

**EVAPORATION PONDS
REMEDATION WORK PLAN
FEDERAL DOS HERMANOS
EDDY COUNTY, NEW MEXICO
LEGAL: UNIT F SEC 33–T20S–R30E**

Prepared for:

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Soils Remediation Work Plan
Federal Dos Hermanos
Hudson Oil Company of Texas
Maljamar, New Mexico

Introduction

This site is located at approximate Latitude 32°31'59" N and Longitude 103°58'54" W, Eddy County, New Mexico. The site is located in a rural area on a portion of Federal Oil & Gas Lease NM-070286. There are no permanent residences within a 1,000-foot radius of the evaporation ponds.

The ponds were permitted by the OCD and authorized for use in depositing produced water for evaporation by **R-3221** (copies of permit and R order are attached hereto as Attachments 1 and 2 respectively). The ponds are maintained with berms and fenced to prevent livestock entrance. The ponds were allowed due to the lack of groundwater and the surrounding area is under potash operations (copies of lease map, topographical map and satellite photo have been attached hereto).

Pond #1 is approximately 200' x 200' x 12' (LxWxD)

Pond #2 is approximately 240' x 120' x 12' (LxWxD)

Hydrology

According to information available from the New Mexico Office of the State Engineer, no water wells are located in Sec 33-T20S-R30E. Additionally, per information available from the State Engineer and the New Mexico Oil Conservation Division, the water depth in Sec 33-T20S-R30E is approximately 150 to 200 feet bgs (copies of OCD water map and State Engineer report have been attached hereto).

Lithology

The lithology at the site consists primarily of clayey-sands, gypsum and calcium carbonate-cemented soils (caliche).

Regulatory Framework

Under the NMOCD "Pit Rule", guidance for all federal, state, and fee lands in New Mexico for remediating contaminants resulting from leaks, spills, and releases of oilfield wastes or products has been developed. This guidance is based on depth to groundwater, distance from water supply sources, and distance to surface water bodies, and provides remediation/clean-up targets for Benzene, Total BTEX (benzene, toluene, ethylbenzene, and xylenes), and Total Petroleum Hydrocarbons (TPH).

NMOCD Table II Guidelines:

Table II Closure Criteria for Burial Trenches and Waste Left in Place in Temporary Pits			
>100 Feet	Chloride	EPA Method 300.0	80,000 mg/kg
	TPH	EPA SW - 846 Method 418.1	2,500 mg/kg
	GRO+DRO	EPA SW - 846 Method 8015M	1,000 mg/kg
	BTEX	EPA SW - 846 Method 8021B or 8260B	50 mg/kg
	Benzene	EPA SW - 846 Method 8021B or 8015M	10 mg/kg

Additional Site Investigation Activities

November 14, 2013

In an effort to delineate the extent of impacted soil at the site, Shelly J. Tucker advanced five (5) test holes to depths ranging from three (3) to twelve (12) feet below ground surface (bgs) in **Pond One (1)** and four (4) test holes to depths ranging from three (3) to twelve (12) feet below ground surface (bgs) in **Pond Two (2)** on November 14, 2013. Field testing for chlorides was performed on site.

These test holes were initiated utilizing a backhoe operated by contracted personnel. The test hole locations were selected based on overall surface inspection, to evaluate the current subsurface conditions, and determine if natural attenuation is occurring at the site. Due to physical constraints presented by massive gypsum at the site, the test holes were limited in depth. Shelly J. Tucker performed a physical inspection of the retrieved soil samples and then logged each sample interval. A site map with the test hole locations, complete analytical data sheets, completed chain-of-custody forms and pictures are attached.

Soil samples from the borings were submitted to TraceAnalysis Laboratories in Lubbock, TX, under proper chain-of-custody procedures.

Samples were analyzed for the following tests using their respective methods.

Pond #1 – Test Methods – November 14, 2013					
Test	Method	Prep Batch	Prep Date	QC Batch	Analysis Date
BTEX	S 8021B	90737	2013-11-27 at 08:51	107168	2013-11-27 at 08:51
Chloride (Titration)	SM 4500-Cl B	91053	2013-12-12 at 10:00	107549	2013-12-12 at 15:00
TPH DRO – NEW	S 8015 D	90781	2013-11-27 at 17:00	107213	2013-12-03 at 11:45
TPH GRO	S 8015 D	90737	2013-11-27 at 08:51	107169	2013-11-27 at 08:51

Pond #1 Analytical Results – Summary – November 14, 2013							
	BTEX				TPH DRO – NEW	TPH GRO	Chlorides
Sample Field Code	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethylbenzene (mg/Kg)	Xylene (mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
347575 - Hole 1 3'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	120
347576 - Hole 1 6'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	90
347577 - Hole 2 3'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	5000
347578 - Hole 2 12'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	4020
347579 - Hole 3 3'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	5000
347580 - Hole 3 12'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	3380
347581 - Hole 4 3'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	800
347582 - Hole 4 12'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	4480
347583 - Hole 5 3'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	5000
347584 - Hole 5 12'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	4320

Pond #2 – Test Methods – November 14, 2013

Test	Method	Prep Batch	Prep Date	QC Batch	Analysis Date
BTEX	S 8021B	90737	2013-11-27 at 08:51	107168	2013-11-27 at 08:51
Chloride (Titration)	SM 4500-Cl B	91053	2013-12-12 at 10:00	107550	2013-12-12 at 15:00
TPH DRO – NEW	S 8015 D	90781	2013-11-27 at 17:00	107213	2013-12-03 at 11:45
TPH GRO	S 8015 D	90737	2013-11-27 at 08:51	107169	2013-11-27 at 08:51

Pond #2 Analytical Results – Summary – November 14, 2013

	BTEX				TPH DRO – NEW	TPH GRO	Chlorides
Sample Field Code	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethylbenzene (mg/Kg)	Xylene (mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
347585 - Hole 1 3'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	4520
347586 - Hole 1 12'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	2780
347587 - Hole 2 3'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	146	<4.00	94
347588 - Hole 3 6'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	104
347589 - Hole 4 3'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	4030
347590 - Hole 4 12'	<0.0200	<0.0200	<0.0200 Qs	<0.0200	<50.0	<4.00	1920

April 22, 2014

In an additional effort to further delineate the extent of impacted soil at the site, Shelly J. Tucker, with Mike Burton of the Bureau of Land Management (BLM) as a witness, advanced one (1) test hole to a depth of approximately eight (8) feet below ground surface (bgs) on the North side of **Pond One (1)** between the berm and fence line, one (1) test hole to a depth of approximately ten (10) feet below ground surface (bgs) on the West side of **Pond One (1)** between the berm and fence line; three (3) test holes to depths of approximately five (5) feet below ground surface (bgs) in the walls of **Pond Two (2)**; three (3) test holes ranging in depths of approximately three (3) to eight (8) feet below ground surface (bgs) between the berm and the fence line on the North, East and South sides of **Pond Two (2)** on April 22, 2014. Field testing for chlorides was performed on site.

These test holes were initiated utilizing a backhoe operated by contracted personnel. The test hole locations were selected based on overall surface inspection, to evaluate the current subsurface conditions, and determine if natural attenuation is occurring at the site.

Due to physical constraints presented by massive gypsum at the site, the test holes were limited in depth. Shelly J. Tucker performed a physical inspection of the retrieved soil samples and then logged each sample interval. A site map with the test hole locations and pictures are attached.

Soil samples from the borings were submitted to TraceAnalysis Laboratories in Lubbock, TX, under proper chain-of-custody procedures.

NOTE: ANALYTICAL RESULTS OF THE FINAL TESTING WILL BE ATTACHED TO THE FINAL REPORT WHEN COMPLETED.

Proposed Remediation Activities

The site investigation results indicate the presence of a hydrocarbon and saltwater impact at the site, within the applicable New Mexico Oil Conservation Division (NMOCD) guidelines.

Due to the surrounding potash activities, the absence of surface water, ground water greater than 100', solid gypsum encountered at a depth of twelve (12) feet below ground surface (bgs), absence of BTEX and the minimal amount of Chlorides and TPH present, it is requested that Hudson Oil Company of Texas (HOCT) be allowed to collapse the sides of Ponds One (1) and Two (2), remove the top four (4) feet of soil from the berms and place in the interior of each of the ponds. Two (2) feet of caliche will be brought in and compacted to encapsulate the contaminated area. HOCT will then backfill with native material, dome with two (feet) of top soil and reseed the area with an approved BLM seed mixture.

Reporting Activities

Upon completion of the proposed activities, all office analytical results and findings will be compiled as a letter report and submitted to the NMOCD and the BLM for approval. In the event that additional work is warranted by the sampling results, an appropriate work plan will be prepared for review by the NMOCD and BLM.

Conclusion

This report with all included attachments and documentation is hereby submitted to the NMOCD and BLM for review and approval.