

May 11, 2010

ExxonMobil Production Company  
CORP-MI-3011  
PO Box 4358  
Houston, TX 77210-4358

Attention: Adrienne Rosecrans, P.E. – Senior Environmental Engineer

Subject: **Pit Evaluation and Site Background Findings Report**  
**Location PCU 297-13A**  
**Rio Blanco County, Colorado**  
**KRW Project No. 0911-06A**

Dear Adrienne:

As requested by ExxonMobil Production, KRW Consulting, Inc. (KRW) collected sediment and soil samples for laboratory analysis at the subject site to evaluate disposal options for pit contents prior to the removal of synthetic pit liners at the subject site. Also, background soil samples from areas not impacted by site development were collected to evaluate background conditions for specific parameters. This report presents findings of field observations and analyses.

### **Background**

Well pad PCU 297-13A is located in Section 13; Township 2 South; Range 97 West in Rio Blanco County, Colorado. The site presently consists of seven wells, a fresh water pit, a reserve pit and a cuttings pit/trench. Each of the pits is lined with a synthetic liner. In addition, some sediments reportedly derived from previous drill cuttings are stockpiled adjacent to the present cuttings pit. Refer to the attached Site Plan for the locations of the pits and stockpiled sediments.

### **Sampling Event**

The sampling activities were conducted at the subject site on December 22, 2009 (initial pit content); December 29, 2009 and January 27, 2010 (surface and depth background); February 3, 2010 (cuttings trench); and February 18 and 19, 2010 (additional pit and stockpile samples). KRW collected sediment samples from each of the pits and the stockpiled material at the site. These samples were collected prior to initiating any pit closure or reclamation activities. One representative sediment sample was collected from each of the pits and three composite samples were collected from the stockpiled sediment for the analysis of Colorado Oil and Gas Conservation Commission (COGCC) Table 910-1 parameters. These parameters include the following: total metals; BTEX (benzene, toluene, ethylbenzene, and total xylenes); select semi-volatile organics; total petroleum hydrocarbons (both volatile and extractable); SAR (sodium

absorption ratio); EC (electrical conductivity); and pH. In addition, paired background samples were collected at three undisturbed locations adjacent to the site. Paired samples consisted of a surficial sample, collected at a depth of one-foot below ground surface (bgs) and a sample collected at a depth consistent with the depth of pits (and/or at depths of backhoe refusal) at the site, between approximately 10 and 11 feet bgs. Background samples were analyzed for total arsenic, SAR, EC, and pH.

During the sampling event, samples were collected in accordance with KRW's sampling protocol attached as Appendix A. Samples were placed in laboratory prepared bottles, sealed and delivered to Accutest Laboratories in Wheat Ridge, Colorado for analysis. Proper chain of custody protocol was followed for the sampling event. Refer to the attached Site Plan for approximate sample locations.

### **Analytical Findings**

Refer to Table 1 for a summary of the laboratory results and to Appendix B for a complete laboratory report. Detected concentrations of specific parameters that exceed COGCC Table 910-1 "Allowable Levels" are summarized below.

- TPH levels were detected above the allowable level of 500 mg/kg in the fresh water pit and cuttings pit content samples, 222,871 mg/kg and 19,077 mg/kg, respectively.
- Benzene was detected above the allowable level of 0.17 mg/kg in the fresh water pit sample (1.260 mg/kg).
- Arsenic was detected above the allowable limit (0.39 mg/kg) in all pit and stockpile samples collected at the site with concentrations ranging from 1.3 to 8.6 mg/kg. It should be noted, however, that background levels for arsenic all exceeded the allowable limit as well. Using Background Data Evaluation Method B, the statistical methodology recommended by the Colorado Department of Public Health and Environment (CDPHE)<sup>1</sup> for sites with more than five but less than nine background samples, a background level of 10.3 mg/kg for arsenic has been calculated. Adding an additional 20 percent factor for site variability to this value results in a maximum allowable arsenic level at the site of 12.3 mg/kg.

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<sup>1</sup> CDPHE, December 31, 1997, *Proposed Soil Remediation Objectives Policy Document (Attachment 4)*, Hazardous Material and Waste Management Division.

### Arsenic Background Data Evaluation Method B

Sample Point	Arsenic (mg/KG)
Bckgrnd. Pt. 1 surficial	4.7
Bdkgrnd. Pt. 1 deep	8.5
Bckgrnd. Pt. 2 surficial	3.8
Bckgrnd. Pt. 2 deep	3.1
Bckgrnd. Pt. 3 surficial	6.6
Bckgrnd. Pt. 3 deep	4.6
Median	4.65
Upper Quartile (Qu)	6.6
Lower Quartile (Ql)	3.8
IRQ (Qu-Ql)	2.8
Background Level at a 95% Confidence level (MEDIAN + 2 X IRQ)	
	10.3

Based on this statistical method and the 20 percent factor for site variability, the elevated arsenic levels detected in each of the samples are below the maximum allowable level for the site.

- The boron concentrations detected in all pit and stockpile samples are above the allowable limit. However, recent COGCC guidance indicates that the reference to the Hot Water Soluble Boron allowable limit concentration is an artifact from a previous table version and is no longer applicable (answer to question No. 33 on COGCC’s website “Frequently Asked Questions”).
- The electrical conductivity (EC) level detected in the reserve pit sample (23.900 mmhos/cm) as well as the EC level detected in all the stockpile samples (4.690 mmhos/cm, 9.410 mmhos/cm, and 5.650 mmhos/cm) are above the allowable limit of 4 mmhos/cm. A review of the background sample data does not increase the allowable level above the Table 910-1 limit.
- The sodium adsorption ratio (SAR) was detected above the allowable limit of <12 in the reserve pit and cuttings pit samples (160 and 36.1, respectively), as well as in one of the stockpile samples (12.1). A review of the background sample data does not increase the allowable level above the Table 910-1 limit.

- The allowable limit for pH (6 – 9) was exceeded in the reserve and cuttings pit samples (9.58 and 9.37, respectively) as well as in two of the stockpile samples (9.18 and 9.29). It should be noted, however, that pH levels were also detected above the allowable limit in three of the background samples. Using the CDPHE Background Data Evaluation Method B referenced above, a background level of 10.05 for pH has been calculated. Adding an additional 20 percent factor for site variability to this value results in a maximum allowable pH level at the site of 12.06.

### pH Background Data Evaluation Method B

Sample Point	pH
Bckgrnd. Pt. 1 surficial	8.99
Bdkgrnd. Pt. 1 deep	9.39
Bckgrnd. Pt. 2 surficial	8.80
Bckgrnd. Pt. 2 deep	9.19
Bckgrnd. Pt. 3 surficial	8.91
Bckgrnd. Pt. 3 deep	9.63
Median	9.09
Upper Quartile (Qu)	9.39
Lower Quartile (Ql)	8.91
IRQ (Qu-Ql)	0.48
Background Level at a 95% Confidence level (MEDIAN + 2 X IRQ)	10.38

Based on this statistical method and the 20 percent factor for site variability, the elevated pH levels detected in the reserve pit, cuttings pit, and stockpile samples are below the maximum allowable level for the site.

Please contact us should you have any questions regarding our methods or findings.

**Report Compiled by:**

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