

August 23, 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 FRU 297-17A
Rio Blanco County, Colorado
KRW Project No. 1001-04

Dear Adrienne:

As requested by ExxonMobil Production, KRW Consulting, Inc. (KRW) collected sediment 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 FRU 297-17A is located in Section 17 of Township 2 South; Range 97 West in Rio Blanco County, Colorado. The site presently consists of nine wells; a fresh water pit; a reserve pit; and a cuttings pit/trench. Each of these pits is lined with a synthetic liner. Refer to the attached Site Plan for the locations of the pits.

Sampling Event

Sampling was conducted at the subject site on January 20, 2010 (cuttings, reserve pits and background) and February 4, 2010 (fresh water pit). KRW collected sediment samples from pits prior to any pit closure or reclamation activities. One representative sediment sample was collected from each of the pits 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 extractible); 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 (or at depths of backhoe refusal) at the site, between 8.5 and 13.5 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.

- The TPH concentration levels detected in the fresh water and reserve pit samples (207,196 mg/Kg and 132,570 mg/kg, respectively) are above the allowable level of 500 mg/kg.
- The benzene concentrations detected in the fresh water and reserve pit samples (0.231 mg/kg and 8.650 mg/kg, respectively) are above the allowable level of 0.170 mg/kg.
- The toluene concentration detected in the reserve pit sample (87.5 mg/kg) is slightly above the allowable level of 85 mg/kg.
- The total xylenes concentration detected in the reserve pit sample (777 mg/kg) is above the allowable level of 175 mg/kg.
- Naphthalene was detected above the allowable limit of 23 mg/kg in the reserve pit sample at a concentration of 128 mg/kg.
- Arsenic was detected above the allowable limit (0.39 mg/kg) in all pit samples; fresh water pit at 5.1 mg/kg; reserve pit at 5.2 mg/kg; and cuttings pit at 10.8 mg/kg. It should be noted, however, that background levels for arsenic all exceeded the allowable limit as well. Using the statistical methodology recommended by the Colorado Department of Public Health and Environment (CDPHE)¹ for sites with more than five but less than nine

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

background samples, Background Data Evaluation Method B, a background level of 40.0 mg/kg for arsenic has been calculated.

Sample Point	Arsenic (mg/KG)
Bckgrnd. Pt. 1 surficial	5.9
Bdkgrnd. Pt. 1 deep	45.8
Bckgrnd. Pt. 2 surficial	9.8
Bckgrnd. Pt. 2 deep	9.7
Bckgrnd. Pt. 3 surficial	7.3
Bckgrnd. Pt. 3 deep	22.4
Median	9.75
Upper Quartile (Qu)	22.4
Lower Quartile (Ql)	7.3
IRQ (Qu-Ql)	15.1
Background Level at a 95% Confidence level (MEDIAN + 2 X IRQ)	
	40.0

Alternatively, COGCC allows the determination of background concentrations based upon a 10 percent variability factor, where the maximum allowable level is computed by multiplying the highest background value by 1.1. Using this method, the maximum allowable background concentration for arsenic is 50.4.

Arsenic levels detected in all pit samples are well below the site background levels determined by both acceptable methods for determining background concentrations.

- Boron concentrations were detected in all pit samples 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").
- Electrical conductivity was detected above the allowable limit of <4 mmhos/cm in the cuttings pit sample at a concentration of 41.200 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 cuttings and fresh water pit samples at levels of 108 and 26.8, respectively. The SAR allowable level was also exceeded in one of the background samples at a level of 13.2. Using the CDPHE Background Data Evaluation Method B referenced above, a Background Level of 12.8 for SAR has been calculated.

SAR Background Data Evaluation Method B

Sample Point	SAR
Bckgrnd. Pt. 1 surficial	13.2
Bckgrnd. Pt. 1 deep	7.05
Bckgrnd. Pt. 2 surficial	2.78
Bckgrnd. Pt. 2 deep	3.51
Bckgrnd. Pt. 3 surficial	0.855
Bckgrnd. Pt. 3 deep	2.23
Median	3.145
Upper Quartile (Qu)	7.05
Lower Quartile (Ql)	2.23
IRQ (Qu-Ql)	4.82
Background Level at a 95% Confidence level (MEDIAN + 2 X IRQ)	
	12.8

Alternatively, COGCC allows the determination of background levels based upon a 10 percent variability factor, where the maximum allowable level is computed by multiplying the highest background value by 1.1. Using this method, the maximum allowable background level for SAR is 14.5.

Therefore, the SAR levels detected in the fresh water and cuttings pit samples are above the allowable level, based on both the statistical data evaluation method and the 10 percent variability factor method using site background data.

- The allowable limit for pH (6-9) was exceeded in the cuttings pit and reserve pit samples (12.10 and 9.79, respectively). It should be noted, however, that pH levels were also detected above the allowable limit in five of the six background samples. Using the CDPHE Background Data Evaluation Method B referenced above, a background pH Level of 9.90 has been calculated.

pH Background Data Evaluation Method B

Sample Point	pH
Bckgrnd. Pt. 1 surficial	10.00
Bdkgrnd. Pt. 1 deep	9.58
Bckgrnd. Pt. 2 surficial	8.87
Bckgrnd. Pt. 2 deep	9.54
Bckgrnd. Pt. 3 surficial	9.38
Bckgrnd. Pt. 3 deep	9.46
Median	9.50
Upper Quartile (Qu)	9.58
Lower Quartile (Ql)	9.38
IRQ (Qu-Ql)	0.20
Background Level at a 95% Confidence level (MEDIAN + 2 X IRQ)	
	9.90

Alternatively, COGCC allows the determination of background levels based upon a 10 percent variability factor, where the maximum allowable level is computed by multiplying the highest background value by 1.1. Using this method, the maximum allowable background level for pH is 11.00.

Based on both the statistical method and the 10 percent variability factor method, the elevated pH level in the reserve pit is below the maximum allowable level for the site. The pH level detected in the cuttings pit sample is above the maximum allowable pH level, based on both acceptable methods for determining site background levels.

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

Report Compiled by:

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ATTACHMENTS

Site Plan

Table 1 Laboratory Results Summary

Appendix A KRW Soil Sampling Protocol

Appendix B Laboratory Report