Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Matt Mead, Governor

Todd Parfitt, Director

March 26, 2013

Mr. Jeff Locker
124 Harris Bridge Road
Pavillion, WY 82523

RE: WDEQ Response – Request for Additional Site Characterization at Tribal Pavillion 42-11
Encana Natural Gas Field, Pavillion, Fremont County, Wyoming (VRP Site #2058)

Dear Mr. Locker,

During a phone call on March 5, 2013, you requested that Encana Oil & Gas (USA), Inc. (Encana) conduct additional site characterization activities at the Tribal Pavillion (TP) 42-11 former production pit ("site") to investigate for potential impacts to deeper groundwater in the vicinity of your residence, unless Encana had already completed such an investigation. TP 42-11 is located in the Encana Natural Gas Field in Pavillion, WY, and Encana is pursuing cleanup of contaminated soils and groundwater at TP 42-11 through the Wyoming Department of Environmental Quality (WDEQ), Voluntary Remediation Program (VRP). The VRP relayed your request for additional site characterization to Encana on March 5, 2013, and asked Encana to provide you with a data package including the most recent supplemental site characterization results for the site as soon as possible.

The majority of the monitoring wells located at TP 42-11 were installed to a total depth of 20 feet below ground surface (bgs) or shallower. However, as part of the supplemental site investigation activities conducted in September 2011, Encana advanced soil boring SB-5-11 to a total depth of 40 feet bgs in order to characterize the deeper lithology at the site. SB-5-11 is physically located between the former production pit at TP 42-11 and your residence (please see the attached site maps). Field screening observations (e.g., photoionization detector (PID) results, observations for staining and odor, etc.) and soil sampling results for SB-5-11 indicate that the most impacted soil interval present in this boring is located between 16 and 20 feet bgs. The depth of petroleum hydrocarbon impacts observed in SB-5-11 is generally consistent with the depth of observed impacts in the shallower site monitoring wells, and the field screening observations for SB-5-11 do not indicate the presence of petroleum hydrocarbons at depths significantly below the impacted interval of 16-20 feet bgs (please see the attached boring log with field observations for SB-5-11). In addition, monitoring well MW-1, which is physically located between SB-5-11 and your residence, was installed to a total depth of 38.28 feet bgs. With the exception of one detection of Total Petroleum Hydrocarbons – Gasoline Range Organics, which was below the cleanup level of 7.3 mg/L, at a concentration of 0.872 mg/L in 2007, no contaminants of concern have been detected in this monitoring well at concentrations above the method detection limit (please see the attached groundwater analytical data table for TP 42-11 monitoring wells). In addition, Encana has submitted a draft, revised Remedial Alternatives Evaluation (RAE) for TP 42-11 in which Encana proposed an active remedy for treatment of source soils and shallow groundwater at the site. Although the RAE is still under review and revision, the VRP is confident that treatment of source soils and shallow groundwater at the site will also remediate

Table 2-1 Soil Sample Analytical Results, 2011
WH Paul Patent 42x-11, Encana Oil & Gas (USA) Inc.

				Sample Name	SB-1-11	SB-2-11	SB-3-11	SB-4-11	SB-5-11	SB-5-11	SB-5-11[1]	SB-5-11[1]	SB-6-11	MW-6	SB-7-11
				Sample Depth (feet)	4-6	2-4	2-4	2-4	2-4	4-6	16-18	18-20	2-4	4-6	4-6
				Sample Date	8/25/2011	8/25/2011	8/25/2011	8/25/2011	8/25/2011	9/6/2011	9/6/2011	9/6/2011	8/25/2011	9/7/2011	8/25/2011
Parameter	**Units**	**Method**	**Residential Soil Cleanup Levels (mg/kg)[3]**	**Migration to Groundwater Cleanup Levels (mg/kg)[3]**	**Results**										
TPH (GC/FID) Low Fraction	mg/kg	GRO	1,000 (Combined)[2]		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**510**	**580**	<0.50	<0.50	<0.50
TPH (GC/FID) High Fraction (DRO Wyoming C10-C32)	mg/kg	8015			**99**	<4.0	<4.0	**5.5**	**15**	<4.0	**450**	**100**	**11**	<4.0	**7.4**
Benzene	mg/kg	8260B	1.1	0.00023	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.050	<0.0050	<0.0050	<0.0050
Toluene	mg/kg	8260B	5000	1.7	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.25	<0.25	<0.025	<0.025	<0.025
Ethylbenzene	mg/kg	8260B	5.7	0.0019	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	**0.26**	**0.52**	<0.0050	<0.0050	<0.0050
Total Xylenes	mg/kg	8260B	600	0.23	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	**0.4**	**1.1**	<0.015	<0.015	<0.015
Naphthalene	mg/kg	8270C	3.9	0.00055	--	--	--	--	--	--	**0.58**	**0.52**	--	--	--
Other Semi-Volatile Organic Compounds (SVOC)	mg/kg	8270C	Note[3]	Note[3]	--	--	--	--	--	--	Not Detected[1]	Not Detected[1]	--	--	--

Notes:
-- = not analyze; DRO = diesel range organics; FID = flame ionization detector; GC = gas chromatograph; GRO = gasoline range organics; mg/kg = milligrams per kilogram; TPH = total petroleum hydrocarbons

=exceeds Migration to Groundwater Cleanup Levels
=exceeds Migration to Groundwater Cleanup Levels and Residential Soil Cleanup Levels
Bold = dectection
[1] Samples SB-5-11 16-18 and SB-5-11 18-20 were analyzed for SVOCs using method 8270C. Detected SVOCs are identified in the table and all other SVOCs were below detection limits (see corresponding laboratory
[2] The TPH cleanup level of 1,000 mg/kg is based on the most stringent cleanup level identified in the Wyoming Oil and Gas Conservation Commission "Guideline for Closure of Unlined Production Pits". If TPH is
[3] Soil cleanup levels are based on the Wyoming Department of Environmental Quality/Solid and Hazardous Waste Division (DEQ/SHWD) cleanup level spreadsheet effective June 30, 2009.

Table 2-2 Historical Groundwater Sampling Analytical Results
WH Paul Patent 42x-11, Encana Oil & Gas (USA) Inc.

Well ID	Analyte / Cleanup Levels / Sample Date	Depth to Water (feet)	TPH-DRO	TPH-GRO	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	2-Methyl naphthalene	Acetone	1,2,4-Trimethyl benzene	1,2,3-Trimethyl benzene	1,3,5-Trimethyl benzene	sec-Butyl benzene	tert-Butyl benzene	Isoprpyl benzene	p-Isopropyl toluene	n-Propyl benzene	n-Butyl benzene	2-Butanone (MEK)
	Cleanup Levels		1.1[1]/10	7.3	0.005	1.0	0.7	10	0.729	0.146	32.8	0.365	N/A[3]	1.82	N/A[3]	N/A[3]	3.6	N/A[3]	N/A[3]	N/A[3]	219
			Results (mg/L)																		
MW-1	7/17/2007	NA	ND	0.672	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	5/7/2008	NA	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--
	10/29/2008	NA	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--
	3/6/2009	NA	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--
	10/29/2009	NA	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--
	4/15/2010	NA	<0.3	<0.02	<0.001	<0.001	<0.001	<0.001	--	--	--	--	--	--	--	--	--	--	--	--	<0.02
	10/6/2010	NA	<0.3	<0.02	<0.001	<0.001	<0.001	<0.001	--	--	--	--	--	--	--	--	--	--	--	--	<0.02
	8/8/2011	5.58	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	<0.0050	--	<0.05	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010
	11/2/2011	8.88	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	<0.0050	--	<0.05	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010
	1/27/2012	11.19	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	<0.0050	--	<0.05	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0100
	5/10/2012	8.04	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	--	--	NA	--	--	--	--	--	--	--	--	--	--
MW-2	7/17/2007	NA	5.4	2.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	5/7/2008	NA	3.6	1.3	0.027	ND	ND	0.019	0.043	0.015	--	--	--	--	--	--	--	--	--	--	--
	10/29/2008	NA	11	0.438	0.013	ND	ND	ND	0.0021	ND	--	--	--	--	--	--	--	--	--	--	--
	3/6/2009	NA	9.4	1.15	0.014	ND	0.076	0.054	0.013	0.0056	--	--	--	--	--	--	--	--	--	--	--
	10/29/2009	NA	3.2	0.28	0.0079	ND	0.0052	0.032	--	--	--	--	--	--	--	--	--	--	--	--	--
	4/12/2010	NA	5.6	0.313	0.0042	0.00013	0.023	0.034	--	--	--	--	--	--	--	--	--	--	--	--	<0.02
	8/8/2011	5.57	2	0.3	0.011	<0.0050	0.022	0.051	<0.0050	--	<0.050	0.0026	<0.0010	<0.0010	0.0027	0.0024	0.012	0.0017	0.008	<0.0010	<0.0010
	8/8/2011[2]	NA	1	0.36	0.009		0.019	0.033	<0.0010	--		0.0026	<0.0010	<0.0010	0.0026	0.0021	0.012	0.0016	0.0069	NA	NA
	11/2/2011	NA	4.3	0.46	0.015	<0.0050	0.026	0.065	<0.0050	--	<0.050	0.0045	<0.0010	<0.0010	0.003	0.0025	0.016	0.0014	0.01	<0.0010	<0.010
	11/2/2011[2]	8.18	5.2	0.46	0.017	<0.0050	0.028	0.071	0.0110	--	<0.050	0.0072	0.0017	<0.0010	0.0036	0.0028	0.018	0.0016	0.012	<0.0010	<0.010
	1/27/2012	9.68	9.1	0.79	0.0061	<0.0050	0.026	0.027	<0.0050	--	<0.050	0.0034	<0.0010	0.0078	0.0078	0.0052	0.027	0.0039	0.017	<0.0010	<0.0100
	5/10/2012	10.46	5.1	0.40	0.0043	<0.0050	0.0058	0.029	--	--	--	--	--	--	--	--	--	--	--	--	--
	5/10/2012[2]	NA	9.4	0.41	0.0053	<0.0050	0.011	0.042	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-3	7/17/2007	NA	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	5/7/2008	NA	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	10/29/2008	NA	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--
	3/6/2009	NA	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	--	ND	--	--
	10/29/2009	NA	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	ND	--	--
	4/12/2010	NA	<0.3	<0.02	<0.001	<0.001	<0.001	<0.001	--	--	--	--	--	--	--	--	--	--	--	--	<0.02
	8/8/2011	4.22	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	<0.0050	--	<0.050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010
	11/2/2011	7.25	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	<0.0050	--	<0.050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010
	1/27/2012	9.46	<0.10	<0.10	<0.0010	<0.025	<0.0010	<0.0030	<0.0050	--	<0.25	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0100
	5/10/2012	5.24	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 2-2 Historical Groundwater Sampling Analytical Results
WH Paul Patent 42x-11, Encana Oil & Gas (USA) Inc.

Well ID	Analyte / Cleanup Levels	Depth to Water (feet)	TPH-DRO	TPH-GRO	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	2-Methyl naphthalene	Acetone	1,2,4-Trimethyl benzene	1,2,3-Trimethyl benzene	1,3,5-Trimethyl benzene	sec-Butyl benzene	tert-Butyl benzene	Isopropyl benzene	p-Isopropyl toluene	n-Propyl benzene	n-Butyl benzene	2-Butanone (MEK)
	Cleanup Levels		1.1[1]/10	7.3	0.005	1.0	0.7	10	0.729	0.146	32.8	0.365	N/A[3]	1.82	N/A[3]	N/A[3]	3.6	N/A[3]	N/A[3]	N/A[3]	211
Well ID	Sample Date											Results (mg/L)									
MW-4	10/29/2008	NA	ND	4.91	0.0021	ND	ND	0.032	0.0029	ND	--	--	--	--	--	--	--	--	--	--	--
	3/6/2009	NA	12	7.76	0.021	ND	0.19	0.505	0.236	0.225	--	--	--	--	--	--	--	--	--	--	--
	10/29/2009	NA	0.27	0.73	0.0013	ND	0.016	0.04	--	--	--	--	--	--	--	--	--	--	--	--	--
	4/12/2010	NA	13	2.83	0.011	0.00061	0.111	0.289	--	--	--	--	--	--	--	--	--	--	--	--	<0.02
	8/8/2011	4.01	0.12	0.27	<0.0010	<0.0050	0.034	0.01	0.0053	--	<0.050	0.0041	0.002	0.0022	<0.0010	<0.0010	0.0014	<0.0010	<0.0010	<0.0010	<0.010
	11/2/2011	7.92	0.41	0.26	<0.0010	<0.0050	0.016	0.038	0.016	--	<0.050	0.013	0.0029	0.0037	0.0014	0.001	0.0069	<0.0010	0.0046	<0.0010	<0.010
	1/27/2012	10.17	1.4	0.47	0.0015	<0.001	0.023	0.520	0.0280	--	<0.050	0.017	0.0052	0.0048	0.0024	0.002	0.0097	<0.0010	0.0055	2.9	<0.0100
	5/10/2012	5.88	1.5	0.23	<0.0010	<0.0050	0.0056	0.016	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-5	3/6/2009	NA	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--
	10/29/2009	NA	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--
	4/12/2010	NA	<0.3	<0.02	<0.001	<0.0010	<0.0010	<0.0010	--	--	--	--	--	--	--	--	--	--	--	--	--
	8/8/2011	9.7	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	<0.0050	--	<0.050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010
	11/2/2011	12.46	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	<0.0050	--	<0.050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010
	1/28/2012	14.75	<0.10	<0.10	<0.0010	<0.005	<0.0010	<0.0030	<0.0050	--	<0.05	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0100
	5/10/2012	13.61	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-6	9/9/2011	NA	0.47	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/2/2011	8.35	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	<0.0050	--	<0.050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.005	<0.010
	1/27/2012	10.69	<0.10	<0.10	<0.0010	<0.025	<0.0010	<0.0030	<0.005	--	<0.25	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.005	<0.0100
	5/10/2012	5.47	<0.10	<0.10	<0.0010	<0.0050	<0.0010	<0.0030	--	--	--	--	--	--	--	--	--	--	--	--	--
WT-1-11	9/9/2011	NA	14	50	0.13	<0.025	0.18	0.46	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/2/2011	9.81	14	7.4	0.16	0.016	0.15	0.41	0.11	--	0.052	0.17	0.067	0.059	0.016	0.0097	0.053	0.007	0.052	0.0032	0.13
	1/26/2012	12.20	31	7.7	0.22	<0.05	0.16	0.40	0.12	--	<0.5	0.17	0.077	0.054	0.015	<0.0010	0.051	<0.0010	0.046	<0.01	0.14
	5/10/2012	10.58	15	8.9	0.24	0.0250	0.24	0.62	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Data not validated

-- = Not analyzed

mg/L = milligrams per liter

bold font = above detection limit

MCL = maximum contaminant level

N/A = not applicable

ND = non detect (detection limits prior to April 2010 are not available)

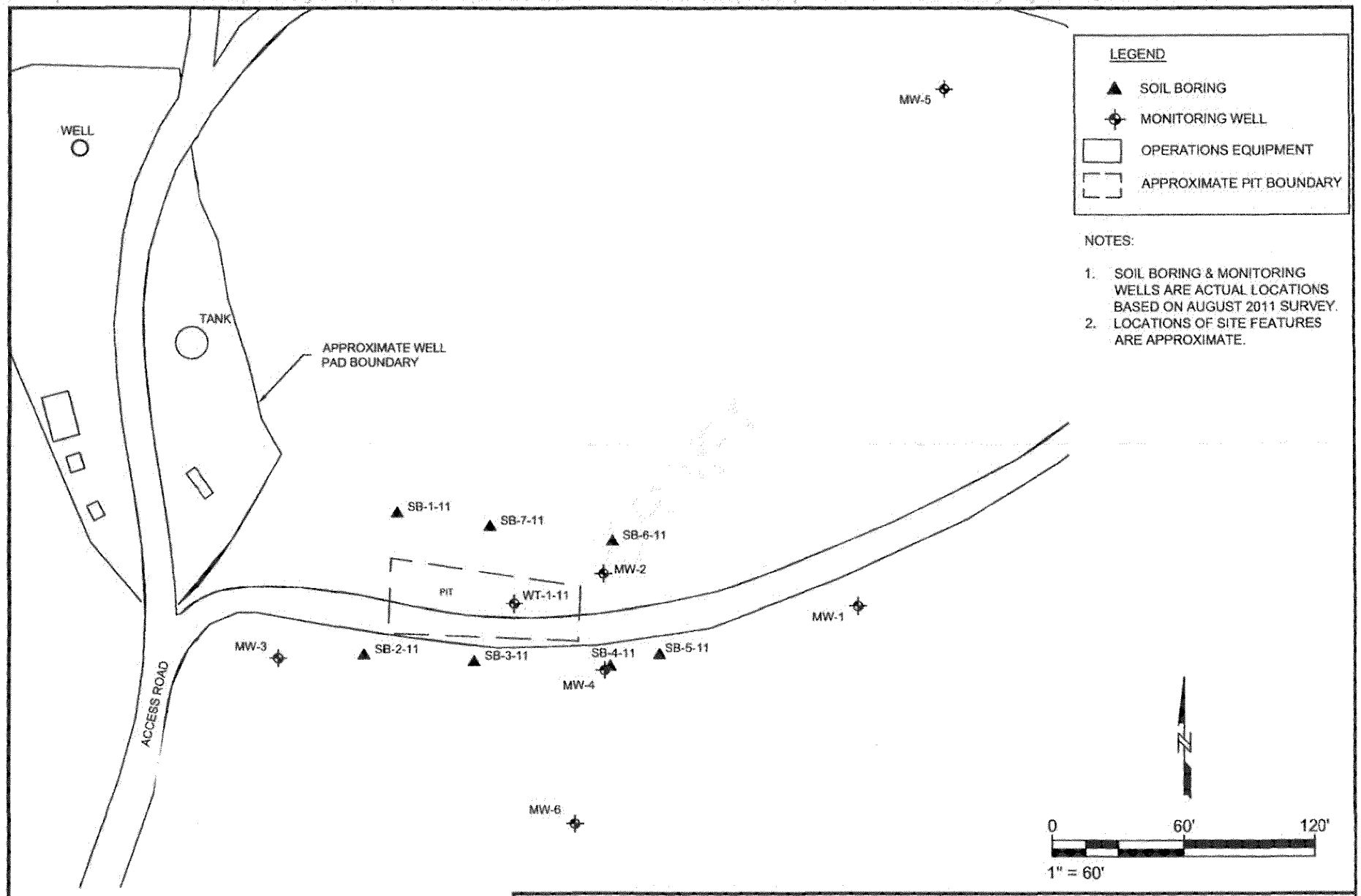
bold, shaded font = concentration detected above applicable cleanup level

Cleanup levels are based on Wyoming Department of Environmental Quality/Solid and Hazardous Waste Division (DEQ/SHWD) cleanup level spreadsheet effective June 30, 2009.

[1] This level is applicable when naphthalene and/or methylnaphthalenes are detected in groundwater at measurable concentrations.

[2] Duplicate sample collected

[3] Cleanup level is not available



AECOM

ENCANA OIL & GAS (USA) INC.
PAVILLION NATURAL GAS FIELD
FREMONT COUNTY, WYOMING

WH PAUL PATENT 42x-11
2011 SOIL BORING LOCATION MAP

DATE: 7/3/12 | DRWN: EM/FTC | **FIGURE 2-1**

EPAPAV0130257