# FINAL CLOSURE REPORT

# REMEDIATION
# OF THE
# FEDERAL DOS HERMANOS
# EVAPORATION PONDS

## EDDY COUNTY, NEW MEXICO
## LEGAL: UNIT F  SEC 33–T20S–R30E

*Prepared for:*

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# Soils Remediation Final Closure Report
## Federal Dos Hermanos
### Hudson Oil Company of Texas
### Maljamar, New Mexico

## Introduction

This site is located at approximate Latitude 32º31'59" N and Longitude 103º58'54" 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<br>Closure Criteria for<br>Burial Trenches and<br>Waste Left in Place<br>in Temporary Pits | | | |
|---|---|---|---|
| **>100 Feet** | Chloride | EPA Method 300.0 | 80,000 mg/kg |
| | TPH | EPA SW<br>-<br>846<br>Method 418.1 | 2,500 mg/kg |
| | GRO+DRO | EPA SW<br>-<br>846<br>Method 8015M | 1,000 mg/kg |
| | BTEX | EPA SW<br>-<br>846 Method<br>8021B or 8260B | 50 mg/kg |
| | Benzene | EPA SW<br>-<br>846 Method<br>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) between the berm and the fence line on the North, East and South sides of **Pond Two (2)**. 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.

**Ponds #1 & #2 – Test Methods – April 22, 2014**

| Test | Method | Prep Batch | Prep Date | QC Batch | Analysis Date |
|---|---|---|---|---|---|
| BTEX | S 8021B | 95851 | 2014-07-02 at 15:38 | 113336 | 2014-07-02 at 15:38 |
| Chloride (Titration) | SM 4500-Cl B | 95875 | 2014-07-03 at 13:20 | 113367 | 2014-07-03 at 13:21 |
| Chloride (Titration) | SM 4500-Cl B | 95882 | 2014-07-03 at 14:02 | 113371 | 2014-07-03 at 14:02 |
| TPH DRO – NEW | S 8015 D | 95861 | 2014-07-02 at 16:00 | 113348 | 2014-07-03 at 14:47 |
| TPH DRO – NEW | S 8015 D | 95926 | 2014-07-07 at 13:00 | 113422 | 2014-07-08 at 09:34 |
| TPH GRO | S 8015 D | 95851 | 2014-07-02 at 15:38 | 113337 | 2014-07-02 at 15:38 |

**Ponds #1 & #2 Analytical Results – Summary – April 22, 2014**

| | 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 |
| 367293 – Pond 1 – N Outside 8’ | <0.0200 | <0.0200 | <0.0200 Qs | <0.0200 | <50.0 | <4.00 | 1870 |
| 367294 – Pond 1 W Outside 10’ | <0.100 | <0.100 | <0.100 Qs | <0.100 | 461 | <20.00 | 2570 |
| 367295 – Pond 2 N outside 5’ | <0.100 | <0.100 | <0.100 Qs | <0.100 | 250 | <20.00 | 53 |
| 367296 – Pond 2 E outside 5’ | <0.0200 | <0.0200 | <0.0200 Qs | <0.0200 | 63.4 | <4.00 | 53 |
| 367297 – Pond 2 S outside 5’ | <0.100 | <0.100 | <0.100 Qs | <0.100 | 430 | <20.00 | 1100 |
| 367298 – old spill area comp | <0.0200 | <0.0200 | <0.0200 Qs | <0.0200 | <50.0 | <4.00 | 187 |

## 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, Hudson Oil Company of Texas (HOCT) was allowed to collapse the sides of Ponds One (1) and Two (2) and remove the top four (4) feet of soil from the berms. The walls and tops of the berms were placed in the interior of each pond.

During remediation activities, permission was given by the BLM to blend and collect samples of the material within the Hydrocarbon Pond. Material was blended and stacked outside the pond boundary.

## June 24, 2014

Once all material had been extracted and stacked, Shelly J. Tucker collected two (2) composite samples from the blended material. Contracted personnel began using a trackhoe to roll and agitate the stacked material to further the natural remediation of the blended material

## June 27, 2014

Once all material had been removed from the Hydrocarbon Pond, Shelly J Tucker advanced one (1) test hole in the center of the Hydrocarbon Pond to a depth of approximately fourteen (14) feet below ground surface (bgs). Two (2) additional composite samples were also obtained from the blended material.

The test hole was initiated utilizing a trackhoe operated by contracted personnel. The test hole location was selected based on the 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 location and pictures are attached.

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

| Hydrocarbon Pond Stockpiles – Test Methods – June 24, 2014 | | | | | |
|---|---|---|---|---|---|
| **Test** | **Method** | **Prep Batch** | **Prep Date** | **QC Batch** | **Analysis Date** |
| BTEX | S 8021B | 95851 | 2014-07-02 at 15:38 | 113336 | 2014-07-02 at 15:38 |
| Chloride (Titration) | SM 4500-Cl B | 95875 | 2014-07-03 at 13:20 | 113367 | 2014-07-03 at 13:21 |
| TPH DRO – NEW | S 8015 D | 95861 | 2014-07-02 at 16:00 | 113348 | 2014-07-03 at 11:47 |
| TPH GRO | S 8015 D | 95851 | 2014-07-02 at 15:38 | 113337 | 2014-07-02 at 15:38 |

| Hydrocarbon Pond Stockpiles – Analytical Results – June 24, 2014 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **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 |
| 367291 – HCP – comp Dry | <0.400 | <0.400 | <0.400 Qs | 0.919 | 3270 | 101 | 695 |
| 367292 – HCP – comp Wet | <1.00 | <1.00 | <1.00 Qs | <1.07 | 4810 | <200 | 775 |

| Hydrocarbon Pond and Stockpiles – Test Methods – June 27, 2014 | | | | | |
|---|---|---|---|---|---|
| **Test** | **Method** | **Prep Batch** | **Prep Date** | **QC Batch** | **Analysis Date** |
| BTEX | S 8021B | 95851 | 2014-07-02 at 15:38 | 113336 | 2014-07-02 at 15:38 |
| Chloride (Titration) | SM 4500-Cl B | 95875 | 2014-07-03 at 13:20 | 113367 | 2014-07-03 at 13:21 |
| TPH DRO – NEW | S 8015 D | 95861 | 2014-07-02 at 16:00 | 113348 | 2014-07-03 at 11:47 |
| TPH GRO | S 8015 D | 95851 | 2014-07-02 at 15:38 | 113337 | 2014-07-02 at 15:38 |

| Hydrocarbon Pond Stockpiles – Analytical Results – June 27, 2014 | | | | | | |
|---|---|---|---|---|---|---|
| | BTEX | | | | TPH DRO – NEW | TPH GRO |
| Sample Field Code | Benzene (mg/Kg) | Toluene (mg/Kg) | Ethylbenzene (mg/Kg) | Xylene (mg/Kg | (mg/Kg) | (mg/Kg) |
| Hydrocarbon Pond 14' | <1.00 | <1.00 | <1.00 Qs | <1.00 | 2710 | <20.0 |
| 367291 – HCP – comp Dry | <0.400 | <0.400 | <0.400 Qs | <0.400 | 3050 | <80.0 |
| 367292 – HCP – comp Wet | <1.00 | <1.00 | <1.00 Qs | <1.00 | 2230 | <20.0 |

Upon analysis of the analytical results and discussions with the BLM, permission was given to continue to blend, bury and compact the Hydrocarbon Pond material within the boundaries of the evaporation ponds and the hydrocarbon pond. Additional native fill material was brought in along with two (2) feet of caliche (compacted to encapsulate the contaminated area). Finally two (feet) of top soil was transported in and contoured to the surrounding landscape. The area was reseeded with an approved BLM seed mixture #3.

## Conclusion

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