ADDENDUM NO. 2
SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN

South State Street Manufactured Gas Plant
Remedial Investigation/Feasibility Study

Prepared for

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December 19, 2011

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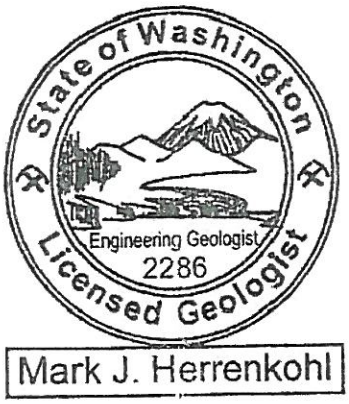
ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
City	City of Bellingham
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
Ecology	Washington State Department of Ecology
ft	foot or feet
HASP	Health and Safety Plan
Herrenkohl Consulting	Herrenkohl Consulting LLC
IHS	indicator hazardous substance
Landau Associates	Landau Associates, Inc.
MDL	method detection limit
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MLLW	mean lower low water
MTCA	Model Toxics Control Act
PAHs	polycyclic aromatic hydrocarbons
PID	photoionization detector
PSE	Puget Sound Energy
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RI/FS	remedial investigation and feasibility study
SAP	sampling and analysis plan
SIM	Selective Ion Monitoring
SSSMGP	South State Street Manufactured Gas Plant
TOC	total organic carbon
VOCs	volatile organic compounds
WAC	Washington Administrative Code
WAD	weak acid dissociable
WISHA	Washington Industrial Safety and Health Act

CERTIFICATION

I, Mark J. Herrenkohl, a licensed engineering geologist in the State of Washington, certify that I have reviewed the geosciences portions of this document.

Signature and Stamp of Geologist:



Name: Mark J. Herrenkohl Date: December 19, 2011

I, Stacy Lane, a licensed hydrogeologist in the State of Washington, certify that I have reviewed the geosciences and hydrogeology portions of this document.

Signature and Stamp of Geologist:

Name: Stacy Lane Date: December 19, 2011

1 INTRODUCTION

This document is the second addendum to the sampling and analysis plan (SAP) and quality assurance project plan (QAPP) for the South State Street Manufactured Gas Plant (SSSMGP) Site remedial investigation and feasibility study (RI/FS) in Bellingham, Washington. It outlines additional sampling and testing activities proposed for the SSSMGP Site, activities supplementary to work conducted under the August 6, 2010 Work Plans (Herrenkohl Consulting and Landau Associates 2010) based on recommendations in the *Remedial Investigation Interim Data Report* (Interim Data Report, Herrenkohl Consulting and Landau Associates 2011a) and further discussions with the Washington State Department of Ecology (Ecology).

This addendum provides specific guidance for field methodology and quality assurance procedures that will be followed by Herrenkohl Consulting LLC (Herrenkohl Consulting), Landau Associates, Inc. (Landau Associates), and subcontractors. Herrenkohl Consulting and Landau Associates are conducting this work under contract with the City of Bellingham, Parks and Recreation Department (City), with direction from the Ecology Toxics Cleanup Program. The addendum to the SAP and QAPP was prepared in accordance with an Agreed Order and Scope of Work negotiated between the City, Puget Sound Energy (PSE), and Ecology and signed April 30, 2010 (Document No. 7655), and was developed to meet the requirements of an RI/FS as defined by the Washington State Model Toxics Control Act (MTCA) Cleanup Regulation [Washington Administrative Code (WAC) 173-340; Ecology 2007].

Several documents are cited in this addendum. Altogether, these documents are referred to as the Work Plans for the SSSMGP Site RI/FS:

- ***Work Plan*** for the RI/FS of the SSSMGP Site Bellingham, Washington. The Work Plan provides information on existing data for the SSSMGP Site and the sampling strategy and design to meet the data needs for completing the RI/FS. The Work Plan also describes the project management strategy for implementing and reporting RI/FS activities for the Site, including project team responsibilities and schedule.
- ***Sampling and Analysis Plan*** (Appendix B of the Work Plan) for the RI/FS of the SSSMGP Site, Bellingham, Washington. The SAP describes the procedures for conducting field activities and presents the proposed laboratory analyses for samples collected in the field.
- ***Quality Assurance Project Plan*** (QAPP; Appendix C of the Work Plan) for the RI/FS of the SSSMGP Site, Bellingham, Washington. The QAPP describes analytical method reporting limit goals, field and laboratory quality assurance/quality control (QA/QC) requirements and reporting requirements for the RI/FS for the Site.
- ***Project Health and Safety Plan*** (Appendix D of the Work Plan) for the RI/FS of the SSSMGP Site, Bellingham, Washington. The HASP has been prepared in accordance with WAC 173-340-810, applicable Washington Industrial Safety and Health Act (WISHA) regulations, and project requirements. It addresses those activities associated with work to be performed at the Site.

The Work Plan described an environmental investigation designed to meet the data needs for completing the RI/FS. Data collected in that investigation were summarized in the Interim Data Report. An evaluation of that data resulted in the identification of remaining data gaps and recommendations for additional investigation activities to fulfill the data needs for completing the RI/FS. Some of those additional investigation activities (i.e., laboratory analysis of some archived soil and sediment samples, soil vapor sampling, and bivalve reconnaissance) were conducted in July 2011, in accordance with *Addendum No. 1, Sampling and Analysis Plan and Quality Assurance Project Plan* (SAP Addendum 1, Herrenkohl Consulting and Landau Associates 2011b).

Although the Interim Data Report presented recommendations for the scope of work to be completed in the additional investigation, it did not present procedural details for sampling and analysis. Many of the procedures to be used in the additional investigation are already described in the SAP and QAPP; however, some modifications and additions to the SAP and QAPP are warranted for the proposed additional investigation.

Following this introduction, the document has been organized into two sections. Section 2 describes the field and analytical approach for the additional soil and groundwater investigations. References are presented in Section 3.

Figures and tables are provided after the report text.

Upon evaluation of the new data described in this addendum, additional sampling and testing may be required to complete the RI/FS for the Site.

2 FIELD SAMPLING AND TESTING METHODS

Additional environmental investigation activities will be completed during the winter of 2012 to address data gaps identified in the Interim Data Report and others subsequently discussed with Ecology. Field investigation and laboratory analysis methods described in the SAP and QAPP will be used for the additional investigation, except for activities that warrant the use of new or modified methods. This section presents only those field sampling and laboratory testing methods that are not contained in the SAP and QAPP or that deviate from the methods described therein.

2.1 SOIL INVESTIGATION

Soil samples will be collected from the four borings that will be drilled during the installation of monitoring wells MW-46, MW-53, MW-54, and MW-55 (Figure 1). The previously proposed location MW-47 cannot be installed because the beach area is covered with riprap (Herrenkohl Consulting and Landau Associates 2011b). This section describes sampling and analysis procedures that differ from those described in the SAP and QAPP.

2.1.1 Sample Depth Intervals

Soil samples in MW-46, MW-53, MW-54, and MW-55 will be collected in accordance with the methodology described in the SAP.

2.1.2 Laboratory Analyses

Laboratory analyses for the additional investigation soil samples will be focused on the chemicals identified as preliminary indicator hazardous substances (IHSs) in the Interim Data Report. Preliminary IHSs in soil include gasoline-range petroleum hydrocarbons, metals (lead), volatile organic chemicals (VOCs, benzene), carcinogenic polycyclic aromatic hydrocarbons (cPAHs), and total cyanide. Soil samples collected from the MW-46 boring will be analyzed for all of the preliminary IHSs identified above.

Soil samples from the three borings located outside of the preliminary site boundary (MW-53, MW-54, and MW-55) will be analyzed only for those preliminary IHSs that were detected at concentrations exceeding preliminary screening levels at or near the southwest extent of the preliminary site boundary in the lower portion of Boulevard Park. All samples from these three borings will be analyzed for cPAHs. Whether or not soil testing for benzene and gasoline-range petroleum hydrocarbons is performed on soil samples from these borings will depend on the results of field screening. PID readings above background, presence of a visible sheen, or observation of odors indicative of petroleum hydrocarbons will trigger analysis for both benzene and gasoline-range petroleum hydrocarbons in soil samples.

Laboratory analysis of the soil samples for the preliminary IHSs will be conducted using the same analytical methods specified in the SAP and QAPP.

2.2 GROUNDWATER INVESTIGATION

Four additional monitoring wells (MW-46, MW-53, MW-54, and MW-55), will be installed and groundwater samples will be collected from these wells for laboratory analysis. Monitoring well MW-46 will be located along the shoreline to the northwest of existing monitoring well MW-28. The other three monitoring wells will be located outside the southwest extent of the preliminary site boundary in the lower portion of Boulevard Park. Monitoring well locations are shown on Figure 1; including existing Site wells proposed for additional groundwater sampling (refer to Section 2.2.2). Proposed well locations may be adjusted based on location of utilities and other field conditions. This section describes the planned monitoring well installation and construction and the sampling and analysis procedures that differ from those described in the SAP and QAPP.

2.2.1 Monitoring Well Installation and Construction

The new groundwater monitoring wells will be installed within the shallow groundwater zone. Boreholes will be drilled using a limited access, track-mounted hollow-stem auger drilling rig for installation of the monitoring wells. If practicable, MW-46, which is located near Bellingham Bay will extend from ground surface to a depth that approximately coincides with elevation -3 ft mean lower low water (MLLW). The ground surface elevation at monitoring well MW-46 is approximately +12 ft MLLW; therefore, the borehole for monitoring well MW-46 will be advanced approximately 15 ft bgs or to bedrock, if encountered shallower than 15 ft bgs.

MW-46 will be constructed with 2-inch diameter, flush-threaded, Schedule 40 PVC pipe and a 10-ft screen so that the well is screened from approximately -3 ft MLLW to + 7 ft MLLW. The well screen will consist of 0.020-inch machine slotted PVC casing. A filter pack material consisting of pre-washed, pre-sized number 20/40 silica sand will be placed from the bottom of the well to approximately 2 ft above the top of the screen. Filter pack material will be placed slowly and carefully to avoid bridging of material. A bentonite seal will be placed above the filter sand pack material to within about 2 ft of ground surface. Neat cement grout will be used to backfill the boring to the subgrade for placement of the protective cover. The well will be completed with an aboveground steel monument. The steel monument will be placed in cement to a depth of 2 ft bgs; however, cement will not be placed in the borehole until the bentonite chips have been allowed to hydrate for approximately 1 hour. The well casing will also be capped with a lockable, watertight cap. Three posts will be cemented in a triangle around the well to form a protective barrier against accidental damage.

The other monitoring wells (MW-53, MW-54, and MW-55) will be installed in accordance with the methods described in the SAP.

The monitoring wells will be constructed by a licensed drilling contractor in the state of Washington in accordance with the Minimum Standards for Construction and Maintenance of Wells (WAC 173-160; Ecology 2006). Oversight of drilling and well installation activities will be performed by an environmental professional familiar with environmental sampling and construction of resource protection wells. The well name and the identification number assigned

by Ecology will be marked on the well identification tags supplied by Ecology and will be attached to each well casing following well installation.

2.2.2 Groundwater Sampling

Groundwater samples will be collected from each of the new wells after they are developed in accordance with the procedures described in the SAP. Groundwater samples will also be collected from existing Site wells MW-19, MW-28, MW-29, MW-31, MW-38 and MW-40 (Figure 1). The groundwater samples will be collected using the procedures described in the SAP with the following exceptions for MW-46:

- Field parameters will be measured at multiple depths prior to purging to confirm the depth of the freshwater and saltwater interface.
- The intake end of the tubing will be lowered to a depth no greater than 1 ft below the groundwater table and at depth that is more than 1 ft above the freshwater and saltwater interface.

Field geochemical parameters (ferrous iron, dissolved oxygen, oxygen reduction potential) will be measured in groundwater collected from the new wells and selected existing Site wells.

Water level data will be measured for all Site monitoring wells following procedures in the SAP.

2.2.3 Laboratory Analyses

The groundwater samples collected from the new monitoring wells will be analyzed for the preliminary IHSs identified in the Interim Data Report, including those chemicals classified as "undetermined" based on reporting limit exceedances for non-detect chemicals. These consist of gasoline-range petroleum hydrocarbons; metals (arsenic, lead, selenium, and silver); VOCs (benzene); cPAHs; and weak acid dissociable (WAD) cyanide. The groundwater samples will be analyzed for both total and dissolved metals (including iron and manganese). Samples will also be analyzed for conventional parameters including salinity (lower Site wells only), conductivity, total dissolved solids, nitrite, sulfate, total organic carbon (TOC), and hardness. Analysis of the groundwater samples for the preliminary IHSs and conventional parameters will be conducted using the same analytical methods specified in the SAP and QAPP, with the following exceptions:

- Total and dissolved metals will be analyzed using EPA Method 6010B.
- cPAHs will be analyzed using EPA Method 8270D with low-level selected ion monitoring (SIM) analysis.
- Salinity will be analyzed by EPA Method SM 2520B.
- Conductivity will be analyzed by EPA Method 120.1.
- Nitrite and sulfate will be analyzed by EPA Method 300.0.
- TOC will be analyzed by EPA Method 415.1.

Target reporting limits for each analysis will be those specified in the QAPP with the following exception: for the total and dissolved metals the laboratory instruments will be set to report the method detection limit (MDL) as well as the reporting limit. Detailed analyte lists, MDLs and reporting limits for this modification are summarized in Table 1. During data validation, concentrations observed between the MDL and the reporting limit will be identified and qualified as estimated values.

3 REFERENCES

Ecology. 2007. Model Toxics Control Act (MTCA) Cleanup Regulation Chapter 173-340 WAC. Washington State Department of Ecology. Publication No. 94-06. Olympia, WA. Last updated October 12, 2007.

Herrenkohl Consulting and Landau Associates. 2010. Work Plan, South State Street Manufactured Gas Plant Remedial Investigation and Feasibility Study, Bellingham, Washington. Prepared for the City of Bellingham, Parks & Recreation Department, Bellingham, Washington and Puget Sound Energy, Environmental Services, Bellevue, Washington. Prepared by Herrenkohl Consulting LLC of Bellingham, Washington and Landau Associates Inc., of Edmonds, Washington. August 6.

Herrenkohl Consulting and Landau Associates. 2011a. Remedial Investigation Interim Data Report, South State Street Manufactured Gas Plant Remedial Investigation and Feasibility Study, Bellingham, Washington. Prepared for the City of Bellingham, Parks & Recreation Department, Bellingham, Washington and Puget Sound Energy, Environmental Services, Bellevue, Washington. Prepared by Herrenkohl Consulting LLC of Bellingham, Washington and Landau Associates Inc., of Edmonds, Washington. June 29.

Herrenkohl Consulting and Landau Associates. 2011b. Addendum No. 1 Sampling and Analysis Plan, Quality Assurance Project Plan, South State Street Manufactured Gas Plant Remedial Investigation and Feasibility Study, Bellingham, Washington. Prepared for the City of Bellingham, Parks & Recreation Department, Bellingham, Washington and Puget Sound Energy, Environmental Services, Bellevue, Washington. Prepared by Herrenkohl Consulting LLC of Bellingham, Washington and Landau Associates Inc., of Edmonds, Washington. July 25.

Legend

Proposed Additional Sample Locations

Location Type

- Monitoring Well

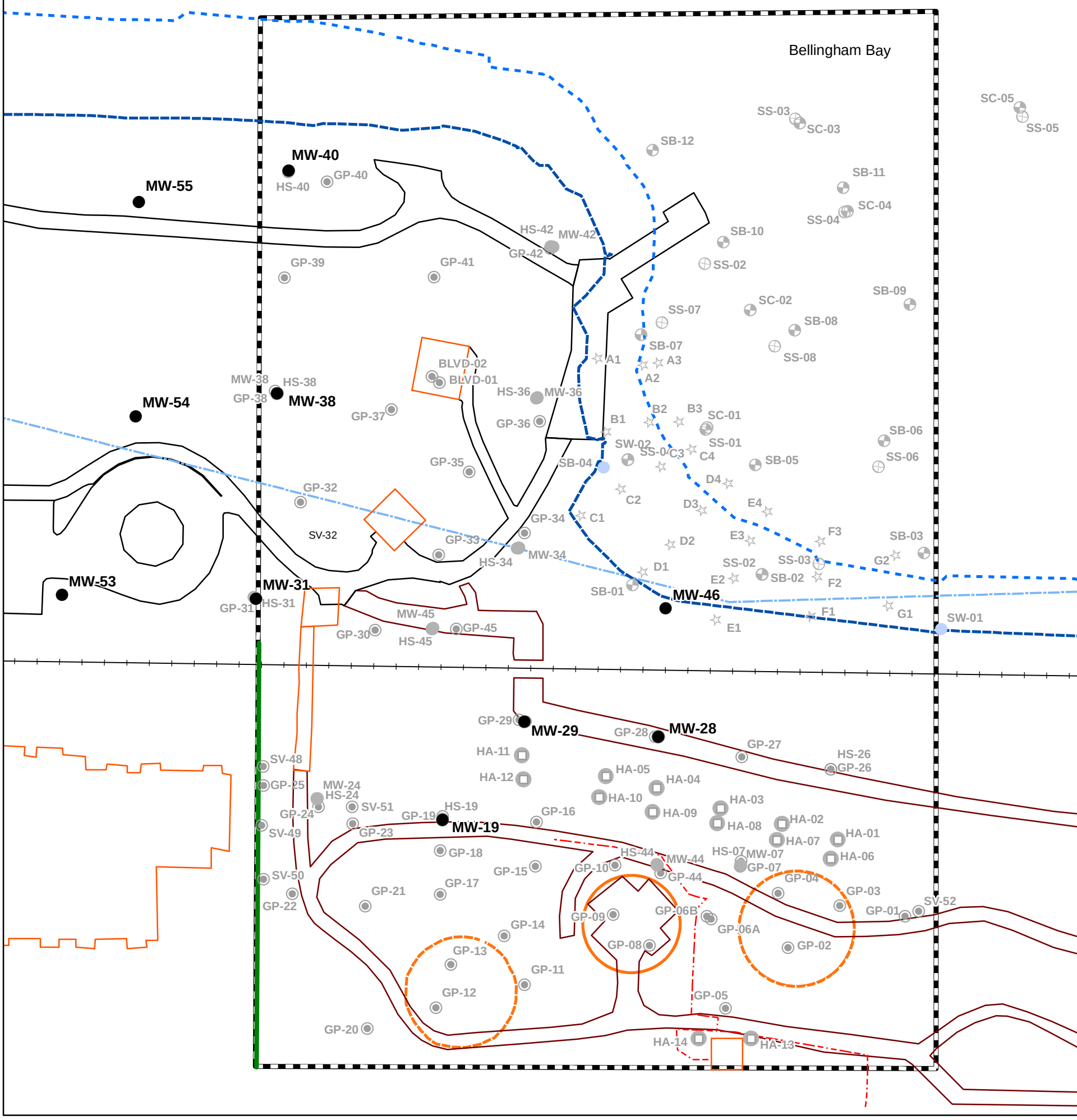
RI Dataset Locations

Location Type

- GeoProbe
- Hand Auger
- Monitoring Well
- Sediment Boring
- Surface Sediment
- Stormwater
- Bivalve Sample Locations

- **Buried Pipe**
- **Property Boundary**
- **Buildings**
- **Mean Lower Low Water (Elev = 0)**
- **Mean High Tide**
- **Inner Harbor Line**
- **Existing Dock**
- **Paved Paths/Parking**
- **Gravel Paths**
- **Railroad**
- **Gas Holder Foundation**
  - Existing
  - Removed
- **Site Boundary**

Note
The proposed groundwater sampling locations include new monitoring wells and a sub-set of existing monitoring wells.



Herrenkohl Consulting LLC

0 30 60 120 180 Feet

1 inch = 60 feet

True North

LANDAU ASSOCIATES

Data Sources:
Survey - Larry Steele and Assoc, 2010
Contours - COB
Bathymetry - Larry Steele and Assoc, 2010
Horizontal Datum: Washington State Plane Coordinate System of 1983 (1991 update)
Elevation Datum: COB contours - sea level using the COB datum
Bathymetric contours - mean lower low water
Elevation Units: Feet

South State Street Manufactured Gas Plant RI/FS Bellingham, WA	**Proposed Sampling Locations**	Figure **1**

Table 1. Modified Groundwater Analytical Methods, Target Reporting Limits, and Method Detection Limits

Analyte	Analytical Method	Target Reporting Limits (a)	Method Detection Limits
Metals (b)			
Arsenic	EPA Method 6010B	50 µg/L	3.33 µg/L
Lead	EPA Method 6010B	20 µg/L	1.55 µg/L
Selenium	EPA Method 6010B	50 µg/L	4.99 µg/L
Silver	EPA Method 6010B	3.0 µg/L	0.43 µg/L

(a) Reporting limits goals are based on current laboratory data and may be modified during the investigation process as methodology is refined. Laboratory reporting will be based on the lowest standard on the calibration curve. Instances may arise where high sample concentrations, nonhomogeneity of samples, or matrix interferences preclude achieving the desired reporting limits.

(b) Groundwater samples will be analyzed for both total and dissolved metals.