

March 10, 2010

**To:** Lucy McInerney, PE, Department of Ecology Northwest Regional Office

**cc:** Charles San Juan, LHG, Department of Ecology Headquarters;  
Brian Gouran, LG, Port of Bellingham

**From:** Steve Germiot, LHG  
Senior Associate Hydrogeologist

**Re:** **Addendum to RI/FS Work Plan**  
GP West Site, Bellingham, Washington

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We are submitting for Ecology review and discussion this Addendum to the Remedial Investigation/Feasibility Study (RI/FS) Work Plan for the GP West Site (Site) in Bellingham, Washington. The Addendum presents our recommended supplemental investigation to fill remaining data gaps, based on the information collected during the September-October 2009 RI data collection program at the Site. We discussed the preliminary information with you during a meeting on December 16, 2009, and discussed the proposed supplemental investigation with you on February 25, 2010. The Addendum also outlines the proposed approach for addressing potential cultural resources at the Site during the proposed RI/FS activities. Following discussion and resolution of any issues regarding the proposed approaches, we will request Ecology's written approval of this Addendum prior to initiating further work at the Site.

The recommended supplemental investigation activities are summarized below by Site subarea, and the attached figures depict the locations of proposed explorations for selected subareas. The last section of the Addendum describes the process to monitor for potential archaeological artifacts during RI/FS activities, and respond if potential artifacts are encountered.

## **Proposed Supplemental Investigation**

### ***Caustic Plume Area***

- Install three additional Fill Unit monitoring wells (CP-MW07, CP-MW08, CP-MW09) to better delineate the southern extent of the Caustic Plume (elevated groundwater pH and dissolved mercury) (Figure 1). Soil pH will be measured in the field during drilling at each location. If the field screening indicates elevated soil pH in the saturated zone at CP-MW08 or CP-MW09, a well will not be completed there. Rather, a new monitoring well will be drilled and completed farther to the southwest (denoted CP-MW08a and CP-MW09a respectively on Figure 1). The southern contingency locations will be marked in the field and cleared for utilities when clearing the CP-MW08 and -09 locations. All monitoring wells proposed in this Addendum would be drilled using a direct push drill rig and completed with 5-foot pre-packed well screens.

- Install one additional Fill Unit monitoring well (CP-MW10) between existing wells Law-1 and EMW-8S, to provide an additional groundwater monitoring location downgradient of the former wastewater settling basin and help verify apparently anomalous 2009 groundwater quality results from Law-1 (Figure 1). Install an additional Fill Unit monitoring well (CP-MW11) to better define the northeastern extent of the caustic plume (Figure 1).
- Sample the five newly installed monitoring wells as part of the 2010 wet season Site-wide groundwater sampling event.
- Collect and analyze four additional soil vapor samples for mercury to better define the extent of elevated soil vapor mercury concentrations around the core of the Caustic Plume (CP-VP01 through –VP04; Figure 1).

### ***Stormwater Swale Area***

- Collect soil samples for total mercury analysis at nine additional locations around the perimeter of the stormwater swale to better define the lateral and vertical extent of soil mercury in the area (Figure 2):
  - Shallow soil samples will be collected from two hand-augered borings north, and four hand-augered borings south and east, of the topographic swale to define lateral extent of soil mercury (SW-HA01 through -06). Two soil samples will be collected from each of these six locations, at depths of 0 to 0.5 and 0.5 to 1 feet, for consistency with the majority of the existing soil sample data in the subarea.
  - Drill and sample three deeper soil borings to define vertical extent of elevated soil mercury across the area:
    - Boring SW-SB01 will be drilled west of the swale and west of the 1993 D1 sample location where mercury was detected at a concentration of 73 mg/kg to a depth of 1 foot (no deeper samples collected). Soil samples will be collected at depths of 0 to 0.5, 0.5 to 1, 2 to 3, 5 to 6, and 8 to 9 feet.
    - Boring SW-SB02 will be drilled adjacent to the 1993 sample locations B1 and D3, where the highest mercury concentration was detected (530 mg/kg at D3) and 49 mg/kg was detected to a depth of 1 foot at B1 (no deeper samples collected there). Soil samples will be collected at depths of 0 to 0.5, 0.5 to 1, 2 to 3, 5 to 6, 8 to 9, 11 to 12, and 14 to 15 feet.
    - Boring MG-MW02 would be drilled at the northeast corner of the swale, adjacent to the concrete stormwater conveyance structure from which a sample of accumulated sediment (“Trench” on Figure 2) contained 48 mg/kg in 1993. Soil samples will be collected at depths of 0 to 0.5, 0.5 to 1, 2 to 3, 5 to 6, and 8 to 9 feet. This boring will also be completed as a monitoring well for sampling groundwater quality associated with the Million Gallon Tanks (see below).

**Million Gallon Tanks Area**

- Install and sample groundwater from new monitoring well MG-MW02, located south of the former petroleum storage tank (Figure 3). This well will be sampled for diesel- and oil-range TPH (NWTPH-Dx) and PAHs, and also provides water level data to better define groundwater flow directions in this area.
- Install and sample groundwater from new monitoring well MG-MW03, located north of the former petroleum storage tank and just north of the former bulkhead (Figure 3). This well will be sampled for diesel- and oil-range TPH and PAHs, and will provide additional information to assess whether groundwater TPH observed in wells CF-MW01 and CF-MW02 has migrated from the Million Gallon Tanks. The water level data from MG-MW03 will better define groundwater flow directions in proximity to the former bulkhead structure, particularly given anomalous water level data from nearby well EMW-16S, which will assist with determining a migration pathway from the Million Gallon Tanks area.
- Analyze the wet season 2010 groundwater samples from existing wells EMW-7S, EMW-8S, and EMW-20S for diesel- and oil-range TPH, to better define the downgradient extent of groundwater TPH observed in wells CF-MW01 and CF-MW02 (Figure 3). Wells EMW-7S, EMW-8S, and EMW-20S are already being sampled for dissolved mercury for characterization of the Chemfix/Nearshore Confined Fill Area.
- Sample existing well EMW-18S, located east of well EMW-12S, for diesel- and oil-range TPH in the wet season 2010 sampling event to better assess a potential eastern groundwater migration pathway from the Million Gallon Tanks area.
- In addition to analyses stated above, the wet season groundwater samples from wells MG-MW01, EMW-12S, EMW-16S, MG-MW03, CF-MW01, CF-MW02, EMW-7S, and EMW-8S will be submitted to Ecology's Manchester Laboratory for analysis of petroleum biomarkers. Biomarkers (e.g., steranes, terpanes) provide detailed information on the origin of the petroleum product and are more resistant to degradation than other petroleum components, so can be useful in chemically fingerprinting petroleum releases. This information, in combination with chromatograms from the NWTPH-Dx petroleum analysis, will be used to more accurately assess similarities/differences in petroleum composition amongst the wells, and thus better define the continuity and migration of groundwater contamination from the Million Gallon Tanks area.

**Bunker C Tank Area**

- Install a new soil boring BC-SB09 to an anticipated depth of 20 feet immediately outside the secondary containment structure for the former tank, adjacent to where the subsurface petroleum pipelines entered and exited the structure (Figure 4). This boring will better define the vertical extent of petroleum adjacent to the existing hand-augered boring BC-SB01 within the containment structure, which encountered Bunker C-saturated soil to the depth of exploration (refusal at about 3 feet). Ten soil samples will be collected for NWTPH-Dx

analysis at depths of 1 to 2, 3 to 4, 5 to 6, 7 to 8, 9 to 10, 11 to 12, 13 to 14, 15 to 16, 17 to 18, and 19 to 20 feet, or as determined based on field observations and screening. If field observations indicate that petroleum contamination persists at a depth of 20 feet, the boring will be deepened until field evidence of contamination is no longer apparent. An aliquot of soil from each sample will be frozen for preservation and, based on the TPH results, three of the samples will be submitted for PAH analysis.

- Install a new soil boring BC-SB10 to an anticipated depth of 20 feet near the terminus of the pipeline from the Bunker C tank to the steam plant (Figure 4). Five soil samples will be collected for NWTPH-Dx analysis at depths of 1 to 2, 5 to 6, 9 to 10, 13 to 14, and 17 to 18 feet, or as determined based on field observations and screening. If field observations indicate that petroleum contamination persists at a depth of 20 feet, the boring will be deepened until field evidence of contamination is no longer apparent. An aliquot of soil from each sample will be frozen for preservation and, based on the TPH results, two of the samples will be submitted for PAH analysis.
- Analyze for dissolved metals the wet season groundwater samples from existing wells BC-MW01 and BC-MW03 to assess the extent and potential source of elevated dissolved metals observed in well BC-MW02 (Figure 4).

### ***Laurel Street Pipe Rack***

- Complete a new soil boring/monitoring well (PR-MW03) at the location of the 1993 soil samples where the highest soil mercury concentrations (590 and 14,000 mg/kg at PLHA-9-24-36 and PLHA-9-0-6, respectively) were detected in shallow soil but not vertically bounded in that immediate area (Figure 5). Five soil samples will be collected for total mercury analysis from depth intervals of approximately 1 to 2, 3 to 4, 6 to 7, 9 to 10, and 13 to 14 feet bgs, or as sample recovery allows. The boring will be completed as a monitoring well, which will be sampled for dissolved mercury during the wet season sampling event.

### ***Lignin Plant Area (Well LP-MW01)***

- Continue monitoring LP-MW01 groundwater for VOCs. Because there were no exceedances of VOCs detected in soil or grab groundwater samples collected from any of the six borings surrounding LP-MW01<sup>1</sup>, no permanent monitoring wells or vapor sampling will be conducted, in accordance with Section 8.8.1 of the RI/FS Work Plan.

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<sup>1</sup> PCE was detected at 0.081 mg/kg in the 4- to 5-foot soil sample from new boring LP-SB11, which is marginally above the 0.05 mg/kg Method A soil cleanup level based on protection of groundwater. However, the fact that PCE was not detected in the groundwater sample collected from that boring, nor in the deeper soil sample from that boring, indicates empirically that the detected 0.081 mg/kg PCE soil concentration is protective of Site groundwater, in accordance with WAC 173-340-747(9).

### ***Stormwater Conveyance System Evaluation***

As part of the ongoing RI investigations, the potential for the existing storm drain systems located on the Site to act as migration pathways for contaminated groundwater is being assessed. This work includes the following elements:

- Dry season (completed) and wet season (pending) inspections of each storm drain system located on the Site to assess whether dry weather flow conditions indicative of potential groundwater infiltration are present. This includes inspection of the storm drain systems for water accumulations and/or discharges in the absence of storm events, and estimation of flow rates onto (in the case of the Laurel Street drain) and off of the Site.
- Review of groundwater elevations and gradients in the vicinity of the storm drain systems to check for potential indications that the drains may be affecting localized groundwater conditions.
- If applicable, review of groundwater quality in the areas potentially influenced by the storm drain systems.

The initial round of stormwater inspections (September and October 2009) indicated no dry weather flow in the private storm drain systems located on the Site. Some dry weather flow was present in the City-owned Laurel Street drain. The initial inspection showed dry weather flow both at the storm drain discharge point (into the Whatcom Waterway; estimated flow rate 3 to 4 gallons per minute (gpm)), as well as onto the Site (based on inspections of manholes located along Cornwall Avenue).

The presence of water within the Laurel Street pipe does not necessarily indicate groundwater infiltration, because the drain has influences from both tidal influx and from off-Site areas. The drain has a lower invert elevation than the other drains on the Site, and it is exposed to seawater infiltration during high tide events. It appears that, at typical high tide conditions, seawater would encroach up the drain pipe to a point between the Laurel Street Pipe Rack area and Cornwall Avenue. The drain services a large off-Site drainage area south of Cornwall Avenue, and flow was observed in the drain line entering the Site. During the dry season inspections, the water discharging from the pipe to the waterway was brackish, indicating some likely contribution from both sources. The rates of flow onto the Site were not quantified during the initial dry weather inspections, but these will be quantified during the wet season round of inspections.

Review of groundwater elevations indicates the Laurel Street storm drain locally influences groundwater in the Fill Unit. Figure 6 presents groundwater elevation contours for the Fill Unit, and interpreted groundwater flow directions, based on September 2009 (dry season) measurements. The area of influence away from the drain appears localized, perhaps on the order of 150 feet on either side. Though the pipe has been slip-lined by the City, some groundwater infiltration into it could potentially occur if there is a gap in the slip lining. In addition, the drain trench backfill outside the pipe may be sufficiently permeable to provide a preferential groundwater flow pathway.

Table 1 provides recent groundwater quality data, collected in 2004 and 2009, for all monitoring wells located within 150 feet on either side of the Laurel Street sewer line. For reference, Figure 6 shows the September 2009 Fill Unit groundwater elevation contours and interpreted groundwater flow directions, along with the 300-foot corridor about the sewer line and the wells within it. From the waterway south, the eight wells are GF-MW01, AA-MW03, GF-MW02, EMW-18S, AP-MW01, PR-MW02, PR-MW01, EMW-13S, and CW-MW01. Wells GF-MW02 and AP-MW01 were sampled in 2004, but, following decommissioning of the Tissue Plant, are no longer accessible.

Of the eight wells located nearest to the sewer line, well GF-MW02 had detected concentrations of several dissolved metals exceeding preliminary groundwater screening levels during the 2004 or 2009 sampling events (Table 1). During the 2004 sampling event, dissolved copper was also detected at well EMW-13S at a concentration (4 µg/L) marginally above the 3.1 µg/L screening level. Elevated dissolved metals (and low groundwater pH) detected at GF-MW02 are associated with the Acid Plant Area. Just to the southeast, existing well AA-MW04 is located within the footprint of the former Acid Plant and had similar low groundwater pH and dissolved metals exceedances when sampled in 2009. While Fill Unit groundwater is interpreted to locally flow toward the sewer line, the groundwater quality data indicate that migration of dissolved metals from the Acid Area is predominantly toward the north, rather than northwest toward the sewer line. Groundwater at existing well FH-MW01, located north of wells AA-MW04 and GF-MW02 (Figure 6), showed low pH (4.1 to 4.4) and dissolved metals exceedances during the 2004 and 2009 samplings. Conversely, groundwater at well AA-MW03, located between well GF-MW02 and the sewer line, showed somewhat depressed pH (5.1) but no dissolved metals exceedances in the 2009 sampling (Table 1).

In summary, the Laurel Street sewer line appears to provide a localized preferential conduit for groundwater flow in the Fill Unit; however, based on the lack of exceedances at monitoring wells located nearest to it, it does not appear to be a preferential conduit for contaminant migration from the Site.

In accordance with the Site RI/FS Work Plan, the following wet season activities will be conducted to complete the analysis of potential groundwater/storm drain interactions as part of the RI/FS:

- Stormwater inspections will be completed for all storm drain systems located on the property (including the Laurel street drain, as well as the other on-site drain systems).
- Flow rates for the Laurel street drain will be quantified both onto and off of the property. These measurements will allow estimation of potential gain or loss of flow as the drain crosses the Mill site.
- Groundwater elevations and gradients will be reviewed to assess the extent of influence of the Laurel Street drain on groundwater flow patterns during the wet season. These data will be used in conjunction with the flow measurements to further assess potential influence of groundwater on discharges from the storm drain (i.e., estimation of potential flow rates into the drain, as well as the potential mixing ratios between any such infiltration and other off-property flows within the drain).

- Groundwater wells GF-MW01, AA-MW03, EMW-18S, PR-MW02, PR-MW01, and EMW-13S, located within 150 feet of the Laurel Street storm drain, will be resampled, and the data will be reviewed against groundwater screening levels along with previous groundwater quality data.

If the collective data indicate potential significant groundwater flow into the Laurel Street storm drain, and if exceedances of groundwater screening levels are noted along the storm drain alignment (in the area of potential influence), then storm drain water samples will be collected and analyzed for those parameters exceeding groundwater screening levels in the vicinity of the storm drain. Samples would be collected concurrently from water flowing onto the Site via the drain (i.e., from a sampling location south of Cornwall Avenue), and in water discharging to the waterway via the drain (i.e., from the stormwater outfall discharge point).

If the wet season inspection indicates potential groundwater flow into any of the on-site storm drain systems (other than the Laurel Street drain), the same procedures will be used as described above for the Laurel Street drain system to assess potential quantity and quality of groundwater influence. Aspect will meet with Ecology before sampling of storm drains is conducted to review the available information and finalize sampling parameters (if applicable).

## **Historic and Cultural Resources**

Cultural resource (historic and archaeological) conditions at the Site are summarized in Section 3.11 of the Draft Environmental Impact Statement (DEIS) for the New Whatcom Project, and are presented in detail in Appendix M of the DEIS (Port of Bellingham, January 2008). The DEIS synthesized a pair of detailed assessments conducted to support the redevelopment planning: (1) an investigation of historical Site structures provided in the December 2007 Historic Property Resources Technical Report prepared by Artifacts Consulting Inc., and (2) an investigation of archaeological resources provided in the December 2007 Cultural Resource Assessment prepared by Northwest Archaeological Associates. The latter assessment included coordination with the Lummi Nation and Nooksack Tribe to identify potential issues and availability of existing information. The Port's Supplemental DEIS released in October 2008 concurred with the description of Site cultural resources presented in the DEIS.

None of the Site structures present at the time of the historic resources assessment were listed on the National Register of Historic Places, the Washington Heritage Register, or the Bellingham Local Landmark Registry. None of the proposed RI activities will have an impact on any of the existing structures at the Site.

Although no archaeological resources have been recorded on the Site, it is located within an archaeologically sensitive area of former tidal flats adjacent to the mouth of Whatcom Creek and to the bluffs to the south. The ancestors of the Lummi Nation inhabited and utilized the area, and appear to have established seasonal fishing encampments near the creek mouth. Prior to the filling and development of the Site area, the Bellingham Bay shoreline was located generally along the bottom of the bluffs south of the Site. Based on the pre-development conditions, Figure 7 (derived from Figure 3.11-2 in the DEIS) graphically depicts the expected probabilities (high, medium, low) for the presence of Native American

archaeological materials beneath the Site and surrounding areas. Areas near the former shoreline, south of the Site and along its southeast corner, have greatest probability, with progressively lower probability moving north and northwest away from the bluffs. Therefore, there is a moderate probability for artifacts being present on the former tidal flat surface (top of Tidal Flat Aquitard unit) buried beneath fill across most of the eastern 2/3 of the Site, with higher probability along the trace of the former Whatcom Creek which is interpreted to have traversed the east-central portion of the site. The northwestern portion of the Site, including parts of the Caustic Plume and Confined Nearshore Fill subareas, has a low probability for encountering archeological artifacts. .

Based on the cultural resource assessments conducted to date and the locations of the proposed supplemental explorations depicted on Figure 7, the Port will implement the procedures presented below during this phase of the RI/FS project. It is our understanding that additional procedures will be required as engineering, design, and permitting processes proceed.

### ***Cultural Resource Procedures***

Based on the archaeological assessments completed for the Site as described above, there is a possibility that buried cultural artifacts, such as chipped or ground stone, historic refuse, building foundations, or human bone, could be discovered in the historical tidal flat unit.

The supplemental exploration activities proposed in this addendum include installation of soil borings, monitoring wells, and vapor probes. These activities involve advancing a 2- to 3-inch diameter borehole using direct push technology, which will produce minimal ground disturbance. The proposed explorations will be limited to the fill soils overlaying the historical tidal flats, within medium or low probability zones for archaeological artifacts (Figure 7). To address the possibility of encountering cultural artifacts, the following procedures will be implemented:

- The soils in the borings will be logged by a geologist, with attention paid to looking for evidence of non-soil materials;
- If apparent archaeological artifacts are encountered, the Port will be notified immediately. The Port will notify Ecology, DAHP, the Lummi Nation, and Nooksack Tribe, and will invite the parties to attend an on-Site inspection with a professional archaeologist contracted by the Port. The archaeologist will document the discovery in a report submitted to DAHP so that they may control access to information regarding potential sensitive-site locations, in accordance with Chapter 27.53 RCW; the report will be referenced, but not included, in the Site RI/FS report; and
- In the event of an inadvertent discovery of potential human remains, work will be immediately halted in the discovery area, and the apparent remains will be covered and secured against further disturbance. The City of Bellingham Police Department and Whatcom County Medical Examiner would be immediately contacted, along with DAHP and authorized Tribal representatives. A treatment plan would be developed by a professional archaeologist in accordance with applicable state law.



## **Schedule**

Drilling and construction of the proposed supplemental monitoring wells and vapor sampling probes is planned for late March 2010, followed immediately by the wet season Site-wide water sampling event that includes the new monitoring wells. The wet season stormwater system inspections are also planned for March 2010. Thereafter, the tentative RI/FS schedule milestones are as follows:

- Submit to Ecology the Draft RI report (Volume 1 of RI/FS) by July 2010;
- Resolve comments on Draft RI to Ecology's satisfaction by September 2010;
- Submit to Ecology the Draft FS report (Volume 2 of RI/FS) by February 2011;
- Resolve comments on Draft FS to Ecology's satisfaction by May 2011; and
- Submit to Ecology the Draft RI/FS for public review by June 2011.

This schedule is subject to change as the RI/FS progresses, as described in the RI/FS Work Plan.

Please contact me if you have questions, or would otherwise like to further discuss this Work Plan Addendum.

### **Attachments:**

Table 1 – Groundwater Quality Data within 150 Feet of Laurel St. Sewer Line (2004, 2009)

Figure 1 – October 2009 Dissolved Mercury and pH in Groundwater, Caustic Plume Area

Figure 2 – Mercury Concentrations in Soil, Stormwater Swale Area

Figure 3 – cPAH and TPH Concentrations in Soil and Groundwater, Million Gallon Tank Area

Figure 4 – Soil and Groundwater Data, Bunker C Tank Area

Figure 5 – Mercury Concentrations in Soil and Groundwater, Laurel Street Pipe Rack Area

Figure 6 – Fill Unit Groundwater Elevation Contours (Sept. 2009)

Figure 7 – Proposed Supplemental Explorations Overlain on Archaeological Probability Zones

**Table 1 - Groundwater Quality Data within 150 Feet of Laurel St. Sewer Line (2004, 2009)**

GP West Site RI/FS Work Plan Addendum

Chemical Name	Preliminary Groundwater Screening Level	GF-MW01 07/25/04	GF-MW01 09/29/09	AA-MW03 09/29/09	GF-MW02 07/25/04	AP-MW01 07/25/04	EMW-18S 07/26/04	PR-MW02 09/30/09	PR-MW01 09/30/09	EMW-13S 07/26/04	EMW-13S 09/30/09	CW-MW01 07/26/04
<b>Field Parameters</b>												
Conductivity in us/cm		3,901	9,390	1,581	2,442	1,441	993	1,992	901	1,085	1,242	648
Dissolved Oxygen in mg/L		9.8	8.9	8.6	1.6	1.3	0.9					
ORP in mVolts		-187	-102	-68	394	-168	-214	-204	-143	-254	-133	-178
pH in pH units		6.8	6.6	5.1	3.3	6.9	6.7	10.6	9.0	7.4	7.6	6.5
Temperature in deg C		18.7	17.7	15.9	18.9	16.4	18.9	16.0	18.2	19.7	17.6	14.0
<b>Total Petroleum Hydrocarbons</b>												
Diesel Range Hydrocarbons in ug/L		280			530	400	250 U			250 U		250 U
Gasoline Range Hydrocarbons in ug/L		250 U			250 U	250 U	250 U			250 U		250 U
<b>BTEX</b>												
Benzene in ug/L	2,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Ethylbenzene in ug/L	6,900	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Toluene in ug/L	19,000	1.0 U			5.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Xylenes (total) in ug/L		1.0 U				1.0 U	1.0 U			1.0 U		1.0 U
<b>Dissolved Metals</b>												
Dissolved Arsenic in ug/L	5	1 U	4.77	0.87	38	1.1	0.5 U			0.8		0.5 U
Dissolved Cadmium in ug/L	9.3	0.2 U	0.842	0.02 J	81.1	0.2 U	0.5 U			0.5 U		0.5 U
Dissolved Chromium in ug/L		10.4	3.2	12.4	35.6	30	1 U			8		1
Dissolved Hexavalent Chromium in ug/L	50	11 U	5 J	50 U	18	11 U	11 U			11 U		11 U
Dissolved Copper in ug/L	3.1	0.9	0.61	0.99	795	1.1	1 U			4		1 U
Dissolved Iron in ug/L		780	38.3	19,600	125,000	6,170	190			50 U		2,000
Dissolved Lead in ug/L	8.1	1 U	0.04 U	0.02 U	750	1 U	2 U			2 U		2 U
Dissolved Manganese in ug/L		516	1,000	813	1,870	292	22			202		1,110
Dissolved Mercury in ug/L	0.94	0.1 U	0.001 J	0.001 J	0.1 U	0.1 U	0.1 U	0.00136 J	0.0343	0.1 U	0.00662	0.1 U
Dissolved Nickel in ug/L	8.2	1.6	2.42	3.01	626	3.6	1 U			2		2
Dissolved Zinc in ug/L	81	4 U	3.73	32.3	2,440	4 U	10 U			10 U		10 U
<b>Polycyclic Aromatic Hydrocarbons (PAHs)</b>												
Acenaphthene in ug/L	640	0.10 U			0.10 U	0.10 U	0.10 U			14		0.10 U
Acenaphthylene in ug/L		0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Anthracene in ug/L	26,000	0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Benzo(g,h,i)perylene in ug/L		0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Fluoranthene in ug/L	90	0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Fluorene in ug/L	3,500	0.10 U			0.10 U	0.10 U	0.10 U			6.6		0.10 U
Phenanthrene in ug/L		0.10 U			0.10 U	0.10 U	0.10 U			0.89		0.10 U
Pyrene in ug/L	2,600	0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Total cPAHs TEF in ug/L		ND			ND	ND	ND			ND		ND
Benzo(a)anthracene in ug/L		0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Benzo(a)pyrene in ug/L	0.03	0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Benzo(b)fluoranthene in ug/L		0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Benzo(k)fluoranthene in ug/L		0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Chrysene in ug/L		0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Dibenzo(a,h)anthracene in ug/L		0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Indeno(1,2,3-cd)pyrene in ug/L		0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
1-Methylnaphthalene in ug/L		0.10 U			0.10 U	0.10 U	0.10 U			8.7		0.10 U
2-Methylnaphthalene in ug/L		0.10 U			0.10 U	0.10 U	0.10 U			3.4		0.10 U
Naphthalene in ug/L	4,940	0.10 U			0.12	0.10 U	0.10 U			12		0.10 U
<b>Volatile Organic Compounds</b>												
1,1,1,2-Tetrachloroethane in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,1,1-Trichloroethane in ug/L	420,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,1,2 - Trichlorotrifluoroethane in ug/L		2.0 U			2.0 U	2.0 U	2.0 U			2.0 U		2.0 U
1,1,2,2-Tetrachloroethane in ug/L	6.5	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,1,2-Trichloroethane in ug/L	2,300	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,1-Dichloroethane in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,1-Dichloroethene in ug/L	23,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,1-Dichloropropene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,2,3-Trichlorobenzene in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
1,2,3-Trichloropropane in ug/L		3.0 U			3.0 U	3.0 U	3.0 U			3.0 U		3.0 U
1,2,4-Trichlorobenzene in ug/L	230	5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
1,2,4-Trimethylbenzene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,2-Dibromo-3-chloropropane in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
1,2-Dibromoethane (EDB) in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,2-Dichlorobenzene in ug/L	4,200	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,2-Dichloroethane (EDC) in ug/L	43,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,2-Dichloropropane in ug/L	23	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,3,5-Trimethylbenzene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,3-Dichlorobenzene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,3-Dichloropropane in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,4-Dichloro-2-Butene in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
1,4-Dichlorobenzene in ug/L	4.9	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
2,2-Dichloropropane in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
2-Butanone in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
2-Chloroethyl Vinyl Ether in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
2-Chlorotoluene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
2-Hexanone in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
4-Chlorotoluene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
4-Methyl-2-pentanone in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
Acetone in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
Acrolein in ug/L		50 U			50 U	50 U	50 U			50 U		50 U
Acrylonitrile in ug/L	0.4	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Benzene in ug/L	2,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Bromobenzene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Bromochloromethane in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Bromodichloromethane in ug/L	14,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Bromoethane in ug/L		2.0 U			2.0 U	2.0 U	2.0 U			2.0 U		2.0 U
Bromoform in ug/L	14,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Bromomethane in ug/L	970	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Calculated in house - Total Xylenes in ug/L		1.00 U			1.00 U	1.00 U	1.00 U			1.00 U		1.00 U
Carbon disulfide in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Carbon tetrachloride in ug/L	2.7	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Chlorobenzene in ug/L	5,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Chloroethane in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Chloroform in ug/L	280	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Chloromethane in ug/L	130	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
cis-1,2-Dichloroethene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
cis-1,3-Dichloropropene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Dibromochloromethane in ug/L	14,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Dibromomethane in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Ethylbenzene in ug/L	6,900	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Hexachlorobutadiene in ug/L	190	5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
Isopropylbenzene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Methylene chloride in ug/L	170,000	2.0 U			2.0 U	2.0 U	2.0 U			2.0 U		2.0 U
Methyl iodide in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
n-Butylbenzene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
n-Propylbenzene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
o-Xylene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
p-Isopropyltoluene in ug/L		1.0 U			26	1.0 U	1.0 U			1.0 U		25
sec-Butylbenzene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U

**Table 1 - Groundwater Quality Data within 150 Feet of Laurel St. Sewer Line (2004, 2009)**

GP West Site RI/FS Work Plan Addendum

Chemical Name	Preliminary Groundwater Screening Level	GF-MW01 07/25/04	GF-MW01 09/29/09	AA-MW03 09/29/09	GF-MW02 07/25/04	AP-MW01 07/25/04	EMW-18S 07/26/04	PR-MW02 09/30/09	PR-MW01 09/30/09	EMW-13S 07/26/04	EMW-13S 09/30/09	CW-MW01 07/26/04
Styrene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
tert-Butylbenzene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Tetrachloroethene (PCE) in ug/L	4.2	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Toluene in ug/L	19,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
trans-1,2-Dichloroethene in ug/L	33,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
trans-1,3-Dichloropropene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Trichloroethene (TCE) in ug/L	56	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Trichlorofluoromethane in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Vinyl acetate in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
Vinyl chloride in ug/L	3.7	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Xylenes (total) in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Naphthalene in ug/L	4,940	5.0 U			5.0 U	5.0 U	5.0 U			12		5.0 U
<b>Semi-Volatile Organics</b>												
1,2,4-Trichlorobenzene in ug/L	230	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,2-Dichlorobenzene in ug/L	4,200	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,3-Dichlorobenzene in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
1,4-Dichlorobenzene in ug/L	4.9	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
2,4,5-Trichlorophenol in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
2,4,6-Trichlorophenol in ug/L	3.9	5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
2,4-Dichlorophenol in ug/L	190	3.0 U			3.0 U	3.0 U	3.0 U			3.0 U		3.0 U
2,4-Dimethylphenol in ug/L	550	3.0 U			3.0 U	3.0 U	3.0 U			3.0 U		3.0 U
2,4-Dinitrophenol in ug/L	3,500	25 U			25 U	25 U	25 U			25 U		25 U
2-Chloronaphthalene in ug/L	1,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
2-Chlorophenol in ug/L	97	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
2-Methylphenol in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
2-Nitroaniline in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
2-Nitrophenol in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
3,3'-Dichlorobenzidine in ug/L	0.046	5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
3-Nitroaniline in ug/L		6.0 U			6.0 U	6.0 U	6.0 U			6.0 U		6.0 U
4,6-Dinitro-2-methylphenol in ug/L		15 U			15 U	15 U	15 U			15 U		15 U
4-Bromophenyl phenyl ether in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
4-Chloro-3-methylphenol in ug/L		2.0 U			2.0 U	2.0 U	2.0 U			2.0 U		2.0 U
4-Chloroaniline in ug/L		3.0 U			3.0 U	3.0 U	3.0 U			3.0 U		3.0 U
4-Chlorophenyl phenyl ether in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
4-Methylphenol in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		13
4-Nitroaniline in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
4-Nitrophenol in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
Benzoic acid in ug/L		10 U			10 U	10 U	10 U			10 U		12 M
Benzyl alcohol in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
Benzyl butyl phthalate in ug/L	1,300	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Bis(2-chloro-1-methylethyl) ether in ug/L	37	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Bis(2-chloroethoxy)methane in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Bis(2-chloroethyl) ether in ug/L	0.85	2.0 U			2.0 U	2.0 U	2.0 U			2.0 U		2.0 U
Bis(2-ethylhexyl) phthalate in ug/L	3.6	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.1 B
Carbazole in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.6		1.0 U
Dibenzofuran in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.8		1.0 U
Diethyl phthalate in ug/L	28,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Dimethyl phthalate in ug/L	72,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Di-n-butyl phthalate in ug/L	2,900	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Di-n-octyl phthalate in ug/L		1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Hexachlorobenzene in ug/L	0.00047	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Hexachlorobutadiene in ug/L	190	2.0 U			2.0 U	2.0 U	2.0 U			2.0 U		2.0 U
Hexachlorocyclopentadiene in ug/L	3,600	5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
Hexachloroethane in ug/L	30	2.0 U			2.0 U	2.0 U	2.0 U			2.0 U		2.0 U
Isophorone in ug/L	120,000	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Nitrobenzene in ug/L	450	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
N-Nitroso-di-n-propylamine in ug/L	0.82	2.0 U			2.0 U	2.0 U	2.0 U			2.0 U		2.0 U
N-Nitrosodiphenylamine in ug/L	9.7	1.0 U			1.0 U	1.0 U	1.0 U			1.0 U		1.0 U
Pentachlorophenol in ug/L	4.9	5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
Phenol in ug/L	1,100,000	2.0 U			2.0 U	2.0 U	2.0 U			2.0 U		2.0 U
2,4-Dinitrotoluene in ug/L	1,400	5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
2,6-Dinitrotoluene in ug/L		5.0 U			5.0 U	5.0 U	5.0 U			5.0 U		5.0 U
<b>Polychlorinated Biphenyls (PCBs)</b>												
Aroclor 1016 in ug/L	0.0058	0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Aroclor 1221 in ug/L	0.03	0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Aroclor 1232 in ug/L	0.03	0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Aroclor 1242 in ug/L	0.03	0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Aroclor 1248 in ug/L	0.03	0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Aroclor 1254 in ug/L	0.0017	0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Aroclor 1260 in ug/L	0.03	0.10 U			0.10 U	0.10 U	0.10 U			0.10 U		0.10 U
Total PCBs in ug/L		0.35 U			0.35 U	0.35 U	0.35 U			0.35 U		0.35 U

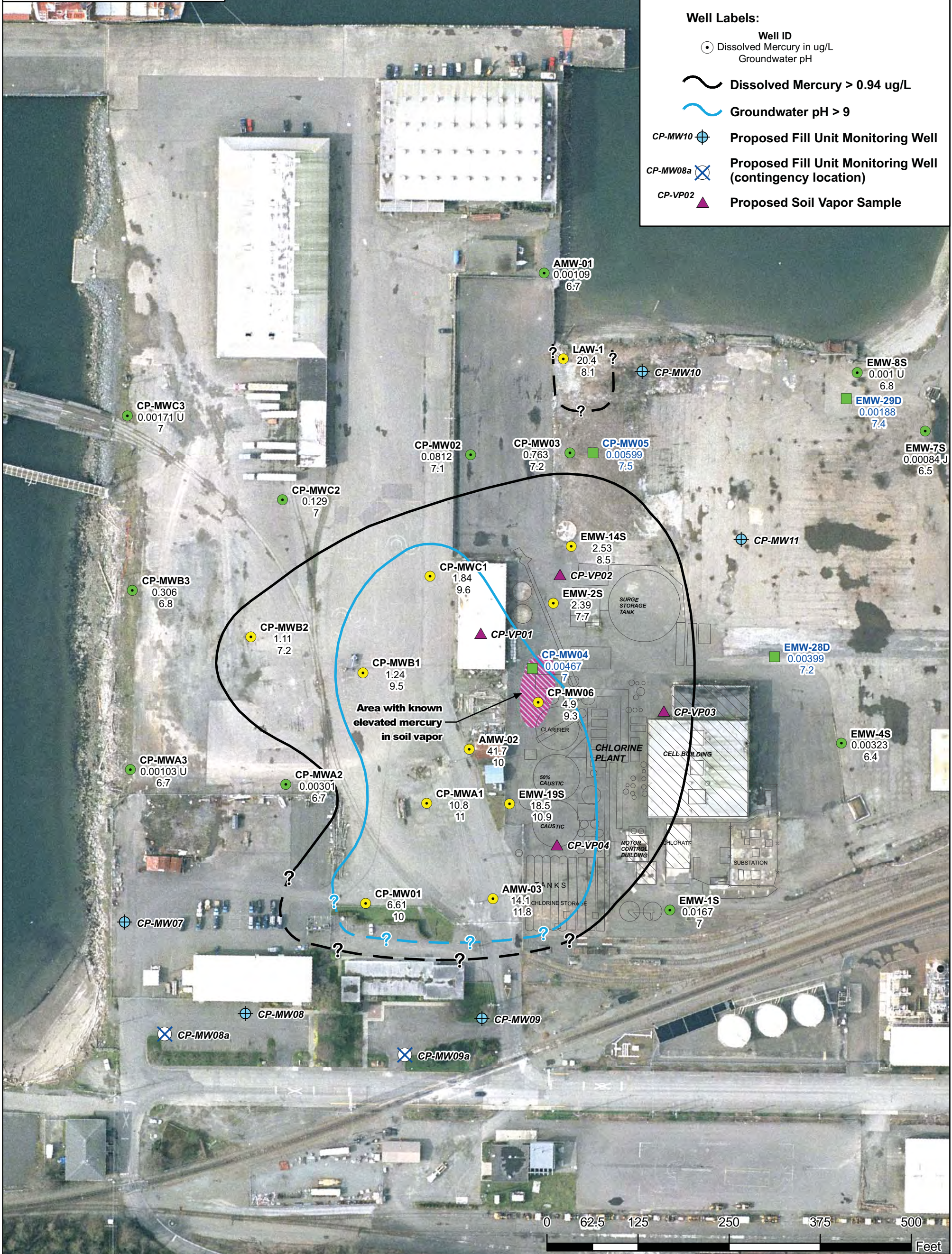
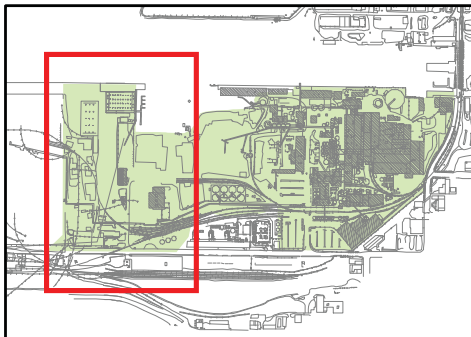
**Notes**

Concentrations in shaded cells indicate value exceeds Preliminary Groundwater Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimated detection limit.



**Well Completion**

- CP-MW04  Lower Sand Monitoring Well
- CP-MW01  Fill Unit Monitoring Well

**Dissolved Mercury in Groundwater**

- Mercury <= 0.94 ug/L
- Mercury > 0.94 ug/L

**Well Labels:**

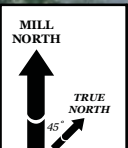
- Well ID
- Dissolved Mercury in ug/L
- Groundwater pH

~ Dissolved Mercury > 0.94 ug/L

~ Groundwater pH > 9

- CP-MW10  Proposed Fill Unit Monitoring Well
- CP-MW08a  Proposed Fill Unit Monitoring Well (contingency location)
- CP-VP02 ▲ Proposed Soil Vapor Sample

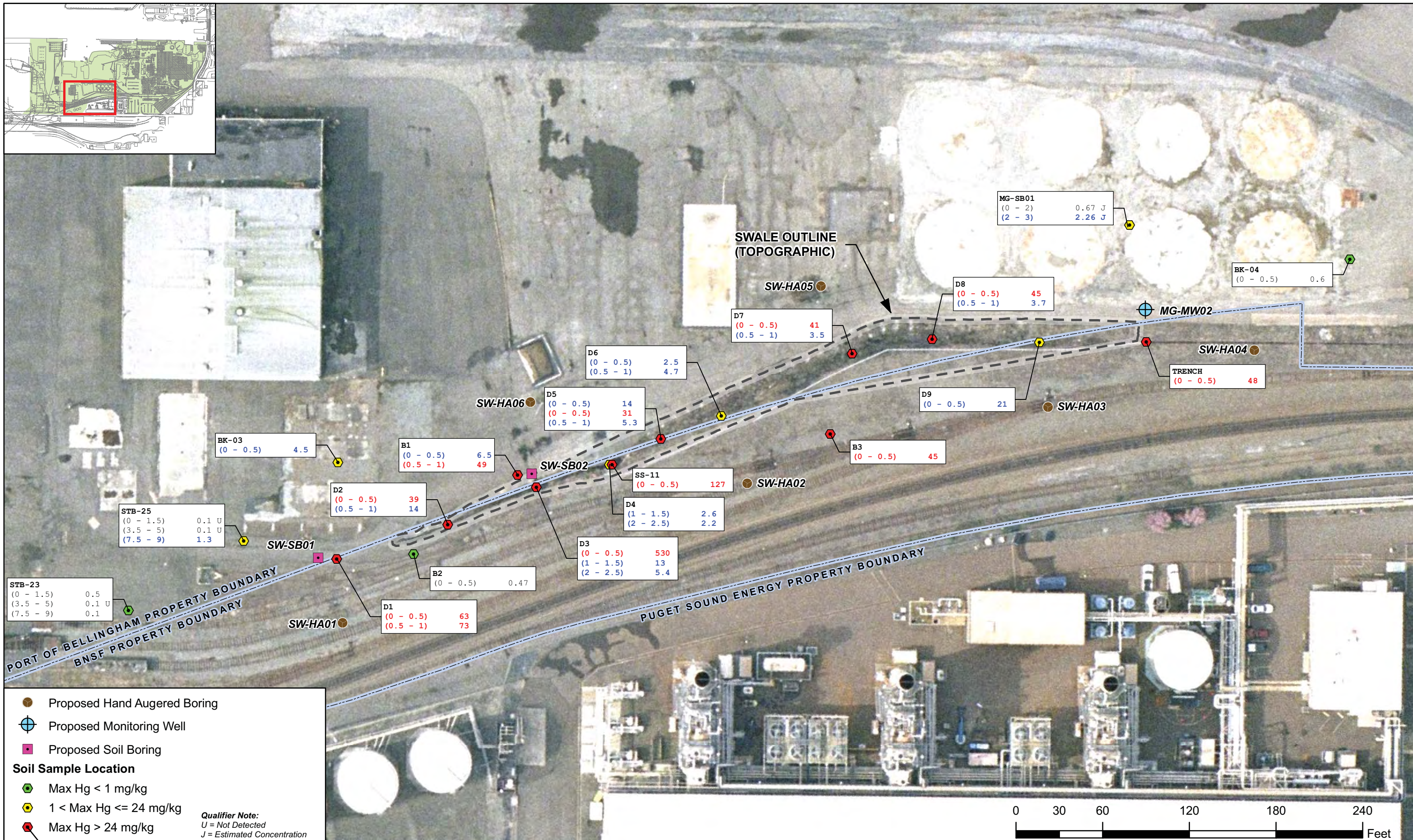
Area with known elevated mercury in soil vapor



**October 2009 Dissolved Mercury and pH in Groundwater, Caustic Plume Area**  
GP West Site RI/FS - Bellingham, WA

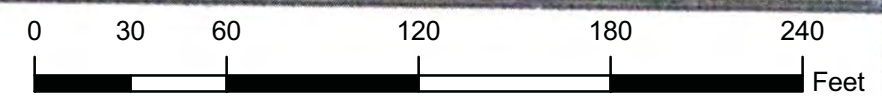
DATE: Feb 2010	PROJECT NO. 070188
DESIGNED BY: PPW	FIGURE NO. 1
DRAWN BY: PPW	
REVISED BY:	

T:\projects\_8\Port\_of\_Bellingham\Working\Draft\_RI\Feb2010\CausiticPlume\_GW\_Hg\_and\_pH.mxd



- Proposed Hand Augered Boring
  - ⊕ Proposed Monitoring Well
  - Proposed Soil Boring
- Soil Sample Location**
- 🟢 Max Hg < 1 mg/kg
  - 🟡 1 < Max Hg ≤ 24 mg/kg
  - 🔴 Max Hg > 24 mg/kg
- Qualifier Note:  
U = Not Detected  
J = Estimated Concentration*

Sample Location ID (Depth Interval in ft)	Hg in mg/kg
RED TEXT indicates concentration > 24 mg/kg	
BLUE TEXT indicates concentration > 1 mg/kg	



MILL NORTH  
TRUE NORTH

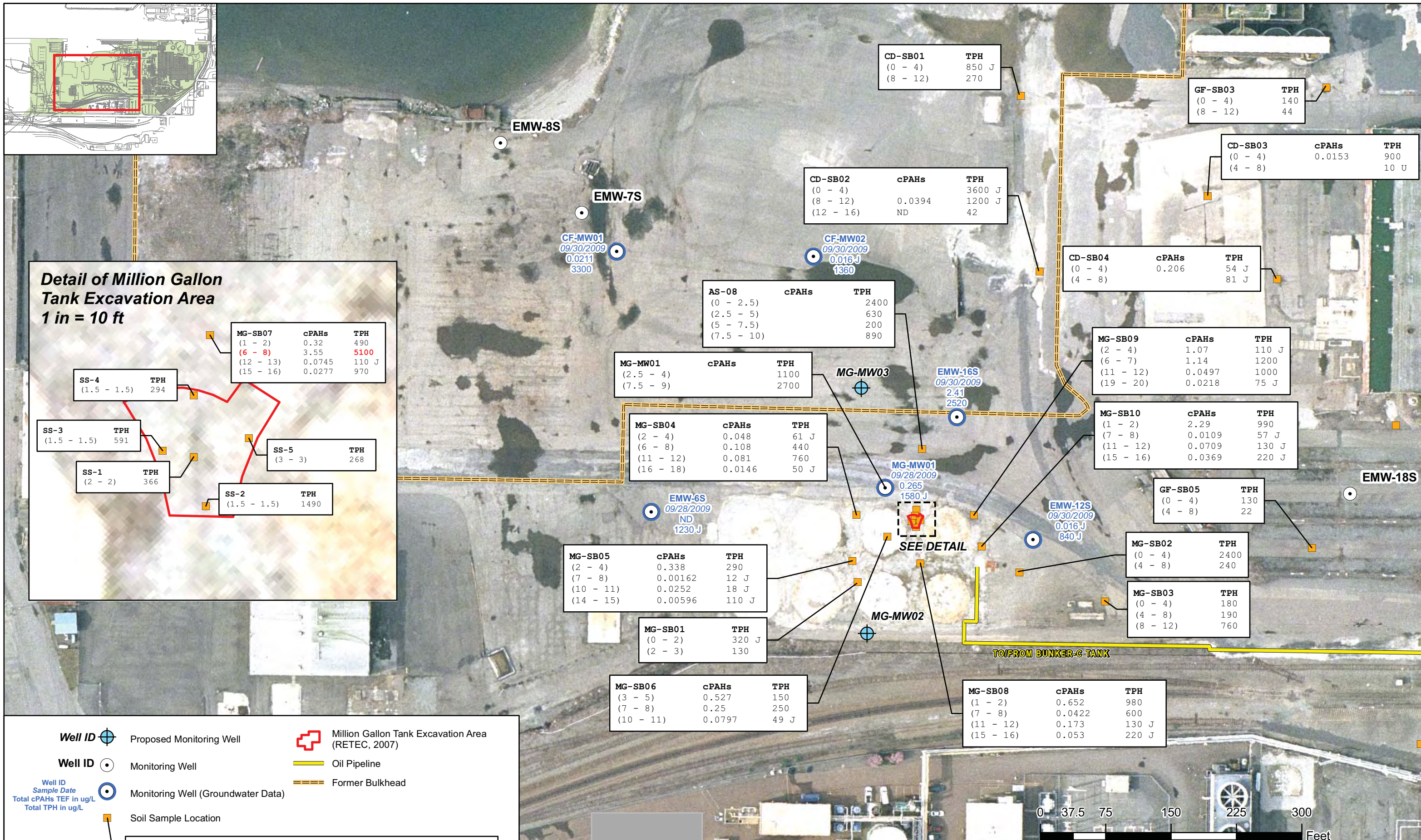
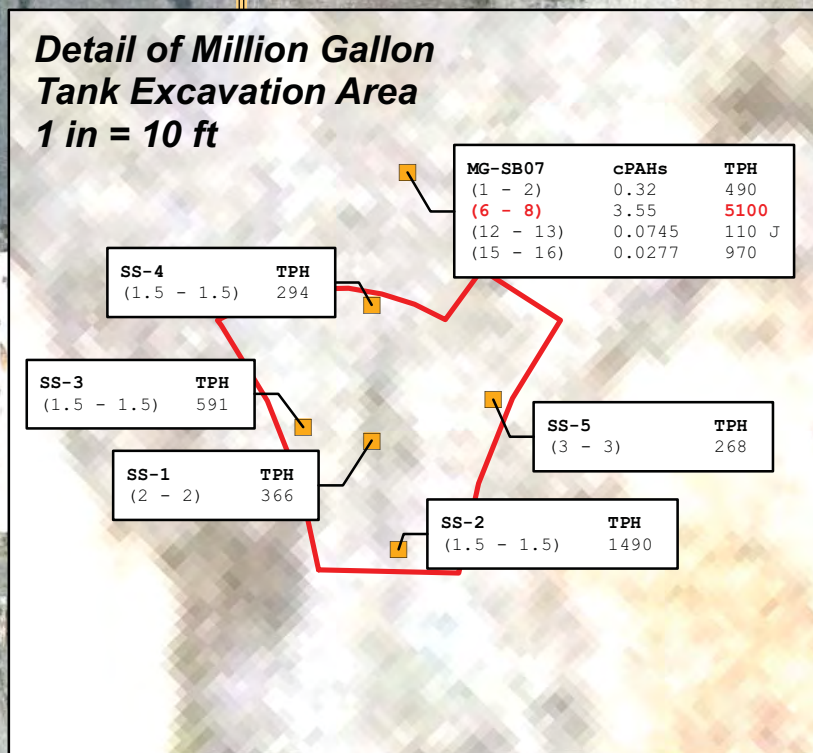
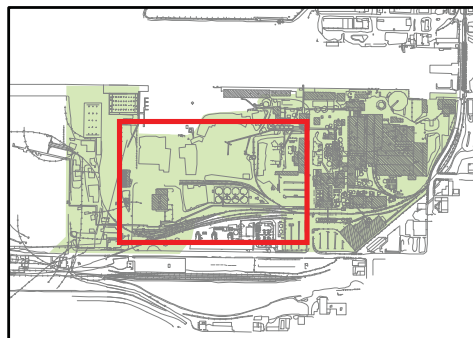
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## Mercury Concentrations in Soil, Stormwater Swale Area

GP West Site RI/FS - Bellingham, WA

DATE: Feb 2010	PROJECT NO. 070188
DESIGNED BY: PPW	
DRAWN BY: PPW	FIGURE NO. 2
REVISED BY:	

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**Well ID** Proposed Monitoring Well

**Well ID** Monitoring Well

**Well ID** Monitoring Well (Groundwater Data)

**Well ID** Soil Sample Location

**Well ID** Million Gallon Tank Excavation Area (RETEC, 2007)

**Well ID** Oil Pipeline

**Well ID** Former Bulkhead

**Well ID** Sample Date

**Well ID** Total cPAHs TEF in ug/L

**Well ID** Total TPH in ug/L

Sample Location ID	Depth Interval in ft	Total cPAHs TEF in mg/kg	Total TPH in mg/kg
XXX	XXX	XXX	XXX

RED TEXT indicates Total TPH > 4100 mg/kg

**Note:** Total TPH is either Bunker C or the sum of detected diesel- and oil-range TPH.

MILL NORTH

TRUE NORTH

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## cPAH and TPH Concentrations in Soil and Groundwater, Million Gallon Tank Area

GP West Site RI/FS - Bellingham, WA



DATE: Feb 2010	PROJECT NO. 070188
DESIGNED BY: PPW	FIGURE NO. 3
DRAWN BY: PPW	
REVISED BY:	

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Well ID	cPAHs	TPH
BC-SB06 (4 - 5)	0.00344	120 U
(9 - 10)	0.00236	170 U
(12 - 14)	0.00203	150 U
(17.5 - 18.5)	0.232	1100
(19 - 20)	0.00361	130 U

BC-MW02 (10/1/09) Dissolved Metals GW Data			
Analyte	µg/L	Analyte	µg/L
Arsenic	10 U	Magnesium	999000
Cadmium	1.5	Manganese	258
Calcium	241000	Mercury	0.001 U
Chromium	1.1 J	Nickel	32.4 J
Copper	12.7 J	Potassium	291000
Iron	554	Sodium	8590000
Lead	412	Zinc	208

Well ID	cPAHs	TPH
BC-MW02 (2 - 4)	0.035	110 U
(8 - 10)	0.0711	840
(12 - 14)	0.194	450
(17 - 19)	1.92	2000
(21 - 22)	0.00184	130 U

Well ID	cPAHs	TPH
GF-SB20 (0 - 4)		110
(4 - 8)		3100
(12 - 16)		98

Well ID	cPAHs	TPH
BC-SB08 (4 - 5)	0.00204	110 U
(9 - 10)	0.0167	130 U
(13 - 14)	0.00333	130 U
(15.5 - 16.5)	0.0683	3000
(18 - 19)	0.00361	120 U

Well ID	cPAHs	TPH
BH-SB02 (4 - 8)		1600
(8 - 12)		1500
(12 - 16)	5.42	430

Well ID	cPAHs	TPH
BC-SB07 (4 - 5)	0.288	4300
(7.5 - 9.5)	0.153	190
(13 - 14)	0.0995	130
(16 - 17)	0.051	130

Well ID	cPAHs	TPH
BC-MW03 (4 - 5)	0.217	140
(7.5 - 9.5)	0.17	140
(13 - 15)	0.00366	120 U
(18.5 - 19.5)	0.00361	130 U

BC-MW01  
10/01/09  
FREE PRODUCT

Well ID	cPAHs	TPH
BC-MW01 (5 - 6.5)		1600
(10 - 11.5)	0.188	8600
(15 - 16.5)		36

BC-MW03  
09/28/2009  
0.0146 J  
144 J

BC-SB10 FROM TANK TO STEAM PLANT

Well ID	cPAHs	TPH
BC-SB01 (0 - 2)		97000
(2 - 2.8)	ND	88000

Well ID	cPAHs	TPH
BC-SB02 (4 - 8)		26000
(8 - 12)	0.586	30000
(12 - 16)		310

Well ID	cPAHs	TPH
GF-SB18 (0 - 4)		220
(4 - 8)		37

TO/FROM MILLION GALLON TANKS

Well ID	cPAHs	TPH
BC-SB03 (4 - 5)	0.212	2100
(8.5 - 9.5)	0.031	220
(11.5 - 12.5)	0.00622	11 J
(14 - 15)	0.0403	47 J

Well ID	cPAHs	TPH
BC-SB05 (7.5 - 8.5)	0.839	87 J
(10.5 - 11.5)	0.00192	9.1 J
(14 - 15)	0.0432	41 J

Well ID	cPAHs	TPH
BC-SB04 (1 - 2)	ND	6.3 J
(7.5 - 8.5)	0.024	14 J
(10.5 - 11.5)	0.00227	5.3 J
(14 - 15)	0.0133	39 J

Well ID	cPAHs	TPH
TS-SB01 (0 - 4)	0.0175	980
(4 - 8)		80

Well ID	cPAHs	TPH
TS-SB02 (0 - 4)	0.0191	220
(4 - 8)		68

Well ID	cPAHs	TPH
TS-MW01 (2.5 - 4)		130
(5 - 6.5)	0.00603	21

Well ID	cPAHs	TPH
GF-SB19 (0 - 4)		840 J
(4 - 8)		160

Well ID	cPAHs	TPH
ET-SB02 (0 - 4)		240
(4 - 8)		30

**Well ID**  
Sample Date  
Total cPAHs TEF in ug/L  
Total TPH in ug/L

Monitoring Well (Groundwater Data)    Proposed Soil Boring  
Monitoring Well Location  
Soil Sample Location

Oil Pipeline

Sample Location ID	Total cPAHs TEF in mg/kg	Total TPH in mg/kg
(Depth Interval in ft) XXX	XXX	XXX

RED TEXT indicates Total TPH > 4100 mg/kg

**Note:** Total TPH is either Bunker C or the sum of detected diesel- and oil-range TPH.

MILL NORTH  
TRUE NORTH  
45°

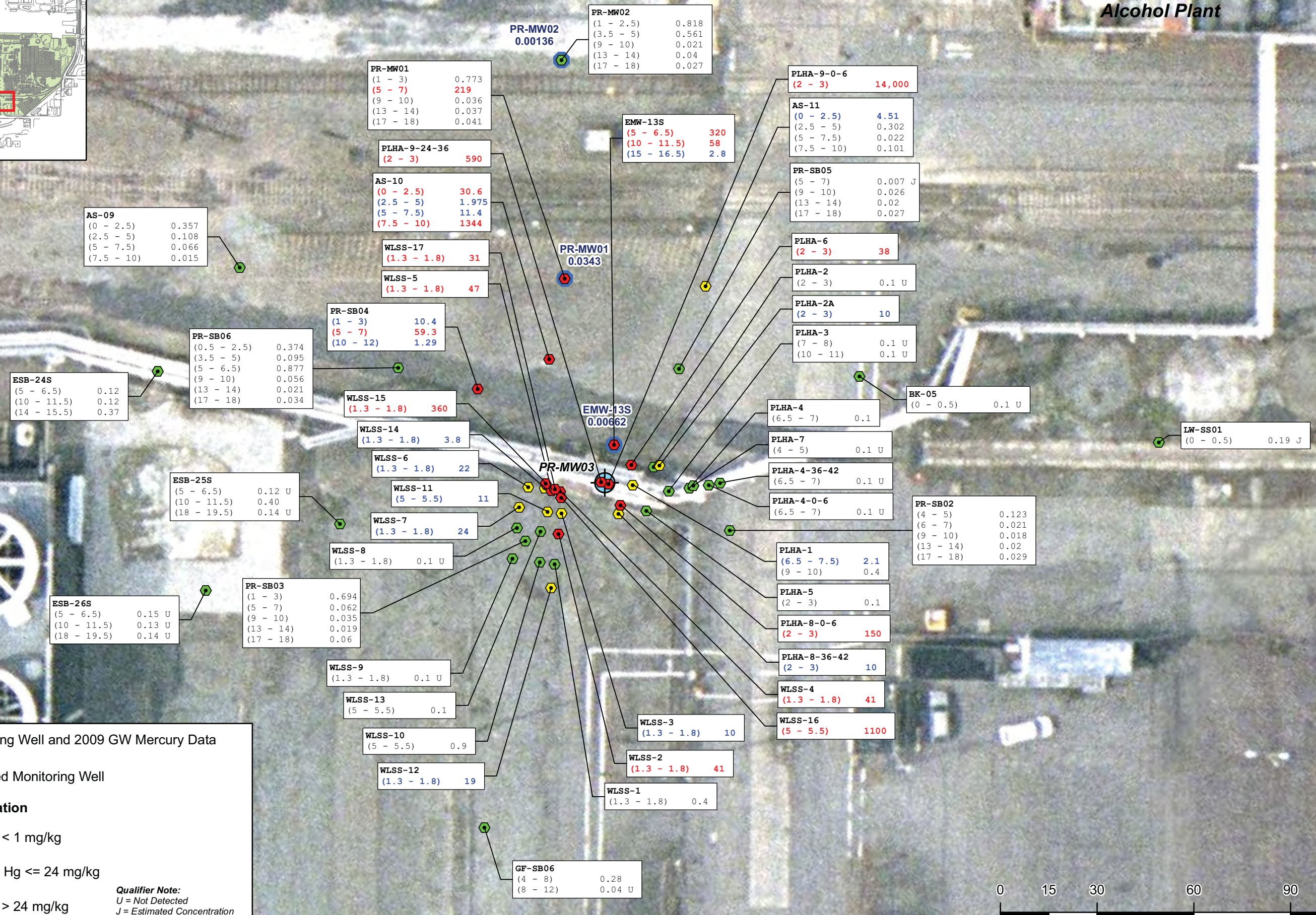
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earth + water  
www.aspectconsulting.com  
a limited liability company

**Soil and Groundwater Data,  
Bunker C Tank Area**  
GP West Site RI/FS - Bellingham, WA



DATE: Feb 2010	PROJECT NO. 070188
DESIGNED BY: PPW	
DRAWN BY: PPW	FIGURE NO. 4
REVISED BY:	

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**Well ID** Monitoring Well and 2009 GW Mercury Data  
**Well ID** Proposed Monitoring Well

**Soil Sample Location**

- Max Hg < 1 mg/kg
- 1 < Max Hg <= 24 mg/kg
- Max Hg > 24 mg/kg

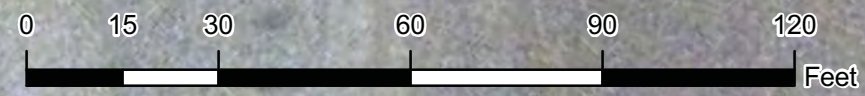
**Qualifier Note:**  
 U = Not Detected  
 J = Estimated Concentration

Sample Location ID (Depth Interval in ft)	Hg in mg/kg
<b>RED TEXT</b> indicates concentration > 24 mg/kg	
<b>BLUE TEXT</b> indicates concentration > 1 mg/kg	

MILL NORTH  
  
 TRUE NORTH

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 earth+water  
 www.aspectconsulting.com  
 a limited liability company

**Mercury Concentrations in Soil and Groundwater,  
 Laurel Street Pipe Rack Area**  
 GP West Site RI/FS - Bellingham, WA



DATE: Feb 2010	PROJECT NO. 070188
DESIGNED BY: PPW	
DRAWN BY: PPW	FIGURE NO. 5
REVISED BY:	





Well ID → AMW-01 (6.1) ⊕ Wells

Spot groundwater elevation measured between 8:50 and 10:20 am on 9/25/09

\* Anomalous value not included in contouring.

○ Well sampled in 2004, now inaccessible

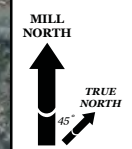
— Fill Unit GW Elevation Contours

➔ Generalized groundwater flow direction

— City of Bellingham Storm Sewer

— Former Bulkhead

**NOTE:** Vertical datum for groundwater elevations is MLLW

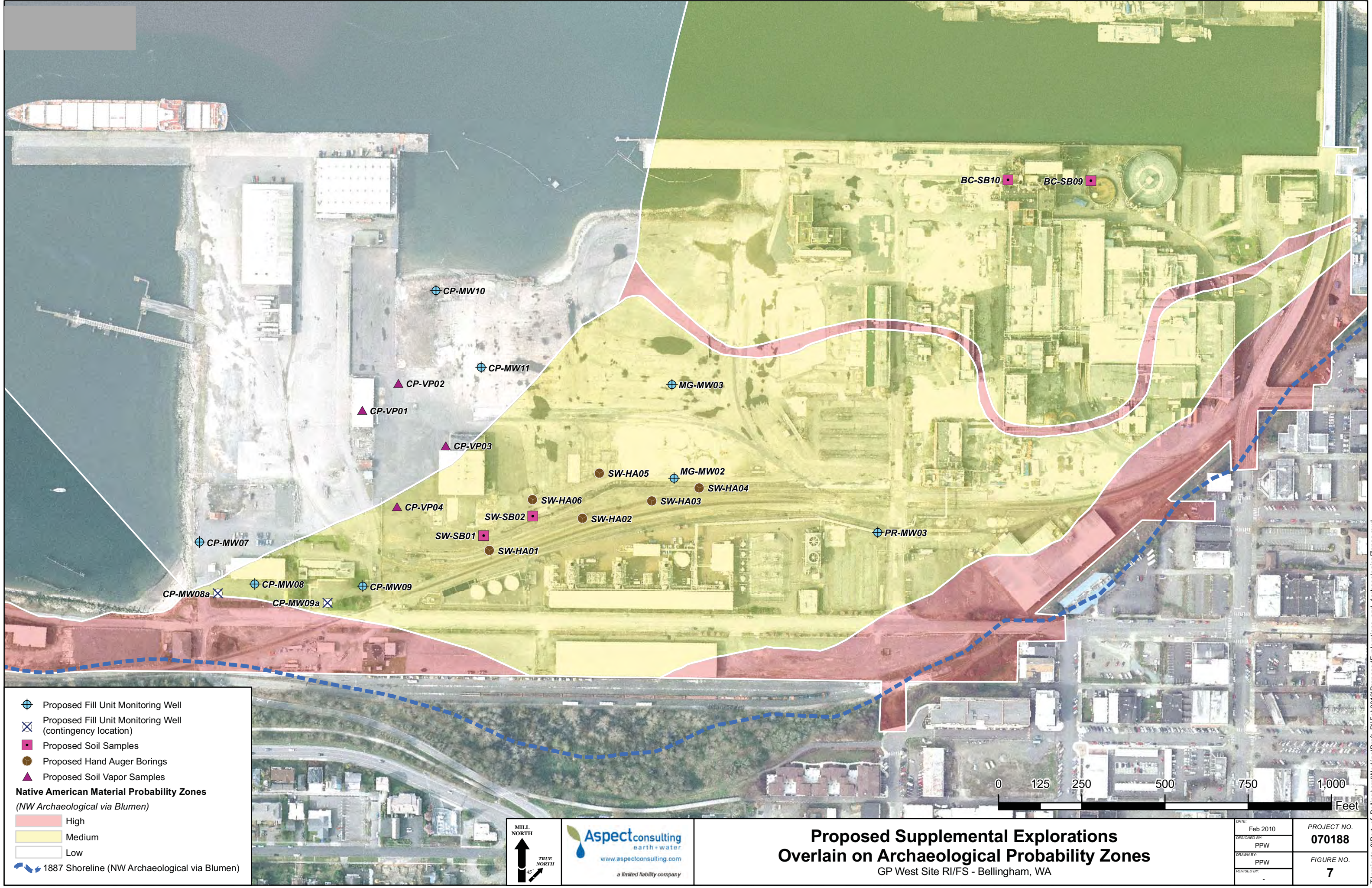


### Fill Unit Groundwater Elevation Contours (Sept 2009)

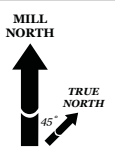
GP West Site RI/FS - Bellingham, WA

DATE: Feb 2010	PROJECT NO. 070188
DESIGNED BY: JTL	FIGURE NO. 6
DRAWN BY: PPW	
REVISED BY:	

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- ⊕ Proposed Fill Unit Monitoring Well
  - ⊗ Proposed Fill Unit Monitoring Well (contingency location)
  - Proposed Soil Samples
  - Proposed Hand Auger Borings
  - ▲ Proposed Soil Vapor Samples
- Native American Material Probability Zones**  
(NW Archaeological via Blumen)
- High
  - Medium
  - Low
- 1887 Shoreline (NW Archaeological via Blumen)



**Proposed Supplemental Explorations  
Overlain on Archaeological Probability Zones**  
GP West Site RI/FS - Bellingham, WA

DATE: Feb 2010	PROJECT NO. 070188
DESIGNED BY: PPW	
DRAWN BY: PPW	FIGURE NO. 7
REVISED BY:	

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