MEMORANDUM

TO: Frank Winslow, Department of Ecology, Central Regional Office

FROM: Don Wyll, Leidos Inc.

DATE: October 11, 2018

RE: Response to "Request for Additional Information to Provide Opinion on Cleanup under VCP" for the Unocal Bulk Plant 0082 in Chelan, Washington

This memo is in response to your letter addressed to Don Wyll, dated March 30, 2018, which outlined the steps necessary to attain a No Further Action (NFA) determination by Ecology. This was followed by a second letter from Ecology, dated July 11, 2018, which further outlined the details of the first letter and closed the initial opinion request. Our initial request for an NFA was submitted on September 24, 2015, along with the "Site Summary Report, former Unocal Bulk Plant Facility No. 306562," dated August 31, 2015. This current memo responds to Ecology's two letters and is a renewed request for NFA for this site.

Your first letter addressed the following two major points:

1. Soil samples listed within a table in the report did not identify which samples were removed during previous excavations and which ones were remaining at the site. In particular, it appears that three remaining soil samples exceed the MTCA Method A cleanup levels for TPH.
2. Although groundwater concentrations appear to have achieved cleanup levels, the soil exceedance concentrations were not addressed, and thus an NFA cannot be issued at this time. The report also did not discuss Method B cleanup levels. An empirical demonstration of the soil to groundwater pathway can be made because the soil contamination is deeper than 15 feet below ground surface (bgs), the groundwater contamination does not exceed cleanup levels, and residual saturation appears to be eliminated.

These two points will be addressed in the following sections.

POINT NO. 1

Soil samples that were removed during the two site excavations (2001 and 2005) were previously designated on Table 1 by brown highlighting (modified table is attached). Most notably, four remaining samples (including post-excavation samples) at three locations have concentrations that exceed MTCA Method A cleanup levels for TPH, as follows:

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- SB-11 (top of sample at 21.5 feet bgs): 8,100 mg/kg TPH-DRO and 2,400 mg/kg TPH-GRO
- SB-11 (24 feet bgs): 6,000 mg/kg TPH-DRO and 2,300 mg/kg TPH-GRO
- 037/25 (25 feet bgs): 4,600 mg/kg TPH-DRO
- MW-5A-26 (26 feet bgs): 260 mg/kg TPH-GRO

These four remaining samples were collected from depths between 21.5 and 27 feet bgs, and thus are deeper than the MTCA point of compliance (depth of 15 feet bgs) for the human health direct-contact and ecological pathways. Note also that shallower soils in the 2005 excavated area, between the surface and 15 feet bgs, were not impacted and were set aside as clean overburden material.

One additional sample location did have contamination identified at a shallow depth: TP-9 (1995) showed TPH-GRO at 290 mg/kg from a depth of 10 feet bgs. However, all other analytes in this sample (TPH-DRO, HRO, and BTEX) were either non-detected or were detected at far below the Method A cleanup levels. Therefore, this GRO result appears anomalous. During the 2001 excavation at this location, the shallower soil was all non-impacted, and thus was excavated only down to 6 feet bgs. To reevaluate and confirm this suspect result, soil sampling was conducted in 2003 immediately adjacent to TP-9 at sample location GP-5. TPH-GRO at GP-5 (10 feet bgs) was non-detected (5.0 U mg/kg), and other constituents were non-detected or far below MTCA cleanup levels. Consequently, the GRO concentration at TP-9 could not be reproduced and is considered to be spurious.

In summary, the site soil contamination that exceeds MTCA Method A cleanup levels is all deeper than the direct-contact point of compliance (>15 feet bgs). This leaves protection of groundwater as the primary pathway of concern.

POINT NO. 2

The MTCA Method B calculations for petroleum hydrocarbons have been performed on analyses from a vadose-zone soil sample, SB-11-24 (24-25 feet bgs), using default input parameters. The calculated Method B results are summarized below, and the worksheet input/output is attached.

- Measured soil sample TPH concentration: 922 mg/kg
- Protection of soil, direct contact, human health (Method B): 2,803 mg/kg
- Protection of Method B groundwater quality (potable GW, human health): 4,497 mg/kg
- Protection of Method B groundwater quality (target TPH conc. @ 500 µg/L): 2,522 mg/kg

These Method B calculated results show that the measured soil TPH concentration is below these exposure pathway levels for soil direct contact and protection of groundwater, for both potable and leaching concerns.

In addition to these calculated results, more direct and pertinent empirical data exist in the form of groundwater sample results from a number of site monitoring wells,

extending over many years. Thus, these direct groundwater results and Method A cleanup levels are being applied in the following discussion. This involves making an empirical demonstration showing that the contaminated soil is not adversely affecting groundwater concentrations.

For an *empirical demonstration* of the soil to groundwater pathway, MTCA requires that the following four components are met, such that the measured soil concentrations will not cause an exceedance of the groundwater cleanup levels. These four components are summarized below with their WAC citation, followed by our response in meeting the regulation.

1. WAC 173-340-747(9)(b)(i): MTCA states that the measured groundwater concentration must not exceed the applicable cleanup levels.

The data presented in the August 2015 report show that the recent groundwater contaminant concentrations at all locations are less than the MTCA Method A cleanup levels. This includes concentrations measured in the following existing monitoring wells: MW-1A, MW-2, MW-3A, MW-4A, MW-5A, MW-6A, MW-7, MW-8, MW-9, and MW-10. In particular, MW-5A is located in the midst of the area of remaining soil contamination. At this site, the groundwater flows generally toward the west and northwest. Thus, monitoring wells MW-2, MW-3A, MW-9, and MW-10 are also located in positions generally downgradient of the remaining soil contamination and any other potential sources of subsurface contamination. Therefore, existing monitoring wells are situated in appropriate locations to intercept groundwater within and downgradient of areas with remaining soil contamination.

2. WAC 173-340-747(9)(b)(ii): MTCA states that the measured soil concentration will not cause an exceedance of the applicable groundwater cleanup level at any time in the future. Specifically, this involves demonstrating that a sufficient amount of time has elapsed for migration of contaminants from soil into groundwater, and that the characteristics of the site (depth to water table and infiltration) are representative of future conditions.

The groundwater sampling data for this site extend back to 1989. Many of the monitoring well samples (for MW-1 through MW-8) have shown concentrations of TPH exceeding Method A cleanup levels in the past, but they are no longer exceeding. Benzene also previously exceeded the cleanup level in two wells. Historical concentrations reached as high as 12,000 µg/L TPH-GRO (MW-1 in 1991), 23,000 µg/L TPH-DRO (MW-5 in 1995), and 300 µg/L benzene (MW-5 in 1991). However, due to soil excavations, air-sparge/soil vapor extraction, and natural attenuation, these concentrations are now much lower. The last time a groundwater sample contaminant exceeded MTCA Method A cleanup levels was in March 2014 (DRO in MW-5A, where measurements have been mostly below cleanup levels since 2011).

This pattern shows that a significant amount of time has elapsed since the release of contaminants into soil and groundwater, followed by active remediation and natural attenuation, and that concentrations are now low and stable. Contaminant concentration trends have been declining through time for site monitoring wells. Water levels during this time have varied significantly, by as much as 14 feet since 2014, but concentrations

now remain low in all wells throughout the year. Site conditions that affect hydrogeologic conditions, including infiltration, are also stable and are not planned to change in the future. In summary, despite varying water levels and previously high concentrations in many wells, all groundwater sampling results since 2014 have been below MTCA Method A cleanup levels. Thus, all evidence indicates that the soil contamination is no longer causing exceedances of groundwater concentrations, and a significant amount of time has elapsed for this demonstration.

3. WAC 173-340-747(9)(c): MTCA states that an empirical demonstration shall be based on methods approved by the department and in compliance with WAC subsections 173-340-702(14), (15) and (16). These include the topics of burden of proof (14), new scientific information (15), and criteria for quality of information (16).

This empirical demonstration of low groundwater concentrations at the site is in compliance with all three subsections, in that MTCA cleanup levels are being applied, without changing any assumptions or default values, and without the use of conditional points of compliance. Also, common standard testing methods and quality assurance were used in the sampling and analysis procedures for petroleum contamination.

4. WAC 173-340-747(10)(c): MTCA states that an empirical demonstration may be used for residual saturation, to show that soil concentrations at the site will not result in the accumulation of non-aqueous phase liquid (NAPL) on or in the groundwater.

This demonstration is made by the current and historical absence of NAPL in monitoring wells onsite. NAPL has never been identified at the site. In addition, this involves demonstrating (identical to number 2 above) that a sufficient amount of time has elapsed for migration of contaminants from soil into groundwater, and that the characteristics of the site are representative of future conditions. Refer to response in number 2 for this demonstration.

Ecology's Implementation Memo on Empirical Demonstrations

Ecology's Implementation Memo (No. 15) has also been utilized in this demonstration (2016 memo titled "Frequently Asked Questions [FAQs] Regarding Empirical Demonstrations and Related Issues"). Ecology's memo states that Method A cleanup levels can be utilized at the site if three criteria are met with regard to source removal, groundwater monitoring, and assessment of groundwater quality. Site remediation and monitoring are summarized below, as they pertain to these three criteria.

Source removal involves showing that a remedial action has been implemented, which removes the majority of contaminant mass in the soil. Two periods of soil removal (2001 and 2005), in a total of eight excavation areas, were performed at the site. A total of approximately 1,540 cubic yards of petroleum-contaminated soil were removed during this work, which includes the vast majority of contamination at the site. In addition, groundwater remediation took place via air-sparge and soil vapor extraction in 2001 and 2002.

A *groundwater monitoring* program has been implemented, with sampling beginning in 1989. This program follows Ecology's guidance for petroleum contaminated sites.

Results from recent years document that all contaminants of concern are below MTCA Method A cleanup levels.

An *assessment of groundwater quality* indicates that the site plume is stable or receding, and sufficient time has elapsed. Based on the decreasing concentrations through time, it is clear that the plume is receding and all sample concentrations are now relatively low.

Consequently, according to Ecology's 2016 Implementation Memo, the measured GRO soil concentrations can be considered as empirically derived Method B soil cleanup levels that are protective of the soil to groundwater pathway.

According to this 2016 memo, where the soil to groundwater pathway is adequately addressed, the other pathways should also be assessed, including direct contact, vapor intrusion, and the Terrestrial Ecological Evaluation (TEE). These are described below for the Chelan site.

The *direct contact* pathway is addressed for this site because no contamination above MTCA Method A (or Method B) cleanup levels is more shallow than 15 feet bgs, which is the point of compliance for direct contact.

The *vapor intrusion* pathway is addressed for this site because benzene is not a concern at the site and measured concentrations within groundwater and remaining soil are below Method A cleanup levels for all substances. Ecology considers that benzene concentrations less than three times the Method A cleanup level are not significant, provided that limited contaminant mass remains in soil.

The *TEE* is addressed in the Leidos 2015 report. In that evaluation, the soil concentrations above the point of compliance (15 feet bgs) are all below the simplified TEE concentrations in MTCA (Table 749-2), and the TEE was ended.

Conclusion

In summary, all pathways have been covered in the above assessment. The remaining deep soil contamination is below the point of compliance for human health direct contact and ecological pathways, and other pathways are also protected. The MTCA Method B TPH calculations further show that all pathways are protective under current conditions. As a result, we believe that the site is eligible for an NFA determination, and no environmental covenant would be necessary. Therefore, we are requesting that Ecology issue an NFA letter for this site.

TABLE 1
HISTORICAL SOIL ANALYTICAL RESULTS - TPH, BTEX and MTBE
FORMER UNOCAL BULK PLANT FACILITY NO. 306562
1329 West Woodin Avenue
Chelan, Washington
Concentrations reported in mg/kg

Sample ID	Date	Depth (ft bgs)	Total TPH	TPH-DRO	TPH-HRO	TPH-GRO	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
MW-1	11/30/1989	15	4,600	NA	NA	NA	<0.025	0.046	0.22	2.6	NA
MW-1	11/30/1989	20	1,300	NA	NA	NA	<0.025	0.029	0.079	0.83	NA
MW-2	11/30/1989	15	6	NA	NA	NA	<0.025	<0.025	<0.025	<0.025	NA
MW-3	11/30/1989	15	19	NA	NA	NA	<0.025	<0.025	<0.025	<0.025	NA
TP-1[89]	12/4/1989	1	14,000	NA	NA	NA	<0.13	1.1	<0.13	**59**	NA
TP-1[89]	12/4/1989	11	1,900	NA	NA	NA	<0.025	<0.025	<0.025	1.8	NA
TP-2[89]	12/4/1989	5	6,000	NA	NA	NA	<0.025	0.066	0.15	0.72	NA
TP-2[89]	12/4/1989	11	590	NA	NA	NA	<0.05	<0.025	<0.025	<0.025	NA
TP-3[89]	12/4/1989	0	69,000	NA	NA	NA	<0.025	<0.025	<0.025	<0.025	NA
TP-3[89]	12/4/1989	3	160	NA	NA	NA	<0.025	<0.025	<0.025	<0.025	NA
WH-1	12/5/1989	0	150	NA	NA	NA	NA	NA	NA	NA	NA
MW-4	4/3/1991	20	35	<5	NA	<5	**0.033**	0.052	0.033	0.072	NA
MW-5	4/4/1991	20	6,600	**7,000**	NA	**1,200/4,000**	**1.4**	2	4.3	14	NA
MW-5	4/4/1991	29.5	54	<5	NA	<5	<0.025	<0.025	<0.025	<0.025	NA
MW-6	4/4/1991	21	11	<5	NA	<5	<0.025	<0.025	<0.025	<0.025	NA
MW-7	11/14/1992	26	NA	<36	NA	<6	<0.032	0.049	<0.032	<0.032	NA
MW-7	11/14/1992	28.5	NA	NA	NA	NA	<0.032	0.040	<0.032	<0.032	NA
S-1	11/14/1992	1	NA	1,800	NA	**15,000**	<0.027	0.51	1.2	**590**	NA
TP-1[95]	8/29/1995	14	NA	<10	<25	<1.0	<0.05	<0.05	<0.05	<0.1	NA
TP-2[95]	8/29/1995	10	NA	15	NA	<1.0	<0.05	<0.05	<0.05	<0.1	NA
TP-2[95]	8/29/1995	14	NA	<10	<25	<1.0	<0.05	<0.05	<0.05	<0.1	NA
TP-3[95]	8/29/1995	12	NA	<10	<25	<1.0	<0.05	<0.05	<0.05	<0.1	NA
TP-4[95]	8/29/1995	2	NA	50	73	<1.0	<0.05	<0.05	<0.05	<0.1	NA
TP-4[95]	8/29/1995	6	NA	**10,000**	910	**340**	<0.08	<0.08	<0.08	0.52	NA
TP-4[95]	8/29/1995	13.5	NA	200	50	3.6	<0.05	<0.05	<0.05	<0.1	NA
TP-5[95]	8/29/1995	8	NA	41	40	<1.0	<0.05	<0.05	<0.05	<0.1	NA
TP-5[95]	8/29/1995	13.5	NA	**10,000**	670	**510**	<0.08	<0.9	<0.08	8.9	NA
TP-6[95]	8/29/1995	10	NA	13	27	<1.0	<0.05	<0.05	<0.05	<1.0	NA
TP-6[95]	8/29/1995	14	NA	<10	28	<1.0	<0.05	<0.05	<0.05	<1.0	NA
TP-7[95]	8/29/1995	6	NA	<10	<25	14	<0.05	<0.05	<0.05	<1.0	NA
TP-7[95]	8/29/1995	14	NA	<10	<25	11	<0.05	<0.05	<0.05	<1.0	NA

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Sample ID	Date	Depth (ft bgs)	Total TPH	TPH-DRO	TPH-HRO	TPH-GRO	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
TP-8[95]	8/29/1995	10	NA	37	29	32	<0.05	<0.05	<0.05	<1.0	NA
TP-8[95]	8/29/1995	12	NA	33	120	44	<0.05	<0.05	<0.05	<1.0	NA
TP-9[95]	8/29/1995	10	NA	73	81	**290***	<0.08	<0.08	<0.08	1.4	NA
TP-9[95]	8/29/1995	11	NA	130	57	54	<0.05	<0.05	<0.05	<1.0	NA
TP-10[95]	8/29/1995	12	NA	<10	43	<1.0	<0.05	<0.05	<0.05	<1.0	NA
TP-11[95]	8/30/1995	6	NA	80	230	<1.0	<0.05	<0.05	<0.05	<1.0	NA
TP-12[95]	8/30/1995	12	NA	<10	28	<1.0	<0.05	<0.05	<0.05	<1.0	NA
TP-13[95]	8/30/1995	8	NA	<10	27	<1.0	<0.05	<0.05	<0.05	<1.0	NA
TP-14[95]	8/30/1995	9	NA	<10	<25	<1.0	<0.05	<0.05	<0.05	<1.0	NA
TP-15[95]	8/30/1995	12	NA	<10	<25	<1.0	<0.05	<0.05	<0.05	<1.0	NA
EX1-SW1-7.5-0401	4/30/2001	7.5	NA	25.7	<25.0	NA	NA	NA	NA	NA	NA
EX1-SW2-7.5-0401	4/30/2001	7.5	NA	<10.0	<25.0	NA	NA	NA	NA	NA	NA
EX1-F-11-0501	5/1/2001	11	NA	<10.0	<25.0	NA	NA	NA	NA	NA	NA
EX2-SW1-7.5-0401	4/30/2001	7.5	NA	<10.0	<25.0	NA	NA	NA	NA	NA	NA
EX2-SW2-7.5-0401	4/30/2001	7.5	NA	1,660	330	NA	NA	NA	NA	NA	NA
EX2-SW3-2.0-0401	4/30/2001	2	NA	<10.0	<25.0	NA	NA	NA	NA	NA	NA
EX2-SW2B-0501	5/1/2001	7	NA	<10.0	<25.0	NA	NA	NA	NA	NA	NA
EX3-SW1-7.5-0401	4/30/2001	7.5	NA	325	<25.0	NA	NA	NA	NA	NA	NA
EX3-SW2-7.5-0401	4/30/2001	7.5	NA	<10.0	<25.0	NA	NA	NA	NA	NA	NA
EX3-SW3-1.0-0401	4/30/2001	1	NA	<10.0	<25.0	NA	NA	NA	NA	NA	NA
EX3-SW1B-0501	5/1/2001	7	NA	179	<25.0	NA	NA	NA	NA	NA	NA
EX4-SW-0501	5/1/2001	0.5	NA	92.3	129	NA	NA	NA	NA	NA	NA
EX4-F-0501	5/1/2001	1	NA	376	1,010	NA	NA	NA	NA	NA	NA
EX4-F-0501	5/1/2001	3	NA	11.1	47.7	NA	NA	NA	NA	NA	NA
EX5-SW-0501	5/1/2001	3.5	NA	198	29.8	NA	NA	NA	NA	NA	NA
EX5-SW2-0501	5/1/2001	3.5	NA	<10.0	<25.0	NA	NA	NA	NA	NA	NA
EX5-F-0501	5/1/2001	3.5	NA	128	<25.0	NA	NA	NA	NA	NA	NA
TP11B-3-0501	5/1/2001	3	NA	<10.0	<25.0	NA	NA	NA	NA	NA	NA
TP11B-8-0501	5/1/2001	8	NA	<10.0	<25.0	NA	NA	NA	NA	NA	NA
AS1-12.0-0501	5/25/2001	11.5-12.5	NA	**9,570**	<1,020	**1,530**	<1.0	1.07	**6.93**	**112**	NA
AS2-12.0-0501	5/25/2001	11.5-12.5	NA	<10.0	<25.0	<5.0	<0.05	<0.05	<0.05	<0.10	NA

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Sample ID	Date	Depth (ft bgs)	Total TPH	TPH-DRO	TPH-HRO	TPH-GRO	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
AS3-12.0-0501	5/25/2001	11.5-12.5	NA	75	<25.0	<5.0	<0.05	<0.05	<0.05	<0.10	NA
GP-1	1/9/2003	13.5	NA	34.4	<25	<5.0	<0.03	<0.05	<0.05	<0.1	NA
GP-2	1/9/2003	6	NA	87.8	<25	<5.0	<0.03	<0.05	<0.05	<0.1	NA
GP-2	1/9/2003	13	NA	69	25.9	<5.0	<0.03	<0.05	<0.05	<0.1	NA
GP-3	1/9/2003	11	NA	15	<25	<5.0	<0.03	<0.05	<0.05	<0.1	NA
GP-4	1/9/2003	5	NA	<10	<25	<5.0	<0.03	<0.05	<0.05	<0.1	NA
GP-4	1/9/2003	11	NA	<10	<25	<5.0	<0.03	<0.05	<0.05	<0.1	NA
GP-5	1/13/2003	10	NA	46.6	<25	<5.0	<0.03	<0.05	<0.05	<0.1	NA
B-1(3.5-4)	2/1/2005	3.5-4	NA	<10.0	<25.0	<5.00	<0.03	<0.05	<0.05	<0.10	NA
B-1(8.5-9)	2/1/2005	8.5-9	NA	<10.0	<25.0	<5.00	<0.03	<0.05	<0.05	<0.10	NA
B-1(13.5-14)	2/1/2005	13.5-14	NA	<10.0	<25.0	<5.00	<0.03	<0.05	<0.05	<0.10	NA
B-1(18.5-20)	2/1/2005	18.5-20	NA	<10.0	<25.0	<3.91	<0.0235	<0.0391	<0.0391	<0.0782	NA
B-2(5-6.5)	2/1/2005	5-6.5	NA	35.3	28.5	8.19	<0.03	<0.05	<0.05	<0.10	NA
B-2(15-16.5)	2/1/2005	15-16.5	NA	11.3	<25.0	<7.12	<0.0427	<0.0712	<0.0712	<0.142	NA
B-2(20-21.5)	2/1/2005	20-21.5	NA	<10.0	<25.0	<5.00	<0.03	<0.05	<0.05	<0.10	NA
B-2(25-26.5)	2/1/2005	25-26.5	NA	<10.0	<25.0	<5.00	<0.03	<0.05	<0.05	<0.10	NA
B-3(15-16.5)	2/1/2005	15-16.5	NA	<10.0	<25.0	<5.00	<0.03	<0.05	<0.05	<0.10	NA
B-3(20-21.5)	2/1/2005	20-21.5	NA	<10.0	<25.0	<4.52	<0.0271	<0.0452	<0.0452	<0.905	NA
B-3(25-26.5)	2/1/2005	25-26.5	NA	<10.0	<25.0	<5.00	<0.03	<0.05	<0.05	<0.10	NA
B-4(15-16.5)	2/1/2005	15-16.5	NA	<10.0	<25.0	<4.48	<0.0269	<0.0448	<0.0448	<0.0897	NA
B-4(20-21.5)	2/1/2005	20-21.5	NA	<10.0	<25.0	<4.48	<0.0269	<0.0448	<0.0448	<0.0896	NA
B-4(25-26.5)	2/1/2005	25-26.5	NA	<10.0	<25.0	<4.13	<0.0248	<0.0413	<0.0413	<0.0826	NA
B-5(10-11.5)	2/1/2005	10-11.5	NA	**3,080**	60.1	**281**	<0.03	<0.05	<0.05	0.188	NA
B-5(15-16.5)	2/1/2005	15-16.5	NA	**2,870**	75.4	**1,070**	<0.0250	<0.0416	0.167	0.600	NA
B-5(20-21.5)	2/1/2005	20-21.5	NA	**4,690**	104	**1,140**	<0.0247	<0.0412	0.268	0.983	NA
B-5(25-26.5)	2/1/2005	25-26.5	NA	**2,260**	<125	**373**	<0.03	<0.05	0.0769	0.143	NA
B-6(15-16.5)	2/1/2005	15-16.5	NA	1,800	<25.0	**242**	<0.0267	<0.0444	<0.0444	<0.0889	NA
B-6(20-21.5)	2/1/2005	20-21.5	NA	**7,370**	58.6	**378**	<0.0245	<0.0408	<0.0408	<0.0816	NA
B-6(25-26.5)	2/1/2005	25-26.5	NA	86.7	<25.0	30.8	<0.0260	<0.0434	<0.0434	<0.0868	NA
B-7(15-16.5)	2/1/2005	15-16.5	NA	<10.0	<25.0	<5.00	<0.03	<0.05	<0.05	<0.10	NA
B-7(20-21.5)	2/1/2005	20-21.5	NA	<10.0	<25.0	<5.00	<0.03	<0.05	<0.05	<0.10	NA

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Chelan, Washington
Concentrations reported in mg/kg

Sample ID	Date	Depth (ft bgs)	Total TPH	TPH-DRO	TPH-HRO	TPH-GRO	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
B-7(25-26.5)	2/1/2005	25-26.5	NA	<10.0	<25.0	<4.15	<0.0249	<0.0415	<0.0415	<0.0828	NA
B-8(15-16.5)	2/1/2005	15-16.5	NA	<10.0	<25.0	<4.44	<0.0266	<0.0444	<0.0444	<0.0887	NA
B-8(20-21.5)	2/1/2005	20-21.5	NA	<10.0	<25.0	<5.00	<0.03	<0.05	<0.05	<0.10	NA
B-8(25-26.5)	2/1/2005	25-26.5	NA	<10.0	<25.0	<4.55	<0.0273	<0.0455	<0.0455	<0.0909	NA
022/27'	4/25/2005	27	NA	1,000	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
023/27'	4/26/2005	27	NA	<20.0	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
024/27'	4/25/2005	27	NA	<20.0	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
025/18'	4/25/2005	18	NA	41	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
026/25'	4/25/2005	25	NA	<20.0	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
027/25'	4/25/2005	25	NA	<20.0	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
031/24'	4/25/2005	24	NA	<20.0	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
036/29'	4/25/2005	29	NA	<20.0	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
032/16'	4/26/2005	16	NA	110	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
037/25'	4/27/2005	25	NA	**4,600**	<40.0	<10.0	<0.02	<0.05	<0.05	0.03	NA
038/24'	4/28/2005	24	NA	<20.0	120	<10.0	<0.02	<0.05	<0.05	<0.05	NA
040/24'	4/28/2005	24	NA	88	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
042/25'	4/28/2005	25	NA	<20.0	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
043/25'	4/29/2005	25	NA	<20.0	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
044/25'	4/29/2005	25	NA	<20.0	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
045/25'	4/29/2005	25	NA	<20.0	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
046/25'	4/29/2005	25	NA	<20.0	<40.0	<10.0	<0.02	<0.05	<0.05	<0.05	NA
EX0426NW1	4/26/2005	--	NA	12.4	<25.0	<4.32	<0.00127	<0.00127	<0.00339	<0.00847	<0.000847
EX0426EW1	4/26/2005	--	NA	11.1	<25.0	<4.08	<0.00150	<0.00150	<0.00400	<0.0100	<0.00100
EX0430SW1	4/30/2005	--	NA	<10.0	<25.0	<5.00	<0.00150	<0.00150	<0.00400	<0.0100	<0.00100
EX0430WW1	4/30/2005	--	NA	<10.0	<25.0	<5.00	<0.00129	<0.00129	<0.00345	<0.00862	<0.000862
EX0430NW1	4/30/2005	--	NA	18.7	<25.0	7.01	<0.00132	<0.00132	<0.00351	<0.00877	<0.000877
MW-1A-26	5/5/2005	26	NA	<10.0	<25.0	<4.10	<0.0246	<0.0410	<0.0410	<0.0820	NA
MW-1A-31	5/5/2005	31	NA	<10.0	<25.0	<3.71	<0.00127	<0.00127	<0.00340	<0.00849	NA
MW-5A-26	5/5/2005	26	NA	1,360	<125	**260**	<0.0250	<0.0417	0.0959	0.675	NA
MW-5A-31	5/5/2005	31	NA	<10.0	<25.0	<3.96	<0.0238	<0.0396	<0.0396	<0.0792	NA
MW-5A-36	5/5/2005	36	NA	<10.0	<25.0	<5.00	<0.00150	<0.00150	<0.00400	<0.0100	NA
MW-3A-31	5/5/2005	31	NA	185	<25.0	18.9	<0.0219	<0.0365	<0.0365	<0.0731	NA
MW-4A-31	5/6/2005	31	NA	<10.0	<25.0	<3.92	<0.0235	<0.0392	<0.0392	<0.0784	NA

TABLE 1
HISTORICAL SOIL ANALYTICAL RESULTS - TPH, BTEX and MTBE
FORMER UNOCAL BULK PLANT FACILITY NO. 306562
1329 West Woodin Avenue
Chelan, Washington
Concentrations reported in mg/kg

Sample ID	Date	Depth (ft bgs)	Total TPH	TPH-DRO	TPH-HRO	TPH-GRO	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
SB-1	03/19/12	23	NA	560	<53	73	<0.0005	<0.001	<0.001	<0.001	<0.0005
	03/19/12	25	NA	<3.2	<11	<1.1	<0.0005	<0.001	<0.001	<0.001	NA
	03/19/12	28	NA	<3.5	<12	<1.2	<0.0005	<0.001	<0.001	<0.001	NA
	03/19/12	33	NA	<3.6	<12	<1.3	<0.0005	<0.001	<0.001	<0.001	NA
SB-2	03/19/12	25	NA	6.2	<11	<1.1	<0.0005	<0.001	<0.001	<0.001	NA
	03/19/12	28	NA	<3.6	<12	<1.3	<0.0006	<0.001	<0.001	<0.001	NA
	03/19/12	33	NA	<4.1	<14	<1.7	<0.0007	<0.001	<0.001	<0.001	NA
SB-3	03/19/12	28	NA	<3.6	<12	<1.6	<0.0007	<0.001	<0.001	<0.001	NA
	03/19/12	33	NA	<3.4	<11	<1.1	<0.0005	<0.001	<0.001	<0.001	NA
SB-4	03/20/12	12.5	NA	<3.2	<11	<1.0	<0.0005	<0.001	<0.001	<0.001	NA
	03/20/12	35	NA	<3.3	<11	<1.0	<0.0005	<0.001	<0.001	<0.001	NA
SB-5	03/20/12	4	NA	3.2	<11	<1.0	<0.0005	<0.001	<0.001	<0.001	NA
	03/20/12	26	NA	<3.6	<12	<1.3	<0.0005	<0.001	<0.001	<0.001	NA
	03/20/12	36	NA	<3.7	<12	<1.5	<0.0006	<0.001	<0.001	<0.001	NA
SB-6	03/20/12	4	NA	<3.2	<11	<1.1	<0.0005	<0.001	<0.001	<0.001	NA
	03/21/12	25	NA	<3.4	<11	<1.2	<0.0006	<0.001	<0.001	<0.001	NA
	03/21/12	37	NA	<3.6	<12	<1.3	<0.0006	0.002	0.016	0.095	NA
SB-7	03/21/12	6	NA	<3.2	<11	<1.0	<0.0005	<0.0009	<0.0009	<0.0009	NA
	03/21/12	28	NA	<3.3	<11	<1.2	<0.0006	<0.001	<0.001	<0.001	NA
	03/21/12	35	NA	<3.4	<11	<1.2	<0.0005	<0.001	<0.001	<0.001	NA
SB-8	03/21/12	6	NA	<3.1	<10	<1.1	<0.0005	<0.001	<0.001	<0.001	NA
	03/21/12	26	NA	<3.2	<11	<1.1	<0.0005	<0.001	<0.001	<0.001	NA
	03/21/12	31	NA	3.9	<11	<0.9	0.0008	<0.0009	<0.0009	<0.0009	NA
SB-9	03/21/12	2	NA	<3.3	<11	<1.1	<0.0007	0.003	<0.001	<0.001	NA
	03/21/12	27.5	NA	<3.5	<12	<1.4	<0.0006	<0.001	<0.001	<0.001	NA
	03/21/12	35.5	NA	<3.5	<12	<1.3	<0.0006	<0.001	<0.001	<0.001	NA
SB-10	03/22/12	23	NA	3.2	<10	<1.1	<0.0005	<0.001	<0.001	<0.001	NA
	03/22/12	28	NA	<3.3	<11	<1.1	<0.0005	<0.001	<0.001	<0.001	NA
SB-11	03/22/12	21.5	NA	**8,100**	<1,100	**2,400**	<0.029	<0.058	0.060	0.077	NA
	03/22/12	24	NA	**6,000**	<1,100	**2,300**	<0.056	<0.11	<0.11	0.12	<0.056
	03/22/12	28.5	NA	7.7	<12	<1.4	<0.0006	<0.001	<0.001	<0.001	NA
	03/22/12	31	NA	100	<13	3.5	<0.0006	<0.001	<0.001	<0.001	NA
MW-6A	03/22/12	31	NA	<3.5	<12	<1.2	<0.0005	<0.001	<0.001	<0.001	NA

TABLE 1
HISTORICAL SOIL ANALYTICAL RESULTS - TPH, BTEX and MTBE
FORMER UNOCAL BULK PLANT FACILITY NO. 306562
1329 West Woodin Avenue
Chelan, Washington
Concentrations reported in mg/kg

Sample ID	Date	Depth (ft bgs)	Total TPH	TPH-DRO	TPH-HRO	TPH-GRO	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
MW-9	03/20/12	26	NA	<3.2	<11	<1.1	<0.0005	<0.001	<0.001	<0.001	NA
	03/20/12	28	NA	<3.4	<11	<1.1	<0.0005	<0.001	<0.001	<0.001	NA
	03/20/12	33.5	NA	<3.8	<13	<1.4	<0.0006	<0.001	<0.001	<0.001	NA
MW-10	03/20/12	24	NA	<3.1	<10	<1.0	<0.0005	<0.001	<0.001	<0.001	NA
	03/20/12	28	NA	<3.6	<12	<1.3	<0.0005	<0.001	<0.001	<0.001	NA
	03/20/12	33	NA	<3.4	<11	<1.1	<0.0005	<0.001	<0.001	<0.001	NA
MTCA Method A Cleanup Levels:			--	2,000	2,000	30/100[1]	0.03	7	6	9	0.1

EXPLANATIONS:

Analytical results in bold font indicate concentrations exceed MTCA Method A cleanup levels.
Laboratory analytical methods for historical data may not be consistent with current analytical methods. When necessary, consult original reports to verify methods usec

BTEX = Benzene, toluene, ethylbenzene, and total xylenes
ft = Feet
mg/kg = Milligrams per kilogram
MTCA = Model Toxics Control Act
TPH = Total petroleum hydrocarbons
TPH-DRO = TPH as diesel-range organics
TPH-GRO = TPH as gasoline-range organics
TPH-HRO = TPH as heavy oil-range organics
USEPA = United States Environmental Protection Agency
< = Analyte not detected at or above the laboratory reporting limit

BTEX and MTBE analyzed by USEPA 8260B.
TPH-GRO analyzed by Northwest Method NWTPH-Gx.
TPH-DRO and TPH-HRO analyzed by Northwest Method NWTPH-Dx.

Soil removed during remedial excavations in 2001 and 2005.

[1] Cleanup level is 30 mg/kg when benzene is present onsite and 100 mg/kg when not present. Benzene is not present onsite.

* See text regarding TP-9 and the confirmation sampling at GP-5.

leidos

A1 Soil Cleanup Levels: Worksheet for Soil Data Entry: Refer to WAC 173-340-720, 740,745, 747, 750

1. Enter Site Information

Date: 03/22/12
Site Name: Chevron Site No. 306562
Sample Name: SB-11-24

2. Enter Soil Concentration Measured

Chemical of Concern or Equivalent Carbon Group	Measured Soil Conc dry basis mg/kg	Composition Ratio %
Petroleum EC Fraction		
AL_EC >5-6	1.475	0.16%
AL_EC >6-8	1.53	0.17%
AL_EC >8-10	150	16.27%
AL_EC >10-12	37	4.01%
AL_EC >12-16	290	31.45%
AL_EC >16-21	210	22.78%
AL_EC >21-34	41	4.45%
AR_EC >8-10	82.746	8.97%
AR_EC >10-12	0.74	0.08%
AR_EC >12-16	12.79	1.39%
AR_EC >16-21	71	7.70%
AR_EC >21-34	15.969	1.73%
Benzene	0.028	0.00%
Toluene	0.154	0.02%
Ethylbenzene	1.79	0.19%
Total Xylenes	0.664	0.07%
Naphthalene	0.86	0.09%
1-Methyl Naphthalene	4.2	0.46%
2-Methyl Naphthalene	0.007	0.00%
n-Hexane	0.055	0.01%
MTBE	0	0.00%
Ethylene Dibromide (EDB)	0	0.00%
1,2 Dichloroethane (EDC)	0	0.00%
Benzo(a)anthracene	0	0.00%
Benzo(b)fluoranthene	0	0.00%
Benzo(k)fluoranthene	0	0.00%
Benzo(a)pyrene	0	0.00%
Chrysene	0.031	0.00%
Dibenz(a,h)anthracene	0	0.00%
Indeno(1,2,3-cd)pyrene	0	0.00%
Sum	922.039	100.00%

Notes for Data Entry | Set Default Hydrogeology

Clear All Soil Concentration Data Entry Cells

Restore All Soil Concentration Data cleared previously

REMARK:
1) Half detection limits used for AL_EC>6-8, benzene, n-hexane, and 2-methyl naphthalene.
2) MTBE, EDB, EDC, Benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene have never been detected on the site, so a value of zero was entered.
3) Double counting was avoided for E-C fractions.
4) Default values were used for total porosity, soil bulk density, fraction organic carbon, and dilution factor.

3. Enter Site-Specific Hydrogeological Data

Total soil porosity:	0.43	Unitless
Volumetric water content:	0.3	Unitless
Volumetric air content:	0.13	Unitless
Soil bulk density measured:	1.5	kg/L
Fraction Organic Carbon:	0.001	Unitless
Dilution Factor:	20	Unitless

4. Target TPH Ground Water Concentation (if adjusted)

If you adjusted the target TPH ground water concentration, enter adjusted value here:	500	ug/L

A2 Soil Cleanup Levels: Calculation and Summary of Results. Refer to WAC 173-340-720, 740, 745, 747, 750

Site Information

Date: 3/22/2012
Site Name: Chevron Site No. 306562
Sample Name: SB-11-24
Measured Soil TPH Concentration, mg/kg: **922.039**

1. Summary of Calculation Results

Exposure Pathway	Method/Goal	Protective Soil TPH Conc, mg/kg	With Measured Soil Conc		Does Measured Soil Conc Pass or Fail?
			RISK @	HI @	
Protection of Soil Direct Contact: Human Health	Method B	2,803	4.53E-09	3.29E-01	Pass
	Method C	38,066	9.49E-10	2.42E-02	Pass
Protection of Method B Ground Water Quality (Leaching)	Potable GW: Human Health Protection	4,497	3.54E-06	6.86E-01	Pass
	Target TPH GW Conc. @ 500 ug/L	2,522	NA	NA	Pass

Warning! Check to determine if a simplified or site-specific Terrestrial Ecological Evaluation may be required (Refer to WAC 173-340-7490 through ~7494).

2. Results for Protection of Soil Direct Contact Pathway: Human Health

	Method B: Unrestricted Land Use	Method C: Industrial Land Use
Protective Soil Concentration, TPH mg/kg	**2,803.09**	**38,065.62**
Most Stringent Criterion	**HI =1**	**HI =1**

Soil Criteria	Protective Soil Concentration @Method B				Protective Soil Concentration @Method C			
	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @	Most Stringent?	TPH Conc, mg/kg	RISK @	HI @
HI =1	YES	2.80E+03	1.38E-08	1.00E+00	YES	3.81E+04	3.92E-08	1.00E+00
Total Risk=1E-5	*NO*	2.03E+06	1.00E-05	7.26E+02	*NO*	9.72E+06	1.00E-05	2.55E+02
Risk of Benzene= 1E-6	*NO*	5.98E+05	2.94E-06	2.13E+02	NA			
Risk of cPAHs mixture= 1E-6	*NO*	3.08E+05	1.52E-06	1.10E+02				
EDB	NA	NA	NA	NA				
EDC	NA	NA	NA	NA				

3. Results for Protection of Ground Water Quality (Leaching Pathway)

3.1. Protection of Potable Ground Water Quality (Method B): Human Health Protection

Most Stringent Criterion	**Benzene MCL = 5 ug/L**
Protective Ground Water Concentration, ug/L	**512.42**
Protective Soil Concentration, mg/kg	**4496.72**

Ground Water Criteria	Protective Potable Ground Water Concentration @Method B				Protective Soil Conc, mg/kg
	Most Stringent?	TPH Conc, ug/L	RISK @	HI @	
HI=1	*NO*	5.28E+02	7.72E-06	8.75E-01	100% NAPL
Total Risk = 1E-5	*NO*	5.28E+02	7.72E-06	8.75E-01	100% NAPL
Total Risk = 1E-6	YES	2.79E+02	1.00E-06	4.02E-01	1.66E+02
Risk of cPAHs mixture= 1E-5	*NO*	5.28E+02	7.72E-06	8.75E-01	100% NAPL
Benzene MCL = 5 ug/L	YES	5.12E+02	6.29E-06	8.21E-01	4.50E+03
MTBE = 20 ug/L	NA	NA	NA	NA	NA

Note: 100% NAPL is 69000 mg/kg TPH.

3.2 Protection of Ground Water Quality for TPH Ground Water Concentration previously adjusted and entered

Ground Water Criteria	Protective Ground Water Concentration			Protective Soil Conc, mg/kg
	TPH Conc, ug/L	Risk @	HI @	
Target TPH GW Conc = 500 ug/L	5.00E+02	5.43E-06	7.86E-01	**2.52E+03**