



May 23, 2011

Mr. David South
Senior Engineer
Toxics Cleanup Program
Washington Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

Re: Proposed Additional Data Gap Investigation Sampling and Pilot Testing Activities, Laurel Station, 1009 East Smith Road, Bellingham, Washington – Revision 1.0

Dear Mr. South:

In June and August 2010 and February 2011, Kinder Morgan Canada (Kinder Morgan) and URS Corporation (URS) performed the data gap investigation outlined in Section 9.0 and Appendix G (Sampling and Analysis Plan [SAP]) of the Final Supplemental Remedial Investigation/Feasibility Study (RI/FS) Work Plan (URS, 2010a) and the Work Plan Addendums (URS, 2010b and 2011) for the Laurel Station facility. The following additional data gap investigation sampling activities were performed in February 2011:

- Drilling and installation of groundwater monitoring wells in Study Unit 1 (borings SU1-B29 and MW-1 through MW-8) (Figure 1)
- Groundwater samples were collected from existing site monitoring wells SW-1 through SW-4 and new wells MW-1, MW-2, and MW-4 through MW-7 in February 2011 (Figure 1, monitoring wells SW-5, MW-3 and MW-8 were dry)

PRELIMINARY DATA GAP INVESTIGATION FINDINGS AND CONCEPTUAL MODEL FOR THE FORMER OILY WATER SUMP AREA

Subsurface Conditions

During the 1950s, the slope located to the southeast of the current pump station building and piping manifold was cut back during station construction activities. The Bellingham Drift (the uppermost geologic unit at the site), which consists of silty pebbly clay, was removed from this portion of the site during the construction activities, effectively creating an area for overland stormwater flow to infiltrate into the underlying glacial outwash deposits and shallow perched groundwater. Shallow perched groundwater in this portion of the site does not appear to be continuous across the entire site and the perched groundwater elevation may fluctuate substantially with precipitation events.

Soil Impacts

Impacted soil in this portion of the site appears to be the result of accidental leakage from the former oily water sump. The former oily water sump was reportedly constructed of a 4x4 foot concrete structure, which extended from the ground surface to approximately 16 feet below ground surface. The former oily water sump received discharges from a number of former sources including drain lines from the three main pumps, valve and pipe fittings, and oily water from the storage tanks that separated out from the crude oil. The oily water sump was originally designed so that water which accumulated was drained along the drain line to a burn pit west of the office building, while the accumulated oil in an oil/water

separator was pumped back into the pipeline. Following removal of the sump in 1991, river rock was used to backfill the excavation.

The areal extent of soils exceeding preliminary cleanup levels (PCLs) for total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAHs) is approximately 8,000 square feet (Figure 1). The greatest vertical thickness of soil contamination (up to 20 feet) is seen in the locations of SU1-B12, SU1-B21, and MW-1 (Figure 2), located approximately 20 feet northeast of the former oily water sump. The vertical thickness of soil contamination decreases with lateral distance from this location.

The preliminary analytical data for the soil samples (Tables 1a and 1b) collected during the February 2011 data gap investigation activities indicated that additional borings are necessary to define the lateral extent of petroleum impacts to the south, southeast and east of the former oily water sump area (Figure 1). The lateral extent of petroleum-impacted soils is also not defined to the north of boring location SU1-B11 (Figure 1).

Shallow Perched Groundwater Impacts

Impacted shallow perched groundwater at the site appears to be the result of stormwater infiltrating directly into the underlying glacial outwash deposits (where the Bellingham Drift has been removed) and coming into contact with impacted soils. The shallow perched groundwater appears to migrate within preferential pathways (coarser outwash deposits), which were observed in soil cores to be interbedded within the upper portion of the outwash deposits. Based on the February and April 2011 groundwater elevations, a mound of shallow perched groundwater was inferred in the vicinity of MW-2 and MW-6. Groundwater was interpreted to flow southeasterly, southerly and westerly from this mounded area (Figure 3).

The preliminary analytical data for the groundwater samples collected from the site monitoring wells in February 2011 indicated that TPH concentrations exceeded PCLs in MW-1, MW-2, MW-5 and MW-7 (Tables 2a and 2b). Based on these results, the lateral extent of impacted groundwater to the east of the former oily water sump is not defined (Figure 4).

PROPOSED ADDITIONAL FIELD INVESTIGATION

To further characterize the lateral extent of hydrocarbon impacts in soil to the south, southeast and east of the former oily water sump area, 6 soil borings (MW-9 through MW-14) will be drilled in the proposed locations depicted on Figure 1 and completed as groundwater monitoring wells screened within the perched groundwater zone. Additionally, one soil boring (SU1-B30) will be drilled to the north of soil boring SU1-B11 to further characterize impacts to soil at that location (Figure 1). The rationale for each proposed location is presented in Table 3. These borings will be completed using sonic drilling techniques.

The next phase of field work is tentatively scheduled for the weeks of June 6 and June 13, 2011, and will include soil sample collection using Sonic drilling methods, groundwater monitoring well installations, and the collection of groundwater samples from the new monitoring wells during the next scheduled quarterly monitoring event (June 2011). This additional field work will be performed based on procedures approved in Appendix G of the Final Supplemental RI/FS Work Plan (URS, 2010a) and the Work Plan Addendums (URS, 2010b and 2011) and is discussed in more detail below.

Soil Sampling

The proposed boring and monitoring well locations are shown on Figure 1. The proposed sampling depths and analytical methods are outlined in Table 3. Sample collection and handling will be performed as described in the SAP.

Additional soil volume (approximately 5 total gallons) will be collected from proposed source-area borings MW-9 and/or MW-10 for the purposes of performing a thermal treatability study. The treatability study and testing will be performed by TerraTherm, Inc. of Fitchburg, Massachusetts and Kemron Environmental Services, Inc. of Atlanta, Georgia. The objectives of the treatability study are to determine if thermal heating of soils in the former oily water sump area can effectively reduce contaminant concentrations to below PCLs and the treatment temperature required to achieve that reduction. The study will include analysis of pretreatment samples for TPH and PAHs, treatment of soil at three different temperatures (100°C, 150°C, and 225°C), and analysis of post-treatment samples for TPH and PAHs. The results of the treatability study will be included as part of the evaluation of this remedial technology in the Draft Supplemental RI/FS Report.

Monitoring Well Installation

Proposed monitoring wells MW-9 and MW-10 will be installed and screened across the area of contamination within the glacial outwash deposits near the former oily water sump (Figure 1), and will be constructed with 4-inch diameter, flush-threaded blank and screened stainless steel well casing. Each of the wells will have a bottom, flush-threaded cap, up to 20 feet of screened well casing, and blank well casing to complete the wells to ground surface. The wells will be constructed with 0.020-inch slotted screen and 2/12 filter sand.

Proposed monitoring wells MW-11 through MW-14 will be installed and screened just below the Bellingham Drift and within the glacial outwash deposits present in this area of the site. The wells will be constructed with 2-inch-diameter, flush-threaded, blank and screened schedule 40 polyvinyl chloride (PVC) well casing. Each of the wells will have a bottom, flush-threaded cap, 10 to 25 feet of screened well casing, and blank well casing to complete the wells to ground surface. The wells will be constructed with 0.010-inch slotted screen and 20/40 filter sand.

Following installation, the location and elevation of the groundwater monitoring well network will be surveyed by a licensed land surveyor.

Groundwater Sampling

If groundwater is present in the new wells, the wells will be included in the current quarterly groundwater sampling program to further assess impacts to shallow perched groundwater. Groundwater samples will be collected from the new wells on a quarterly basis for the remainder of 2011 (3 total events) and will be analyzed for gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx, diesel and motor oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx, BTEX by EPA Method 8021B, and PAHs by 8270D-SIM. Groundwater samples from monitoring wells SW-2, MW-1, MW-2, MW-4, MW-5, MW-6, MW-7, and proposed monitoring well MW-10 will also be analyzed for monitored natural attenuation (MNA) parameters including dissolved oxygen, nitrate, ferrous iron, manganese, sulfate, methane, oxidation reduction potential, pH, temperature, specific conductivity, and alkalinity.

Groundwater sampling will be conducted using disposable bailers designed to accommodate suspended solids in the water column that previously precluded the use of downhole pumps for low flow sampling.

Groundwater field parameters will be monitored until stabilized readings are obtained or three well casing volumes have been purged. Groundwater elevation measurements recorded during the well monitoring will be used to confirm groundwater flow conditions at the site.

Dual-Phase Extraction (DPE) and Bioventing (BV) Pilot Testing

Proposed monitoring wells MW-9 and MW-10 will be used as pilot test extraction wells to assess DPE and BV remediation technologies. Existing monitoring wells MW-1, MW-2, MW-5, MW-7, SW-4 and SW-5 will be used as observation wells during the pilot tests. A detailed pilot testing work plan will be prepared separately and submitted to Ecology for approval prior to implementing pilot testing activities.

SCHEDULE

The proposed drilling activities are tentatively scheduled for the weeks of June 6 and June 13, 2011. The next quarterly groundwater monitoring event is scheduled for late June 2011. The proposed pilot testing activities are tentatively scheduled for August 2011 and the pilot testing work plan will be submitted in late June/early July 2011. Kinder Morgan and URS anticipate that meetings will be necessary with Ecology prior to and following completion of the pilot testing activities to discuss the cleanup alternatives that will likely be evaluated as part of the Feasibility Study. These meetings will likely occur in July 2011 and late September/October 2011. The Draft Supplemental RI/FS Report will be submitted to Ecology in December 2011 or January 2012.

We trust this information meets your current requirements. Please contact us if you have any questions.



MICHAEL THOMAS MEYER

Sincerely,
URS CORPORATION

A handwritten signature in black ink that reads "Karen L. Mixon".

Karen L. Mixon
Project Manager

A handwritten signature in blue ink that reads "Michael T. Meyer".

Michael T. Meyer, LHG, LEG
Project Engineering Geologist

Copy: Mike Droppo – Kinder Morgan
Patrick Davis – Kinder Morgan
Dale McClary – Kinder Morgan
Matt Annis – URS Corporation

References

URS, 2010a. *Final Supplemental Remedial Investigation/Feasibility Study Work Plan, Laurel Station, 1009 East Smith Road, Bellingham, Washington.* May 28.

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URS, 2010b. Proposed Additional Data Gap Investigation Sampling Activities, Laurel Station, 1009 East Smith Road, Bellingham, Washington. August 5.

URS, 2011. Proposed Additional Data Gap Investigation Activities, Laurel Station, 1009 East Smith Road, Bellingham, Washington. January 20.

Attachments:

Table 1a – Summary of Soil Analytical Results for Study Unit 1 – TPH and BTEX

Table 1b – Summary of Soil Analytical Results for Study Unit 1 – PAHs

Table 2a – Summary of Groundwater Analytical Results – TPH and BTEX

Table 2b – Summary of Groundwater Analytical Results – PAHs

Table 3 – Proposed Sampling Locations and Rationale

Figure 1 – Proposed Soil Boring/Monitoring Well Locations (Study Unit 1)

Figure 2 – Geologic Cross Section F-F'

Figure 3 – Groundwater Elevation Contour Map, Shallow Perched Groundwater – February 23, 2011

Figure 4 – Isoconcentration Contour Map – Shallow Perched Groundwater

Table 1a
 Summary of Soil Analytical Results for Study Unit 1 - TPH and BTEX
 Laurel Station
 Bellingham, Washington

Location ID	Sample Date	Depth (ft bgs)	Analyte							
			TPH (mg/kg)			VOCs (ug/kg)				
			TPH - gasoline range	TPH - diesel range	TPH - oil range	benzene	toluene	ethylbenzene	m,p-xylene	o-xylene
Preliminary Cleanup Level			100 / 30^a	460	2,000	30	7,000	6,000	9,000^b	9,000^b
MW-1	1/31/2011	20	1,400	1,600	1,400	40 U	40 U	40 U	80 U	1,600
		25	13	560	510	12 U	12 U	12 U	25 U	12 U
MW-2	2/1/2011	5	6.6 U	17	42	17 U	17 U	17 U	33 U	17 U
		10	5.5 U	16	21	14 U	14 U	14 U	27 U	14 U
		15	290	200	210	20 U	20 U	20 U	40 U	280
		20	6.6 U	5.2 U	30	16 U	16 U	16 U	33 U	16 U
		25	6.4 U	5.2 U	10 U	16 U	16 U	16 U	32 U	16 U
		30	5.8 U	100	120	14 U	14 U	14 U	29 U	14 U
		35	5.8 U	5.2 U	10 U	14 U	14 U	14 U	29 U	14 U
MW-3	2/2/2011	5	8 U	6.3 U	13 U	20 U	20 U	20 U	40 U	20 U
		10	6.2 U	5.7 U	11 U	15 U	15 U	15 U	31 U	15 U
		15	7.5 U	5.4 U	11 U	19 U	19 U	19 U	38 U	19 U
		20	8.2 U	5.9 U	12 U	20 U	20 U	20 U	41 U	20 U
		25	7.5 U	6.1 U	12 U	19 U	19 U	19 U	38 U	19 U
		30	5.8 U	5.3 U	11 U	14 U	14 U	14 U	29 U	14 U
MW-4	2/2/2011	5	7 U	5.8 U	12 U	17 U	17 U	17 U	35 U	17 U
		10	5.6 U	5.7 U	11 U	14 U	14 U	14 U	28 U	14 U
		15	5.8 U	5.7 U	11 U	15 U	15 U	15 U	29 U	15 U
		20	6.5 U	5.8 U	12 U	16 U	16 U	16 U	32 U	16 U
		25	5.1 U	5.2 U	16	13 U	13 U	13 U	25 U	13 U
		30	5.3 U	5.2 U	11	13 U	13 U	13 U	27 U	13 U
MW-5	2/3/2011 DUP	20	6.3 U	5.2 U	10 U	16 U	16 U	16 U	31 U	16 U
		20	6.2 U	5.2 U	10 U	16 U	16 U	16 U	31 U	16 U
		25	6.4 U	5.1 U	10 U	16 U	16 U	16 U	32 U	16 U
		30	6.4 U	5.3 U	11 U	16 U	16 U	16 U	32 U	16 U
		35	140	200	220	13 U	13 U	100	26 U	13 U
		40	5.8 U	5.2 U	16	14 U	14 U	14 U	29 U	14 U
SU1-B1	6/15/2010	5	8.1 U	6.7 U	21	20 U	20 U	20 U	40 U	20 U
		10	5.6 U	5.6 U	11 U	14 U	14 U	14 U	28 U	14 U
		15	5.4 U	5.3 U	11 U	14 U	14 U	14 U	27 U	14 U
SU1-B2	6/15/2010	5	190	95	17	13 U	13 U	450	27 U	13 U
		10	5.4 U	5.7 U	11 U	14 U	14 U	14 U	27 U	14 U
		15	5.4 U	5.3 U	11 U	14 U	14 U	14 U	27 U	14 U
SU1-B3	6/16/2010	5	9.1 U	7.2 U	14 U	23 U	23 U	23 U	45 U	23 U
		10	6 U	5.8 U	12 U	15 U	15 U	15 U	30 U	15 U
		15	5.3 U	5.8 U	12 U	13 U	13 U	13 U	26 U	13 U
SU1-B4	6/15/2010	5	85	7.6 U	15 U	28 U	28 U	240	57 U	28 U
		10	6.1 U	5.9 U	12 U	15 U	15 U	15 U	31 U	15 U
		15	6 U	5.6 U	11 U	15 U	15 U	15 U	30 U	15 U
SU1-B5	6/16/2010	2	6.6 U	6 U	12 U	17 U	17 U	17 U	33 U	17 U
		5	5.6 U	5.7 U	12 U	14 U	14 U	14 U	28 U	14 U
SU1-B6	6/16/2010	3	6.1 U	5.9 U	12 U	15 U	15 U	15 U	30 U	15 U
		5	41	47	12 U	46	32	100	100	15 U
		10	5.2 U	5.8 U	12 U	13 U	13 U	13 U	26 U	13 U

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 Laurel Station
 Bellingham, Washington

Location ID	Sample Date	Depth (ft bgs)	Analyte							
			TPH (mg/kg)			VOCs (ug/kg)				
			TPH - gasoline range	TPH - diesel range	TPH - oil range	benzene	toluene	ethylbenzene	m,p-xylene	o-xylene
Preliminary Cleanup Level			100 / 30^a	460	2,000	30	7,000	6,000	9,000^b	9,000^b
SU1-B7	6/16/2010	3	6.7 U	5.9 U	12 U	17 U	17 U	17 U	34 U	17 U
		5	40	6.4 U	13 U	1,100	20 U	560	4,900	170
		10	9.2	6 U	12 U	15 U	15 U	15 U	31 U	15 U
		12	6 U	5.8 U	12 U	15 U	15 U	15 U	30 U	15 U
SU1-B8	6/16/2010	5	30	8.2 U	20	420	30 U	47	220	30 U
		10	6.3 U	5.5 U	11 U	16 U	16 U	16 U	31 U	16 U
		12	5.4 U	5.7 U	11 U	13 U	13 U	13 U	27 U	13 U
SU1-B9	6/16/2010	3	6 U	8.8	40	15 U	15 U	15 U	30 U	15 U
		5	9.4	6 U	12 U	680	14 U	190	1,300	88
		10	6.4 U	5.8 U	12 U	16 U	16 U	16 U	32 U	16 U
		12.5	5.8 U	5.8 U	12 U	15 U	15 U	15 U	29 U	15 U
		DUP 12.5	5.4 U	5.6 U	11 U	14 U	14 U	14 U	27 U	14 U
SU1-B10	6/14/2010	5	12 U	5.7 U	11 U	29 U	29 U	29 U	58 U	29 U
		10	11 U	5.7 U	12 U	28 U	28 U	28 U	57 U	28 U
		15	10 U	5.5 U	11 U	25 U	25 U	25 U	51 U	25 U
SU1-B11	6/14/2010	5	1,800	140	130	33 U	190	3,700	65 U	33 U
		10	5.8 U	5.6 U	11 U	15 U	15 U	15 U	29 U	110
		15	5.3 U	5.4 U	11 U	13 U	13 U	13 U	26 U	13 U
		DUP 15	10 U	5.5 U	11 U	26 U	26 U	26 U	52 U	26 U
SU1-B12	6/7/2010	6	5.8	6.4	12	11 U	18	11 U	23 U	20
		10	1,200	940	1,100	18	150	2,300	120	1,000
		15	8,400	3,700	3,400	180 U	1,100	16,000	680	2,800
		20	2,200	1,200	1,100	30 U	250	4,400	170	1,800
		34	63	54	63	13 U	13 U	61	26 U	34
		45	350	140	140	13 U	41	570	34	240
SU1-B13	8/18/2010	5	4.9 U	5.3 U	11 U	12 U	12 U	12 U	25 U	12 U
		10	11	13	18	13 U	13 U	13 U	26 U	13 U
		DUP 10	4.2 U	20	28	10 U	10 U	10 U	21 U	10 U
		15	5.2 U	5 U	10 U	13 U	13 U	13 U	26 U	13 U
		20	5.6 U	5.5 U	11 U	14 U	14 U	14 U	28 U	14 U
		25	5.2 U	5.3 U	11 U	13 U	13 U	13 U	26 U	13 U
		30	5.3 U	5.3 U	11 U	13 U	13 U	13 U	26 U	13 U
SU1-B14	6/8/2010	5	15	45	71	12 U	12 U	12 U	24 U	12 U
		10	5.6 U	5.1 U	10 U	14 U	14 U	14 U	28 U	14 U
		15	1,500	1,200	1,200	26 U	240	4,400	190	26 U
		DUP 15	1,000	920	920	12 U	110	1,800	85	12 U
		20	920	840	900	14 U	86	1,600	110	430
		DUP 25	160	240	260	14 U	14 U	170	27 U	74
		30	5.6 U	5 U	10 U	14 U	14 U	14 U	28 U	14 U
		35	11	5.2 U	10 U	13 U	33	13 U	36	19
		40	6.1 U	5.1 U	10 U	15 U	15	15 U	30 U	15 U
		45	6.6 U	5.1 U	10 U	16 U	16 U	16 U	33 U	16 U

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Location ID	Sample Date	Depth (ft bgs)	Analyte							
			TPH (mg/kg)			VOCs (ug/kg)				
			TPH - gasoline range	TPH - diesel range	TPH - oil range	benzene	toluene	ethylbenzene	m,p-xylene	o-xylene
Preliminary Cleanup Level			100 / 30^a	460	2,000	30	7,000	6,000	9,000^b	9,000^b
SU1-B15	8/18/2010	5	6.1 U	5.4 U	11 U	15 U	15 U	15 U	31 U	15 U
		10	5 U	5 U	10 U	12 U	12 U	12 U	25 U	12 U
		15	14	570	590	17	19	13 U	25 U	13 U
	8/19/2010	20	5.2 U	5.1 U	10 U	13 U	13 U	13 U	26 U	13 U
		25	6.2 U	5.2 U	10 U	16 U	16 U	16 U	31 U	16 U
		30	5.5 U	5.3 U	10 U	14 U	14 U	14 U	27 U	14 U
SU1-B16	6/8/2010	5	5.6 U	93	59	14 U	14 U	14 U	28 U	14 U
		15	5.5 U	5.3 U	11 U	14 U	14 U	14 U	27 U	14 U
		20	6 U	5.1 U	10 U	15 U	15 U	15 U	30 U	15 U
		25	5.4 U	5.3 U	11 U	14 U	14 U	14 U	27 U	14 U
		30	5 U	5.2 U	10 U	12 U	12 U	12 U	25 U	12 U
		35	5.7 U	5.1 U	10 U	14 U	14 U	14 U	28 U	14 U
SU1-B17	6/15/2010	3	6.2 U	5.4 U	11 U	16 U	16 U	16 U	31 U	16 U
		5	5.7 U	5.6 U	11 U	14 U	14 U	14 U	28 U	14 U
		10	5.5 U	5.6 U	11 U	14 U	14 U	14 U	27 U	14 U
SU1-B18	6/16/2010	5	6.3 U	6 U	12 U	16 U	16 U	16 U	32 U	16 U
		10	5.5 U	5.6 U	11 U	14 U	14 U	14 U	27 U	14 U
SU1-B19	6/14/2010	6	14	7.6	23	14 U	14 U	14 U	28 U	570
		8	8.8 U	5.4 U	11 U	22 U	22 U	22 U	44 U	110
		10	6.4 U	5.6 U	11 U	16 U	16 U	16 U	32 U	16 U
SU1-B20	6/7/2010	29	7.3 U	14	19	18 U	18 U	18 U	36 U	18 U
		30	5.7 U	5.1 U	10 U	14 U	14 U	14 U	28 U	14 U
SU1-B21	8/17/2010	32	5.5 U	8	42	14 U	14 U	14 U	28 U	14 U
		45	5 U	5 U	10 U	12 U	12 U	12 U	25 U	12 U
		50	5.5 U	5.3 U	11 U	14 U	14 U	14 U	28 U	14 U
SU1-B22	8/17/2010	5	5.6 U	5 U	10 U	14 U	14 U	14 U	28 U	14 U
		10	190	85	100	14 U	29	310	33	80
		15	5.7 U	5.3 U	11 U	14 U	14 U	14 U	28 U	14 U
		20	5.1 U	5.2 U	10 U	13 U	13 U	13 U	26 U	13 U
	8/18/2010	25	5.2 U	5 U	10 U	13 U	13 U	13 U	26 U	13 U
		30	6 U	5.2 U	10 U	15 U	15 U	15 U	30 U	15 U
		35	5.4 U	5.3 U	11 U	14 U	14 U	14 U	27 U	14 U
		40	4.8 U	5.3 U	11 U	12 U	12 U	12 U	24 U	12 U
45	5.6 U	5 U	10 U	14 U	14 U	14 U	28 U	14 U		
SU1-B23	8/19/2010	5	5.5 U	10	81	14 U	14 U	14 U	28 U	14 U
		10	4.9 U	5 U	10 U	12 U	12 U	12 U	24 U	12 U
		15	5.7 U	5.3 U	10 U	14 U	14 U	14 U	29 U	14 U
		20	6.6 U	5.7 U	12 U	17 U	17 U	17 U	33 U	17 U
		25	5.3 U	5.2 U	10 U	13 U	13 U	13 U	26 U	13 U
SU1-B24	8/19/2010 DUP	5	6.2 U	5.3 U	11 U	15 U	15 U	15 U	31 U	15 U
		5	7.4 U	5.3 U	11 U	19 U	19 U	19 U	37 U	19 U
		10	5.5 U	5.3 U	11 U	14 U	14 U	14 U	28 U	14 U
		15	5.4 U	5.1 U	10 U	13 U	13 U	13 U	27 U	13 U
		20	5.6 U	5 U	10 U	14 U	14 U	14 U	28 U	14 U
		25	5.9 U	5.1 U	10 U	15 U	15 U	15 U	30 U	15 U

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Location ID	Sample Date	Depth (ft bgs)	Analyte								
			TPH (mg/kg)			VOCs (ug/kg)					
			TPH - gasoline range	TPH - diesel range	TPH - oil range	benzene	toluene	ethylbenzene	m,p-xylene	o-xylene	
Preliminary Cleanup Level			100 / 30^a	460	2,000	30	7,000	6,000	9,000^b	9,000^b	
SU1-B25	8/19/2010	5	6.5 U	5 U	10 U	16 U	16 U	16 U	33 U	16 U	
		10	5.4 U	5.3 U	11 U	14 U	14 U	14 U	27 U	14 U	
		15	5.1 U	5.2 U	10 U	13 U	13 U	13 U	26 U	13 U	
		20	4.8 U	5.3 U	11 U	12 U	12 U	12 U	24 U	12 U	
SU1-B26	8/20/2010	5	5.8 U	5 U	10 U	14 U	14 U	14 U	29 U	14 U	
		10	320	100	110	14 U	56	680	41	140	
		15	56	130	140	15 U	38	53	29 U	35	
		20	110	14	35	11 U	81	100	22 U	35	
		23	7.2 U	6.1	72	18 U	18 U	18 U	36 U	18 U	
SU1-B27	2/4/2011	5	5.4 U	5.1 U	10 U	13 U	13 U	13 U	27 U	13 U	
		10	7.6 U	5.9 U	16	19 U	19 U	19 U	38 U	19 U	
		15	5.7 U	5.6 U	14	14 U	14 U	14 U	29 U	14 U	
		20	5.9 U	5.3 U	16	15 U	15 U	15 U	29 U	15 U	
		25	4.9 U	5.2 U	10 U	12 U	12 U	12 U	24 U	12 U	
SU1-B28	2/7/2011	20	6.2 U	5.7	72	16 U	16 U	16 U	31 U	16 U	
		25	5.7 U	5.2 U	10 U	14 U	14 U	14 U	28 U	14 U	
		30	5.2 U	5.3 U	27	13 U	13 U	13 U	26 U	13 U	
		30	4.8 U	5.4 U	29	12 U	12 U	12 U	24 U	12 U	
	DUP	35	440	330	330	14 U	14 U	1,400	100	520	
		2/8/2011	40	30	5.4	10 U	16 U	29	39	46	23
			45	88	34	36	15 U	15 U	110	30 U	50
			55	5.7 U	5.4 U	11 U	14 U	14 U	14 U	29 U	14 U
60	5.6 U		5.3 U	10 U	14 U	14 U	14 U	28 U	14 U		
SU1-B29	2/9/2011	20	5.7 U	5.4 U	14	14 U	14 U	14 U	28 U	14 U	
		25	5.4 U	5.3 U	11 U	14 U	14 U	14 U	27 U	14 U	
		30	4.7 U	5.3 U	11	12 U	12 U	12 U	24 U	12 U	
		30	5 U	5.4 U	15	12 U	12 U	12 U	25 U	12 U	
		34	5.2 U	5.4 U	45	13 U	13 U	13 U	26 U	13 U	

Notes:

Bolded values indicate the chemical was detected above the laboratory reporting limit

Bolded and highlighted values exceed the selected Preliminary Cleanup Level for individual chemicals and/or petroleum fractions

Highlighted values indicate the total TPH concentration (sum of GRO, DRO, and ORO) exceeds the Preliminary Cleanup Level for DRO (460 mg/kg)

Italicized values indicate the laboratory reporting limit was above the Preliminary Cleanup Level

TPH - total petroleum hydrocarbons

VOCs - volatile organic compounds

ft bgs - feet below ground surface

mg/kg - milligrams per kilogram

ug/kg - micrograms per kilogram

U - undetected

^a gasoline mixtures without benzene/gasoline mixtures with benzene

^b Value for m-xylene used in calculation, p-xylene value is NE

Table 1b
Summary of Soil Analytical Results for Study Unit 1 - PAHs
Laurel Station
Bellingham, Washington

Location ID	MW-1		SU1-B12			SU1-B14			SU1-B15	SU1-B28	Preliminary Cleanup Level
Sample Date	1/31/2011		6/7/2010			6/8/2010			8/18/2010	2/7/2011	
Depth (ft bgs)	20	25	10	15	20	15	15 (DUP)	20	15	35	
PAHs (ug/kg)											
1-methylnaphthalene	6,900	2,100	700	12,000	3,300	4,400	2,200	510	150	370	NE
2-methylnaphthalene	10,000	2,900	860	17,000	4,900	6,500	3,100	710	230	460	320,000
acenaphthene	220	49	38 U	270	95	97	110	14 U	9.7 U	21	4,800,000
acenaphthylene	100 Y	49 U	38 U	200 U	62 U	81 U	44 U	19 U	26	4.9 U	NE
anthracene	170	49 U	15 U	30 U	14 U	15 U	14 U	14 U	16	16 M	24,000,000
benzo(a)anthracene	49 U	49 U	28	150	48	53	18	22	9.7 U	4.9 U	See Note a
benzo(a)pyrene	49 U	49 U	18	40	14 U	15 U	14 U	14 U	9.7 U	15	100
benzo(b)fluoranthene	NA	NA	15 U	36	15	15 U	14 U	14 U	NA	NA	See Note a
benzo(g,h,i)perylene	49 U	49 U	22	49	25	24	14 U	14	9.7 U	4.9 U	NE
benzo(k)fluoranthene	NA	NA	15 U	36	15	15 U	14 U	14 U	NA	NA	See Note a
chrysene	310	93	180	620	230	280	130	120	44	42	See Note a
dibenz(a,h)anthracene	49 U	49 U	15 U	30 U	14 U	15 U	14 U	14 U	9.7 U	4.9 U	See Note a
dibenzofuran	360 M	98 M	40 U	300	120	130	89	17	9.7 U	37 Y	160,000
fluoranthene	170	49 U	15 U	73 U	32 U	18 U	14 U	14 U	12	12	3,200,000
fluorene	1,200	330	230	1,500	540	710	390	95	42	140	3,200,000
indeno[1,2,3-cd]pyrene	49 U	49 U	15 U	30 U	14 U	15 U	14 U	14 U	9.7 U	4.9 U	See Note a
naphthalene	3,200	520	180	4,600	1,400	1,600	970	150	850	48 Y	5,000
phenanthrene	2,300	610	230	2,900	1,000	1,300	630	140	62	230	NE
pyrene	150	49 U	98	360	130	150	71	60	16	11	2,400,000
total benzofluoranthene	88	49 U	NA	NA	NA	NA	NA	NA	9.7 M	13	See Note a
TTEC cPAH	11.9	0.93	22.6	64.2	7.1	8.1	3.1	3.4	1.41	16.72	100

Notes:

Bolded values indicate the chemical was detected above the laboratory reporting limit

Bolded and highlighted values exceed the selected Preliminary Cleanup Level

PAHs - polycyclic aromatic hydrocarbons

cPAHs - carcinogenic PAHs

ft bgs - feet below ground surface

ug/kg - micrograms per kilogram

NA - not analyzed

NE - not established

U - undetected

M - estimated value with low spectral match parameters

Y - undetected, but reporting limit raised due to chromatographic interference

^a Carcinogenic PAH (cPAH) cleanup levels under MTCA are based on the calculated total toxicity of the mixture using the Toxicity Equivalency Methodology in WAC 173-340-708 (8).

The mixture of cPAHs shall be considered a single hazardous substance and compared to the applicable MTCA Method A cleanup level for benzo(a)pyrene.

Table 2a
Summary of Groundwater Analytical Results - TPH and BTEX
Laurel Station
Bellingham, Washington

Location ID	Sample Date	TPH - gasoline range mg/L	TPH - diesel range mg/L	TPH - lube oil mg/L	benzene ug/L	toluene ug/L	ethylbenzene ug/L	m,p-xylene ug/L	o-xylene ug/L
Preliminary Cleanup Level		0.8 / 1.0^a	0.5	0.5	5	1,000	700	16,000	16,000
MW-1	2/23/2011	0.98	6.6	5.9	0.25 U	0.25 U	2	0.5 U	0.25 U
MW-2	2/23/2011	0.51	0.56	0.58	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
MW-4	2/23/2011	0.63	0.14	0.2 U	1.6	0.25 U	0.25 U	0.5 U	0.25 U
MW-5	2/24/2011	0.26	0.6	1.8	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
MW-6	2/24/2011	0.1 U	0.1 U	0.29	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
DUP	2/24/2011	0.1 U	0.1 U	0.2 U	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
MW-7	2/24/2011	0.94	1.3	1.5	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
SW-1	8/26/2010	0.25 U	0.1 U	0.2 U	1 U	1 U	1 U	1 U	1 U
	12/1/2010	0.1 U	0.1 U	0.2 U	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
	2/24/2011	0.1 U	0.1 U	0.2 U	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
SW-2	8/26/2010	0.29	0.51	3.4	1 U	1 U	1 U	1 U	1 U
DUP	8/26/2010	0.34	0.43	2.5	1 U	1 U	1 U	1 U	1 U
SW-2	12/1/2010	0.1 U	0.1 U	0.2 U	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
DUP	12/1/2010	0.1 U	0.1 U	0.2 U	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
SW-2	2/24/2011	0.1 U	0.1 U	0.2 U	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
SW-3	2/23/2011	0.1 U	0.1 U	0.2 U	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
SW-4	8/26/2010	0.25 U	0.1 U	0.2 U	1 U	1 U	1 U	1 U	1 U
	12/1/2010	0.1 U	0.1 U	0.2 U	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U
	2/23/2011	0.1 U	0.1 U	0.2 U	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U

Notes:

Bolded values indicate the chemical was detected above the laboratory reporting limit

Bolded and highlighted values exceed the selected Preliminary Cleanup Level for individual chemicals and/or petroleum fractions

Highlighted values indicate the total TPH concentration (sum of GRO, DRO, and ORO) exceeds the Preliminary Cleanup Level for DRO (0.5 mg/L)

TPH - total petroleum hydrocarbons

mg/L - milligrams per liter

ug/L - micrograms per liter

U - undetected

^a gasoline mixtures without benzene/gasoline mixtures with benzene

Table 2b
Summary of Groundwater Analytical Results - PAHs
Laurel Station
Bellingham, Washington

Location ID	MW-1	MW-2	MW-4	MW-5	MW-6		MW-7	SW-1			SW-2					SW-3	SW-4			Preliminary Cleanup Level
Sample Date	2/23/2011	2/23/2011	2/23/2011	2/24/2011	2/24/2011	2/24/2011 (D)	2/24/2011	12/1/2010	2/24/2011	8/26/2010	12/1/2010	12/1/2010 (D)	2/24/2011	8/26/2010	8/26/2010 (D)	2/23/2011	12/1/2010	2/23/2011	8/26/2010	
PAHs (ug/L)																				
1-methylnaphthalene	75	4.2	8.8	1.7	0.019	0.047	22	0.019	0.03	0.29	0.017	0.01 U	0.01 U	0.01 U	0.018	0.022	0.01 U	0.072	0.016	NE
2-methylnaphthalene	74	2.5	7.9	1.3	0.026	0.059	26	0.021	0.031	0.22	0.028	0.01 U	0.01 U	0.015	0.025	0.025	0.01 U	0.074	0.028	32
acenaphthene	0.2 U	0.05 U	0.18	0.01 U	0.086	0.082	0.39	0.01 U	0.01 U	0.026	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	960
acenaphthylene	1.6	0.1	0.01 U	0.01 U	0.01 U	0.01 U	0.15 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	NE
anthracene	0.2 U	0.05 U	0.01 U	0.01 U	0.52	0.42	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.022	0.01 U	0.01 U	0.01 U	0.01 U	4,800
benzo(a)anthracene	0.2 U	0.05 U	0.01 U	0.01 U	1.4	0.72	0.01 U	0.054	0.03	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.03	0.01 U	0.01 U	0.01 U	0.01 U	See Note a
benzo(a)pyrene	0.41	0.082	0.012	0.01 U	0.71	0.44	0.01 U	0.082	0.045	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.028	0.01 U	0.01 U	0.01 U	0.01 U	0.1
benzo(g,h,i)perylene	0.46	0.099	0.01 U	0.01 U	0.14	0.094	0.01 U	0.041	0.014	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	NE
chrysene	4 J	0.63 J	0.034 J	0.01 U	0.96 J	0.58 J	0.077 J	0.072	0.025 J	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.033	0.01 U	0.011	0.01 U	0.015	See Note a
dibenz(a,h)anthracene	0.2 U	0.062	0.01 U	0.01 U	0.1	0.067	0.01 U	0.022	0.011	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	See Note a
dibenzofuran	3.5	0.29	0.21	0.087	0.05	0.052	0.49	0.01 U	0.01 U	0.015	0.01 U	0.01 U	0.01 U	0.01 U	0.011	0.01 U	0.01 U	0.01 U	0.013	32
fluoranthene	1.9	0.15	0.017	0.01 U	3.2	1.6	0.048	0.05	0.025	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.072	0.01 U	0.01 U	0.01 U	0.027	640
fluorene	15	0.81	0.84	0.3	0.13	0.12	1.9	0.01 U	0.01 U	0.05	0.01 U	0.01 U	0.01 U	0.01 U	0.02	0.01 U	0.01 U	0.01 U	0.016	640
indeno[1,2,3-cd]pyrene	0.2 U	0.05 U	0.01 U	0.01 U	0.18	0.11	0.01 U	0.038	0.016	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	See Note a
naphthalene	30	0.98	5.3	0.22	0.044	0.055	11	0.045	0.036	0.059	0.014	0.01 U	0.018	0.02	0.028	0.046	0.01 U	0.06	0.028	160
phenanthrene	15	0.39	0.39	0.17	1.3	0.95	1.6	0.025	0.014	0.013	0.017	0.01 U	0.01 U	0.014	0.12	0.015	0.01 U	0.01 U	0.055	NE
pyrene	2.6	0.34	0.035	0.01 U	2.1	1	0.071	0.056	0.021	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.077	0.01 U	0.01 U	0.01 U	0.032	480
total benzofluoranthenes	0.7	0.16	0.01 U	0.01 U	1.2	0.74	0.016	0.1	0.058	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.042	0.01 U	0.01 U	0.01 U	0.023	See Note a
TTEC cPAH	0.520	0.111	0.012	0	1.008	0.610	0.002	0.104	0.057	0	0	0	0	0	0.036	0	0	0	0.002	0.1

Notes:

Bolded values indicate the chemical was detected above the laboratory reporting limit

Bolded and highlighted values exceed the selected Preliminary Cleanup Level

PAHs - polycyclic aromatic hydrocarbons

cPAHs - carcinogenic PAHs

ug/L - micrograms per liter

(D) - duplicate sample

NE - not established

U - undetected

UJ - not detected above the reporting limit shown. Reporting limit is estimated.

J - estimated

^a Carcinogenic PAH (cPAH) cleanup levels under MTCA are based on the calculated total toxicity of the mixture using the Toxicity Equivalency Methodology in WAC 173-340-708 (8).

The mixture of cPAHs shall be considered a single hazardous substance and compared to the applicable MTCA Method A cleanup level for benzo(a)pyrene.

Table 3
Proposed Sampling Locations and Rationale - Additional Characterization and Pilot Testing
Study Unit 1
Laurel Station
Bellingham, Washington

Proposed Sample Location/Sample ID	Reference Figure	Media	Proposed Sampling Depth (feet bgs)	Analytical Parameters	Rationale
MW-9 and MW-10 ^a	Figure 1	Soil	5, 10, 15, 20 and 25	NWTPH-Gx, NWTPH-Dx, BTEX, and PAHs ^b	Additional characterization of the vertical and lateral extent of hydrocarbon impacts exceeding PCLs in the vicinity of the former oily water sump. Four-inch stainless steel groundwater monitoring wells will be installed and screened across the area of contamination within the glacial outwash deposits present in this area (see Figure 2). The wells will be included in a groundwater sampling program to assess potential impacts to shallow groundwater. The wells will also be used for pilot testing of in-situ soil remediation technologies. Additional soil volume (approximately 5 total gallons) will be collected from proposed source-area borings MW-9 and/or MW-10 for the purposes of performing a thermal treatability study.
MW-11 and MW-14 ^c	Figure 1	Soil	20, 25, 30, 35, 40, 45 and 50 ^d	NWTPH-Gx, NWTPH-Dx, BTEX, and PAHs ^b	Characterization of the lateral extent of hydrocarbon impacts exceeding PCLs in soil and groundwater to the south and northeast of the former oily water sump. Two-inch PVC groundwater monitoring wells will be installed and screened in the glacial outwash deposits at similar elevations to MW-1, MW-2, MW-5, MW-6, MW-7 and proposed wells MW-9, MW-10, MW-12 and MW-13. The wells will be included in a groundwater sampling program to assess potential impacts to shallow groundwater. The wells may also be used as distant observation wells for pilot testing of in-situ soil remediation technologies.
MW-12 and MW-13 ^c	Figure 1	Soil	25, 30, 35, 40, 45, 50, 55 and 60 ^e	NWTPH-Gx, NWTPH-Dx, BTEX, and PAHs ^b	Characterization of the lateral extent of hydrocarbon impacts exceeding PCLs in soil and groundwater to the east and southeast of the former oily water sump. Two-inch PVC groundwater monitoring wells will be installed and screened in the glacial outwash deposits at similar elevations to MW-1, MW-2, MW-5, MW-6, MW-7 and proposed wells MW-9, MW-10, MW-11 and MW-14. The wells will be included in a groundwater sampling program to assess potential impacts to shallow groundwater. The wells may also be used as distant observation wells for pilot testing of in-situ soil remediation technologies.
SU1-B30	Figure 1	Soil	3, 5 and 10	NWTPH-Gx, NWTPH-Dx, BTEX, and PAHs ^b	Characterization of the lateral extent of hydrocarbon impacts exceeding PCLs at soil boring SU1-B11.

Notes:

PCL - Preliminary Cleanup Level

NWTPH-Gx - Northwest Total Petroleum Hydrocarbons Gasoline

NWTPH-Dx - Northwest Total Petroleum Hydrocarbons Diesel extended (diesel and oil-range)

BTEX - Benzene, toluene, ethylbenzene, and xylenes

PAHs - Polycyclic aromatic hydrocarbons

bgs - below ground surface

^a Proposed groundwater monitoring well and pilot test well; to be included in future quarterly groundwater monitoring events















^b PAH analysis will be conducted where NWTPH-Dx exceeds the Preliminary Cleanup Level of 460 milligrams per kilogram

^c Proposed groundwater monitoring well; to be included in future quarterly groundwater monitoring events

^d Ground surface elevation estimated to be approximately 15 feet higher than ground surface elevations at MW-1. Proposed sampling depths for these borings are estimated to be equal in elevation to the elevations where contaminated soil and groundwater have been detected near the former oily water sump.

^e Ground surface elevation estimated to be approximately 20 feet higher than ground surface elevations at MW-1. Proposed sampling depths for these borings are estimated to be equal in elevation to the elevations where contaminated soil and groundwater have been detected near the former oily water sump.

Legend

-  Post-Excavation Soil Sample (URS, 2000)
-  Test Pit (Dames & Moore, 1991/1992)
-  Soil Boring (Dames & Moore, 1991/1992)
-  Groundwater Monitoring Well (Dames & Moore, 1991/1992)
-  Soil Boring Location (URS, 2010/2011)
-  Groundwater Monitoring Well (URS, 2011)
-  2000 Spill Excavation Limits
-  Property Line
-  Drainage Ditch/Swale
-  Fence
-  4-Inch Ø PVC Storm Drain Line
-  Approximate extent of contamination exceeding PCL (dashed where inferred)
-  Proposed groundwater monitoring well
-  Proposed soil boring

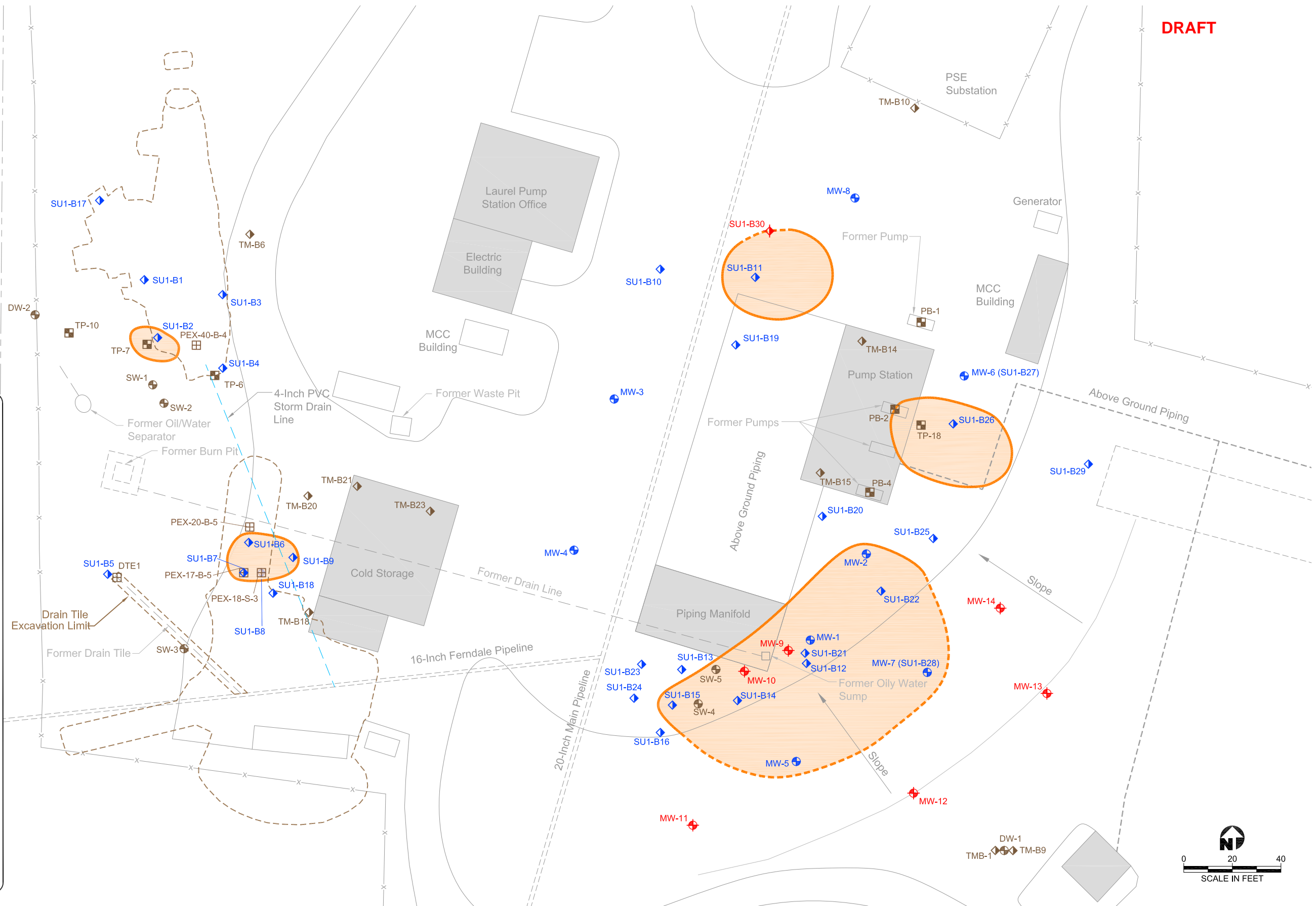


Figure 1
Proposed Soil Boring/Monitoring Well Locations
(Study Unit 1)

Q:\geo\Kinder Morgan\Laurel Pump Station\SubTasks\Memo\Study Unit 1\Figure 1 (Unit 1 Prop Samp Locs).dwg
Mod: 04/06/2011, 13:35 | Plotted: 04/06/2011, 13:36 | John_Knobbs

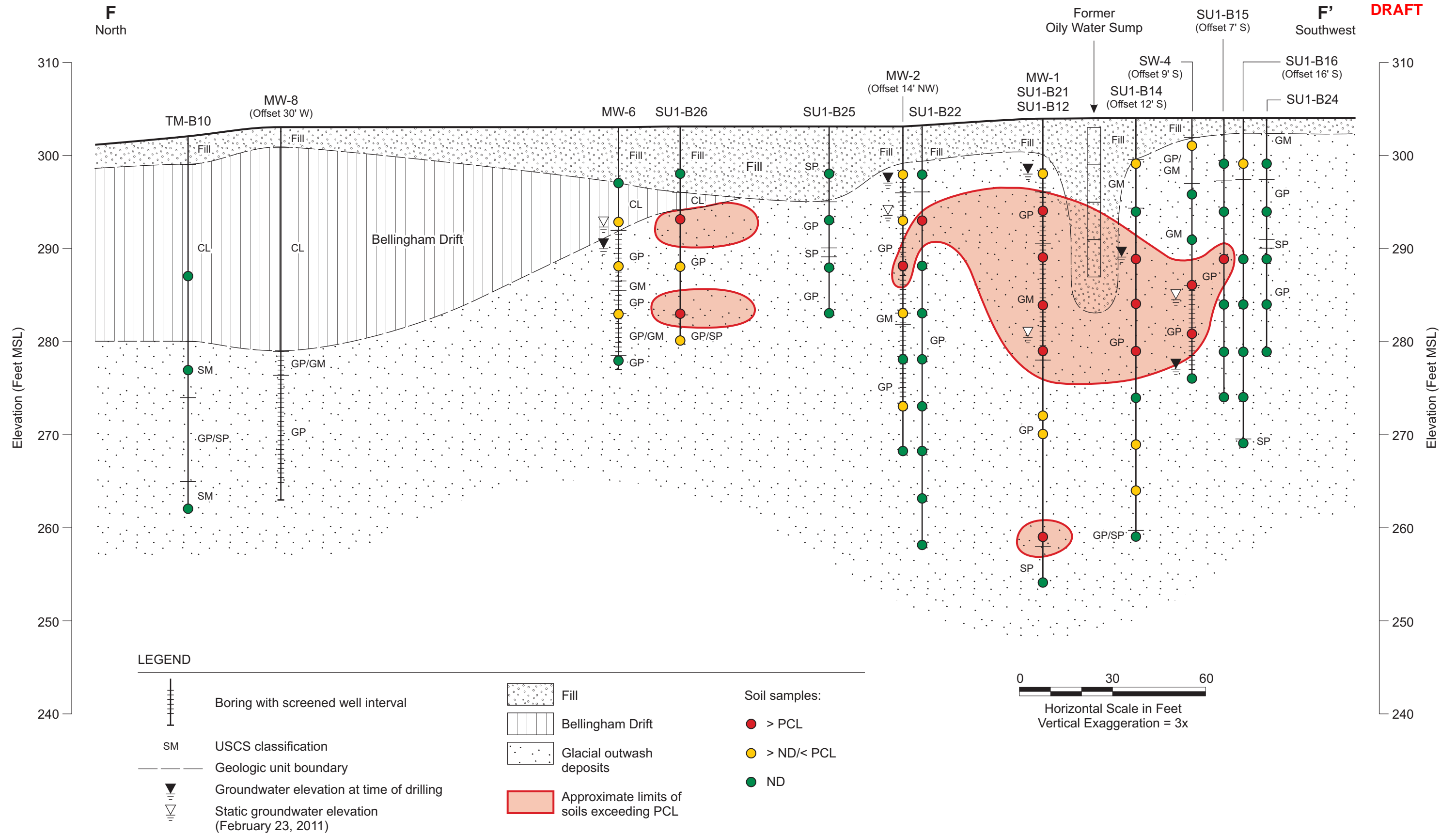
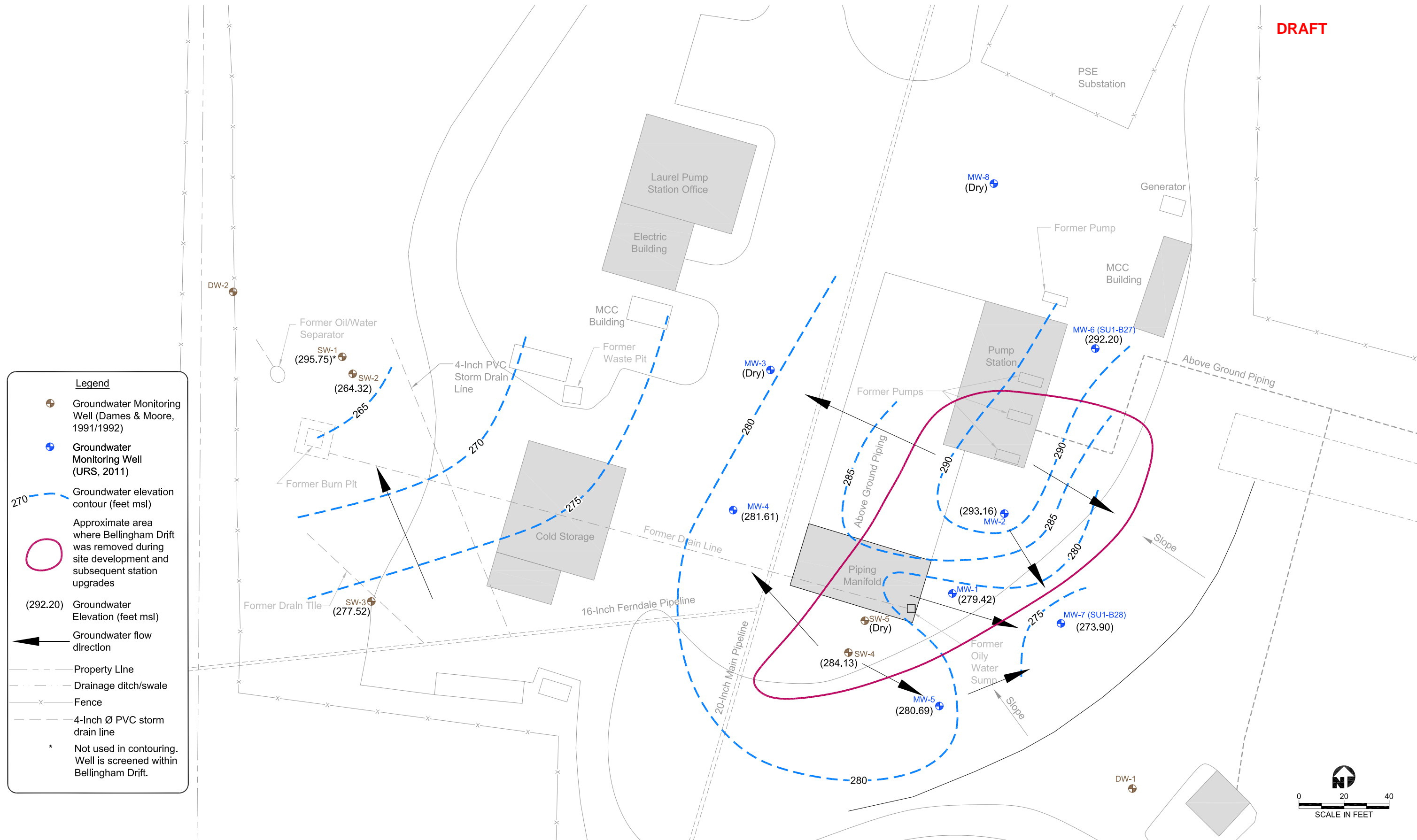


Figure 2
Geologic Cross Section F-F'



Legend

- + Groundwater Monitoring Well (Dames & Moore, 1991/1992)
- + Groundwater Monitoring Well (URS, 2011)
- Groundwater elevation contour (feet msl)
- Approximate area where Bellingham Drift was removed during site development and subsequent station upgrades
- (292.20) Groundwater Elevation (feet msl)
- ← Groundwater flow direction
- Property Line
- Drainage ditch/swale
- x Fence
- 4-Inch Ø PVC storm drain line
- * Not used in contouring. Well is screened within Bellingham Drift.



Figure 3
Groundwater Elevation Contour Map
Shallow Perched Groundwater - February 23, 2011

Laurel Station
 Bellingham, Washington

Q:\geol\Kinder Morgan\Laurel Pump Station\SubTasks\Memo\Study Unit 1\Figure 3 (GW Elev Contours).dwg
 Mod: 04/25/2011, 11:09 | Plotted: 04/25/2011, 11:12 | john_knobbs



Legend

- Groundwater Monitoring Well (Dames & Moore, 1991/1992)
- Groundwater Monitoring Well (URS, 2011)
- Property line
- Drainage ditch/swale
- Fence
- 4-Inch Ø PVC storm drain line
- 0.5** DRO Isoconcentration contour (mg/L)
- 0.5** ORO Isoconcentration contour (mg/L)
- 0.8** GRO Isoconcentration contour (mg/L)
- (NS)** Not sampled (well was dry)

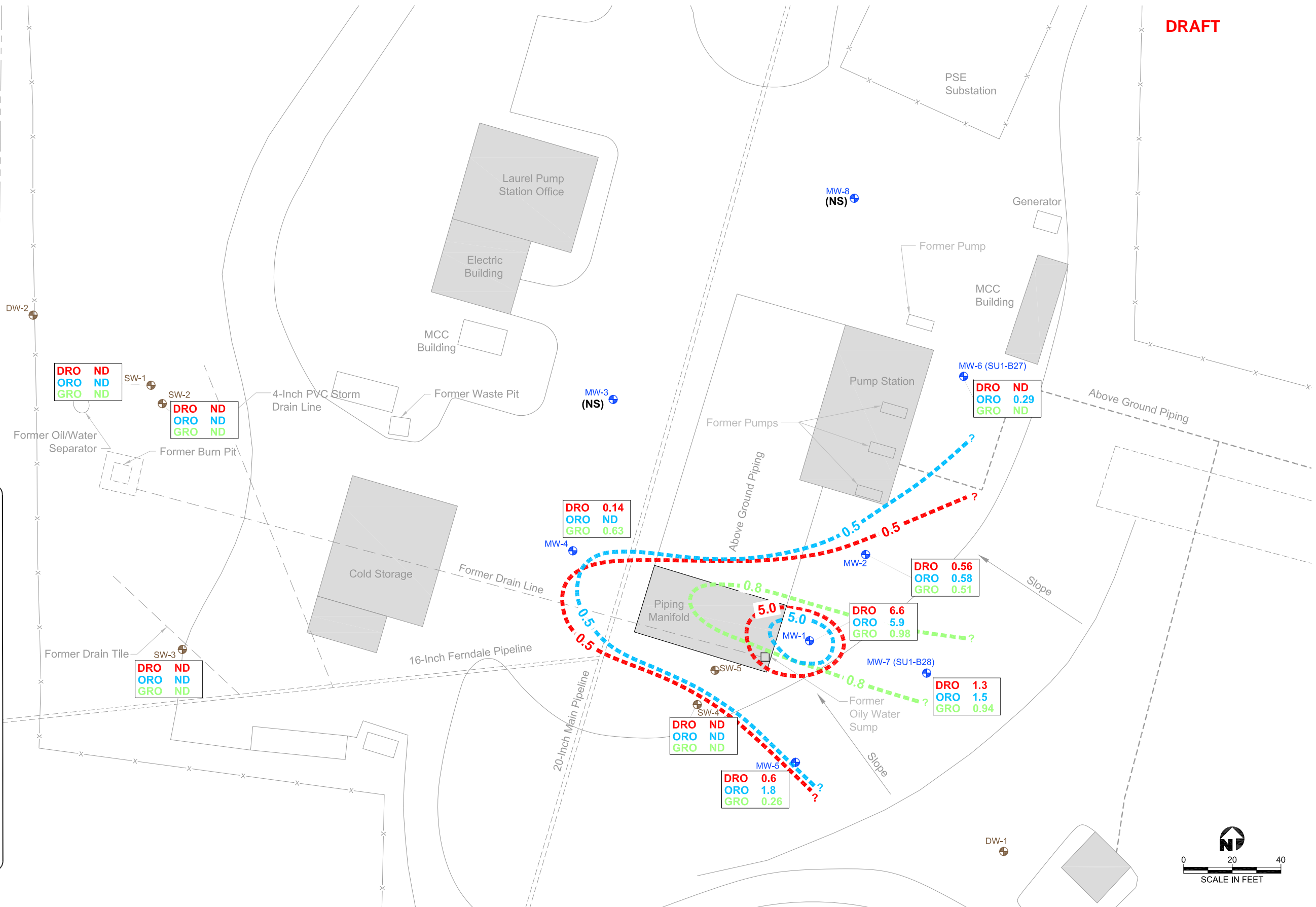


Figure 4
Isoconcentration Contour Map - Shallow Perched Groundwater
February 23 and 24, 2011 - (Study Unit 1)