scf
Annual Operation for PTE	1000	hours/year
Total Heater Capacity[a]	28.5	MMBTU/hour
Fd	8710	dscf/MMBtu
Sulfur Content of Fuel	5	ppm
Exhaust percent O2	3	%
Exhaust flow rate	4831	dscf/min
NO_x Emission Limit	30	ppm
CO Emission Limit	100	ppm
VOC Emissions as methane	50	ppm

	Emission Factor		Heater PTE			
Pollutant	**(lb/MMSCF)**	**(lb/MMBTU)**	**(lb/hour)**	**(tons/year)**		
NO_x[a]		0.036	1.04	0.52		
CO[a]		0.074	2.11	1.05		
SO_2[b]		8.1E-04	0.02	0.01		
PM_{10}[c]	7.6	7.5E-03	0.21	0.11		
$PM_{2.5}$[c]	7.6	7.5E-03	0.21	0.11		
VOC[d]		0.021	0.60	0.30		
H_2SO_4 Mist[b]		4.1E-05	1.16E-03	5.80E-04		
Total TAPs			3.17	1.59		
Total HAPs			0.05	0.03		
	Emission Factor[e]		**Each Heater PTE**			
Speciated Organic Compounds	**(lb/MMSCF)**	**(lb/MMBTU)**	**(lb/hour)**	**(tons/year)**	**HAP**	**TAP**
2-Methylnaphthalene	2.4E-05	2.4E-08	6.7E-07	3.4E-07	x	
3-Methylchloranthrene	1.8E-06	1.8E-09	5.0E-08	2.5E-08	x	x
7,12-Dimethylbenz(a)anthracene	1.6E-05	1.6E-08	4.5E-07	2.2E-07	x	x
Acenaphthene	1.8E-06	1.8E-09	5.0E-08	2.5E-08	x	
Acenaphthylene	1.8E-06	1.8E-09	5.0E-08	2.5E-08	x	
Anthracene	2.4E-06	2.4E-09	6.7E-08	3.4E-08	x	
Benzo(a)anthracene	1.8E-06	1.8E-09	5.0E-08	2.5E-08	x	x
Benzene	2.1E-03	2.1E-06	5.9E-05	2.9E-05	x	x
Benzo(a)pyrene	1.2E-06	1.2E-09	3.4E-08	1.7E-08	x	x
Benzo(b)fluoranthene	1.8E-06	1.8E-09	5.0E-08	2.5E-08	x	x
Benzo(g,h,i)perylene	1.2E-06	1.2E-09	3.4E-08	1.7E-08	x	
Benzo(k)fluoranthene	1.8E-06	1.8E-09	5.0E-08	2.5E-08	x	x
Chrysene	1.8E-06	1.8E-09	5.0E-08	2.5E-08	x	x
Dibenz(a,h)anthracene	1.2E-06	1.2E-09	3.4E-08	1.7E-08	x	x
Dichlorobenzene	1.2E-03	1.2E-06	3.4E-05	1.7E-05	x	
Fluoranthene	3.0E-06	2.9E-09	8.4E-08	4.2E-08	x	
Fluorene	2.8E-06	2.7E-09	7.8E-08	3.9E-08	x	
Formaldehyde	7.5E-02	7.4E-05	2.1E-03	1.0E-03	x	x
Hexane	1.8E+00	1.8E-03	5.0E-02	2.5E-02	x	
Indeno(1,2,3-cd)pyrene	1.8E-06	1.8E-09	5.0E-08	2.5E-08	x	x
Naphthalene	6.1E-04	6.0E-07	1.7E-05	8.5E-06	x	x
Phenanthrene	1.7E-05	1.7E-08	4.8E-07	2.4E-07	x	
Pyrene	5.0E-06	4.9E-09	1.4E-07	7.0E-08	x	
Toluene	3.4E-03	3.3E-06	9.5E-05	4.8E-05	x	x
Arsenic	2.0E-04	2.0E-07	5.6E-06	2.8E-06	x	x
Beryllium	1.2E-05	1.2E-08	3.4E-07	1.7E-07	x	x
Cadmium	1.1E-03	1.1E-06	3.1E-05	1.5E-05	x	x
Chromium	1.4E-03	1.4E-06	3.9E-05	2.0E-05	x	
Cobalt	8.4E-05	8.2E-08	2.3E-06	1.2E-06	x	x
Copper	8.5E-04	8.3E-07	2.4E-05	1.2E-05		x
Manganese	3.8E-04	3.7E-07	1.1E-05	5.3E-06	x	x
Mercury	2.6E-04	2.5E-07	7.3E-06	3.6E-06	x	x
Nickel	2.1E-03	2.1E-06	5.9E-05	2.9E-05	x	
Selenium	2.4E-05	2.4E-08	6.7E-07	3.4E-07	x	x
Vanadium	2.3E-03	2.3E-06	6.4E-05	3.2E-05		x

Notes:
Chromium emissions assumed to be Chromium 3+ (CrO3) and are not a TAP

Greenhouse Gases	EF (Natural Gas) kg/MMBtu	Reference	Capacity (MMBTU/year)	Heater PTE (metric ton/yr)	Heaters PTE (ton/yr)
CO_2[a]	53.02	40 CFR 98 Subpart C Equation C-1(b) (Tier 1)	28,500	1,511	979
N_2O[f]	1.0E-04	40 CFR 98 Subpart C Equation C-8(b) Tiers (1 & 3)	28,500	2.85E-03	3.14E-03
CH_4[f]	1.0E-03	40 CFR 98 Subpart C Equation C-8(b) (Tiers 1 & 3)	28,500	2.85E-02	3.14E-02
CO2e[g]		40 CFR 98 Part A			981

Notes:
PTE: Potential to Emit
[a] Emissions based on generic BACT for Boilers and Heaters 10 to 50 MMBtu/hr. The unit may be one 28.5 MMBtu/hr unit or two units adding up to 28.5 MMBtu/hr.
[b] SO_2 emission factors based on treated gas maximum design concentration of 5 ppm S.
[c] Emission Factor from Table 1.4-2: Compilation of Air Pollutant Emission Factors (AP-42), July 1998. U.S. Environmental Protection Agency, from EPA's TTN web site as of January 4, 2012. lb/MMSCF to lb/MMBTU conversion 1,020 MMBTU/MMSCF
[d] VOC emission factor from CBI document Estimated Air Emissions - Tacoma LNG Project

[e] Emission Factor from Table 1.4-3,4: Compilation of Air Pollutant Emission Factors (AP-42), July 1998. U.S. Environmental Protection Agency, from EPA's TTN web site as of January 7, 2012 Conversion from lb/MMSCF to lb/MMBTU assumes natural gas HHV of 1,020 MMBTU/MMSCF.
[f] Eqn C-8(b): CH_4 or N_2O = 1×10^{-3} x Fuel x EF
Fuel =Annual Natural Gas Combusted, (MMBTU/Year)
1×10^{-3} = Conversion Factor from Kilograms to Metric Tons
[g] CO_2e = (GWP CO_2 x CO_2 metric ton/yr) + (GWP CH4 x CH4 metric ton/yr) + (GWP N_2O x N_2O metric ton/yr)
Global Warming Potential (GWP) for Selected GHG - 40 CFR 98 Subpart A, Table A-1

GWP CO_2 = 1 GWP CH_4 = 25 GWP N_2O = 298

Enclosed Ground Flare
Tacoma LNG Project

Annual Operation of Pilots	8760	hours per year
Number of Pilots	6	
Pilot Gas Flow Rate	65,000	btu/hour
Total Pilot Gas Flow Rate	390,000	btu/hour
	0.39	MMBtu/hr
	3,416	MMBtu/year
	4.431	MMSCF/year
Fd for Natural Gas	8,710	dscf/MMBtu
H2S Content of NG to Pilots	5	ppm
Exhaust percent O2	15	%
Exhaust flow rate	201	dscf/min
NO_x Emission Limit	30	ppm
CO Emission Limit	100	ppm
VOC Emissions as methane	50	ppm
Annual operation of process	8760	hours/year
Normal vent flow to Flare:	10.2	MMBtu/hr
	310	Btu/scf
	0.033	MMScf/hr
	32,903	scf/hr
CO_2 content of vent gas:	65	% of total
Design maximum total sulfur	0.17	lb S/MMBtu
H_2S Content of Process Gas	60	ppm
	27.3	% of total
TBM (C4H10S) Content of Process Gas	120	ppm
	54.5	% of total
MES (C3H8S) Content of Process Gas	40	ppm
	18.2	% of total
Fd for Natural Gas	8710	dscf/MMBtu
Exhaust percent O2	15	%
Exhaust flow rate	6508	dscf/min
NO_x Emissions	30	ppm
CO Emissions	100	ppm
VOC Emissions	100	ppm
Pilot Gas Heating Value	771	MMBTU/MMSCF
Destruction Efficiency of Flare	99	percent

	Emissions from Pilots				Emissions from Process Gases					Total Emissions	
Pollutant	Emission Factor (lbs/MMSCF)	Emission Factor (lbs/MMBTU)	PTE (lbs/hour)	PTE (tons/year)	Emission Factor (lbs/MMSCF)	Emission Factor (lbs/MMBTU)	Percent control	PTE (lbs/hour)	PTE (tons/year)	PTE (lbs/hour)	PTE (tons/year)
NO_x[a]	87	0.112	0.04	0.19	43	0.137		1.40	6.13	1.44	6.32
CO[a]	176	0.228	0.09	0.39	86	0.278		2.84	12.44	2.93	12.83
VOC[a]	50	0.065	0.03	0.11	49	0.159		1.63	7.12	1.65	7.23
SO_2[b]	0.83	1.08E-03	4.20E-04	1.8E-03	38	0.122		1.24	5.45	1.24	5.45
PM_{10}[c]	7.6	9.86E-03	3.84E-03	1.7E-02	7.6	9.86E-03		0.10	0.44	0.10	0.46
$PM_{2.5}$[c]	7.6	9.86E-03	3.84E-03	1.7E-02	7.6	9.86E-03		0.10	0.44	0.10	0.46
H_2SO_4 Mist[b]	4.15E-02	5.39E-05	2.10E-05	9.2E-05	1.89E+00	6.10E-03		0.06	0.27	0.06	0.27
CO_2 (Non-combustion)								2444	10703	2444	10703
CO_2 (Combustion)											
Sulfur Compounds											
Total Sulfur[b]					0.37	0.000	99	4.84E-03	2.12E-02	4.84E-03	2.12E-02
H_2S					0.10	0.000	99	1.32E-03	5.78E-03	1.32E-03	5.78E-03
TBM (C4H10S)					0.20	0.000	99	2.64E-03	1.16E-02	2.64E-03	1.16E-02
MES (C3H8S)					0.07	0.000	99	8.79E-04	3.85E-03	8.79E-04	3.85E-03
HAPS[d]			9.5E-04	4.2E-03				6.2E-02	2.71E-01	6.29E-02	2.75E-01
2-Methylnaphthalene	2.40E-05	3.11E-08	1.2E-08	5.3E-08	2.40E-05	7.74E-08		7.9E-07	3.46E-06	8.02E-07	3.51E-06
3-Methylchloranthrene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		5.9E-08	2.59E-07	6.01E-08	2.63E-07
7,12-Dimethylbenz(a)anthracene	1.60E-05	2.08E-08	8.1E-09	3.5E-08	1.60E-05	5.16E-08		5.3E-07	2.31E-06	5.35E-07	2.34E-06
Acenaphthene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		5.9E-08	2.59E-07	6.01E-08	2.63E-07
Acenaphthylene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		5.9E-08	2.59E-07	6.01E-08	2.63E-07
Anthracene	2.40E-06	3.11E-09	1.2E-09	5.3E-09	2.40E-06	7.74E-09		7.9E-08	3.46E-07	8.02E-08	3.51E-07
Benz(a)anthracene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		5.9E-08	2.59E-07	6.01E-08	2.63E-07
Benzene	2.10E-03	2.72E-06	1.1E-06	4.7E-06	2.10E-03	6.77E-06		6.9E-05	3.03E-04	7.02E-05	3.07E-04
Benzo(a)pyrene	1.20E-06	1.56E-09	6.1E-10	2.7E-09	1.20E-06	3.87E-09		3.9E-08	1.73E-07	4.01E-08	1.76E-07
Benzo(b)fluoranthene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		5.9E-08	2.59E-07	6.01E-08	2.63E-07
Benzo(g,h,i)perylene	1.20E-06	1.56E-09	6.1E-10	2.7E-09	1.20E-06	3.87E-09		3.9E-08	1.73E-07	4.01E-08	1.76E-07
Benzo(k)fluoranthene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		5.9E-08	2.59E-07	6.01E-08	2.63E-07
Chrysene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		5.9E-08	2.59E-07	6.01E-08	2.63E-07
Dibenzo(a,h)anthracene	1.20E-06	1.56E-09	6.1E-10	2.7E-09	1.20E-06	3.87E-09		3.9E-08	1.73E-07	4.01E-08	1.76E-07
Dichlorobenzene	1.20E-03	1.56E-06	6.1E-07	2.7E-06	1.20E-03	3.87E-06		3.9E-05	1.73E-04	4.01E-05	1.76E-04
Fluoranthene	3.00E-06	3.89E-09	1.5E-09	6.6E-09	3.00E-06	9.68E-09		9.9E-08	4.32E-07	1.00E-07	4.39E-07
Fluorene	2.80E-06	3.63E-09	1.4E-09	6.2E-09	2.80E-06	9.03E-09		9.2E-08	4.04E-07	9.35E-08	4.10E-07
Formaldehyde	7.50E-02	9.73E-05	3.8E-05	1.7E-04	7.50E-02	2.42E-04		2.5E-03	1.08E-02	2.51E-03	1.10E-02
Hexane	1.80E+00	2.33E-03	9.1E-04	4.0E-03	1.80E+00	5.81E-03		5.9E-02	2.59E-01	6.01E-02	2.63E-01
Indeno(1,2,3-cd)pyrene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		5.9E-08	2.59E-07	6.01E-08	2.63E-07
Naphthalene	6.10E-04	7.91E-07	3.1E-07	1.4E-06	6.10E-04	1.97E-06		2.0E-05	8.79E-05	2.04E-05	8.93E-05
Phenanthrene	1.70E-05	2.20E-08	8.6E-09	3.8E-08	1.70E-05	5.48E-08		5.6E-07	2.45E-06	5.68E-07	2.49E-06
Pyrene	5.00E-06	6.49E-09	2.5E-09	1.1E-08	5.00E-06	1.61E-08		1.6E-07	7.21E-07	1.67E-07	7.32E-07
Toluene	3.40E-03	4.41E-06	1.7E-06	7.5E-06	3.40E-03	1.10E-05		1.1E-04	4.90E-04	1.14E-04	4.98E-04

Natural Gas

Greenhouse Gases	Emission Factor (Natural Gas) kg/MMBtu	Reference	Flare (Pilot Gas) (MMBTU/year)	Flare (Pilot) PTE[e,f,g] (metric ton/yr)	Flare (Pilot) PTE (ton/yr)	Flare (Vent Gas) (MMBTU/year)	Flare (Vent Gas) PTE[e,f,g] (metric ton/yr)	Flare (Vent Gas) PTE (ton/yr)	Total Flare PTE[e,f,g] (metric ton/yr)	Total Flare PTE' (ton/yr)
CO_2 - Combustion	53.02	40 CFR 98 Subpart C Equation C-1(b) (Tier 1)	3,416	181.1	199.3	89,352	4,737	5,211	4,919	5,410
CO_2- Non Combustion							9,730	10,703	9,730	10,703
CO_2 - Total				181.1	199.3		14,467	15,914	14,649	16,113
N_2O	1.0E-04	40 CFR 98 Subpart C Equation C-8(b) Tiers (1 & 3)	3,416	3.4E-04	3.8E-04	89,352	8.9E-03	9.8E-03	9.28E-03	1.02E-02
CH_4	1.0E-03	40 CFR 98 Subpart C Equation C-8(b) (Tiers 1 & 3)	3,416	3.4E-03	3.8E-03	89,352	8.9E-02	9.8E-02	9.28E-02	1.02E-01
CO_2e		40 CFR 98 Part A		181	199		14,472	15,920	14,654	16,119

Notes:

PTE: Potential to Emit

[a] NO_x and CO from CBI. VOC for pilot from CBI and VOC emission factors for flare obtained from AP-42 Table 13.5-1.

[b] Conservative design value of 1 lb/MMBtu total sulfur provided by CBI. Sulfuric acid mist emissions (SO3/H2SO4) are based on a 5% conversion of SO2 to SO3 by the flare. Speciated sulfur content based on percent of total provided by CBI

[c] PM_{10} and $PM_{2.5}$ is assumed to equal PM. PM_{10}, $PM_{2.5}$,and SO_2 emission factor obtained from AP-42, Chapter 1.4 Natural Gas Combustion, Conversion from lb/MMSCF to lb/MMBTU assumes natural gas HHV of 1,020 MMBTU/MMSCF.

[d] Emission Factors for HAPs obtained from AP-42 Table 1.4-3. Total HAPs were calculated based on the sum of the individual HAP emissions.

[e] Eqn C-1b: $CO_2 = 1 \times 10^{-3}$ x Gas x EF
Gas = Annual Gas Usage (MMBTU/Year)
EF = Fuel-specific default CO_2 emission factor for natural gas and propane, from Table C-1 of 40 CFR Part 98 Subpart C (kg CO_2/MMBTU)

1×10^{-3} = Conversion Factor from Kilograms to Metric Tons

[f] Eqn C-8(b): CH_4 or $N_2O = 1 \times 10^{-3}$ x Fuel x EF
Fuel =Annual Natural Gas Combusted, (MMBTU/Year)
EF = Fuel-specific default CH_4 or N_2O emission factor for natural gas and propane, from Table C-2 of 40 CFR Part 98 Subpart C (kg CH_4 or
1×10^{-3} = Conversion Factor from Kilograms to Metric Tons

[g] CO_2e = (GWP CO_2 x CO_2 metric ton/yr) + (GWP CH4 x CH4 metric ton/yr) + (GWP N_2O x N_2O metric ton/yr)
Global Warming Potential (GWP) for Selected GHG - 40 CFR 98 Subpart A, Table A-1

GWP CO_2 = 1 GWP CH_4 = 25
GWP N_20 = 298

Emergency Flare
Tacoma LNG Project

Annual Operation of Pilots	8760	hours per year
Number of Pilots	6	
Pilot Gas Flow Rate	65,000	btu/hour
Total Pilot Gas Flow Rate	390,000	btu/hour
	0.39	MMBtu/hr
	3,416	MMBtu/year
	4.431	MMSCF/year
Fd for Natural Gas	8,710	dscf/MMBtu
H_2S Content of NG to Pilots	5	ppm
Exhaust percent O2	15	%
Exhaust flow rate	201	dscf/min
NO_x Emission Limit	30	ppm
CO Emission Limit	100	ppm
VOC Emissions as methane	50	ppm
Annual operation of process	8760	hours/year
Normal vent flow to Flare:	0.0	MMBtu/hr
	310	Btu/scf
	0.000	MMScf/hr
	0	scf/hr
CO_2 content of vent gas:	65	% of total
Design maximum total sulfur	1	lb S/MMBtu
H_2S Content of Process Gas	60	ppm
	27.3	% of total
TBM (C4H10S) Content of Process Gas	120	ppm
	54.5	% of total
MES (C3H8S) Content of Process Gas	40	ppm
	18.2	% of total
Fd for Natural Gas	8710	dscf/MMBtu
Exhaust percent O2	15	%
Exhaust flow rate	0	dscf/min
NO_x Emissions	30	ppm
CO Emissions	100	ppm
Pilot Gas Heating Value	771	MMBTU/MMSCF
Destruction Efficiency of Flare	99	percent

	Emissions from Pilots				Emissions from Process Gases					Total Emissions	
Pollutant	Emission Factor (lbs/MMSCF)	Emission Factor (lbs/MMBTU)	PTE (lbs/hour)	PTE (tons/year)	Emission Factor (lbs/MMSCF)	Emission Factor (lbs/MMBTU)	Percent control	PTE (lbs/hour)	PTE (tons/year)	PTE (lbs/hour)	PTE (tons/year)
NO_x[a]	87	0.112	0.04	1.9E-01	43	0.137		0.00	0.00	4.38E-02	1.92E-01
CO[a]	176	0.228	0.09	3.9E-01	86	0.278		0.00	0.00	8.88E-02	3.89E-01
VOC[a]	50	0.065	0.03	1.1E-01	49	0.159		0.00	0.00	2.54E-02	1.11E-01
SO_2[b]	0.83	1.08E-03	4.20E-04	1.8E-03	37.82	1.22E-01		0.00	0.00	4.20E-04	1.84E-03
PM_{10}[c]	7.6	9.86E-03	3.84E-03	1.7E-02	7.6	9.86E-03		0.00	0.00	3.84E-03	1.68E-02
$PM_{2.5}$[c]	7.6	9.86E-03	3.84E-03	1.7E-02	7.6	9.86E-03		0.00	0.00	3.84E-03	1.68E-02
H_2SO_4 Mist[b]	4.15E-02	5.39E-05	2.10E-05	9.2E-05	1.89E+00	6.10E-03		0.00	0.00	2.10E-05	9.21E-05
CO_2 (Non-combustion)								0.00	0.00	0.00E+00	0.00E+00
CO_2 (Combustion)											
Sulfur Compounds											
Total Sulfur[b]					0.37	0.000	99	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H_2S					0.10	0.000	99	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TBM (C4H10S)					0.20	0.000	99	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MES (C3H8S)					0.07	0.000	99	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HAPS[d]			9.5E-04	4.2E-03				0.0E+00	0.00E+00	9.52E-04	4.17E-03
2-Methylnaphthalene	2.40E-05	3.11E-08	1.2E-08	5.3E-08	2.40E-05	7.74E-08		0.0E+00	0.00E+00	1.21E-08	5.32E-08
3-Methylchloranthrene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		0.0E+00	0.00E+00	9.11E-10	3.99E-09
7,12-Dimethylbenz(a)anthracene	1.60E-05	2.08E-08	8.1E-09	3.5E-08	1.60E-05	5.16E-08		0.0E+00	0.00E+00	8.09E-09	3.54E-08
Acenaphthene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		0.0E+00	0.00E+00	9.11E-10	3.99E-09
Acenaphthylene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		0.0E+00	0.00E+00	9.11E-10	3.99E-09
Anthracene	2.40E-06	3.11E-09	1.2E-09	5.3E-09	2.40E-06	7.74E-09		0.0E+00	0.00E+00	1.21E-09	5.32E-09
Benz(a)anthracene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		0.0E+00	0.00E+00	9.11E-10	3.99E-09
Benzene	2.10E-03	2.72E-06	1.1E-06	4.7E-06	2.10E-03	6.77E-06		0.0E+00	0.00E+00	1.06E-06	4.65E-06
Benzo(a)pyrene	1.20E-06	1.56E-09	6.1E-10	2.7E-09	1.20E-06	3.87E-09		0.0E+00	0.00E+00	6.07E-10	2.66E-09
Benzo(b)fluoranthene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		0.0E+00	0.00E+00	9.11E-10	3.99E-09
Benzo(g,h,i)perylene	1.20E-06	1.56E-09	6.1E-10	2.7E-09	1.20E-06	3.87E-09		0.0E+00	0.00E+00	6.07E-10	2.66E-09
Benzo(k)fluoranthene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		0.0E+00	0.00E+00	9.11E-10	3.99E-09
Chrysene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		0.0E+00	0.00E+00	9.11E-10	3.99E-09
Dibenzo(a,h)anthracene	1.20E-06	1.56E-09	6.1E-10	2.7E-09	1.20E-06	3.87E-09		0.0E+00	0.00E+00	6.07E-10	2.66E-09
Dichlorobenzene	1.20E-03	1.56E-06	6.1E-07	2.7E-06	1.20E-03	3.87E-06		0.0E+00	0.00E+00	6.07E-07	2.66E-06
Fluoranthene	3.00E-06	3.89E-09	1.5E-09	6.6E-09	3.00E-06	9.68E-09		0.0E+00	0.00E+00	1.52E-09	6.65E-09
Fluorene	2.80E-06	3.63E-09	1.4E-09	6.2E-09	2.80E-06	9.03E-09		0.0E+00	0.00E+00	1.42E-09	6.20E-09
Formaldehyde	7.50E-02	9.73E-05	3.8E-05	1.7E-04	7.50E-02	2.42E-04		0.0E+00	0.00E+00	3.79E-05	1.66E-04
Hexane	1.80E+00	2.33E-03	9.1E-04	4.0E-03	1.80E+00	5.81E-03		0.0E+00	0.00E+00	9.11E-04	3.99E-03
Indeno(1,2,3-cd)pyrene	1.80E-06	2.33E-09	9.1E-10	4.0E-09	1.80E-06	5.81E-09		0.0E+00	0.00E+00	9.11E-10	3.99E-09
Naphthalene	6.10E-04	7.91E-07	3.1E-07	1.4E-06	6.10E-04	1.97E-06		0.0E+00	0.00E+00	3.09E-07	1.35E-06
Phenanthrene	1.70E-05	2.20E-08	8.6E-09	3.8E-08	1.70E-05	5.48E-08		0.0E+00	0.00E+00	8.60E-09	3.77E-08
Pyrene	5.00E-06	6.49E-09	2.5E-09	1.1E-08	5.00E-06	1.61E-08		0.0E+00	0.00E+00	2.53E-09	1.11E-08
Toluene	3.40E-03	4.41E-06	1.7E-06	7.5E-06	3.40E-03	1.10E-05		0.0E+00	0.00E+00	1.72E-06	7.53E-06

Natural Gas

Greenhouse Gases	Emission Factor (Natural Gas) kg/MMBtu	Reference	Flare (Pilot Gas) (MMBTU/year)	Flare (Pilot) PTE[e,f,g] (metric ton/yr)	Flare (Pilot) PTE (ton/yr)	Flare (Vent Gas) (MMBTU/year)	Flare (Vent Gas) PTE[e,f,g] (metric ton/yr)	Flare (Vent Gas) PTE (ton/yr)	Total Flare PTE[e,f,g] (metric ton/yr)	Total Flare PTE' (ton/yr)
CO_2 - Combustion	53.02	40 CFR 98 Subpart C Equation C-1(b) (Tier 1)	3,416	181.14	199.25	0.00	0.00	0.00	181	199
CO_2- Non Combustion							0.00	0.00	0.00	0.00
CO_2 - Total				181.14	199.25		0.00	0.00	181	199
N_2O	1.0E-04	40 CFR 98 Subpart C Equation C-8(b) Tiers (1 & 3)	3,416	3.4E-04	3.8E-04	0.00	0.0E+00	0.0E+00	3.42E-04	3.76E-04
CH_4	1.0E-03	40 CFR 98 Subpart C Equation C-8(b) (Tiers 1 & 3)	3,416	3.4E-03	3.8E-03	0.00	0.0E+00	0.0E+00	3.42E-03	3.76E-03
CO_2e		40 CFR 98 Part A		181.3	199.5		0.00	0.00	181	199

Notes:

PTE: Potential to Emit

[a] NO_x and CO from CBI. VOC for pilot from CBI and VOC emission factors for flare obtained from AP-42 Table 13.5-1.

[b] Conservative design value of 1 lb/MMBtu total sulfur provided by CBI. Sulfuric acid mist emissions (SO3/H2SO4) are based on a 5% conversion of SO2 to SO3 by the flare. Speciated sulfur content based on percent of total provided by CBI

[c] PM_{10} and $PM_{2.5}$ is assumed to equal PM. PM_{10}, $PM_{2.5}$, and SO_2 emission factor obtained from AP-42, Chapter 1.4 Natural Gas Combustion, Conversion from lb/MMSCF to lb/MMBTU assumes natural gas HHV of 1,020 MMBTU/MMSCF.

[d] Emission Factors for HAPs obtained from AP-42 Table 1.4-3. Total HAPs were calculated based on the sum of the individual HAP emissions.

[e] Eqn C-1b: $CO_2 = 1 \times 10^{-3}$ x Gas x EF
Gas = Annual Gas Usage (MMBTU/Year)
EF = Fuel-specific default CO_2 emission factor for natural gas and propane, from Table C-1 of 40 CFR Part 98 Subpart C (kg CO_2/MMBTU)

1×10^{-3} = Conversion Factor from Kilograms to Metric Tons

[f] Eqn C-8(b): CH_4 or $N_2O = 1 \times 10^{-3}$ x Fuel x EF
Fuel =Annual Natural Gas Combusted, (MMBTU/Year)
EF = Fuel-specific default CH_4 or N_2O emission factor for natural gas and propane, from Table C-2 of 40 CFR Part 98 Subpart C (kg CH_4 or
1×10^{-3} = Conversion Factor from Kilograms to Metric Tons

[g] CO_2e = (GWP CO_2 x CO_2 metric ton/yr) + (GWP CH4 x CH4 metric ton/yr) + (GWP N_2O x N_2O metric ton/yr)
Global Warming Potential (GWP) for Selected GHG - 40 CFR 98 Subpart A, Table A-1

GWP CO_2 = 1 GWP CH_4 = 25
GWP N_2O = 298

Pretreatment Fugitives
Tacoma LNG Project

Annual Hours	8760 hours/year						Methane PTE		VOC PTE[d]	
Components	Phase	Oil and Gas Emission Factors[a] (lb/hr/component)	Actual Component Count[b]	Assumed % Methane Content[c]	Assumed % VOC Content[c]	28 MID Credit[a] (%)	(lb/hour)	(ton/year)	(lb/hour)	(ton/year)
Valves[e]	Gas/Vapor	0.0099	902	96.6	0.1	97	2.59E-01	1.13E+00	3.64E-04	1.60E-03
	Light Liquid	0.0055	0	96.6	0.1	97	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Heavy Liquid	0.00001848	0	96.6	0.1	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pressure Relief Valves	Gas/Vapor	0.0194	43	96.6	0.1	97	2.41E-02	1.05E-01	3.39E-05	1.48E-04
Pump Seals	Light Liquid	0.0286	0	96.6	0.1	93	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Heavy Liquid	0.00113	3	96.6	0.1	0	3.27E-03	1.43E-02	4.61E-06	2.02E-05
Flanges/Connectors	Gas/Vapor	0.000858	315	96.6	0.1	30	1.83E-01	7.99E-01	2.57E-04	1.13E-03
	Light Liquid	0.000242	0	96.6	0.1	30	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Heavy Liquid	0.000000858	0	96.6	0.1	30	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Compressor Seals[f]	Gas/Vapor	0.0194	0	96.6	0.1	95	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sampling Connections	All	0.033	0	96.6	0.1	97	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total							0.47	2.05	6.60E-04	2.89E-03
Total CH_4 (metric ton/year)								1.87		
Total CO_2e (metric ton/year)[g]								46.6		
Total CO_2e (ton/year)								51.2		

Notes:
PTE: Potential to Emit

[a]Values obtained from Table 2-4. Oil and Gas Productions of *EPA-453/R-95-017 Protocol for Leak Detection Estimates* , EPA (1995), Emissions Factors For Equipment Leak Fugitive Components , TCEQ (January 2008), and Volatile Organic Compound (VOC) Equipment Leak Fugitives, TCEQ (Effective July 1, 1994, Modified March 28, 1996, August 19 and November 16, 1998).
[b]Component counts provided by CBI and shown below.
[c]Used highest methane content from Case 2 Sendout. VOC content sum of ethane, propane, i-butane, n-butane, i-pentane, n-pentane, n-hexanes from Case 1 liquification.
[d]VOC Potential to Emit, lb/hour = Oil and Gas Factor, lb/hr/component x Actual Component Count X 1-28 MID Credit/100
[e]Did not include Instrumentation valves
[f]Compressor seal emissions calculated below.
[g]Per 40 CFR 98 - Mandatory Gas Reporting, Subpart A, Table A-1, Total CO2e I equal to Methane Potential to Emit, Metric Ton X Global Warming Potential
CH_4 Global Warming Potential = 25

TFFP Valve Count

Type	Number off-Skid	Number On-Skid[h]	Total
Gate - Flanged	38	11	49
Gate - Socket Weld	233	70	303
Globe - Socket Weld	20	6	26
Ball - Flanged	18	5	23
Ball - Socket Weld	201	60	261
Check - Flanged	25	8	33
Check - Socket Weld	31	9	40
Control - Flanged	85	26	111
Butterfly - Flanged	43	13	56
Total	694	208	902
Relief - Flanged	33	10	43

[h]Add 30 percent to off-skid valves to get on-skid valves.

Fugitive Emissions - Refrigerant losses through Compressor Seals

Constituent	lb/hour	lb/year[1]	ton/year	metric ton/yr
Methane	3.20	28000	14	
Ethylene	6.85	60000	30	
Propane	4.34	38000	19	
iso-Pentane	6.39	56000	28	
Nitrogen	2.17	19000	9.5	
Total VOC	17.6	154000	77	
GHG as CO_2e	79.9	700000	350	318

Storage Tanks
Propane Storage Vessel - 4500gal (6'Dia x 20'T/T)
Pentane Storage Vessel - 4500gal (6'Dia x 20'T/T)
Ethylene Storage Vessel - 4500gal (6'Dia x 20'T/T)
Heavies Knockout Storage Vessel - 4500gal (6'Dia x 20'T/T)
MRL Storage Vessel (can only be roughly 15% full of liquid with system completely evacuated to vessel) - 30,000gal (10'Dia x 50'T/T)

Emergency Generator (1)
Tacoma LNG Project

Fuel	Diesel	Note: May be natural gas, calculated for Diesel
Number of Generators	1	
Annual Operation for PTE[a]	500	hours/year (Each)
Emergency Generator Capacity	1,600	KW — Note: Greater than 600 HP -> Large Stationary Diesel Engine

Pollutant	**Emission Factor[b] (g/KW-hour)**	**Emission Factor[b] (lb/KW-hour)**	**PTE[f,g] (lb/hour)**	**PTE[f,g] (tons/year)**
NO_x[c]	6.08	1.34E-02	21.4	5.36
CO[c]	3.50	7.72E-03	12.3	3.09
SO_2[d]	0.007	1.45E-05	0.02	0.006
PM_{10}[c]	0.20	4.41E-04	0.71	0.18
$PM_{2.5}$[c]	0.20	4.41E-04	0.71	0.18
TOC[c]	0.32	7.05E-04	1.13	0.28
Total TAPs			34.6	8.65
Total HAPs			2.36E-02	5.90E-03

Speciated Organic Compounds	**Emission Factor[e] (lb/MMBTU)**	**Emission Factor[e] (lb/KW-hour)[f]**	**PTE (lb/hour)**	**PTE (tons/year)**	**HAPS**	**TAPS**
Benzene	7.76E-04	7.28E-06	1.16E-02	2.91E-03	x	x
Toluene	2.81E-04	2.64E-06	4.22E-03	1.05E-03	x	x
Xylenes	1.93E-04	1.81E-06	2.90E-03	7.24E-04	x	x
Propylene	2.79E-03	2.62E-05	4.19E-02	1.05E-02		x
Formaldehyde	7.89E-05	7.40E-07	1.18E-03	2.96E-04	x	x
Acetaldehyde	2.52E-05	2.36E-07	3.78E-04	9.46E-05	x	x
Acrolein	7.88E-06	7.39E-08	1.18E-04	2.96E-05	x	x
Naphthalene	1.30E-04	1.22E-06	1.95E-03	4.88E-04	x	x
Acenaphthylene	9.23E-06	8.66E-08	1.39E-04	3.46E-05	x	
Acenaphthene	4.68E-06	4.39E-08	7.02E-05	1.76E-05	x	
Fluorene	1.28E-05	1.20E-07	1.92E-04	4.80E-05	x	
Phenanthrene	4.08E-05	3.83E-07	6.12E-04	1.53E-04	x	
Anthracene	1.23E-06	1.15E-08	1.85E-05	4.61E-06	x	
Fluoranthene	4.03E-06	3.78E-08	6.05E-05	1.51E-05	x	
Pyrene	3.71E-06	3.48E-08	5.57E-05	1.39E-05	x	
Benzo(a)anthracene	6.22E-07	5.83E-09	9.33E-06	2.33E-06	x	x
Chrysene	1.53E-06	1.44E-08	2.30E-05	5.74E-06	x	x
Benzo(b)fluoranthene	1.11E-06	1.04E-08	1.67E-05	4.16E-06	x	x
Benzo(k)fluoranthene	2.18E-07	2.04E-09	3.27E-06	8.18E-07	x	x
Benzo(a)pyrene	2.57E-07	2.41E-09	3.86E-06	9.64E-07	x	x
Indeno(1,2,3-cd)pyrene	4.14E-07	3.88E-09	6.21E-06	1.55E-06	x	x
Dibenz(a,h)anthracene	3.46E-07	3.25E-09	5.19E-06	1.30E-06	x	x
Benzo(g,h,i)perylene	5.56E-07	5.22E-09	8.34E-06	2.09E-06	x	
TOTAL PAH	2.12E-04	1.99E-06	3.18E-03	7.95E-04	x	

Green House Gases	**EF Distillate Fuel Oil #2 (kg/MMBtu)**	**Engine Break-Specific Fuel Consumption (MMBTU/HP-hr)**	**PTE (lb/yr)**	**PTE (ton/yr)**
CO_2[g]	73.96	0.007	1,223,563	612
N_2O[h]	6.0E-04	0.007	9.93	5.0E-03
CH_4[h]	3.0E-03	0.007	49.6	2.5E-02
CO_2e[i]				614

Notes:

PTE: Potential to Emit

[a]100 hours per year for testing and maintenance per 40 CFR Part 60 Subpart IIII 60.4211(f)

[b]Emission Factor, lb/HP-hour = Emission Factor g/HP-hour x 1 lb/ 453.59 g

[c]PM, CO, NOx, TOC emission factor is based on the applicable Tier 2 emission standard stated in US Code of Federal Regulations, Title 40, Part 89 [40 CFR Part 89].

The EPA's Tier 2 NOx + NMHC emission factor was apportioned to NOx and VOC by a ratio of 0.95 and 0.05, respectively, according to "The Carl Moyer Program Guidelines - Approved Revisions 2011", released March 27, 2013, California Environmental Protection Agency - Air Resources Board, Table D-25: Pollutant Fractions NOx+NMHC Standards

[d]Emission factor for SO_2 based on a maximum sulfur content of 15 ppm per 40 CFR Part 60 Subpart IIII (§60.4207 (b))

SO_2 Emission Factor, g/HP-hour = %S/100 × pf, lb/gal × CF1, gram/lb × 1/MW_S g/g-mole × MR × $MWSO_2$, g/g-mole × 1/HHV, BTU/gal × BSFC, BTU/HP-hr

where:

%S = Percent Sulfur by weight = Concentration of Sulfur,	0.0015	%
pf = density of fuel (lb/gal) =	7.08	lb/gal (from Diesel Fuel MSDS)
CF1 = grams to pounds conversion factor =	453.59	grams/lb
MW_S = Molecular Weight of Sulfur	32	g/g-mole
MR = Molar ratio (S + O2 => SO2) =	1	
MW_{SO2} = Molecular Weight of SO_2 =	64	g/g-mole
HHV = Diesel Higher Heating Value =	137,000	BTU/Gallon (from footnote (a) of AP-42 Table 3.4-1)
BSFC = Engine Brake-Specific Fuel Consumption =	7000	BTU/HP-hour (from footnote (e) of AP-42 Table 3.4-1)
SO_2 Emission Factor = 4.92E-03	g/HP-hour = 1.45E-05	lb/kW-hour
Conversion Factor 1.34	HP/KW	

[e]Emission Factor from Table 3.4-3,4: Compilation of Air Pollutant Emission Factors (AP-42), October 1996. U.S. Environmental Protection Agency, from EPA's TTN web site as of January 7, 2012.

[f]Conversion using 7000 BTU/HP-hr Engine Brake-Specific Fuel Consumption as in Note (e)

[g]Potential to emit calculated using 40 CFR 98 Subpart C Equation C-1

Fuel = Annual Gas Usage (gallons/year)

HHV = Default high heat value of the fuel, from Table C-1 of this subpart.

EF = Fuel-specific default CO_2 emission factor for Distillate Fuel Oil No. 2, from Table C-1 of 40 CFR Part 98 Subpart C (kg CO_2/MMBTU)

1×10^{-3} = Conversion Factor from Kilograms to Metric Tons

[h]Potential to emit calculated using 40 CFR 98 Subpart C

Fuel = Annual Usage (gallons/year)

HHV = Default high heat value of the fuel, from Table C-1 of this subpart .

EF = Fuel-specific default CH_4 or N_2O emission factor for Distillate Fuel Oil No. 2, from Table C-2 of 40 CFR Part 98 Subpart C (kg CH_4 or N_2O/MMBTU)

1×10^{-3} = Conversion Factor from Kilograms to Metric Tons

[i]CO_2e = (GWP CO_2 x CO_2 metric ton/yr) + (GWP CH4 x CH4 metric ton/yr) + (GWP N_2O x N_2O metric ton/yr)

Global Warming Potential (GWP) for Selected GHG - 40 CFR 98 Subpart A, Table A-1

GWP CO_2 =	1
GWP CH_4 =	25
GWP N_2O =	298

APPENDIX E

Wetland Delineation Report

Report

Wetland and Waters Delineation Report for Tacoma LNG Project – Pierce County, Washington

Prepared for

Puget Sound Energy, Inc.

November 2014

Prepared by

CH2MHILL®

Contents

Disclaimer

CH2M HILL Engineers, Inc. (CH2M HILL) has prepared this report for use by Puget Sound Energy (PSE). The results and conclusions of this report represent the professional opinion of CH2M HILL. They are based in part upon examination of public domain information concerning the project site.

Work performed during preparation of this report will conform to accepted standards in the field of jurisdictional wetland determination and delineation using the following:

- *Corps of Engineers Wetlands Delineation Manual* (U.S. Army Corps of Engineers [USACE] 1987),
- *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (USACE 2010); and

Effective March 14, 2011, the Washington Department of Ecology repealed Washington Administrative Code (WAC) 173-22-080 (the state delineation manual) and replaced it with a revision of WAC 173-22-035 that states that delineations should be done according to the currently approved federal manual and supplements (listed above). This eliminated the requirement to also complete delineations according to the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997).]

The findings and conclusions contained in this report represent the best professional judgment and knowledge of the investigators. It should be considered a Preliminary Jurisdictional Determination until it has been reviewed and approved by Ecology and the Seattle District of the USACE. Final determination of jurisdictional wetland and other waters boundaries pertinent to Section 404 of the Clean Water Act is the responsibility of the USACE. Additionally, various agencies of the State of Washington and the local jurisdictions may require review of final site development plans that could potentially affect zoning, buffer requirements, water quality, and/or habitat functions of lands in question.

1.0 Introduction

CH2M HILL conducted a wetland delineation to identify potentially jurisdictional wetlands and other waters for components of the proposed Puget Sound Energy (PSE) Tacoma LNG Project (Project) (see Figure 1, figures provided at end of this report).

The Project would include construction and operation of a small-scale facility to produce liquefied natural gas (LNG) to fuel marine vessels and to provide LNG fuel to various industries in the Puget Sound area via LNG bunkering barges and tanker trucks. This facility would also have the capability to convert LNG back into natural gas for reinjection into the PSE natural gas distribution system during periods of high demand (referred to as peak shaving). This wetland delineation includes review of the following Project components:

- **Tacoma LNG Facility:** Liquefies and stores LNG and includes facilities to transfer stored LNG to the Totem Ocean Trailer Express (TOTE) Marine Vessel LNG Fueling System (described below), bunkering barges in the Hylebos Waterway, or tanker trucks onsite. Also includes facilities to gasify stored LNG and inject into the PSE natural gas distribution system.
- **TOTE Marine Vessel LNG Fueling System**: Conveys LNG from the Tacoma LNG Facility to the TOTE site and includes transfer facilities and in-water trestle and loading platform in Blair Waterway to fuel TOTE vessels.

The Tacoma LNG Facility and TOTE Marine Vessel LNG Fueling System would be located on the Blair-Hylebos peninsula in the Port of Tacoma within the City of Tacoma. The Tacoma LNG Facility would receive natural gas from PSE's existing natural gas pipeline system, chill it to a liquid state, and store it for delivery to a public- and private-sector customer base. The proposed improvements in the vicinity of the Tacoma LNG Facility and TOTE Marine Vessel LNG Fueling System sites would include demolition of certain upland and in-water structures, stabilization of the Hylebos Waterway shoreline, construction of a new pier in the Hylebos Waterway, and construction of a new LNG loading platform in the Blair Waterway.

The purpose of this report is to identify and describe wetlands and other waters within the project area. This report is intended to support the project's Clean Water Act Section 404 permit application to the Seattle District of the U.S. Army Corps of Engineers (USACE). It is also provided to support permits and compliance required by state and local jurisdictions.

2.0 Methods

The delineation study area was established around the Tacoma LNG Facility and TOTE Marine Vessel LNG Fueling System components and totaled 33.5 acres (Figure 1). The study area for the Tacoma LNG Facility site totals approximately 33 acres including the portion of the Hybelos Waterway where new piers will be constructed. The study area for the TOTE Marine Vessel LNG Fueling System site totals 0.5 acre.

2.1 Literature Review

A review of the following digital data sources was conducted to determine the recorded and potential locations of wetlands and other waters in the study area:

- National Wetland Inventory (NWI)
- Pierce County wetland inventory
- City of Tacoma wetland inventory
- Google Earth aerial photography imagery
- U.S. Geological Survey (USGS) 7.5-minute series topographic maps
- United States Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) soil survey (Pierce County Area) and hydric soils list for Pierce County Areas
- National Hydrography Database

Existing stream and wetland mapping is shown on Figure 2. Soils mapping and hydric soil map units are shown on Figure 3.

2.2 Field Delineation

The site was surveyed on December 6, 2012.

2.2.1 Wetlands

Field work followed procedures in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region (Version 2.0)* (USACE, 2010).

The routine onsite wetland determination method was used to observe vegetation, soils, and hydrological conditions at representative locations. The USACE National Wetland Plant List (Lichvar, 2009) was used to determine the hydrophytic status of vegetation.

No wetlands or wetland indicators were observed within the study area and no wetland determination data forms were completed.

2.2.2 Other Waters

The Hylebos and Blair waterways are tidally-influenced portions of Puget Sound's Commencement Bay. The landward limit of Section 404 jurisdiction for tidal waters is defined in USACE regulation 33 CFR § 328.4(b) as the "high tide line." According to the USACE Seattle District on-line Electronic Permit Guidebook (USACE, 2013), USACE has determined that the landward limit of Section 404 jurisdiction for tidal waters in Washington State is the line of "mean higher high water." The NOAA tidal datum for the Tacoma tide gauge, located on Commencement Bay, is the nearest tidal datum available and was used to determine the elevation of mean higher high water for the Hylebos and Blair waterways.

3.0 Results

3.1 Site Description

The Tacoma LNG Facility and TOTE Marine Vessel LNG Fueling System sites are described separately.

3.1.1 Tacoma LNG Facility Site

The Tacoma LNG Facility site would be located within the Port of Tacoma's industrial development district on the Blair-Hylebos peninsula. The 33 acre site is generally located north of East 11th Street, east of Alexander Avenue, south of Commencement Bay, and on the west shoreline of the Hylebos Waterway (see Figure 1.1). The upland portion of the site is approximately 30 acres and the aquatic area is approximately 3 acres.

The Tacoma LNG Facility site is primarily developed for industrial maritime use and is composed of four separate parcels. These parcels are distinguished by Pierce County parcel numbers: 2275200532, 5000350021, 2275200502, and 5000350040.

The boundaries for these parcels include both in-water and upland areas, reflecting a total acreage of approximately 33 acres. There are several existing buildings and structures currently located on the proposed Tacoma LNG Facility site. These include a small, abandoned pier on Parcel 2275200532; a series of storage sheds and metal structures on Parcel 5000350021; and a large pier, two vacant U.S. Naval and Marine Reserve buildings, and a structure housing a furnace steam boiler on Parcel 2275200502. Parcel 5000350040 is predominantly paved and does not contain aboveground structures.

This area historically was mud flats and estuarine wetlands associated with Commencement Bay. The Hylebos Waterway was constructed during a series of port development projects from the 1920s through the 1970s. The waterway was created by dredging through the tidal marsh and using the dredged material to create the adjacent uplands (Port, 2009). Elevations of the upland areas are from 15 to 18 feet above mean lower low water. The upland areas are a mix of existing buildings, paved, and gravel-covered areas. The Hylebos Waterway shoreline at the site is generally developed in a manner that is consistent with maritime industrial uses.

3.1.2 TOTE Marine Vessel LNG Fueling System

The TOTE Marine Vessel LNG Fueling System site would be located on a 0.5 acre portion of Pierce County parcel 5000350011, which is developed for industrial maritime use. The boundary of this 68.1 acres parcel encompasses both aquatic and upland areas. Parcel 5000350011 is primarily a paved parking area for ship containers, but includes some small buildings and structures.

The construction corridor for the underground cryogenic pipeline from the Tacoma LNG Facility site would be approximately 20 feet wide. The cryogenic pipeline corridor would cross East Alexander Avenue and would traverse the TOTE site to reach the in-water fueling platform.

3.2 Wetlands

No wetlands were identified within the study area.

3.3 Other Waters

Locations of other waters in and adjacent to the study area are shown on Figure 4. The Hylebos and Blair waterways are tidally-influenced arms of Commencement Bay. The mean higher high water elevation for the Hylebos and Blair waterways is 11.8 feet above mean lower low water, based on the NOAA tidal datum for the Tacoma tide gauge, located on Commencement Bay.

The portion of the Hylebos Waterway shoreline adjacent to the Tacoma LNG Facility site contains two existing piers. The first pier, located at the northeast corner of Parcel 2275200532 is approximately 40 feet by 15 feet with an approximately 90-foot walkway. This small creosote-treated timber pier is abandoned and in disrepair. A larger creosote-treated timber pier in the Hylebos Waterway measuring roughly 600 feet by 25 feet is located in the

center of the site's shoreline on Parcel 2275200502. The bank of the Hylebos Waterway is a constructed timber bulkhead supported by timber piling. Waterway depths drop to 35 to 40 feet below mean lower low water at the northeast edge of the study area.

The shoreline along the Blair Waterway is developed with wharves, piers, and riprap armored slopes. It is generally sloped at approximately 40 to 60 percent and is covered with various slope protection materials including riprap, concrete and asphalt pieces, and various debris. Several existing in-water structures in the Blair Waterway are associated with existing TOTE operations: one timber T-pier, three concrete piers, and one concrete breasting dolphin.

4.0 Jurisdictional Determinations

All the waters and wetlands delineated in this report are potentially subject to federal and/or state jurisdiction. Jurisdictional determinations, including the applicability of exemptions, are made by a case-by case basis by Ecology and USACE.

4.1 Waters of the State

"Surface waters of the state" include lakes, rivers, ponds, streams, inland waters, saltwaters, wetlands, and all other surface waters and water courses within the jurisdiction of the state of Washington (Washington Administrative Code 173-201A-020).

The Hylebos Waterway and the Blair Waterway waters of the state.

4.2 Waters of the United States

USACE asserts jurisdiction over the following waters:

- Traditional navigable waters (TNWs)
- Wetlands adjacent to TNWs
- Nonnavigable tributaries of TNWs that are relatively permanent waters (RPWs) where the tributaries typically flow year-round or have continuous flow at least seasonally (that is, typically 3 months)
- Wetlands that directly abut (that is, have a continuous surface connection to) such tributaries (EPA and USACE, 2008)

USACE will decide jurisdiction over the following waters based on a fact-specific analysis to determine whether they have a significant nexus with a TNW:

- Nonnavigable tributaries that are not relatively permanent
- Wetlands adjacent to nonnavigable tributaries that are not relatively permanent
- Wetlands adjacent to but that do not directly abut a relatively permanent nonnavigable tributary (EPA and USACE, 2008)

The Hylebos Waterway and the Blair Waterway are waters of the United States.

4.3 Traditional Navigable Waters (TNWs)

USACE asserts jurisdiction over "traditional navigable waters," which are waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commence, including all waters which are subject to the ebb and flow of the tide. USACE Seattle District has identified the Puget Sound, including Commencement Bay and the Hybelos and Blair waterways, as navigable waters for the purposes of regulation under Section 404 (USACE, 2008).

5.0 Literature Cited

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Figures

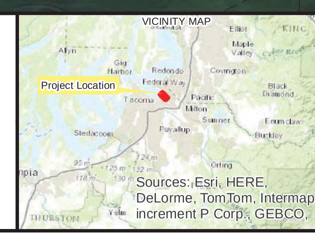
Legend

- Proposed Tacoma LNG Facility Site Boundary
- TOTE Marine Vessel LNG Fueling System
- Parcel Boundary

0 500 Feet

PUGET SOUND ENERGY
The Energy To Do Great Things

Sources:
Esri, DigitalGlobe aerial imagery web mapping service
(c) 2010 Microsoft Corporation and its data suppliers



Tacoma LNG Project

Figure G-1
Project Area
Wetland Delineation Report

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Legend

- Proposed Tacoma LNG Facility Site Boundary
- TOTE Marine Vessel LNG Fueling System
- City of Tacoma Wetlands

National Wetlands Inventory

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lacustrine Wetlands
- Riverine

National Hydrography Dataset Flowline

- Artificial Path
- Canal/Ditch
- Coastline
- Connector
- Stream/River

0 500 Feet

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The Energy To Do Great Things

Sources:
USGS, USFWS, Local Jurisdictions, Bing Maps aerial imagery web mapping service (c) 2010 Microsoft Corporation and its data suppliers

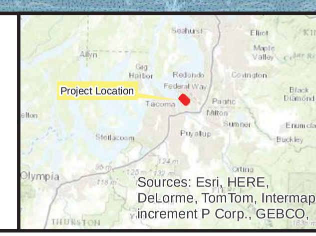

Figure G-2
Existing Stream and Wetland Mapping
Wetland Delineation Report

Tacoma LNG Project

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Tacoma LNG Project

Figure G-3
Soils
Wetland Delineation Report

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System

Soils

- Qf - artificial fill, including modified land
- Qga - advance continental glacial outwash, Fraser-age
- Qgo - continental glacial outwash, Fraser-age
- Qgp - continental glacial drift, pre-Fraser
- Qgt - continental glacial till, Fraser-age
- wtr - water

0 500 Feet

PSE PUGET SOUND ENERGY
The Energy To Do Great Things

Sources:
U. S. Geological Survey (USGS)
National Geologic Mapping Program
Esri, DigitalGlobe aerial imagery
web mapping service (c) 2010 Microsoft Corporation
and its data suppliers

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO,

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Legend
- Proposed Tacoma LNG Facility Site Boundary
- TOTE Marine Vessel LNG Fueling System
- Mean Higher High Water
- Culvert
- Unclassified Water

0 500 Feet

PSE PUGET SOUND ENERGY
The Energy To Do Great Things

Sources:
USGS, USFWS, Local Jurisdictions, Esri, DigitalGlobe aerial imagery web mapping service (c) 2010 Microsoft Corporation and its data suppliers

Tacoma LNG Project

Figure G-4
Wetlands and Other Waters
Wetland Delineation Report

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APPENDIX F

Stormwater Mapbook

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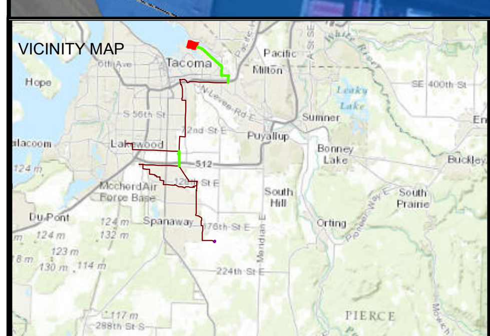

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100
Feet

Tacoma
City of Tacoma

Figure F-1
Tacoma LNG Facility
Hydro Features

Tacoma LNG Project

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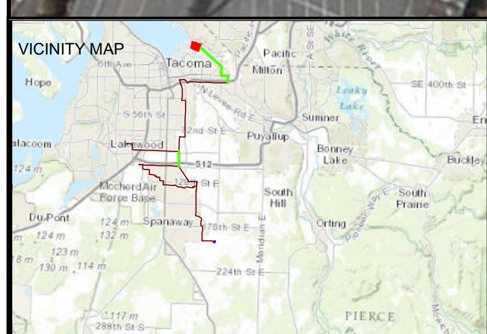

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure F-2 Segment A - Map 01 Hydro Features

Tacoma LNG Project

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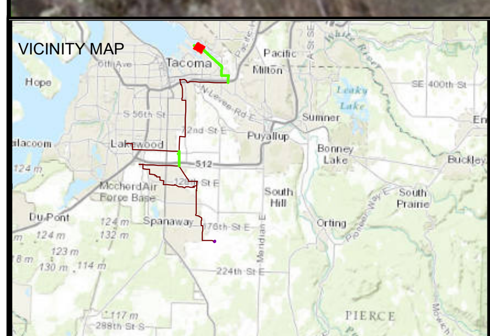

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure F-3 Segment A - Map 02 Hydro Features

Tacoma LNG Project

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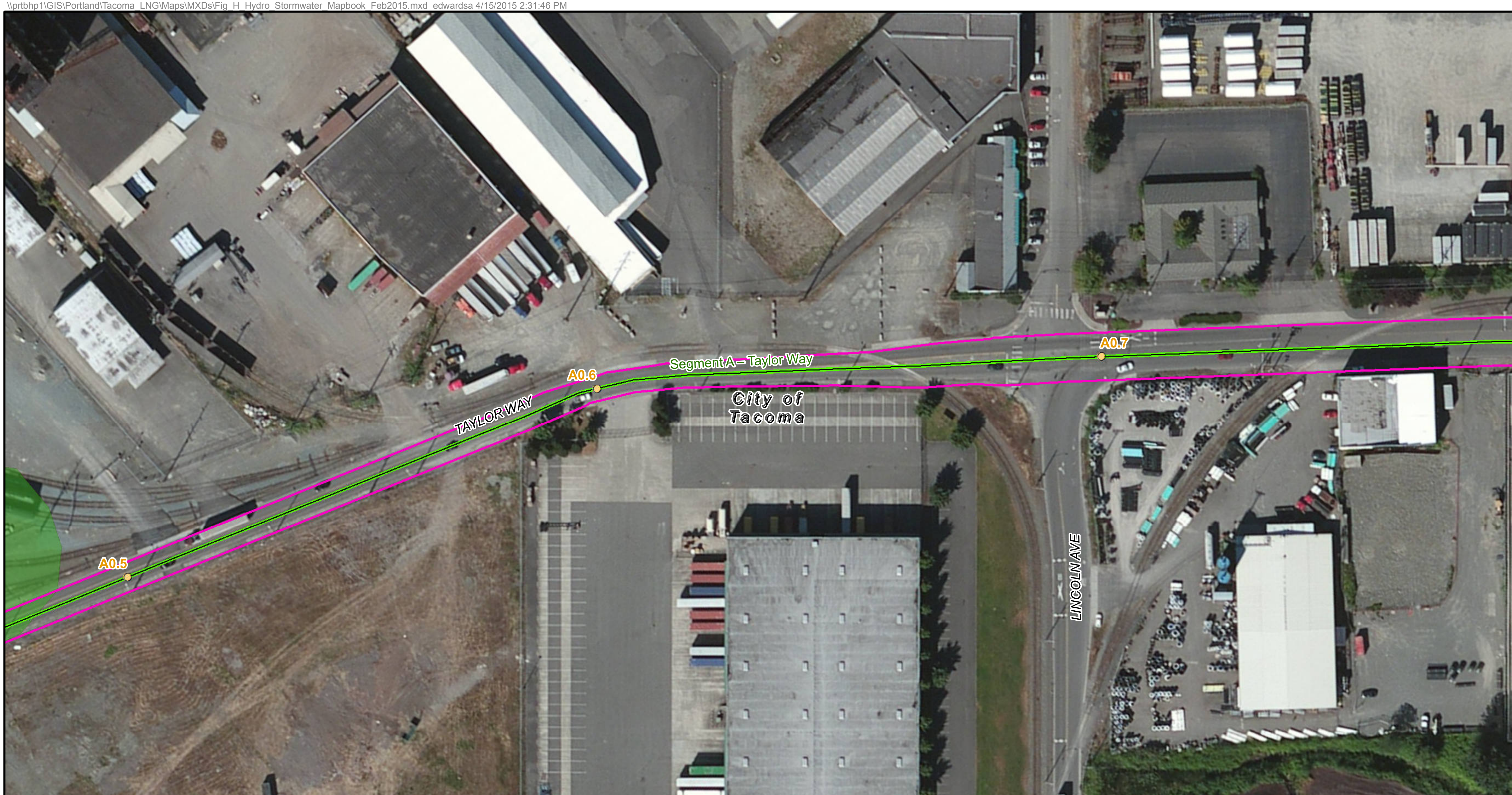

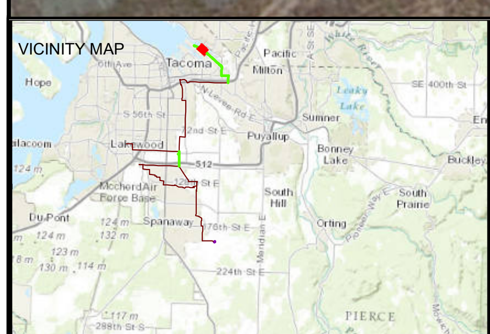

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure F-4 Segment A - Map 03 Hydro Features

Tacoma LNG Project

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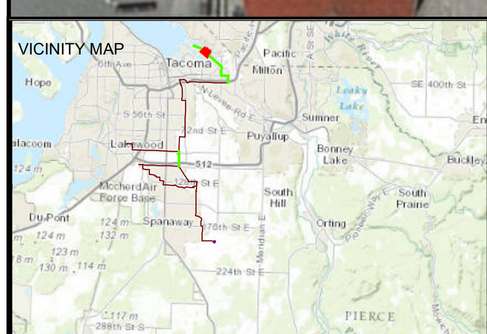

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

N E S W

0 50 100 Feet

Tacoma

City of Tacoma

Figure F-5 Segment A - Map 04 Hydro Features

Tacoma LNG Project

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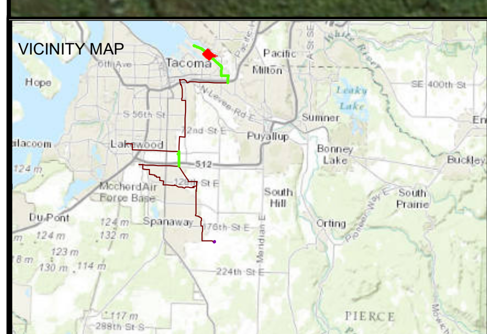

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure F-6 Segment A - Map 05 Hydro Features

Tacoma LNG Project

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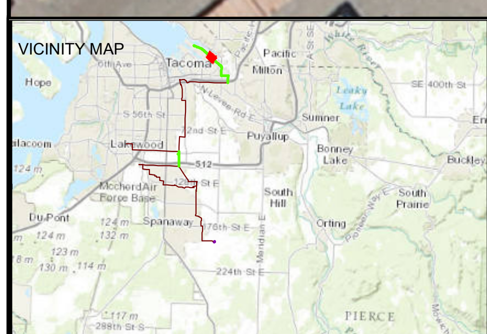

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure F-7 Segment A - Map 06 Hydro Features

Tacoma LNG Project

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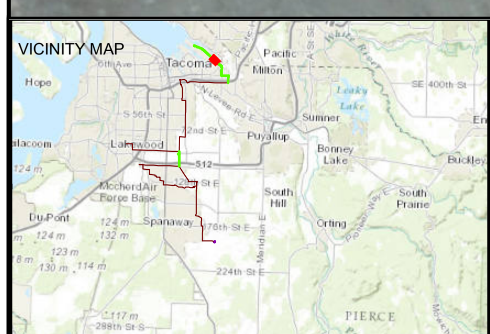

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure F-8 Segment A - Map 07 Hydro Features

Tacoma LNG Project

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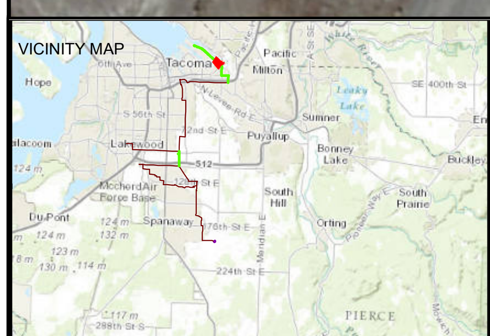

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure F-9 Segment A - Map 08 Hydro Features

Tacoma LNG Project

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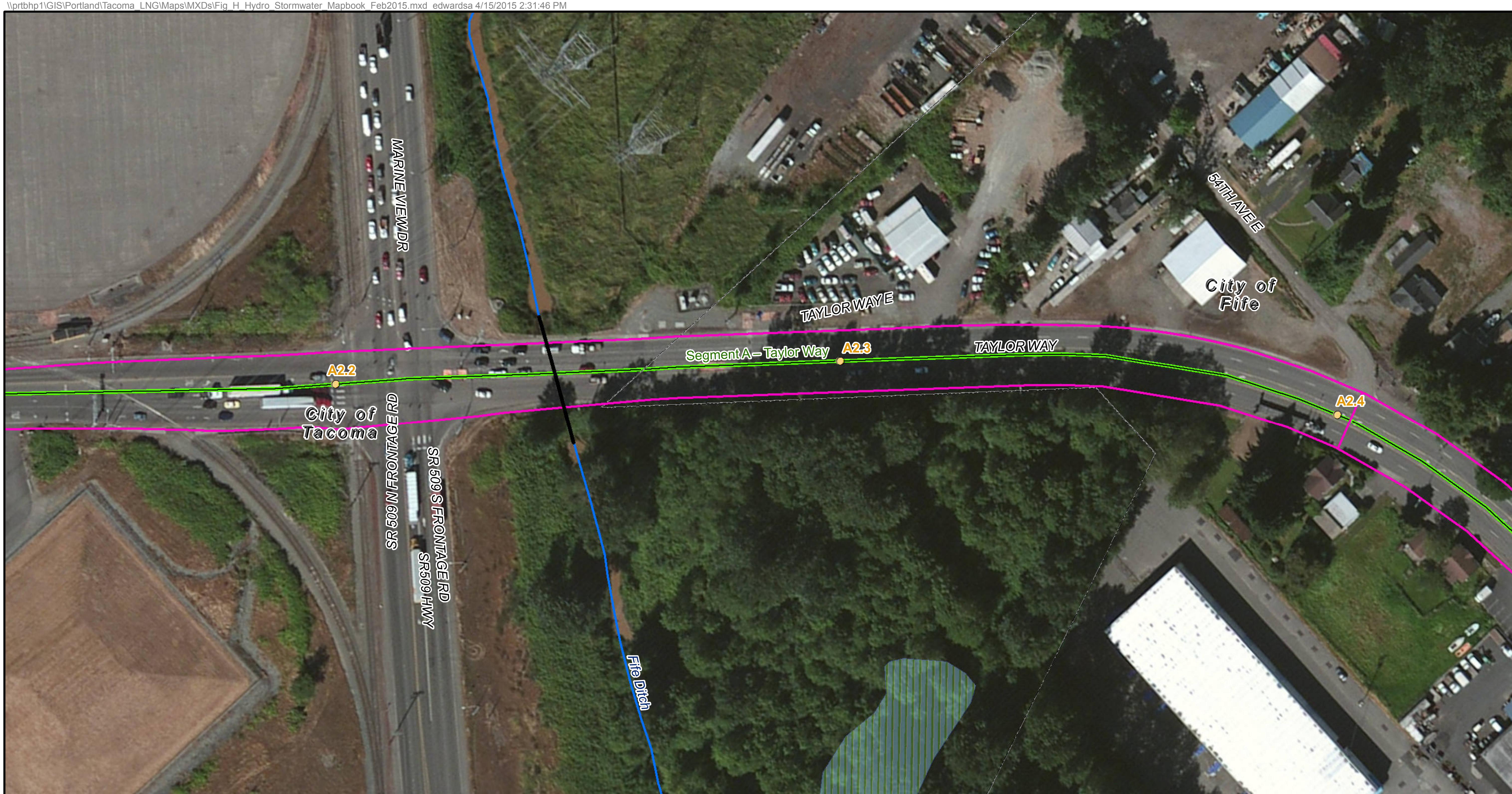

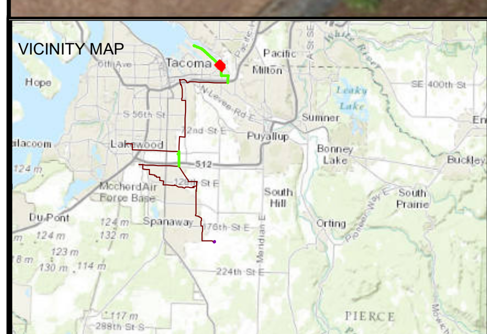

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

Tacoma
City of Tacoma

Figure F-10
Segment A - Map 09
Hydro Features

Tacoma LNG Project

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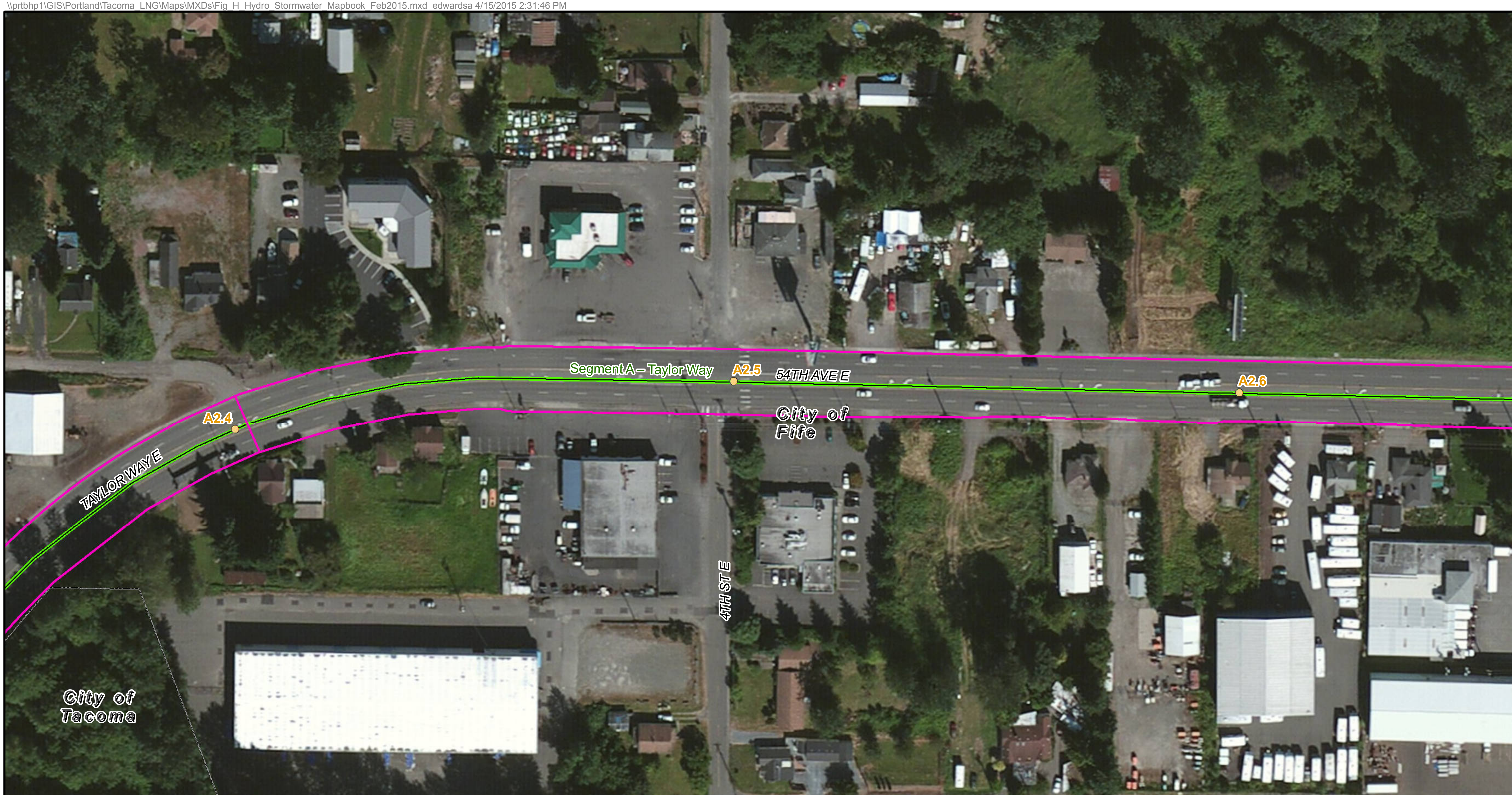
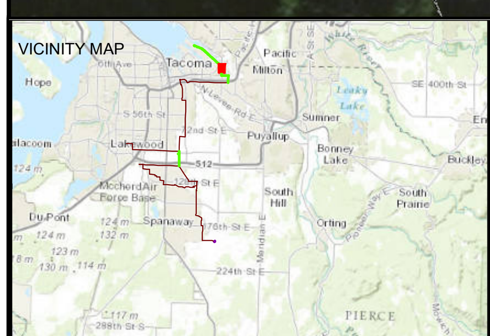




Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

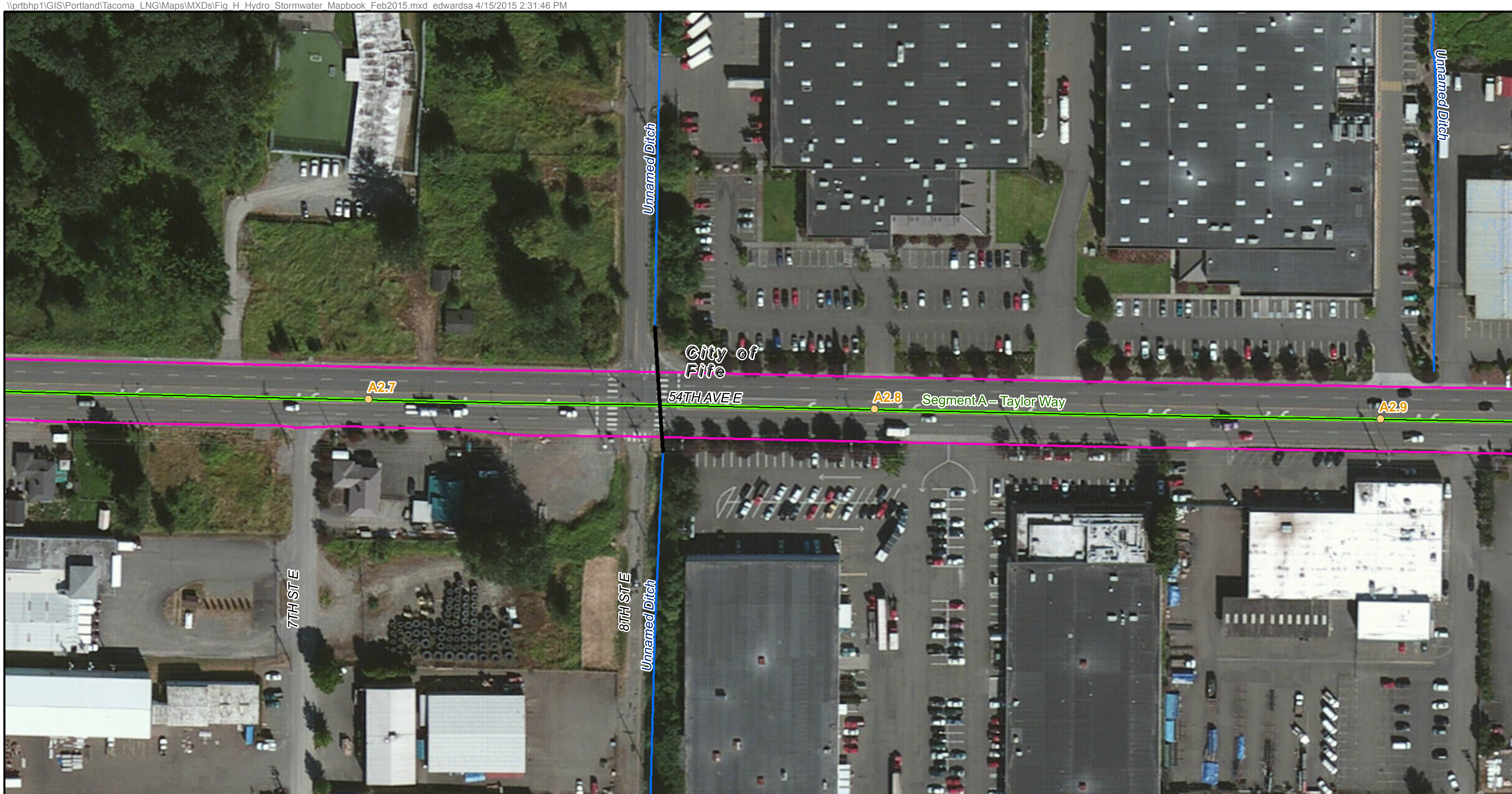
- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

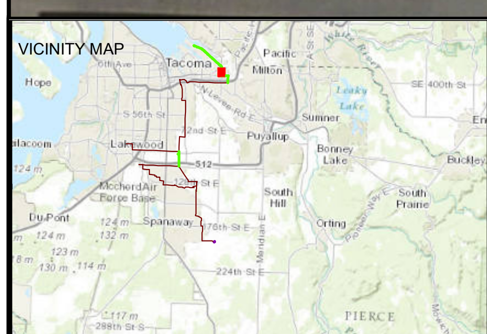
0 50 100 Feet

City of Tacoma

Figure F-11
Segment A - Map 10
Hydro Features

Tacoma LNG Project





Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Fredrickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure F-12
Segment A - Map 11
Hydro Features

Tacoma LNG Project

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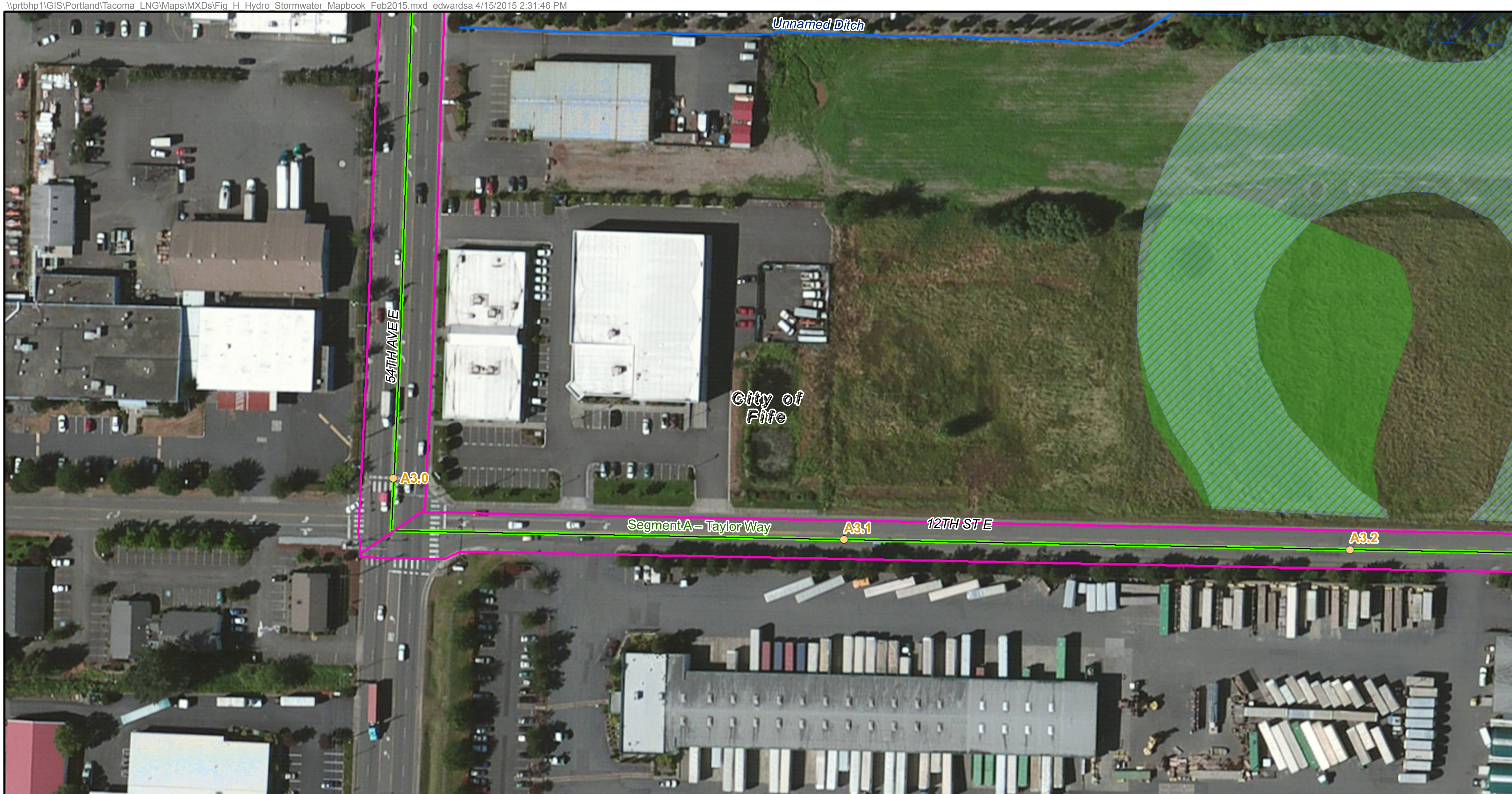

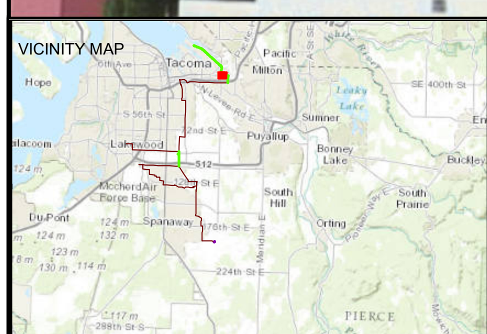

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

N W E S

0 50 100 Feet

Tacoma
City of Tacoma

Figure H-13
Segment A - Map 12
Hydro FeatureF

Tacoma LNG Project

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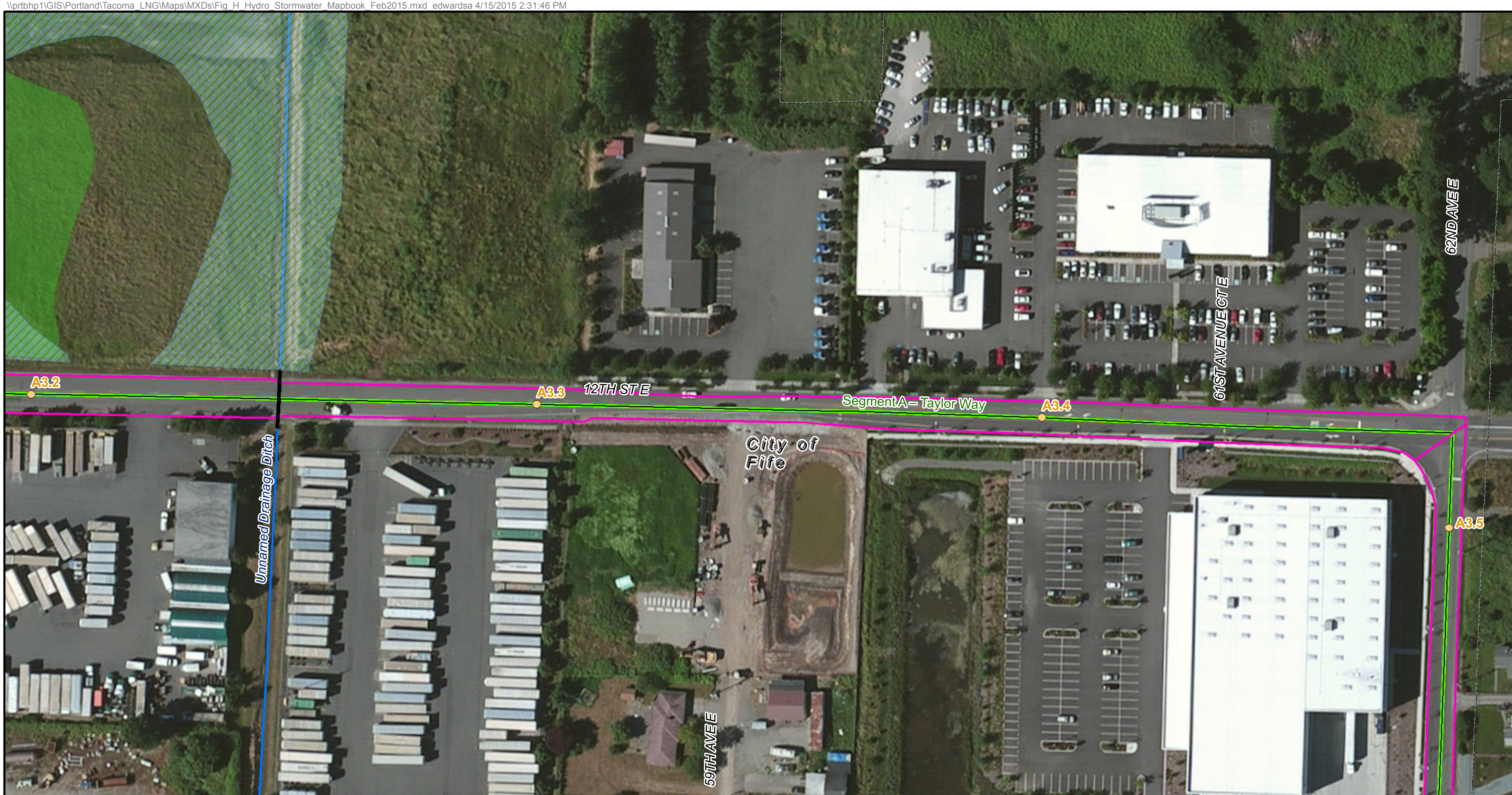

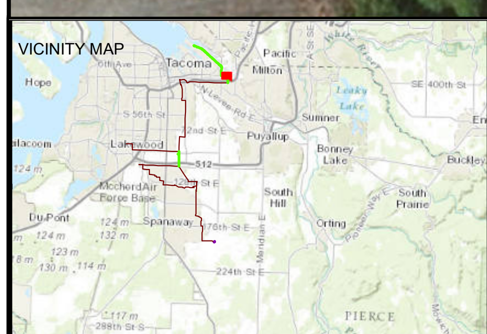

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure F-14
Segment A - Map 13
Hydro Features

Tacoma LNG Project

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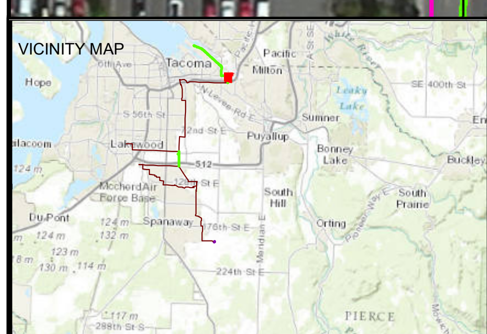

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure HF15
Segment A - Map 14
Hydro Features

Tacoma LNG Project

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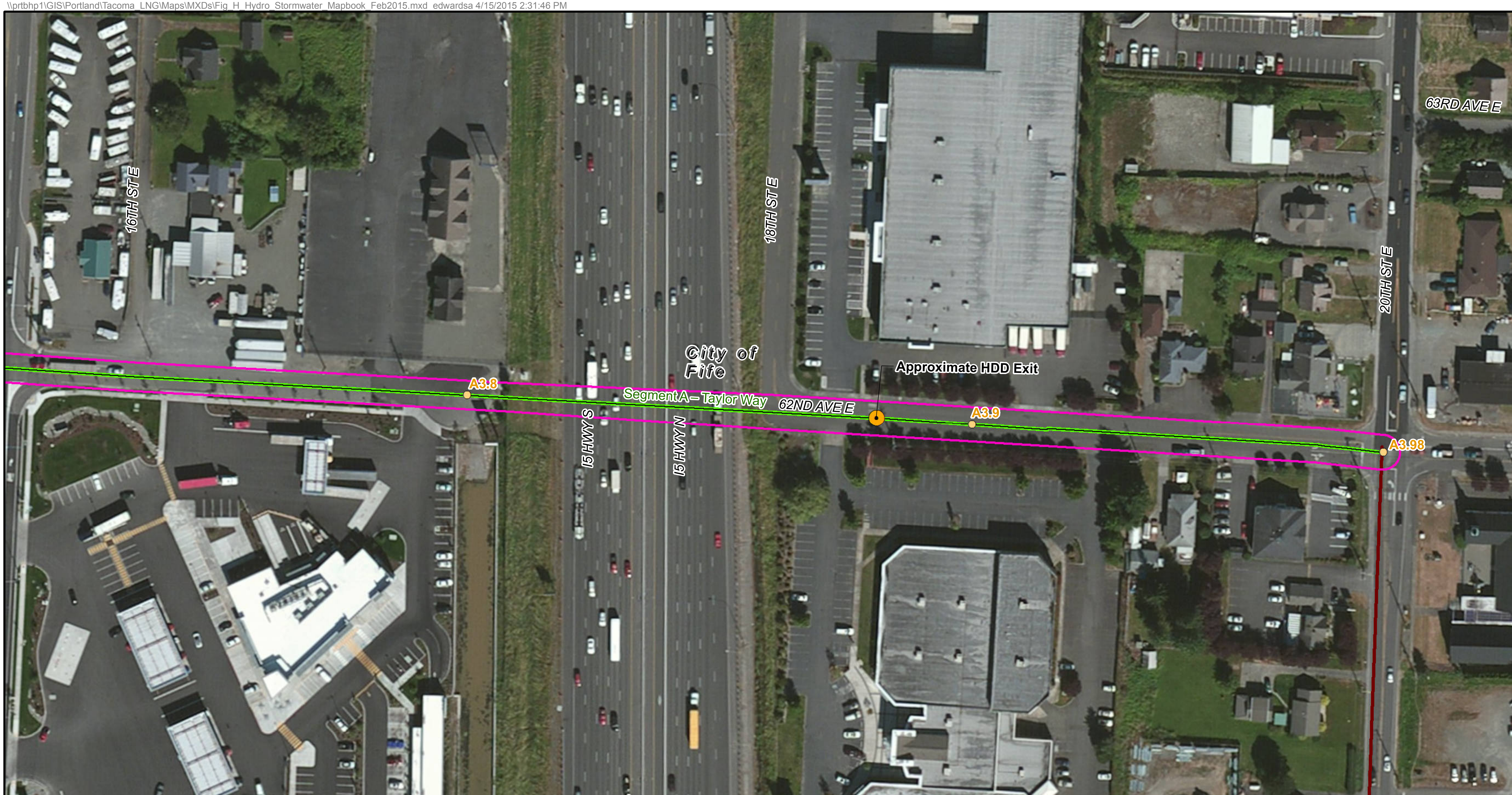

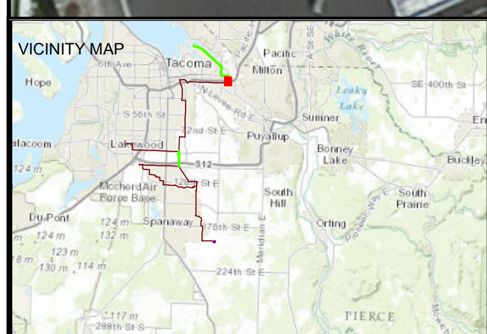

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure F-16
Segment A - Map 15
Hydro Features

Tacoma LNG Project

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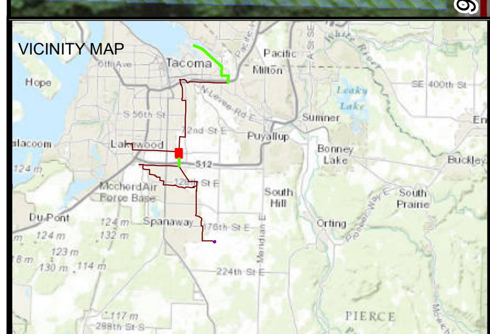

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure HF17
Segment B - Map 01
Hydro Features

Tacoma LNG Project

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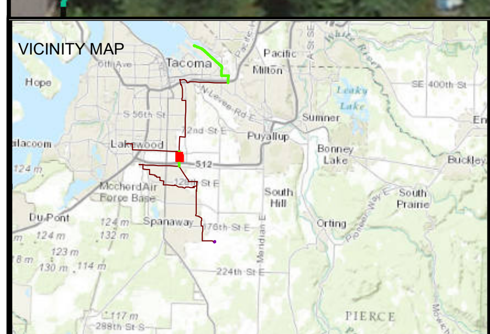

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

Tacoma
City of Tacoma

Figure F-18
Segment B- Map 02
Hydro Features

Tacoma LNG Project

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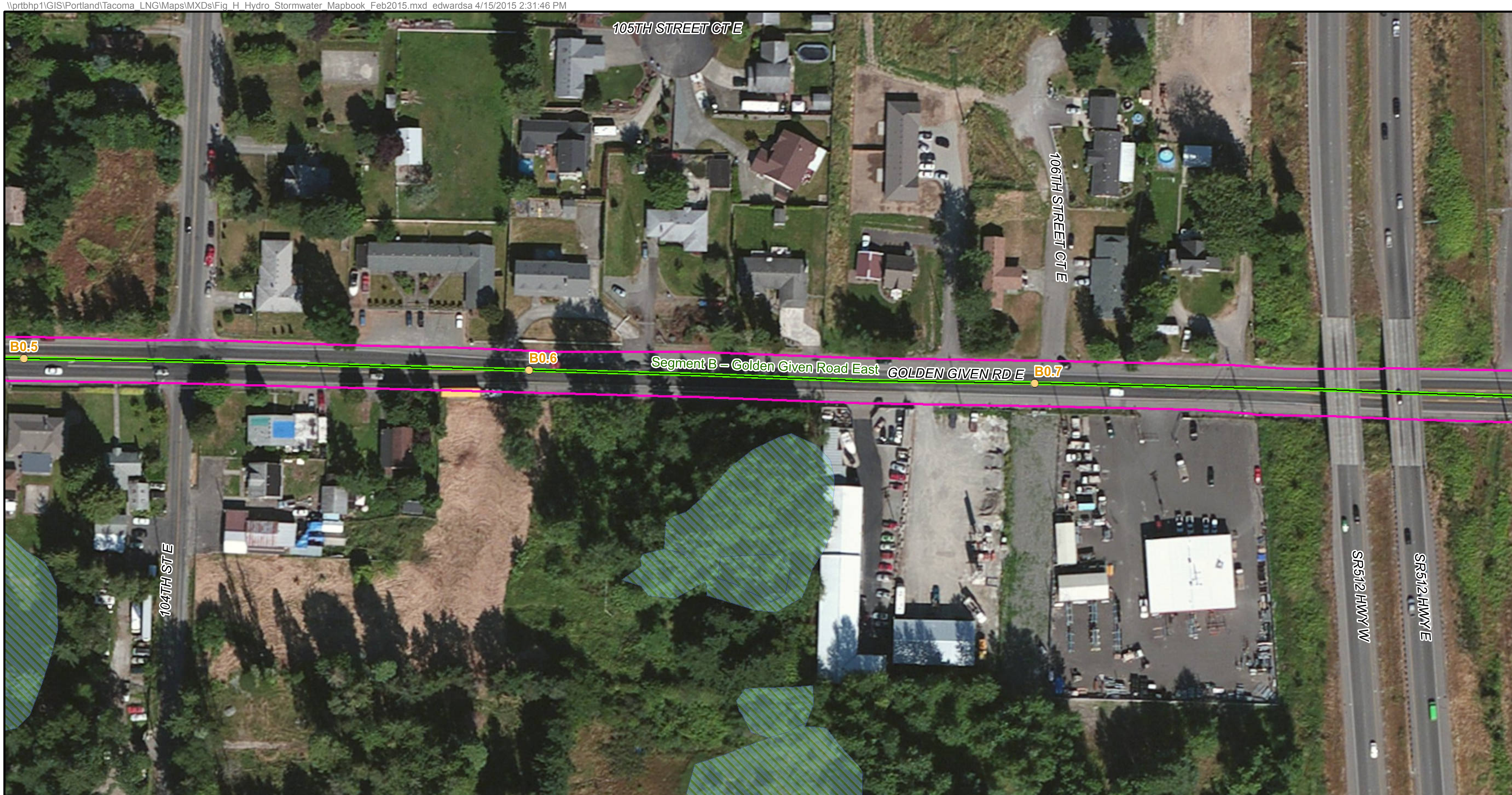

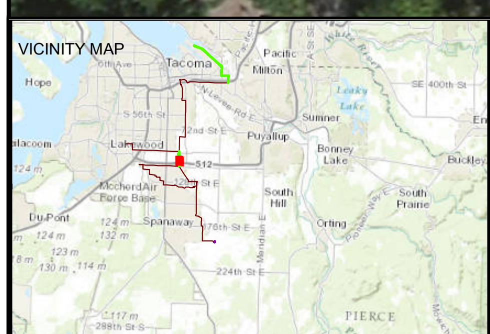

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

City of Tacoma

Figure F-19
Segment B- Map 03
Hydro Features

Tacoma LNG Project

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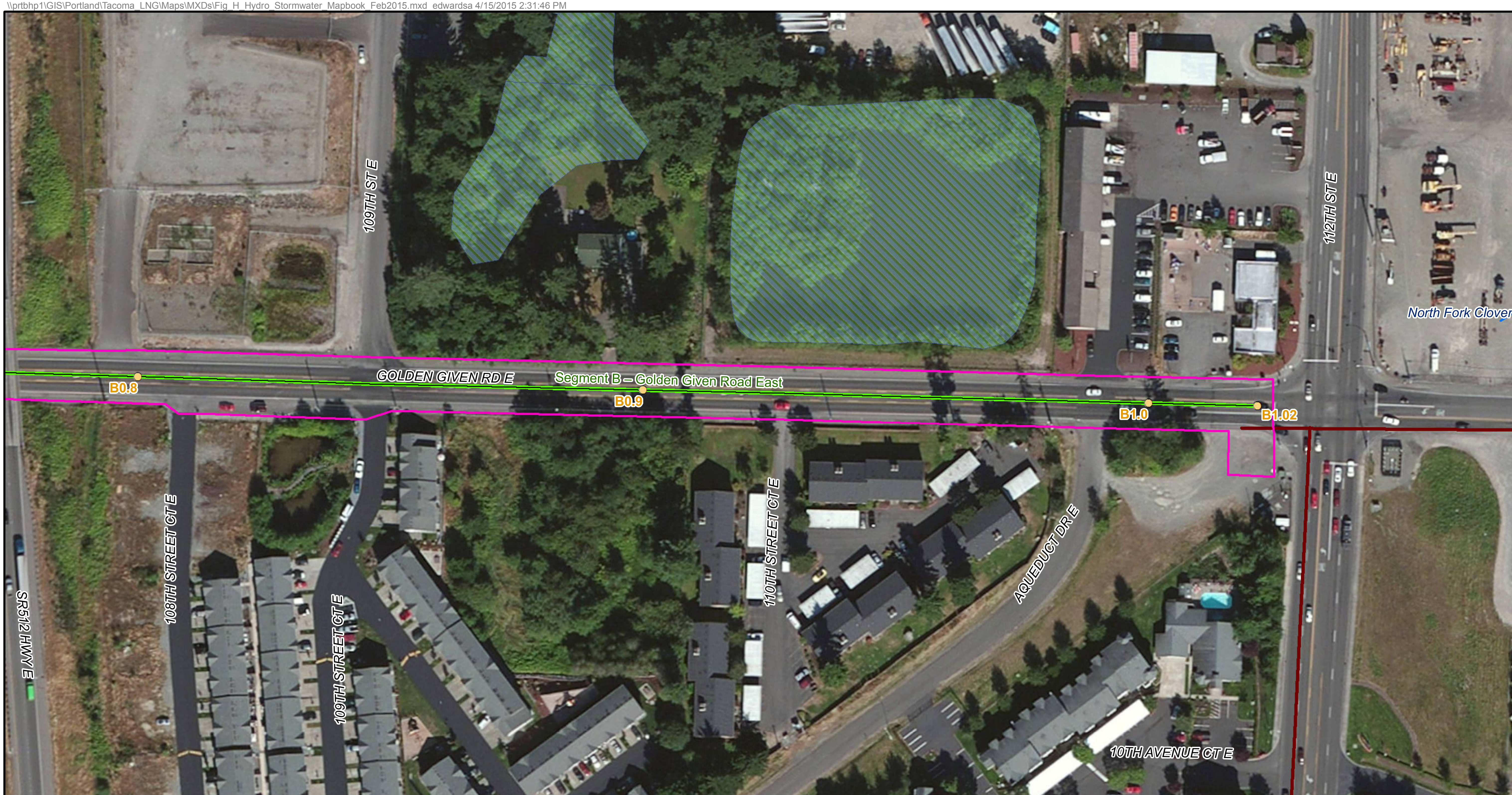

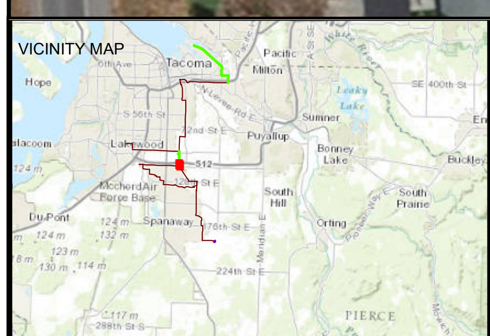

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Frederickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

0 50 100 Feet

Tacoma

City of Tacoma

Figure F-20
Segment B- Map 04
Hydro Features

Tacoma LNG Project

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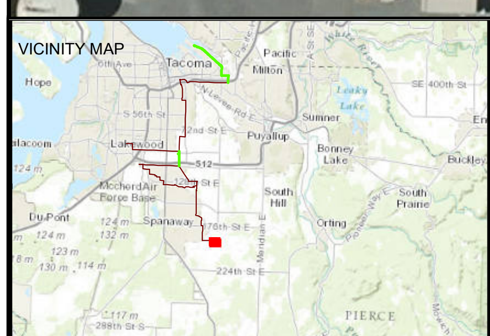

Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Proposed Tacoma LNG Facility Site Boundary
- Proposed TOTE Marine Vessel LNG Fueling System
- Proposed Loading Platform
- Proposed Pier
- Fredrickson Gate Station
- Golden Given Limit Station Site Boundary
- Proposed New Pipeline
- Existing Pipeline
- Milepost
- Workspace
- Culvert
- Stream / River
- Stream / River
- City Limit Boundary
- Wetlands from Pierce County

National Wetlands Inventory Wetland Types

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

N E S W

0 50 100 Feet

Tacoma

City of Tacoma

Figure F-21 Fredrickson Gate Station Hydro Features

Tacoma LNG Project

Appendix G-1: Visual Simulations

Existing Conditions and Photographic Simulations from Key Observation Points

This appendix contains a series of four paired photographs. The first photograph in each pair shows existing conditions at representative locations around the Tacoma LNG Facility site. The second photograph in each pair shows a photographic simulation of the view as it would appear when the facility is in place. The representative locations are referred to as key observation points (KOPs). Each KOP is located within the visual assessment area. **Figure I-1** in this appendix depicts the locations from which each photograph was taken.

The photographs are organized and titled as follows:

- KOP1:
  - KOP 1a: Existing view to the south of the Tacoma LNG Facility site from the sidewalk of Browns Point Boulevard north of McMurray Ravine.
  - KOP 1b: View with Tacoma LNG Facility.
- KOP2:
  - KOP 2a: Existing view to the south of the Tacoma LNG Facility site from parking area near marina off of Marine View Drive.
  - KOP 2b: View with Tacoma LNG Facility.
- KOP3:
  - KOP 3a: Existing view to the west of the Tacoma LNG Facility site from sidewalk on the Hylebos Bridge (East 11th Street).
  - KOP 3b: View with Tacoma LNG Facility.
- KOP4:
  - KOP 4a: View to the northwest of the Tacoma LNG Facility site from the corner of East Alexander Avenue and East 11th Street.
  - KOP 4b: View with Tacoma LNG Facility.

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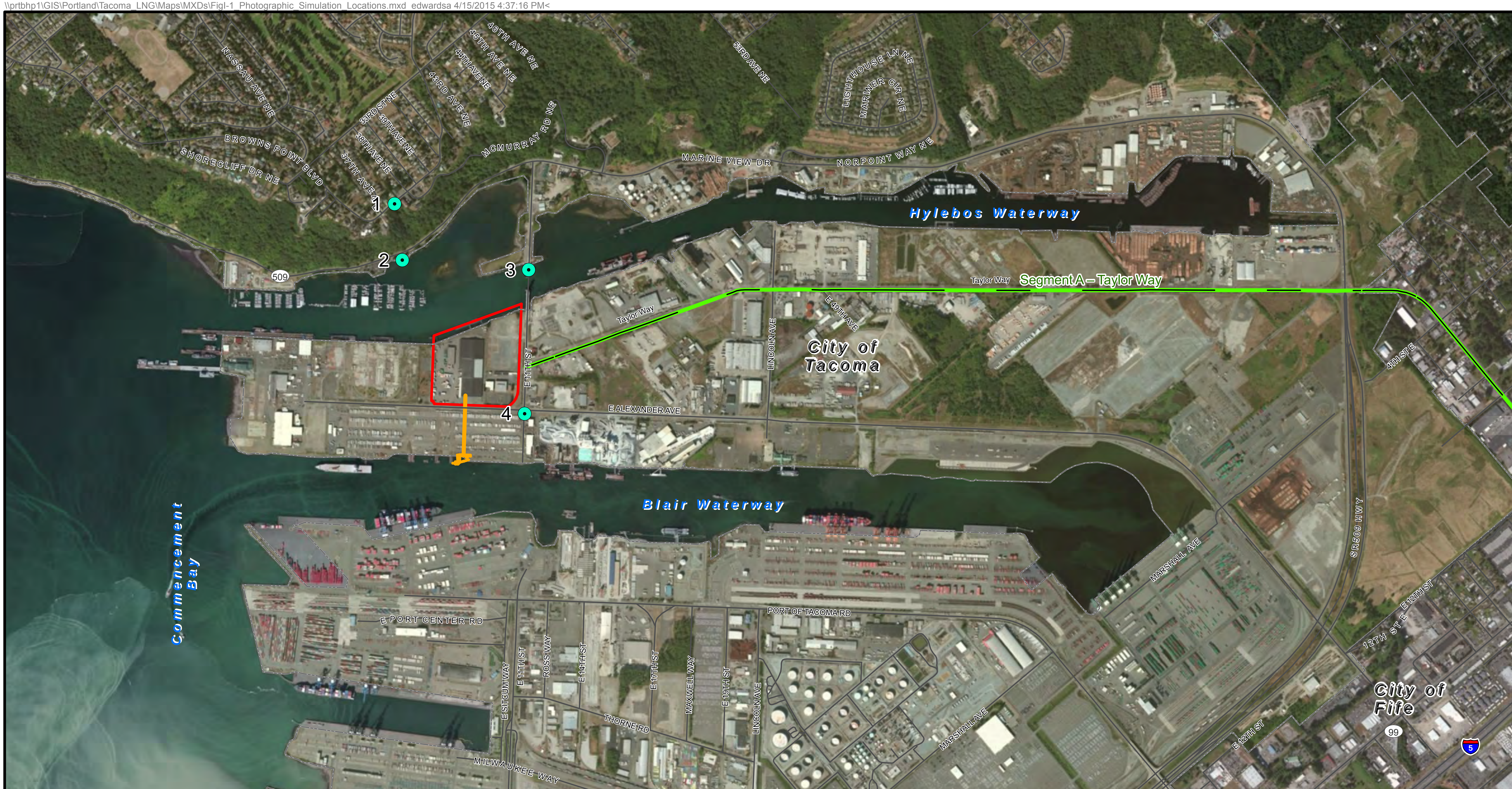
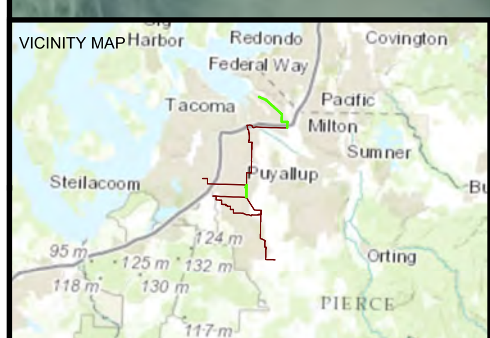




Sources: ESRI 2012, Puget Sound Energy 2015

Legend

- Simulation Locations
- Tacoma LNG Facility Boundary
- TOTE Marine Vessel LNG Fueling System
- Proposed New Pipeline
- City Limit Boundary

0 1,000 2,000 Feet

City of Tacoma

Figure G-1
Photographic Simulation Locations

Tacoma LNG Project

KOP 1a: Existing view to the south of the Tacoma LNG Facility site from the sidewalk of Browns Point Boulevard north of McMurray Ravine.

KOP 1b: View with Tacoma LNG Facility.

KOP 2a: Existing view to the south of the Tacoma LNG Facility site from parking area near marina off of Marine View Drive.

KOP 2b: View with Tacoma LNG Facility.

KOP 3a: Existing view to the west of the Tacoma LNG Facility site from sidewalk on the Hylebos Bridge (East 11th Street).

KOP 3b: View with Tacoma LNG Facility.

KOP 4a: View to the northwest of the Tacoma LNG Facility site from the corner of East Alexander Avenue and East 11th Street.

KOP 4b: View with Tacoma LNG Facility.

Appendix G-2: Site Characterization Photos

Character Photographs

This appendix contains a series of photographs that were taken from locations within the visual assessment area of the Tacoma LNG Project. Some of the photographs illustrate the character of landscapes within the visual assessment area. Other photographs illustrate how visible, or not visible, the Tacoma LNG Facility site is from various locations in the assessment area looking toward the site. The Proposed Action would not result in changes to the viewed landscape from areas where the Tacoma LNG Facility site cannot be seen.

Table J-1 describes the photographs in this appendix. The photographs were taken using a digital single-lens reflex camera set to take photos with a focal length equivalent to a photo taken with a 35-millimeter (mm) camera using a 50-mm lens. This setting is the generally accepted setting for visual assessment in that it captures views that closely resemble what the human eye sees in a landscape. **Figure J-1** shows the locations where each character photograph was taken.

TABLE G-1
Description of Character Photographs of Existing Conditions

Location Number	Approximate Viewing Distance to Tacoma LNG Facility Site	Location	Notes
1	2 miles	Cliff House Restaurant parking area	Twilight view from well-known viewpoint in Browns Point area west of Tacoma LNG Facility site. Note west end of Blair Peninsula behind empty anchored container ship.
2	2 miles	Herron Ridge Drive NE	Twilight view from subdivision above Marine View Drive west of Tacoma LNG Facility site. Tyee Marina seen in foreground. Roof of existing large building on Tacoma LNG Facility site can be seen as a long horizontal reflected feature.
3	0.4 mile	Browns Point Boulevard from sidewalk overlooking McMurray Ravine	Provides unobstructed view from the north toward the Tacoma LNG Facility site.
4	0.25 mile	Along Marine View Drive	Can see parts of site, although boat at marina partially block some views of it.
5	1 mile	On slope below Point Woodworth subdivision and above Norpointe Way NE	Difficult to see Tacoma LNG Facility site because of Hylebos Bridge and other obstructions. Can see bridge opening and large tank farm.
6	0.7 mile	Along edge of Hylebos Waterway looking west towards tank farm	Example of industrial-maritime character of the waterway and residences on the slope north of Marine View Drive.
7	0.1 mile	Looking west along Taylor Way at Tacoma LNG Project	Example of industrial character of lands adjacent to Taylor Way.
8	0.2 mile	Blair Waterway	Example of industrial-maritime character of Blair Waterway and area south of Blair Peninsula.
9	Adjacent to site	Corner of East 11th Street and Alexander Avenue looking north toward bridge	Can see edge of Tacoma LNG Facility site, East 11th Street, Hylebos Bridge, and slope north of Marine View Drive.
10	2.2 miles	Downtown overlook	Example of appearance of the industrial area north of downtown when viewed from downtown.
11	3 miles	Ruston Way walking path on pier of Silver Cloud Hotel	Example of the appearance of the industrial area as seen from Ruston Way.

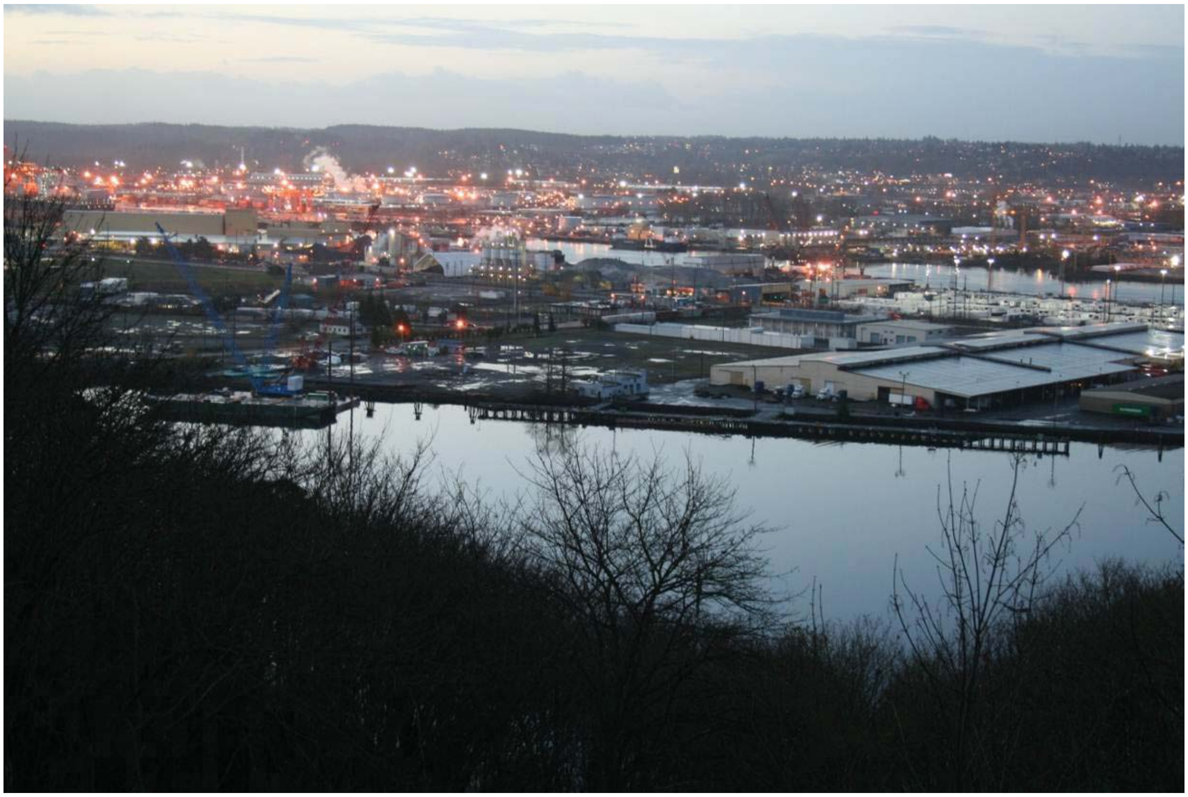
\\prtbhp1\GIS\Portland\Tacoma_LNG\Maps\MXDs\FigJ-1_Character_Photograph_Locations.mxd edwardsa 4/17/2015 1:04:40 PM

Figure G-1
Character Photograph Locations

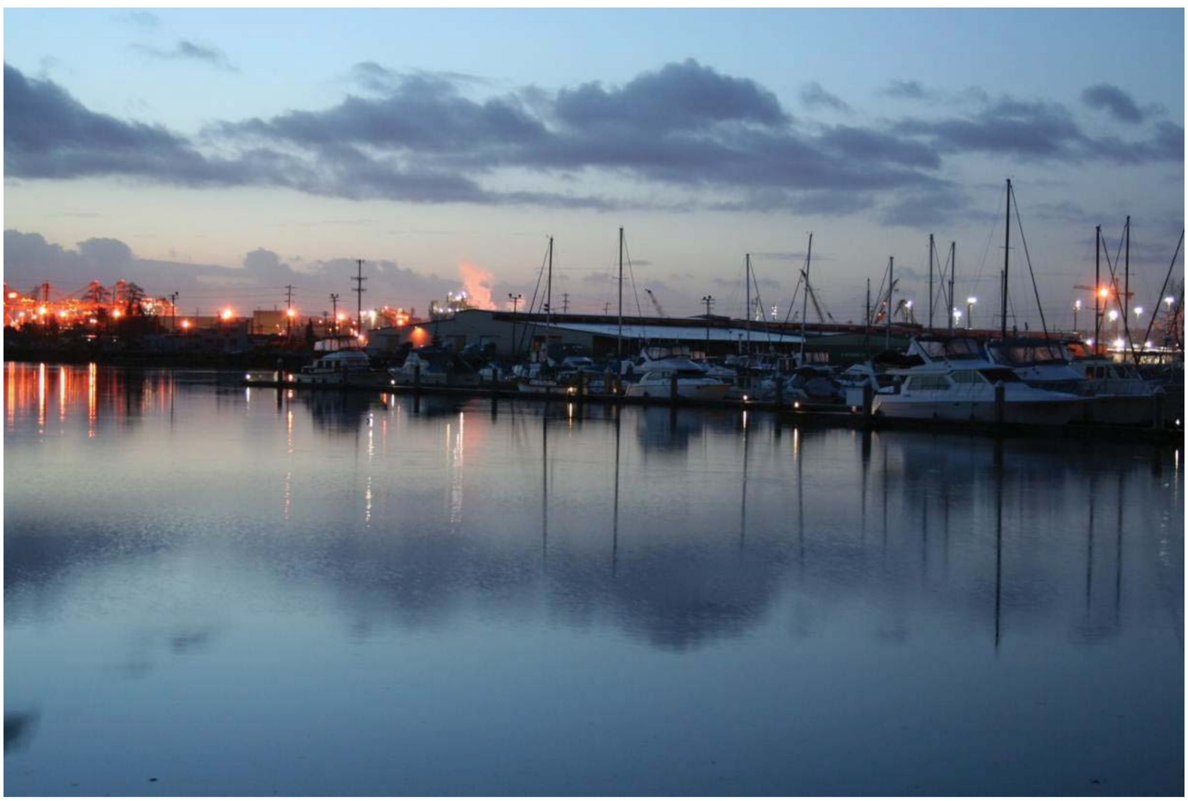
Tacoma LNG Project

Location 1. Cliff House Restaurant parking area.

Location 2. Herron Ridge Drive NE.

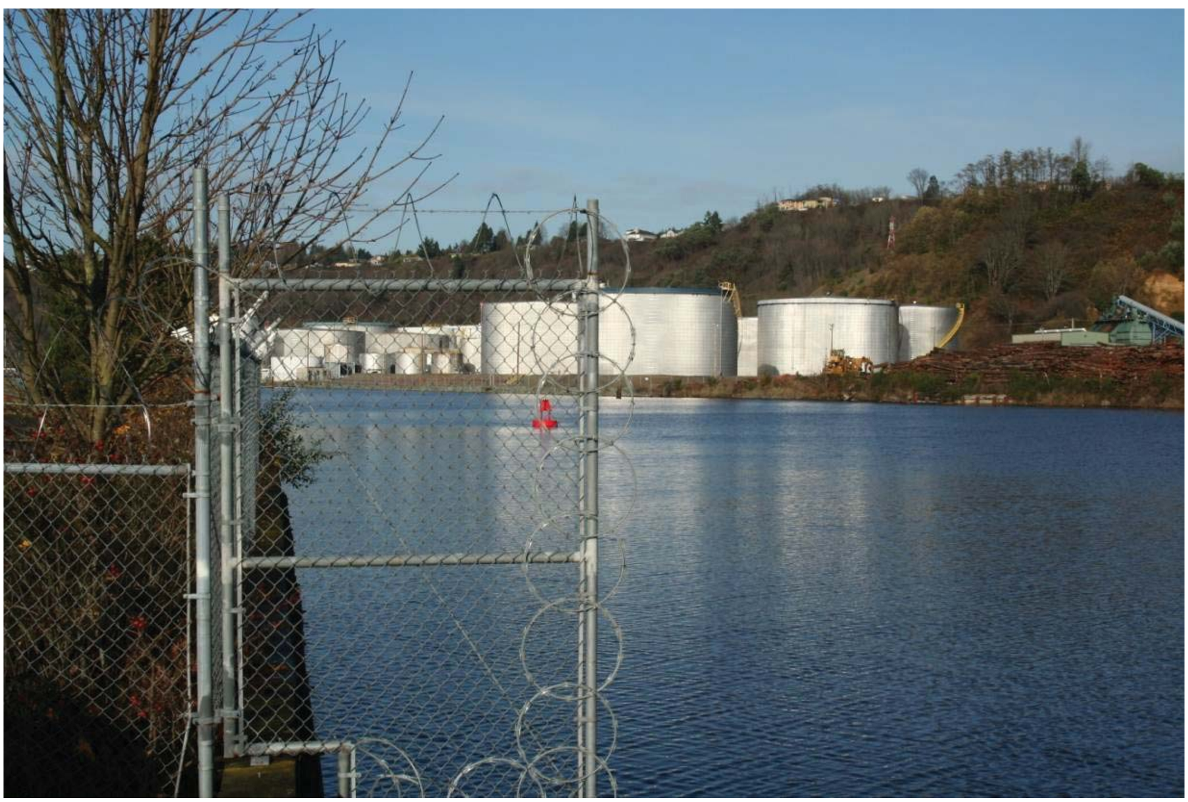


Location 3. Browns Point Boulevard from sidewalk overlooking McMurray Ravine.



Location 4. Along Marine View Drive.

Location 5. On slope below Point Woodworth Subdivision and above Norpointe Way NE.



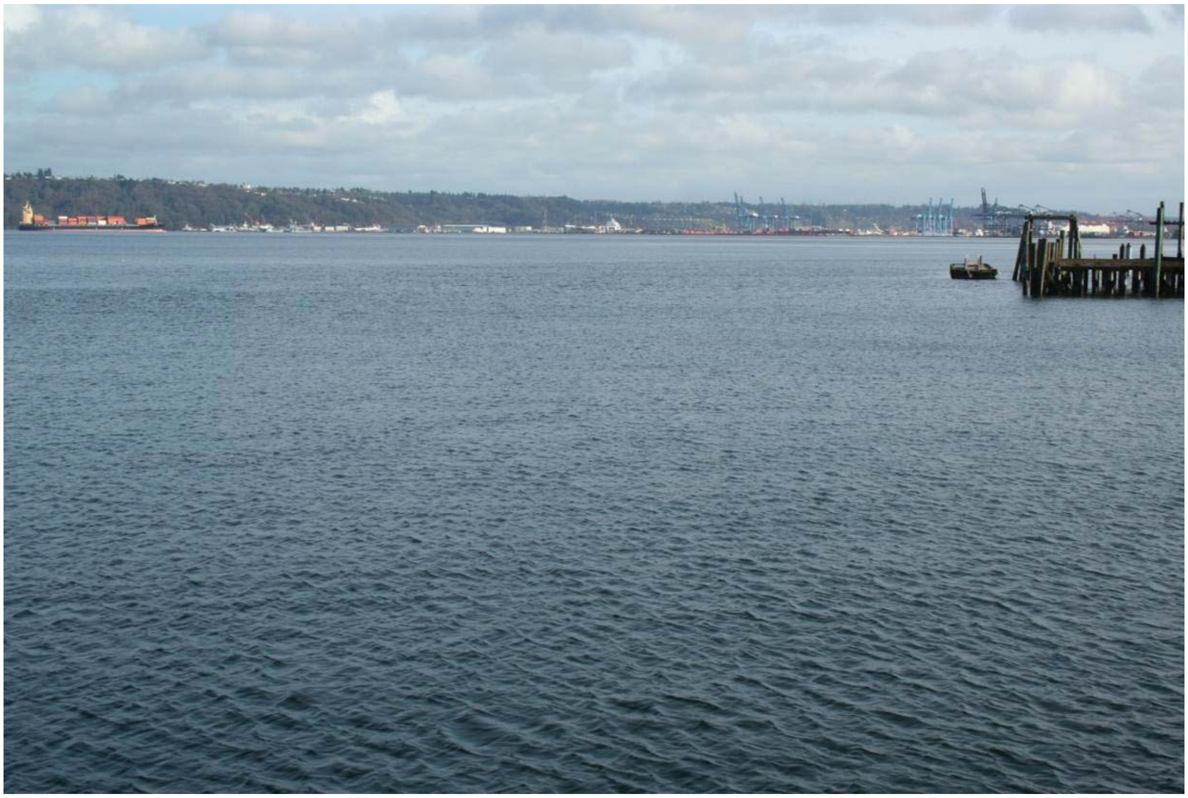
Location 6. Along edge of Hylebos Waterway looking west toward tank farm.

Location 7. Looking west along Taylor Way at Tacoma LNG Project.

Location 8. Blair Waterway.

Location 9. Corner of East 11th Street and Alexander Avenue looking north toward bridge.

Location 10. Downtown overlook.



Location 11. Ruston Way walking path on pier of Silver Cloud Hotel.

Appendix H-1: Correspondence with Tribes

PUGET SOUND ENERGY
The Energy To Do Great Things

Puget Sound Energy
P.O. Box 97034
Bellevue, WA 98009-9734
PSE.com

August 8, 2014 **Hand Delivered**

Puyallup Indian Tribe
Bill Sterud, Chairman
5722 66th Ave E
Puyallup, WA 98371

Re: Request for meeting with the Puyallup Tribe for PSE project plans at the Port of Tacoma

Dear Chairman:

The purpose of this letter is to provide an introduction and background on a project at the Port of Tacoma for which Puget Sound Energy (PSE) will soon be seeking permits from various government agencies. PSE recognizes that the Puyallup Tribe is an important stakeholder and we would like to introduce you to the project and give you an opportunity to address PSE directly with any questions. We hope this letter is the beginning of a frequent dialogue and good communication with the Puyallup Tribe regarding our project.

Proposed Project:

PSE is undertaking a lease agreement with the Port of Tacoma for a 33-acre site on the Blair-Hylebos Peninsula in the Port of Tacoma. This is an area of the Port that has been designated for redevelopment for the last several years. PSE intends to develop a natural gas liquefaction and storage facility to meet its customers' gas demands and to provide a cleaner-burning fuel that meets or exceeds applicable regional, state and federal air quality standards. The PSE facility would liquefy natural gas at a rate of 250,000 gallons daily for use as a reduced-emissions fuel for marine vessels and land-based vehicles, as well as for utility peak shaving during periods of high demand on the PSE system. The natural gas would be supplied from PSE's existing natural gas pipeline distribution system. A single 8-million gallon, non-pressurized LNG storage tank, inclusive of full-containment inner and outer tanks with interstitial insulation, would be located on the site. The Tacoma LNG facility would be built to the nation's highest and most current safety standards.

Permitting Process:

Tacoma LNG will require state agency permits and/or approvals under the State Environmental Policy Act (SEPA), and federal agency permits and/or approvals under the National Environmental Policy Act (NEPA) including permits from the US Army Corps of Engineers. PSE understands that the Puyallup Tribe is entitled to consultation by the federal agencies in accordance with these permitting processes, and PSE would like to request an introductory meeting with the Puyallup Tribe to begin the discussion of the Tacoma LNG Project in greater detail.

Time Frame:

PSE will stipulate to an Environmental Impact Statement and likely submit permit applications beginning in late August or September. The PSE project, technical and legal staff would be able to meet with you and any technical staff that you deem appropriate as soon as you are available. PSE is genuine in the desire to have open communication about this project. We like you and your staff have many other projects and obligations to juggle; these dates are the most immediate times that we can meet with you, but please let us know if you require later dates.

1. August 11
2. August 14
3. August 19

This meeting can take place in Tacoma at the PSE Office at 3130 South 38th St in Tacoma or at a location in your tribal government facility. Please contact Larry Tornberg, PSE's Sr. Siting Project Manager, at 425-456-2691 or email larry.tornberg@pse.com to coordinate the details for a meeting.

Sincerely,

Roger Garratt
Director Strategic Initiatives
Tacoma LNG Project
PUGET SOUND ENERGY

PSE PUGET SOUND ENERGY

Puget Sound Energy
P.O. Box 97034
Bellevue, WA 98009-9734
PSE.com

September 18, 2014

Honorable Virginia Cross
Chairwoman, Muckleshoot Tribal Council
39015 172nd Ave SE
Auburn, WA 98092

Re: Tacoma LNG Project; PSE Proposal to Meet

Honorable Chairwoman Cross,

I am the Puget Sound Energy ("PSE") siting manager for the company's proposed Tacoma LNG Project ("Project") at the Blair-Hylebos Peninsula. It is my responsibility to coordinate and solicit input from all agency and tribal stakeholders involved in the project permitting process. The Project will undergo permit review by local, state and federal agencies. PSE has stipulated that an Environmental Impact Statement ("EIS") should be prepared for Tacoma LNG under the Washington State Environmental Policy Act ("SEPA"). The City of Tacoma will serve as the SEPA lead agency responsible for conducting environmental review on the Project.

My purpose in writing today is to follow up on a phone call I made to you last Thursday, September 11, 2014. In your absence the Muckleshoot Administrative Officer referred me to Mardee Marquard. I left voice mail with Mardee sharing my purpose in calling, which was to personally advise you, as Chairman of the Tribal Council, that the Muckleshoot Indian Tribe will soon be receiving a notice from the City with information about opportunities to offer public comments on the scope of the EIS.

PSE would welcome the Muckleshoot Tribe's participation in the public scoping and comment processes for the Project, and would welcome any additional opportunity to hear the Muckleshoot Tribe's concerns and comments in person before or afterwards. PSE has developed a Project website, www.tacomacleanlng.com, which may be helpful for you and your staff in gathering information about our proposal. However, a website cannot replace the value of meeting with each other in person.

PSE would very much like to set up a meeting time with you and any technical staff that you think appropriate. Please let me know what dates and times work for you in the next few weeks. PSE would be happy to meet at a location on your tribal government campus for your convenience, or we can host the meeting at our Tacoma office.

Please contact me at 425-456-2691 or larry.tornberg@pse.com to coordinate potential meeting times.

Sincerely,

Larry Tornberg
PSE

PSE PUGET SOUND ENERGY

Puget Sound Energy
P.O. Box 97034
Bellevue, WA 98009-9734
PSE.com

September 19, 2014

Honorable Bill Sterud
Chairman, Puyallup Tribal Council
3009 E Portland Ave
Tacoma, WA 98404

Re: Proposal to meet to discuss PSE's proposed project on the Blair-Hylebos Peninsula

Honorable Chairman Sterud,

I am the Puget Sound Energy ("PSE") siting manager for the company's proposed Tacoma LNG Project ("Project") at the Blair-Hylebos Peninsula. It is my responsibility to coordinate and solicit input from all agency and tribal stakeholders involved in the project permitting process. You will kindly recall that I had previously outlined, in an August 8, 2014 letter, PSE's desire to meet in order to discuss and provide an overview of the Project. PSE recognizes that the Puyallup Tribe of Indians may have specific concerns or questions about our proposed facility and the company understands that having clear lines of communication will be helpful. Since the August 8 letter was sent, PSE has developed a project website, www.tacomacleanlng.com, which may be helpful for you and your staff in gathering information about our proposal. However, a website cannot replace the value of meeting with each other in person.

PSE would very much like to set up a meeting time with you and any technical staff that you think appropriate. Please let me know what dates and times work for you in the next few weeks. PSE would be happy to meet at a location on your tribal government campus for your convenience, or we can host the meeting at our Tacoma office.

The Tacoma LNG is a project will undergo permit review by local, state and federal agencies. PSE has stipulated that an Environmental Impact Statement ("EIS") should be prepared for Tacoma LNG under the Washington State Environmental Policy at Ch. 43.21C RCW. The City of Tacoma will serve as the SEPA lead agency responsible for conducting environmental review on the Project.

Last Thursday afternoon, September 11, 2014, I tried to contact you via phone. I was referred by the Puyallup Tribe of Indians' administrative office operator to your staff assistant. I left a voice message indicating my purpose in calling was to personally advise you, as Chairman of the Tribal Council, that the Puyallup Tribe will soon be receiving a notice from the City with information about opportunities to offer public comments on the scope of the EIS. PSE would welcome the Puyallup Tribe's participation in the public scoping and comment processes for the Project, and would welcome any additional opportunity to hear the Puyallup Tribe's concerns and comments in person before or afterwards.

Please contact me at 425-456-2691 or larry.tornberg@pse.com to coordinate potential meeting times.

Sincerely,

Larry Tornberg

Larry Tornberg
PSE

Appendix H-2: Summary of Archaeological Data

Archaeological Data

TABLE H-1
Previous Archaeological Investigations Conducted within 0.25 mile of the Tacoma LNG Project Area of Potential Effect

Report	Location Vicinity	Description	Results	Reference
Seattle, Washington, Cultural Resources Assessment of 502 54th Avenue East and 503 53rd Avenue East, Fife, Pierce County, Washington	Segment A	Pedestrian survey and shovel testing	No archaeological sites or historic properties recorded in the vicinity of the Tacoma LNG Project	Gillespie et al., 2008
Cultural Resources Investigations for the City of Fife's 20th Street East Widening Project, Pierce County, Washington	Segment A	Pedestrian survey	No archaeological sites or historic properties recorded in the vicinity of the Tacoma LNG Project	Luttrell, 2007
Results of Archaeological Monitoring for the Hylebos Bridge Rehabilitation Project, Pierce County, Washington	Segment A	Archaeological monitoring	No archaeological sites or historic properties recorded in the vicinity of the Tacoma LNG Project	Shong and Miss, 2010
Results of Archaeological Monitoring for the Port Parcel 88 Combined Habitat Project, Port of Tacoma, Pierce County, Washington	Segment A	Archaeological monitoring	Recorded precontact sites 45PI1188 and 45PI1203	Shong and Miss, 2011
Archaeological Monitoring of the Tacoma Rail Sound Refining Spur Track Project, 1601 Taylor Way, Tacoma, Pierce County, Washington	Segment A	Archaeological monitoring	No archaeological sites or historic properties recorded in the vicinity of the Tacoma LNG Project	Trautman and Williams, 2011
Results of Testing at Xaxtl'abish 1 (45PI974), Hylebos Creek, Pierce County, Washington	Segment A	Archaeological testing of precontact site 45PI974	Recommended eligible for listing on the NRHP	Shantry et al., 2010
Cultural Resources Report: Wildlands of Washington Hauff Property, Tacoma, Washington	Segment A	Pedestrian survey and shovel testing	No archaeological sites or historic properties recorded in the vicinity of the Tacoma LNG Project	Goetz and Rust, 2008
Cultural Resource Investigations for the Washington State Department of Transportation's SR 167: Puyallup to SR 509 Project, Pierce County, Washington	Segment A	Pedestrian survey and shovel testing	Recorded precontact site 45PI488 and historic era site 45PI490	Luttrell, 2004
Historical Resources Survey, Naval & Marine Corps Reserve Center, Tacoma, Washington	Segments A and B	Historic property survey	Sixteen historic properties recorded, none recommended as eligible for the NRHP	HHM, Inc., 2008
Puyallup Tribal Terminal Cultural Resources Assessment, Pierce County, Washington	Segments A and B	Pedestrian survey, shovel testing, and trenching	No archaeological sites or historic properties recorded in the vicinity of the Tacoma LNG Project	Cooper, 2009b
Cultural Resources Survey of the	Segment B	Pedestrian survey and	No archaeological sites or	Gall et al., 2012

TABLE H-1

Previous Archaeological Investigations Conducted within 0.25 mile of the Tacoma LNG Project Area of Potential Effect

Report	Location Vicinity	Description	Results	Reference
Proposed Woods at Golden Given Project Area, Parkland, Pierce County, Washington		shovel testing	historic properties recorded in the vicinity of the Tacoma LNG Project	
Resources Assessment of the SR 7: SR 507 to SR 512 Safety Project, Pierce County, Washington	Segment B	Pedestrian survey and shovel testing	No archaeological sites or historic properties recorded in the vicinity of the Tacoma LNG Project	Hamilton, 2005
Cultural Resources Assessment for the Spanaway Loop Road South Improvement Project, Pierce County, Washington	Segment B	Pedestrian survey and shovel testing	No archaeological sites or historic properties recorded in the vicinity of the Tacoma LNG Project	Gill, 2005

NRHP = National Register of Historic Places

TABLE H-2

Historic Built Environment within 300 feet of the Tacoma LNG Project Area of Potential Effect

Building Type/Name	NRHP Status	Year Built	Reference	General Location
Naval Reserve Training Center–Bldg. 40, Berthing Wharf	Recommended not eligible	1942	Moore, 2008a	Northeast side of Tacoma LNG Facility
Naval Reserve Training Center–Bldg. 60, Berthing Wharf	Recommended not eligible	1942	Moore, 2008b	Northeast side of Tacoma LNG Facility
Naval Reserve Training Center–Bldg. 61, Boat Mooring Float	Recommended not eligible	1953	Moore, 2008c	Northeast side of Tacoma LNG Facility
Warehouse	Undetermined	1962	Artifact Consulting, Inc., 2011	Segment A
Industrial storage	Undetermined	1929	Artifact Consulting, Inc., 2011	Segment A
House	Undetermined	Unknown	Gallacci, 1982	Segment A
Commercial building	Undetermined	1963	Artifact Consulting, Inc., 2011	Segment A
Industrial facility	Undetermined	1935	Artifact Consulting, Inc., 2011	Segment A
Commercial building	Undetermined	1920	Artifact Consulting, Inc., 2011	Segment A
House	Undetermined	1948	Artifact Consulting, Inc., 2011	Segment A
House	Undetermined	1935	Luttrell, 2007	Segment A
Formerly a house, converted in 1988 to commercial building	Determined not eligible for the NRHP	1948	Feldman, 2007	Segment A
House	Undetermined	1929	Artifact Consulting, Inc., 2011	Segment B
House	Undetermined	1941	Artifact Consulting, Inc., 2011	Segment B
House	Undetermined	1955	Artifact Consulting, Inc., 2011	Segment B
House	Undetermined	1930	Artifact Consulting, Inc., 2011	Segment B
House	Undetermined	1902	Artifact Consulting, Inc., 2011	Segment B

TABLE H-2

Previous Archaeological Investigations Conducted within 0.25 mile of the Tacoma LNG Project Area of Potential Effect

Report	Location Vicinity	Description	Results	Reference
House	Undetermined	1955	Artifact Consulting, Inc., 2011	Segment B
House	Undetermined	1964	Artifact Consulting, Inc., 2011	Segment B
House	Undetermined	1964	Artifact Consulting, Inc., 2011	Segment B

NRHP = National Register of Historic Places

TABLE H-3

Archaeological Sites Recorded within 0.25 Mile of the Tacoma LNG Project Area of Potential Effect

Site	Location Vicinity	Distance from APE (miles)	Type	Description	NRHP Status	Reference
45PI488	Segment A	0.25	Precontact	Subsurface fire-cracked rock, charcoal, lithic debitage, and one flaked stone tool	Eligible	Luttrell, 2001
45PI974	Segment A	0.16	Precontact isolate	Shell midden with faunal remains, bone tools, and charcoal	Unevaluated	Shantry, 2009
45PI975	Tacoma LNG Facility	0.25	Historic	Ceramics, bottle glass, and a comb	Unevaluated	Cooper, 2009a
45PI1188	Segment A	0.22	Precontact	Basal-notched projectile point	Unevaluated	Shong, 2010a
45PI1203	Segment A	0.22	Precontact	Fire-cracked rock and faunal remains	Unevaluated	Shong, 2010b
45PI1235	Segment A	0.25	Historic	Historic refuse dumps, foundations, and drain pipes	Unevaluated	Shong, 2011

NRHP = National Register of Historic Places

References

Artifacts Consulting, Inc. 2001. *Historic Property Inventory Reports*. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

Cooper, Jason B. 2009a. *State of Washington Archaeological Site Inventory Form, 45PI975*. On file, Department of Archaeology and Historic Preservation, Olympia, Washington.

Cooper, Jason B. 2009b. *Puyallup Tribal Terminal Cultural Resources Assessment, Pierce County, Washington*. AMEC Earth & Environmental, Inc., Bothell, Washington.

Feldman, Jessica. 2007. *Historic Property Inventory Report, Truck-N-Trailer Refrigeration Service*. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

Gall, Alexander, Michael Smith, and Dana Holschuh. 2012. *Cultural Resources Survey of the Proposed Woods at Golden Given Project Area, Parkland, Pierce County, Washington*. Archaeological Services of Clark County Survey Report No. 12751. Archaeological Services of Clark County, Vancouver, Washington.

Gallacci, Caroline. 1982. *Pierce County Cultural Resource Survey, Community Resource Form.* House (PC-93-3a). On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

Gill, Matthew. 2005. *Cultural Resources Assessment for the Spanaway Loop Road South Improvement Project, Pierce County, Washington*. Technical Report 0253. Western Shore Heritage Services Inc., Bainbridge Island, Washington.

Gillespie, Ann, Derek Shaw, Jennifer Gilpin, and Heather Lee Miller. 2008. *Seattle, Washington Cultural Resources Assessment of 502 54th Avenue East and 503 53rd Avenue East Fife, Pierce County, Washington*. Historical Research Associates, Inc., Seattle, Washington.

Goetz, Linda Naoi, and Thomas Rust. 2008. *Cultural Resources Report: Wildlands of Washington Hauff Property, Tacoma, Washington*. Landau Associates, Edmonds, Washington.

Hamilton, Fran. 2005. *Cultural Resources Assessment of the SR 7, SR 507 to SR 512 Safety Project, Pierce County, Washington*. NWAA Report WA 05-29. Northwest Archaeological Associates, Inc., Seattle, Washington.

HHM, Inc. 2008. *Historical Resources Survey, Naval & Marine Corps Reserve Center, Tacoma, Washington*. HHM Inc., Austin, Texas.

Luttrell, Charles. 2001. *State of Washington Archaeological Site Inventory Form, 45PI488*. On file, Department of Archaeology and Historic Preservation, Olympia, Washington.

Luttrell, Charles T. 2004 (revised). *Cultural Resource Investigations for the Washington State Department of Transportation's SR 167: Puyallup to SR 509 Project, Pierce County, Washington*. Short Report DOT01-14. Archaeological and Historical Services, Eastern Washington University, Cheney.

Luttrell, Charles. 2007. *Cultural Resources Investigations for the City of Fife's 20th Street East Widening Project, Pierce County, Washington*. Short Report 935. Archaeological and Historical Services, Eastern Washington University, Cheney.

Moore, David. 2008a. *Historic Property Inventory Report. Naval Reserve Training Center - Bldg. 40*. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

Moore, David. 2008b. *Historic Property Inventory Report. Naval Reserve Training Center - Bldg. 60*. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

Moore, David. 2008c. *Historic Property Inventory Report. Naval Reserve Training Center - Bldg. 61*. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

Shantry, Kate. 2009. *State of Washington Archaeological Site Inventory Form, 45PI974*. On file, Department of Archaeology and Historic Preservation, Olympia, Washington.

Shantry, Kate, Brandy Rinck, and Ross Smith. 2010. *Results of Testing at Xaxtl'abish 1 (45PI974), Hylebos Creek, Pierce County, Washington*. NWAA Report No. WA 09-099. Northwest Archaeological Associates, Inc., Seattle, Washington.

Shong, Michael. 2010a. *State of Washington Archaeological Site Inventory Form, 45PI1188*. On file, Department of Archaeology and Historic Preservation, Olympia, Washington.

Shong, Michael. 2010b. *State of Washington Archaeological Site Inventory Form, 45PI1203*. On file, Department of Archaeology and Historic Preservation, Olympia, Washington.

Shong, Michael. 2011. *State of Washington Archaeological Site Inventory Form, 45PI1235*. On file, Department of Archaeology and Historic Preservation, Olympia, Washington.

Shong, Michael, and Christian Miss. 2010. *Results of Archaeological Monitoring for the Hylebos Bridge Rehabilitation Project, Pierce County, Washington*. Northwest Archaeological Associates, Inc., Seattle, Washington.

Shong, Michael, and Chris Miss. 2011. *Results of Archaeological Monitoring for the Port Parcel 88 Combined Habitat Project, Port of Tacoma, Pierce County, Washington*. Northwest Archaeological Associates, Inc., Seattle, Washington.

Trautman, Pam, and Scott Williams. 2011. *Archaeological Monitoring of the Tacoma Rail Sound Refining Spur Track Project, 1601 Taylor Way, Tacoma, Pierce County, Washington*. Report No. 11-08. WSDOT Cultural Resources Program, Environmental Services Office, Olympia, Washington.

Appendix H-3: Unanticipated Discoveries Plan

Unanticipated Discovery Plan

PLAN AND PROCEDURES FOR THE UNANTICIPATED DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS FOR TACOMA LNG PROJECT, PIERCE COUNTY, WASHINGTON

1.0 Introduction

Puget Sound Energy (PSE) proposes to construct and operate a small-scale, liquefied natural gas (LNG) facility on Commencement Bay in the city of Tacoma, Washington. Associated with the proposed facility are a cryogenic pipeline for conveying LNG directly to the Totem Ocean Trailer Express (TOTE) site for fueling of marine vessels in Blair Waterway, and pipeline upgrades that would occur in the cities of Tacoma and Fife, Washington, as well as in unincorporated Pierce County. This Unanticipated Discovery Plan outlines the training and procedures to follow, in accordance with state and federal laws, if cultural resources or human remains are discovered during construction.

2.0 Recognizing Cultural Resources

Puget Sound Energy will require all construction personnel to participate in Cultural Resources Sensitivity Training. The purpose of the training is to instruct Project personnel on the sensitivity of cultural resources in the Project area, and introduce them to the tribe's perspective on potential impacts. DAHP staff and individuals from the Puyallup Tribe of Indians will be invited to contribute to this training. The training will focus on:

1. Why the training is required
2. What are cultural resources
3. How are cultural resources protected
4. What is the cultural and historical background of the project location
5. What types of cultural resources might be encountered
6. What to do if an inadvertent discovery is made during construction

A cultural resource is an item of historical, traditional, or cultural importance. The item could be prehistoric or historic. Examples are as follows:

- A multispecies accumulation of shell (shell-midden) with associated bone, stone, antler or wood artifacts, burned rocks, or charcoal
- Bones that appear to be human or animal bones associated with a shell-midden (i.e., with associated artifacts or cooking features)
- An area of charcoal or very dark stained soil with associated artifacts
- Artifacts made of chipped or ground stone (i.e., an arrowhead, adze, or metate) or an accumulation (more than one) of cryptocrystalline stone flakes (lithic debitage)
- Items made of botanical materials
- Clusters of tin cans, bottles, and agricultural or military equipment that appear to be older than 50 years

3.0 Onsite Responsibilities

STEP 1: STOP WORK IMMEDIATELY

If a PSE construction worker or equipment operator, contractor, or subcontractor believes that he or she has uncovered any cultural resource during construction of the Project, all work adjacent to the discovery must stop. The discovery location should not be left unsecured at any time.

STEP 2: NOTIFY PROJECT MANAGEMENT IMMEDIATELY

Contact the PSE Project manager as follows:

Project Construction Manager:

Jim Hogan
(425) 462-3957
(425) 466-6934
jim.hogan@pse.com

If the above contact cannot be reached, contact the Project's assigned Cultural Resources Specialist:

Robin McClintock
Cell: (503) 329-2458
RMcClint@ch2m.com

STEP 3: NOTIFY THE WASHINGTON DEPARTMENT OF ARCHAEOLOGY AND HISTORIC PRESERVATION (DAHP) IMMEDIATELY

The PSE Project Manager or Project Cultural Resources Specialists will notify the Washington DAHP immediately.

STEP 4: CONSULTATION AND DOCUMENTATION

The PSE Project Manager will participate in consultation with DAHP and affiliated Tribes. After consultation, PSE will complete a written plan of action describing the disposition of cultural resources and will execute their prescribed duties within that plan of action.

4.0 Further Contacts and Consultation

The PSE's Project Manager's specific responsibilities are as follows:

- **Secure the Site**: The PSE Project Manager is responsible for taking appropriate steps to protect and secure the discovery site. All work will stop in an area adequate to provide for the total security, protection, and integrity of the resource. Vehicles, equipment, and unauthorized personnel will not be permitted to traverse the discovery site. Work in the immediate area will not resume until treatment of the discovery has been completed following provisions for treating archaeological/cultural material in consultation with the Tribe.
- **Direct Construction Elsewhere Onsite:** The PSE Project Manager will direct construction to resume away from cultural resources where appropriate and in communication with the Tribes.
  - If the find consists of human remains or funerary objects, the special procedures outlined in Section 5.0 will be followed.
  - The PSE Project Manager will contact the state agency (Washington DAHP).
- **Contact Project Cultural Resources Specialist:** If the Project Cultural Resources Specialist has not yet been reached in earlier attempts, the PSE Project Manager will do so.

5.0 Special Procedures for the Discovery of Human Skeletal Material

In accordance with *Inadvertent Discovery of Human Skeletal Remains on Non-Federal and Non-Tribal Land in the State of Washington* (RCWs 68.50.645, 27.44.055, and 68.60.055):

If ground-disturbing activities encounter human skeletal remains during the course of construction, then all activity will cease that may cause further disturbance to those remains. The area of the find will be secured and protected from further disturbance. The finding of human skeletal remains will be reported to the county medical examiner/coroner and local law enforcement in the most expeditious manner possible. The remains will not be touched, moved, or further disturbed. The county medical examiner/coroner will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or nonforensic. If the county medical examiner/coroner determines the remains are nonforensic, then they will report that finding to the Washington DAHP, who will then take jurisdiction over the remains. The DAHP will notify any appropriate cemeteries and all affected tribes of the find. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains.

Pierce County Sheriff's Department

Paul A. Pastor—Sheriff
930 Tacoma Avenue South
Tacoma, WA 98402
(253) 798-7530

Pierce County Medical Examiner

Thomas B. Clark, MD—Chief Medical Examiner
3619 Pacific Avenue
Tacoma, WA 98418
(253) 798-6494

Washington Department of Archaeology and Historic Preservation (DAHP)

Rob Whitlam—State Archaeologist
email: Rob.Whitlam@dahp.wa.gov
(360) 586-3080

Guy Tasa—State Physical Anthropologist
email: Guy.Tasa@dahp.wa.gov
(360) 586-3534

Puyallup Tribe of Indians

Brendon Reynon
Cultural Resources Program Director
Puyallup Tribe of Indians
3009 Portland Avenue
Tacoma, WA 98404
(253) 573-7986

6.0 Proceeding with Construction

Project construction outside the discovery location may continue while documentation and assessment of the cultural resources proceed. The PSE Project Manager must determine the boundaries of the discovery location. Construction may continue at the discovery location only after the process outlined in this plan is followed and the Washington DAHP (and federal agencies, if any) determines that compliance with state and federal laws is complete.

Appendix I-1: Transportation Discipline Report

From Appendix K in Blair-Hylebos Terminal Redevelopment Project Final Environmental Impact Statement (February 2009)

Transportation Discipline Report

Blair-Hylebos Peninsula Terminal Redevelopment Project

Prepared for:
Port of Tacoma
One Sitcum Plaza
Tacoma, WA 98421

Prepared by:
David Evans and Associates, Inc.
415-118th Ave. SE
Bellevue, WA 98005

DAVID EVANS AND ASSOCIATES INC

February 2009

Shading indicates new or updated information provided subsequent to issuance of the Draft EIS.

Summary

The Blair-Hylebos Peninsula Terminal Redevelopment Project is expected to generate 3,902 new daily trips (2,824 trucks and 1,078 autos) and displace 2,562 daily trips (1,021 trucks and 1,541 autos). This is a net increase of 1,803 trucks and a net decrease of 463 automobiles, all associated with the YTTI terminal. There are no additional trips, above background growth, anticipated for the TOTE relocation. The expansion of the Washington United Terminals wharf is only expected to generate 1 additional truck trip in each direction in the PM peak period.

Delays to rail operations due to increased project rail traffic will be slightly over acceptable levels with a delay ratio of expected train movement time to unimpeded time of 1.34 (the delay ratio considered acceptable by the Port of Tacoma is 1.30). This delay ratio is not expected to significantly impact rail operations on the peninsula.

Road and rail improvements on the peninsula are proposed to mitigate the transportation impacts. New roadways and an overpass structure on the peninsula will allow traffic to avoid major at-grade rail crossings. All new roadways and intersections will operate at an acceptable level of service. Sidewalks will be constructed adjacent to all new roadways, improving pedestrian mobility as compared to existing conditions.

Off-site improvements include the addition of turn lanes at the Taylor Way/SR 509 intersection and installation of a traffic signal at the 54th Avenue East/I-5 northbound ramps (these improvements are also identified as mitigation in previous Port environmental documents for the development of the EB1 terminal, but have not yet been implemented).

The intersections of 54th Ave E/4th St E, 54th Ave E/SR 99, Port of Tacoma Road/SR 99, Port of Tacoma Road/20th Street E, 70th Avenue E/SR 99, and 70th Avenue E/20th Street E are below the City of Fife standard of LOS D for all future scenarios. The BHTRP project has no impact on the intersections of Port of Tacoma Road/SR 99 and Port of Tacoma Road/20th Street E. The BHTRP project increases delay at the other intersections. After implementation of the proposed mitigation, those intersections will remain below the LOS standard, and will remain so until construction of SR 167 or other improvements are implemented or both.

The intersection of Lincoln Avenue/Taylor Way will experience significant train delays. Although the proposed improvements will mitigate the impacts for the majority of traffic, a small number of motorists travelling between Totem Ocean Trailer Express or YTTI and Pierce County Terminal will experience delays or increased travel distance to avoid the train delays.

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Appendix A: Rail Study

Acronyms and Abbreviations

BHTRP	Blair-Hylebos Terminal Redevelopment project
EB1	East Blair 1 Terminal (also known as Kaiser marshalling yard)
EB	eastbound
GMA	Growth Management Act
ITE	Institute of Transportation Engineers
LOS	level of service
NB	northbound
PCT	Pierce County Terminal
POTR	Port of Tacoma Road
SB	southbound
SR	State Route
TEU	Twenty-foot equivalent units
WB	westbound
WSDOT	Washington State Department of Transportation
WUT	Washington United Terminals
YTTI	Yusen Terminal Tacoma, Inc.

1.0 Introduction

The proposed Blair-Hylebos Terminal Redevelopment (BHTRP) project site (site) is located on Port of Tacoma (Port) property[1] on the peninsula between the Blair Waterway and the Hylebos Waterway, on the west side of the Blair Waterway (Washington United Terminal [WUT]) and south of the Blair Waterway turning basin in Tacoma, Washington. The site and the two waterways (Blair and Hylebos) are located within the Port of Tacoma's Industrial Development District, which is adjacent to Commencement Bay. The project location and transportation study area is shown in Figure 1.

1.1 Proposed Action

The Proposed Action includes relocation of the existing Totem Ocean Trailer Express (TOTE) terminal, construction of the new Yusen Terminal Tacoma, Inc. (YTTI) Terminal and expansion of the wharf for the WUT Terminal (Figure 2). Road and rail infrastructure improvements will be completed on the Blair-Hylebos Peninsula, including new roadways, a grade separation north of the intersection of Taylor Way/SR 509 and a new rail yard with supporting approach tracks.

The existing TOTE Terminal will be relocated to the north tip of the peninsula to make room for the new YTTI Terminal. Operations are expected to remain unchanged. Any additional truck trips associated with TOTE operations as a result of the proposal have been captured in the background traffic growth. The new YTTI Terminal will be constructed in the general area of the existing TOTE Terminal. The terminal development is anticipated to be complete by July 2012. It is expected that the YTTI terminal capacity will be 1.4 million 20-foot equivalent units (TEUs). It is assumed that the YTTI terminal will operate at peak capacity during its first full year of operation (2013). It is also assumed by the Port of Tacoma and the YTTI terminal designers that seventy percent of containers will be transported by rail, with the remaining thirty percent transported by truck. This assumed mode split is based on similar terminal operations within the Port.

The WUT on Port of Tacoma Road (POTR) will have a wharf expansion and minor associated terminal improvements. The WUT terminal operations are not expected to change, but are expected to experience growth of 3 percent per year with or without the wharf expansion.

1.1.1 Road Improvements (From South to North)

The SR 509/Taylor Way intersection will be expanded to include two left-turn lanes on northbound (NB) and southbound (SB) SR 509 at Taylor Way for the movements to NB Taylor Way and SB 54th Avenue East, respectively (Figure 2). Right-turn pockets will be added for the following movements: NB 54th Avenue East to EB Marine View Drive, SB Taylor Way to westbound (WB) SR 509 and eastbound (EB) SR 509 to SB 54th Avenue East. All of the foregoing improvements, plus a signal at 54th and I-5 NB ramp, are also identified as mitigation in previous Port environmental documents for development of the EB1 terminal.

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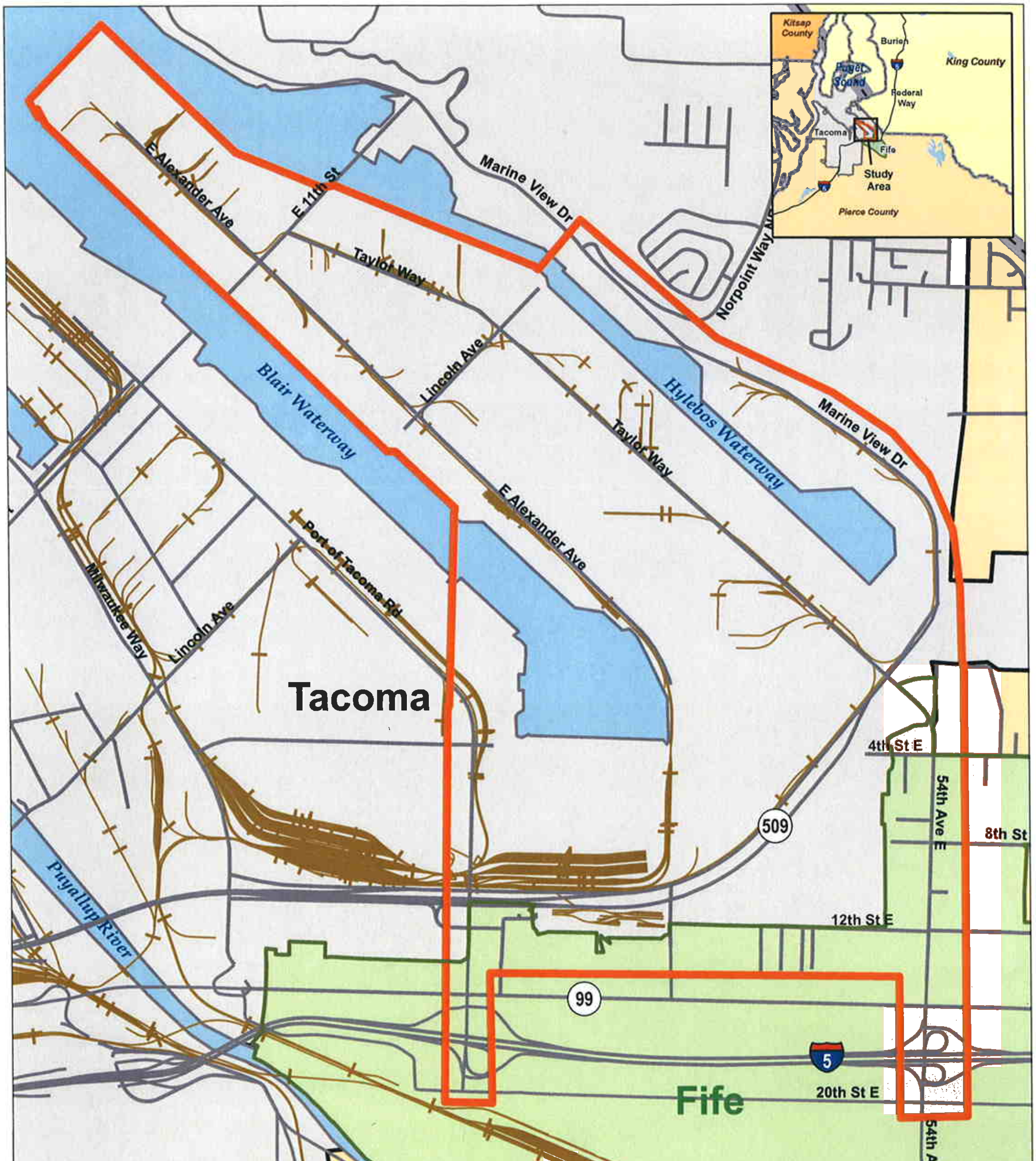
[1] Acquisition of properties within the project area that are not currently owned by the Port of Tacoma is in progress.



Transportation Study Area
County Boundary
Road
Rail
Water body

The intersections of 70th Avenue East/SR 99, 70th Avenue East/20th Street East and 70th Avenue East/Valley Avenue East are outside the transportation study area, but have been included in the LOS tables

Blair-Hylebos Terminal Redevelopment Project

Figure 1: Vicinity Map

0 0.125 0.25 0.5
Miles

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Two 14-foot travel lanes with a 12-foot center turn lane will be constructed in the present location of Taylor Way. A sidewalk will be added on the east side of Taylor Way and a new driveway will be constructed into the Glacier property. Approximately 880 feet north of the SR 509/54th Avenue intersection, Taylor Way will head west into the Taylor Way Grade Separation, a three-lane structure with sidewalk which crosses the Arrival/Departure Rail tracks and the Taylor Way intermodal yard. This overpass will provide access to the Pierce County Terminal (PCT) and the future Taylor Yard via a two-lane side street just west of the structure. Taylor Way will remain in its existing location north to the Lincoln Avenue intersection, consisting of two 14-foot travel lanes, a 12-foot center turn lane, and sidewalk on the west side. Two driveways for access into the Carlile property will be provided near their present locations.

The Taylor Way Bypass route will be constructed on the east side of the peninsula, connecting to existing Taylor Way approximately 2,500 feet north of the overpass structure. Between the Taylor Way overpass and Lincoln Avenue, the roadway will consist of two 14-foot travel lanes, a 12-foot center turn lane, and sidewalk on the east side. This route can be used when rail operations block Taylor Way near Lincoln Avenue. Access from the Taylor Way Bypass into the Carlile property will be provided approximately 1,200 feet south of their existing administration building. Access into the Buffelen property will be provided near the existing portion of Lincoln Avenue east of Taylor Avenue, which will be vacated. The new bypass route will be constructed in compliance with City of Tacoma lighting standards, spaced approximately 150 feet apart.

North of Lincoln Avenue, Taylor Way will remain in its existing location for approximately 2,400 feet until relocating to the east, and tying into a relocated Taylor Way/East 11th Street intersection. This section of roadway will consist of two 14-foot travel lanes, a 12-foot center turn lane, and sidewalk on the easterly side.

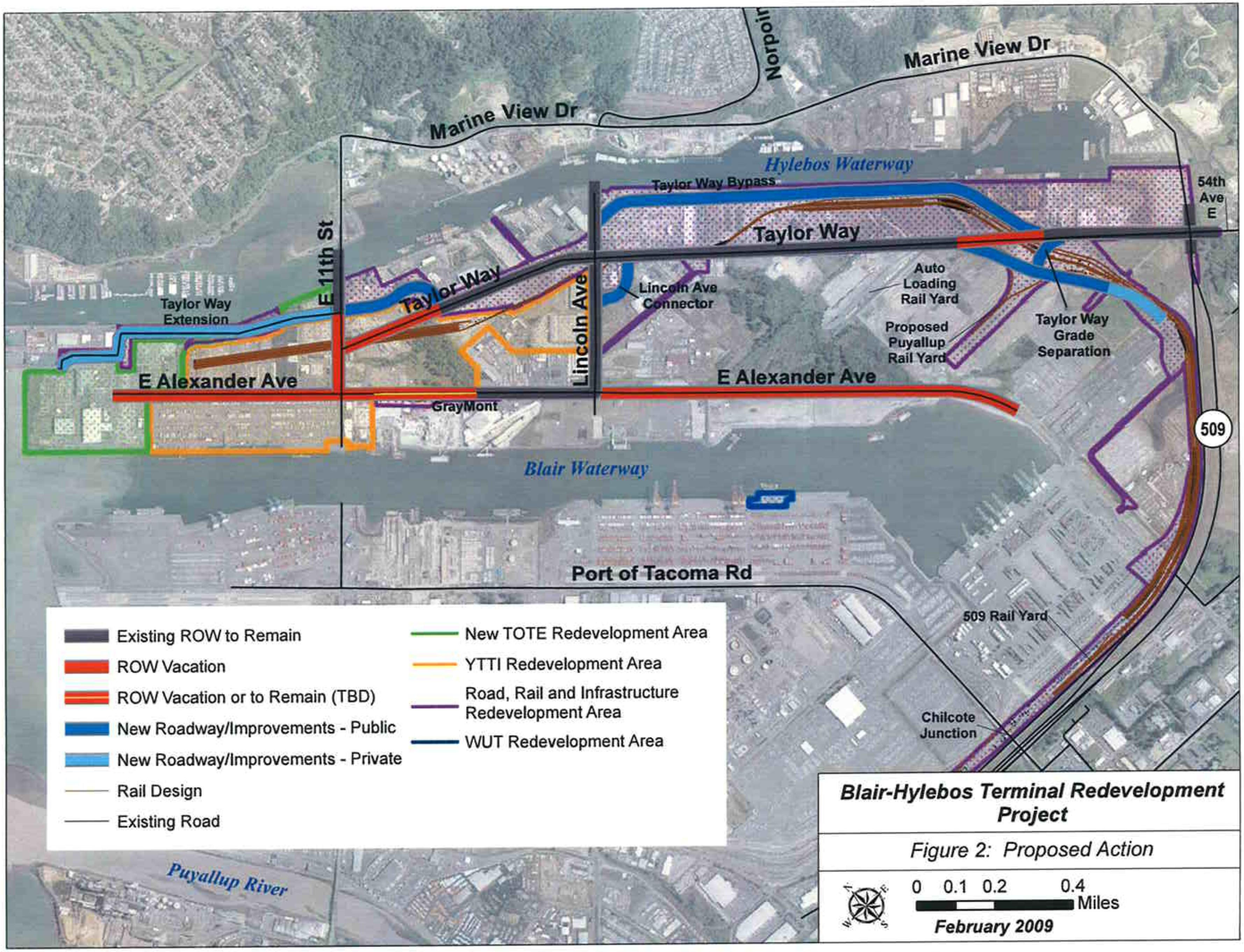
From East 11th Street, Taylor Way will continue on the east side of the Blair Hylebos Peninsula, terminating in a cul-de-sac near the existing Trident Seafoods plant and the Army Reserve Center at the north end of the peninsula. The roadway will consist of two 12-foot lanes with 8-foot shoulders and no sidewalks.

From the intersection of Taylor Way and Lincoln Avenue, the roadway will consist of two 14-foot lanes and a 12-foot center turn lane approximately 400 feet west of the proposed YTTI gate and transition to connect to the existing Lincoln Avenue roadway east of Alexander Avenue. The portion of Alexander Avenue south of Lincoln Avenue and north of Graymont will be vacated, leaving the remaining section in its existing condition (two 14-foot lanes with 10-foot shoulders). The Lincoln Avenue/Taylor Way intersection would be revised and would operate with several signals timed and coordinated to allow multiple movements at one time. During times when trains block the intersection, the new intersection configuration would allow the following movements: right-turns from eastbound Lincoln Avenue to southbound Taylor Way; left-turns from northbound Taylor Way to westbound Lincoln Avenue; right-turns from northbound Taylor Way Bypass to northbound Taylor Way; and, left-turns from southbound Taylor Way to eastbound (and ultimately southbound) Taylor Way Bypass. Appropriate signage would be provided to direct drivers from SR 509 to the most direct route when the intersection is blocked with a train.

1.1.2 Rail Improvements (From South to North)

The rail system starts at the east end of the Tacoma Rail Yard with a series of revised turnouts and crossovers to improve the connection between the Tacoma Rail Yard and Chilcote Junction (Figure 2). The rail then continues east through the 509 Rail Yard where four tracks are added to provide a total of seven Arrival/Departure tracks, each capable of holding an 8,000-foot-long train. In this area, a series of turnouts are also added to the existing PCT Loading Yard, which is currently stub-ended. The turnouts will improve operations and allow the PCT Loading Yard to operate from either end. The seven Arrival/Departure tracks curve around the existing PCT gate where they neck down through a series of crossovers and head northeast towards the new Taylor Way Grade Separation. After the crossovers, the tracks expand into the Taylor Yard, the Taylor Intermodal Yard, and the Taylor Auto Loading Yard. Before entering the new grade separation, the Taylor Auto Loading Yard access track splits off and goes west into the Taylor Auto Loading Yard, which consists of six tracks, each approximately 1,300 feet long. Another track adjacent to the Taylor Auto Loading Yard continues on to connect into the Taylor dock track.

As the remaining tracks go under the Taylor Way Grade Separation, the tracks split off into the Taylor Yard and the Taylor Loading Yard. A separate track going to the Taylor Loading Yard maintains access to the Puyallup Tribe's existing Intermodal Yard. After passing under the new grade separation, the tracks turn north. The Taylor Loading Yard, which is located adjacent to the existing Taylor Way, consists of eight tracks, each capable of holding seven 305-foot-long railcars. The Taylor Yard consists of fourteen tracks, each capable of holding half a train or fourteen 270-foot-long railcars. At the north end of the Taylor Yard and Taylor Loading Yard, the tracks come back together into two tracks and head north along the east side of the existing Taylor Way until they reach the intersection of Lincoln Avenue/Taylor Way. From there, the two tracks head northeast into the YTTI Intermodal Yard where they expand into six tracks, each capable of holding half a train or fourteen 270-foot-long railcars. The tracks end at the north end of the YTTI Intermodal Yard.



Blair-Hylebos Terminal Redevelopment Project

Figure 2: Proposed Action

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1.2 Alternative 1 - Lincoln Overpass Alternative

Many components of the Lincoln Overpass Alternative are identical to the Proposed Action, including relocation of the existing TOTE terminal, construction of the new YTTI Terminal and expansion of the wharf for the WUT Terminal (Figure 3). Rail infrastructure improvements are also identical to the Proposed Action, including a grade separation and new rail yard with supporting approach tracks. The road improvements are the primary difference between the two alternatives.

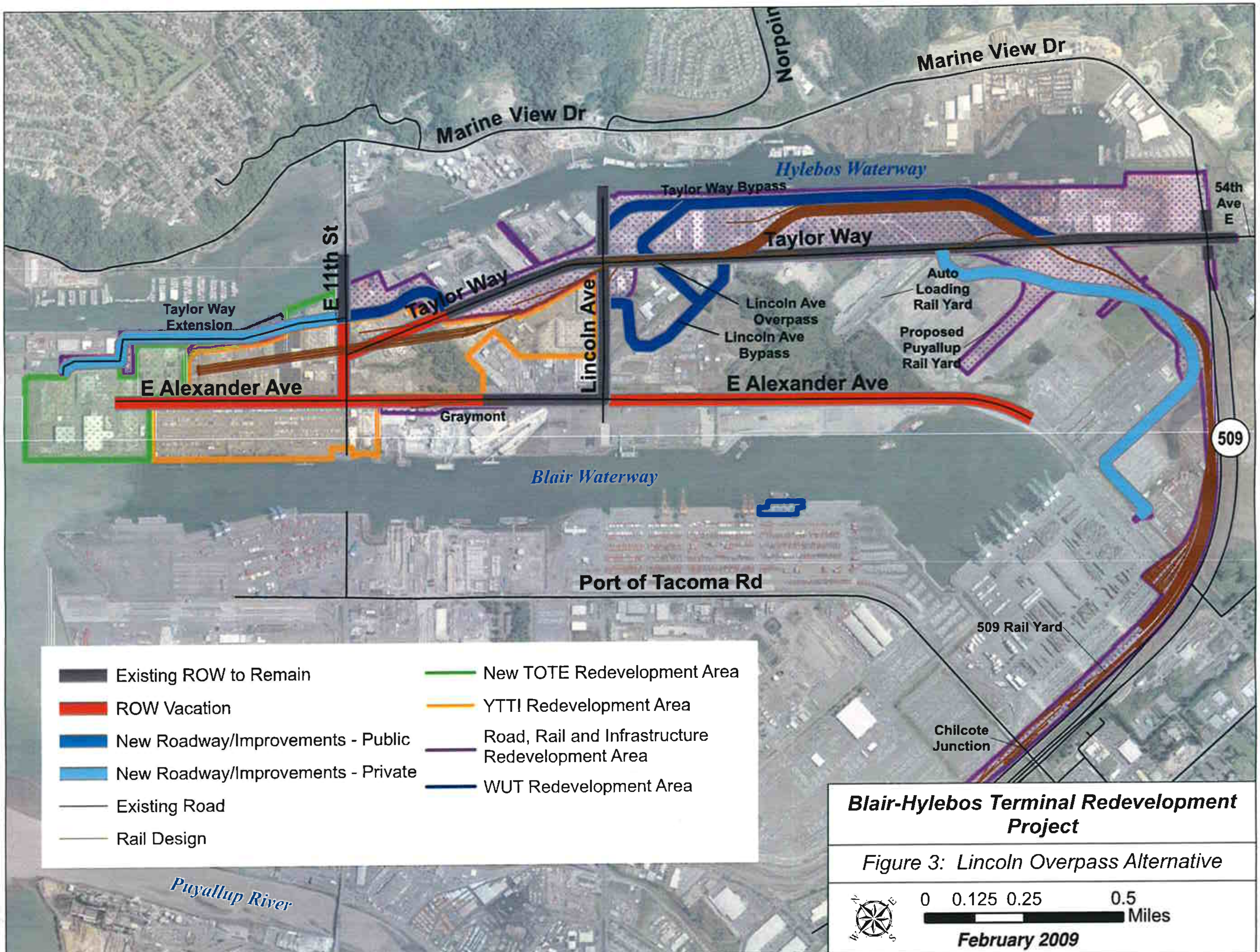
The following road improvements are identical to the Proposed Action:

- Expansion of the SR 509/Taylor Way intersection.
- Construction of two 14-foot travel lanes, a 12-foot center turn lane, and sidewalk on Taylor Way, with access driveways onto the Glacier property.
- Construction of the Taylor Way Bypass to the east (south of Lincoln Avenue) and the Taylor Way Extension north of East 11th Street.

The proposed road improvements are highlighted as they differ from the Proposed Action:

The Lincoln Overpass Alternative will construct a Lincoln Avenue Bypass and Overpass south of existing Lincoln Avenue (Figure 3). A structure will be provided over the proposed rail tracks for the Taylor Way Bypass south of the current Lincoln Avenue intersection. The crossing will consist of two 14-foot travel lanes, a 12-foot center turn lane, 4-foot shoulders, and sidewalk on the northern side. Existing Taylor Way between the Lincoln Avenue Crossing and the PCT gate will consist of two 14-foot lanes with a 12-foot center turn lane and sidewalk on the west side.

The north and south sections of Alexander Avenue will be vacated, leaving only a small section north of Lincoln Avenue in its existing condition (two 14-foot lanes with 10-foot shoulders).



Blair-Hylebos Terminal Redevelopment Project

Figure 3: Lincoln Overpass Alternative

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1.3 Alternative 2 – Straight Overpass Alternative

The Straight Overpass Alternative (Figure 4) is identical to the Proposed Action, with the exception of the configuration of the overpass structure for Taylor Way over the rail yard and the re-orientation of the intersection of Taylor Way and the PCT access road. In addition, EB1 will access the PCT access road under this alternative as compared to a direct access to Taylor Way under the Proposed Action.

The primary operational differences are 1) there would be no elevated intersection, and 2) traffic from PCT, Tacoma Power and BPA properties would cross the rail tracks that lead to the auto loading yard at grade whereas the Proposed Action includes a grade separation for traffic to those properties.

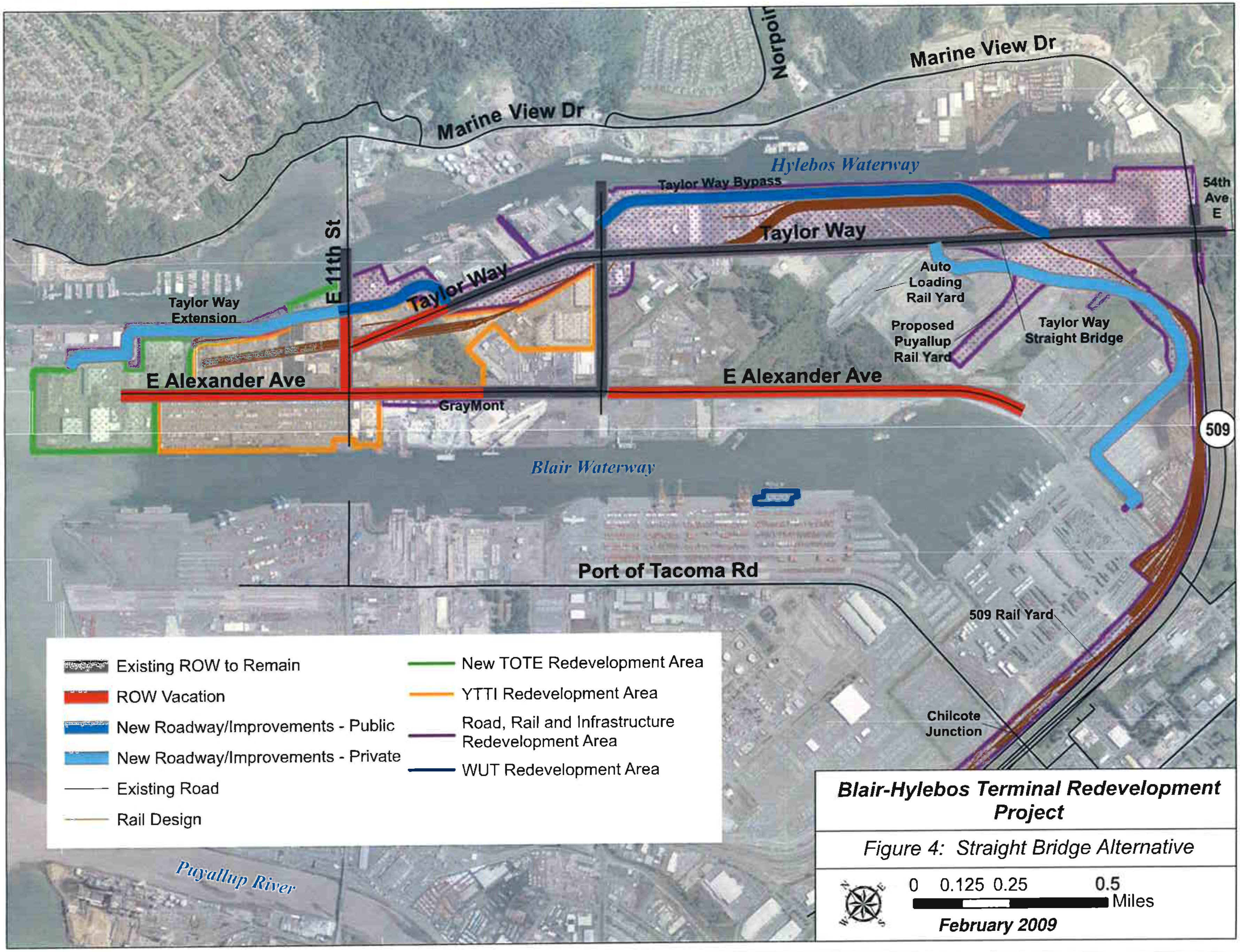
The primary benefit of Alternative 2 is the elimination an elevated intersection that would force surface traffic, much of which would be trucks, to stop on an incline.

1.4 Alternative 3 - No Action Alternative

The No Action Alternative includes the existing 48-acre TOTE Terminal (no relocation) and operation of a new 47-acre container terminal and a new 58-acre Break Bulk/Auto Terminal (Figure 5). The new container terminal is expected to have an annual throughput between 230,000 and 300,000 TEUs. Based on an e-mail from KPFF Engineers to the Port of Tacoma dated May 12, 2008, the Port assumes that eighty percent of the containers would be transported by rail, with the remaining 20 percent transported by truck. The new Break Bulk/Auto Terminal is expected to handle 78,000 autos per year and between 120,000 and 160,000 metric tons of break bulk cargo per year. The autos are assumed to be transported 75 percent by rail and 25 percent by truck. The break bulk cargo is assumed to be transported 10 percent by rail and 90 percent by truck.

The No Action Alternative makes use of the existing roadway system but incorporates two elements from the Proposed Action: the SR 509/Taylor Way intersection expansion and Taylor Way modifications north of East 11th Street. The No Action Alternative also includes the construction of a traffic signal at 54th Avenue East/I-5 NB ramps as identified in previous Port environmental documents.

No change is anticipated to existing rail infrastructure, with the exception of minor upgrades to portions of the existing rail lines on the Blair Hylebos Peninsula. Service will be maintained to the existing rail-served properties.



Blair-Hylebos Terminal Redevelopment Project

Figure 4: Straight Bridge Alternative

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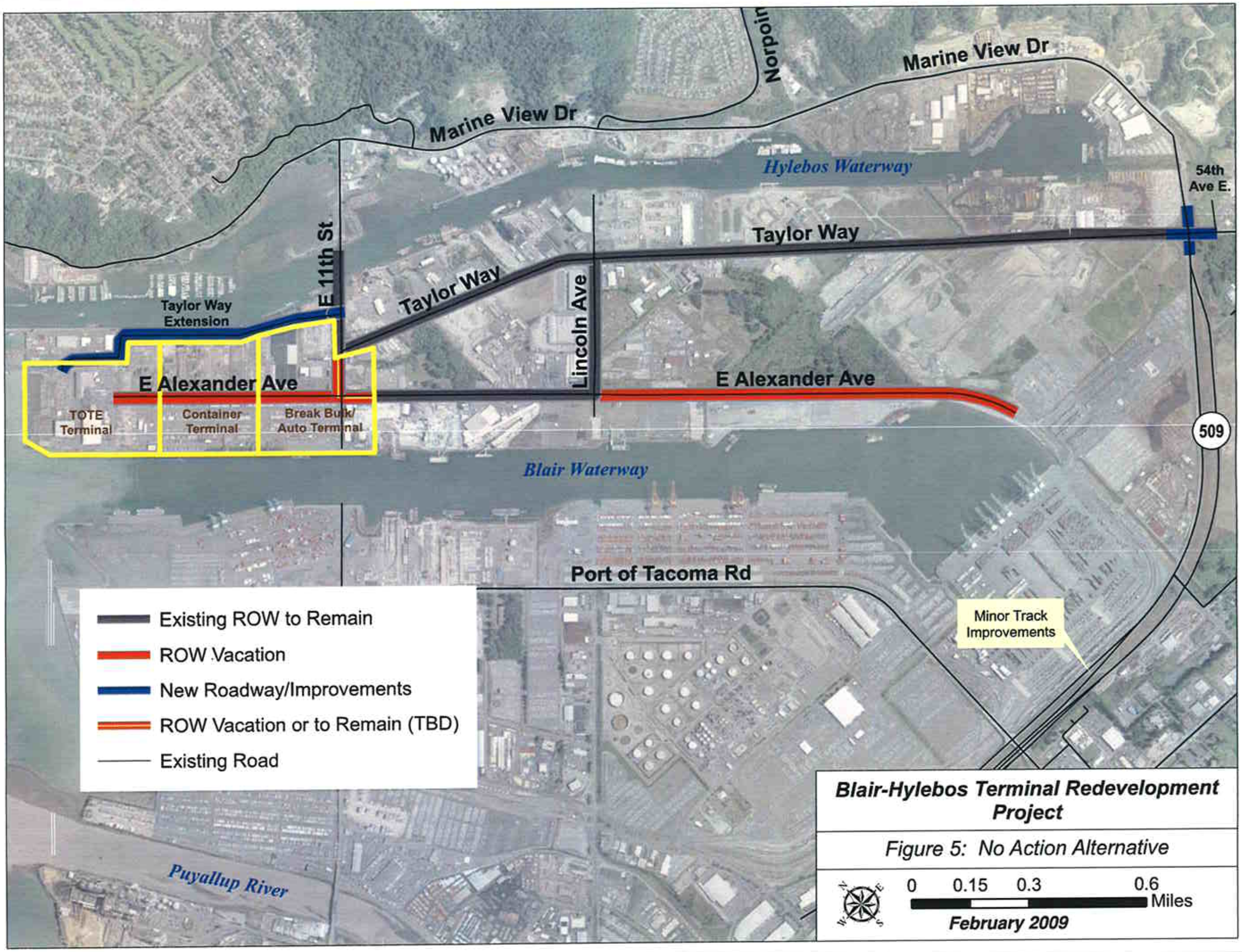

Blair-Hylebos Terminal Redevelopment Project

Figure 5: No Action Alternative

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2.0 Studies and Coordination

2.1 Study Methods

Existing transportation conditions, along with plans and development regulations associated with the alternatives, were analyzed. Existing transportation information was developed through site visits, review of recent aerial photography, and other secondary sources. The consistency of the proposal with adopted plans and development regulations was evaluated by reviewing comprehensive plans, and development regulations for the City of Tacoma and the City of Fife.

Key intersections were identified in consultation with the City of Tacoma and the City of Fife. Peak hour turning movement traffic counts were conducted at those intersections in late 2007 and early 2008. The counts are inflated at a rate of 2% per year (a typical growth rate factor which was discussed with both the City of Tacoma and the City of Fife) to derive the expected 2013 background traffic volumes. Known pipeline developments (listed in section 4.3) were added to the inflated traffic volumes to arrive at a baseline traffic condition.

Trip generation was estimated using information from the Port of Tacoma and the terminal designers and operators. The following assumptions utilized to estimate the trips are based on existing terminal operations in the Pacific Northwest, and reflect the best estimate of expected terminal operations.

- The TEU to container ratio is 1.80
- 70% of the containers travel via on-dock rail (30% by truck)
- The gates operate 5 days per week from 8AM-noon and from 1PM-5PM
- Truck volumes are increased by 110% to account for weekday peaks
- Truck volumes are increased by 120% to account for monthly peaks
- 20% of trucks would make double turns (arrive with a container and leave with a container)

The trip generation was validated against trip generation estimates for the "Port Terminals" land use from the Institute of Transportation Engineers (ITE) *Trip Generation 7th Edition.*

The terminal designers analyzed the arrivals and departures of truck trips throughout the day, based on expected operations of the terminal and typical arrival and departure rates identified for similar terminals in the Port of Tacoma – Tideflats Area Truck Volume and Route Study. Based on that analysis, it is estimated that 62 trucks will arrive and 138 trucks will depart the terminal during the PM peak hour.

The estimated number of employees expected to work at the YTTI terminal was provided by the terminal designers and is based on expected operation needs at the terminal. There is estimated to be 263 day shift (8:00 AM to 5:00 PM) and 216 night shift (6:00 PM to 3:00 AM) employees at the YTTI Terminal in 2013. It is expected that the day shift employees will arrive at the terminal between 7:30 AM and 8:00

AM and leave the terminal between 5:00 PM and 5:30 PM. The swing shift employees are expected to arrive at the terminal between 5:30 PM and 6:00 PM. Assuming, conservatively, that there are 2.25 trips per day per employee, the total daily employee trips would be 1,078 trips. The estimated PM peak employee trips are 132 occurring between 5:00 PM and 5:15 PM. The estimated PM Peak project trips are shown in Figure 12A and 12B.

Estimates of trips removed from the roadway system due to businesses displaced by the alternatives were based on the ITE *Trip Generation 7th Edition* in conjunction with employee information provided by the Port of Tacoma or building areas obtained from the Pierce County Assessor's website. Displaced trips for the No Action and Proposed Action are shown in Table 1.

Transportation Level of Service (LOS) was estimated using methodology in the 2000 *Highway Capacity Manual*. Input data for LOS analysis was obtained from the City of Tacoma, City of Fife and the Washington State Department of Transportation (WSDOT) records and field traffic counts.

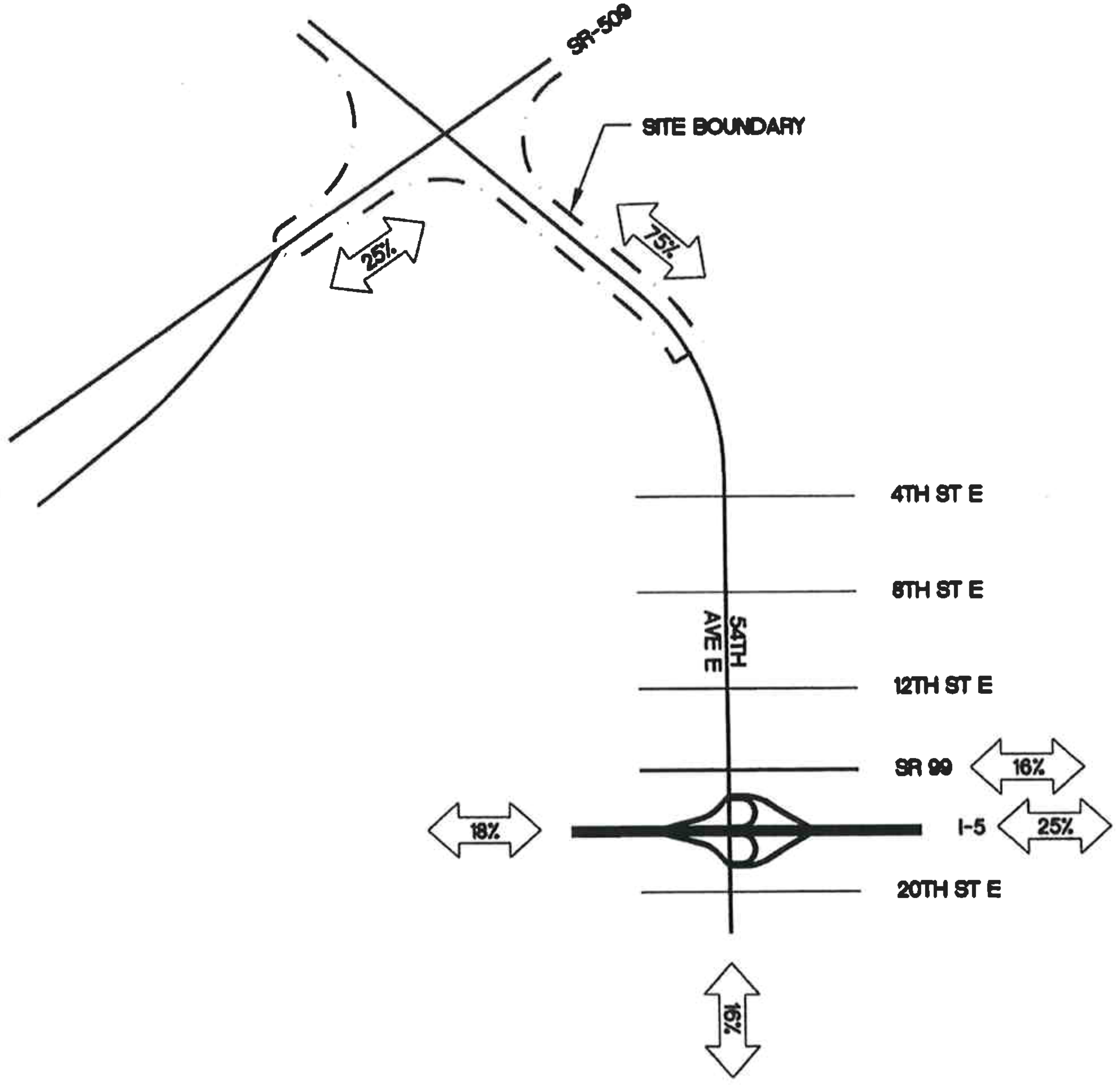
Trip distribution for trucks was derived from the Port of Tacoma – Tideflats Area Truck Volume and Route Study and the Traffic Analysis for the EB1 Terminal SEPA Checklist completed by the Port. Trip distribution for terminal employees was derived from Commute Trip Reduction survey data obtained from the City of Tacoma and was refined for this study based on comments from the Cities of Tacoma and Fife. The truck trip distribution is shown in Figure 6. The employee trip distribution is shown in Table 2.

LOS calculations for the PM Peak hour were performed using SYNCHRO 7 software employing *Highway Capacity Manual* methods. SYNCHRO7 provides intersection level analysis of traffic impacts at a detailed level not available in macro level modeling. The level of service along an arterial corridor is controlled by the individual intersections, since the intersections are the critical capacity constraints. The PM peak hour is the most concentrated, and thus the critical, period of the day. The PM peak hour for this analysis was determined to occur between 4:15 p.m. and 5:15 p.m.

Table 1: Displaced Trips				
Existing Business	Affected by No Action	Affected by Proposed Action	PM Peak Hour Trips	Average Daily Trips
Bob's Pier Tavern	Yes	Yes	67	670
Vance Lift Truck	Yes	Yes	7	50
Conastova Rovers	Yes	Yes	1	6
Trim Systems	Yes	Yes	2	11
Hercules Trucking	Yes	Yes	1	7
Willex	Yes	Yes	1	7
Atlas Foundry	Yes	Yes	1	2
Sand Lumber	Yes	Yes	1	2
Legacy Propane	Yes	Yes	5	32
Aleutian Yachts	Yes	Yes	25	149
Northcoast Yachts	Yes	Yes	11	64
Metalcraft Marine	Yes	Yes	5	32
Harris Rebar	Yes	Yes	18	107
Navy Reserve	Yes	Yes	30	75
American Fast Freight	Yes	Yes	33	412
Jesse Engineering	Yes	Yes	4	21
Total No Action			**212**	**1647**
One Reel		Yes	1	2
PQ Corporation		Yes	2	11
Seafarers Center		Yes	8	32
Rangar		Yes	3	35
City Delivery		Yes	1	7
BLC Trucking		Yes	1	7
Defiance Forest Products		Yes	1	4
Full Container Recovery		Yes	2	13
Glacier Packaging		Yes	3	17
Mapletex		Yes	2	11
Petroleum Reclaiming		Yes	4	26
EB1 Dray		Yes	43	750
Total Proposed Action			**283**	**2562**

Table 2: Employee Trip Distribution			
Route	SR 509 eastbound	SR 509 westbound	54th Ave E
Destination	NE Tacoma & Federal Way	I-5 SB, Kitsap peninsula, southwest Pierce County	I-5 NB, Fife, east Pierce County
Buffelen	0%	71%	29%
Port of Tacoma	4%	56%	40%
Recommended*	**5%**	**60%**	**35%**

*Based on recommendations from City of Tacoma and City of Fife



Blair-Hylebos Terminal Redevelopment Project

Figure 6: Truck Trip Distribution

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2.2 Agency Coordination

Consultations were conducted with the City of Tacoma, the City of Fife and WSDOT during early planning and analysis phases of the proposed project. A meeting was held with the City of Tacoma and the City of Fife on October 25, 2007, to present preliminary traffic modeling assumptions, intersections proposed to be analyzed and proposed roadway cross-sections. As a result of that meeting, additional intersections were identified to be analyzed (a total of 24 intersections are analyzed) and input was received from the cities regarding modeling and roadway design assumptions. A follow-up meeting was held on February 22, 2008, to present preliminary traffic modeling results and discuss more detailed roadway design issues. A meeting was held with WSDOT on January 24, 2008, to discuss potential roadway improvements related to the project.

2.3 Regulatory Context

2.3.1 Applicable Statutes and Regulations

Growth Management Act

The Washington State Legislature adopted growth management legislation in 1990 and 1991, and it has adopted subsequent amendments. The Growth Management Act (GMA) (RCW 36.70A.070) sets goals to guide planning in the larger, faster growing counties and cities. Pierce County and all the cities within Pierce County are subject to the full planning and regulatory requirements of GMA. The GMA requirements relevant to transportation include the following:

- Adopt local comprehensive plans, including a transportation element.
- Ensure that development regulations are consistent with comprehensive plans.
- Establish a process for siting essential public facilities, which cannot be precluded.

The GMA identifies the following goals to guide counties and cities in developing comprehensive plans and development regulations:

- Assure adequate public facilities and services at the time developments are completed (concurrency requirements).
- Provide economic development consistent with adopted comprehensive plans; encourage growth in areas of need.
- Provide efficient transportation systems based on regional priorities and coordinated county and city plans.
- Encourage development in urban areas where adequate public facilities and services exist or can be provided efficiently.

GMA-related Transportation Plans and Policies

Pierce County Planning Policies

To ensure cooperation between neighboring jurisdictions, each county planning under GMA is required to adopt countywide planning policies, formulated with and agreed upon by all of the cities in the county. These policies are the framework of the county's overall growth management strategy. Countywide planning policies are required to give direction for establishment of UGAs, preservation of natural resource plans and critical areas and siting of public capital facilities of a countywide or statewide nature, including transportation facilities and services of statewide significance. The following transportation services are considered countywide in nature (by Pierce County): state and federal highways; major arterials; public transit facilities and services; waterborne transportation; airports; and rail facilities. Countywide planning policies on transportation facilities and strategies relevant to the proposed project include the following as stated in the Pierce County Comprehensive Plan (Pierce County 2005):

9. The County, and each municipality in the County, shall address concurrency through the following methods:

   9.1 providing transportation facilities needed to accommodate new development within six years of development approval;

   9.2 limiting new development to a level that can be accommodated by existing facilities and facilities planned for completion over the next six years;

   9.3 encouraging new and existing development to implement measures to decrease congestion and enhance mobility through transportation demand and congestion management.

14. The County, and each municipality in the County, shall utilize the following transportation systems management measures to make the most efficient use of the existing roadway system.

   14.1 structural improvements;

   14.2 non-structural improvements.

Local Comprehensive Plans

Each county and city that plans fully under GMA must adopt a comprehensive plan consistent with countywide planning policies. Comprehensive plans designate urban and rural areas, natural resource lands, and critical areas. Local comprehensive plans including the cities of Tacoma and Fife are required to include the following elements: land use; housing; capital facilities; public utilities; rural areas (counties only); and transportation. Under the GMA, state agencies must comply with local comprehensive plans and development regulations. The City of Tacoma adopted its Comprehensive Plan in 2004 with amendments in 2007. The City of Fife adopted its current Comprehensive Plan in 2007.

Multi-county Planning Policies

Multi-county planning policies are required for King, Pierce, and Snohomish counties and their cities. Local governments in the multi-county region have agreed to use the Puget Sound Regional Council to develop and adopt regional planning policies and a subsequent regional transportation plan. This plan must be consistent with local comprehensive plans and countywide planning policies. The following

multi-county planning policies are relevant to the project and quoted from the Pierce County Comprehensive Plan (Pierce County 2007):

- Manufacturing Centers shall be designated based on consistency with specific criteria for Manufacturing Centers, consideration of the Center's location in the county and region, consideration of the total number of Manufacturing Centers in the county that are needed over the next 20 years, environmental analysis and adoption within the comprehensive plan of the Center's designation, and provisions to ensure that job growth targeted to the Manufacturing Center is achieved.
- Manufacturing Centers shall be characterized by clearly defined geographic boundaries; intensity of land uses sufficient to support alternatives to single-occupancy vehicle use; direct access to regional highway, rail, air and/or waterway systems for the movements of goods; provisions to prohibit housing; and identified transportation linkages to high density housing areas.
- Provisions to achieve targeted employment growth should include preservation and encouragement of the aggregation of vacant land parcels sized for manufacturing uses; prohibition of land uses which are not compatible with manufacturing, industrial, and advanced technology uses; limiting the size and number of offices and retail uses, and allowing only as an accessory use to serve the needs of employees within centers, and reuse and intensification of the land.
- Jurisdictions having a designated Manufacturing Center shall plan for and fund capital facility improvement projects which support the movement of goods, coordinate with utility providers to ensure that utility facilities are available to serve such centers, provide buffers around the Center to reduce conflicts with adjacent land uses, facilitate land assembly, and assist in recruiting appropriate businesses.

2.3.2 Transportation-related Permits and Approvals

State Permits and Approvals

Work on State Highways

Improvements necessary to mitigate impacts to state-owned transportation facilities (i.e., I-5, SR 509 and US 99) require design approval from WSDOT.

Local Permits and Approvals

City of Tacoma Municipal Code

Chapter 13.16 of the Tacoma Municipal Code (TMC) establishes the City's transportation concurrency requirements, including a concurrency test and associated resultant actions. LOS for roads and intersections are divided into three categories: (a) arterial connecting corridors; (b) port industrial area arterials; and (c) all other arterials and collectors on the transportation network not included in the first two categories.

Title 10 of the TMC establishes the City's authority to regulate public works design, construction and operation. This includes, but is not limited to, sidewalks and streets. Title 9 of the TMC establishes rules governing public rights-of-way, including streets, sidewalks, and railroads.

City of Fife Municipal Code

Chapter 20.25 of the Fife Municipal Code (FMC) establishes the process for calculating transportation impact fees, based upon the study entitled *Rate Study for Transportation Impact Fees* (DEA 2006). The payment of the impact fee is a condition of issuance of a building permit. Developments owned or operated by the City of Fife are exempt from the requirement for payment of impact fees.

Title 12 of the FMC includes standard specifications for road, bridge, and municipal construction, as well as right-of-way restrictions, street use standards, and street construction standards.

3.0 Affected Environment

3.1 Regional Setting

The project is located within the City of Tacoma in north Pierce County. The project site is located on Port of Tacoma property in between the Blair Waterway and Hylebos Waterway. The Port of Tacoma is the fifth largest container port in North America, serving local, regional, national, and international markets. Freight shipments into and out of the Port totaled nearly 1.74 million TEUs in 2003 (Tacoma 2007). This shipping activity generates a significant amount of truck traffic to and from Port facilities. I-5, which forms the spine of the regional transportation system and is the nation's major west coast highway, intersects the southern portion of the Transportation Study Area.

3.2 Project Setting

The majority of the project site, as shown in Figure 1, is occupied by industrial and light industrial facilities and some undeveloped parcels. Prior to development the peninsula was a tidal marsh crossed by tidal channels and tributary streams of the Puyallup River, Hylebos Creek and Wapato Creek. The peninsula was built and expanded to its present day elevation by filling the tideflats with material dredged to deepen and extend the waterways.

Portions of the site extend from the north[2] tip of the peninsula to SR 509 in the south, Hylebos Waterway in the east, and along Blair Waterway. The remainder of the site is between the Blair Waterway turning basin, SR 509 and PCT (at Alexander Avenue and SR 509) and also includes a portion of the WUT terminal on the west side of Blair Waterway.

The site encompasses most of the peninsula north of East 11th Street, the center portion of the peninsula between East 11th Street and Lincoln Avenue, and the eastern portion of the peninsula east of Taylor Way and south of Lincoln Avenue. The project also includes the area along the north side of SR 509 extending from Taylor Way to the PCT.

3.2.1 Existing Transportation Network and Conditions

Cities of Tacoma and Fife have established a hierarchy of arterial streets based upon three functional classifications.

1. Principal arterials are streets that move large volumes of traffic between major traffic generators and destinations.
2. Minor arterials are streets that move traffic from higher classification arterials to lesser arterials.
3. Collector arterials are streets that move traffic from arterials to local access streets.

[2] For the purposes of this project the north/south axis is assumed to be parallel to Blair Waterway.

Principal Arterials

Port of Tacoma Road

Port of Tacoma Road (POTR) consists of a five lane roadway with concrete curb and gutter on both sides. The channelization consists of two lanes of traffic in each direction with a center turn lane. The grade is relatively flat, with the exception of the overpasses at SR 509 and at I-5. There are intermittent cement concrete sidewalks on both sides of the roadway. There is no on-street parking. The speed limit is 40 miles per hour (mph) from East 11th Street to the south city limits.

Marine View Drive

Marine View Drive consists of a five lane roadway with concrete curb and gutter on both sides. The channelization consists of two lanes of traffic in each direction with a center turn lane. The grade is relatively flat. There are cement concrete sidewalks on both sides of the roadway. There is no on-street parking. The speed limit is 40 mph from East 11th Street to Taylor Way.

East 11th Street

East 11th Street consists of a five-lane roadway with concrete curb and gutter on both sides. The channelization consists of two lanes of traffic in each direction with a center turn lane. The grade is relatively flat, with the exception of the approach to the Hylebos Bridge. The Hylebos Bridge is currently closed to traffic, but is planned to reopen in 2010. There are no sidewalks. There is no on-street parking. The speed limit is 35 mph from Alexander Avenue to Marine View Drive.

SR 509

SR 509 is a divided highway from downtown Tacoma to approximately 530 feet west of Taylor Way. The channelization consists of two lanes of traffic in each direction, widening to accommodate turn lanes at the at-grade intersections. The grade is relatively flat east of Milwaukee Way. There are no sidewalks or on-street parking. There is a bike lane in each direction. The speed limit is 50 mph from Milwaukee Way to just west of Taylor Way and 40 mph from just west of Taylor Way to Marine View Drive.

Pacific Highway East (US Highway 99)

Pacific Highway East consists of a five-lane roadway with concrete curb and gutter on both sides. The channelization consists of two lanes of traffic in each direction with a center turn lane. The grade is relatively flat. There are cement concrete sidewalks on both sides of the roadway. There is no on-street parking. The speed limit is 35 mph.

54th Avenue East

54th Avenue East consists of a five-lane roadway with concrete curb and gutter on both sides. The channelization consists of two lanes of traffic in each direction with a center-turn lane. The grade is relatively flat, with the exception of the overpass at I-5. There are cement concrete sidewalks on both sides of the roadway. There is no on-street parking. The speed limit is 35 mph.

70th Avenue East

70th Avenue East consists of a two to three-lane roadway with gravel shoulders on both sides. The channelization consists of two lanes of traffic in each direction with a left turn lane at the intersections.

The grade is flat. There are no sidewalks on either side of the roadway. There is no on-street parking. The speed limit is 35 mph.

Minor Arterials

Taylor Way

Taylor Way consists of a three-lane roadway with concrete curb and gutter on both sides, south of Lincoln Avenue, widening to five lanes at its intersection with SR 509. The channelization consists of one lane of traffic in each direction with a center turn lane. The grade is relatively flat. There are no sidewalks or on-street parking. The speed limit is 40 mph.

North of Lincoln Avenue, Taylor Way is a two-lane roadway with concrete curb and gutter on both sides. The grade is relatively flat. There are cement concrete sidewalks on the west side. There is no on-street parking. The speed limit is 30 mph.

Collector Arterials

East Alexander Avenue south of Lincoln Avenue is a two-lane roadway with no curbs and no shoulders. The grade is relatively flat. There are no sidewalks. There is no on-street parking. The speed limit is 40 mph. A portion of Alexander Avenue was recently vacated and is gated at a point north of the Pierce County Terminal access. The gate can be opened in the case of emergency.

Alexander Avenue north of Lincoln Avenue consists of a two-lane roadway with no curbs and 10-foot paved shoulders. The grade is relatively flat. There are no sidewalks. The speed limit is 35 mph.

Lincoln Avenue

Lincoln Avenue, between Alexander Avenue and Taylor Way, consists of a two-lane roadway with concrete curb and gutter, widening to three lanes at its intersection with Taylor Way. The grade is relatively flat. There are no sidewalks and no on-street parking. The posted speed limit is 35 mph.

3.2.2 Existing Traffic Volumes

Figure 7 shows the average daily traffic for study area roadways. Daily traffic counts were obtained from City of Tacoma, City of Fife, and WSDOT records and from recent field studies. Where daily traffic data was not available from 2007 or 2008, the traffic volumes were estimated by applying a 2 percent per year growth factor to the earlier counts. Where available, truck percentages are shown.

PM peak hour traffic volumes were collected at the study area intersections in late 2007 and early 2008. The existing PM peak hour turning movement counts are shown in Figures 8A and 8B.

3.2.3 Existing Levels of Service

LOS is a qualitative measure used to characterize traffic operating conditions. The transportation LOS system uses the letters A through F, with A being best traffic operations and little or no delay to motorist; and F being worst with congestion and long traffic delays. Existing LOS for each key intersection in the study area is identified in Table 3.

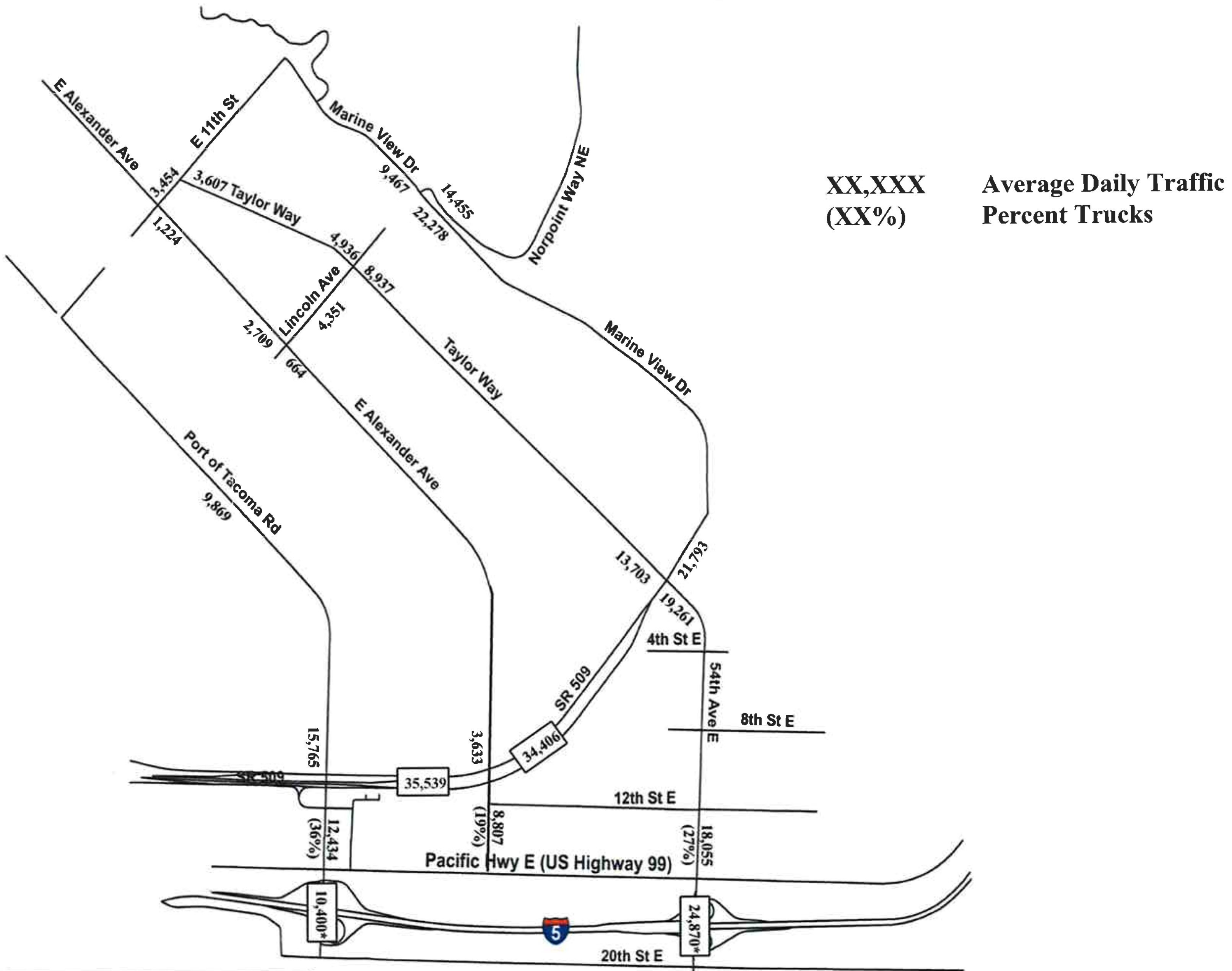

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Figure 7: Existing Average Daily Traffic

February 2009

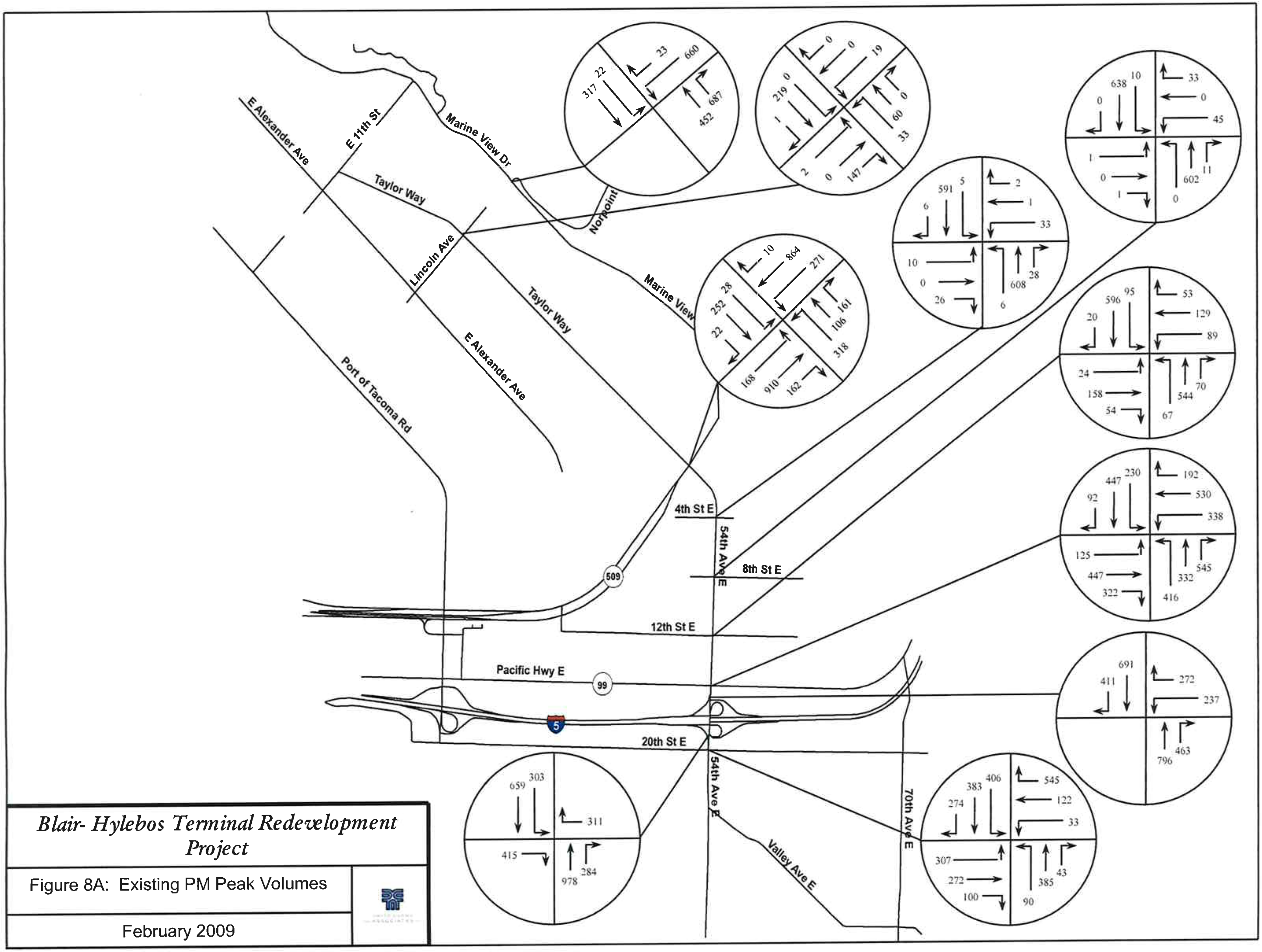

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Figure 8A: Existing PM Peak Volumes

February 2009

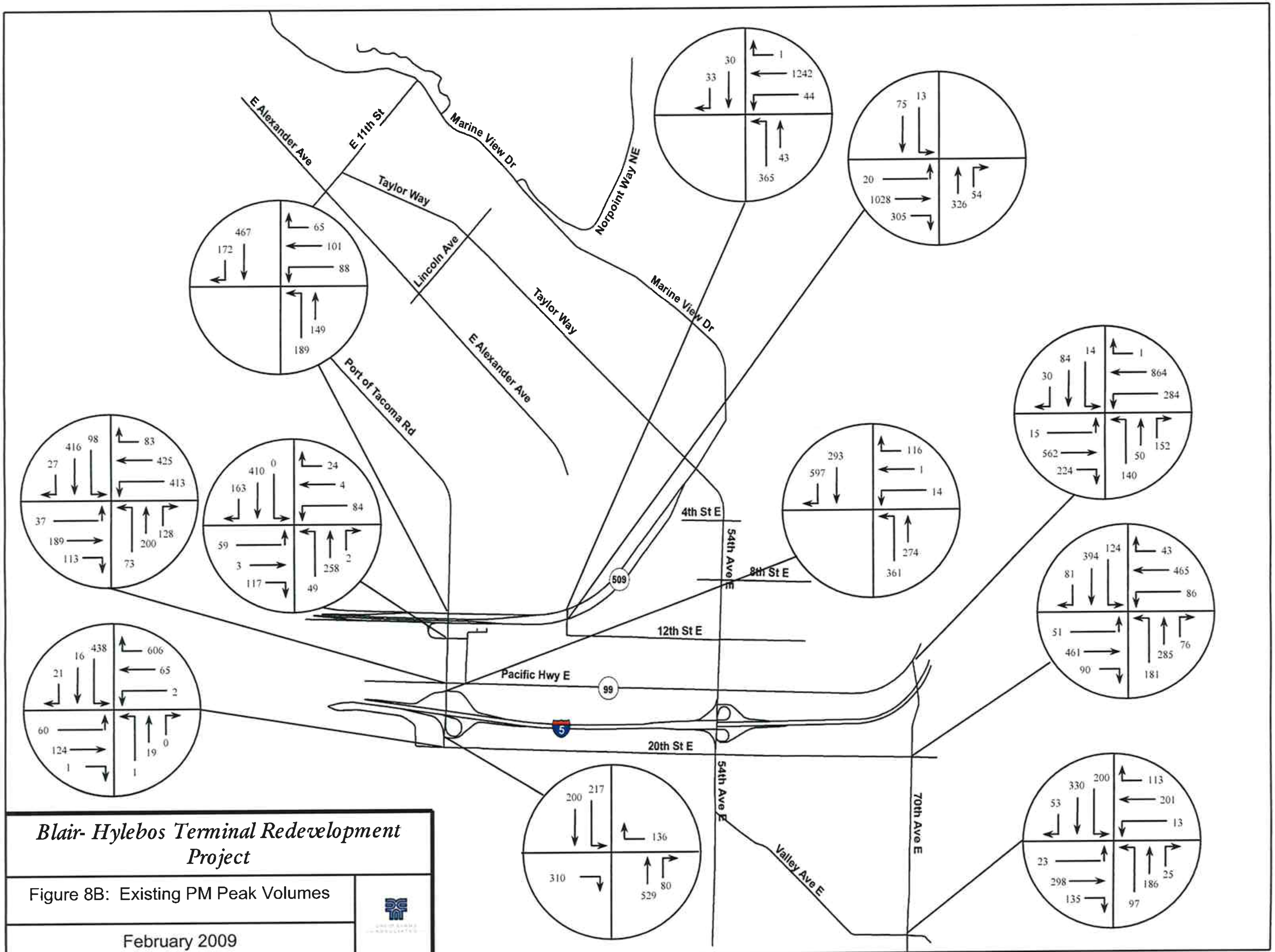

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Figure 8B: Existing PM Peak Volumes

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Table 3: 2008 LOS during PM Peak Period

Intersections	Traffic Control	LOS	Delay
SR 509/Taylor Way	Signal	E	71
54th Ave E/4th St	Stop	E-WB*	36
54th Ave E/8th St	Signal	A	7
54th Ave E/12th St	Signal	B	14
54th Ave E/SR 99	Signal	F*	125
54th Ave E/I-5 SB	Signal	B	15
54th Ave E/I-5 NB	Stop	F-EB*	111
54th Ave E/20th St	Signal	D	47
Alexander/North Frontage Rd	Signal	C	28
Alexander/South Frontage Rd	Signal	B	20
Marine View Dr/Norpoint	Signal	B	16
POTR/North Frontage Rd	Signal	C	35
POTR/12th St	Signal	D	47
POTR/SR 99	Signal	E*	67
POTR/I-5 SB	Signal	C	25
POTR/I-5 NB	Stop	B-EB	13
POTR/20th St	Stop	F-EB*	**
Lincoln Avenue/Taylor Way	Signal	B	10
E 11th St/Taylor Way	Stop	A	8
70TH Ave E/SR 99	Signal	D	50
70th Ave E/20th St E	Signal	E*	66
70th Ave E/Valley Ave E	Signal	E*	65

*intersection does not meet Fife LOS standard (LOS D)

** Synchro was unable to calculate the delay

The City of Tacoma LOS standard requires that 85% of the arterial lane-miles within the Port area must exhibit a LOS D or better.. The City of Fife has adopted an LOS standard of D for all local roadways.

3.2.4 Traffic Safety

Traffic collision data was obtained from the City of Tacoma, the City of Fife and WSDOT for the study area for 2005, 2006, and 2007. Table 4 shows the collision summary for the study area for intersection and non-intersection collisions.

Table 4: Collision Summary

	Total Collisions			Injury Collisions		
	2005	2006	2007	2005	2006	2007
Intersection Collisions						
Lincoln/Taylor Way	1	0	0	1	0	0
SR 509/Taylor Way	2	3	0	1	1	0
SR 509/Alexander	8	12	14	1	2	6
MVD Norpoint	6	4	3	1	0	0
54th Ave E/4th	0	2	0	0	2	0
54th Ave E/8th	0	0	0	0	0	0
54th Ave E/12th	0	3	3	0	2	1
54th Ave E/SR 99	7	10	7	1	4	1
54th Ave E/I-5 SB	0	3	2	0	1	1
54th Ave E/I-5 NB	0	1	0	0	0	0
54th and 20th	3	7	4	1	0	1
POTR/12th	0	0	1	0	0	0
POTR/SR 99	4	5	0	1	0	0
POTR/I-5 SB	1	1	0	1	0	0
POTR/I-5 NB	0	0	0	0	0	0
POTR and 20th	1	2	0	0	0	0
Non Intersection Collisions						
54th Ave E	20	28	25	1	3	3
POTR	15	16	13	4	3	2
Taylor Way	6	5	3	2	2	1
E Alexander Ave	2	0	2	1	0	0
Marine View Dr	20	30	9	6	11	2

There were no fatality accidents in the study area in 2005, 2006, or 2007. For those collisions where detailed information is available, approximately 55 percent involved drivers that were cited for such offenses as speeding, negligent driving, and improper lane travel. Approximately 20 percent involved single-vehicle collisions with fixed objects, and approximately 15 percent involved rear-end collisions. These collisions are most likely due to driver inattention or negligence and do not indicate the existence of a roadway design deficiency.

Emergency vehicles accessing the peninsula travel through the SR 509 and Taylor Way intersection to access the majority of the peninsula. In order to access parcels on the south end of Alexander Avenue, they need to follow the route along Taylor Way, Lincoln Avenue and Alexander Avenue. This adds over 3 miles and approximately 4 minutes to their trip. An alternative route is available, if necessary, via SR 509 and Alexander Avenue through an emergency gate which blocks Alexander Avenue just north of PCT.

3.2.5 Pipeline Transportation Projects

Expected by 2013

Hylebos Bridge

The Hylebos Bridge is one of two key transportation routes off the peninsula and connects East 11th Street with Marine View Drive. The Bridge was constructed in 1939 and is currently inoperable due to a mechanical failure in 2001. Funds have been dedicated to upgrade the existing mechanical and electrical equipment, replace existing approach ramps, repair structural components, and improve the existing stormwater drainage. Improvement plans do not include increasing bridge capacity. The proposed improvements are funded and are scheduled for completion in 2010. Therefore, this analysis assumes the Hylebos Bridge is operational by 2013.

70th Ave E/Valley Avenue E Intersection Improvement

The intersection of 70th Avenue East/Valley Avenue East will be widened in conjunction with a street improvement project in 2009 or 2010. The south and east leg will be widened to five lanes with left turn lanes. The north leg will be widened to six lanes with two left turn lanes. The west leg will remain in its current configuration.

Expected after 2013

34th Avenue East/12th Street East

The City of Fife, in conjunction with WSDOT, is considering improvement of 34th Avenue East and 12th Street East to ease traffic impacts at the intersection of POTR and SR 99. The proposed improvements include the installation of a traffic signal at the intersection of 34th Avenue East and SR 99. Also proposed is a modification of the SB Port of Tacoma Road off-ramp from I-5 to allow freeway traffic direct access to the proposed signal. The proposed improvements have not been included in this analysis because the design has not begun, the project is not fully funded, and the construction schedule has not been determined. Although the impacts of the proposed improvements are not yet known, it is expected that the project will eventually improve operation of the intersection of POTR and SR 99.

SR 167

WSDOT proposes to construct a limited access highway from SR 509 to the current southerly terminus of the limited access portion of SR 167 in Puyallup. A Tier II EIS has been completed for this project and preliminary design is currently underway. There is no construction funding identified for this project; therefore, this project is not considered in this traffic analysis for 2013. When SR 167 is constructed, it is expected that a significant portion of the Port of Tacoma's truck traffic will use the new facility, which is expected to improve traffic operations at many of the intersections analyzed in this report.

3.2.6 Freight

Truck Traffic and Routes

Within the city of Tacoma, a number of principal, minor, and collector arterials are designated as "heavy haul industrial corridors" (TMC 11.55). In the project study area, these include East 11th Street, Alexander Avenue north of East 11th Street, POTR, and Taylor Way. Each heavy haul corridor serves as

a key connection for truck traffic traveling internally between the Port's marine terminals and other industrial areas within the heavy haul zone.

Truck traffic accesses the peninsula via the intersection of Taylor Way and SR 509. A secondary access will be available via the Hylebos Bridge when it is reopened in 2010, although this bridge is only load rated for HS-15 vehicles. For purposes of this analysis, truck traffic from the peninsula is not expected to use the reopened Hylebos Bridge since that route is longer than using Taylor Way. Most trucks are destined for I-5; following the Hylebos Bridge access would result in a longer, more circuitous route to I-5 for trucks. Truck traffic accesses WUT via Port of Tacoma Road.

The City of Fife has identified truck routes within the city (Figure 9). The truck routes are classified according to allowable gross vehicle weight.

New truck counts and travel route data have been collected as part of the *Port of Tacoma - Tideflats Area Truck Volume and Route Study* (Heffron Transportation, Inc. 2007). Data was collected using video cameras at 13 stations (37 individual movements) surrounding the Port area. The camera recorded traffic flows from 6:00 a.m. to 6:00 p.m. from December 4 through 8, 2006. Seven types of trucks were observed: trucks with shipping containers; trucks with empty chassis; bobtails; auto carriers; logging trucks; non-container semi trucks; and other non-Port trucks (delivery vans, concrete trucks, etc.) Based on the data, both volume and percentage of trucks (between 8 to 12 percent of daily traffic) entering and leaving the Port is highest during the middle of the day (8:00 a.m. to 4:00 p.m.). The highest percentage of trucks (11.4 percent) occurs between 11:00 a.m. and noon. The percentage of trucks is approximately equal (6 percent) in the morning commute period (7:00 a.m. to 8:00 a.m.) and in the evening commute period (4:00 p.m. to 5:00 p.m.). During the study period, approximately 18 percent of the Port related truck trips originated from the south on I-5 and approximately 42 percent of the trips originated from the north on I-5. Approximately 32 percent of the trucks accessing the overall Port industrial area used Port of Tacoma Road and 15 percent used 54th Avenue East.

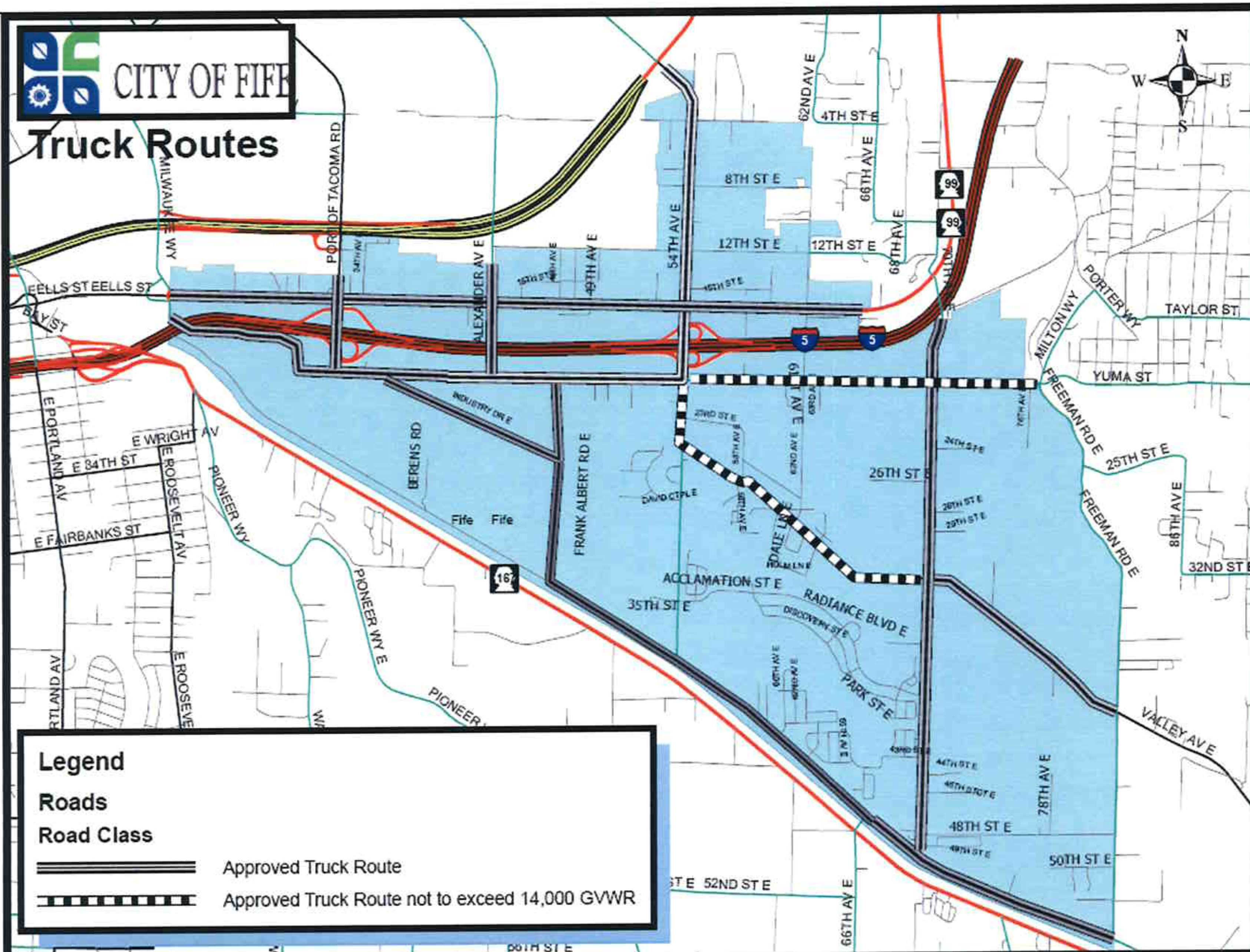

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Figure 9: City of Fife Truck Routes

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3.2.7 Rail Facilities

Rail facilities on the peninsula consist of industrial rail lines serving a number of parcels. All rail line crossings of the existing roadways are at-grade crossings. None of the crossings are controlled by crossing signals. Tacoma Rail Tideflats Division operates all trains on the peninsula. Although some train activity is conducted at night, there are times during the day that trains occupy the at-grade crossings, resulting in vehicle delays that are typical of a port industrial area.

3.2.8 Transit

Pierce Transit provides transit service to the project vicinity. There is one regular route that circulates within the Port (Route 60) and several routes that pass near the Port on SR 509 or through Fife (Routes 61, 500, and 501). Route 60 originates in downtown Tacoma and makes four stops in the Port area. Route 61 serves Northeast Tacoma and Federal Way, Route 500 serves Fife and Federal Way, and Route 501 serves Fife, Milton, and Federal Way. Transit routes and stops near the study area are illustrated in Figure 10.

3.2.9 Non-motorized Facilities

There is very little pedestrian traffic and limited sidewalks existing on the peninsula. Where there are no sidewalks, pedestrians typically use the shoulder area of the public streets. There are currently no planned sidewalk improvements on the peninsula. Section 3.2.1 identifies existing sidewalks.

There is very little bicycle activity and no bicycle lanes on the peninsula. The City of Tacoma Comprehensive Plan identifies planned bicycle lanes on Alexander Avenue (including that portion previously vacated by the City of Tacoma) and East 11th Street. No funding is identified for construction of those bicycle lanes.

3.2.10 Parking

City of Tacoma Municipal Code requires parking and loading spaces typically based on gross floor area of improvements in the study area. Generally, there are adequate parking and loading spaces provided on site for most parcels in the study area. There are some industrial parcels, such as Schnitzer Steel and WUT terminal, which currently experience periods where vehicles awaiting access to the sites queue on city streets. In addition, there are streets and freeway ramps within the cities of Tacoma and Fife which experience unwanted truck parking. Some of the unwanted parking has been controlled by posting and enforcing no parking restrictions on certain streets.

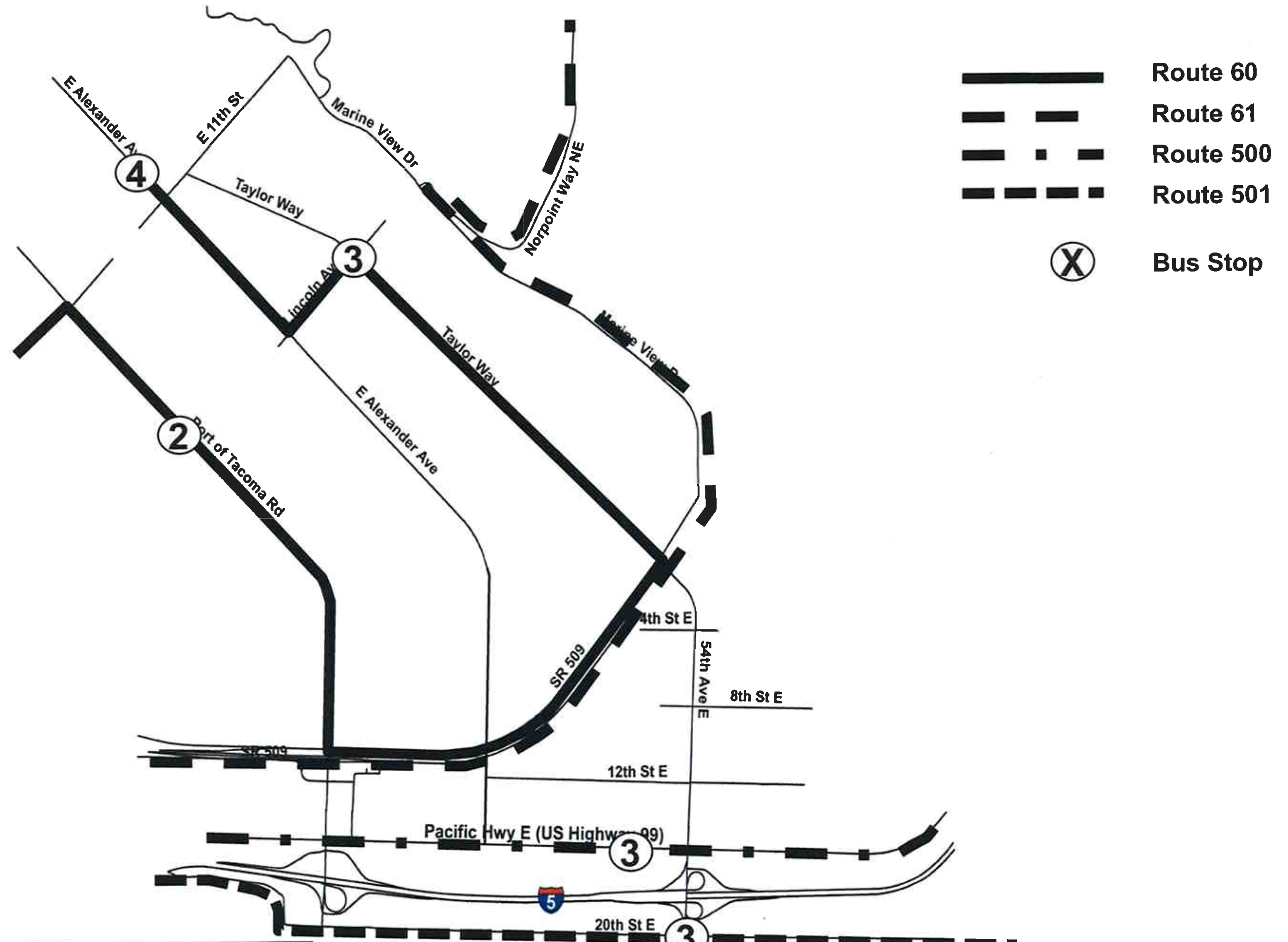

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Figure 10: Transit Routes and Stops

February 2009

4.0 Environmental Effect Assessment

4.1 Effects during Construction

Traffic volumes attributed to project construction will include contractor employee vehicles and construction vehicles typically associated with construction on an industrial site. In addition, the Proposed Action will require an estimated 1.1 million cubic yards of fill. Most of that fill will be brought in by barge or rail. It is assumed that up to 20% of the fill may be brought in by trucks. This will result in approximately 220,000 cubic yards of fill by truck, or 11,000 trucks (22,000 trip ends). It is anticipated that the majority of fill will be imported during the first construction season, resulting in an estimated 260 trucks per day, or 32 trucks per hour (assuming four months of hauling at 8 hours per weekday). This will be less than the 271 daily truck trips from peninsula businesses displaced by the Proposed Action, and will therefore have no negative impact on traffic operations. Construction sites will employ best management practices to minimize tracking of debris onto public roads.

Traffic impacts as a result of construction of the proposed road and rail transportation improvements may occur, such as lane reductions and periodic vehicle delays. The Port will work with the City of Tacoma during the permit process to identify and minimize those impacts. Any roadway closures or lane reductions will need to be approved by the City of Tacoma. Any access interruptions to occupied parcels during construction will be coordinated with the affected businesses to minimize impacts.

4.2 Effects during Operation

The Proposed Action, Straight Overpass and Lincoln Overpass alternatives include improvements to existing roadways as well as the construction of new roadway infrastructure.

The Proposed Action will create the following two new intersections:

- Taylor Way Overpass/Taylor Way
- Lincoln Bypass/Lincoln Avenue

The Straight Overpass Alternative will create the following two new intersections:

- Taylor Way /PCT Access Road
- Lincoln Bypass/Lincoln Avenue

The Lincoln Overpass Alternative will create the following new intersections:

- Lincoln Overpass/Taylor Way Bypass
- Lincoln Overpass/Lincoln Bypass
- Lincoln Bypass/Lincoln Avenue

The operational effects of each alternative, including the No Action Alternative, are discussed throughout the remainder of this section.

4.2.1 Level of Service

Table 5 provides a comparison of 2013 LOS between the three alternatives during the PM peak period. "2013 with current land uses" is the same as No Action, except that it assumes the existing land uses continue on the BHTRP site. This scenario is included to illustrate that the No Action is a more appropriate 2013 base condition, since the No Action alternative generates fewer trips than are displaced from the BHTRP site.

Table 5: Comparison of 2013 LOS during PM Peak Period

Intersection	2013 with current land uses		No Action		Proposed Action		Straight Overpass		Lincoln Overpass	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
SR 509/Taylor Way[1,3]	E	59	E	56	E	67	E	67	E	67
54th Ave E/4th St[2,4]	F-WB*	67	F-WB*	55	F-WB*	74	F-WB*	74	F-WB*	74
54th Ave E/8th St[2,3]	A	7	A	7	A	7	A	7	A	7
54th Ave E/12th St[2,3]	B	13	B	13	B	13	B	13	B	13
54th Ave E/SR 99[2,3]	F*	168	F*	163	F*	180	F*	180	F*	180
54th Ave E/I-5 SB[2,3]	C	27	C	27	C	26	C	26	C	26
54th Ave E/I-5 NB[2,3]	C	32	C	31	D	41	D	41	D	41
54th Ave E/20th St[2,3]	D	48	D	48	D	49	D	49	D	49
Alexander/North Frontage Rd[1,3]	C	33	C	33	C	21	C	21	C	21
Alexander/South Frontage Rd[1,3]	B	19	B	19	B	20	B	20	B	20
MVD and Norpoint[1,3]	C	22	C	22	C	22	C	22	C	22
POTR/North Frontage Rd[1,3]	C	33	C	33	C	33	C	33	C	33
POTR/12th St[1,3]	D	40	D	40	D	40	D	40	D	40
POTR/SR 99[2,3]	E*	69	E*	69	E*	69	E*	69	E*	69
POTR/I-5 SB[2,3]	C	22	C	22	C	22	C	22	C	22
POTR/I-5 NB[2,4]	B-EB	14	B-EB	14	B-EB	14	B-EB	14	B-EB	14
POTR/20th St[2,4]	F-EB*	**	F-EB*	**	F-EB*	**	F-EB*	**	F-EB*	**
Lincoln Ave/Taylor Way[1,3]	B	10	B	11	B	12	B	12	B	12
E 11th St/Taylor Way[1,4]	A	8	A	8	A	8	A	8	A	8
Lincoln Bypass/Lincoln Ave[1,4]	-	-	-	-	-	-	-	-	B	13
Lincoln Bypass/Lincoln Overpass[1,4]	-	-	-	-	-	-	-	-	C	16
Taylor Bypass/Lincoln Overpass[1,4]	-	-	-	-	-	-	-	-	C	18
Taylor Way/Taylor Overpass[1,4]	-	-	-	-	C	20	-	-	-	-
Taylor Way/PCT Access Road[1,4]	-	-	-	-	-	-	C	17	-	-
70th Ave E /SR 99[2,3]	F*	101	F*	98	F*	109	F*	109	F*	109
70th Ave E/20th St E[2,3]	E*	68	E*	69	E*	74	E*	74	E*	74
70th Ave E/Valley Ave E[2,3]	D	38	D	38	D	38	D	38	D	38

* Intersection does not meet Fife LOS standard (LOS D)
** Synchro was unable to calculate the delay
[1] Tacoma intersection
[2] Fife intersection
[3] Signal control
[4] Stop control

The No Action Alternative is expected to generate 481 new daily trips (296 trucks and 185 autos) and displace 1647 daily trips (247 trucks and 1,400 autos). This is a net increase of 49 trucks and a net decrease of 1,215 automobiles. The expected PM peak traffic with the No Action Alternative is shown in Figures 11A and 11B. The decreased LOS as compared to existing conditions for some intersections is due to expected growth of background traffic (2 percent per year from 2008 to 2013) and the addition of pipeline projects. The intersections of 54th Ave E/4th St E, 54th Ave E/SR 99, Port of Tacoma Road/SR 99, Port of Tacoma Road/20th Street E, 70th Avenue E/SR 99, and 70th Avenue E/20th Street E are below the City of Fife standard of LOS D for all future scenarios. The BHTRP project has no impact on the intersections of Port of Tacoma Road/SR 99 and Port of Tacoma Road/20th Street E. The BHTRP project increases delay at the other intersections.

The Proposed Action, Lincoln Overpass Alternative and Straight Overpass Alternative are expected to generate 3,902 new daily trips (2,824 trucks and 1,078 autos) and displace 2,562 daily trips (1,021 trucks and 1,541 autos). The displaced trucks include those trucks from displaced businesses as well as 750 trucks attributed to the elimination of the EB1 Terminal dray to off-peninsula intermodal yards (the Traffic Analysis for the EB1 Terminal SEPA Checklist completed by the Port identified truck trips associated with transportation of containers between the proposed EB1 Terminal and the existing intermodal yards on Port of Tacoma Road; these trips would be unnecessary with the construction of the rail tracks included in the Proposal and Lincoln Overpass Alternative, and are, therefore, eliminated from the net trip total). This is a net increase of 1,803 trucks and a net decrease of 463 automobiles. The expected PM peak traffic with the Proposed Action is shown in Figure 13A and 13B. The expected PM peak traffic with the Lincoln Overpass Alternative is shown in Figure 14A and 14B. The expected PM peak traffic with the Straight Overpass Alternative is shown in Figure 15A and 15B. There is no net reduction in LOS at any of the study intersections as compared to the No Action Alternative , except for 54th Ave E/I-5 NB which drops from LOS C to LOS D (see Table 5). The intersections of 54th Ave E/4th St E, 54th Ave E/SR 99, Port of Tacoma Road/SR 99, Port of Tacoma Road/20th Street E, 70th Avenue E/SR 99, and 70th Avenue E/20th Street E are below the City of Fife standard of LOS D for all future scenarios. The BHTRP project has no impact on the intersections of Port of Tacoma Road/SR 99 and Port of Tacoma Road/20th Street E. The BHTRP project increases delay at the other intersections.

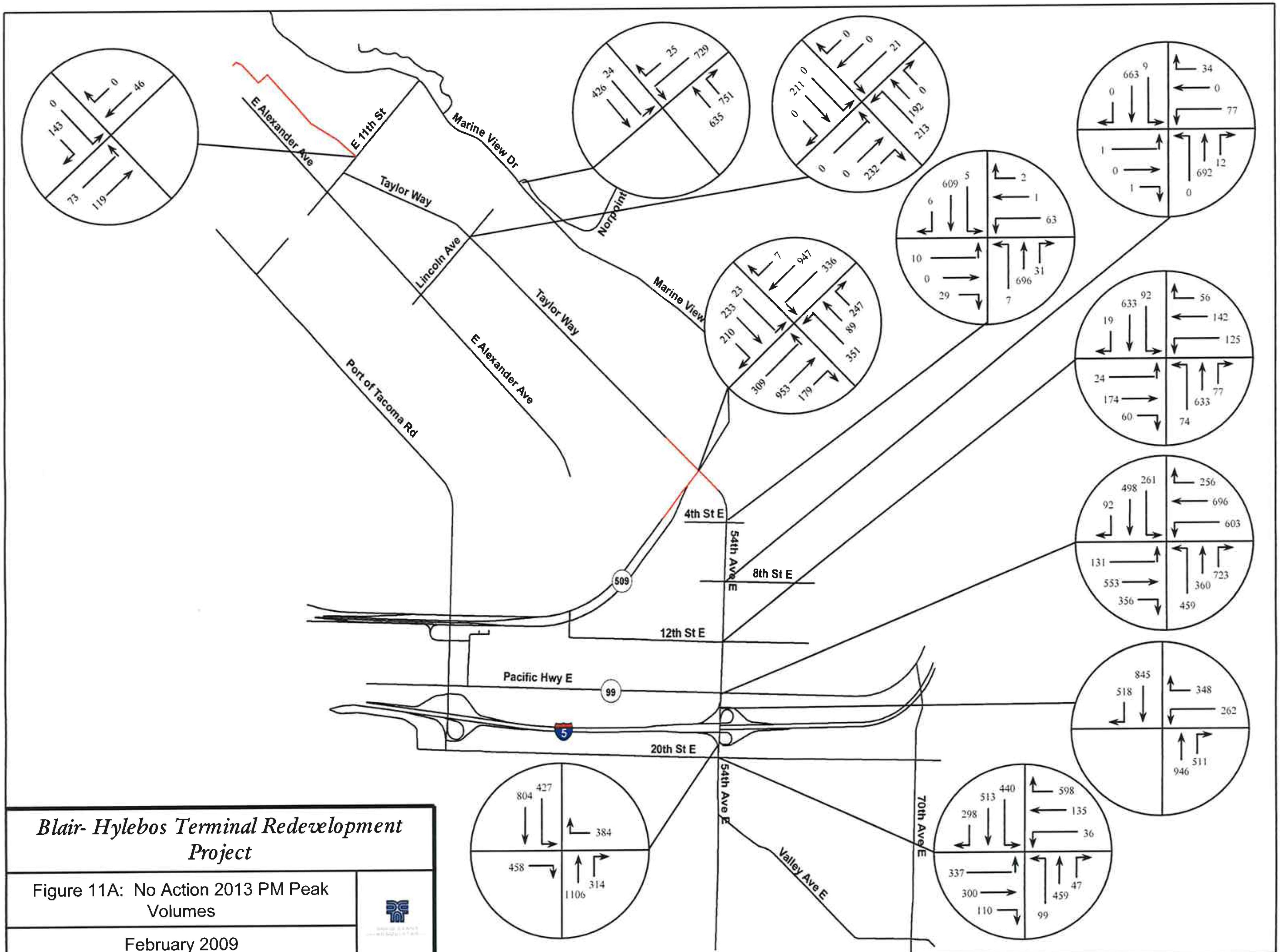

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Figure 11A: No Action 2013 PM Peak Volumes

February 2009

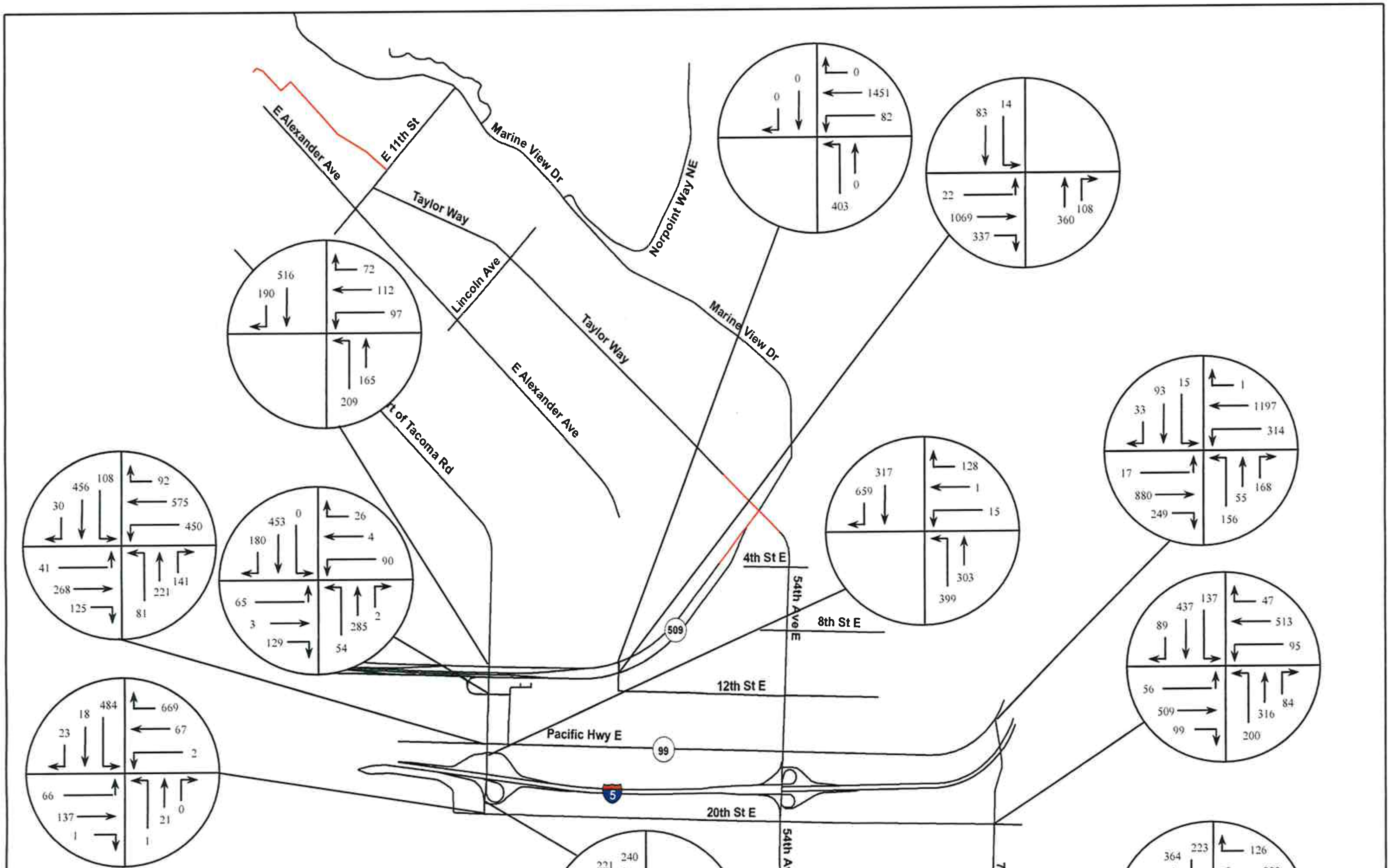

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Figure 11B: No Action 2013 PM Peak Volumes

February 2009

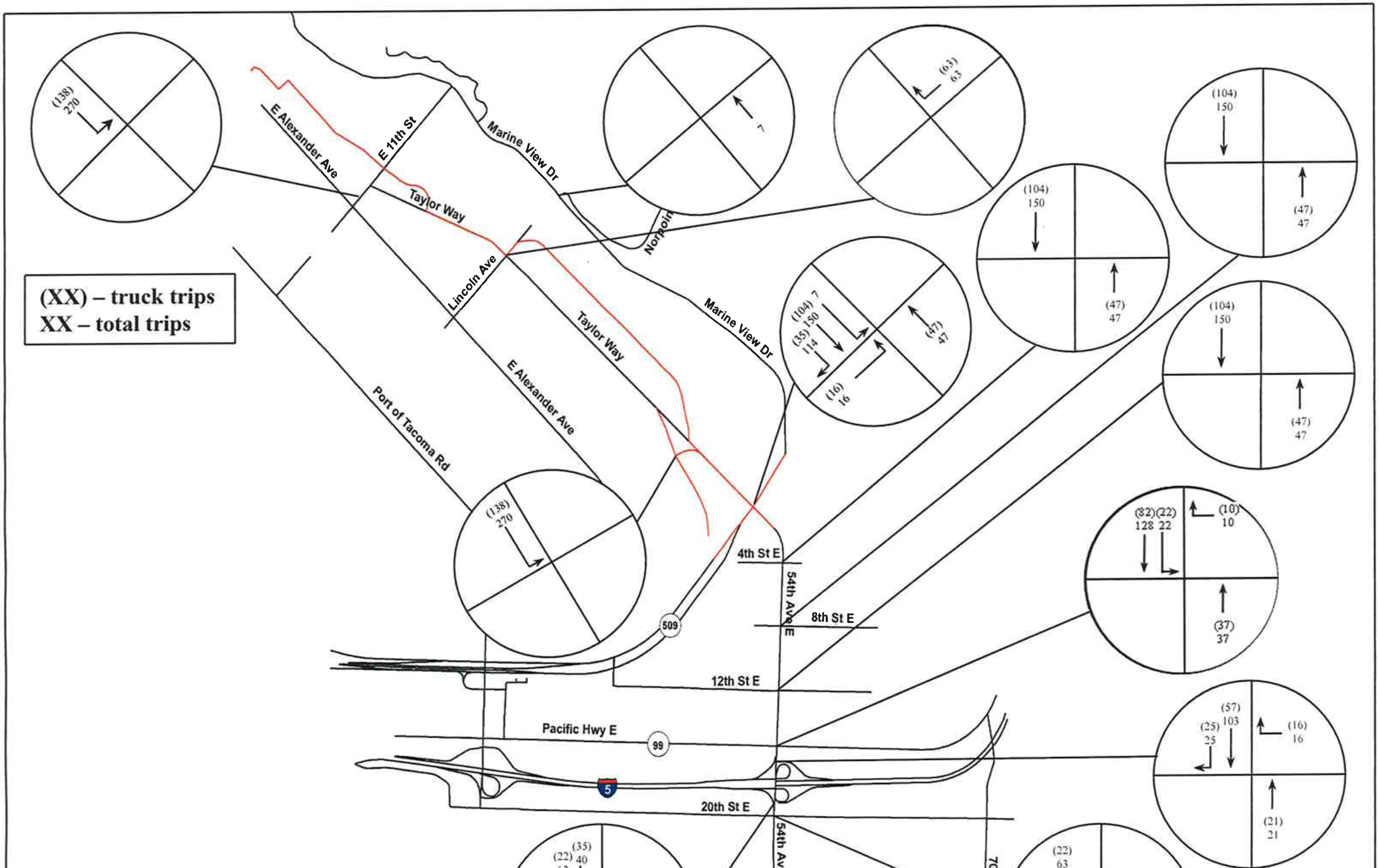

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Figure 12A: 2013 PM Peak Project Trips

February 2009

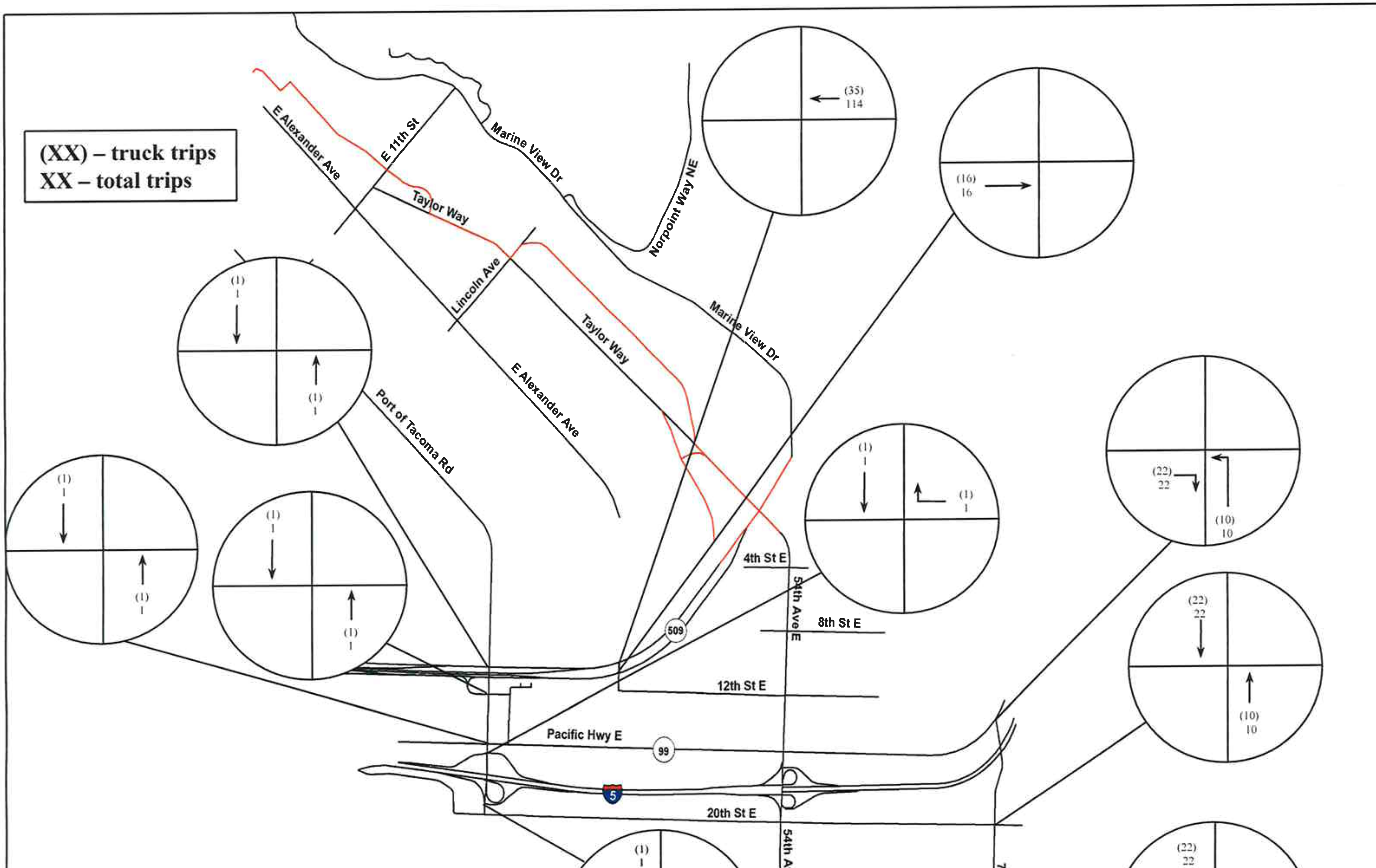

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Figure 12B: 2013 PM Peak Project Trips

February 2009

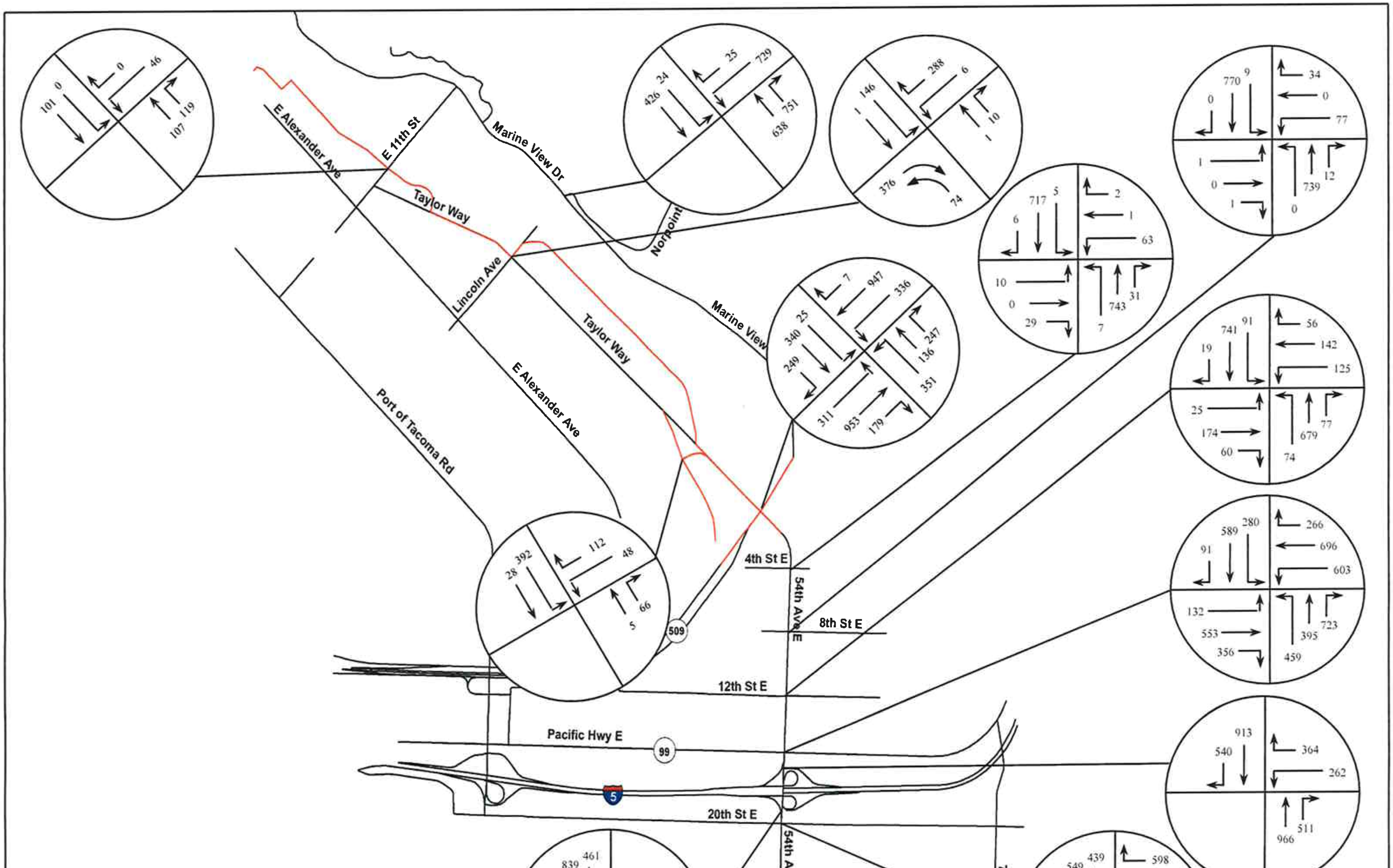

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Figure 13A: Proposed Action 2013 PM Peak Volumes

February 2009

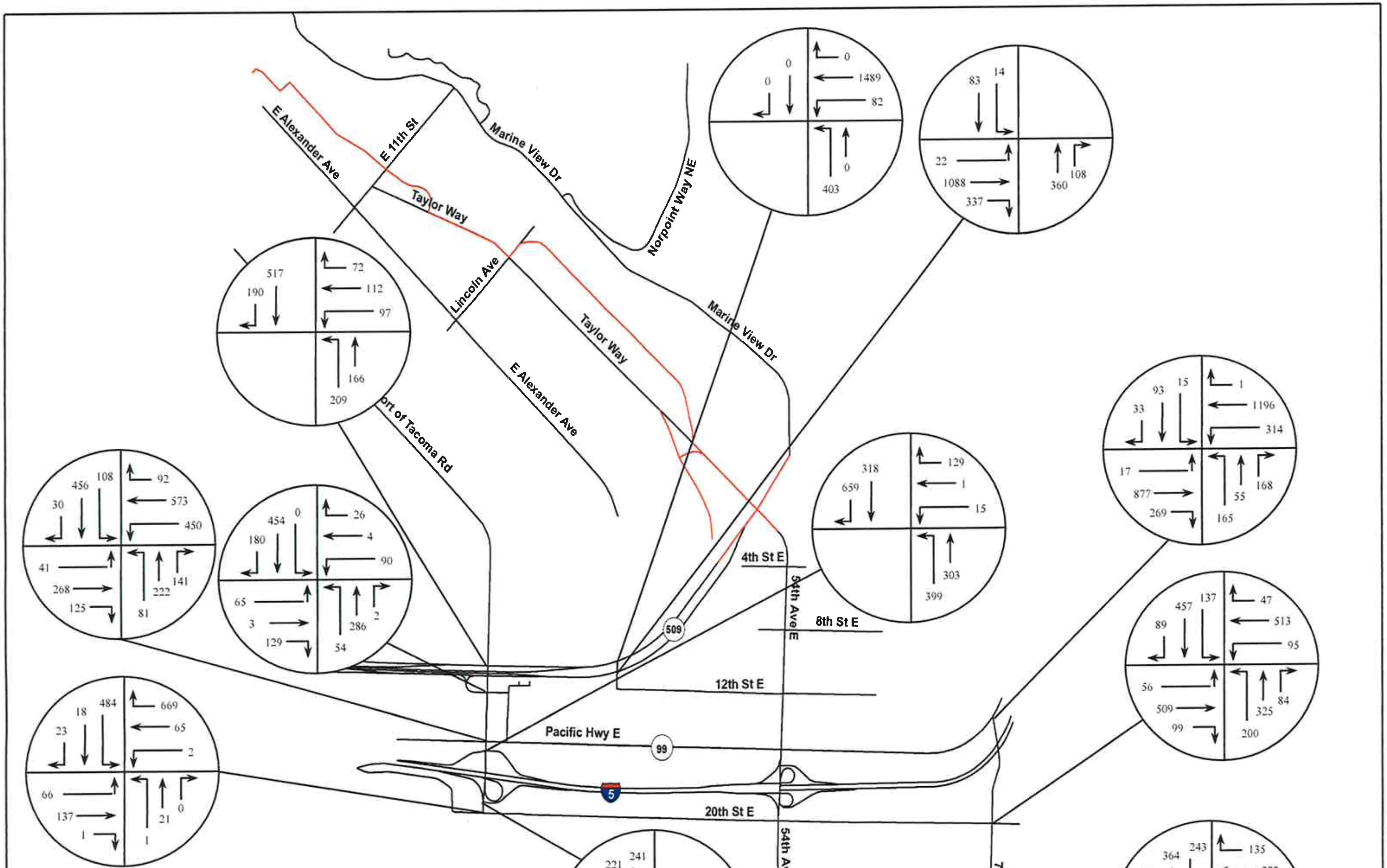

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Figure 13B: Proposed Action 2013 PM Peak Volumes

February 2009

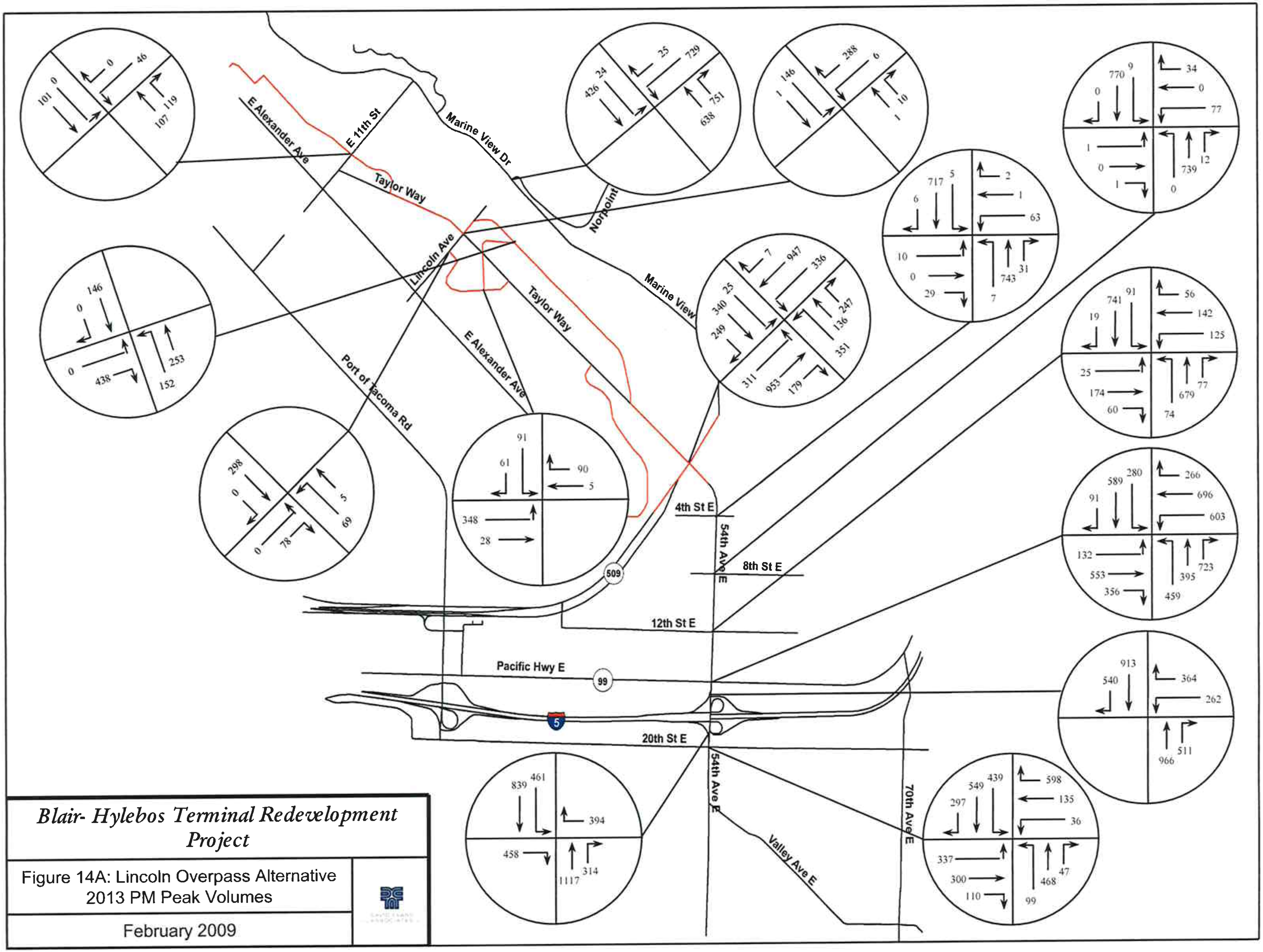

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Figure 14A: Lincoln Overpass Alternative
2013 PM Peak Volumes

February 2009

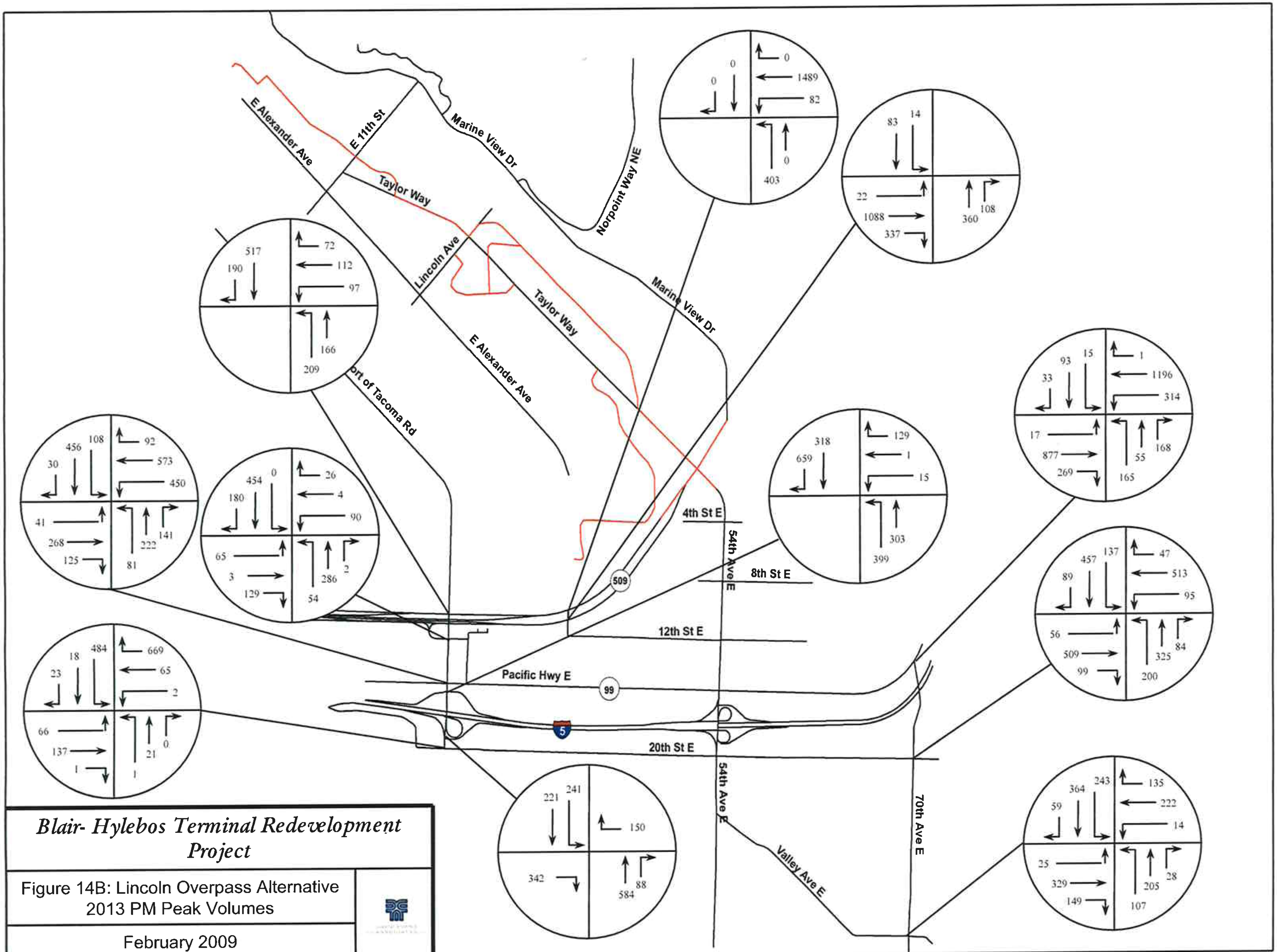

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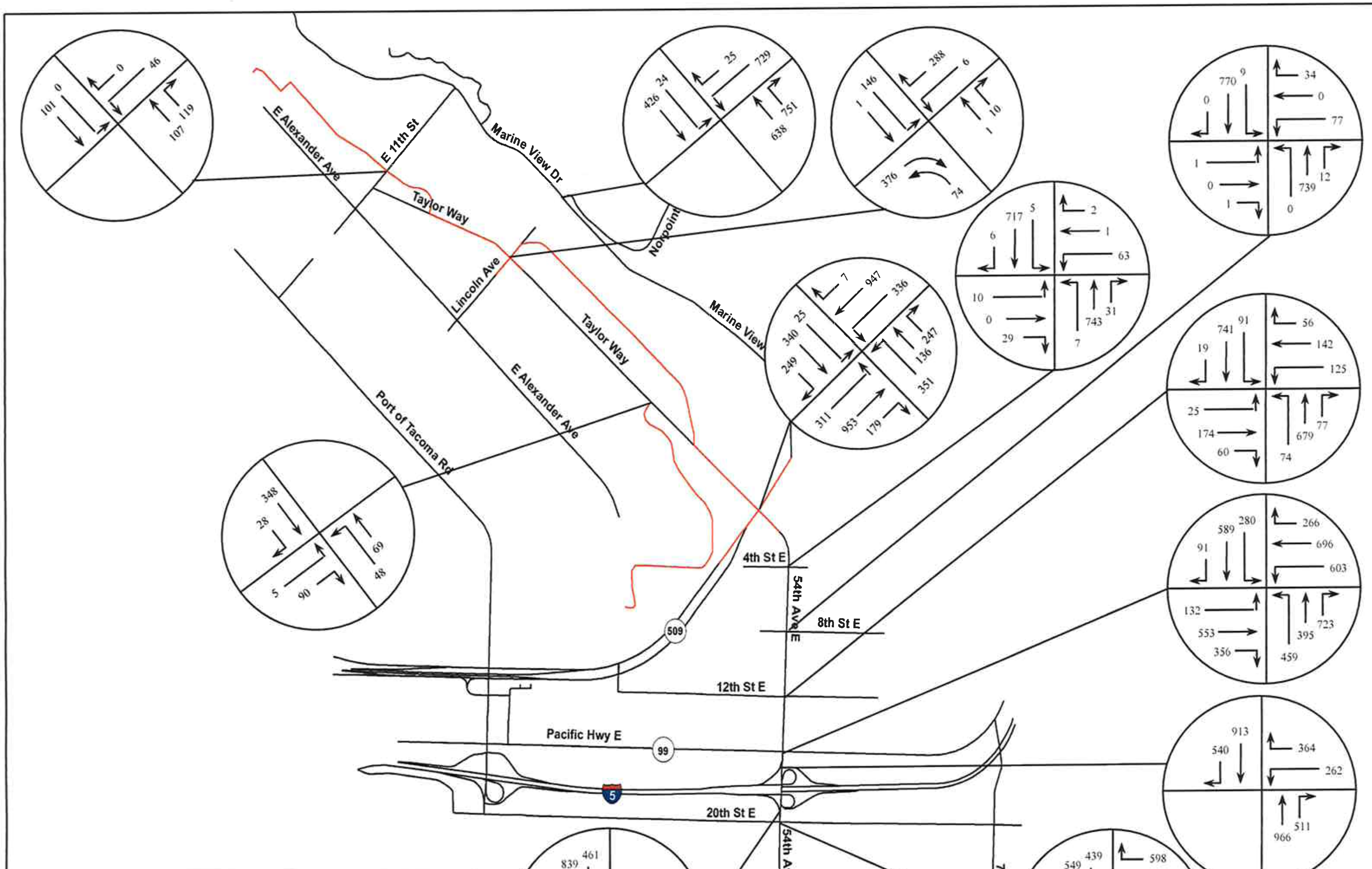
Figure 14B: Lincoln Overpass Alternative
2013 PM Peak Volumes

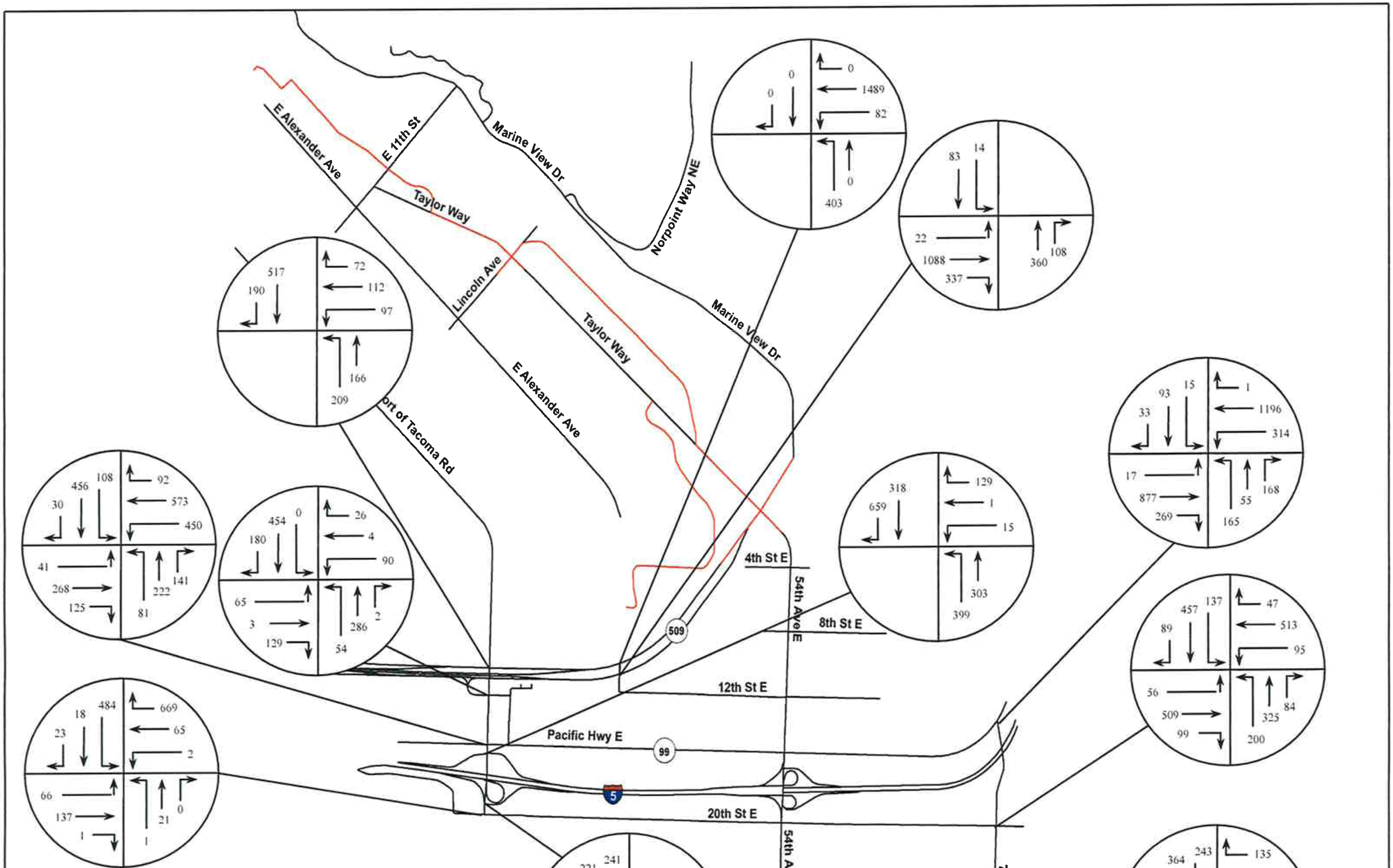
February 2009



Blair- Hylebos Terminal Redevelopment Project

Figure 15A: Straight Overpass 2013 PM Peak Volumes

February 2009



Blair- Hylebos Terminal Redevelopment Project

Figure 15B: Straight Overpass 2013 PM Peak Volumes

February 2009

4.2.2 Safety

The repair and reopening of the Hylebos Bridge (by the City of Tacoma) under each alternative will allow the permanent closure of Alexander Avenue north of SR 509 in accordance with the conditions of the previously approved street vacation. Under the No Action and Lincoln Overpass Alternatives, this closure will require emergency vehicles accessing the PCT to travel through the SR 509 and Taylor Way intersection and follow the route along Taylor Way, Lincoln Avenue and Alexander Avenue. This will add approximately 3.15 miles to the trip. Emergency vehicle response to the PCT will be affected under the No Action and Lincoln Overpass Alternatives, resulting in an estimated 4 minutes added to their response times. The resulting response time will not meet the Tacoma Fire Department's level of service standard (pers. comm., Tacoma Fire Department 2008). Emergency vehicle response to the PCT and other properties along Alexander Avenue will be improved under the Proposed Action and Straight Overpass Alternative with the addition of the grade separation structures.

Sidewalks will be constructed on one side of all new roadways under the Lincoln Overpass, Straight Overpass and Proposed Actions. This will improve conditions for pedestrians as compared to the existing conditions and No Action Alternative.

Although difficult to predict, it is possible that on-peninsula collisions will increase due to the introduction of additional intersections under the Proposed Action, Straight Overpass and Lincoln Overpass alternatives. Proper design of the intersections and appropriate traffic control consistent with City of Tacoma standards will help minimize those potential increases.

Off the peninsula, the highest number of collisions occurs between intersections. The Proposed Action, Straight Overpass Alternative, Lincoln Overpass Alternative and No Action are not expected to alter traffic patterns off the peninsula; therefore, there should not be a significant increase in the type or rate of collisions. It could be expected to experience an increase in collisions consistent with the expected increase in traffic volumes from the alternatives. The proposed construction of a traffic signal at 54th Street East and I-5 NB ramps may result in a modest increase in rear-end collisions normally experienced at traffic signals.

4.2.3 Changes in Traffic Patterns

The repair of the Hylebos Bridge under each alternative will allow the permanent closure of Alexander Avenue north of SR 509 in accordance with the conditions of the previously approved street vacation. Under the No Action and Lincoln Overpass Alternatives, this closure will require traffic accessing the PCT to travel through the SR 509 and Taylor Way intersection and follow the route along Taylor Way, Lincoln Avenue, and Alexander Avenue. This will add approximately 3.15 miles to the trip. Under the Proposed Action and Straight Overpass Alternative, this closure will require traffic accessing the PCT to travel through the SR 509 and Taylor Way intersection and follow the route across the grade separation structure. There will be no significant change in distance over the existing route to the PCT.

Truck access for WUT will be unaffected by the project. The current access on POTR will remain in its existing configuration. Access for TOTE will be via Taylor Way north of East. 11th Street. Ingress for trucks for YTTI will be via Taylor Way between Lincoln Avenue and East. 11th Street. Egress for trucks and ingress and egress for autos will be via Lincoln Avenue and Taylor Way.

Access to other businesses on the peninsula will be maintained, although their current driveway locations may be modified. The Port of Tacoma will work with the affected businesses and the City of Tacoma during the final design and construction permit process to address any potential access issues.

4.2.4 Parking and Queuing

The Proposed Action, Straight Overpass, Lincoln Overpass Alternative and No Action alternatives include provisions on the terminal sites to handle parking for all new traffic and truck queuing needs. As a result of proposed improvements, there will be no expected parking or queuing impacts due to terminal operations. Some trucks which leave the terminal site may choose to park in the cities of Tacoma and Fife, similar to the type of truck parking which occurs under existing conditions in those cities. That parking is unrelated to terminal operations and beyond the control of the terminal operators or the Port of Tacoma.

4.2.5 Road and Rail Delays

Delays to rail operations under the No Action Alternative will be within acceptable levels with a delay ratio of expected train movement time to unimpeded time of 1.25. The normally acceptable delay ratio identified by the Port of Tacoma is 1.30. Delays to rail operations under the Lincoln Overpass, Straight Overpass and Proposed Actions will be slightly over acceptable levels with a delay ratio of expected train movement time to unimpeded time of 1.34. According to the Port of Tacoma, this delay ratio will not significantly impact rail operations in the Port (pers. comm., Port of Tacoma 2008) refer to Appendix.

Train blockages of roadways under the No Action alternative will be increased over current conditions. This will be due to an expected increase in rail traffic associated with the two new terminals Roadway blockages by trains under the Proposed Action and Straight Overpass Alternative could be considerable at the intersection of Lincoln Avenue and Taylor Way. However, the proposed road improvements will provide alternative routes to allow traffic to bypass the blockage. There would be no train blockages of roadways under the Lincoln Overpass Alternative, with the exception of occasional spur crossings expected in all alternatives.

The roadway improvements proposed as part of the Proposed Action are intended to mitigate the impacts of these blockages. The traffic modeling assumes that the Taylor Way/Lincoln Avenue crossing is blocked during the PM peak hour and analyzes impacts of traffic diverting around the crossing.

The proposed configuration of the Taylor Way grade separation under the Proposed Action and Straight Overpass Alternative will preclude vehicles from traveling directly from TOTE to PCT without crossing the tracks at Taylor Way/Lincoln Avenue. During those periods where trains are blocking the crossing, vehicles will need to travel off-peninsula and return back on the peninsula to make that movement. This is not expected to affect a significant number of vehicles, other than delivery vehicles visiting multiple terminals.

4.2.6 Consistency Analysis

Table 6 provides a consistency analysis for policies from the transportation elements of the Fife and Tacoma Comprehensive Plans. The Lincoln Overpass, Straight Overpass and Proposed Actions are consistent with all policies, with the exception of Fife Policy 2.3.1 on concurrency (all three alternatives

and the No Action alternative will result in three intersections that do not meet the City of Fife LOS standards.) The No Action Alternative is inconsistent with several policies because it fails to support local economic development and regional goods movement and resolve intermodal conflict since substantial road and rail improvements would not be undertaken.

Table 6: Consistency with Fife and Tacoma Comprehensive Plans

Policy #	Policy	Consistent?			
Tacoma Transportation Element (City of Tacoma 2004)		No Action	Lincoln Overpass	Straight Overpass	Proposed Action
T-LUT-4	Support Economic Base. Give high priority to those transportation facilities that provide the greatest opportunity to serve and support the existing economic bases and will aid the City in attracting new investments.	No	Yes	Yes	Yes
T-LUT-6	Concurrency. Ensure that the City's transportation network adequately serves the existing and projected land use developments. If adequate service levels are not maintained, pursue improvements to the transportation systems, mitigations of impacts, or modifications to the land use assumptions, where appropriate.	Yes	Yes	Yes	Yes
T-MS-3	Intermodal Conflict. Support programs, regulations, and design standards that separate at-grade crossing conflicts to increase safety and to increase the capacity and timeliness of both over-land and rail freight.	No	Yes	Yes	Yes
T-MS-6	Moving Freight. Maintain Tacoma as a primary hub for regional goods movement and as a gateway to national and overseas markets. Support the integrated development and operation of air, trucking, rail, and water terminal facilities to enhance the freight transportation system and strengthen the City's economic base.	No	Yes	Yes	Yes
Fife Transportation Element (City of Fife 2005)					
1.1.3	Work with the Union Pacific Railroad and others to ensure public safety at all rail crossings in the planning area, including grade separated rail crossing wherever possible.	N/A	Yes	Yes	Yes
2.3.1	Maintain a Concurrency Management System that provides a mechanism for assuring that transportation facilities are provided at the time of development or that such facilities will be provided within six years of the completion of development.	No	No	No	No
3.1.1	Work with WSDOT to promote the construction of appropriate highway improvements, including new highway construction to help relieve regional and local traffic congestion.	Yes	Yes	Yes	Yes

Indirect Effects

Increased vehicle traffic attributed to the action will impact some intersections outside of the study area. The project traffic traveling through those intersections is expected to result in a small percentage increase in traffic at those intersections. Since most project trips will access I-5, the project trips will decrease south of the freeway and are not expected to impact the level of service of those intersections.

4.3 Cumulative Effects

In order to determine cumulative impacts, the No Action, Straight Overpass, Lincoln Overpass, and Proposed Action analyses all consider, as background traffic, traffic volumes from the following known future developments:

4.3.1 The Point at Northshore

This proposed residential development in Northeast Tacoma includes a total of 864 residential units. The development is proposed to be located on the site of the current Northshore Golf Course. The project is anticipated to complete full build-out in 2012 and will contribute traffic to the study area intersections. Traffic volumes obtained from the traffic impact analysis for the project were inflated at 2 percent per year to year 2013 and included in this analysis.

4.3.2 Emerald Queen Casino Expansion

This casino expansion in Fife, located at the intersection of 59th Avenue East and SR 99, consists of construction of a parking structure (additional 1240 parking stalls) and improvements to the existing casino and hotel (235,300 square feet). All three phases of the project are anticipated to be complete by 2015 and will contribute traffic to the study area intersections. For purposes of the BHTR project, trips from full build-out were included in this analysis.

4.3.3 EB1 Terminal

This proposed terminal on the peninsula will contribute traffic to the study area intersections. Traffic volumes obtained from the EB1 traffic impact analysis for the project were inflated at 2 percent per year to 2013 and are included in this analysis.

This traffic analysis did not consider traffic volumes from a potential Stevedoring Services of America Terminal proposed for a Puyallup Tribe property on the peninsula. At the time of this traffic analysis, the potential traffic generation and trip distribution or the year of opening of the proposed terminal were unknown.

5.0 Mitigation

Mitigation is intended to address traffic impacts at intersections that fall below the level of service standard as a result of the proposed project. None of the intersections within the study area fall below the level of service standard or, for those intersections that are already below the level of service standard, the project related traffic impacts do not further reduce the level of service. Therefore, we have not identified any necessary mitigation measures beyond those already included as part of the Proposed Action.

Several roadway and rail improvements have been incorporated into the Proposed Action that mitigate potential impacts from the project. Some of these improvements have been identified in previous environmental processes involving other projects (including offsite improvements at the Taylor Way/SR 509 intersection and a new signal at 54th/I-5 NB ramps), but have not yet been built. Roadway and rail improvements proposed for the Proposed Action are as follows:

5.1 On-site Improvements

5.1.1 Taylor Way Overpass

This structure will provide a grade separation from the rail tracks serving the proposed rail yard. The roadway will consist of a minimum of three lanes on all approaches. Sidewalks will be constructed on one side of all approaches. The intersection of Taylor Way/Taylor Way Overpass will be controlled by an all-way stop.

5.1.2 Taylor Way Bypass

This new roadway will consist of three lanes of traffic and will have a sidewalk on the east side (opposite the proposed rail yard). The intersection of Lincoln Avenue/Taylor Way will be signalized.

5.1.3 Lincoln Avenue Connector/Taylor Way Intersection

This intersection would operate with several signals timed and coordinated to allow multiple movements at one time. During times when trains block the intersection, the new intersection configuration would allow the following movements: right-turns from eastbound Lincoln Avenue to southbound Taylor Way; left-turns from northbound Taylor Way to westbound Lincoln Avenue; right-turns from northbound Taylor Way Bypass to northbound Taylor Way; and, left-turns from southbound Taylor Way to eastbound (and ultimately southbound) Taylor Way Bypass. Appropriate signage would be provided to direct drivers from SR 509 to the most direct route when the intersection is blocked with a train.

5.1.4 Rail Improvements

The at-grade crossing at the intersection of Lincoln Avenue/Taylor Way will be signalized.

5.2 Off-site Improvements

5.2.1 SR 509 and Taylor Way Intersection Widening

Proposed improvements to the intersection include the addition of a left-turn lane from EB SR 509 to NB Taylor Way and a left-turn lane from WB SR 509 to SB 54th Avenue East. In addition, right turn pockets are proposed for the NB to EB movement and the EB to SB movement.

5.2.2 54th Avenue East and I-5 NB Ramp Signalization

A traffic signal is proposed at the intersection of 54th Avenue East and the I-5 NB ramps. Further analysis of the interaction between the proposed signal and the adjacent signals would need to be conducted during the signal design/permitting process in order to obtain support from WSDOT.

5.2.3 Other Potential Off-site Improvements

There may be strategies that could improve the LOS at the intersections that remain below the City of Fife LOS standard that could be implemented in the future. The Port of Tacoma will work with the City of Fife and WSDOT to identify potential improvements and cooperatively pursue funding. In addition to these potential improvements, the eventual construction of SR 167 should improve the LOS of all intersections along 54th Avenue East.

5.3 Mitigation to Alleviate Construction Impacts

The Port will work with the City of Tacoma during the permit process to identify and minimize road and rail impacts. Roadway closures or lane reductions will be approved by the City of Tacoma. Access interruptions to occupied parcels during construction will be coordinated with the affected businesses to minimize impacts.

5.4 Unavoidable Adverse Impacts

The intersections of 54th Ave E/4th St E, 54th Ave E/SR 99, Port of Tacoma Road/SR 99, Port of Tacoma Road/20th Street E, 70th Avenue E/SR 99, and 70th Avenue E/20th Street E are below the City of Fife standard of LOS D under the No Action, Lincoln Overpass, Straight Overpass and Proposed Actions. Even after implementation of the proposed mitigation, those intersections remain below the LOS standard, and will remain so until construction of SR 167 or other mitigation measures or both.

The intersection of Lincoln Avenue and Taylor Way will experience significant train delays. Although the proposed improvements will mitigate the impacts for the majority of traffic, a small number of motorists travelling between TOTE and PCT will experience delays or increased travel distance to avoid the train delays.

6.0 Benefits of the Project

The project will improve the intersection of Taylor Way and SR 509 as well as improving several roadways on the peninsula. The roadway improvements will include sidewalks, which will improve pedestrian access on the peninsula. In addition, the project proposes construction of a new traffic signal at 54th Avenue East and I-5 NB Ramps. The project will also construct several miles of new railroad tracks which will improve the ability to build and handle trains on the peninsula.

7.0 References

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Pierce County Assessor-Treasurer. http://www.co.pierce.wa.us/cfapps/atr/ePIP/search.cfm Accessed on 11/21/07.

Appendix A: Rail Study

Memorandum

PORT OF TACOMA
Planning and Regional Transportation

DATE: July 23, 2008

TO: Tony Warfield
cc: Brian Mannelly

FROM: Rob Collins

RE: Rail Simulation and Modeling in Support of EIS

Per your request, the following is a Memo that summarizes the results of the recent modeling and analysis effort undertaken by TranSystems, and can be used in support of the Port's Environmental Impact Statement for the Blair Hylebos Peninsula Terminal Redevelopment Program (BHPTRP). Note that the modeling effort summarized here, as with all rail modeling conducted by the Port, include not only intermodal (doublestack container) traffic, but auto and general cargo, or "industrial" traffic serving Port and non-Port industries on the Tideflats.

Rail Modeling

The Port of Tacoma has created a customized rail modeling application, the Transportation Modeling Studio (TMS) based on the Rockwell Software Arena® suite of simulation applications. The TMS includes the entire Tideflats rail network, including the BHPTR site. Note that actual intermodal working facilities, such as the North and South Intermodal yards are not "explicitly" modeled, i.e. they are not represented to the detail of each individual track. The TMS is intended to analyze how the entire network operates, as opposed to how an individual intermodal facility operates. Thus, this modeling effort did not analyze the operation of the proposed YTTI intermodal facility, but rather how that facility will integrate into the larger rail network and function as part of the network. The TMS runs a 10 day simulation of all rail traffic moving onto, around and off of the Tideflats. The simulation is based on an actual 10 day period of movements which were analyzed and recorded by Port staff and others; future forecast traffic is then added to that base data. This EIS modeling effort assumes that rail volumes will be as documented in the Port's Q3-2007 Long Range Cargo Forecast, which are the most current forecast currently available, and are consistent with the rail volumes assumed in the EIS .

The TMS is primarily a "policy" based tool in that it focuses more on whether a given rail network can accommodate different volumes of traffic adequately, as opposed to other application which focus on operations optimization.

Tacoma Rail, a Class III short line railroad that is a division of Tacoma Public Utilities performs all switching, movement, and positioning of rail cars, and disassembly and assembly of trains on

the Tideflats. Tacoma Rail receives and interchanges, or "hands off" trains from and to the BNSF Railway (BNSF) and Union Pacific Railroad (UP) at Bullfrog Junction. As with all On-Tideflats modeling conducted by the Port, the "boundary" for the model network is Bullfrog Junction. Bullfrog Junction is the connection point between the BNSF and UP mainlines, and the Tideflats rail network. Bullfrog Junction is located between Milwaukee Avenue and the Puyallup River directly beneath SR-509. Bullfrog Junction is not impacted by any at-grade crossings or vehicle traffic because of its isolated location.

The TMS model "creates" the rail traffic based on the traffic data files, and assumes that rail traffic "enters" the Tideflats rail network at the Bullfrog Junction area; rail traffic essentially "disappears" as it passes through the Junction on its way off the Tideflats. The model does not represent the main line rail system, so, no operational conclusions can be made about level of delay or congestion outside the Tideflats rail network.

Currently between 10 and 12 intermodal and/or auto trains arrive or depart the Tideflats complex through Bullfrog Junction a day. These trains range from 7,000 to 8,000 feet in length. Another five to six industrial cargo trains arrive or depart the complex; these trains however are typically much shorter than the intermodal and auto trains.

If for some reason one of the trains isn't present at the scheduled time for interchanges between Tacoma Rail and BNSF or UP, trains may sit idle awaiting locomotives and/or crews to arrive. This may create congestion if another train is blocked from making a movement through the area. This congestion could conceivably affect any type of train moving in either direction depending on the time of day and that day's train movement schedule.

BHTRP Project Impacts

The Port provided TranSystems with two track alternatives: 1) Proposed Action; 2) No Action. The Port also provided forecasts of volumes for the assumed first year of full operation, 2013 using the same assumptions and conversion factors used as part of the data for the BHPTRP EIS traffic study. All other components of the proposed Tideflats rail system were assumed to be identical to the 2013 rail configuration used for the December 2007 On-Tideflats modeling work done as part of the OTIS-M project.

The measurement generally used by the Port to gauge the effectiveness of infrastructure and operations is *delay ratio*. Delay ratio compares the total time all trains take to complete their assigned moves, including delays caused by movement conflicts and other congestion-related delays throughout the 10-day modeled period, to the total time all trains would take to complete their moves if there was no congestion at all on the network. The Port uses a figure of 1.30 as the upper end of acceptable delay ratio for operations on the Tideflats rail network.

Proposed Action

This alternative assumes a TEU forecast of 1,400,000 per year from the new YTTI terminal, resulting in 535,518 intermodal lifts. Based on this volume, assumptions regarding train length, slot utilization (the number of potential container "spaces"

available on a full-length train) and ratio of mixed to pure trains (mixed trains carry containers for multiple terminals, while pure trains carry containers for only one terminal destination) this will result in an average 18 trains per week arriving to the terminal, and 18 trains per week departing from the terminal, or between two and three trains per day each way, arriving and departing.Modeling results show that in year 2013 the Tideflats rail network including rail traffic from the Proposed Action will operate at a delay ratio of 1.34, which is slightly above the upper end of acceptable delay.

However, the ability to mitigate this slightly elevated congestion level will be highly likely by optimizing "return to staging" and "spot" movements. Return to staging movements are when rail cars that have been loaded in the terminal intermodal facility are taken to support rail yards in advance of being assembled into full departing trains. Spot movements are when rail cars are taken from support rail yards to the terminal intermodal facility to either be loaded with, or stripped of containers. This is typical of what Tacoma Rail does on an ongoing basis to maintain fluid and high velocity operations within the Tideflats rail network. So, the Port does not see this slight excess estimated by the model as cause for concern or a significant impact from the BHTRP project. It is very likely that the Tideflats rail network will operate acceptably with the Proposed Action in place.

Lincoln Overpass Alternative

A third option, the Lincoln Overpass Alternative was not included in the modeling effort as it is similar to the Proposed Action as far as the proposed rail network is concerned and thus would operate similarly for rail traffic.

Straight Overpass Alternative

A fourth option, the Straight Overpass Alternative was not included in the modeling effort as it is similar to the Proposed Action as far as the proposed rail network is concerned and thus would operate similarly for rail traffic.

No-Action Alternative

The No-Action Alternative assumes three terminals served by the existing rail line on the Blair-Hylebos peninsula: TOTE terminal reconfigured, a new 45 AC container terminal and a new 50 AC Auto/Breakbulk terminal. This alternative assumes a TEU forecast of 300,000 per year for the container terminal, and 78,000 auto units or 160,000 tons of break bulk per year. General cargo coming to the Auto/Breakbulk terminal and bound for rail will generate insignificant volumes of traffic. TOTE also generates little to no rail traffic. Total traffic will amount to about one full train departing from and one full train arriving onto the Blair-Hylebos peninsula per day.

Given the significantly lower volume of rail traffic generated from the two assumed terminals, even though the facilities are served by a single track, train movements will be spaced out enough that movements would not conflict with each other. Thus rail traffic on the peninsula will not be congested.

Overall, modeling results show that in hear 2013 the Tideflats rail network including the No-Action Alternative design will operate at a 1.25 delay ratio, well below the Port's generally accepted threshold. The Tideflats rail network will operate acceptably with this Alternative in place.

It is not possible to predict if, when or what level of congestion could occur at Bullfrog Junction or other off-Tideflats area from increased rail traffic from the proposed BHRTP project. As the volume of traffic moving onto and off of the Tideflats increases over time, it can be statistically assumed that the potential for congestion would also increase. However, more rigorous adherence to scheduled operations by BNSF and UP will minimize that possibility. It is not expected that potential congestion increases from the project will be significant.

Appendix I-2: Supporting Transportation Data

TABLE I-1
Collision Summary (2011-2013)

		Total Number of Collisions			Number of Injury Collisions		
		2011	**2012**	**2013**	**2011**	**2012**	**2013**
Intersection Collisions							
1	Port of Tacoma Road/North Frontage Road	2	2	1	1	1	0
2	Port of Tacoma Road/12th Street	1	2	2	1	1	0
3	Port of Tacoma Road/Pacific Highway East	13	6	12	6	1	4
4	Port of Tacoma Road/I-5 Southbound	9	9	3	5	2	0
5	Port of Tacoma Road/I-5 Northbound	2	2	2	1	0	1
6	Port of Tacoma Road/20th Street	4	3	1	0	0	0
7	Alexander Avenue East/North Frontage Road	3	6	5	1	2	0
8	Alexander Avenue East/South Frontage Road	6	19	8	4	11	2
9	Taylor Way/East 11th Street	0	0	0	0	0	0
10	Taylor Way/Lincoln Avenue	0	0	1	0	0	0
11	Taylor Way/SR-509	8	4	2	2	2	0
12	54th Avenue East/4th Street	0	0	0	0	0	0
13	54th Avenue East/8th Street	1	0	1	1	0	0
14	54th Avenue East/12th Street	3	4	2	1	2	1
15	54th Avenue East/Pacific Highway East	20	19	18	8	6	7
16	54th Avenue East/I-5 Southbound	11	10	10	1	5	5
17	54th Avenue East/I-5 Northbound	17	16	11	4	1	3
18	54th Avenue East/20th Street	10	16	11	3	4	1
19	Marine View Drive/Norpoint Way NE	1	0	1	0	0	0
20	70th Avenue East/Pacific Highway East	0	0	0	0	0	0
21	70th Avenue East/20th Street East	5	5	1	4	2	0
22	70th Ave E/Valley Ave E	4	0	3	3	0	1
Nonintersection Collisions							
	Taylor Way	3	2	3	2	1	0
	54th Avenue E	14	17	26	5	6	7
	Port of Tacoma Road	1	7	5	1	3	1
	Alexander Avenue E	2	2	3	0	1	0
	70th Avenue E	10	4	8	5	2	4

Sources:

Washington State Department of Transportation. 2011. 2011 Annual Traffic Report. http://www.wsdot.wa.gov/mapsdata/travel/pdf/Annual_Traffic_Report_2011.pdf.

David Evans and Associates, Inc. 2009. *Transportation Discipline Report—Blair-Hylebos Peninsula Terminal Redevelopment Project*. February.

TABLE I-2

Hylebos Waterway (Tacoma) Deep-Draft Vessel Arrivals (2010-2014)

Month	2010	2011	2012	2013	2014	AVERAGE Number of Arrivals
JAN	2	3	7	3	3	3.6
FEB	5	6	3	6	5	5
MAR	2	8	2	4	2	3.6
APR	7	6	5	1	4	4.6
MAY	5	6	5	6	3	5
JUN	5	5	3	2	3	3.6
JUL	6	7	4	2	NA	4.8
AUG	8	7	6	4	NA	6.3
SEP	2	3	3	2	NA	2.5
OCT	6	5	3	2	NA	4
NOV	5	3	3	3	NA	3.5
DEC	4	4	4	4	NA	4
TOTAL	57	63	48	39	20	
AVERAGE	4.8	5.3	4	3.3	3.3	4.1

*Does not include barges, tugs, fishing vessels, or pleasure craft.

NA = not available

Source: Personal communication with Neil Caldwell/Marine Exchange of Puget Sound. August 11, 2014.

TABLE I-3

Blair Waterway (Tacoma) Deep Draft Vessel Arrivals (2014)

Month	2014
JAN	52
FEB	56
MAR	76
APR	61
MAY	57
JUN	73
JUL	54
AUG	63
SEP	75
OCT	64
NOV	56
DEC	66
TOTAL	**753**
AVERAGE	**62.8**

*Does not include barges, tugs, fishing vessels, or pleasure craft.

Source: Personal communication with Tony Warfield/Port of Tacoma, regarding *Berthing Report by Date Range Arrival Dates: 01/01/14 – 02/01/15*. February 10, 2015.

TABLE I-4

Hylebos Waterway (Tacoma) Barge and Tug Traffic (2014)

Month	Barge	Tug	Total
JAN	36	41	77
FEB	17	22	39
MAR	20	21	41
APR	22	25	47
MAY	27	32	59
JUN	29	32	61
JUL	26	26	52
AUG	27	30	57
SEP	33	34	67
OCT	22	24	46
NOV	31	32	63
DEC	32	48	80
TOTAL	**322**	**367**	**689**
AVERAGE	**26.8**	**30.6**	**57.4**

Source: Personal communication with Chris Wolf/Foss Maritime. January 12, 2015.

TABLE I-5

Blair Waterway (Tacoma) Barge and Tug Traffic (2014)

Month	Barge	Tug	Total
JAN	35	35	70
FEB	32	34	66
MAR	35	36	71
APR	32	32	64
MAY	43	43	86
JUN	35	36	71
JUL	36	36	72
AUG	32	33	65
SEP	37	37	74
OCT	34	34	68
NOV	30	30	60
DEC	29	29	58
TOTAL	**410**	**415**	**825**
AVERAGE	**34.2**	**34.6**	**68.8**

Source: Personal communication with Chris Wolf/Foss Maritime. January 12, 2015.

Appendix J-1: ECONorthwest Economic Impact Analysis

Economic Impact Analysis of a Natural Gas Fuels Facility in Tacoma

October 30, 2014

Prepared for:

Puget Sound Energy

ECONorthwest
ECONOMICS • FINANCE • PLANNING

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ECONorthwest specializes in economics, planning, and finance. Founded in 1974, we're one of the oldest independent economic consulting firms in the Pacific Northwest. ECONorthwest has extensive experience applying rigorous analytical methods to examine the benefits, costs, and other economic effects of environmental and natural resource topics for a diverse array of public and private clients throughout the United States and across the globe.

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1 Introduction and Background

PUGET SOUND ENERGY

Headquartered in Bellevue, Washington, Puget Sound Energy serves over 1 million electricity customers and over 760,000 natural gas customers in 11 counties in northwest Washington. A subsidiary of Puget Energy, PSE is the state's oldest local energy company.

Puget Sound Energy's 2,800 employees are dedicated to providing high quality customer service and delivering safe, dependable and efficient energy.

Summary of Economic Impacts

Construction (annual average):

Output: $71.1 million

Labor Income: $27.5 million

Jobs: 401

Operations (annual):

Output: $78.9 million

Labor Income: $9.8 million

Jobs: 130

Puget Sound Energy (PSE) is an electric and natural gas utility serving a 6,000 square-mile area, primarily in the Puget Sound region of Washington State. In 2012, PSE delivered 112,934,400 dekatherms (Dth)[1] of energy to its natural gas customers. PSE is regulated by the Washington Utilities and Transportation Commission, which is charged with ensuring that utility services are fairly priced, available, reliable, and safe.[2]

PSE engaged ECONorthwest to estimate the economic impacts of building and operating a liquefied natural gas (LNG) storage plant at the Port of Tacoma. Like many such storage plants around the county, PSE's plant would provide standby supply reducing natural gas costs for its utility customers. In addition to serving utility customers, PSE's plant will also produce natural gas fuel for marine and truck transportation, which will cost less and pollute less than traditional fuel. The plant will also have vaporization capacity to inject natural gas back into the utility distribution system.

The plant will use a mixed refrigerant LNG cycle and have a liquefaction capacity of 250,000 gallons a day. ECONorthwest estimates annual LNG production of approximately 87 million gallons. Total LNG tank storage capacity is 8 million gallons. LNG will leave the facility by:

- Truck tanker via onsite truck loading racks;
- Marine bunker barge or vessel, which will be loaded over the pier facilities;
- Through a pipeline that delivers LNG directly to a Port of Tacoma marine customer;
- Through a pipeline as vaporized natural gas to support the Tacoma gas distribution system.

This study measures the impacts of construction from 2012 to 2018 and for an operating year at full production. ECONorthwest used an economic impact model for the Puget Sound Region based on the local spending patterns of businesses and workers. The model mathematically traces such spending as it flows through the local economy and measures the effects on other businesses and households. ECONorthwest also measured the social value to the region from reduced air emissions. Using LNG as a fuel is less detrimental to air quality than burning diesel or marine fuel oil.

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[1] A dekatherm is ten therms or one million Btus. A Btu is a unit of measure for the heat content of a fuel and stands for British thermal unit.

[2] Washington Utilities and Transportation Commission website accessed March 15, 2013 at http://www.utc.wa.gov/aboutUs/Pages/overview.aspx

About Natural Gas Storage

Natural gas demand fluctuates predictably by the time of day and day of the week, and in less predictable ways, such as during cold weather snaps when heating demand surges. As a utility, PSE is obligated to meet peak demand. They do this by purchasing extra capacity on large interstate pipelines. However, this capacity is expensive, and prohibitively so if it is used infrequently to meet peak demand.

Puget Sound Energy will design the plant to cost-effectively meet the region's peak energy demand, and at the same time, produce low-cost, low-emissions transportation fuel.

The project will create economic, environmental and social benefits for the Puget Sound and beyond.

Developing the capacity to store natural gas is an alternative method of assuring reliable supply. Utilities buy natural gas when supplies are abundant and prices are low, store it locally, and then release it back into their delivery system when demand peaks. This reduces the utility's cost for purchasing gas from their suppliers, as well as the cost of transporting the gas to their system, and these savings are passed on to consumers.

PSE's Current Storage Methods

PSE currently uses two methods to store natural gas: underground reservoirs and peak shaving plants. Between the two, underground storage offers the highest capacity and lowest cost. The utility pumps natural gas into underground reservoirs, often in the summer when demand and prices for heating fuel are low, and withdraws it when demand is high. This method works well for addressing seasonal demand swings on the interstate pipeline system, but it can only be used in places with suitable geologic formations. PSE owns underground storage capacity at Jackson Prairie (Southwestern Washington) and contracts for capacity at Clay Basin (Utah).

To meet short-notice demand (on the order of several days, often due to cold weather events), utilities use LNG peak shaving plants that convert natural gas to its liquid form. Some plants use propane. The plants store the fuel on-site. When consumer demand peaks, plant operators convert the LNG or propane back into gas and add it to the distribution system. Utilities operate more than a hundred such plants in the United States, which are typically located in cities and towns close to their customers.

PSE operates one LNG peak shaving plant, in Gig Harbor. PSE uses this plant as standby supply for its local natural gas customers.

PSE has an inactive propane peak shaving plant in Renton, Washington. When operating, it also acts as a back-up supply for local utility customers.

About Liquefied Natural Gas

LNG is pipeline gas that has been cooled to -160° C or below, the temperature at which it transforms to its liquid state. Liquefying the gas reduces its volume by about 600-fold (one gallon of LNG contains over 80 cubic feet of natural gas), allowing it to be stored more affordably. When local demand rises, the utility can vaporize the LNG and add it to the customer distribution system.

Pipeline natural gas consists of 95 to 99 percent methane and one to five percent other compounds. As the temperature drops during the liquefaction process, the constituent compounds begin to liquefy or solidify. Solid compounds, such as water and carbon dioxide, are removed, along with sulfur and other harmful trace compounds. Hydrocarbons heavier than methane, such as propane, may be left in the LNG.

LNG as a Transportation Fuel

Recent developments in natural gas production technology have resulted in large reserves and lower prices. Because of this, LNG has become a more affordable transportation fuel and is expected to remain price-competitive with liquid fuels such as gasoline, diesel, and ethanol for the foreseeable future.

Like most industrial plants, larger-capacity peak shaving plants have lower unit production costs, so building a large peak shaving facility will allow PSE to reduce its unit costs for its customers. However, the utility only needs 6.3 million gallons of LNG for the winter season requiring 23,000 gallons per day of liquefaction over the non-winter months. In contrast, the planned liquefaction capacity for the transportation fuels market is greater by an order of magnitude.

By including capacity for transportation fuel customers, PSE is increasing economies of scale and reducing the unit cost for utility customers. By doing so, PSE could lower utility customers' costs even further. ECONorthwest estimates that the uniform equivalent cost savings for ratepayers is $3.0 million annually over the first 25 years of operations. That is the savings versus the higher cost of securing interstate pipeline capacity. The lower unit cost of the plant, resulting from increased plant capacity, would improve the price-competitiveness of LNG compared to other fuels.

As a fuel, LNG has a similar energy density (77,000 Btus per gallon) compared to ethanol (76,000 Btus per gallon), but less than more common transportation fuels.[3] Diesel fuel contains about 139,000 Btus per gallon. This means a truck using a gallon of LNG would get about 64 percent of the fuel mileage it would get using a gallon of diesel. Table 1 shows the approximate energy densities of common transportation fuels.

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[3] LNG energy density estimate (lower heating value) provided by Chicago Bridge & Iron.

Table 1: Energy Content of LNG and Other Transportation Fuels

Fuel	Btus per Gallon
Ethanol	76,000
LNG	77,000
Propane	92,500
Biodiesel	120,000
Gasoline	125,000
Diesel	139,000
Marine HFO	149,700

Although LNG is less energy-dense, it has three advantages over other transportation fuels: it is relatively cheap, abundant in the U.S., and cleaner than petroleum-based fuels. At current market prices, a million Btus of crude oil costs $12.89, compared to $3.62 for natural gas.[4] Refining and liquefaction add additional costs to providing usable fuel for consumers.

PSE's planned facility will sell LNG as a replacement for marine heavy fuel oil (HFO) used in large marine vessels. HFO is also known as bunker or residual fuel. The company will also sell LNG as a replacement for truck and marine diesel.

While there is an emerging market for LNG for these purposes, it is still relatively small and its growth limited by high equipment costs. Over time, however, more companies will shift to LNG for the long-term benefits of lower fuel costs and the security of having a stable and abundant supply. Also, tougher environmental regulations will accelerate the adoption of LNG as companies look for cost-effective alternatives to more polluting diesel and HFO.

According to PSE's estimate their plant will produce 15.7 million gallons of LNG, which will replace 8.7 million gallons of common diesel fuel. Another 65.0 million gallons of LNG will replace 33.4 million gallons of marine HFO (Table 2).

Table 2: LNG Facility Annual Production

Annual LNG Production	Gallons of LNG	Dekatherms	Gallons of Petroleum Products Replaced
Peak shaving	6,300,000	485,100	none
Diesel fuel replacement	15,700,000	1,208,900	8,697,122
HFO marine fuel replacement	65,000,000	5,005,000	33,433,534
Total Annual Production	87,000,000	6,699,000	-

[4] Bloomberg, prices on October 24, 2014, WTI crude at $81.01 a Bbl and NYMEX natural gas at $3.62.

Marine Heavy Fuel Oil

ECONorthwest estimates that by using the facility's LNG instead of heavy fuel oil, marine shippers will spend about 27 percent less per Btu.

New regulations limiting emissions for marine vessels may hasten the transition from petroleum fuel to LNG. The United States, under federal regulation 40 CFR 1043, sets forth fuel sulfur limits for Emission Control Areas (ECAs). By 2015, marine vessels must use fuel with a maximum sulfur content of 0.1 percent in North American ECAs and by 2020 globally. The International Maritime Organization estimates that heavy fuel oil contains about 2.7 percent sulfur.[5] LNG has virtually no sulfur. Puget Sound is part of an ECA that extends 200 miles offshore along the entire West Coast of the US and Canada as well as much of Alaska.

Diesel Fuel

LNG is less costly than truck diesel—about 28 percent less per Btu, according to ECONorthwest's analysis—and it is less polluting.

Federal regulation 40 CFR 80 required the on-road trucking industry to phase in ultra-low-sulfur diesel (0.0015 percent sulfur) between 2006 and 2010. The EPA is still phasing in regulations for low-sulfur diesel some marine and port purposes. This creates an incentive to switch to LNG.

Environmental and Health Benefits

Emissions from burning fuels have environmental and health impacts. This section describes the impacts associated with carbon dioxide (CO_2,) nitrogen oxides (NOx), sulfur (SOx), and particulate (PM_{10}) emissions both generally and in the context of Pierce County and PSE's market area.

General Environmental Impacts of Emissions

Researchers have linked emissions to a number of negative environmental impacts, all of which are mitigated by reducing emissions:

- Climate change from greenhouse gasses, specifically CO_2;
- Increased ground-level ozone and smog from NOx and CO_2;
- Acidification of lakes and streams from the reaction of SO_2 and NOx emissions;
- Acid rain damage to forest ecosystems;
- Degraded coastal water quality from nitrogen deposits;
- Higher particulate levels from SOx and NOx emissions; and

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5 International Maritime Organization, 2009, Second IMO GHG Study, accessed March 20, 2013 at http://www.imo.org/blast/blastDataHelper.asp?data_id=27795&filename=GHGStudyFINAL.pdf.

- Haze and impaired visibility from particulate matter.[6]

By reducing emissions across the board, LNG can limit the harmful impacts described above. The precise value of the emissions reduction from LNG depends on several factors, including how customers use LNG, where the fuel is used, engine type, operating conditions, and what fuel it replaces.

Emissions Impacts in a Regional Context

In 2009, the Environmental Protection Agency (EPA) designated the Wapato Hills-Puyallup River Valley area as a Nonattainment Area for fine particulate matter ($PM_{2.5}$). This area is also known as the Tacoma-Pierce County Nonattainment Area. Since that time, the area has attained the EPA's standards, but the Washington State Department of Ecology must submit a maintenance plan to the EPA for how it will ensure ongoing compliance.

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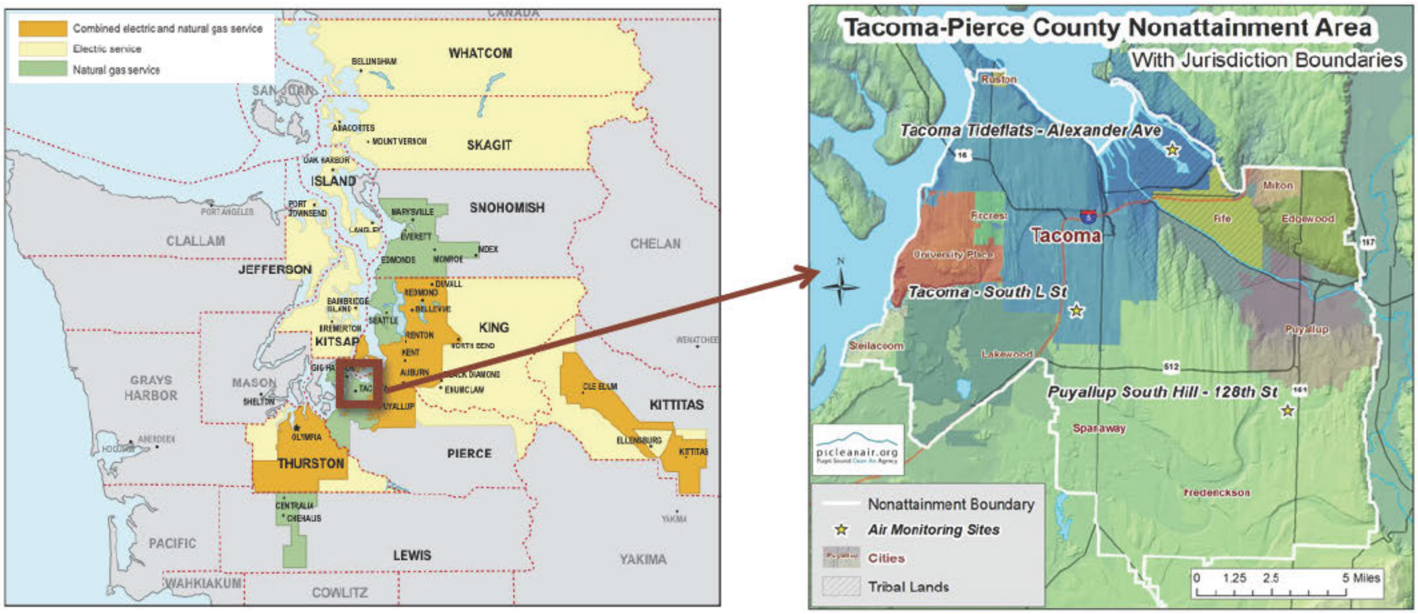
6 ASME, 2009, ASME General Position Statement on Technology and Policy Recommendations and Goals for Reducing Carbon Dioxide Emissions in the Energy Sector, accessed March 27, 2013 at http://files.asme.org/asmeorg/NewsPublicPolicy/GovRelations/PositionStatements/17971.pdf; U.S. Environmental Protection Agency, Human Health and Environmental Effects of Emissions from Power Generation, accessed March 27, 2013 at http://www.epa.gov/captrade/documents/power.pdf.

Figure 1: Puget Sound Energy Service Area and the Tacoma-Pierce County Non-Attainment Area



(Source: PSE and the Washington State Department of Ecology)

Fine particulate pollution is highest in the winter months, when households burn wood for heating and the fine particles are trapped close to the ground by weather conditions. Based on monitoring between 2000 and 2010, about half of Pierce County's fall and wintertime fine particulates come from wood smoke, 20 percent comes from gasoline vehicles, five percent comes from diesel vehicles, and another four percent comes from ships[7].

In 2011, the Tacoma-Pierce County Clean Air Task Force made a set of recommendations to the Department of Ecology for reducing fine particulate matter in the area. The first two recommendations are for enhanced enforcement of air quality burn bans, and requiring the removal of uncertified wood stoves and inserts.

The Task Force recommends continued implementation of rules and support for programs and initiatives that target pollution reductions from transportation and industrial sources. Approximately one-quarter to one-third of the emission reductions needed will be accomplished from new federal regulations and local initiatives for more efficient engines, cleaner fuels, and improved industrial practices.[8]

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[7] Tacoma-Pierce County Clean Air Task Force. Report and Recommendations to Puget Sound Clean Air Agency. December 2011.
http://www.cleanairpiercecounty.org/taskforce/CleanAirTaskForceReport_FullReport.pdf

[8] Better Air in Tacoma and Pierce County: Recommendation of the Clean Air Task Force.
http://www.cleanairpiercecounty.org/taskforce/CleanAirTaskForceReport_RecOverview.pdf

Based on the emissions goals for the nonattainment area, the Clean Air Task Force estimates that reductions from gas, diesel, ship and industrial sources will make up 50 percent of the total reductions in emissions by 2014. The absolute amount of reductions in these sources will grow slightly by 2019, although their share of the total reductions will fall to about 27 percent as other recommendations are fully enacted.

The Tacoma-Pierce County Nonattainment Area falls in an area where Puget Sound Energy provides natural gas service, and because natural gas generates almost no particulate matter when it burns, PSE is poised to be a key player in maintaining the area's attainment status. PSE's plan to create a market for LNG transportation fuel is well aligned with the Task Force's call for cleaner fuels (Figure 1).

ECONorthwest calculated the changes in emissions from the transportation sector if shipping companies use the facility's LNG instead of heavy fuel oil and diesel (Table 3). We assume the plant will sell all its annual LNG production, other than the 6.3 million gallons needed for peak shaving. The first year in which PSE achieves such a sales level would depend on market conditions and how quickly shipping companies adopt the fuel. Actual emissions can vary widely depending on the specific types of engines used, operating conditions, and composition of fuel.

Table 3: Annual Emissions from Use of LNG as a Replacement for Diesel and Marine HFO, Metric Tonnes at Full Operations

		Air Emissions in Metric Tonnes per Year			
Source Added or (Removed)	Decatherms	CO2	SO2	Nitrogen Oxides	Particulates
LNG as a fuel	6,213,900	329,683	-	544	21
(Diesel replaced)	(1,208,900)	(88,248)	(1)	(79)	(8)
(Marine HFO replaced)	(5,005,000)	(394,295)	(235)	(713)	(146)
Net Change	-	(152,860)	(236)	(248)	(133)

The analysis shows that the LNG sold as fuel by PSE would reduce annual CO_2 emissions by 152,860 metric tonnes per year. Sulfur dioxide emissions would decrease by 236 metric tonnes, even assuming that LNG would displace only ultra-low-sulfur diesel and low-sulfur marine fuel. Reflecting the comparatively low carbon content of LNG, replacing diesel and HFO with LNG lowers particulates by 133 metric tonnes a year.

Substituting LNG for diesel and marine fuels will reduce emissions. Because trucks and vessels powered by LNG may travel outside the region, we do not have sufficient information to estimate the local and non-local shares of emissions reductions. Regardless, reduced emissions do result in lower social costs overall.

Economists use the "social cost of carbon" to estimate the value of changes in greenhouse gas emissions. The social cost of carbon represents "the full global cost today of emitting an incremental unit of carbon at some point of time in the future, and it includes the sum of the global cost of the damage it imposes on the entire time it is in the atmosphere."[9] There are currently over 200 different estimates of the social cost of carbon. One review of the literature found values ranging from about $7 to $60 per metric tonne of carbon.[10]

For our analysis, we apply a middle value of $42 per metric tonne of carbon (about $11.45 cents per tonne of CO_2) to estimate the social cost of emissions. Studies on the annual value of pollutant removal for PM_{10}, SO_2, and NOx also vary widely. For purposes of estimating the social benefits of emissions reductions at the Port of Tacoma and its environs, ECONorthwest used mid-point values developed for the City of Portland by Entrix.[11] The values per tonne of annual emissions are $6,593 for PM_{10}; $5,982 for SO_2; and $6,957 for NOx.

Based on the costs associated with these pollutants and the expected amount of reduction, ECONorthwest estimated the annual value of emissions reductions at approximately $5.8 million, as shown in Table 4.

Table 4: Annual Quantity and Value of Emissions Reductions from Use of LNG as a Replacement for Diesel and Marine HFO

Pollutant	Annual Value per Metric Tonne	Reduction from Using LNG, Tonnes	Change in Social Cost
CO2	$11.45	(152,904)	($1,750,746)
SO2	$5,982	(236)	($1,410,683)
Nox	$6,957	(248)	($1,724,365)
Particulates	$6,593	(133)	($874,363)
Total			($5,760,157)

9 Shaw, M., L. Pendleton, et al. 2009. The Impact of Climate Change on California's Ecosystem Services. California Climate Change Center. CEC-500-2009-025-F.

10 Shaw, R. et al, 2009. The Impact of Climate Change on California's Ecosystem Services. August.

11 Entrix. 2010. "WHI Environmental Foundation Study." City of Portland Bureau of Planning and Sustainability. Portland, Oregon. July.

2 Economic Impacts

Upstream and Downstream Economic Impacts

This analysis distinguishes between direct, upstream, and downstream impacts. In this case, the terms refer to the economic relationships between the PSE LNG plant and the regional economy. Activities at the plant itself, including its construction and production, count as direct impacts. Using an input-output model, we can then follow the subsequent impacts going upstream and downstream. Figure 2 summarizes the types of impacts included in this analysis.

Economic Impacts

ECONorthwest estimates that the plant will create the following economic impacts:

Construction
(annual average over 7 years):

Output: $71.1 million

Labor Income: $27.5 million

Jobs: 401

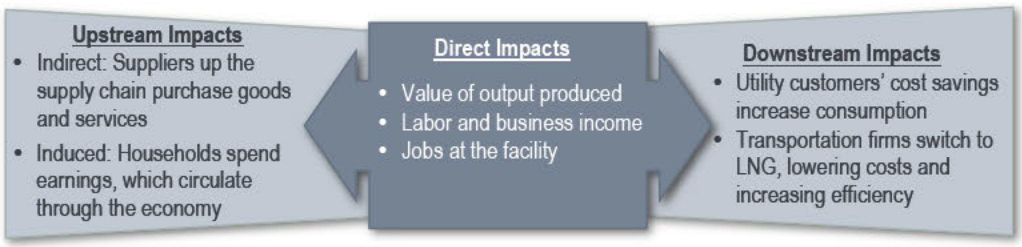
Annual Operations

Output: $78.9 million

Labor Income: $9.8 million

Jobs: 130

Figure 2: Types of Economic Impacts for Storage and Fuel Plant



Most commonly, economists follow the upstream impacts, which result from the plant's spending on all the goods and services it buys locally and on the payroll for its workers. Impacts continue moving upstream as suppliers and employee households spend money, triggering more spending and employment in the local economy.

LNG production at the facility could have many types of downstream impacts, and we consider two in this analysis. First, we estimate the economic impacts of the savings that accrue to local utility customers who will pay lower rates. These customers will spend their savings in other ways, causing a ripple effect of spending in the economy.

Second, we consider community-wide downstream impacts resulting from increased efficiency and reduced emissions. For example, the LNG produced by the facility will reduce natural gas utility bills throughout the region because it lowers natural gas supply costs. Sold as a transportation fuel, LNG is less expensive than marine HFO and diesel. These savings allow the local economy produce more with less, resulting in higher economic activity. Furthermore, lower CO_2 emissions lead to lower social costs, which is another downstream impact.

Economic impacts measure relationships between industry sectors, households and communities. While it may be tempting to sum the upstream, downstream, and direct impacts, and call it the "total impact", such an assertion would overstate the impacts and be misleading. Impacts are not necessarily additive; rather, they individually describe the relationships between economic activities.

Upstream Impacts

ECONorthwest used an input-output modeling software program called IMPLAN® to estimate the direct, indirect and induced impacts of the proposed peak shaving facility on the Puget Sound economy, including King, Snohomish, Pierce, Thurston, Kitsap, Mason, Skagit, and Island Counties.

Economic impacts are classified by their relationship to the activity in question. For this analysis, the three types of impacts are defined, with regard to the plant, as follows:

- **Direct impacts** of the plant include its production, the wages and benefits it pays, and the people it employs.
- **Indirect impacts** come from spending between businesses. They start with the plant's purchases from its suppliers and propagate throughout the economy *via* subsequent business-to-business spending.
- **Induced impacts,** also known as "consumption-driven" impacts, occur first when plant employees' households spend their earnings. The impacts continue to accrue as other households, whose incomes also rise, spend more money locally.

For this analysis, we measure and describe impacts in three ways:

- **Output** is the value of the plant's annual production. In measuring the economic impacts of construction, output is the cost of the construction project, including engineering, equipment purchases, and various fees. Business revenues are counted as indirect and induced output for other sectors. For retail and wholesale businesses, output is the value of sales minus their cost of goods sold.
- **Labor Income** equals employee payroll costs, including wages, benefits and employer-paid payroll taxes, plus the earnings of any self-employed persons.
- **Jobs** are the number full-year-equivalent jobs. IMPLAN uses the official definition of a job from the U.S. Bureau of Labor Statistics, which counts one job as 12 months of work, including payroll jobs, self-employment or farm work. For example, two jobs that each last six months count as one job in IMPLAN. A job is counted based on the number of months of employment, and not the number of hours worked; a job can be full or part time.

Upstream Construction Impacts

PSE provided estimates of the capital costs for building the facility. Construction costs include upgrades to PSE's existing distribution system and laying new pipe.[12] These estimates formed the basis of the construction impacts analysis.

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[12] Email from Mr. Charles Daitch of Puget Sound Energy to ECONorthwest. August 18, 2014.

PSE estimates that the entire cost of the plant, from pre-development through opening, will amount to $325 million. Pre-development activities, such as planning and engineering, began in 2012. On-site construction will take place from 2015 to 2018, and total expenditures over that four-year period will be $315 million.

Over the entire course of the contraction project (2012 through 2016), PSE expects to incur about $19.9 million in financing costs. According to convention in the field of economics, these are excluded from the economic impact analysis.

Table 5 shows the upstream impacts for the on-site construction phase (2014 through 2016.)

Table 5: Upstream Construction Impacts (2012 dollars)

Impact Measure	Type	2012	2013	2014	2015	2016	2017	2018	Average
Output	Direct	$1,327,115	$2,112,396	$6,808,185	$29,443,160	$86,183,760	$135,587,298	$50,498,510	$44,565,775
	Indirect	568,744	778,918	2,643,887	13,597,166	40,001,655	64,235,795	21,816,286	20,520,350
	Induced	250,858	386,011	1,370,565	4,316,331	11,467,736	18,067,325	6,515,385	6,053,459
	Total	$2,146,717	$3,277,325	$10,822,637	$47,356,657	$137,653,151	$217,890,418	$78,830,181	$71,139,584
Labor Income	Direct	$391,552	$748,545	$2,098,656	$8,957,352	$27,189,737	$41,683,220	$17,686,040	$14,107,872
	Indirect	207,218	283,116	962,833	4,887,062	14,341,864	23,019,485	7,830,151	7,361,676
	Induced	196,304	341,826	1,061,504	3,982,265	11,503,468	17,809,636	7,144,771	6,005,682
	Total	$795,073	$1,373,487	$4,122,992	$17,826,679	$53,035,068	$82,512,341	$32,660,962	$27,475,229
Jobs	Direct	4	7	21	101	309	481	192	159
	Indirect	3	5	16	78	229	368	125	118
	Induced	4	7	22	82	237	367	147	124
	Total	11	19	59	262	775	1,216	464	401

From 2014 to 2016, the project will produce an average of $71.1 million per year in direct output. It will also generate an average of $26.6 million in indirect and induced output each year. Total output will amount to an average of $71.1 million each year.

During construction, the project will support an average of 159 direct construction jobs per year, and another 118 indirect and 124 induced jobs, for an average of 401 total jobs per year.

Labor income paid to the project's workers will amount to an average of $14.1 million each year. Adding the indirect and induced effects, total labor income in the study area will average $24.5 million per year.

Upstream Operating Impacts

Puget Sound Energy expects to begin operations at the plant in 2019. PSE projected its fuel sales, the value of peak shaving to its utility operations, and the plant's operating costs for the first year of production. The plant will produce 250,000 gallons of LNG per day, operating about 360 days per year, for an average capacity utilization rate of 98 percent. At this level of production, the plant will employ 16 workers at an average annual cost of $137,412 per worker. This includes all benefits, payroll costs, and employment taxes.

After natural gas and electric power from local utilities, the plant's largest expenses are labor, consumables, wharfage, and land lease fees to the Port of Tacoma. This spending is included in the impact analysis, as are spending on regular maintenance and repairs.

ECONorthwest estimated the annual impacts of this spending on the regional economy (Table 6). The plant will produce $58.0 million in direct output per year, and another $20.9 million in indirect and induced output, for a total of $78.9 million in output per year. Operations at the plant will support 16 jobs that will pay $2.2 million in labor income. Adding the indirect and induced impacts, the plant will support a total of 130 jobs paying $9.8 million in labor income.

ECONorthwest assumes the market will absorb the LNG produced as fuel as forecast by PSE. It is possible the market will not demand all the production from the plant operating at 98 percent of capacity in 2019. It is also possible that demand could exceed PSE's forecast.

Table 6: Upstream Annual Operating Impacts (in 2019)

Impact Measure	Type	2019
Output	Direct	$57,963,198
	Indirect	15,028,977
	Induced	5,911,770
	Total	$78,903,945
Labor Income	Direct	$2,198,593
	Indirect	5,493,170
	Induced	2,104,258
	Total	$9,796,021
Jobs	Direct	16
	Indirect	72
	Induced	43
	Total	130

Downstream Impacts

Puget Sound Energy will sell LNG to marine and truck transportation companies, which will reduce their fuel costs. In addition, the low-cost peak shaving capacity from the plant will improve PSE's operational efficiency. ECONorthwest used IMPLAN to estimate the annual economic impacts of these downstream effects.

Each year, PSE expects to sell 65.0 million gallons of LNG directly to marine users. This will displace 33.4 million gallons of low-sulfur marine HFO, for a net savings of $28.9 million. PSE also expects to sell 15.7 million gallons of LNG each year for use in truck transportation. This will reduce the trucking industry's diesel consumption by almost 8.7 million gallons, amounting to $16.0 million in savings.

The reductions in marine HFO and diesel use would also have a negative downstream impact on fuel wholesalers. While some will likely sell LNG, in net terms they will lose some market share. Fuel wholesalers would see their output (the difference between sales and cost of goods sold) decline about $4.8 million. The loss is counted as a downstream impact in this analysis.

For regular gas utility customers, the new peak shaving capacity at the plant would generate savings in utility costs. ECONorthwest assumes those savings are distributed among PSE's residential, commercial, and industrial natural gas customers in proportion to their consumption. Over the first 25 years of operations, the net present value of savings to ratepayers would average $3.0 million annually.

Table 7: Savings from LNG Use (in 2019)

Savings Resulting from LNG Use	Amount
Savings From Peak Shaving	
Households	$2,045,312
Commercial Businesses	795,485
Industrial Businesses	192,716
Subtotal	$3,033,513
Savings From Using LNG as Fuel	
Marine Transportation	$28,884,158
Truck Transportation	15,993,089
Wholesaling	(4,818,902)
Subtotal	$40,058,345
Grand Total	$43,091,859

Table 7 shows the expected sources of downstream impacts for natural gas utility and LNG fuel consumers in the Puget Sound Area, and the savings (or costs) for each group. ECONorthwest estimated the economic impacts of these savings as they ripple through the local economy.

For this analysis, we assumed that households would use their savings to purchase other goods and services, rather than investing or saving them. We also assumed that businesses using natural gas would increase production by an amount equivalent to their savings, which would increase their spending on goods and services, raising incomes and employment downstream.

Although many transportation topics have been well researched, we found little information about the effect of lower fuel prices on Washington's transportation industries that is applicable to the emerging LNG market. The relevant questions for this analysis include whether transportation volumes would increase, and how the savings would be distributed between the transportation companies and their customers.

In lieu of this information, we relied on the following assumptions for calculating the economic impacts of the downstream effects in IMPLAN:

- Marine and truck transportation companies' LNG-related savings would be distributed evenly between the companies and their customers. Half of these companies and customers would be located outside the Puget Sound region, so those savings would not generate economic impacts inside the region.
- Half of the savings realized by local transportation companies would be either retained by companies to offset capital costs of acquiring or converting equipment for LNG fuel or distributed as profits. Our analysis does not consider potential

economic impacts resulting from these savings because we cannot accurately estimate where the recipients reside.

- All lost wholesaling revenues would occur within the study area.

- To convert vehicles and ships to LNG, companies must make capital investments in new engines and fuel tanks, and this will take time. Trucks that run on LNG are now available from manufacturers.[13] The changeover from petroleum-based fuels to LNG will spark economic activity. However, the degree that it does and how much of the spending on new equipment would occur in the Puget Sound area is uncertain. Thus, ECONorthwest did not include it in this analysis as a downstream impact. Further, we assume that the facility will have sufficient demand for the 87 million gallons of LNG it produces in 2019.

- The social value of reduced pollution, estimated at $5.7 million per year (see Table 4), is a type of downstream impact. However, this was not included in the economic impact analysis because we cannot determine the distribution of these values by economic sector and geography.

As shown in Table 7, the plant will save PSE's ratepayers and LNG consumers $43.1 million per year. Using IMPLAN, we estimate that the annual economic impact of those savings for the Puget Sound Region will total $14.9 million in output annually, supporting $3.8 million in labor income for 74 jobs (Table 8).

Table 8: Downstream Economic Impacts (in 2019)

Impact Measure	2019
Output	$14,892,642
Labor Income	$3,810,590
Jobs	74

[13] Cardwell, S and Krauss, "Trucking industry is set to expand use of natural gas." The New York Times. April 22, 2013.

Appendix J-2: Local Government Tax Analysis

APPENDIX J-2

Local Government Tax Analysis

April 20, 2015

Overview

This analysis outlines the estimated incremental taxes generated by the Tacoma LNG Project for local governments (Tacoma, Fife, Pierce County, and other local agencies). The taxes outlined below do not include any taxes for the state. This look at incremental tax revenues excludes a large portion of the total tax revenues the project will generate. For example, sales and fuel tax paid by marine and on road consumers is not counted because it is presumably already being collected today on the diesel or bunker fuel purchases these customers are making.

Taxes are broken out into sales tax paid during construction, taxes generated from operational expenses, property taxes and business and occupation (B&O) and Utility tax collected on project revenues. These taxes will come from multiple different sources (for example, Tacoma Public Utilities, Washington State Department of Revenue), and in some cases, will not be traceable directly back to the Tacoma LNG Facility.

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Sales Tax Related to Construction														
Tacoma LNG Facility [1]	466,000	804,000	781,000	355,000										
Gas System Upgrades in Tacoma [2]		45,000	337,000											
Gas System Upgrades in Fife [3]		32,000	240,000											
Gas System Upgrades in Unincorporated Pierce [4]		25,000	190,000											
Agreement with City of Tacoma [5]			2,250,000	1,000,000	1,000,000									
Total Estimated Tax During Construction	466,000	906,000	3,798,000	1,355,000	1,000,000									
Taxes on Operating Costs														
Utility Tax (Plant Electricity) [6]					421,000	425,000	449,000	453,000	470,000	480,000	495,000	514,000	528,000	543,000
Sales tax on plant maintenance and consumables [7]					26,000	27,000	27,000	28,000	29,000	29,000	30,000	31,000	32,000	32,000
Total Estimated Taxes Paid on Operations					447,000	452,000	476,000	481,000	499,000	509,000	525,000	545,000	560,000	575,000
Property Tax*														
LNG Facility														
City of Tacoma [8]					688,000	688,000	688,000	688,000	688,000	688,000	688,000	688,000	688,000	688,000
Pierce County [9]					275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000
Other Local Jurisdictions [10]					1,813,000	1,813,000	1,813,000	1,813,000	1,813,000	1,813,000	1,813,000	1,813,000	1,813,000	1,813,000
Gas System Upgrades														
City of Tacoma [11]					44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000
City of Fife [12]					19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000
Pierce County [13]					44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000
Other Local Jurisdictions [14]					286,000	286,000	286,000	286,000	286,000	286,000	286,000	286,000	286,000	286,000
Total Estimated Property Tax Total [15]					3,169,000	3,169,000	3,169,000	3,169,000	3,169,000	3,169,000	3,169,000	3,169,000	3,169,000	3,169,000
Revenue Tax														
Business and Occupation (B&O) Tax [16]					73,000	73,000	72,000	72,000	74,000	74,000	76,000	83,000	81,000	81,000
Increased Utility Tax from Tacoma Ratepayers [17]					60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Total Estimated Taxes Paid on Sales of LNG					133,000	133,000	132,000	132,000	134,000	134,000	136,000	143,000	141,000	141,000
Total Estimated Taxes Generated for Local Government	466,000	906,000	3,798,000	1,355,000	4,749,000	3,754,000	3,777,000	3,782,000	3,802,000	3,812,000	3,830,000	3,857,000	3,870,000	3,885,000

***Note on Property Tax Estimates**

The estimate in this analysis represents an indicative calculation of what annual property tax revenues may look like. PSE is centrally assessed by the Washington State Department of Revenue (DOR) and has no control over how property tax revenues are assigned to the jurisdictions. The estimate contained herein is based on the total levy rate for the taxable areas, which include taxes for the county, city, and other public services, including schools and emergency management multiplied by adjustments made by the State DOR. The division of the levy rate between these jurisdictions or public services is publicly available from Pierce County. However, since PSE is centrally assessed, this breakout does not necessarily apply to PSE's property. Ultimately, property tax allocations are governed by the state DOR.

Notes:

[1] Assumes local tax rate of 3% on plant construction items that are not subject to the manufacturing exemption. City of Tacoma general fund receives 1% of sales (1/3 of listed amount), with the balance going to other local designated agencies.
[2] Local sales tax (at 3% of sales) for construction of gas system upgrades in the City of Tacoma.
[3] Local sales tax (at 2.9% of sales) for construction of gas system upgrades in the City of Fife
[4] Local sales tax (at 2.3% of sales) for construction of gas system upgrades in unincorporated Pierce County.
[5] Agreement with the City of Tacoma dated November 25, 2014.
[6] Utility tax paid on LNG Facility electricity consumption.
[7] Assumes 3% local tax rate paid on plant consumables and maintenance during operations.
[8] Property tax for Tacoma generated by the LNG plant at the rate of $3.21/$1,000 of assessed value plus $0.50/$1,000 of assessed value for EMS (see note above).
[9] Property tax related to the Tacoma LNG Facility for Pierce County based on a levy rate of $1.48/$1000 of assessed value (see note above).
[10] Other local agencies include the Port, Flood Control, Schools, and Parks.
[11] Property tax for Tacoma generated by the gas system upgrades considers the city rate of $3.21/$1,000 of assessed value plus $0.50/$1,000 of assessed value for EMS (see note above).
[12] Property tax for Fife related to the gas system upgrades considers the city rate of $1.6/$1,000 of assessed value plus $0.50/$1,000 of assessed value for EMS (see note above).
[13] Property tax related to the Tacoma LNG Facility for Pierce County based on a levy rate of $1.48/$1000 of assessed value.
[14] Other local agencies include the Port, Flood Control, Schools, Local Roads, EMS, Rural Libraries and Fire Departments.
[15] This total includes an estimate for all property taxes related to the project except for those levied by the state (approximately $604k/year).
[16] Local B&O taxes at the wholesale rate of .102% assessed on the entire projected revenues from LNG as fuel sales. Sales tax from TOTE and other downstream sales is not considered as it is not an incremental tax with this project.
[17] PSE's rates will increase as a result of this project. The rate increase will be spread across the service territory. The estimate is based on the projected rate increase applied to 2014 utility taxes paid by PSE in Tacoma.