AP - 110

ANNUAL REPORT

2011

HOLLYFRONTIER
THE HOLLYFRONTIER COMPANIES

April 13, 2012

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

FEDEX

Re: RY2011 Annual Discharge Permit Report
Navajo Refining Co. LLC
Lovington, NM GW-014

Dear Carl,

Enclosed, please find the Annual Discharge Permit Report for RY2011 for the Navajo-Lovington Refinery. If you have any questions concerning this submission, please contact me at 575-746-5382 or by email Robert.combs@hollyfrontier.com

RECEIVED OCD
2012 APR 16 A 10: 29

Sincerely,

Robert Combs, Ph.D
Environmental Specialist

W/out enclosures:
Electronic cc: MGM, JEL, MLS, AMS

Env. File: Annual Discharge Permit Rpt (ART.REF.12-4A01D)
2012-04-12 RY2011 Artesia Cover Ltr.

2011 ANNUAL REPORT
NAVAJO REFINING COMPANY-LEA REFINERY
DISCHARGE PERMIT GW-014

EXECUTIVE SUMMARY

This report was prepared to fulfill the requirement of the Lea Refining Company's Discharge Permit GW-014. The requirement specifies that an Annual Report be submitted by April 15 following the reporting year and should include at minimum:

A. Summary of major refinery activities and events.
B. Results of all sampling or monitoring events.
C. Summary of all sump and underground waste water lines tested.
D. Summary of all leaks, spills, and releases and/or contamination or threat to the City of Lovington Well Head Protection Area.
E. Summary of discovery of new groundwater contamination.
F. Summary of all City of Lovington and OCD Activity.

A. MAJOR REFINERY ACTIVITIES

The Navajo-Lovington refinery conducted normal operations for the majority of the 2011 year. There were a few exceptions due to inclement weather, but production was maintained without need for extended process shut-downs or maintenance activities. The refinery did not undergo any expansions in regards to production capacity, but did make several modifications to improve operability and reliability.

A 2,000,000 gallon firewater pond was constructed that will be put in service in 2012.

There were several storage tanks that were taken out of service for repairs.

An agreement was reached with the City of Lovington to purchase water for refinery usage.

Navajo Refining will continue:

- Waste water monitoring for discharges to City of Lovington POTW
- Groundwater monitoring
- Sump, sewer and underground piping testing
- Notification of spills

B. RESULTS OF SAMPLING AND MONITORING EVENTS

Included in Supplement 1 of this submittal is a report titled "Ground Water and Treatment System Annual Monitoring Report—Navajo Refining Company, Lea Refinery". This report details the analyses and sampling performed at the Lovington facility in 2011 and the first semiannual sampling event for 2012.

C. SUMMARY OF SUMP AND UNDERGROUND WASTE WATER LINES TESTED

As required by the Discharge Permit for the Lovington refinery (GW-014), the maintenance department tests all sumps and underground process and waste water lines. It is Navajo's policy to fill the sump or line with water, mark the initial level, revise the level mark after four hours if any change occurs. Enclosed are Table 1, (Navajo Refining Company Lovington Refinery Sewer and Underground Pipe Testing) and Table 2, (Navajo Refining Company Lovington Refinery Sump Testing), both of which detail the test date, test method, pass/fail, tested by, and any repairs needed and/or made to the applicable sump or sewer. These spreadsheets only serve to compile the test data; all of the actual inspection forms are kept on file at the refinery, and are available for review by OCD as required by our permit.

There were no inspections due in 2011 for underground lines, sewers, or sumps. All items were addressed in previous year's inspections and are shown in Tables 2 and 3. The next inspections are due in 2012.

D. SUMMARY OF ALL LEAKS, SPILLS, FIRES, AND RELEASES

The Lovington facility had six spills during 2011 with zero fires to report. Please see the details below:

1. On January 29, 2011 a relief valve at the Holly Energy Partners pump station discharged to a sump which quickly overflowed, and approximately 37 barrels of gas oil contacted bare ground. A vacuum truck recovered approximately 35 barrels that were transferred to the light slop tank (T-1207). The contaminated soil was excavated to a depth where no visible signs of contamination were observed. The removed soil was placed on plastic until it could be loaded into a waste container and disposed. Further investigation will require removal of a section of process piping for drilling rig access. Please see Supplement 2 for supporting documents (C-141 form, and disposal manifests).

2. On February 27, 2011, a power failure caused several waste water pumps to shut down and subsequently, overfilled the waste water tank (T-1209B) and resulted in the release of approximately 10 barrels. Included in the pumps that were shut down was P-307, which removes water from the tank and pumps the effluent waste water to the City of Lovington POTW. The event occurred during a period with high winds; some of the water evaporated and the remainder was absorbed by the ground surface, which prevented freestanding water from being recovered. Please see Supplement 2 for supporting documents (C-141 form, SESI analysis and correspondence and waste water analytical report).
3. On March 17, 2011, a check valve failed near T-1209B (waste water tank), which allowed the liquid level in the tank to increase and eventually overfilled the tank. The pump(s) that pump water from the tank remained in operation, but discharge flow was restricted by the check valve failure. It was estimated that 10 barrels of waste water was released. The water was quickly absorbed into the ground surface, preventing liquid recovery. After the area dried, there were no indications of staining, oil residues, etc. Please see Supplement 2 for supporting documents (C-141 form, SESI analysis and correspondence).
4. On March 18, 2011, a sump pump near the Hobbs pipeline manifold failed to start and caused approximately 5 barrels of crude to overfill the sump and spill onto the ground. A vacuum truck was dispatched to the area, but there was no liquid recovered as the oil had soaked into the ground. The stained soil was excavated down to solid caliche and disposed as non-hazardous waste. Please see Supplement 2 for supporting documents (C-141 form, and disposal manifests).
5. On August 1, 2011, a leak in T-1215 (tank used for vacuum unit feed; heavy slop oil) was discovered. Operations transferred the remaining liquid contents to T-1214 (slop tank) while vacuum trucks recovered approximately 280 barrels that reached the ground surface. The recovered volume was also transferred to T-1214. SESI was utilized to delineate the spill and sample the area; please see the SESI report (Supplement 1, Appendix A) for detailed investigation results including analyses and boring logs. Other supporting documents can be found in Supplement 2 (C-141 form and disposal manifests).
6. At approximately 08:30 on December 10, 2011, a frac tank overflowed waste water into a secondary containment which then overflowed onto the ground. A vacuum truck liquid from the secondary containment to prevent more of the water from overflowing onto the ground, however approximately 15 barrels reached the ground and were unable to be recovered. The frac tank liner had deteriorated and small fragments plugged the suction strainer to P-307 causing the spill. Operators have since adopted a program to clean the pump suction screens on a weekly basis to prevent further incidents. The frac tank was used to temporarily replace the T-1209B Strip Tank while it was being repaired; this tank functioned by utilized air to strip water of H_2S. After the area dried, there were no indications of staining, oil residues, etc. Please see Supplement 2 for supporting documents (C-141 form, SESI analysis and correspondence).

E. SUMMARY OF NEW GROUNDWATER CONTAMINATION

Please see Supplement 1 to find the report: "Ground Water and Treatment System Annual Monitoring Report". This report provides the sampling, analyses and monitoring performed at the Lovington facility in 2011 and includes are sampling/monitoring results for the February-March 2012 semiannual event.

A brief summary of those findings are as follows:

- There were elevated benzene concentrations found in MW-11 and MW-13. These are likely due to historic releases. The benzene concentration in the remaining wells tested were below EPA method 8260 reporting limits.
- No hydrocarbon product or hydrocarbon sheen was found in the replacement monitor wells in the vicinity of the waste water separator.
- Many of the contaminants detected are attributed to migration from off-site sources or from historic releases.
- Chromium was detected in a few wells during 2012. MW-29 chromium is likely attributable to former chromate use in the up-gradient cooling tower. Other monitor wells where chromium was detected are likely not due to refinery processes.
- Iron and manganese concentrations declined from previous sampling events where present.
- Replacement monitor wells will need to be installed due to declining water levels.

F. SUMMARY OCD AND CITY OF LOVINGTON ACTIVITY

For each reportable spill, the City of Lovington was notified, as noted on all of the C-141 forms submitted to OCD. Information regarding these events is located in Supplement 2.

An agreement was reached with the City of Lovington to purchase water for refinery usage.

Navajo samples the effluent waste water transferred to the City of Lovington POTW on a monthly basis; those analytical reports are enclosed as Supplement 3.

Finally, the Navajo Refining Lovington facility has representation at most of the Lovington City Council meetings.

G. COMMENTS

Navajo continues to take a proactive approach to stopping leaks by installation of secondary containment and leak detection systems and, where possible, removing underground piping and replacing it with aboveground piping.

Improvements to the groundwater monitoring system will provide improved analytical results and more reliable data by replacing several of the monitoring wells that have declining water levels.

Further correspondence will be submitted regarding the repairs and modifications to T-1215. This tank is a necessary component in the refinery process at the Lovington facility and needs to be returned to service as quickly as possible.

Table 1.
Navajo Refining Company
Lovington Refinery
Sewer Testing
Note: Notify Environmental if there are any repairs required.

UNIT #	DWG #	LINE, BOX OR HUB #	TEST MEDIUM	TEST DATE	NEXT TEST DUE	TEST METHOD	TESTED BY	TEST PASS/FAIL	COMMENTS/REPAIR METHOD
83	PLOT PLAN	PSB#01 to LPS#8809	WATER	4/21/2010	4/21/2015	HYDROTEST	GILES, INC.	PASS	
83	PLOT PLAN	LML 8800 - LPS 8811 - LPS 8812	WATER	4/21/2010	4/21/2015	HYDROTEST	GILES, INC.	PASS	
83	PLOT PLAN	LML 8800 - PSB 01 - PSB 02	WATER	4/29/2010	4/29/2015	HYDROTEST	GILES, INC.	FAIL	
83	PLOT PLAN	LML 8800 - PSB 01 - PSB 02	WATER	5/6/2010	5/6/2015	HYDROTEST	GILES, INC.	PASS	REPAIRED/RETESTED
83	PLOT PLAN	PSB 01 - PSB 02 - LPS 8812 - LML 8800	WATER	4/29/2010	4/29/2015	HYDROTEST	GILES, INC.	PASS	
83	PLOT PLAN	LPS 8815 - LPS 8816 - LPS 8817 - PSB 06 - PSB 07 - PSB 08	WATER	5/6/2010	5/6/2015	HYDROTEST	GILES, INC.	PASS	
83	PLOT PLAN	LPS 5514 - LML 8801 - PSB 02 - PSB 05	WATER	5/6/2010	5/6/2015	HYDROTEST	GILES, INC.	FAIL	
83	PLOT PLAN	LPS 5514 - LML 8801 - PSB 02 - PSB 05	WATER	5/27/2010	5/27/2015	HYDROTEST	GILES, INC.	PASS	REPAIRED/RETESTED
83	PLOT PLAN	LPS 8818 - LPS 8819 - PSB 03 - PSB 09 - PSB 10	WATER	5/13/2010	5/13/2015	HYDROTEST	GILES, INC.	PASS	
83	PLOT PLAN	LML 8802 - PSB 03 - PSB 04	WATER	5/13/2010	5/13/2015	HYDROTEST	GILES, INC.	PASS	
83	PLOT PLAN	LPS 8820 - LPS 8821 - PSB 04 - PSB 11 - PSB 12	WATER	5/13/2010	5/13/2015	HYDROTEST	GILES, INC.	PASS	
82	PLOT PLAN	LPS 8823 - LPS 8827	WATER	5/18/2010	5/18/2015	HYDROTEST	GILES, INC.	PASS	
82	PLOT PLAN	LML 8803 - PSB 13 - PSB 04	WATER	5/19/2010	5/19/2015	HYDROTEST	GILES, INC.	FAIL	
82	PLOT PLAN	LML 8803 - PSB 13 - PSB 04	WATER	6/10/2010	6/10/2015	HYDROTEST	GILES, INC.	PASS	REPAIRED/RETESTED
82	PLOT PLAN	LML 8805 - LPS 8838	WATER	9/16/2010	9/16/2015	HYDROTEST	GILES, INC.	PASS	
82	PLOT PLAN	LML 8806 - PSB 15 - LML 8805 - PSB 14	WATER	9/16/2010	9/16/2015	HYDROTEST	GILES, INC.	PASS	
82	PLOT PLAN	LML 8805 - LPS 8839 - LPS 8840 - LPS 8841	WATER	9/16/2010	9/16/2015	HYDROTEST	GILES, INC.	PASS	
82	PLOT PLAN	PSB 14 - LPS 8835 - LPS 8830 - LPS 8837 - PSB 16	WATER	9/16/2010	9/16/2015	HYDROTEST	GILES, INC.	FAIL	
82	PLOT PLAN	PSB 14 - LPS 8835 - LPS 8830 - LPS 8837 - PSB 16	WATER	9/24/2010	9/24/2015	HYDROTEST	GILES, INC.	PASS	REPAIRED/RETESTED
82	PLOT PLAN	LML 8806 - LPS 8844 - PSB 18	WATER	10/6/2010	10/6/2015	HYDROTEST	GILES, INC.	FAIL	
82	PLOT PLAN	LML 8806 - LPS 8844 - PSB 18	WATER	10/13/2010	10/13/2015	HYDROTEST	GILES, INC.	PASS	REPAIRED/RETESTED
82	PLOT PLAN	LML 8806 - LPS 8848 - LPS 8849	WATER	10/6/2010	10/6/2015	HYDROTEST	GILES, INC.	FAIL	
82	PLOT PLAN	LML 8806 - LPS 8848 - LPS 8849	WATER	10/13/2010	10/13/2015	HYDROTEST	GILES, INC.	PASS	REPAIRED/RETESTED
82	PLOT PLAN	LML 8806 - LPS 8847	WATER	10/6/2010	10/6/2015	HYDROTEST	GILES, INC.	FAIL	
82	PLOT PLAN	LML 8806 - LPS 8847	WATER	10/13/2010	10/13/2015	HYDROTEST	GILES, INC.	PASS	REPAIRED/RETESTED
82	PLOT PLAN	PSB 15 - LML 8806 - PSB 17	WATER	10/6/2010	10/6/2015	HYDROTEST	GILES, INC.	PASS	
83	PLOT PLAN	LML 8806 - LPS 8842	WATER	10/6/2010	10/6/2015	HYDROTEST	GILES, INC.	PASS	
83	PLOT PLAN	LML 8806 - LPS 8843	WATER	10/6/2010	10/6/2015	HYDROTEST	GILES, INC.	PASS	
86	PLOT PLAN	LML 8807 - LPS 8793	WATER	11/16/2010	11/16/2015	HYDROTEST	GILES, INC.	FAIL	
86	PLOT PLAN	LML 8807 - LPS 8793	WATER	11/22/2010	11/22/2015	HYDROTEST	GILES, INC.	PASS	REPAIRED/RETESTED
86	PLOT PLAN	LML 8807 - LPS 8850 - LPS 8790	WATER	11/16/2010	11/16/2015	HYDROTEST	GILES, INC.	PASS	
86	PLOT PLAN	LML 8807 - LPS 8850 - LPS 8791	WATER	12/13/2010	12/13/2015	HYDROTEST	GILES, INC.	PASS	REPAIRED/RETESTED
86	PLOT PLAN	PSB 17 - PSB 19 - LML 8807 - LPS 8794	WATER	11/16/2010	11/16/2015	HYDROTEST	GILES, INC.	PASS	

Table 2.
Navajo Refining Company
Lovington Refinery
Listing of all sumps
Note: Notify Environmental if there are any repairs required.

No. of Sumps	Sump ID #	Location	Description	Approx. Dimensions	Last Test Date	Test Pass/Fail	Tested by	Test Method	Repair Method	Next Test Date	Comments
	83SUMP01	EAST OF COOLING TOWER, NORTH OF RACK @ E-436	CONCRETE BOX	CONCRETE CAP	n/a						(OUT OF SERVICE) OLD HDU SEWER HUB/LIFT STA., SUMP FILLED WITH CONCRETE, CLOSED 10/22/2009
	83SUMP02	AT OLD BUNDLE CLEANING PAD	CONCRETE BOX	4' x 4' x 4', 3' x 32.5' x 4'	11/18/2008	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/18/2013	(OUT OF SERVICE) TWO SUMPS, SUMPS FILLED WITH CONCRETE, CLOSED 10/22/2009
1	83SUMP03	AT CHEMICAL STORAGE PAD	CONCRETE BOX	4' x 4' x 4'	6/9/2009	Pass	Giles, Inc.	Hydro/Check Level	n/a	6/9/2014	TEST - SUMP NEW IN 2004
2	83SUMP04	(NAPHTHA SUMP) NORTH OF CONTROL ROOM	CONCRETE BOX	4' DIAMETER	11/21/2007	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/20/2012	TEST - SUMP
	83SUMP04	(NAPHTHA SUMP) NORTH OF CONTROL ROOM	CONCRETE BOX	4' DIAMETER	5/6/2010	Pass	Giles, Inc.	Hydro/Check Level	n/a	5/6/2015	
3	83SUMP05	SOUTH OF 400 & 401 CAUSTIC TANKS	CONCRETE BOX	4' x 4' x 4'	11/21/2007	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/21/2012	TEST - SUMP
	83SUMP05	SOUTH OF 400 & 401 CAUSTIC TANKS	CONCRETE BOX	4' x 4' x 4'	11/16/2010	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/16/2015	
4	83SUMP06	AT NON-HAZ PAD	CONCRETE BOX	4' x 4' x 4'	11/21/2007	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/21/2012	TEST - SUMP
5	83SUMP07	AT BUNDLE CLEANING PAD	FIBERGLASS DRUM	ROUND DRUM	11/21/2007	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/21/2012	TEST - SUMP
	83SUMP08	WEST OF API SEPARATOR	CONCRETE BOX	10' x 20' x 3'	11/20/2008	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/20/2013	(OUT OF SERVICE) SUMP FILLED WITH CONCRETE, CLOSED 10/22/2009
	83SUMP10	SOUTH OF T-1208	METAL BOX	6' x 6' x 6'	11/22/2008	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/22/2013	(OUT OF SERVICE) SUMP FILLED WITH CONCRETE, CLOSED 10/22/2009
	83SUMP11	NORTH OF T-1215	METAL BOX	3' x 3' x 2'	11/24/2008	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/24/2013	(OUT OF SERVICE) SUMP FILLED WITH CONCRETE, CLOSED 10/22/2009
	83SUMP13	WEST OF MAIN OFFICE BUILDING (OLD A/C CONDENSATE SUMP)	CONCRETE BOX	CONCRETE CAP	11/24/2008	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/24/2013	(OUT OF SERVICE) SUMP REMOVED DURING SEPTIC SYSTEM CAPITAL PROJECT, 2009
6	83SUMP14	NW CORNER OF MAIN BUILDING (OLD A/C CONDENSATE SUMP)	CONCRETE BOX	3' x 5' x 2'	11/25/2008	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/25/2013	TEST - SUMP
7	83SUMP15	TRUCK UNLOADING EAST OF T-1201A	CONCRETE BOX	4' x 4' x 3'-10" H	6/9/2009	Pass	Giles, Inc.	Hydro/Check Level	n/a	6/9/2014	TEST - SUMP
8	83SUMP16	SOUTH OF T-1201D, CRUDE METER STATION	CONCRETE BOX	3' DIAMETER	11/25/2008	Pass	Giles, Inc.	Hydro/Check Level	n/a		TEST - SUMP
9	83SUMP17	SOUTH AND WEST OF T-1201D, BEESON SUMP	METAL BOX	6' DIA x 6' D	6/9/2009	Pass	Giles, Inc.	Hydro/Check Level	n/a	6/9/2014	TEST - SUMP
	83SUMP18	AT RAILROAD LOADING SPUR ALONG HIGHWAY	CONCRETE BOX	6' x 6' x 4'							
10	83SUMP19	SUMP LOCATED NORTH OF TRUCK RACK, COVERED	CONCRETE BOX	36' x 36' x 5'	6/9/2009	Pass	Giles, Inc.	Hydro/Check Level	n/a	6/9/2014	TEST - SUMP
11	83SUMP20	AT TRUCK LOADING RACK	CONCRETE BOX	3' x 3' x 5'	6/9/2009	Pass	Giles, Inc.	Hydro/Check Level	n/a	6/9/2014	TEST - SUMP
	83SUMP21	OLD "JET A" LOADING RACK	CONCRETE BOX	5' x 5' x 4' & 3' x 2' x 2'	11/25/2008	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/25/2013	
12	83SUMP22	LEA 8"/10" P/L SUMP	METAL BOX	4' x 4' x 8'	6/9/2009	Pass	Giles, Inc.	Hydro/Check Level	n/a	5/6/2015	TEST - SUMP
	83SUMP22	LEA 8"/10" P/L SUMP	METAL BOX	4' x 4' x 8'	5/6/2010	Pass	Giles, Inc.	Hydro/Check Level	n/a	5/6/2015	
13	83SUMP23	AT PROVER MANIFOLD SOUTH AND EAST OF T-1201A, RUSSEL STATION	METAL BOX	4' x 4' x 4'	6/9/2009	Pass	Giles, Inc.	Hydro/Check Level	n/a	6/9/2014	TEST - SUMP
	83SUMP24	ABANDONED PHILIPS BLEND AREA	CONCRETE BOX	6' x 6' x 6'	11/25/2008	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/25/2013	(OUT OF SERVICE) SUMP FILLED WITH CONCRETE, CLOSED 10/22/2009
	83SUMP25	ABANDONED PHILIPS BLEND AREA	CONCRETE BOX	6' x 6' x 6'	11/25/2008	Pass	Giles, Inc.	Hydro/Check Level	n/a	11/25/2013	(OUT OF SERVICE) SUMP FILLED WITH CONCRETE, CLOSED 10/22/2009
14	83SUMP26	SOUTH OF T-1201D AT METERS (HAS ELECTRIC SUMP PUMP IN HOLE)	METAL BOX	3' DIAMETER	5/7/2010	Pass	Giles, Inc.	Hydro/Check Level	n/a	5/7/2015	TEST - SUMP
15	83SUMP27	SUMP AT SPENT CAUSTIC LOADING PUMPS	CONCRETE BOX	8' x 2' x 3'						Mar-12	INSTALLED NEW IN MARCH 2007
16	83SUMP28	LOV/ART CRUDE P/L SUMP	METAL BOX	6' DIA x 6' D	5/7/2010	Pass	Giles, Inc.	Hydro/Check Level	n/a	5/7/2015	TEST - SUMP
17	83SUMP30	NORTH CHEMICAL STORAGE PAD	CONCRETE BOX	4' x 4' x 4'						May-13	INSTALLED NEW IN MAY 2008

SUPPLEMENT 1

"Ground Water and Treatment System Annual Monitoring Report—Navajo Refining Company, Lea Refinery"

Ground Water and Treatment System
Annual Monitoring Report
Volume 1, Report Text, Tables, Figures, Appendices

Navajo Refining Company, Lea Refinery
Lovington, New Mexico

April 15, 2012

Prepared for:

Navajo Refining Company
501 East Main Street
Artesia, New Mexico 88210

By:

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VOLUME II

1. Introduction

The Navajo Refining Company, Lea Refinery is located approximately five miles south of Lovington in Lea County, New Mexico. The location of the refinery is shown in Figure 1. A 2009 aerial view of the refinery and a site plan are shown in Figures 2 and 3. The refinery operates under a Groundwater Discharge Plan (GW-014) issued by the New Mexico Oil Conservation Division (OCD). The discharge plan addresses water and fluid discharges to the subsurface; spills and leaks to the ground surface; pits, ponds and below grade tanks and sumps; waste handling and other activities that have the potential to contaminate groundwater or adversely impact public health and the environment.

A condition of the discharge plan is that an annual monitoring report be submitted to the OCD by April 15th of each year. A copy of the report is also to be submitted to the City of Lovington. The information that is to be submitted with the report includes:

1. A description of the monitoring and remediation activities that occurred during the year including conclusions and recommendations.
2. Summary tables listing laboratory analytical results of all water quality sampling for each monitoring point and plots of concentration vs. time for contaminants of concern from each monitoring point*. Any WQCC constituent found to exceed the groundwater standard shall be highlighted. Copies of the most recent year's laboratory data sheets supporting plots shall also be submitted.
3. Water table (piezometric) and/or potentiometric surface elevation iso-concentration maps utilizing static water level data shall be included in the annual report to assess local and/or regional ground water flow direction(s). A corrected water table elevation shall be determined from all wells containing phase-separated hydrocarbons. Map shall show all monitoring, recovery, PSH and City of Lovington water supply wells, pertinent site features (i.e., pipelines, effluent lines, etc.) and the direction and magnitude of the hydraulic gradient. All maps shall be to scale. Chemical iso-concentration maps of any contaminants exceeding water quality standards are required.
4. Plots of water table elevation vs. time for each ground water monitoring point from monitoring data is required to assess water table fluctuations and potential for PSH smear zone development or dormancy*.
5. Monthly and cumulative flow rates and volumes from PSH and recovery wells and the total recovered to date.
6. Product thickness maps from monitoring based on the thickness of Phase-Separated Hydrocarbons (PSH) or product on ground water in all refinery recovery and monitoring wells shall be included in the report. Maps shall include isopleths to the nearest 0.5 feet or iso-concentration lines to the nearest 10 ppb for organics, 10-100 ppm for metals, TDS, etc., for product and contaminants of concern detected during monitoring.

* Plots of concentration versus time and groundwater elevation versus time are not included with this report as there are only four sample points for the newly installed wells and there is no hydrocarbon product at the refinery. However a graphical plot showing water level decline is provided and water level information is shown in Table 1.

7. File this report in an acceptable electronic format along with hard copies to the City of Lovington and OCD Santa Fe.

The current report is organized to first generally describe activities that occurred during the past year. This is followed by is presentation of the results of water level measurements and changes during the past year, including a graph of water level declines for the two wells for which continuous water level measurements are available. Then summary tables of water quality sampling are presented together with concentration maps of constituents exceeding water quality standards. The results of investigation of spills and releases that occurred in 2011 (or earlier if not previously submitted) are presented. Finally a discussion of ongoing investigation activities is presented together with report conclusions and recommendations.

2. Previous Submittals

A condition of the discharge plan was that a separate monitoring and remediation Environmental Status Report (ESR) be provided the agency within 9 months of permit issuance to provide an update on contaminate hydrogeology with emphasis on threats to the City of Lovington water supply from the facility. A 2009 monitoring report was presented to the agency and the City of Lovington in a meeting on October 8, 2009. The agency in an email dated October 22, 2009 evaluated the report as deficient in satisfying the permit conditions. Further communication with the agency extended the date for resubmittal of required information to November 6, 2009. Accordingly, on that date Navajo resubmitted the ESR together with separate information required by the agency.

The ESR report documented site lithology, proximity to City of Lovington and other water wells, groundwater conditions and the results of sampling conducted at the site during June 2009. The report also includes information on the area hydrogeology, the replacement of the original monitoring wells, lack of hydrocarbon product detected and possible reasons for such. Sections of that report on area hydrogeology and details of the monitor well replacement are not included in the current monitoring report.

The OCD responded to the submitted reports with a letter dated December 10, 2009, listing deficiencies with the submitted material and requiring additional investigation including further investigatory borings, installation of additional monitoring wells, mapping of pipelines and additional actions required to be taken to protect groundwater.

The annual report dated April 15, 2010 was submitted to the OCD and contained water level and water quality information from the 14 monitor wells previously installed at the refinery and summarized investigation work performed to that date.

The December 2009 letter required additional monitor well installation and such drilling was completed on June 6, 2010. Exploratory borings in the vicinity of the crude tank manifold area and the wastewater separator were drilled in mid-June. In late June several follow-up borings were drilled in the area of the wastewater separator. The monitor wells were developed to remove sand and turbidity in July and sampled in August 2010. In July

they were surveyed by a professional registered surveyor who provided locations and surface and top of casing elevations. This information was compiled and submitted with the Environmental Status Report (ESR) dated November 15, 2010. Copies of the lithologic and well completion logs and geologic cross-sections were included with that report.

City of Lovington water wells in the vicinity of the refinery were located and plotted on a large-scale plate (Plate 1) which was previously provided to the agency. Information on other wells on file with the NM Office of the State Engineer was also included on Plate 1. A copy of this plate was with the April 2011 report and is not duplicated here.

For reference, Lovington city water wells surround the refinery to the southwest, west, northwest and to the east on the east side of NM Highway 18. The closest water well to the Refinery is LW-9 approximately 200 feet upgradient from the refinery's north east property boundary. Wells to the west of the refinery are located 2,400 feet (LW-12, 0.45 miles) or greater from the property fence. The distances to the west range from 2,400 feet to 4,600 feet (0.9 miles). To the east, the closest well (LW-3) is about 1,100 feet (0.2 miles) and the distance from the refinery ranges from 1,100 feet to 4,000 feet.

Also during the summer of 2010, mapping of pipelines entering and exiting the refinery was completed and the information plotted on a large-scale plate (Plate 2) submitted with the November 2010 ESR. A copy of the plate was also included with the 2010 report together with the table presenting pipeline information; this plate and associated information is not duplicated with this report.

3. 2011 Monitoring and Remediation Activities

In addition to the investigation work described above, activities performed in 2010 concentrated on better defining groundwater movement and water quality at the refinery. As a result, the fifteen new monitor wells installed around the periphery and interior of the refinery assist in providing additional data in pursuit of those objectives. These wells bring the total number of wells monitoring groundwater to 29 plus one recovery well which also provides water quality information. Water quality from the three water supply wells is also monitored.

Water Level Measurements

Water levels of all wells were measured on February 23, 2011, July 12, 2011 and during the semi-annual sampling event from January 30 through February 2, 2012. A detailed site plan showing the location of the existing and recently installed refinery monitoring wells is provided in Figure 3. The monitoring wells at the Lea Refinery were gauged for depth to groundwater and total depth using a Solinst Model 101 water level meter. Monitor wells where phase-separated hydrocarbons may have been present were measured using an oil/water interface probe (Solinst Model 122).

Groundwater Sampling

The following activities were conducted to measure groundwater levels and document the groundwater quality conditions in accordance with the OCD Groundwater Discharge Plan. The locations of the referenced wells are shown on Figure 3.

- Measured depth to groundwater in monitoring wells MW-1 through MW-29 and RW-1 prior to sampling. This was in addition to single-day measurements performed on the dates shown above.
- Measured free product thickness in monitoring wells RW-1, MW-1 and MW-7. No free product or even a hydrocarbon sheen was noted.
- Collected semi-annual groundwater samples from all monitor wells plus RW-1 in February and July 2011. Samples were collected in January-February 2012 from all wells except MW-12 which was damaged during Tank 105B repair and MW-17 which was destroyed during boneyard cleanup. Both events occurred fall/winter 2011 and both wells will be replaced during Spring 2012.
- Collected groundwater samples from the refinery's North, South and East water wells.

A Proactive model SS-Monsoon stainless steel pump was utilized to enable low flow sampling pursuant to guidelines published by the New Mexico Environment Department. These included measuring drawdown while purging until measured parameters stabilize.

Low flow purging was performed using the above described pump dedicated vinyl tubing. The pump was decontaminated with Alconox detergent, clean water and distilled water between samples. Groundwater parameters of conductivity, temperature and pH were measured during purging operations.

Samples taken for benzene, toluene, ethylbenzene, and total xylene (BTEX) and other volatiles analyses were transferred into air-tight, septum-sealed, 40-milliliter (ml) glass volatile organic analyte (VOA) sample vials with zero head space and preserved with HCl. Samples were placed in an ice-filled cooler immediately after collection and shipped to ALS Laboratory Group in Houston, Texas. The samples were analyzed for BTEX using EPA method SW8260. Chain of custody (COC) forms documenting sample identification numbers, collection times, and delivery times to the laboratory were completed for each set of samples.

Samples collected for semi-volatiles analysis were placed in one-liter amber glass bottles, placed on ice and shipped to the laboratory for analysis by EPA method SW8270.

Samples collected for metals and anion/Total Dissolved Solids (TDS) analyses were collected in separate containers. Metals samples were collected and field filtered using a 0.45 micron filter, preserved with HNO_3. and placed on ice. Samples for mercury were not field filtered. Samples for anion/TDS analysis were collected in liter plastic bottles and placed on ice. The samples were analyzed using methods EPA methods SW6020 for

metals, and methods E300, SM2320B, and M2540C, respectively, for anions, alkalinity and TDS.

4. Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Water levels in the vicinity of the refinery are declining due to withdrawal of water for refinery use from wells on the property and from the City's water wells. The water level declines at two of the original monitoring well locations are shown on Figure 4. Both of these wells have been replaced and deepened.* The average yearly water level decline through 2004-05 for monitor wells in the refinery process area was about -1.2 feet per year. That increased during the time period 2005-2008 to -1.3 to -1.4 feet per year. Measurements of the replacement wells from April to September 2009 show a possible loss of up to -2.4 feet per year. However, comparison of summer 2009 to summer 2010 water levels show an average decline of -1.5 feet per year. Water levels for the calendar year 2010 declined an average of -0.73 feet.

Groundwater elevations for 2009 though February 2012 are summarized in Table 1. Water table elevation maps (potentiometric surface) and directions of groundwater flow for February and July 2011, and January-February 2012 are shown in Figures 5 through 7.

The additional monitor wells installed in May and June 2010 provide much expanded groundwater elevation coverage at the refinery. It shows that contrary to the assumed general direction of groundwater flow to the southeast, groundwater movement is toward a very large groundwater cone of depression centered at the North, South and East water wells. The only exception, seen in Figures 6 and 7, is groundwater movement in the vicinity of MW-5. Flow in the far east-southeast area of the refinery is to the east. Otherwise, based on the water level data, water is moving to the refinery water supply wells from all four directions and not moving from the refinery to the City of Lovington water wells as has been previously postulated.

Comparison was made of water levels taken in February 2011 and February 2012. The average annual decline was -1.73 feet. The decline from February to July 2011 was -1.03 feet and that from July to February 2012 was -0.69 feet. The largest decline seen in the past year was -2.81 feet in MW-25. The likely reason for the large decline is its location between the north and east water supply wells. This is clearly seen in the water level contour maps (Figures 6 and 7). Other declines of interest are -2.60 feet for MW-19 and -2.24 for MW-23. Both wells are relatively close to refinery pumping wells.

Groundwater flow direction and gradient vary within the refinery boundaries. Figure 7 most clearly shows the rather large cone of depression centering on the three water supply wells with resultant change in flow direction depending on monitor well location. The upgradient steepening of the hydraulic gradient from 0.0039 ft/ft in the vicinity of MW-15 to 0.0095 at MW-26 clearly shows the impact of the pumping wells. Likewise

* MW-4 was dry from 2005 until a replacement well was installed in April 2009. MW-6 was replaced twice most recently in April 2009.

the near-flat gradient east and southeast of the wells provides a classic illustration of the effect of groundwater pumping on water level contours.

5. Water Quality Sampling Results

Distribution of Hydrocarbons in Groundwater

Phase Separated Hydrocarbon (PSH) was previously present in the vicinity of the wastewater separator (Figure 3). In 2008 measurable free product was measured at 0.62 feet in RW-1 prior to plugging and drilling a replacement well adjacent to it. Drilling of the three replacement wells in the spring of 2009 on the northwest side of the separator detected free-phase hydrocarbons in rotary cuttings and in the mud tank. Measurements made subsequent to installation of the new monitor wells at that location show no PSH and no hydrocarbon sheen. These measurements were made in June, July, September and October 2009; January, February, April and August 2010; February and July 2011, and February 2012. Drilling of the 15 new monitor wells in May and June 2010 did not detect free phase hydrocarbons in either drill core samples or in water quality samples taken subsequent to drilling. Some dissolved-phase hydrocarbons are present in the existing wells as discussed below. No dissolved-phase volatiles have been found in the 15 new wells.

Analytical results for BETX and other SW 8260 volatiles in groundwater from 2009 to present are summarized in Table 2. SW-8260 naphthalene and 8270 total naphthalenes are also shown. Constituents having detectable concentrations are shown in yellow with concentrations above the New Mexico Water Quality Control Commission (WQCC) standards highlighted in boldface type. The laboratory reports and COC documentation for samples obtained by SESI are included in Volume II.

Based on the most recent analytical data for samples collected by SESI in February 2012 and shown in Table 2, the distribution of volatile hydrocarbons at the Lea Refinery is described below:

- Volatile hydrocarbon concentrations for BTEX and naphthalene were below the laboratory detection limit and below WQCC standards in 14 of the 15 pre-existing/replacement monitoring wells (includes RW-1 as a monitor well) and all but two of the 15 new monitor wells. Volatile hydrocarbons were also absent from the three refinery water wells. The method reporting limit for BTEX and most other volatile constituents is 0.0050 mg/L; the reporting limit for total xylenes is 0.015 mg/L. The reporting limit for 8270 naphthalene is 0.00020 mg/L.

- At the wastewater separator in February 2012 no volatile hydrocarbons were detected in any of the four wells including MW-6 (downgradient from the wastewater separator). During 2011, low levels of volatiles were detected in MW-6 and RW-1.

- Benzene was detected in MW-11 in February 2012 at highly elevated concentration (7.9 mg/L). This well is located directly downgradient from the refinery process area

and also had elevated concentrations exceeding the WQCC standard of 0.010 mg/L in 2009, 2010 and 2011. MW-11 is the only well reporting benzene in February 2012.

- In August benzene was detected in MW-13 for the first time at a concentration of 0.016 mg/L. This decreased to 0.0057 and 0.0063 mg/L in February and July 2011, respectively. Benzene was absent in this well in February 2012. Benzene concentration maps for the reporting period are shown in Figures 8 through 10.

- In 2011 Ethylbenzene was reported in MW-6 and RW-1 but at levels much lower than their respective WQCC standards. Ethylbenzene and xylenes were detected in MW-11 in February 2012 but at levels less than their respective standard. Maps of BTEX volatiles are provided in Figures 11 to 13.

- Naphthalene and/or methyl-naphthalene were detected in February 2011 in wells MW-6, the well directly downgradient from the wastewater separator, and in MW-10. Both concentrations are below the standard of 0.03 mg/L. The detection in MW-10, located offgradient from the wastewater separator is only slightly above the method 8270 reporting limit of 0.00020 mg/L. In February 2012 naphthalene exceeding the groundwater standard was reported in MW-11 (0.096 mg/L). In addition to MW-6 and MW-11 method 8270 (semi-volatile) Naphthalene was reported in MW-4, MW-10, MW-16, MW-18 and MW-29 during one of the sample events. All of the latter detections are much less than the WQCC standard and with the possible exception of MW-29 are from outside sources. Maps showing locations of BTEX and naphthalene detections are shown in Figures 11 to 13.

- Other semi-volatiles detected in MW-6 included acetophenone; there is not a listed water quality standard for this constituent or the various phenols and phthalates. Phenol was not detected in MW-1, MW-6 and RW-1; however various phenolic derivatives were detected in MW-6.

- Various semi-volatile phthalates were seen in nearly all samples including those from the water wells. The likely source in the monitor wells was the PVC casing or the dedicated tubing. The low levels in the water wells were likely laboratory contamination. Phthalates or phthalate esters, are esters of phthalic acid and are mainly used as plasticizers (substances added to plastics to increase their flexibility, transparency, durability, and longevity). The earlier detection of the semi-volatile caprolactam in several samples was not repeated with the current results; the only detection was in MW-28 located on the northern periphery of the refinery. Caprolactam is the precursor to Nylon-6, a widely used synthetic polymer. Though the source is unknown, the fact it was not detected in other wells in the most recent sampling leads to the conclusion that it maybe a laboratory artifact and not present in the refinery groundwater.

Sampling Results for Inorganic Constituents

Sampling was conducted for major cations and anions, total dissolved solids (TDS) and WQCC metals. The results of the sampling are shown in Table 3. The results are highlighted below:

- Results of major anion and TDS sampling in July 2011 and February 2012 showed exceedances of the chloride and/or TDS standards in three existing/replacement wells (MW-2, MW-8, and MW-13), five new monitor wells (MW-15, MW-17, MW-18, MW-19, MW-21, MW-23 and MW-26), and the south water well. Figures 14 through 16 present chloride concentration maps for February 2011, July 2011 and February 2012 samplings. Figures 17 to 19 provide TDS concentrations for the same periods.

  The most recent chloride concentration map of the refinery (Figure 16) shows chloride concentrations exceeding the standard of 250 mg/L in the vicinity of the refinery process area. MW-11 is adjacent to the refinery process area and MW-13 is downgradient from MW-11. Within the process area, Navajo has replaced and tested the wastewater sewer system and the oil desalter sumps. However, wells MW-2 and MW-15 with concentrations approaching 250 mg/L are upgradient of the process area but downgradient from several older oil and gas production areas located just to the northwest and outside the refinery boundary.

  Chloride and total dissolved solids concentrations at MW-6 are no longer elevated. This well is located downgradient of the wastewater separator. Initial sampling in June 2009 following development and pumping in excess of 50 gallons showed low concentrations of both constituents. Sampling in January 2010, August 2010 and March 1, 2011 show elevated but declining values for both. Groundwater temperatures which were elevated in the past due to proximity to hot water from the now-eliminated leak are currently nominal for the area. Therefore, it is likely that the concentrations are artifacts from the former wastewater leak. However, future sampling temperatures and concentrations will be examined to confirm this explanation.

  Though chloride and TDS in MW-6 are no longer elevated, concentrations in MW-8 are elevated over values reported in 2009 and early 2010. MW-8 is shown as downgradient from MW-6 on recent groundwater contour maps.

  Monitor wells MW-17, MW-18 and MW-19 have elevated chloride and/or TDS concentrations. Though February 2012 levels in MW-18 have decreased since last July, chloride/TDS levels in MW-17 in July and MW-19 in July and February 2012 remain elevated above WQCC standards. It is postulated that concentrations in MW-19 are from a pit and/or injection well activity in the area of LSAU 13 or LPU 33. In any event, groundwater flow maps show that elevated concentrations for all three monitor wells likely originate offsite.

Elevated levels of chloride and/or TDS are also found in new monitor wells MW-21 and MW-23. The source or sources at both wells may be one or more of the several oil and gas locations in the area.

In all groundwater samplings the south water well has shown elevated levels of both chloride and total dissolved solids. The refinery itself is not believed to be the source of the chlorides detected. There are numerous oil and gas wells on and in the vicinity of the refinery. Though the OCD has banned pits in the area since at least 1967 older discharges to unlined impoundments had the potential to migrate to groundwater and cause elevated levels of chloride and TDS. Therefore the source of these constituents may be either or a combination of releases from the area of the active injection wells to the south or the former production wells to the east (Figures 16 and 19).

- Fluoride concentration maps are shown in Figures 20 to 22. Four monitor wells (MW-3, MW-9, MW-24 and MW-28) exceed the WQCC standard of 1.6 mg/L. The values have been consistent during the 2009-2012 sampling events and are considered natural.

- Chromium concentration maps (Figures 23-25) show elevated concentrations of chromium exceeding the NM groundwater standard of 0.05 mg/L in MW-29. The source at MW-29 may be the result of former chromate use at the upgradient water cooling tower. Severely elevated levels of chromium, iron, manganese and nickel were reported in MW-14 in July 2011 (Figures 24 and 27). Checking with the laboratory did not resolve the excessive values reported. However sampling before and after does not show detectable concentrations of chromium or iron in the well. Therefore, it is concluded the July 2011 are an artifact from an unknown source. Repeated low-level concentrations of chromium less than the groundwater standard have observed at several other wells, mainly MW-15, MW-18, MW-25 and the north and east water supply wells. The location of these wells is away from any past or current source of chromium and therefore not due to refinery activities.

- Other than chromium discussed above, analytical results of sampling for WQCC metals showed no detections in excess of WQCC standards except for manganese and iron, which are usually indicators of a reducing chemical environment due to lack of oxygen the groundwater in the vicinity of the wells. The iron and manganese concentrations are shown in Figure 26 to 28. In February 2012 manganese exceeded the groundwater standard of 0.20 mg/L in existing wells MW-1, MW-6, MW-7, MW-11 and MW-13. In MW-13 manganese exceeding the groundwater standard is coincident with low-level detections of benzene in 2010 and 2011. Iron does not currently exceed the WQCC standard in any well except MW-11, although it previously exceeded the standard in MW-6 in 2010 and 2011. Wells which have or had dissolved phase hydrocarbon impacts most likely have changed the groundwater environment in the immediate proximity of the wells from aerated to anoxic conditions. Manganese and iron in the environment commonly become soluble in the absence of oxygen.

6. Groundwater Temperature

Measurement of groundwater temperature in the vicinity of the wastewater separator has shown elevated levels as high as 28.4° centigrade (83.1° Fahrenheit) in MW-9 in August 2001. The elevated temperatures compared to normal summer temperatures of 20-22° C (68-72° F) were considered evidence of a leak in the wastewater system as the separator contained hot water.

Navajo completed emptying, cleaning and sealing the wastewater separator system in 2003. The sumps were sandblasted and coated with oil and waterproof sealants and static tested. Sampling subsequent to that time showed a decline in temperatures though measurement was difficult as water levels declined and wells dried up.

Sampling of the new wells conducted in 2010, 2011 and in February 2012 showed no significant difference in temperatures between monitor wells. These results lead to the conclusion that the retrofitting of the wastewater separator performed by Navajo has stopped leakage of fluids from the unit. Temperatures will be monitored in future samplings to detect any significant changes at this location.

7. Oil Recovery

Hydrocarbon product had been detected in groundwater in the vicinity of the wastewater separator at the Lea Refinery since installation of the first monitor wells in September 1995. A recovery well and an air sparge/soil vapor extraction system was installed at the facility in November 1996. The system included seven air sparge/vapor extraction wells and a Xitech oil recovery pump in RW-1 to remove the source of contamination. A total of 160 gallons of free product was recovered along with 8,870 lbs of TVHC (Total volatile hydrocarbons). The system was shut down in September 1999 because the most recent BTEX and TVHC samplings showed concentrations below detection limits and product had been mostly removed from the monitor wells.

However in 2000-2001 product again increased in the two nearby monitor wells (located within 15-20 feet of the recovery well). The Xitech pump recovered product from the RW-1 which was transferred to a storage container for further recycling to the refinery. The total volume recovered is somewhat in excess of 250 gallons (6 barrels).

In 2001 the depth to product varied depending on pump operation. Product thickness varied from less than 0.01 feet to 4.5 feet. Depth to water was 96.5 feet. However, a downgradient monitor well about 50 feet away on the other side of the wastewater separator did not detect measurable hydrocarbon and very little dissolved phase hydrocarbon.

By 2007 the water table in the vicinity of the recovery well had declined so that product and water in the two monitor wells (MW-1 and MW-7) was not detected (i.e. they were dry). In 2008 the water and product levels in the recovery well (RW-1) had declined so that the installed recovery pump could no longer recover product. At the time of the last

measurements of the old wells on March 17, 2009, MW-1 and MW-7 remained dry and in recovery well RW-1 product was 0.6 feet thick and there was slightly over 3 feet of fluid in the well.

Groundwater measurements made in April, June, July, September and October 2009; January, February, April and August 2010; February and July 2011, and February 2012 have not shown any hydrocarbon product in any of the three replacement wells. These measurements are shown Table 1. Additionally, no dissolved phase hydrocarbons are present at detectable levels in the three wells though the presence of iron and manganese indicates that conditions are still anoxic.

A plausible reason for the absence of product in the wells is that the leak had been stopped and what was seen in the old wells was oil from the leak seeping through the intervening sandy material to the water table. By drilling new wells adjacent to the old ones, oil in the formation was removed in the drilling process and what is left there is mainly held by capillary forces and little or none will drain by gravity. The design of the wells is such that any further leaks will be detected during quarterly measurements to allow early remedial action and product recovery.

8. Spill Report Investigation

The Lovington facility had six spills during 2011 with zero fires to report. These releases of hydrocarbons or water requiring reporting to the OCD are summarized in the Navajo Refinery 2011 Annual Report. They are described below with results of subsurface investigation reported in Supplement 1, Appendix A as indicated below.

1. On January 29, 2011 a relief valve at the Holly Energy Partners pump station discharged to a sump which quickly overflowed, and approximately 37 barrels of gas oil contacted bare ground. A vacuum truck recovered approximately 35 bbl that was transferred to the light slop tank (T-1207). The contaminated soil was excavated to a depth where no visible signs of contamination were observed. The removed soil was placed on plastic until it could be loaded into a waste container and disposed. Further investigation will require removal of a section of process piping for drilling rig access. Please see the refinery report, Supplement 2 for supporting documents (C-141 form, and disposal manifests).
2. On February 27, 2011, a power failure caused several waste water pumps to shut down and subsequently, overfilled the waste water tank (T-1209B) and resulted in the release of approximately 10 bbls. Included in the pumps that were shut down was P-307, which removes water from the tank, which is the effluent pump to the City of Lovington POTW. The event occurred during a period with high winds; some of the water evaporated and the remainder was absorbed by the ground surface, which prevented freestanding water from being recovered. Please see refinery report Supplement 2 for supporting documents (C-141 form, SESI analysis and correspondence and waste water analytical report).

3. On March 17, 2011, a check valve failed near T-1209B (waste water tank), which allowed the liquid level in the tank to increase and eventually overfilled the tank. The pump(s) that pump water from the tank remained in operation, but were limited by the check valve failure. It was estimated that 10 bbl of waste water was released. The water was quickly absorbed into the ground surface, preventing liquid volume recovery. After the area dried, there were no indications of staining, oil residues, etc. Please see refinery report Supplement 2 for supporting documents (C-141 form, SESI analysis and correspondence).
4. On March 18, 2011, a sump pump near the Hobbs pipeline manifold failed to start and caused approximately 5 bbl of crude to overfill and spill onto the ground. A vacuum truck was dispatched to the area, but there was no liquid volume recovered as the oil had soaked into the ground. The stained soil was excavated down to solid caliche and disposed as non-hazardous waste. Please see refinery report Supplement 2 for supporting documents (C-141 form, and disposal manifests).
5. On August 1, 2011, a leak in T-1215 (tank used for vacuum unit feed; heavy slop oil) was discovered. Operations transferred the remaining liquid contents to T-1214 (slop tank) while vacuum trucks recovered approximately 280 bbls that reached the ground surface. The recovered volume was also transferred to T-1214. Safety and Environmental Solutions were utilized to delineate the spill and sample the area. Please see refinery report Supplement 1 for supporting documents (C-141 form, and SESI report). Detailed investigation results including analyses and boring logs are provided in Appendix A of this report.
6. At approximately 08:30 on December 10, 2011, a frac tank overflowed waste water into a secondary containment which then overflowed onto the ground. A vacuum truck pulled out of the secondary containment to prevent more of the water from overflowing onto the ground, however approximately 15 barrels made it to the ground was not recovered. The frac tank liner inside the tank is breaking apart and plugged the suction strainer to P-307 causing the spill. Operators have since adopted a program to clean the pump suction screens on a weekly basis to prevent further incidents. The Frac tank was used to temporarily replace the TK-1209B Strip Tank while being repaired and functioned by utilizing air to strip water of H_2S. Excavation efforts were limited due to the lack of oily staining in the area. Please see Supplement 2 for supporting documents (C-141 form, SESI analysis and correspondence).

9. Status of Nearby Oil and Gas Wells

The status of nearby oil and gas wells is shown on Figure 29. The conditions shown are active producing, injection (active injection or injection - plugged and abandoned), temporary abandoned, and plugged and abandoned. The map has been updated from August 2010 as one nearby well has been properly plugged and abandoned. This well, LSAU 13, is located south of MW-19 and was formerly used for salt water injection.

10. Potential Receptors

Neither hydrocarbon product nor a dissolved phase hydrocarbon plume has been detected

from the wastewater separator area during the current investigation. However, if a plume was detected, the nearest receptors are the refinery's North and East water supply wells located about 1,000 feet downgradient of the release previously described in Section 7 above. The water supply wells are monitored semi-annually for WQCC constituents (which include many drinking water parameters) but the water supply is used for refinery makeup water and non-drinking water uses such as restrooms.

Previously, locations of the City of Lovington water supply wells were supplied with the November 2009 ESR (Plate 1). The nearest well, Lovington #9 is about 1,330 feet from MW-11 and 1,430 feet from the area of the wastewater separator release. This well was not considered a potential receptor as localized groundwater flow is southeast toward the Navajo pumping water wells. The other identified water supply wells were not presently considered potential receptors based on their distance from the refinery and current information on groundwater flow direction. This information and the conclusion that conditions at the refinery are not impacting city water wells was reinforced when the expanded groundwater map was prepared following installation of the new monitor wells at the refinery.

11. Conclusions

- With the exception of MW-11 and MW-13, sampling conducted in 2011 and February showed benzene concentrations in all wells were below EPA method 8260 reporting limits (0.0050 mg/L). The highly elevated levels in MW-11 and the low-level detections in MW-13 are likely due to past releases in the refinery process area. As discussed above, Navajo has been retrofitting the process units during refinery expansion and to comply with other provisions of the discharge plan to prevent spills and leaks.

- No hydrocarbon product has been found or hydrocarbon sheens detected in the replacement monitor wells adjacent to the wastewater separator. Groundwater temperatures in these wells are comparable to temperatures in monitor wells away from the area. This leads to the conclusion that the retrofitting completed by Navajo at the separator seven years ago has solved the problem of wastewater fluids and oil leaking to the groundwater.

- In 2011 minor dissolved concentrations of ethylbenzene and various naphthalene compounds were found in the three replacement wells located adjacent to the northwest side of the wastewater separator, and in the downgradient monitor well on the southeast side MW-6. However concentrations of these constituents were well below WQCC standards. The February 2, 2012 sampling did not detect these constituents in any of the four wells.

- No volatile organic compounds were found in the refinery water supply wells. Chloride and TDS in the south water well exceed WQCC standards. Because water from the wells is used by the refinery for hand washing, showering, etc., the wells are now monitored for BTEX on at least a semi-annual basis.

- With the possible exception of elevated chlorides and total dissolved solids found in MW-8 and MW-13, elevated levels found in other monitor wells and the south water well are from non-refinery sources. The elevated level in MW-8 is likely an artifact of the previous release at the wastewater separator. Possible sources of chlorides in the process area are previous releases from the process area or migration from upgradient oil production areas northwest of the refinery boundary. As discussed above, modification of the wastewater system in process area should prevent future releases. The likely source of chlorides in the south water well is from oil production areas to the south and southwest of the refinery boundary.

12. Status of Investigatory Work

1. Major work to map and identify the 23 active, inactive and plugged and abandoned oil and gas production and injection wells within the refinery and on the periphery was completed in 2010. The results of this work including a map showing the location and status of these wells was included in the 2010 annual report. The status of wells has been updated and is presented in Figure 29 in this report.
2. Mapping and identification of all Navajo and Holly pipelines entering and leaving the refinery and on the periphery including crude lines, product lines and effluent lines operated by Navajo, Holly or other entities was completed with the results presented in the 2010 annual report.
3. Mapping and identification of all Navajo and Holly Energy Partners incoming and outgoing crude and product lines through the City of Lovington's well field was completed with results presented in the 2010 annual report.
4. Obtaining and reviewing City of Lovington water well records for drilling and well completion information has been concluded. Records of most water wells to the north and west of the refinery were located. Records of the three water supply wells at the refinery were located and were included with the annual report submitted in April 2010. As a result of water levels from the newly added monitor wells showing a cone of depression centered on the refinery water wells and no current groundwater movement outside of the refinery boundaries (Figures 6 and 7), no additional work on this OCD request is to be performed.
5. Obtaining and reviewing pumping volumes, rates and pumping schedules for all pumping water wells previously identified was not performed. As a result of water levels from the newly added monitor wells showing a cone of depression centered on the refinery water wells and no current groundwater movement outside of the refinery boundaries, the requested work is unnecessary. Also aquifer testing of the aquifer at the refinery has been rescheduled for May-June 2012.
6. Field checking of non-City of Lovington water wells shown on Plate 1 of the Environmental Status Report was not performed and as a result of the conclusion in #5 above it will be dropped.

7. Locating and drilling the additional monitor wells requested by OCD in the December 10, 2009 letter was completed and the work presented in the November 15, 2010 Environmental Status Report. Similarly, work to define possible contamination at the crude manifold and wastewater separator areas has been completed and the results discussed in the ESR.
8. The next semi-annual monitoring event will be scheduled for July 2012. OCD and the City of Lovington will be notified two weeks in advance of the date of the sampling.

13. Recommendations

1. In addition to semi-annual sampling Navajo recommends that the three water supply wells be monitored on a quarterly basis for selected WQCC constituents including BTEX, chloride, and total dissolved solids. These few parameters will provide the refinery with sufficient information to detect an unanticipated excursion of contaminants from an unexpected source.
2. Additional efforts to locate a source for the elevated benzene concentrations seen in MW-11 should be pursued. A possible source may be the sump located outside the northeast side of the former process area control room. Any remaining untested or leaking piping should be scheduled for replacement.
3. Two monitor wells (in addition to the damaged MW-12 and MW-17) will need replacement in the next year to 18-months due to water level declines below sampling levels. The wells are MW-11 and MW-13 which have 5.4 and 7.8 feet of saturated thickness available for sampling.

14. Report Tables and Figures

Table 1. Monitor Well Water Level Elevation Measurements, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well Number	Elevation Top of Casing (TOC, feet)	Measure-ment Date	Depth to Product (feet)	Depth to Water Below TOC (feet)	Total Depth (feet)	Product Thickness (feet)	Corrected Depth to Water (feet)	Corrected Water Level Elev. (feet)	Change from previous reading (ft)
MW-1	3,838.40	04/30/09	--	106.35	136.10	0	106.35	3,732.05	--
		06/10/09	--	106.49	--	0	106.49	3,731.91	-0.14
		06/19/09	--	106.57	129.12	0	106.57	3,731.83	-0.08
		07/02/09	--	106.74	129.13	0	106.74	3,731.66	-0.17
		07/24/09	--	106.83	129.11	0	106.83	3,731.57	-0.09
		09/24/09	--	107.31	129.12	0	107.31	3,731.09	-0.48
		10/27/09	--	107.44	129.10	0	107.44	3,730.96	-0.13
		01/13/10	--	107.57	129.11	0	107.57	3,730.83	-0.13
		04/01/10	--	107.51	--	0	107.51	3,730.89	0.06
		08/11/10	--	108.09	129.16	0	108.09	3,730.31	-0.58
		02/23/11	--	108.12	129.14	0	108.12	3,730.28	-0.03
		07/12/11	--	109.00	129.11	0	109.00	3,729.40	-0.88
		02/02/12	--	109.68	129.12	0	109.68	3,728.72	-0.68
Note: Replacement well; drilled April 2009.									
MW-2	3,837.35	06/22/09	--	104.32	126.41	0	104.32	3,733.03	--
		01/13/10	--	105.44	126.68	0	105.44	3,731.91	-1.12
		08/11/10	--	105.97	126.42	0	105.97	3,731.38	-0.53
		02/23/11	--	105.92	126.46	0	105.92	3,731.43	0.05
		07/12/11	--	107.22	126.47	0	107.22	3,730.13	-1.30
		01/30/12	--	107.55	126.47	0	107.55	3,729.80	-0.33
Note: Replacement well; drilled April 2009.									
MW-3	3,831.65	06/16/09	--	102.65	130.45	0	102.65	3,729.00	--
		01/13/10	--	103.29	130.69	0	103.29	3,728.36	-0.64
		08/11/10	--	104.82	130.42	0	104.82	3,726.83	-1.53
		09/28/10	--	104.70	--	0	104.70	3,726.95	0.12
		02/23/11	--	104.11	130.47	0	104.11	3,727.54	0.59
		07/12/11	--	104.89	130.50	0	104.89	3,726.76	-0.78
		01/30/12	--	105.22	130.45	0	105.22	3,726.43	-0.33
Note: Replacement well; drilled April 2009.									
MW-4	3,839.89	06/16/09	--	106.79	128.02	0	106.79	3,733.10	--
		01/13/10	--	107.72	127.94	0	107.72	3,732.17	-0.93
		08/11/10	--	108.19	128.03	0	108.19	3,731.70	-0.47
		09/28/10	--	108.47	--	0	108.47	3,731.42	-0.28
		02/23/11	--	108.31	127.82	0	108.31	3,731.58	0.16
		07/12/11	--	109.27	128.02	0	109.27	3,730.62	-0.96
		01/30/12	--	109.91	128.02	0	109.91	3,729.98	-0.64
Note: Replacement well; drilled April 2009.									
MW-5	3,819.15	06/16/09	--	90.84	--	0	90.84	3,728.31	--
		01/13/10	--	92.02	118.30	0	92.02	3,727.13	-1.18
		08/11/10	--	92.67	117.93	0	92.67	3,726.48	-0.65
		02/23/11	--	92.68	118.00	0	93.67	3,725.48	-1.00
		07/12/11	--	93.38	117.97	0	94.67	3,724.48	-1.00
		01/31/12	--	94.75	117.75	0	95.67	3,723.48	-1.00
Note: Replacement well; drilled April 2009.									
MW-6	3,838.16	06/18/09	--	106.64	129.48	0	106.64	3,731.52	--
		07/24/09	--	106.92	129.71	0	106.92	3,731.24	-0.28
		09/24/09	--	107.44	129.74	0	107.44	3,730.72	-0.52
		10/27/09	--	107.55	129.73	0	107.55	3,730.61	-0.11
		01/13/10	--	107.64	129.71	0	107.64	3,730.52	-0.09
		02/02/10	--	107.69	--	0	107.69	3,730.47	-0.05

Table 1. Monitor Well Water Level Elevation Measurements, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well Number	Elevation Top of Casing (TOC, feet)	Measure-ment Date	Depth to Product (feet)	Depth to Water Below TOC (feet)	Total Depth (feet)	Product Thickness (feet)	Corrected Depth to Water (feet)	Corrected Water Level Elev. (feet)	Change from previous reading (ft)
MW-6		04/01/10	--	107.65	--	0	107.65	3,730.51	0.04
		08/11/10	--	108.00	129.71	0	108.00	3,730.16	-0.35
		02/23/11	--	108.22	129.72	0	108.22	3,729.94	-0.22
		07/12/11	--	109.09	129.74	0	109.09	3,729.07	-0.87
		02/02/12	--	109.78	129.74	0	109.78	3,728.38	-0.69
Note: Replacement well; drilled April 2009.									
MW-7	3,838.42	04/30/09	--	106.37	135.54	0	106.37	3,732.05	--
		06/10/09	--	106.48	--	0	106.48	3,731.94	-0.11
		06/19/09	--	106.68	129.34	0	106.68	3,731.74	-0.20
		07/02/09	--	106.75	129.51	0	106.75	3,731.67	-0.07
		07/24/09	--	106.84	129.52	0	106.84	3,731.58	-0.09
		09/24/09	--	107.33	129.29	0	107.33	3,731.09	-0.49
		10/27/09	--	107.46	129.53	0	107.46	3,730.96	-0.13
		01/13/10	--	107.60	129.55	0	107.60	3,730.82	-0.14
		02/02/10	--	107.61	--	0	107.61	3,730.81	-0.01
		04/01/10	--	107.52	--	0	107.52	3,730.90	0.09
		08/11/10	--	108.10	129.57	0	108.10	3,730.32	-0.58
		02/23/11	--	108.13	129.52	0	108.13	3,730.29	-0.03
		07/12/11	--	109.01	129.50	0	109.01	3,729.41	-0.88
		02/02/12	--	109.71	129.26	0	109.71	3,728.71	-0.70
Note: Replacement well; drilled April 2009.									
MW-8	3,839.98	06/18/09	--	109.37	132.30	0	109.37	3,730.61	--
		01/13/10	--	110.47	132.56	0	110.47	3,729.51	-1.10
		08/11/10	--	111.05	132.34	0	111.05	3,728.93	-0.58
		02/23/11	--	111.07	132.34	0	111.07	3,728.91	-0.02
		07/12/11	--	111.98	132.36	0	111.98	3,728.00	-0.91
		02/01/12	--	112.91	132.32	0	112.91	3,727.07	-0.93
Note: Replacement well; drilled April 2009.									
MW-9	3,835.22	06/16/09	--	104.58	129.18	0	104.58	3,730.64	--
		01/13/10	--	105.61	129.48	0	105.61	3,729.61	-1.03
		08/11/10	--	106.37	129.21	0	106.37	3,728.85	-0.76
		02/23/11	--	106.28	129.24	0	106.28	3,728.94	0.09
		07/12/11	--	107.17	129.26	0	107.17	3,728.05	-0.89
		01/31/12	--	107.38	129.30	0	107.38	3,727.84	-0.21
Note: Replacement well; drilled April 2009.									
MW-10	3,833.66	06/16/09	--	102.57	129.14	0	102.57	3,731.09	--
		01/13/10	--	103.51	127.42	0	103.51	3,730.15	-0.94
		08/11/10	--	104.31	128.47	0	104.31	3,729.35	-0.80
		02/23/11	--	104.26	128.54	0	104.26	3,729.40	0.05
		07/12/11	--	105.08	128.46	0	105.08	3,728.58	-0.82
		01/31/12	--	105.73	128.40	0	105.73	3,727.93	-0.65
Note: Replacement well; drilled April 2009.									
MW-11	3,839.56	06/20/02	--	99.93	*116.21*	0	99.93	3,739.63	--
		09/17/02	--	100.63	*116.21*	0	100.63	3,738.93	-0.70
		12/19/02	--	100.50	*116.21*	0	100.50	3,739.06	0.13
		03/28/03	--	99.74	*116.21*	0	99.74	3,739.82	0.76
		06/20/03	--	100.76	*116.21*	0	100.76	3,738.80	-1.02
		09/15/03	--	101.51	*116.21*	0	101.51	3,738.05	-0.75
		04/30/04	--	102.31	116.21	0	102.31	3,737.25	-0.80
		02/21/05	--	103.80	*116.21*	0	103.80	3,735.76	-1.49
		06/28/05	--	104.33	*116.21*	0	104.33	3,735.23	-0.53
		09/30/05	--	104.60	*116.21*	0	104.60	3,734.96	-0.27
		12/29/05	--	104.81	*116.21*	0	104.81	3,734.75	-0.21

Table 1. Monitor Well Water Level Elevation Measurements, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well Number	Elevation Top of Casing (TOC, feet)	Measure-ment Date	Depth to Product (feet)	Depth to Water Below TOC (feet)	Total Depth (feet)	Product Thickness (feet)	Corrected Depth to Water (feet)	Corrected Water Level Elev. (feet)	Change from previous reading (ft)
MW-11		04/10/06	--	105.12	*116.21*	0	105.12	3,734.44	-0.31
		07/06/06	--	105.61	*116.21*	0	105.61	3,733.95	-0.49
		01/26/07	--	106.63	*116.21*	0	106.63	3,732.93	-1.02
		03/27/07	--	106.80	*116.21*	0	106.80	3,732.76	-0.17
		07/13/07	--	106.94	*116.21*	0	106.94	3,732.62	-0.14
		09/12/07	--	107.22	*116.21*	0	107.22	3,732.34	-0.28
		12/31/07	--	106.74	*116.21*	0	106.74	3,732.82	0.48
		03/26/08	--	106.81	117.51	0	106.81	3,732.75	-0.07
		06/13/08	--	107.40	*117.51*	0	107.40	3,732.16	-0.59
		09/24/08	--	108.76	*117.51*	0	108.76	3,730.80	-1.36
		12/29/08	--	108.57	*117.51*	0	108.57	3,730.99	0.19
		03/17/09	--	107.91	*117.51*	0	107.91	3,731.65	0.66
		06/18/09	--	108.65	117.49	0	108.65	3,730.91	-0.74
		01/13/10	--	109.81	117.77	0	109.81	3,729.75	-1.16
		08/11/10	--	110.16	117.50	0	110.16	3,729.40	-0.35
		02/23/11	--	110.32	117.70	0	110.32	3,729.24	-0.16
		07/12/11	--	110.31	117.41	0	110.31	3,729.25	0.01
		02/01/12	--	112.02	117.37	0	112.02	3,727.54	-1.71
Note: Italicized values for total depth are estimated values									
MW-12	3,822.73	06/20/02	--	84.20	*100.55*	0	84.20	3,738.53	--
		12/21/02	--	85.21	*100.55*	0	85.21	3,737.52	-1.01
		03/28/03	--	85.35	*100.55*	0	85.35	3,737.38	-0.14
		06/20/03	--	85.51	*100.55*	0	85.51	3,737.22	-0.16
		09/15/03	--	86.13	*100.55*	0	86.13	3,736.60	-0.62
		11/02/03	--	86.57	*100.55*	0	86.57	3,736.16	-0.44
		04/30/04	--	87.40	100.55	0	87.40	3,735.33	-0.83
		02/21/05	--	88.42	*100.55*	0	88.42	3,734.31	-1.02
		06/28/05	--	88.76	*100.55*	0	88.76	3,733.97	-0.34
		09/30/05	--	89.12	*100.55*	0	89.12	3,733.61	-0.36
		12/29/05	--	89.31	*100.55*	0	89.31	3,733.42	-0.19
		04/10/06	--	89.55	*100.55*	0	89.55	3,733.18	-0.24
		07/06/06	--	90.03	*100.55*	0	90.03	3,732.70	-0.48
		01/26/07	--	90.06	*100.55*	0	90.06	3,732.67	-0.03
		03/27/07	--	90.10	*100.55*	0	90.10	3,732.63	-0.04
		07/13/07	--	91.66	*100.55*	0	91.66	3,731.07	-1.56
		09/12/07	--	92.01	*100.55*	0	92.01	3,730.72	-0.35
		12/31/07	--	92.17	*100.55*	0	92.17	3,730.56	-0.16
		03/26/08	--	92.39	100.57	0	92.39	3,730.34	-0.22
		06/13/08	--	92.59	*100.57*	0	92.59	3,730.14	-0.20
		09/24/08	--	93.21	*100.57*	0	93.21	3,729.52	-0.62
		12/29/08	--	93.59	*100.57*	0	93.59	3,729.14	-0.38
		03/17/09	--	93.75	*100.57*	0	93.75	3,728.98	-0.16
		06/16/09	--	93.83	100.51	0	93.83	3,728.90	-0.08
		01/13/10	--	94.78	100.71	0	94.78	3,727.95	-0.95
		08/11/10	--	95.67	100.56	0	95.67	3,727.06	-0.89
		02/23/11	--	95.85	100.56	0	95.85	3,726.88	-0.18
		07/12/11	--	96.58	100.55	0	96.58	3,726.15	-0.73
		02/01/12	--	97.57	100.57	0	97.57	3,725.16	-0.99
Note: Damaged casing and insufficent water for sampling 2/1/12; to be replaced Spring 2012									
Note: Italicized values for total depth are estimated values									
MW-13	3,837.06	04/30/04	--	101.41	119.82	0	101.41	3,735.65	--
		02/21/05	--	103.09	*119.82*	0	103.09	3,733.97	-1.68
		06/28/05	--	103.48	*119.82*	0	103.48	3,733.58	-0.39
		09/30/05	--	103.80	*119.82*	0	103.80	3,733.26	-0.32
		12/29/05	--	104.41	*119.82*	0	104.41	3,732.65	-0.61
		04/10/06	--	104.59	*119.82*	0	104.59	3,732.47	-0.18

Table 1. Monitor Well Water Level Elevation Measurements, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well Number	Elevation Top of Casing (TOC, feet)	Measure-ment Date	Depth to Product (feet)	Depth to Water Below TOC (feet)	Total Depth (feet)	Product Thickness (feet)	Corrected Depth to Water (feet)	Corrected Water Level Elev. (feet)	Change from previous reading (ft)
MW-13		07/06/06	--	104.94	*119.82*	0	104.94	3,732.12	-0.35
		01/26/07	--	106.41	*119.82*	0	106.41	3,730.65	-1.47
		03/27/07	--	106.47	*119.82*	0	106.47	3,730.59	-0.06
		07/13/07	--	106.93	*119.82*	0	106.93	3,730.13	-0.46
		09/12/07	--	107.19	*119.82*	0	107.19	3,729.87	-0.26
		12/31/07	--	106.71	*119.82*	0	106.71	3,730.35	0.48
		03/26/08	--	107.02	119.75	0	107.02	3,730.04	-0.31
		06/13/08	--	107.19	*119.75*	0	107.19	3,729.87	-0.17
		09/24/08	--	108.56	*119.75*	0	108.56	3,728.50	-1.37
		12/29/08	--	108.71	*119.75*	0	108.71	3,728.35	-0.15
		03/17/09	--	108.36	*119.75*	0	108.36	3,728.70	0.35
		06/16/09	--	108.58	108.58	0	108.58	3,728.48	-0.22
		01/13/10	--	109.68	119.95	0	109.68	3,727.38	-1.10
		08/11/10	--	109.72	119.68	0	109.72	3,727.34	-0.04
		02/23/11	--	110.14	119.69	0	110.14	3,726.92	-0.42
		07/12/11	--	111.17	119.71	0	111.17	3,725.89	-1.03
		02/01/12	--	111.81	119.66	0	111.81	3,725.25	-0.64
Note: Italicized values for total depth are estimated values									
MW-14	3,823.03	04/30/04	--	87.46	*105.08*	0	87.46	3,735.57	--
		02/21/05	--	88.48	*105.08*	0	88.48	3,734.55	-1.02
		06/28/05	--	88.80	*105.08*	0	88.80	3,734.23	-0.32
		09/30/05	--	89.14	*105.08*	0	89.14	3,733.89	-0.34
		12/29/05	--	89.34	*105.08*	0	89.34	3,733.69	-0.20
		04/10/06	--	89.63	*105.08*	0	89.63	3,733.40	-0.29
		07/06/06	--	90.08	*105.08*	0	90.08	3,732.95	-0.45
		01/26/07	--	91.02	*105.08*	0	91.02	3,732.01	-0.94
		03/27/07	--	91.18	*105.08*	0	91.18	3,731.85	-0.16
		07/13/07	--	91.68	*105.08*	0	91.68	3,731.35	-0.50
		09/12/07	--	92.02	*105.08*	0	92.02	3,731.01	-0.34
		12/31/07	--	92.25	*105.08*	0	92.25	3,730.78	-0.23
		03/26/08	--	92.43	105.08	0	92.43	3,730.60	-0.18
		06/13/08	--	92.64	*105.08*	0	92.64	3,730.39	-0.21
		12/29/08	--	93.60	*105.08*	0	93.60	3,729.43	-0.96
		03/17/09	--	93.84	*105.08*	0	93.84	3,729.19	-0.24
		06/16/09	--	93.92	105.04	0	93.92	3,729.11	-0.08
		01/13/10	--	94.80	105.30	0	94.80	3,728.23	-0.88
		08/11/10	--	95.67	105.04	0	95.67	3,727.36	-0.87
		02/23/11	--	95.99	105.05	0	95.99	3,727.04	-0.32
		07/12/11	--	96.59	105.06	0	96.59	3,726.44	-0.60
		01/31/12	--	97.54	105.05	0	97.54	3,725.49	-0.95
Note: Italicized values for total depth are estimated values									
MW-15	3,840.19	08/11/10	--	106.94	121.68	0	106.94	3,733.25	--
		02/23/11	--	107.01	121.67	0	107.01	3,733.18	-0.07
		07/12/11	--	108.32	121.62	0	108.32	3,731.87	-1.31
		01/30/12	--	108.54	121.62	0	108.54	3,731.65	-0.22
MW-16	3,838.20	08/11/10	--	106.18	119.61	0	106.18	3,732.02	--
		02/23/11	--	106.34	119.67	0	106.34	3,731.86	-0.16
		07/12/11	--	107.21	119.61	0	107.21	3,730.99	-0.87
		01/30/12	--	107.93	119.47	0	107.93	3,730.27	-0.72
MW-17	3,831.43	08/11/10	--	101.65	115.92	0	101.65	3,729.78	--
		02/23/11	--	101.71	115.69	0	101.71	3,729.72	-0.06
		07/12/11	--	102.41	115.55	0	102.41	3,729.02	-0.70
Note: Damaged Fall 2011; to be replaced Spring 2012									

Table 1. Monitor Well Water Level Elevation Measurements, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well Number	Elevation Top of Casing (TOC, feet)	Measure-ment Date	Depth to Product (feet)	Depth to Water Below TOC (feet)	Total Depth (feet)	Product Thickness (feet)	Corrected Depth to Water (feet)	Corrected Water Level Elev. (feet)	Change from previous reading (ft)
MW-18	3,825.05	08/11/10	--	108.54	119.36	0	108.54	3,716.51	--
		09/30/10	--	104.47	--	0	104.47	3,720.58	4.07
		02/23/11	--	100.02	119.38	0	100.02	3,725.03	4.45
		07/12/11	--	100.73	119.38	0	100.73	3,724.32	-0.71
		01/31/12	--	100.49	119.38	0	100.49	3,724.56	0.24
MW-19	3,823.97	08/11/10	--	102.35	113.60	0	102.35	3,721.62	--
		09/30/10	--	98.70	--	0	98.70	3,725.27	3.65
		02/23/11	--	98.32	113.57	0	98.32	3,725.65	0.38
		07/12/11	--	101.87	113.56	0	101.87	3,722.10	-3.55
		01/31/12	--	100.92	113.54	0	100.92	3,723.05	0.95
MW-20	3,824.58	08/11/10	--	97.75	111.82	0	97.75	3,726.83	--
		02/23/11	--	97.42	111.82	0	97.42	3,727.16	0.33
		07/12/11	--	98.50	111.74	0	98.50	3,726.08	-1.08
		01/31/12	--	99.07	111.74	0	99.07	3,725.51	-0.57
MW-21	3,820.26	08/11/10	--	94.06	108.31	0	94.06	3,726.20	--
		02/23/11	--	93.84	108.27	0	93.84	3,726.42	0.22
		07/12/11	--	94.85	108.23	0	94.85	3,725.41	-1.01
		01/31/12	--	95.72	108.18	0	95.72	3,724.54	-0.87
MW-22	3,821.82	08/11/10	--	95.62	110.80	0	95.62	3,726.20	--
		02/23/11	--	95.36	110.78	0	95.36	3,726.46	0.26
		07/12/11	--	96.26	110.74	0	96.26	3,725.56	-0.90
		01/31/12	--	97.56	110.72	0	97.56	3,724.26	-1.30
MW-23	3,825.58	08/11/10	--	100.49	115.10	0	100.49	3,725.09	--
		02/23/11	--	99.80	115.12	0	99.80	3,725.78	0.69
		07/12/11	--	101.29	115.10	0	101.29	3,724.29	-1.49
		02/01/12	--	102.04	115.07	0	102.04	3,723.54	-0.75
MW-24	3,830.50	08/11/10	--	104.04	118.14	0	104.04	3,726.46	--
		02/23/11	--	104.26	118.09	0	104.26	3,726.24	-0.22
		07/12/11	--	105.29	118.04	0	105.29	3,725.21	-1.03
		02/01/12	--	106.65	119.10	0	106.65	3,723.85	-1.36
MW-25	3,830.77	08/11/10	--	106.46	121.66	0	106.46	3,724.31	--
		02/23/11	--	105.72	121.60	0	105.72	3,725.05	0.74
		07/12/11	--	107.24	121.49	0	107.24	3,723.53	-1.52
		02/01/12	--	108.53	121.42	0	108.53	3,722.24	-1.29
MW-26	3,833.18	08/11/10	--	106.22	121.33	0	106.22	3,726.96	--
		02/23/11	--	108.44	121.31	0	108.44	3,724.74	-2.22
		07/12/11	--	109.58	121.26	0	109.58	3,723.60	-1.14
		02/01/12	--	110.38	121.21	0	110.38	3,722.80	-0.80
MW-27	3,837.27	08/11/10	--	109.00	124.07	0	109.00	3,728.27	--
		02/23/11	--	109.58	123.96	0	109.58	3,727.69	-0.58
		07/12/11	--	110.59	124.00	0	110.59	3,726.68	-1.01
		02/01/12	--	111.37	123.97	0	111.37	3,725.90	-0.78
MW-28	3,833.44	08/11/10	--	103.72	118.42	0	103.72	3,729.72	--
		02/23/11	--	104.03	118.42	0	104.03	3,729.41	-0.31
		07/12/11	--	105.07	118.35	0	105.07	3,728.37	-1.04
		01/30/12	--	105.84	118.38	0	105.84	3,727.60	-0.77

Table 1. Monitor Well Water Level Elevation Measurements, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well Number	Elevation Top of Casing (TOC, feet)	Measure-ment Date	Depth to Product (feet)	Depth to Water Below TOC (feet)	Total Depth (feet)	Product Thickness (feet)	Corrected Depth to Water (feet)	Corrected Water Level Elev. (feet)	Change from previous reading (ft)
MW-29	3,835.55	08/11/10	--	105.80	120.42	0	105.80	3,729.75	--
		02/23/11	--	105.97	120.35	0	105.97	3,729.58	-0.17
		07/12/11	--	107.08	120.33	0	107.08	3,728.47	-1.11
		01/30/12	--	107.69	120.33	0	107.69	3,727.86	-0.61
RW-1	3,838.48	04/30/09	--	106.45	136.09	0	106.45	3,732.03	--
		06/10/09	--	106.59	--	0	106.59	3,731.89	-0.14
		06/19/09	--	106.61	129.62	0	106.61	3,731.87	-0.02
		07/02/09	--	106.82	129.25	0	106.82	3,731.66	-0.21
		07/24/09	--	106.92	129.31	0	106.92	3,731.56	-0.10
		09/24/09	--	107.42	129.73	0	107.42	3,731.06	-0.50
		10/27/09	--	107.53	129.25	0	107.53	3,730.95	-0.11
		01/13/10	--	107.67	129.29	0	107.67	3,730.81	-0.14
		02/02/10	--	107.69	--	0	107.69	3,730.79	-0.02
		04/01/10	--	107.60	--	0	107.60	3,730.88	0.09
		08/11/10	--	108.18	129.29	0	108.18	3,730.30	-0.58
		02/23/11	--	108.22	129.31	0	108.22	3,730.26	-0.04
		07/12/11	--	109.09	129.27	0	109.09	3,729.39	-0.87
		02/02/12	--	109.81	129.34	0	109.81	3,728.67	-0.72
Note: Replacement well; drilled April 2009.									
Notes:									
1. Monitoring wells MW-1 through MW-7 installed September 1995; plugged and redrilled April 2009.									
2. Monitoring wells MW-8 through MW-10 installed March and April 1996; plugged and redrilled April 2009.									
3. Monitoring wells MW-6R, MW-11, MW-12 installed April and May 2002; MW-6R plugged April 2009.									
4. Monitoring wells MW-13 and MW-14 installed January 2004.									
5. Elevation survey of new and existing wells August 7, 2009. Earlier water level information corrected to current survey.									
6. Monitoring wells MW-15 through MW-29 installed May-June 2010.									
7. Elevation survey of wells MW-15 through MW-29 July 13, 2010.									

Table 2. Organic Constituent Concentrations in Groundwater, Navajo Refining Company, Lea Refinery, Lovington, NM

		WQCC Volatiles					WQCC Semi-Volatiles				
Monitor Well	Sample Date	Benzene (mg/L)	Ethyl-benzene (mg/L)	Toluene (mg/L)	Total Xylenes (mg/L)	Total Naphthalene (8260, mg/L)	Total Naphthalenes (8270, mg/L)	Naphthalene (8270, mg/L)	1-Methylnaphthalene (mg/L)	2-Methylnaphthalene (mg/L)	Total Phenols (mg/L)
NM WQCC Groundwater Standards:		**0.010**	**0.75**	**0.75**	**0.62**	**0.03**	**0.03**	--	--	--	**0.005**
MW-1	06/19/09	<0.0050	0.012	<0.0050	0.031	<0.0050					
	01/19/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050			<0.00020	<0.00020	<0.00020
	08/18/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	03/01/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/20/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/02/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-2	06/22/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/19/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/16/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	03/03/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/14/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/30/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-3	06/16/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/14/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
(duplicate)	01/14/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/19/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/24/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/15/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/30/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020

Table 2. Organic Constituent Concentrations in Groundwater, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well	Sample Date	Benzene (mg/L)	Ethyl-benzene (mg/L)	Toluene (mg/L)	Total Xylenes (mg/L)	Total Naphthalene (8260, mg/L)	Total Naphthalenes (8270, mg/L)	Naphthalene (8270, mg/L)	1-Methylnaphthalene (mg/L)	2-Methylnaphthalene (mg/L)	Total Phenols (mg/L)
NM WQCC Groundwater Standards:		0.010	0.75	0.75	0.62	0.03	0.03	- -	- -	- -	0.005
MW-4	06/16/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/13/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/19/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	02/28/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/15/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	0.00044	0.00044	- -	<0.00020	<0.00020
	01/30/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	- -	<0.00020	<0.00020
MW-5	06/16/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/18/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/20/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	02/28/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/19/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	- -	<0.00020	<0.00020
	01/31/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	- -	<0.00020	<0.00020
(duplicate)	01/31/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	- -	<0.00020	<0.00020
MW-6	06/18/09	<0.0050	<0.0050	<0.0050	<0.015	0.0075					
(duplicate)	06/18/09	<0.0050	<0.0050	<0.0050	<0.015	0.0074					
	02/02/10	<0.0050	0.013	<0.0050	<0.015	0.0099					
	08/19/10	<0.0050	0.015	<0.0050	<0.015	<0.0050		0.0017		0.0017	<0.0010
	03/01/11	<0.0050	0.018	<0.0050	<0.015	0.013	<0.00020	0.0062	<0.00020	0.0032	0.0255
	07/20/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	0.00080	0.00080	- -	<0.00020	<0.00020
	02/02/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	- -	<0.00020	<0.00020

Table 2. Organic Constituent Concentrations in Groundwater, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well	Sample Date	Benzene (mg/L)	Ethyl-benzene (mg/L)	Toluene (mg/L)	Total Xylenes (mg/L)	Total Naphthalene (8260, mg/L)	Total Naphthalenes (8270, mg/L)	Naphthalene (8270, mg/L)	1-Methylnaphthalene (mg/L)	2-Methylnaphthalene (mg/L)	Total Phenols (mg/L)
NM WQCC Groundwater Standards:		**0.010**	**0.75**	**0.75**	**0.62**	**0.03**	**0.03**	--	--	--	**0.005**
MW-7	06/19/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/02/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/18/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	03/01/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/20/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/02/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-8	06/18/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/18/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/18/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/25/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/19/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/01/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-9	06/16/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/14/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/19/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	03/01/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/15/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/31/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020

Table 2. Organic Constituent Concentrations in Groundwater, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well	Sample Date	Benzene (mg/L)	Ethyl-benzene (mg/L)	Toluene (mg/L)	Total Xylenes (mg/L)	Total Naphthalene (8260, mg/L)	Total Naphthalenes (8270, mg/L)	Naphthalene (8270, mg/L)	1-Methylnaphthalene (mg/L)	2-Methylnaphthalene (mg/L)	Total Phenols (mg/L)
NM WQCC Groundwater Standards:		**0.010**	**0.75**	**0.75**	**0.62**	**0.03**	**0.03**	--	--	--	**0.005**
MW-10	06/16/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/13/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/19/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050				<0.00020	<0.00020
	03/03/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	0.00028	0.00028	<0.00020	<0.00020	<0.00020
	07/15/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/31/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-11	06/18/09	**0.10**	<0.0050	<0.0050	<0.015	<0.0050					
	01/18/10	**0.20 E**	<0.0050	<0.0050	<0.015	<0.0050					
	08/18/10	**0.078**	0.021	<0.0050	<0.015	<0.0050	0.00036	0.00036			0.00122
	02/25/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/19/11	**1.2**	<0.0050	<0.0050	<0.015	<0.0050	0.00036	0.00036	--	<0.00020	0.00089
	02/01/12	**7.8**	0.051	<0.0050	0.20	**0.096**	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-12	06/16/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/18/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/20/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	02/25/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/19/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/01/12	**Damaged casing; no sample taken. To be replaced Spring 2012**									

Table 2. Organic Constituent Concentrations in Groundwater, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well	Sample Date	Benzene (mg/L)	Ethyl-benzene (mg/L)	Toluene (mg/L)	Total Xylenes (mg/L)	Total Naphthalene (8260, mg/L)	Total Naphthalenes (8270, mg/L)	Naphthalene (8270, mg/L)	1-Methylnaphthalene (mg/L)	2-Methylnaphthalene (mg/L)	Total Phenols (mg/L)
NM WQCC Groundwater Standards:		**0.010**	**0.75**	**0.75**	**0.62**	**0.03**	**0.03**	--	--	--	**0.005**
MW-13	06/16/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/18/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/18/10	**0.016**	<0.0050	<0.0050	<0.015	<0.0050					
	02/25/11	0.0057	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	0.00091
	07/19/11	0.0063	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/01/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	0.0014
MW-14	06/16/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/18/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/20/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	02/25/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/18/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/31/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-15	08/20/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	02/24/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/14/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/30/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-16	08/20/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	02/24/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/15/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	0.00030	0.00030	--	<0.00020	<0.00020
(duplicate)	07/15/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/30/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020

Table 2. Organic Constituent Concentrations in Groundwater, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well	Sample Date	Benzene (mg/L)	Ethyl-benzene (mg/L)	Toluene (mg/L)	Total Xylenes (mg/L)	Total Naphthalene (8260, mg/L)	Total Naphthalenes (8270, mg/L)	Naphthalene (8270, mg/L)	1-Methylnaphthalene (mg/L)	2-Methylnaphthalene (mg/L)	Total Phenols (mg/L)
NM WQCC Groundwater Standards:		**0.010**	**0.75**	**0.75**	**0.62**	**0.03**	**0.03**	--	--	--	**0.005**
MW-17	08/20/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	02/24/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/18/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	--	**Damaged Fall 2011; to be replaced Spring 2012**									
MW-18	08/23/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/24/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/18/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/31/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	0.00021	0.00021	--	<0.00020	<0.00020
MW-19	08/23/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/24/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/18/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/31/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-20	08/23/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/25/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/18/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/31/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-21	08/23/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/28/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	02/28/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/19/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/31/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020

Table 2. Organic Constituent Concentrations in Groundwater, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well	Sample Date	Benzene (mg/L)	Ethyl-benzene (mg/L)	Toluene (mg/L)	Total Xylenes (mg/L)	Total Naphthalene (8260, mg/L)	Total Naphthalenes (8270, mg/L)	Naphthalene (8270, mg/L)	1-Methylnaphthalene (mg/L)	2-Methylnaphthalene (mg/L)	Total Phenols (mg/L)
NM WQCC Groundwater Standards:		**0.010**	**0.75**	**0.75**	**0.62**	**0.03**	**0.03**	**--**	**--**	**--**	**0.005**
MW-22	08/23/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/28/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/19/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/31/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-23	08/23/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/28/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/19/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/01/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-24	08/24/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/28/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/14/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/01/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-25	08/23/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/28/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/18/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/01/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	0.00030

Table 2. Organic Constituent Concentrations in Groundwater, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well	Sample Date	Benzene (mg/L)	Ethyl-benzene (mg/L)	Toluene (mg/L)	Total Xylenes (mg/L)	Total Naphthalene (8260, mg/L)	Total Naphthalenes (8270, mg/L)	Naphthalene (8270, mg/L)	1-Methylnaphthalene (mg/L)	2-Methylnaphthalene (mg/L)	Total Phenols (mg/L)
NM WQCC Groundwater Standards:		**0.010**	**0.75**	**0.75**	**0.62**	**0.03**	**0.03**	--	--	--	**0.005**
MW-26	08/24/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/28/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/14/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/01/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-27	08/18/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/25/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	0.00099
	07/20/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	0.00034
	02/01/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-28	08/28/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/23/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/14/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/30/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
MW-29	08/24/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
(Dupl #1)	08/24/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/28/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/14/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	01/30/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	0.00050	0.00050	--	<0.00020	<0.00020

Table 2. Organic Constituent Concentrations in Groundwater, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well	Sample Date	Benzene (mg/L)	Ethyl-benzene (mg/L)	Toluene (mg/L)	Total Xylenes (mg/L)	Total Naphthalene (8260, mg/L)	Total Naphthalenes (8270, mg/L)	Naphthalene (8270, mg/L)	1-Methylnaphthalene (mg/L)	2-Methylnaphthalene (mg/L)	Total Phenols (mg/L)
NM WQCC Groundwater Standards:		**0.010**	**0.75**	**0.75**	**0.62**	**0.03**	**0.03**	--	--	--	**0.005**
RW-1	06/19/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	02/02/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/19/10	<0.0050	<0.0050	<0.0050	0.015	<0.0050					
	03/01/11	<0.0050	<0.0050	<0.0050	0.0054	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/20/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/02/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
North Well	06/18/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/14/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/24/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	03/03/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/20/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/02/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
South Well	06/22/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/14/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/24/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	03/03/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/20/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/02/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020

Table 2. Organic Constituent Concentrations in Groundwater, Navajo Refining Company, Lea Refinery, Lovington, NM

Monitor Well	Sample Date	Benzene (mg/L)	Ethyl-benzene (mg/L)	Toluene (mg/L)	Total Xylenes (mg/L)	Total Naphthalene (8260, mg/L)	Total Naphthalenes (8270, mg/L)	Naphthalene (8270, mg/L)	1-Methylnaphthalene (mg/L)	2-Methylnaphthalene (mg/L)	Total Phenols (mg/L)
NM WQCC Groundwater Standards:		**0.010**	**0.75**	**0.75**	**0.62**	**0.03**	**0.03**	--	--	--	**0.005**
East Well	06/18/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	01/14/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	08/25/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
	03/03/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	07/20/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
	02/02/12	<0.0050	<0.0050	<0.0050	<0.015	<0.0050	<0.00020	<0.00020	--	<0.00020	<0.00020
Trip Blanks	6, 06/09	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
Trip Blanks	8, 01-02/10	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
Trip Blanks	4, 02/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
Trip Blanks	6, 07/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
Trip Blanks	3, 02/11	<0.0050	<0.0050	<0.0050	<0.015	<0.0050					
NM WQCC Groundwater Standards (mg/L):		**0.010**	**0.75**	**0.75**	**0.62**	**0.03**	**0.03**	--	--	--	**0.005**
Notes:											
Yellow, constituent detected. **Bold,** exceeds NM WQCC standard											
E - Value above quantitation range											
Other Volatiles - See analytical results, Volume II											
Other Semi-volatiles - Bis(2-ethylhexyl)phthalate seen in most every sample; for others see analytical results, Volume II											
Analyses performed by ALS Laboratory Group, Houston, Texas											

Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

Monitor Well	Sample Date	Chloride (mg/L)	Fluoride (mg/L)	Nitrate-Nitrite (as N, mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Aluminum (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cobalt (mg/L)	Copper (mg/L)
NM WQCC Groundwater Standards:		**250**	**1.6**	**10**	**600**	**1,000**	**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**0.05**	**0.05**	**1.0**
MW-1	06/19/09	131	0.827	3.75	123	694	<0.0100	0.00914	0.147	0.175	<0.00200	<0.00500	<0.00500	<0.00500
	01/19/10	**266**	0.249	5.84	145	**1,240**	0.0202	0.00634	0.164	0.236	<0.00200	<0.00500	<0.00500	<0.00500
	08/18/10	126	0.623	2.59	111	694	<0.0100	0.00841	0.117	0.182	<0.00200	<0.00500	<0.00500	<0.00500
	03/01/11	100	0.502	1.84	83.4	580	<0.0100	0.00821	0.0984	0.189	<0.00200	<0.00500	<0.00500	<0.00500
	07/20/12	34.7	0.623	1.14	73.9	492	<0.0100	0.00808	0.0903	0.168	<0.00200	<0.00500	<0.00500	<0.00500
	02/02/12	29.9	0.773	<1.00	65.4	392	<0.0100	0.00782	0.0843	0.164	<0.00200	<0.00500	<0.00500	<0.00500
MW-2	06/22/09	**252**	0.765	2.69	66.8	988	0.0657	0.0386	0.0803	0.190	<0.00200	<0.00500	<0.00500	0.00621
	01/19/10	246	0.672	3.39	55.1	966	<0.0100	<0.00500	0.00500	0.191	<0.00200	<0.00500	<0.00500	<0.00500
	08/16/10	**276**	0.824	3.23	55.9	**1,180**	0.1367	<0.00500	0.193	0.155	<0.00200	<0.00500	<0.00500	<0.00500
	03/03/11	221	0.763	3.49	57.6	**1,010**	<0.0100	<0.00500	0.176	0.171	<0.00200	<0.00500	<0.00500	<0.00500
	07/14/11	190	0.647	2.98	58.4	966	<0.0100	<0.00500	0.160	0.192	<0.00200	<0.00500	<0.00500	<0.00500
	01/30/12	214	0.784	3.43	75.1	**1,230**	<0.0100	<0.00500	0.13	0.164	<0.00200	<0.00500	<0.00500	<0.00500
MW-3	06/16/09	29.1	**3.38**	2.19	64.6	504	0.308	0.00815	0.115	0.160	<0.00200	0.00709	<0.00500	<0.00500
	01/14/10	49.9	**3.18**	2.11	76.5	540	0.144	0.00703	0.119	0.148	<0.00200	0.00977	<0.00500	0.121
(duplicate)	01/14/10	49.8	**3.18**	2.11	75.0	552	0.142	0.00798	0.125	0.167	<0.00200	0.0105	<0.00500	0.148
	08/19/10	72.7	**2.99**	1.52	77.7	518	0.0767	0.00935	0.127	0.151	<0.00200	<0.00500	<0.00500	<0.00500
	02/24/11	88.2	**2.58**	3.02	80.5	566	<0.0100	0.00892	0.124	0.178	<0.00200	<0.00500	<0.00500	<0.00500
	07/15/11	67.3	**2.37**	2.59	74.7	568	<0.0100	0.0125	0.113	0.202	<0.00200	<0.00500	<0.00500	<0.00500
	01/30/12	65.6	**2.94**	2.37	86.3	472	<0.0100	0.0117	0.0831	0.168	<0.00200	<0.00500	<0.00500	<0.00500
MW-4	06/16/09	28.9	0.841	1.84	61.5	422	0.180	<0.00500	0.174	0.160	<0.00200	0.00534	<0.00500	<0.00500
	01/13/10	29.3	1.10	1.67	66.7	416	0.0345	<0.00500	0.0932	0.177	<0.00200	<0.00500	<0.00500	<0.00500
	08/19/10	26.1	1.10	1.10	65.8	324	0.0607	<0.00500	0.0862	0.136	<0.00200	<0.00500	<0.00500	<0.00500
	02/28/11	27.1	1.02	1.91	64.4	378	0.0131	<0.00500	0.0951	0.163	<0.00200	<0.00500	<0.00500	<0.00500
	07/15/11	25.8	1.12	1.57	63.6	422	0.144	<0.00500	0.141	0.172	<0.00200	0.00619	<0.00500	<0.00500
	01/30/12	30.0	1.08	1.71	73.4	388	0.0119	<0.00500	0.0796	0.150	<0.00200	<0.00500	<0.00500	<0.00500
MW-5	06/16/09	186	1.39	3.31	131	952	0.796	0.0233	0.0639	0.116	<0.00200	<0.00500	<0.00500	<0.00500
	01/18/10	26.4	0.781	4.91	80.6	508	<0.0100	<0.00500	0.0966	0.135	<0.00200	<0.00500	<0.00500	<0.00500
	08/20/10	18.5	1.13	3.43	77.7	440	0.0814	<0.00500	0.0967	0.0986	<0.00200	<0.00500	<0.00500	<0.00500
	02/28/11	29.8	1.03	2.91	70.5	570	0.123	<0.00500	0.100	0.085	<0.00200	<0.00500	<0.00500	<0.00500
	07/19/11	20.9	0.858	2.72	59.0	524	<0.0100	<0.00500	0.0968	0.087	<0.00200	<0.00500	<0.00500	<0.00500
	01/31/12	26.9	1.04	2.49	61.2	504	<0.0100	<0.00500	0.0972	0.056	<0.00200	<0.00500	<0.00500	<0.00500
(duplicate)	01/31/12	27.1	1.05	2.54	62.0	436	<0.0100	<0.00500	0.0947	0.073	<0.00200	<0.00500	<0.00500	<0.00500

Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

Monitor Well	Sample Date	Chloride (mg/L)	Fluoride (mg/L)	Nitrate-Nitrite (as N, mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Aluminum (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cobalt (mg/L)	Copper (mg/L)
NM WQCC Groundwater Standards:		250	1.6	10	600	1,000	5.0	0.1	1.0	0.75	0.01	0.05	0.05	1.0
MW-6	06/18/09	188	0.113	0.678	101	844	<0.0100	0.0201	0.186	0.175	<0.00200	<0.00500	<0.00500	<0.00500
(duplicate)	06/18/09	168	<0.100	0.682	90.4	812	<0.0100	0.0221	0.200	0.192	<0.00200	<0.00500	<0.00500	<0.00500
	02/02/10	**334**	<0.100	0.822	90.2	**1,400**	<0.0200	0.0250	0.499	0.234	<0.00200	<0.00500	<0.00500	<0.00500
	08/19/10	**285**	<0.100	<1.00	111	**1,350**	0.0152	0.0456	0.376	0.244	<0.00200	<0.00500	<0.00500	<0.00500
	03/01/11	**282**	<0.100	0.750	80.7	**1,340**	<0.0100	0.0390	0.404	0.271	<0.00200	<0.00500	<0.00500	<0.00500
	07/20/11	174	<0.500	<0.500	114	970	<0.0100	0.0336	0.220	0.223	<0.00200	0.00972	<0.00500	<0.00500
	02/02/12	58.4	0.313	<1.00	88.0	398	<0.0100	<0.00500	0.0827	0.190	<0.00200	<0.00500	<0.00500	<0.00500
MW-7	06/19/09	30.6	1.12	1.66	67.2	384	<0.0100	0.00923	0.169	0.161	<0.00200	<0.00500	<0.00500	<0.00500
	02/02/10	28.0	0.854	1.72	62.2	350	<0.0200	0.00869	0.199	0.169	<0.00200	<0.00500	<0.00500	<0.00500
	08/18/10	27.2	0.570	1.12	60.2	370	0.0223	0.00532	0.252	0.161	<0.00200	<0.00500	<0.00500	<0.00500
	03/01/11	26.5	0.599	1.91	58.2	376	<0.0100	0.00525	0.237	0.161	<0.00200	<0.00500	<0.00500	<0.00500
	07/20/11	23.3	0.626	1.35	56.8	396	<0.0100	0.00669	0.246	0.164	<0.00200	<0.00500	<0.00500	<0.00500
	02/02/12	25.5	0.633	1.66	61.5	356	<0.0100	<0.00500	0.229	0.166	<0.00200	<0.00500	<0.00500	<0.00500
MW-8	06/18/09	219	0.730	3.46	73.3	798	<0.0100	0.00501	0.181	0.228	<0.00200	<0.00500	<0.00500	<0.00500
	01/18/10	151	0.493	3.80	67.6	742	<0.0100	0.00726	0.157	0.215	<0.00200	<0.00500	<0.00500	<0.00500
	08/18/10	**279**	0.560	7.08	65.3	**1,260**	0.0377	0.00676	0.204	0.170	<0.00200	<0.00500	<0.00500	<0.00500
	02/25/11	144	0.820	<0.500	87.5	694	<0.0100	<0.00500	0.106	0.175	<0.00200	<0.00500	<0.00500	<0.00500
	07/19/11	**313**	0.522	4.49	72.4	**1,460**	<0.0100	<0.00500	0.229	0.278	<0.00200	<0.00500	<0.00500	<0.00500
	02/01/12	**376**	0.498	8.21	102	**1,530**	<0.0100	<0.00500	0.221	0.219	<0.00200	<0.00500	<0.00500	<0.00500
MW-9	06/16/09	23.0	**1.69**	0.748	73.2	380	0.0468	0.0373	0.0911	0.122	<0.00200	<0.00500	<0.00500	<0.00500
	01/14/10	23.9	**1.78**	1.72	74.4	450	0.0164	0.0351	0.0676	0.139	<0.00200	<0.00500	<0.00500	<0.00500
	08/19/10	21.8	**1.64**	1.32	75.2	412	0.115	0.0358	0.0649	0.121	<0.00200	<0.00500	<0.00500	<0.00500
	03/01/11	24.1	**1.63**	2.01	74.6	414	0.0112	0.0382	0.0586	0.131	<0.00200	<0.00500	<0.00500	<0.00500
	7/7/15/11	24.9	**1.65**	1.78	70.2	434	0.0371	0.0374	0.0647	0.166	<0.00200	0.00741	<0.00500	<0.00500
	01/31/12	31.5	**2.22**	1.43	80.5	484	<0.0100	0.0341	0.0653	0.108	<0.00200	<0.00500	<0.00500	<0.00500
MW-10	06/16/09	32.2	0.878	1.83	76.5	378	<0.0200	<0.00500	0.113	0.138	<0.00200	<0.00500	<0.00500	<0.00500
	01/13/10	33.4	1.05	1.84	77.9	436	<0.0100	<0.00500	0.0815	0.162	<0.00200	<0.00500	<0.00500	<0.00500
	08/19/10	31.7	1.07	1.91	79.8	508	0.0556	<0.00500	0.0798	0.129	<0.00200	<0.00500	<0.00500	<0.00500
	03/03/11	32.8	0.945	2.06	79.1	422	<0.0100	<0.00500	0.0772	0.159	<0.00200	<0.00500	<0.00500	<0.00500
	07/15/11	30.7	1.06	1.68	75.7	470	0.0318	<0.00500	0.0855	0.177	<0.00200	<0.00500	<0.00500	<0.00500
	01/31/12	42.9	1.00	1.85	87.4	444	<0.0100	<0.00500	0.0865	0.109	<0.00200	<0.00500	<0.00500	<0.00500

Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

Monitor Well	Sample Date	Chloride (mg/L)	Fluoride (mg/L)	Nitrate-Nitrite (as N, mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Aluminum (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cobalt (mg/L)	Copper (mg/L)
NM WQCC Groundwater Standards:		250	1.6	10	600	1,000	5.0	0.1	1.0	0.75	0.01	0.05	0.05	1.0
MW-11	06/18/09	204	0.579	1.23	43.1	994	<0.0100	<0.00500	0.194	0.199	<0.00200	<0.00500	<0.00500	<0.00500
	01/18/10	164	0.527	1.37	71.4	842	<0.0100	<0.00500	0.147	0.238	<0.00200	<0.00500	<0.00500	<0.00500
	08/18/10	146	0.616	2.38	50.6	802	0.0125	<0.00500	0.471	0.255	<0.00200	<0.00500	<0.00500	<0.00500
	02/25/11	**415**	0.549	<0.500	82.3	**1,510**	<0.0100	<0.00500	0.241	0.244	<0.00200	<0.00500	<0.00500	<0.00500
	07/19/11	134	0.575	0.778	57.0	894	<0.0100	<0.00500	0.150	0.232	<0.00200	<0.00500	<0.00500	<0.00500
	02/01/12	175	0.749	<0.500	4.96	966	<0.0100	0.0176	**1.40**	0.288	<0.00200	<0.00500	<0.00500	<0.00500
MW-12	06/16/09	23.0	1.16	1.98	49.6	354	<0.0200	0.00516	0.0775	0.200	<0.00200	<0.00500	<0.00500	<0.00500
	01/18/10	26.1	1.05	2.31	49.8	398	<0.0100	<0.00500	0.0755	0.235	<0.00200	<0.00500	<0.00500	<0.00500
	08/20/10	25.8	1.22	2.00	50.3	340	0.115	0.00550	0.0756	0.176	<0.00200	<0.00500	<0.00500	<0.00500
	02/25/11	28.5	1.14	<0.500	50.8	402	<0.0100	0.00504	0.076	0.198	<0.00200	<0.00500	<0.00500	<0.00500
	07/19/11	26.8	0.856	2.91	51.2	410	<0.0100	<0.00500	0.0828	0.215	<0.00200	<0.00500	<0.00500	<0.00500
	02/01/12	**Damaged casing; no sample taken. To be replaced Spring 2012**												
MW-13	06/16/09	**425**	0.220	2.65	138	**1,790**	<0.0200	<0.00500	0.0692	0.253	<0.00200	<0.00500	0.0285	<0.00500
	01/18/10	**604**	0.170	1.08	79.8	**2,210**	<0.0100	<0.00500	0.111	0.231	<0.00200	0.00728	0.00624	<0.00500
	08/18/10	**390**	0.278	<1.00	144	**1,720**	0.0196	<0.00500	0.106	0.221	<0.00200	<0.00500	<0.00500	<0.00500
	02/25/11	**340**	0.281	<0.500	235	**1,540**	<0.0100	<0.00500	0.0692	0.242	<0.00200	<0.00500	<0.00500	<0.00500
	07/19/11	**351**	0.327	<0.500	244	**1,960**	<0.0100	<0.00500	0.0800	0.249	<0.00200	<0.00500	<0.00500	<0.00500
	02/01/12	**418**	0.322	<0.500	122	**1,590**	<0.0100	<0.00500	0.0752	0.228	<0.00200	<0.00500	0.00663	<0.00500
MW-14	06/16/09	93.0	0.851	5.16	60.9	540	<0.0200	<0.00500	0.0770	0.132	<0.00200	<0.00500	<0.00500	<0.00500
	01/18/10	103	0.810	6.03	59.0	598	<0.0100	<0.00500	<0.00500	<0.0200	<0.00200	<0.00500	<0.00500	<0.00500
	08/20/10	74.1	0.986	2.76	61.3	340	0.103	<0.00500	0.0774	0.131	<0.00200	0.0119	<0.00500	<0.00500
	02/25/11	58.2	0.918	2.32	58.7	440	0.0101	<0.00500	0.0778	0.151	<0.00200	<0.00500	<0.00500	<0.00500
	07/18/11	48.4	1.05	1.36	53.0	482	0.176	0.00615	0.110	0.156	<0.00200	**12.5**	0.122	0.218
	01/31/12	59.7	0.984	1.58	58.3	444	<0.0100	<0.00500	0.0802	0.129	<0.00200	<0.00500	<0.00500	<0.00500
MW-15	08/20/10	221	0.921	3.22	77.6	776	0.079	<0.00500	0.145	0.175	<0.00200	<0.00500	<0.00500	<0.00500
	02/24/11	190	0.885	4.28	67.0	738	<0.0100	<0.00500	0.127	0.165	<0.00200	0.0102	<0.00500	<0.00500
	07/14/11	236	0.701	4.18	60.9	940	<0.0100	<0.00500	0.173	0.201	<0.00200	0.0132	<0.00500	<0.00500
	01/30/12	**304**	0.840	4.09	78.6	**1,330**	<0.0100	<0.00500	0.180	0.178	<0.00200	0.00644	<0.00500	<0.00500
MW-16	08/20/10	25.3	0.930	1.13	73.7	406	0.0746	<0.00500	0.109	0.156	<0.00200	<0.00500	<0.00500	<0.00500
	02/24/11	28.1	0.928	2.36	73.7	412	<0.0100	<0.00500	0.107	0.162	<0.00200	<0.00500	<0.00500	<0.00500
	07/15/11	25.5	1.04	1.82	72.0	484	0.188	<0.00500	0.129	0.181	<0.00200	0.115	<0.00500	<0.00500
(duplicate)	07/15/11	21.0	0.733	1.98	54.1	476	0.0374	<0.00500	0.118	0.185	<0.00200	0.0251	<0.00500	<0.00500
	01/30/12	27.9	0.994	1.79	77.6	398	<0.0100	<0.00500	0.0964	0.166	<0.00200	<0.00500	<0.00500	<0.00500

Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

Monitor Well	Sample Date	Chloride (mg/L)	Fluoride (mg/L)	Nitrate-Nitrite (as N, mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Aluminum (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cobalt (mg/L)	Copper (mg/L)
NM WQCC Groundwater Standards:		**250**	**1.6**	**10**	**600**	**1,000**	**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**0.05**	**0.05**	**1.0**
MW-17	08/20/10	**426**	0.517	4.27	72.6	**1,650**	0.146	<0.00500	0.180	0.157	<0.00200	<0.00500	<0.00500	<0.00500
	02/24/11	**412**	0.435	5.33	80.0	**1,634**	<0.0100	<0.00500	0.152	0.162	<0.00200	<0.00500	<0.00500	<0.00500
	07/18/11	**336**	0.753	4.07	82.7	**1,850**	<0.0100	<0.00500	0.141	0.165	<0.00200	<0.00500	<0.00500	<0.00500
	--	**Damaged Fall 2011; to be replaced Spring 2012**												
MW-18	08/23/10	176	0.456	0.733	287	**1,080**	0.0787	<0.00500	0.0575	0.334	<0.00200	<0.00500	<0.00500	<0.00500
	02/24/11	**286**	0.514	4.14	298	**1,240**	0.0157	<0.00500	0.0766	0.330	<0.00200	0.0186	<0.00500	<0.00500
	07/18/11	218	0.800	5.74	234	**1,290**	0.0244	<0.00500	0.05636	0.396	<0.00200	0.0111	<0.00500	<0.00500
	01/31/12	106	0.722	3.89	94.3	584	0.0113	<0.00500	0.0645	0.133	<0.00200	<0.00500	<0.00500	<0.00500
MW-19	08/23/10	**469**	0.536	2.94	178	**1,650**	0.101	0.0476	0.229	<0.0200	<0.00200	<0.00500	<0.00500	<0.00500
	02/24/11	235	0.713	2.87	90.7	828	<0.0100	<0.00500	0.0764	0.180	<0.00200	<0.00500	<0.00500	<0.00500
	07/18/11	**688**	0.734	3.66	142	**2,880**	<0.0100	<0.00500	0.092	0.266	<0.00200	<0.00500	<0.00500	<0.00500
	01/31/12	**610**	0.568	4.12	121	**1,770**	<0.0100	<0.00500	0.0688	0.350	<0.00200	<0.00500	<0.00500	<0.00500
MW-20	08/23/10	169	0.570	1.74	65.1	868	0.0891	<0.00500	0.122	0.143	<0.00200	<0.00500	<0.00500	<0.00500
	02/25/11	187	0.603	2.58	66.3	840	<0.0100	<0.00500	0.120	0.150	<0.00200	<0.00500	<0.00500	<0.00500
	07/18/11	148	0.765	2.06	51.3	**1,020**	<0.0100	<0.00500	0.134	0.159	<0.00200	<0.00500	<0.00500	<0.00500
	01/31/12	174	0.641	2.51	61.4	726	<0.0100	<0.00500	0.114	0.149	<0.00200	<0.00500	<0.00500	<0.00500
MW-21	08/23/10	115	0.250	2.12	52.7	966	0.195	<0.00500	0.232	0.208	<0.00200	<0.00500	<0.00500	<0.00500
	02/28/11	182	0.257	3.02	56.7	**1,050**	<0.0100	<0.00500	0.258	0.257	<0.00200	0.00620	<0.00500	<0.00500
(duplicate)	02/28/11	183	0.249	2.99	56.3	**1,000**	<0.0100	<0.00500	0.256	0.252	<0.00200	<0.00500	<0.00500	<0.00500
	07/19/11	191	0.163	2.62	57.0	**1,250**	<0.0100	<0.00500	0.242	0.225	<0.00200	<0.00500	<0.00500	<0.00500
	01/31/12	200	0.229	2.84	64.7	**1,040**	<0.0100	<0.00500	0.245	0.216	<0.00200	<0.00500	<0.00500	<0.00500
MW-22	08/23/10	115	0.552	1.76	62.3	726	0.121	<0.00500	0.165	0.174	<0.00200	<0.00500	<0.00500	<0.00500
	02/28/11	117	0.587	2.36	68.6	678	<0.0100	<0.00500	0.146	0.173	<0.00200	<0.00500	<0.00500	<0.00500
	07/19/11	107	0.568	2.06	64.1	740	<0.0100	<0.00500	0.150	0.178	<0.00200	<0.00500	<0.00500	<0.00500
	01/31/12	141	0.570	2.26	74.3	766	<0.0100	<0.00500	0.151	0.141	<0.00200	<0.00500	<0.00500	<0.00500
MW-23	08/23/10	**645**	0.782	2.92	121	**2,260**	0.237	<0.00500	0.245	0.157	<0.00200	<0.00500	<0.00500	<0.00500
	02/28/11	**511**	0.676	3.47	81.9	**1,540**	<0.0100	<0.00500	0.164	0.151	<0.00200	<0.00500	<0.00500	<0.00500
	07/19/11	**712**	0.670	3.79	108	**3,090**	<0.0100	<0.00500	0.272	0.181	<0.00200	<0.00500	<0.00500	<0.00500
	02/01/12	**887**	0.697	4.07	85.4	**2,720**	0.0108	<0.00500	0.268	0.159	<0.00200	<0.00500	<0.00500	<0.00500

Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

Monitor Well	Sample Date	Chloride (mg/L)	Fluoride (mg/L)	Nitrate-Nitrite (as N, mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Aluminum (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cobalt (mg/L)	Copper (mg/L)
NM WQCC Groundwater Standards:		**250**	**1.6**	**10**	**600**	**1,000**	**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**0.05**	**0.05**	**1.0**
MW-24	08/24/10	34.6	**2.31**	2.40	53.9	422	0.187	<0.00500	0.0867	0.140	<0.00200	<0.00500	<0.00500	<0.00500
	02/28/11	39.6	**2.16**	2.94	55.3	414	<0.0100	<0.00500	0.0878	0.154	<0.00200	<0.00500	<0.00500	<0.00500
	07/14/11	43.1	1.55	2.38	48.1	504	<0.0100	<0.00500	0.0932	0.173	<0.00200	<0.00500	<0.00500	<0.00500
	02/01/12	50.6	**2.42**	2.32	62.3	418	<0.0100	<0.00500	0.0946	0.127	<0.00200	<0.00500	<0.00500	<0.00500
MW-25	08/23/10	178	0.871	2.42	182	946	0.244	<0.00500	0.246	0.174	<0.00200	0.0476	<0.00500	<0.00500
	02/28/11	**256**	0.729	2.83	93.9	998	<0.0100	<0.00500	0.205	0.198	<0.00200	**0.0537**	<0.00500	<0.00500
	07/18/11	77.8	1.12	3.64	96.2	634	0.0444	<0.00500	0.186	0.173	<0.00200	0.00732	<0.00500	<0.00500
	02/01/12	175	0.813	4.56	84.4	820	<0.0100	<0.00500	0.228	0.175	<0.00200	0.00744	<0.00500	<0.00500
MW-26	08/24/10	217	0.484	2.88	98.5	958	0.115	<0.00500	0.131	0.169	<0.00200	<0.00500	<0.00500	<0.00500
	02/28/11	202	0.517	3.86	125	940	<0.0100	<0.00500	0.110	0.187	<0.00200	<0.00500	<0.00500	<0.00500
	07/14/11	184	<0.500	3.95	128	**1,030**	<0.0100	<0.00500	0.0994	0.192	<0.00200	<0.00500	<0.00500	<0.00500
	02/01/12	196	0.568	3.68	131	952	<0.0100	<0.00500	0.0854	0.163	<0.00200	<0.00500	<0.00500	<0.00500
MW-27	08/18/10	115	0.644	5.10	118	752	0.218	<0.00500	0.100	0.152	<0.00200	<0.00500	<0.00500	<0.00500
	02/25/11	144	0.595	<0.500	78.5	746	<0.0100	<0.00500	0.0985	0.139	<0.00200	<0.00500	<0.00500	<0.00500
	07/20/11	150	0.510	1.69	73.2	812	0.0378	<0.00500	0.112	0.165	<0.00200	0.0353	<0.00500	<0.00500
	02/01/12	164	0.691	2.43	99.8	676	<0.0100	<0.00500	0.0902	0.126	<0.00200	<0.00500	<0.00500	<0.00500
MW-28	08/24/10	71.2	**1.66**	1.70	60.3	440	0.129	<0.00500	0.0846	0.153	<0.00200	<0.00500	<0.00500	<0.00500
	02/23/11	106	1.57	<0.500	67.4	540	<0.0100	<0.00500	0.0923	0.147	<0.00200	<0.00500	<0.00500	<0.00500
	07/14/11	106	1.28	2.40	67.8	732	<0.0100	<0.00500	0.103	0.172	<0.00200	<0.00500	<0.00500	<0.00500
	01/30/12	80.6	**1.68**	2.53	81.1	572	<0.0100	<0.00500	0.0746	0.152	<0.00200	<0.00500	<0.00500	<0.00500
MW-29	08/24/10	**456**	0.753	2.18	167	726	0.0261	<0.00500	0.0644	0.189	<0.00200	0.0317	<0.00500	<0.00500
Dupl. #1	08/24/10	132	0.741	2.15	100	742	<0.0100	<0.00500	0.0652	0.186	<0.00200	0.0321	<0.00500	<0.00500
	02/28/11	119	0.819	3.05	101	670	<0.0100	<0.00500	0.0630	0.195	<0.00200	**0.0694**	<0.00500	<0.00500
	07/14/11	135	0.707	2.61	71.6	798	<0.0100	<0.00500	0.0652	0.189	<0.00200	**0.162**	<0.00500	<0.00500
	01/30/12	152	0.769	3.22	96.3	898	<0.0100	<0.00500	0.0580	0.181	<0.00200	**0.106**	<0.00500	<0.00500
RW-1	06/19/09	34.8	1.21	--	70.8	398	<0.0100	0.010	0.160	0.161	<0.00200	<0.00500	<0.00500	<0.00500
	02/02/10	34.2	0.913	1.52	66.0	388	<0.0200	0.00857	0.190	0.166	<0.00200	<0.00500	<0.00500	<0.00500
	08/19/10	27.8	0.991	1.42	72.3	380	0.0202	0.0104	0.162	0.154	<0.00200	<0.00500	<0.00500	<0.00500
	03/01/11	28.9	1.03	1.74	74.3	380	<0.0100	0.0121	0.148	0.153	<0.00200	<0.00500	<0.00500	<0.00500
	07/20/11	26.4	0.883	1.36	72.5	484	<0.0100	0.0108	0.158	0.156	<0.00200	<0.00500	<0.00500	<0.00500
	02/02/12	29.6	1.11	1.44	79.9	384	<0.0100	0.0106	0.139	0.165	<0.00200	<0.00500	<0.00500	<0.00500

Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

Monitor Well	Sample Date	Chloride (mg/L)	Fluoride (mg/L)	Nitrate-Nitrite (as N, mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Aluminum (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cobalt (mg/L)	Copper (mg/L)
NM WQCC Groundwater Standards:		**250**	**1.6**	**10**	**600**	**1,000**	**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**0.05**	**0.05**	**1.0**
North Well	06/18/09	140	0.933	2.72	80.6	664	<0.0100	0.00536	0.0997	0.151	<0.00200	0.0104	<0.00500	<0.00500
	01/14/10	143	0.793	2.90	74.2	638	<0.0100	<0.00500	0.107	0.172	<0.00200	<0.00500	<0.00500	<0.00500
	08/24/10	127	0.932	1.81	80.4	594	<0.0100	0.00552	0.100	0.147	<0.00200	<0.00500	<0.00500	0.00856
	03/03/11	137	0.932	2.76	75.2	804	<0.0100	0.00503	0.0968	0.159	<0.00200	0.0199	<0.00500	<0.00500
	07/20/11	124	0.803	2.07	76.5	628	<0.0100	<0.00500	0.106	0.142	<0.00200	0.0140	<0.00500	<0.00500
	02/02/12	149	0.977	2.54	82.1	656	0.0126	<0.00500	0.0944	0.132	<0.00200	0.0145	<0.00500	<0.00500
South Well	06/22/09	**497**	0.665	3.02	106	**1,450**	<0.0100	<0.00500	0.154	0.189	<0.00200	<0.00500	<0.00500	<0.00500
	01/14/10	**498**	0.686	3.27	113	**1,520**	0.0176	<0.00500	0.138	0.229	<0.00200	<0.00500	<0.00500	<0.00500
	08/24/10	**477**	0.651	2.18	101	**1,760**	<0.0100	<0.00500	0.172	0.186	<0.00200	<0.00500	<0.00500	<0.00500
	03/03/11	**549**	0.647	3.24	122	**1,840**	<0.0100	<0.00500	0.147	0.261	<0.00200	<0.00500	<0.00500	<0.00500
	07/20/11	**420**	0.687	2.48	103	**1,600**	<0.0100	<0.00500	0.157	0.195	<0.00200	<0.00500	<0.00500	<0.00500
	02/12/12	**368**	0.756	3.02	89.0	**1,210**	<0.0100	<0.00500	0.117	0.165	<0.00200	<0.00500	<0.00500	<0.00500
East Well	06/18/09	107	0.980	2.59	84.0	554	0.0131	<0.00500	0.0820	0.143	<0.00200	<0.00500	<0.00500	<0.00500
	01/14/10	138	0.991	2.70	72.7	676	<0.0100	<0.00500	0.0941	0.154	<0.00200	0.0119	<0.00500	0.00953
	08/25/10	106	1.00	0.523	74.5	522	<0.0100	<0.00500	0.0873	0.136	<0.00200	0.0145	<0.00500	0.00745
	03/03/11	135	0.905	2.68	75.6	644	<0.0100	<0.00500	0.0970	0.152	<0.00200	0.0189	<0.00500	<0.00500
	07/20/11	124	0.810	1.83	73.8	596	<0.0100	<0.00500	0.104	0.142	<0.00200	0.0200	<0.00500	<0.00500
	02/02/12	150	0.967	2.56	81.4	664	0.0150	<0.00500	0.0993	0.145	<0.00200	0.0166	<0.00500	<0.00500
NM WQCC Groundwater Standards:		**250**	**1.6**	**10**	**600**	**1,000**	**5.0**	**0.1**	**1.0**	**0.750**	**0.01**	**0.05**	**0.05**	**1.0**

Notes:
Yellow and bold highlighted, exceeds NM WQCC standard
Samples field filtered except for Total Mercury
Uranium not analyzed June 2009 sample set
Anomalous results for chromium, iron, manganese and nickel, MW-14, 7/18/11. Likely lab error as not seen in earlier or later samples.
Analyses performed by ALS Laboratory Group, Houston, Texas
Complete analytical results shown in the Appendix

Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

Monitor Well	Sample Date	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Total Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Uranium (mg/L)	Zinc (mg/L)
NM WQCC Groundwater Standards:		**1.0**	**0.05**	**0.20**	**0.002**	**1.0**	**0.2**	**0.05**	**0.05**	**0.03**	**10.0**
MW-1	06/19/09	<0.200	<0.00500	**0.974**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	- -	0.0124
	01/19/10	<0.200	<0.00500	**2.72**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00615	0.00989
	08/18/10	<0.200	<0.00500	**1.62**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00538
	03/01/11	<0.200	<0.00500	**1.62**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00689
	07/20/12	<0.200	<0.00500	**0.485**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00832
	02/02/12	<0.200	<0.00500	**0.780**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00766
MW-2	06/22/09	<0.200	<0.00500	0.00583	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	- -	0.110
	01/19/10	<0.200	<0.00500	0.00538	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0166
	08/16/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0204
	03/03/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0117
	07/14/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0230
	01/30/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0255
MW-3	06/16/09	<0.200	<0.00500	<0.00500	<0.000200	0.0151	<0.00500	<0.00500	<0.00500	- -	<0.0100
	01/14/10	<0.200	<0.00500	0.00597	<0.000200	0.0200	0.00842	<0.00500	<0.00500	0.000625	0.0195
(duplicate)	01/14/10	<0.200	<0.00500	0.00699	<0.000200	0.0216	0.0096	<0.00500	<0.00500	0.000721	0.0230
	08/19/10	<0.200	<0.00500	<0.00500	<0.000200	0.00790	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	02/24/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0524
	07/15/11	<0.200	<0.00500	<0.00500	<0.000200	0.00510	<0.00500	<0.00500	<0.00500	<0.00500	0.0156
	01/30/12	<0.200	<0.00500	<0.00500	<0.000200	0.00621	<0.00500	<0.00500	<0.00500	<0.00500	0.00886
MW-4	06/16/09	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	- -	0.0120
	01/13/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00102	<0.00500
	08/19/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	02/28/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00533
	07/15/11	<0.200	<0.00500	0.0114	<0.000200	<0.00500	0.0103	<0.00500	<0.00500	<0.00500	0.0211
	01/30/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0147
MW-5	06/16/09	0.399	<0.00500	0.0067	<0.000200	0.0103	<0.00500	<0.00500	<0.00500	- -	<0.0100
	01/18/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	08/20/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	02/28/11	<0.200	<0.00500	0.0142	<0.000200	<0.00500	0.0112	<0.00500	<0.00500	<0.00500	0.0368
	07/19/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0309
	01/31/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00948
(duplicate)	01/31/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0119

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Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

Monitor Well	Sample Date	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Total Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Uranium (mg/L)	Zinc (mg/L)
NM WQCC Groundwater Standards:		1.0	0.05	0.20	0.002	1.0	0.2	0.05	0.05	0.03	10.0
MW-6	06/18/09	0.418	<0.00500	**2.86**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	--	0.00996
(duplicate)	06/18/09	0.219	<0.00500	**2.76**	<0.000200	<0.00500	0.00653	<0.00500	<0.00500	--	0.0141
	02/02/10	**2.08**	<0.00500	**4.51**	<0.000200	<0.00500	0.00634	<0.00500	<0.00500	0.0113	<0.00500
	08/19/10	**1.86**	<0.00500	**6.61**	<0.000200	<0.00500	0.00766	<0.00500	<0.00500	0.00785	<0.00500
	03/01/11	0.711	<0.00500	**5.58**	<0.000200	<0.00500	0.00896	<0.00500	<0.00500	0.00659	<0.00500
	07/20/11	**1.57**	<0.00500	**4.51**	<0.000200	<0.00500	0.00576	<0.00500	<0.00500	<0.00500	0.0176
	02/02/12	0.488	<0.00500	**1.25**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00599	0.00858
MW-7	06/19/09	<0.200	<0.00500	0.127	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	--	0.0137
	02/02/10	<0.200	<0.00500	0.125	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	08/18/10	<0.200	<0.00500	**0.343**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	03/01/11	<0.200	<0.00500	**0.441**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00593
	07/20/11	<0.200	<0.00500	**0.617**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	02/02/12	<0.200	<0.00500	**0.550**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00746
MW-8	06/18/09	<0.200	<0.00500	0.00919	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	--	0.0458
	01/18/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00545
	08/18/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00501	0.00760
	02/25/11	<0.200	<0.00500	**0.281**	<0.000200	<0.00500	0.00620	<0.00500	<0.00500	<0.00500	0.0316
	07/19/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00928	0.0213
	02/01/12	<0.200	<0.00500	0.00636	<0.000200	<0.00500	0.0119	<0.00500	<0.00500	0.00745	0.0339
MW-9	06/16/09	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	--	<0.0100
	01/14/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.000656	<0.00500
	08/19/10	<0.200	<0.00500	0.00961	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	03/01/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00662
	7/7/15/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	0.00511	<0.00500	<0.00500	<0.00500	0.00932
	01/31/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00529
MW-10	06/16/09	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	--	0.0127
	01/13/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.000911	0.0133
	08/19/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00569
	03/03/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0133
	07/15/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	01/31/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0252

Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

Monitor Well	Sample Date	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Total Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Uranium (mg/L)	Zinc (mg/L)
NM WQCC Groundwater Standards:		**1.0**	**0.05**	**0.20**	**0.002**	**1.0**	**0.2**	**0.05**	**0.05**	**0.03**	**10.0**
MW-11	06/18/09	0.571	<0.00500	**0.387**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	- -	0.0212
	01/18/10	<0.200	<0.00500	0.0559	<0.000200	<0.00500	0.0126	<0.00500	<0.00500	0.00635	<0.00500
	08/18/10	0.347	<0.00500	**0.571**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00718	<0.00500
	02/25/11	<0.200	<0.00500	0.0101	<0.000200	<0.00500	0.00856	<0.00500	<0.00500	0.00878	0.0982
	07/19/11	<0.200	<0.00500	0.0301	<0.000200	<0.00500	0.00846	<0.00500	<0.00500	0.00616	0.0265
	02/01/12	**1.77**	<0.00500	**1.05**	<0.000200	<0.00500	0.0169	<0.00500	<0.00500	0.0138	0.0189
MW-12	06/16/09	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	- - -	<0.0100
	01/18/10	<0.200	<0.00500	0.0219	<0.000200	<0.00500	0.0182	<0.00500	<0.00500	<0.00500	<0.00500
	08/20/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	02/25/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0185
	07/19/11	<0.200	<0.00500	0.00976	<0.000200	0.00575	0.00684	<0.00500	<0.00500	<0.00500	<0.00500
	02/01/12	**Damaged casing; no sample taken. To be replaced Spring 2012**									
MW-13	06/16/09	<0.200	<0.00500	0.0176	<0.000200	<0.00500	0.0126	<0.00500	<0.00500	- -	0.0269
	01/18/10	<0.200	<0.00500	0.0591	<0.000200	<0.00500	0.0110	<0.00500	<0.00500	0.0119	0.00769
	08/18/10	<0.200	<0.00500	**0.256**	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.0128	0.00618
	02/25/11	<0.200	<0.00500	**0.225**	<0.000200	<0.00500	0.0144	<0.00500	<0.00500	0.0170	0.0744
	07/19/11	<0.200	<0.00500	**0.302**	<0.000200	<0.00500	0.0121	<0.00500	<0.00500	0.0188	0.00785
	02/01/12	<0.200	<0.00500	**0.341**	<0.000200	<0.00500	0.0136	<0.00500	<0.00500	0.0128	0.0553
MW-14	06/16/09	<0.200	<0.00500	0.0199	<0.000200	0.0215	<0.00501	<0.00500	<0.00500	- - -	0.0255
	01/18/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	08/20/10	<0.200	<0.00500	<0.00500	<0.000200	0.00964	0.0480	<0.00500	<0.00500	0.00527	<0.00500
	02/25/11	<0.200	<0.00500	0.0234	<0.000200	0.00903	0.0138	<0.00500	<0.00500	0.00541	0.0532
	07/18/11	**54.9**	<0.00500	**1.45**	<0.000200	0.0860	**6.81**	<0.00500	<0.00500	0.00544	0.0446
	01/31/12	<0.200	<0.00500	0.0276	<0.000200	0.00608	0.0186	<0.00500	<0.00500	<0.00500	0.0287
MW-15	08/20/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0198
	02/24/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0385
	07/14/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	0.00657	<0.00500	<0.00500	<0.00500	0.0122
	01/30/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00967
MW-16	08/20/10	<0.200	<0.00500	0.00554	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0145
	02/24/11	<0.200	<0.00500	0.00671	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0248
	07/15/11	0.613	<0.00500	0.0164	<0.000200	<0.00500	0.0591	<0.00500	<0.00500	<0.00500	0.0176
(duplicate)	07/15/11	0.241	<0.00500	0.00820	<0.000200	<0.00500	0.0234	<0.00500	<0.00500	<0.00500	0.0166
	01/30/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00899

Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

Monitor Well	Sample Date	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Total Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Uranium (mg/L)	Zinc (mg/L)
NM WQCC Groundwater Standards:		**1.0**	**0.05**	**0.20**	**0.002**	**1.0**	**0.2**	**0.05**	**0.05**	**0.03**	**10.0**
MW-17	08/20/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0142
	02/24/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0478
	07/18/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0126
	--	**Damaged Fall 2011; to be replaced Spring 2012**									
MW-18	08/23/10	<0.200	<0.00500	**0.314**	<0.000200	0.00561	0.0298	0.00548	<0.00500	0.0123	0.0772
	02/24/11	<0.200	<0.00500	0.00536	<0.000200	<0.00500	0.0144	0.00501	<0.00500	0.00883	0.0439
	07/18/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	0.0129	<0.00500	<0.00500	0.00666	0.0661
	01/31/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0191
MW-19	08/23/10	<0.200	<0.00500	0.00666	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0227
	02/24/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0318
	07/18/11	<0.200	<0.00500	0.00781	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0553
	01/31/12	<0.200	<0.00500	0.00553	<0.000200	<0.00500	0.00525	<0.00500	<0.00500	<0.00500	0.0345
MW-20	08/23/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00970
	02/25/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0643
	07/18/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0278
	01/31/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0171
MW-21	08/23/10	<0.200	<0.00500	0.0567	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00898	0.0307
	02/28/11	<0.200	<0.00500	0.102	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.0101	0.0184
(duplicate)	02/28/11	<0.200	<0.00500	0.101	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00975	0.0213
	07/19/11	<0.200	<0.00500	0.0346	<0.000200	<0.00500	0.00836	<0.00500	<0.00500	0.00873	0.0286
	01/31/12	<0.200	<0.00500	0.0375	<0.000200	<0.00500	0.00746	<0.00500	<0.00500	0.00704	0.0170
MW-22	08/23/10	<0.200	<0.00500	0.0306	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00604	0.0916
	02/28/11	<0.200	<0.00500	0.0108	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00616	0.0487
	07/19/11	<0.200	<0.00500	0.00721	<0.000200	<0.00500	0.00546	<0.00500	<0.00500	0.00638	0.0203
	01/31/12	<0.200	<0.00500	0.0103	<0.000200	<0.00500	0.00762	<0.00500	<0.00500	0.00501	0.0183
MW-23	08/23/10	<0.200	<0.00500	0.00669	<0.000200	<0.00500	0.00859	<0.00500	<0.00500	<0.00500	0.0570
	02/28/11	<0.200	<0.00500	0.00831	<0.000200	<0.00500	0.00930	<0.00500	<0.00500	<0.00500	0.0463
	07/19/11	<0.200	<0.00500	0.00647	<0.000200	<0.00500	0.00912	<0.00500	<0.00500	<0.00500	0.0213
	02/01/12	<0.200	<0.00500	0.00658	<0.000200	<0.00500	0.00714	<0.00500	<0.00500	<0.00500	0.0207

Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

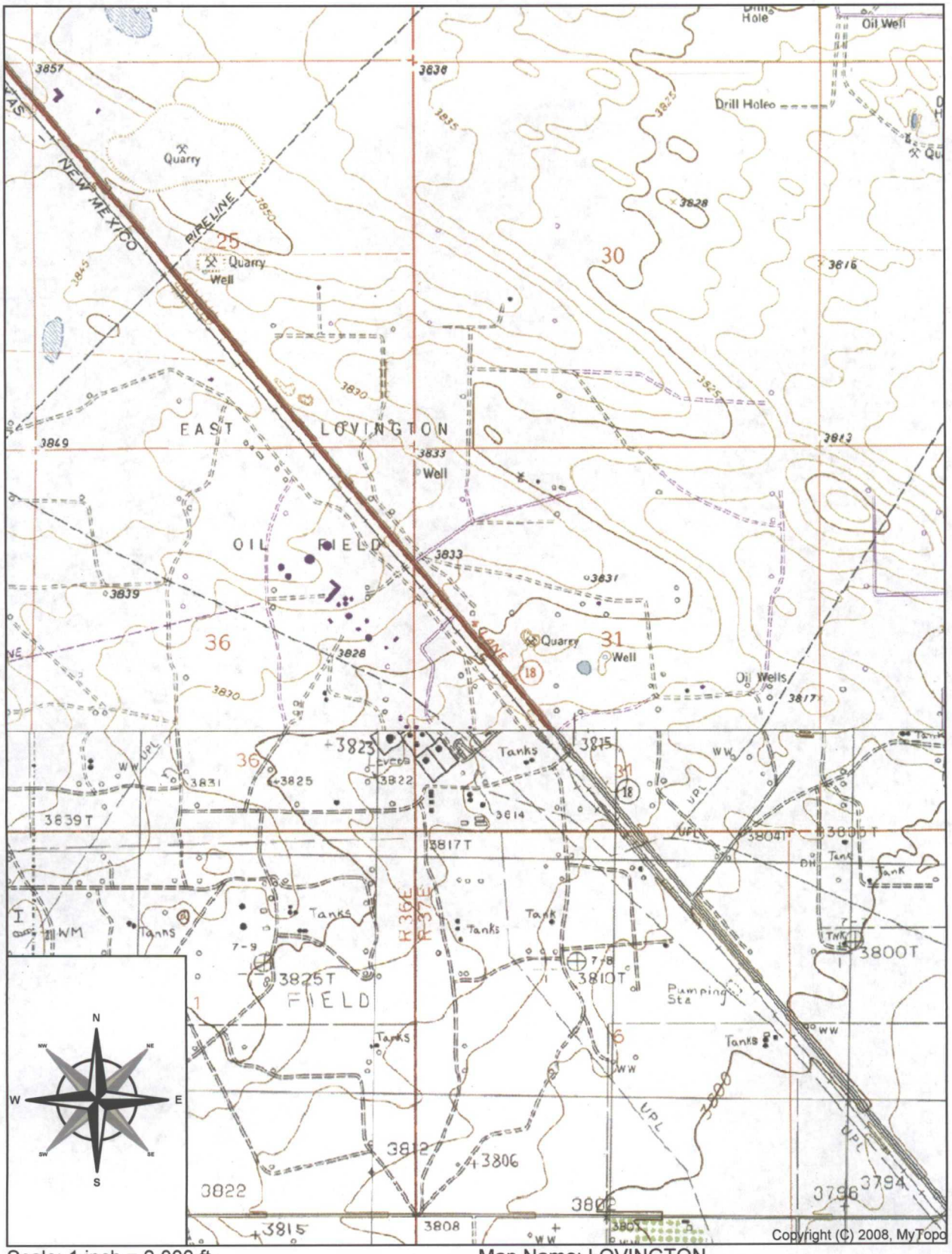
Monitor Well	Sample Date	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Total Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Uranium (mg/L)	Zinc (mg/L)
NM WQCC Groundwater Standards:		**1.0**	**0.05**	**0.20**	**0.002**	**1.0**	**0.2**	**0.05**	**0.05**	**0.03**	**10.0**
MW-24	08/24/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00922
	02/28/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	0.00634	<0.00500	<0.00500	<0.00500	0.0245
	07/14/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	0.00543	<0.00500	<0.00500	<0.00500	0.0249
	02/01/12	<0.200	<0.00500	0.00760	<0.000200	<0.00500	0.00725	<0.00500	<0.00500	<0.00500	0.0101
MW-25	08/23/10	<0.200	<0.00500	0.0109	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0194
	02/28/11	<0.200	<0.00500	0.00715	<0.000200	<0.00500	0.00516	<0.00500	<0.00500	0.00535	0.0424
	07/18/11	<0.200	<0.00500	0.00608	<0.000200	<0.00500	0.00832	<0.00500	<0.00500	<0.00500	0.00556
	02/01/12	<0.200	<0.00500	0.00804	<0.000200	<0.00500	0.00708	<0.00500	<0.00500	0.00602	0.00582
MW-26	08/24/10	<0.200	<0.00500	0.0156	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0161
	02/28/11	<0.200	<0.00500	0.00890	<0.000200	<0.00500	0.00734	<0.00500	<0.00500	0.00602	0.0254
	07/14/11	<0.200	<0.00500	0.00679	<0.000200	<0.00500	0.00792	<0.00500	<0.00500	0.00546	0.0328
	02/01/12	<0.200	<0.00500	0.0122	<0.000200	<0.00500	0.0133	<0.00500	<0.00500	<0.00500	0.00949
MW-27	08/18/10	<0.200	<0.00500	0.0534	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00544	0.0213
	02/25/11	<0.200	<0.00500	0.0336	<0.000200	<0.00500	0.00769	<0.00500	<0.00500	0.00625	0.0453
	07/20/11	0.393	<0.00500	0.0179	<0.000200	<0.00500	0.0415	<0.00500	<0.00500	0.00571	0.0294
	02/01/12	<0.200	<0.00500	0.00556	<0.000200	<0.00500	0.00533	<0.00500	<0.00500	<0.00500	0.0121
MW-28	08/24/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	02/23/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	07/14/11	<0.200	<0.00500	0.00658	<0.000200	<0.00500	0.00696	<0.00500	<0.00500	<0.00500	0.0190
	01/30/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0113
MW-29	08/24/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0433
Dupl. #1	08/24/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0375
	02/28/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0301
	07/14/11	<0.200	<0.00500	0.00532	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0267
	01/30/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0240
RW-1	06/19/09	<0.200	<0.00500	0.0380	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	- -	0.00548
	02/02/10	<0.200	<0.00500	0.0467	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	08/19/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	03/01/11	<0.200	<0.00500	0.00933	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00854
	07/20/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	02/02/12	<0.200	<0.00500	0.00771	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00526

Table 3. Inorganic Constituent Concentrations in Groundwater, Navajo Refining Company, Lovington Refinery

Monitor Well	Sample Date	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Total Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Uranium (mg/L)	Zinc (mg/L)
NM WQCC Groundwater Standards:		**1.0**	**0.05**	**0.20**	**0.002**	**1.0**	**0.2**	**0.05**	**0.05**	**0.03**	**10.0**
North Well	06/18/09	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	- -	<0.00500
	01/14/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00134	<0.00500
	08/24/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	0.0161	<0.00500	<0.00500	<0.00500	0.00920
	03/03/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	07/20/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0695
	02/02/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
South Well	06/22/09	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	- -	0.0195
	01/14/10	<0.200	<0.00500	0.0224	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00236	<0.00500
	08/24/10	<0.200	<0.00500	0.00576	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0207
	03/03/11	<0.200	<0.00500	0.0226	<0.000200	<0.00500	<0.00500	0.00500	<0.00500	<0.00500	0.0329
	07/20/11	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
	02/12/12	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00777
East Well	06/18/09	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	- -	0.0172
	01/14/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	0.00111	0.0291
	08/25/10	<0.200	<0.00500	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0146
	03/03/11	<0.200	0.00662	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0347
	07/20/11	<0.200	0.0116	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00936
	02/02/12	<0.200	0.00988	<0.00500	<0.000200	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.0937
NM WQCC Groundwater Standards:		**1.0**	**0.05**	**0.20**	**0.002**	**1.0**	**0.2**	**0.05**	**0.05**	**0.03**	**10.0**

Notes:
Yellow and bold highlighted, exceeds NM WQCC standard
Samples field filtered except for Total Mercury
Uranium not analyzed June 2009 sample set
Anomalous results for chromium, iron, manganese and nickel, MW-14, 7/18/11. Likely lab error as not seen in earlier or later samples.
Analyses performed by ALS Laboratory Group, Houston, Texas
Complete analytical results shown in the Appendix

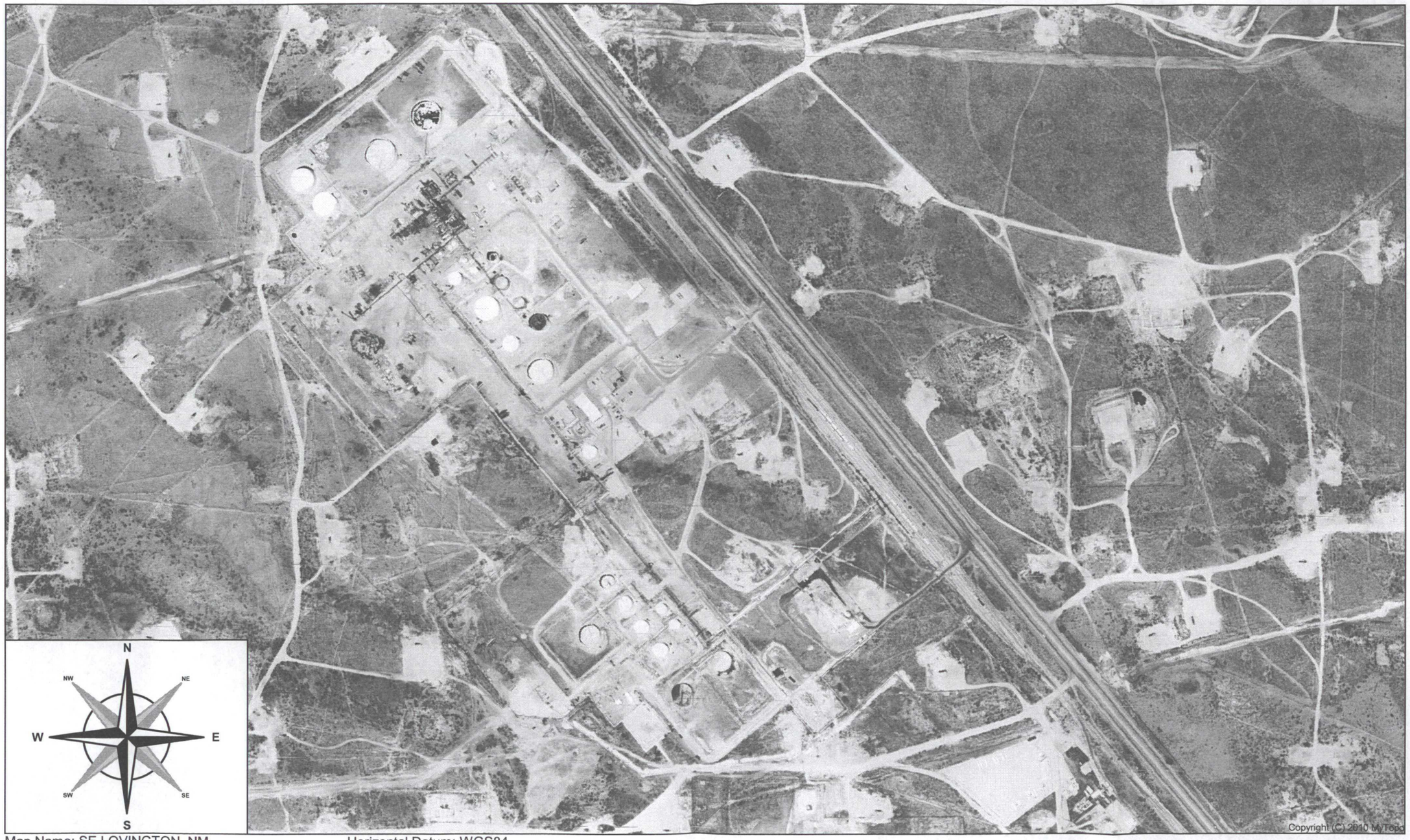
Figure 1. Location Map, Navajo Refining Company, Lea Refinery Lovington, New Mexico



Scale: 1 inch = 2,000 ft.
Map Center: 032.8790426° N 103.2965933° W
Date Published: 1962

Map Name: LOVINGTON,

Figure 2. 2009 Aerial Photograph, Navajo Refining Company Lea Refinery, Lovington, New Mexico



Map Name: SE LOVINGTON, NM
Scale: 1 inch = 500 ft.
Map Center: 032.8779264° N 103.2985382° W

Horizontal Datum: WGS84
Date Published: May 13, 2009

Figure 2. 2009 Aerial Photograph, Navajo Refining Company, Lea Refinery, Lovington, New Mexico

Figure 3. Site Plan, Navajo Refining Company, Lea Refinery, Lovington, New Mexico

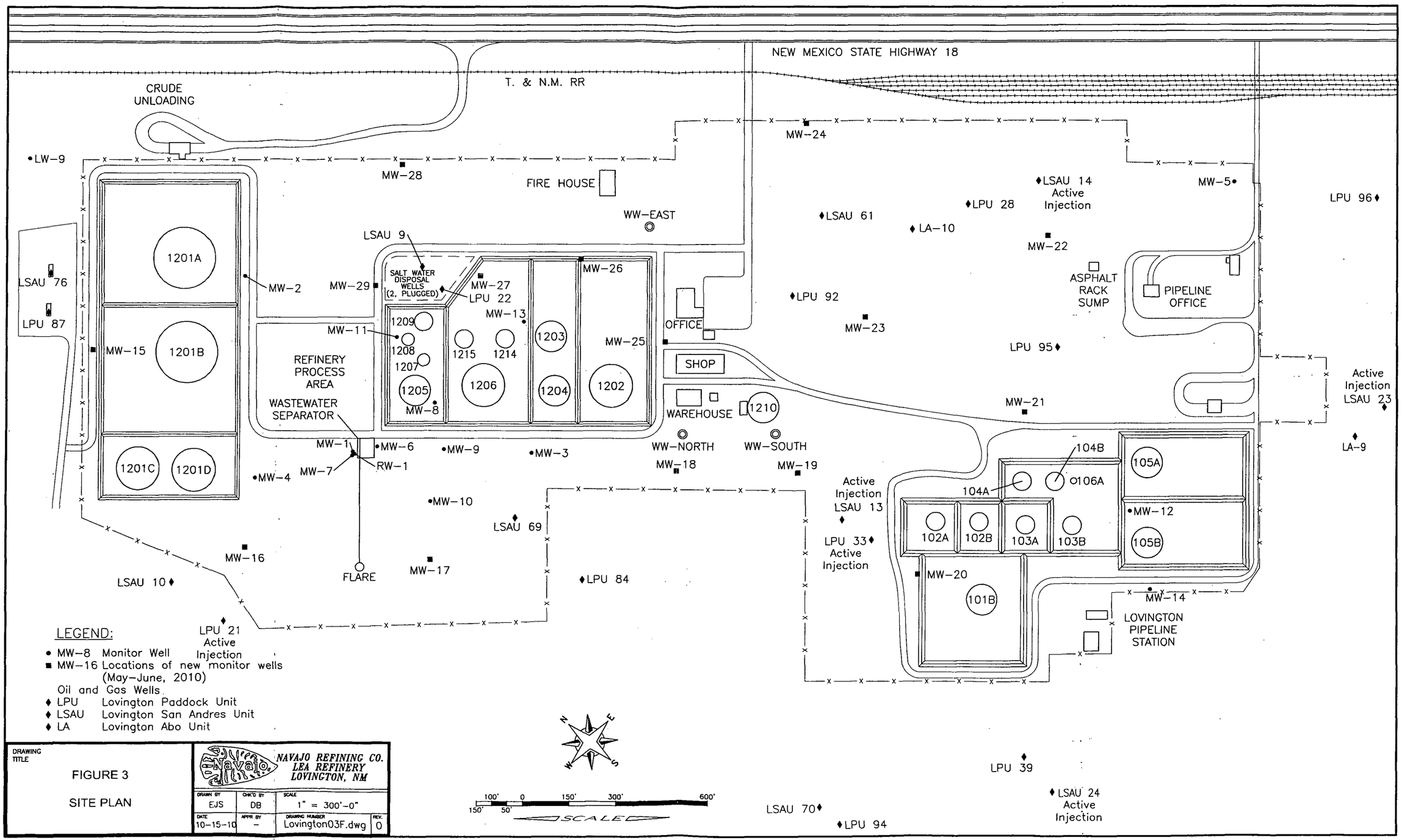

NEW MEXICO STATE HIGHWAY 18
T. & N.M. RR
CRUDE UNLOADING
LW-9
MW-28
FIRE HOUSE
MW-24
WW-EAST
LSAU 14 Active Injection
MW-5
LPU 96
LSAU 61
LPU 28
LA-10
MW-22
LSAU 9
SALT WATER DISPOSAL WELLS (2, PLUGGED)
MW-27
LPU 22
MW-26
ASPHALT RACK SUMP
PIPELINE OFFICE
LSAU 76
LPU 87
MW-2
MW-29
1201A
1201B
1201C
1201D
MW-15
MW-11
1209
1208
1207
1205
MW-8
1215
1214
1206
MW-13
1203
1204
MW-25
1202
LPU 92
MW-23
OFFICE
SHOP
LPU 95
REFINERY PROCESS AREA
WASTEWATER SEPARATOR
MW-1
MW-6
MW-9
MW-3
RW-1
MW-7
MW-4
WAREHOUSE
1210
WW-NORTH
WW-SOUTH
MW-18
MW-19
MW-21
Active Injection LSAU 23
LA-9
104B
105A
104A
0106A
MW-12
102A
102B
103A
103B
105B
Active Injection LSAU 13
LPU 33 Active Injection
MW-10
LSAU 69
MW-16
MW-17
FLARE
LSAU 10
LPU 84
MW-20
101B
MW-14
LOVINGTON PIPELINE STATION
LPU 21 Active Injection
LPU 39
LSAU 24 Active Injection
LSAU 70
LPU 94
LEGEND:
MW-8 Monitor Well
MW-16 Locations of new monitor wells (May-June, 2010)
Oil and Gas Wells
LPU Lovington Paddock Unit
LSAU Lovington San Andres Unit
LA Lovington Abo Unit
N
E
S
W
100' 0 150' 300' 600'
150' 50'
SCALE
DRAWING TITLE
FIGURE 3
SITE PLAN
NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM
DRAWN BY EJS
CHK'D BY DB
SCALE 1" = 300'-0"
DATE 10-15-10
APPR BY -
DRAWING NUMBER Lovington03F.dwg
REV. 0

Figure 4. Water Level Decline, 1995-2012, Navajo Refining Company, Lea Refinery, Lovington, New Mexico

Figure 4. Water Level Decline, 1995-2012, Navajo Refining Company, Lea Refinery, Lovington, NM

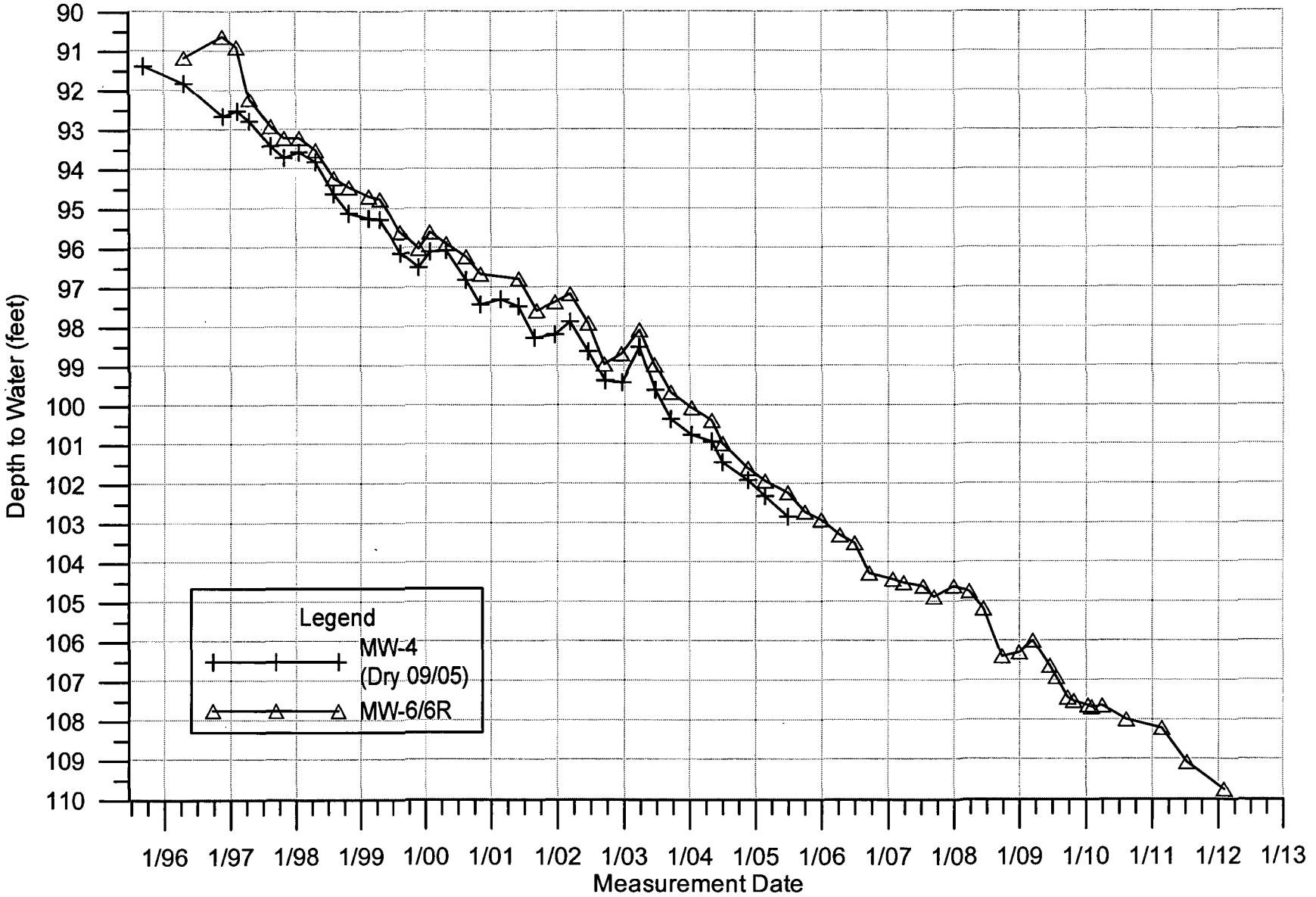


Figure 5. Groundwater Contour Map, February 23, 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

•LW-9

MW-28

MW-24

MW-5•

FIRE HOUSE

WW-EAST

MW-22

OIL WELLS

1201A

1201B

1201C

1201D

MW-15

MW-2

MW-29

SALT WATER DISPOSAL WELLS (2, PLUGGED)

MW-27

MW-26

MW-25

MW-23

MW-11

MW-8

MW-1

MW-6

MW-9

MW-3

MW-4

MW-7

RW-1

MW-10

MW-16

MW-17

FLARE

REFINERY PROCESS AREA

1209

1208

1207

1205

1215

1214

1206

1204

1203

1202

OFFICE

SHOP

WAREHOUSE

1210

WW-NORTH

WW-SOUTH

MW-18

MW-19

ASPHALT RACK SUMP

PIPELINE OFFICE

MW-21

104B

105A

104A

106A

MW-12

102A

102B

103A

103B

105B

MW-20

101B

MW-14

LOVINGTON PIPELINE STATION

3732.0

3731.5

3731.0

3730.5

3730.0

3729.5

3729.0

3728.5

3728.0

3727.5

Monitor Well Name	Water Level Elevation (feet)
MW-1	3730.83
MW-2	3731.91
MW-3	3728.36
MW-4	3732.17
MW-5	3727.13
MW-6	3730.52
MW-7	3730.82
MW-8	3729.51
MW-9	3729.61
MW-10	3730.15
MW-11	3729.75
MW-12	3727.95
MW-13	3727.38
MW-14	3728.23
RW-1	3730.81

LEGEND:

MW-11• MONITOR WELL

3728.5 GROUNDWATER CONTOUR WITH ELEVATION (DASHED WHERE APPROXIMATE) CONTOUR INTERVAL 0.5 FT. UNLESS NOTED OTHERWISE

GROUNDWATER FLOW DIRECTION

N E S W

150' 50' 0 100' 150' 300' 600'

SCALE

DRAWING TITLE

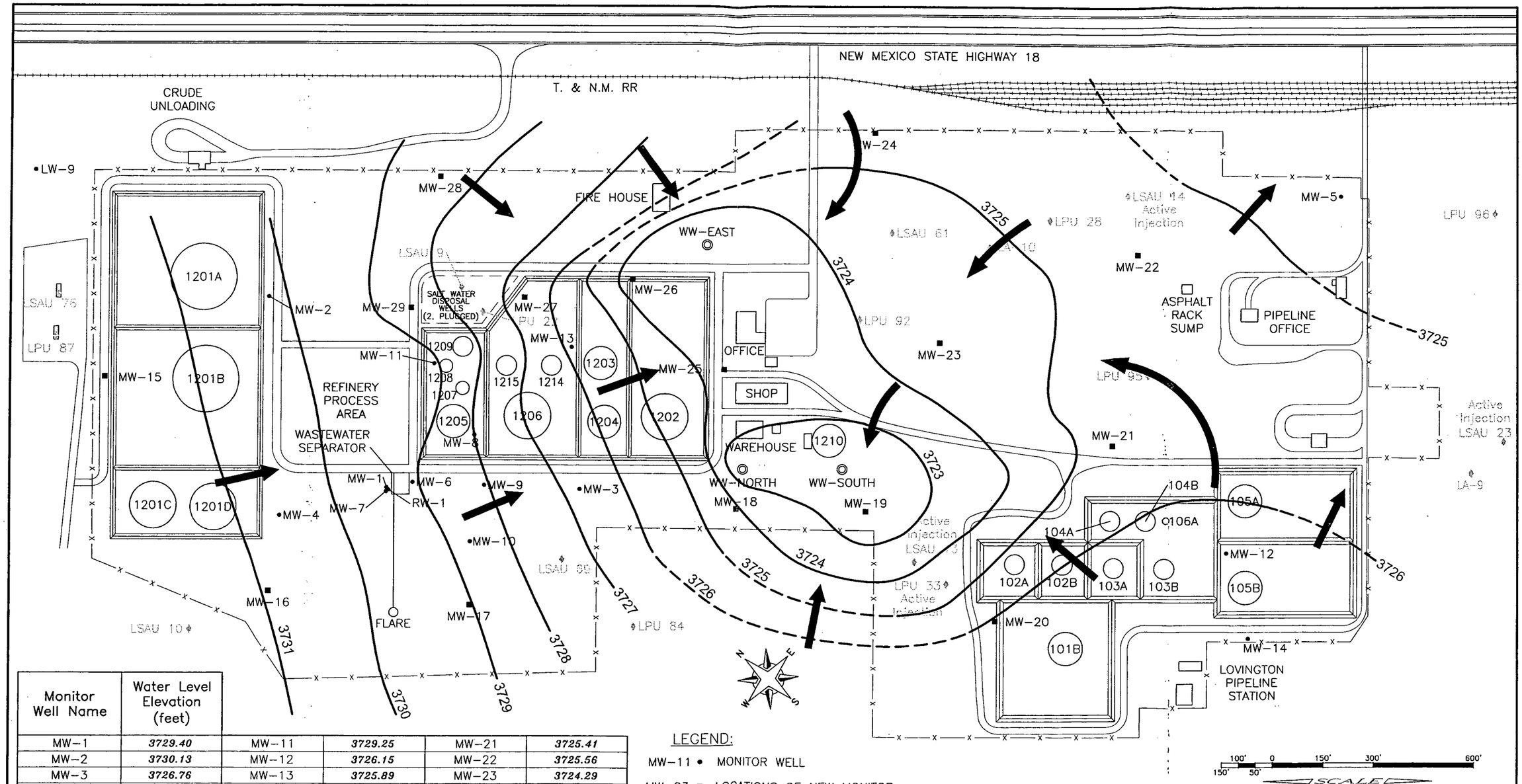
FIGURE 5
GROUNDWATER CONTOUR MAP
JANUARY 13, 2010

Navajo

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'-0"
DATE	APPR BY	DRAWING NUMBER / REV.
4-7-11	–	Lovington03L.dwg / 0

Figure 6. Groundwater Contour Map, July 12, 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico



Monitor Well Name	Water Level Elevation (feet)				
MW-1	3729.40	MW-11	3729.25	MW-21	3725.41
MW-2	3730.13	MW-12	3726.15	MW-22	3725.56
MW-3	3726.76	MW-13	3725.89	MW-23	3724.29
MW-4	3730.62	MW-14	3726.44	MW-24	3725.21
MW-5	3724.48	MW-15	3731.87	MW-25	3723.53
MW-6	3729.07	MW-16	3730.99	MW-26	3723.60
MW-7	3729.41	MW-17	3729.02	MW-27	3726.68
MW-8	3728.00	MW-18	3724.32	MW-28	3728.37
MW-9	3728.05	MW-19	3722.10	MW-29	3728.47
MW-10	3728.58	MW-20	3726.08	RW-1	3729.39

LEGEND:

MW-11 • MONITOR WELL

MW-23 ■ LOCATIONS OF NEW MONITOR WELLS (MAY-JUNE, 2010)

3728 GROUNDWATER CONTOUR WITH ELEVATION (DASHED WHERE APPROXIMATE) CONTOUR INTERVAL 0.5 FT.

GROUNDWATER FLOW DIRECTION

OIL AND GAS WELLS
- LPU LOVINGTON PADDOCK UNIT
- LSAU LOVINGTON SAN ANDRES UNIT
- LA LOVINGTON ABO UNIT

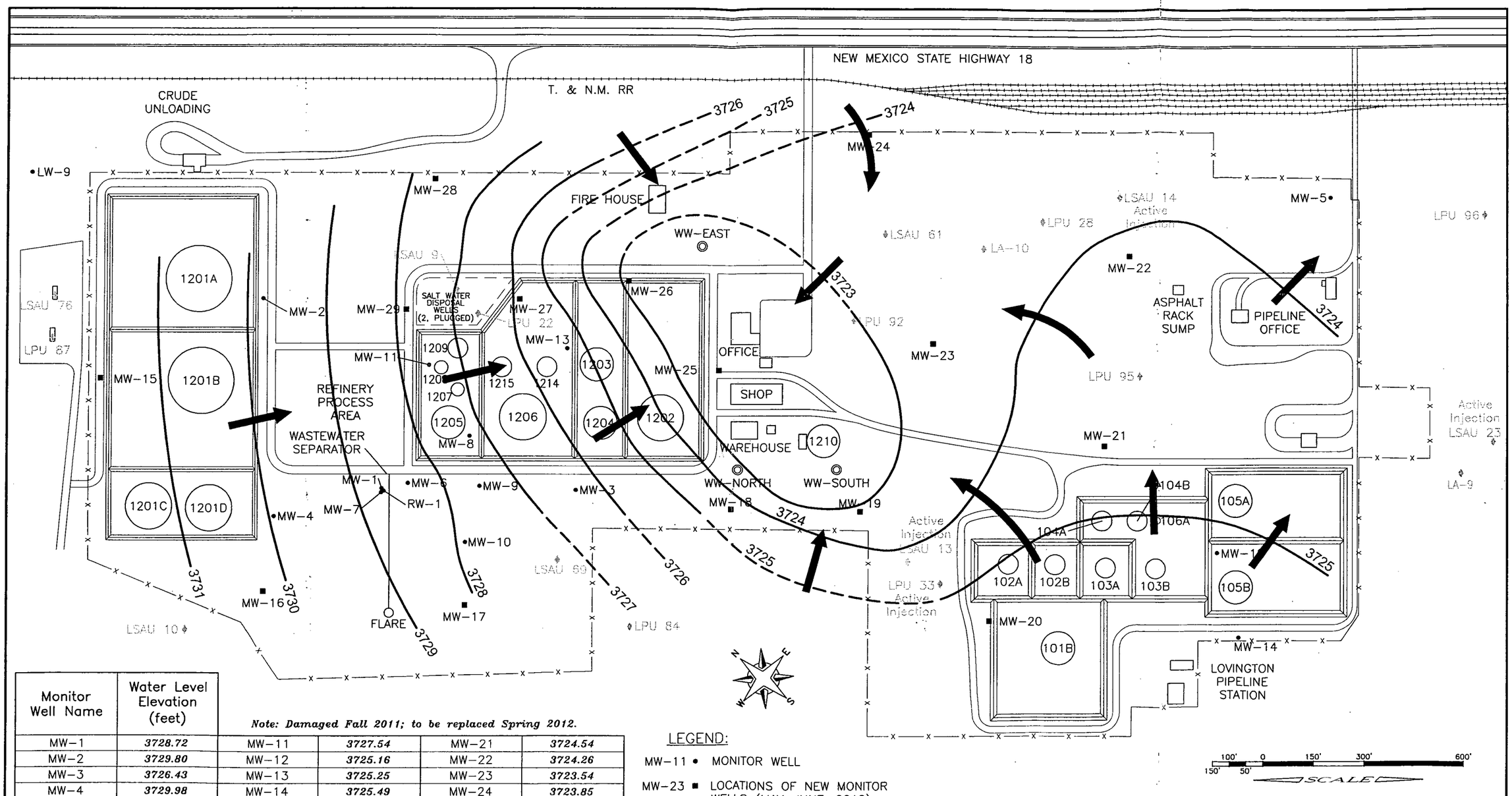
DRAWING TITLE

FIGURE 6
GROUNDWATER CONTOUR MAP
JULY 12, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'-0"
DATE: 4-13-12	APPR BY: -	DRAWING NUMBER: Lovington03P.dwg
		REV. 0

Figure 7. Groundwater Contour Map, January 30-February 2, 2012, Navajo Refining Company, Lea Refinery Lovington, New Mexico



Monitor Well Name	Water Level Elevation (feet)				
MW-1	*3728.72*	MW-11	*3727.54*	MW-21	*3724.54*
MW-2	*3729.80*	MW-12	*3725.16*	MW-22	*3724.26*
MW-3	*3726.43*	MW-13	*3725.25*	MW-23	*3723.54*
MW-4	*3729.98*	MW-14	*3725.49*	MW-24	*3723.85*
MW-5	*3723.48*	MW-15	*3731.65*	MW-25	*3722.24*
MW-6	*3728.38*	MW-16	*3730.27*	MW-26	*3722.80*
MW-7	*3728.71*	MW-17	*See Note*	MW-27	*3725.90*
MW-8	*3727.07*	MW-18	*3724.56*	MW-28	*3727.60*
MW-9	*3727.84*	MW-19	*3723.05*	MW-29	*3727.86*
MW-10	*3727.93*	MW-20	*3725.51*	RW-1	*3728.67*

Note: Damaged Fall 2011; to be replaced Spring 2012.

LEGEND:

MW-11 • MONITOR WELL

MW-23 ■ LOCATIONS OF NEW MONITOR WELLS (MAY-JUNE, 2010)

3728 GROUNDWATER CONTOUR WITH ELEVATION (DASHED WHERE APPROXIMATE) CONTOUR INTERVAL 0.5 FT.

GROUNDWATER FLOW DIRECTION

OIL AND GAS WELLS
- ♦LPU LOVINGTON PADDOCK UNIT
- ♦LSAU LOVINGTON SAN ANDRES UNIT
- ♦LA LOVINGTON ABO UNIT

DRAWING TITLE

FIGURE 7
GROUNDWATER CONTOUR MAP
JANUARY 31 - FEBRUARY 2, 2012

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'-0"
DATE 4-13-12	APPR BY -	DRAWING NUMBER Lovington03P.dwg REV. 0

Figure 8. Benzene Concentration Map, February-March 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

LW-9

MW-28 ND

FIRE HOUSE

WW-EAST ND

MW-24 ND

LSAU 14 Active Injection

LPU 28

LSAU 6

LA-10

MW-22 ND

MW-5 ND

ASPHALT RACK SUMP

PIPELINE OFFICE

LPU 92

MW-23 ND

LSAU 9

LSAU 76

OIL WELLS

LPU 87

1201A

1201B

1201C

1201D

MW-2 ND

MW-29 ND

SALT WATER DISPOSAL WELLS (2, PLUGGED)

MW-27 ND

LPU 22

MW-26 ND

MW-13 0.0057

MW-11 ND

MW-15 ND

REFINERY PROCESS AREA

1209

1208

1207

1205

1215

1214

1206

1203

1204

1202

MW-25

OFFICE ND

SHOP

WAREHOUSE

1210

MW-8 ND

MW-21 ND

LPU 95

MW-1 ND

MW-6 ND

MW-9 ND

MW-3 ND

MW-4 ND

MW-7 ND

RW-1 ND

WW-NORTH ND

WW-SOUTH ND

MW-18 ND

MW-19 ND

Active Injection LSAU 13

LPU 33 Active Injection

104B

105A

104A

106A

MW-12 ND

105B

102A

102B

103A

103B

MW-20 ND

101B

MW-14 ND

LOVINGTON PIPELINE STATION

MW-10 ND

LSAU 69

MW-16 ND

MW-17 ND

FLARE

LSAU 10

LPU 84

LPU 21

LEGEND:

MW-13 0.0057 NONE — MONITOR WELL WITH TOTAL BENZENE (mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD OF 0.010 mg/L

ND — NOT DETECTED REPORTING LIMIT 0.0050 mg/L

♦ — OIL AND GAS WELLS

→ — GROUNDWATER FLOW DIRECTION (FEBRUARY 2011)

NOTE:
SAMPLES COLLECTED FEBRUARY 24 – MARCH 3, 2011

N W E S

150' 50' 0 100' 150' 300' 600'

SCALE

DRAWING TITLE

FIGURE 8
BENZENE
CONCENTRATION MAP
FEBRUARY - MARCH, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'-0"
DATE	APPR BY	DRAWING NUMBER / REV.
4-13-12	–	Lovington03U.dwg / 0

Figure 9. Benzene Concentration Map, July 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

LW-9

MW-28 ND

FIRE HOUSE

WW-EAST ND

MW-24 ND

LSAU 14 Active Injection

MW-5 ND

LPU 28

LSAU 61

LA-10

MW-22 ND

ASPHALT RACK SUMP

PIPELINE OFFICE

LSAU 9

LSAU 76

OIL WELLS

LPU 87

1201A

1201B

1201C

1201D

MW-2 ND

MW-29 ND

SALT WATER DISPOSAL WELLS (2, PLUGGED)

MW-27 ND

LPU 22

MW-26 ND

MW-13 0.0063

MW-11 1.2

MW-15 ND

REFINERY PROCESS AREA

1209

1208

1207

1205

1215

1214

1206

1203

1204

1202

MW-25 ND

MW-8 ND

OFFICE

LPU 92

MW-23 ND

LPU 95

SHOP

WAREHOUSE

1210

MW-21 ND

WW-NORTH ND

WW-SOUTH ND

MW-1 ND

MW-6 ND

MW-9 ND

MW-3 ND

MW-4 ND

MW-7 ND

RW-1 ND

MW-10 ND

MW-18 ND

MW-19 ND

Active Injection LSAU 13

LPU 33 Active Injection

104B

105A

104A

106A

MW-12 ND

102A

102B

103A

103B

105B

MW-20 ND

101B

MW-14 ND

LOVINGTON PIPELINE STATION

LSAU 69

LPU 84

MW-16 ND

MW-17 ND

FLARE

LSAU 10

LPU 21

LEGEND:

MW-13 0.0063 — MONITOR WELL WITH TOTAL BENZENE (mg/L)

1.2 — BOLD – EXCEEDS GROUNDWATER STANDARD OF 0.010 mg/L

ND — NOT DETECTED REPORTING LIMIT 0.0050 mg/L

♦ — OIL AND GAS WELLS

→ — GROUNDWATER FLOW DIRECTION (JULY 2011)

NOTE:
SAMPLES COLLECTED JULY 14–20, 2011.

N W E S

100' 0 150' 300' 600'
150' 50'
SCALE

DRAWING TITLE

FIGURE 9
BENZENE
CONCENTRATION MAP
JULY, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE	
EJS	DB	1" = 300'-0"	
DATE	APPR BY	DRAWING NUMBER	REV.
4-13-12	--	Lovington03R.dwg	0

Figure 10. Benzene Concentration Map, January 30-February 2, 2012, Navajo Refining Company, Lea Refinery, Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

LW-9

MW-28 ND

FIRE HOUSE

MW-24 ND

WW-EAST ND

LSAU 9

LSAU 76 OIL WELLS

LPU 87

1201A

1201B

1201C

1201D

MW-2 ND

MW-29 ND

SALT WATER DISPOSAL WELLS (2, PLUGGED)

MW-27 ND

LPU 22

MW-26 ND

MW-25 ND

MW-13 ND

MW-11 7.8

MW-15 ND

REFINERY PROCESS AREA

1209

1208

1207

1205

1215

1214

1206

1203

1204

1202

MW-8 ND

OFFICE

SHOP

WAREHOUSE

1210

LSAU 61

LPU 28

LSAU 14 Active Injection

MW-5 ND

LA-10

MW-22 ND

LPU 92

MW-23 ND

LPU 95

ASPHALT RACK SUMP

PIPELINE OFFICE

MW-21 ND

MW-1 ND

MW-6 ND

MW-9 ND

MW-3 ND

MW-4 ND

MW-7 ND

RW-1 ND

MW-10 ND

WW-NORTH ND

WW-SOUTH ND

MW-18 ND

MW-19 ND

Active Injection LSAU 13

LPU 33 Active Injection

LSAU 69

MW-16 ND

MW-17

FLARE

LSAU 10

LPU 21

LPU 84

104A

104B

105A

106A

102A

102B

103A

103B

105B

MW-20 ND

101B

MW-14 ND

LOVINGTON PIPELINE STATION

LEGEND:

MW-13 none / 7.8 — MONITOR WELL WITH TOTAL BENZENE (mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD OF 0.010 mg/L

ND — NOT DETECTED REPORTING LIMIT 0.0050 mg/L

♦ — OIL AND GAS WELLS

→ — GROUNDWATER FLOW DIRECTION (JANUARY 2012)

N E S W

100' 0 150' 300' 600'
150' 50'
SCALE

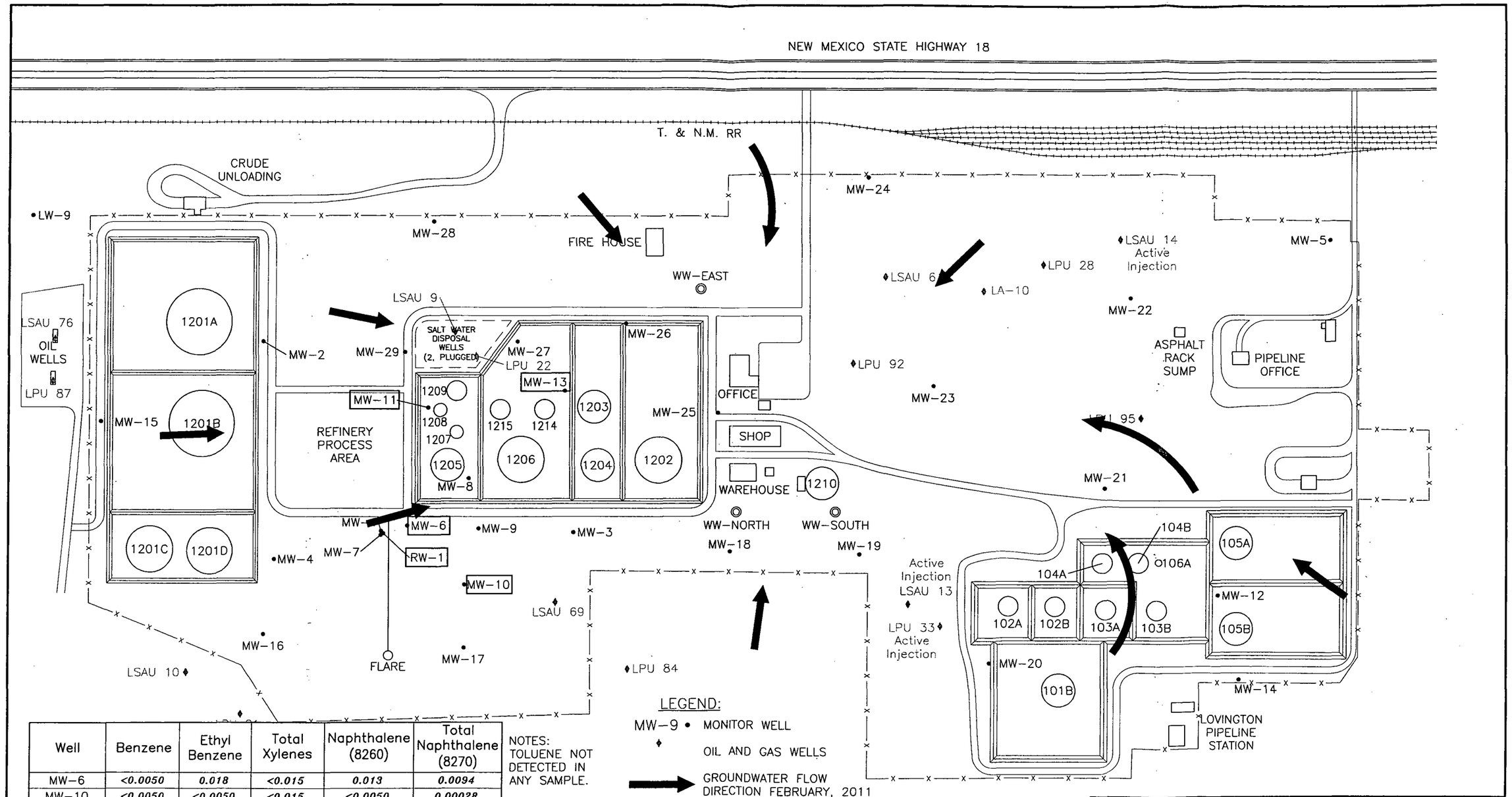
DRAWING TITLE

FIGURE 10
BENZENE
CONCENTRATION MAP
JANUARY 30 -
FEBRUARY 2, 2012

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'-0"
DATE	APPR BY	DRAWING NUMBER / REV.
4-13-12	–	Lovington03R.dwg / 0

Figure 11. BTEX, Naphthalene Concentration Map, February-March 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico



Well	Benzene	Ethyl Benzene	Total Xylenes	Naphthalene (8260)	Total Naphthalene (8270)
MW–6	*<0.0050*	*0.018*	*<0.015*	*0.013*	*0.0094*
MW–10	*<0.0050*	*<0.0050*	*<0.015*	*<0.0050*	*0.00028*
MW–11	*<0.0050*	*<0.0050*	*<0.015*	*<0.0050*	*<0.00020*
MW–13	*0.0057*	*<0.0050*	*<0.015*	*<0.0050*	*<0.00020*
RW–1	*<0.0050*	*<0.0050*	*0.0054*	*<0.0050*	*<0.00020*
NM WQCC STANDARD	*0.010 (mg/L)*	*0.75 (mg/L)*	*0.62 (mg/L)*	*0.03 (mg/L)*	*0.03 (mg/L)*

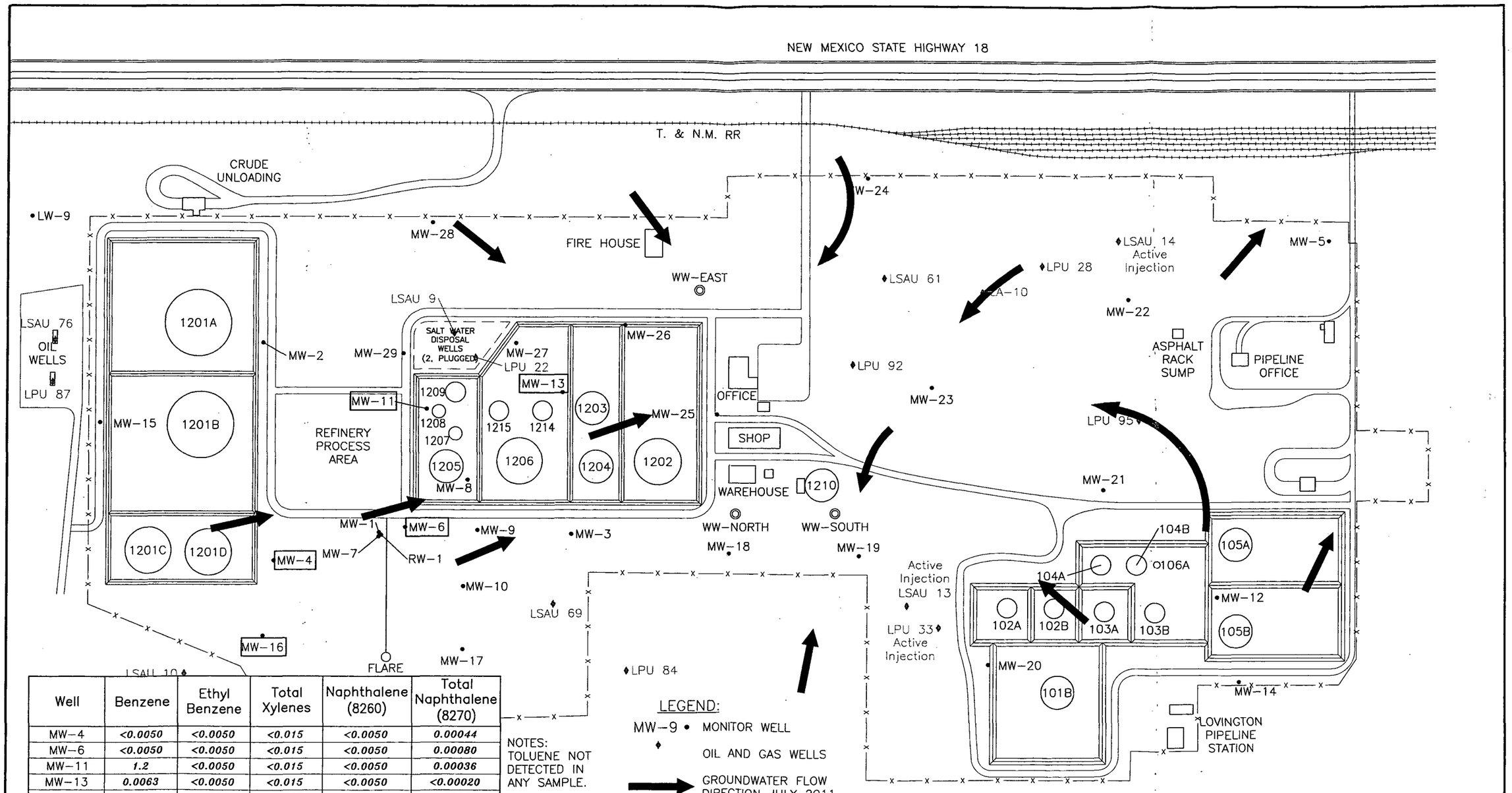
DRAWING TITLE

FIGURE 11
BTEX, NAPHTHALENE
VOLATILES MAP
FEBRUARY - MARCH, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'–0"
DATE: 4–13–12	APPR BY: –	DRAWING NUMBER: Lovington03U.dwg
		REV: 0

Figure 12. BTEX, Naphthalene Concentration Map, July 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico



Well	Benzene	Ethyl Benzene	Total Xylenes	Naphthalene (8260)	Total Naphthalene (8270)
MW–4	*<0.0050*	*<0.0050*	*<0.015*	*<0.0050*	*0.00044*
MW–6	*<0.0050*	*<0.0050*	*<0.015*	*<0.0050*	*0.00080*
MW–11	*1.2*	*<0.0050*	*<0.015*	*<0.0050*	*0.00036*
MW–13	*0.0063*	*<0.0050*	*<0.015*	*<0.0050*	*<0.00020*
MW–16	*<0.0050*	*<0.0050*	*<0.015*	*<0.0050*	*0.00030*
16(Duplicate)	*<0.0050*	*<0.0050*	*<0.015*	*<0.0050*	*<0.00020*
NM WQCC STANDARD	*0.010 (mg/L)*	*0.75 (mg/L)*	*0.62 (mg/L)*	*0.03 (mg/L)*	*0.03 (mg/L)*
REPORTING LIMIT	*0.0050*	*0.0050*	*0.015*	*0.0050*	*0.00020*

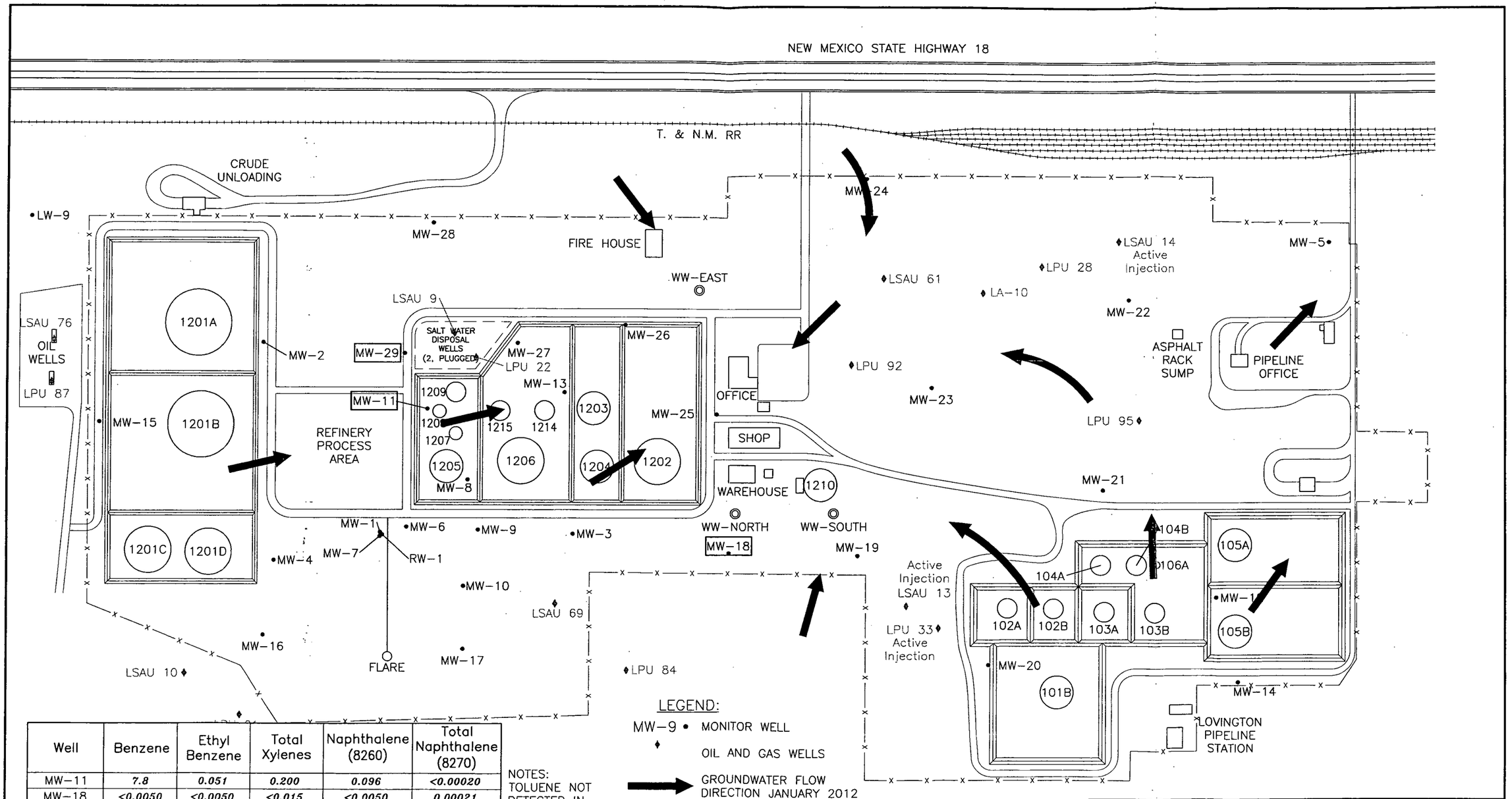
DRAWING TITLE

FIGURE 12
BTEX, NAPHTHALENE MAP
JULY, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'–0"
DATE: 4–13–12	APPR BY: –	DRAWING NUMBER: Lovington03R.dwg REV. 0

Figure 13. BTEX, Naphthalene Concentration Map, January 30-February 2, 2012, Navajo Refining Company, Lea Refinery, Lovington, New Mexico



Well	Benzene	Ethyl Benzene	Total Xylenes	Naphthalene (8260)	Total Naphthalene (8270)
MW-11	7.8	0.051	0.200	0.096	<0.00020
MW-18	<0.0050	<0.0050	<0.015	<0.0050	0.00021
MW-29	<0.0050	<0.0050	<0.015	<0.0050	0.00050
NM WQCC STANDARD	0.010 (mg/L)	0.75 (mg/L)	0.62 (mg/L)	0.03 (mg/L)	0.03 (mg/L)
REPORTING LIMIT	0.0050	0.0050	0.015	0.0050	0.00020

NOTES:
TOLUENE NOT DETECTED IN ANY SAMPLE.

DRAWING TITLE

FIGURE 13
BTEX, NAPHTHALENE MAP
JANUARY 30 -
FEBRUARY 2, 2012

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'-0"
DATE	APPR BY	DRAWING NUMBER / REV.
4-13-12	-	Lovington03R.dwg / 0

Figure 14. Chloride Concentration Map, February-March 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

FIRE HOUSE

LW-9

MW-28 106

MW-24 39.6

MW-5 29.8

LSAU 14 Active Injection

LPU 28

LSAU 6

LA-10

MW-22 117

ASPHALT RACK SUMP

PIPELINE OFFICE

LSAU 76

OIL WELLS

LPU 87

LSAU 9

SALT WATER DISPOSAL WELLS (2, PLUGGED)

MW-2 221

MW-29 119

MW-27 144

LPU 22

MW-26 202

MW-13 340

MW-11 415

MW-25 256

MW-15 190

1201A

1201B

1201C

1201D

REFINERY PROCESS AREA

1209 1208 1207 1205 1215 1214 1203 1206 1204 1202

OFFICE

SHOP

WAREHOUSE

MW-8 144

LPU 92

MW-23 511

LPU 95

183 MW-21

1210

549

WW-SOUTH

MW-19 235

WW-NORTH

MW-18 137 286

WW-EAST 135

MW-1 100

MW-6 282

MW-7 26.5

RW-1 28.9

MW-9 24.1

MW-3 88.2

MW-4 27.1

MW-10 32.8

MW-16 28.1

LSAU 10

LSAU 69

FLARE

MW-17 412

LPU 84

LPU 21

Active Injection LSAU 13

LPU 33 Active Injection

104B 105A 104A 106A MW-12 28.5 105B

102A 102B 103A 103B

MW-20 187 101B

MW-14 58.2

LOVINGTON PIPELINE STATION

100 200 300 400 500

LEGEND:

MW-13 **340** — MONITOR WELL WITH TOTAL CHLORIDE (mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD OF 250 mg/L

300 — CHLORIDE CONCENTRATION (mg/L) (DASHED WHERE APPROXIMATE) CONTOUR INTERVAL 100 mg/L UNLESS NOTED OTHERWISE

GROUNDWATER FLOW DIRECTION (FEBRUARY, 2011)

♦ OIL AND GAS WELLS

NOTE:
SAMPLES COLLECTED FEBRUARY 24 – MARCH 3, 2011.

N W E S

100' 0 150' 300' 600'
150' 50'
SCALE

DRAWING TITLE

FIGURE 14
CHLORIDE CONCENTRATION MAP
FEBRUARY - MARCH, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE	
EJS	DB	1" = 300'-0"	
DATE	APPR BY	DRAWING NUMBER	REV.
4-13-12	–	Lovington03U.dwg	0

Figure 15. Chloride Concentration Map, July 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

FIRE HOUSE

WW-EAST ◎ 124

WW-NORTH ◎ 124

WW-SOUTH ◎ 420

LSAU 9

SALT WATER DISPOSAL WELLS (2. PLUGGED)

LSAU 76

OIL WELLS

LPU 87

LSAU 10♦

LPU 21

LSAU 69

♦LPU 84

♦LSAU 81

♦LPU 28

♦LSAU 14 Active injection

♦LPU 82

LPU 95♦

Active Injection LSAU 13

LPU 33♦ Active Injection

REFINERY PROCESS AREA

OFFICE

SHOP

WAREHOUSE

ASPHALT RACK SUMP

PIPELINE OFFICE

LOVINGTON PIPELINE STATION

FLARE

LW-9

MW-1 34.7
MW-2 190
MW-3 67.3
MW-4 25.8
MW-5 20.9
MW-6 174
MW-7 23.3
MW-8 313
MW-9 24.9
MW-10 30.7
MW-11 134
MW-12 26.8
MW-13 351
MW-14 98.4
MW-15 236
MW-16 25.5
MW-17 336
MW-18 218
MW-19 688
MW-20 148
MW-21 191
MW-22 107
MW-23 212
MW-24 43.1
MW-25 77.8
MW-26 184
MW-27 150
MW-28 106
MW-29 135
RW-1 26.4

1201A 1201B 1201C 1201D 1202 1203 1204 1205 1206 1207 1208 1209 1210 1214 1215 101B 102A 102B 103A 103B 104A 104B 105A 105B 0106A

100 200 300 400 500 600

NOTE:
SAMPLES COLLECTED JULY 14–20, 2011.

LEGEND:

MW-17• / 336 — MONITOR WELL WITH TOTAL CHLORIDE (mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD OF 250 mg/L

300 — CHLORIDE CONCENTRATION (mg/L) (DASHED WHERE APPROXIMATE) CONTOUR INTERVAL 100 mg/L UNLESS NOTED OTHERWISE

GROUNDWATER FLOW DIRECTION (JULY, 2011)

♦ OIL AND GAS WELLS

N W E S

100' 0 150' 300' 600'
150' 50'
SCALE

DRAWING TITLE

FIGURE 15
CHLORIDE CONCENTRATION MAP
JULY, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE	
EJS	DB	1" = 300'-0"	
DATE 4-13-12	APPR BY –	DRAWING NUMBER Lovington03Q.dwg	REV. 0

Figure 16. Chloride Concentration Map, January 30-February 2, 2012, Navajo Refining Company, Lea Refinery, Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

FIRE HOUSE

LW-9

MW-28 80.6

MW-24 50.6

WW-EAST 150

LSAU 9

LSAU 70

OIL WELLS

LPU 87

1201A

1201B

1201C

1201D

MW-2 214

MW-29 152

SALT WATER DISPOSAL WELLS (2, PLUGGED)

MW-27 164

LPU 28

MW-13 418

MW-26 196

MW-11 175

MW-25 175

MW-15 304

REFINERY PROCESS AREA

1209

1208

1207

1205

1215

1214

1206

1203

1204

1202

MW-8 376

OFFICE

SHOP

WAREHOUSE

1210

WW-NORTH 149

WW-SOUTH 368

MW-19 610

MW-18 106

MW-1 29.9

MW-7 25.5

RW-1 29.6

MW-6 58.4

MW-9 31.5

MW-3 65.6

MW-4 30.0

MW-10 42.9

LSAU 69

MW-16 27.9

LSAU 10

FLARE

MW-17

LPU 84

LPU 21

LSAU 61

LA-10

LSAU 14 Active Injection

MW-22 141

MW-5 26.9

ASPHALT RACK SUMP

PIPELINE OFFICE

LPU 92

MW-23 887

LPU 95

MW-21 200

Active Injection LSAU 13

LPU 33 Active Injection

104A

104B

106A

105A

105B

MW-1

102A

102B

103A

103B

MW-20 174

101B

MW-14 59.7

LOVINGTON PIPELINE STATION

100

200

300

400

500

600

700

800

LEGEND:

MW-13 418 — MONITOR WELL WITH TOTAL CHLORIDE (mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD OF 250 mg/L

300 — CHLORIDE CONCENTRATION (mg/L) (DASHED WHERE APPROXIMATE) CONTOUR INTERVAL 100 mg/L UNLESS NOTED OTHERWISE

GROUNDWATER FLOW DIRECTION (FEBRUARY, 2012)

♦ OIL AND GAS WELLS

NOTE:
SAMPLES COLLECTED JANUARY 30 – FEBRUARY 2, 2012.

N W E S

100' 0 150' 300' 600'
150' 50'
SCALE

DRAWING TITLE

FIGURE 16
CHLORIDE CONCENTRATION MAP
JANUARY 30 - FEBRUARY 2, 2012

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'-0"
DATE	APPR BY	DRAWING NUMBER / REV.
4-13-12	–	Lovington03Q.dwg / 0

Figure 17. Total Dissolved Solids Concentration Map, February-March 2011, Navajo Refining Company, Lea Refinery, Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

LW-9

MW-28 540

MW-24 414

FIRE HOUSE

MW-5 570

LSAU 14 Active Injection

LPU 28

LSAU 6

LA-10

678 MW-22

600

WW-EAST 644

900

LSAU 9

LSAU 76

OIL WELLS

LPU 87

1201A

MW-2 1010

670 MW-29

SALT WATER DISPOSAL WELLS (2, PLUGGED)

746 MW-27

LPU 22

MW-26 940

1500 MW-13 1540

1200

MW-11 1510

1209

1208

1207

1215

1214

1203

MW-25 998

OFFICE

ASPHALT RACK SUMP

PIPELINE OFFICE

LPU 92

MW-23 1540

1500

1200

MW-15 738

1201B

REFINERY PROCESS AREA

900

600

SHOP

LPU 95

1000 MW-21

1205

1206

1204

1202

MW-8 694

WAREHOUSE

1210

1500

804 WW-NORTH

WW-SOUTH 1840

1340 MW-6

MW-1 580

MW-9 414

MW-3 566

MW-18 1240

MW-19 828

900

104B

105A

104A

0106A

MW-12 402

105B

1201C

1201D

MW-4 378

MW-7 376

RW-1 380

Active Injection LSAU 13

LPU 33 Active Injection

102A

102B

103A

103B

MW-10 422

LSAU 69

1620 MW-17

MW-20 840

101B

MW-16 412

FLARE

LPU 84

1200

1500

900

600

MW-14 440

LSAU 10

LPU 21

LOVINGTON PIPELINE STATION

LEGEND:

MW-13 1540 — MONITOR WELL WITH TOTAL DISSOLVED SOLIDS CONCENTRATION (mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD OF 1000 mg/L

600 — TOTAL DISSOLVED SOLIDS CONCENTRATION (mg/L) (DASHED WHERE APPROXIMATE) CONTOUR INTERVAL 300mg/L UNLESS OTHERWISE SHOWN

GROUNDWATER FLOW DIRECTION (FEBRUARY. 2011)

OIL AND GAS WELLS

NOTE:
SAMPLES COLLECTED FEBRUARY 24 – MARCH 3, 2011

N W E S

100' 0 150' 300' 600'
150' 50'
SCALE

DRAWING TITLE

FIGURE 17
TOTAL DISSOLVED SOLIDS CONCENTRATION MAP
FEBRUARY - MARCH, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'-0"
DATE	APPR BY	DRAWING NUMBER / REV.
4-13-12	–	Lovington03U.dwg / 0

Figure 18. Total Dissolved Solids Concentration Map, July 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

LW-9

MW-28 732

FIRE HOUSE

WW-EAST 596

MW-24 504

MW-5 524

LSAU 14 Active Injection

LPU 28

MW-22 740

ASPHALT RACK SUMP

PIPELINE OFFICE

LSAU 76 OIL WELLS

LPU 87

LSAU 9

SALT WATER DISPOSAL WELLS (2, PLUGGED)

MW-2 966

MW-29 798

MW-27 812

MW-26 1030

MW-15 1960

MW-11 894

MW-15 940

MW-25 998

OFFICE

SHOP

WAREHOUSE

MW-23 3090

LPU 95

MW-21 1250

REFINERY PROCESS AREA

1201A

1201B

1201C

1201D

1202

1203

1204

1206

1207

1208

1209

1210

1214

1215

MW-8 1460

MW-1 492

MW-6 970

MW-9 434

MW-3 568

MW-7 396

RW-1 484

MW-4 422

MW-10 470

WW-NORTH 628

WW-SOUTH 1600

MW-19 2880

MW-18 1290

Active Injection LSAU 13

LPU 33 Active Injection

LSAU 69

MW-16 476

MW-17 1850

FLARE

LSAU 10

LPU 84

LSAU 21

104A

104B

105A

105B

106A

102A

102B

103A

103B

101B

MW-12 410

MW-20 840

MW-14 482

LOVINGTON PIPELINE STATION

600

900

1200

1500

1800

2100

2400

2700

LEGEND:

MW-13 1960 — MONITOR WELL WITH TOTAL DISSOLVED SOLIDS CONCENTRATION (mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD OF 1000 mg/L

600 — TOTAL DISSOLVED SOLIDS CONCENTRATION (mg/L) (DASHED WHERE APPROXIMATE) CONTOUR INTERVAL 300mg/L UNLESS OTHERWISE SHOWN

GROUNDWATER FLOW DIRECTION (JULY, 2011)

♦ OIL AND GAS WELLS

NOTE:
SAMPLES COLLECTED JULY 14–20, 2011.

N W E S

100' 0 150' 300' 600'
150' 50'
SCALE

DRAWING TITLE

FIGURE 18
TOTAL DISSOLVED SOLIDS CONCENTRATION MAP
JULY, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE	
EJS	DB	1" = 300'-0"	
DATE	APPR BY	DRAWING NUMBER	REV.
4-13-12	--	Lovington03Q.dwg	0

Figure 19. Total Dissolved Solids Concentration Map, January 30-February 2, 2012, Navajo Refining Company, Lea Refinery, Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

600

LW-9

MW-28 572

FIRE HOUSE

418 MW-24

900

1200

LSAU 76

OIL WELLS

LPU 87

1201A

1201B

1201C

1201D

MW-2 1230

1330 MW-15

1200

900

600

REFINERY PROCESS AREA 1530

LSAU 9

SALT WATER DISPOSAL WELLS (2, PLUGGED)

898 MW-29

626 MW-27

LPU 22

MW-11 966

MW-13 1510

1209

1208

1207

1205

1215

1214

1206

1500

1204

1202

1203

MW-8

MW-26 952

MW-25 820

OFFICE

SHOP

WAREHOUSE

1210

WW-EAST 664

656 WW-NORTH

1210 WW-SOUTH

1770 MW-19

MW-18 584

MW-1 392

MW-6 398

MW-9 484

MW-3 472

MW-4 388

MW-7 356

RW-1 384

MW-10 444

LSAU 69

MW-16 398

FLARE

MW-17

LSAU 10

LPU 84

LPU 21

LSAU 61

LA-10

LPU 28

LSAU 14 Active Injection

766 MW-22

MW-5 504

ASPHALT RACK SUMP

PIPELINE OFFICE

LPU 92

2400

2720

2100

MW-23

1800

LPU 95

1040 MW-21

Active Injection LSAU 13

LPU 33 Active Injection

MW-20 726

101B

104B

106A

104A

105A

105B

102A

102B

103A

103B

MW-14 444

LOVINGTON PIPELINE STATION

LEGEND:

MW-13 1510 — MONITOR WELL WITH TOTAL DISSOLVED SOLIDS CONCENTRATION (mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD OF 1000 mg/L

600 — TOTAL DISSOLVED SOLIDS CONCENTRATION (mg/L) (DASHED WHERE APPROXIMATE) CONTOUR INTERVAL 300mg/L UNLESS OTHERWISE SHOWN

GROUNDWATER FLOW DIRECTION (JANUARY, 2012)

♦ OIL AND GAS WELLS

N W E S

100' 0 150' 300' 600'
150' 50'
SCALE

DRAWING TITLE

FIGURE 19
TOTAL DISSOLVED SOLIDS CONCENTRATION MAP
JANUARY 30 - FEBRUARY 2, 2012

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'-0"
DATE	APPR BY	DRAWING NUMBER / REV.
4-13-12	–	Lovington03Q.dwg / 0

Figure 20. Fluoride Concentration Map, February-March 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

LW-9

MW-28 *1.57*

FIRE HOUSE

0.905 WW-EAST

MW-24 *2.16*

LSAU 14 Active injection

LPU 28

MW-5 *1.03*

LSAU 6

LA-10

0.587 MW-22

LSAU 9

LSAU 76 OIL WELLS

LPU 87

1201A

SALT WATER DISPOSAL WELLS (2, PLUGGED)

0.595 MW-27

LPU 22

MW-26 *0.517*

MW-2 *0.763*

MW-29 *0.819*

ASPHALT RACK SUMP

PIPELINE OFFICE

LPU 92

0.676 MW-23

MW-13 *0.281*

MW-11 *0.549*

1209

1208

1207

1215

1214

1203

MW-25 *0.729*

OFFICE

SHOP

MW-15 *0.885*

1201B

REFINERY PROCESS AREA

1205

1206

1204

1202

LPU 95

0.257 MW-21

MW-8 *0.820*

WAREHOUSE

1210

1201C

1201D

MW-1 *0.502*

MW-6 *<0.100*

MW-9 *1.63*

MW-3 *2.58*

WW-NORTH *0.932*

WW-SOUTH *0.647*

MW-19 *0.713*

MW-18 *0.514*

104B

105A

104A

0106A

MW-4 *1.02*

MW-7 *0.599*

RW-1 *1.03*

Active Injection LSAU 13

MW-12 *1.14*

102A

102B

103A

103B

105B

MW-10 *0.945*

LSAU 69

LPU 33 Active Injection

MW-20 *0.603*

101B

MW-16 *0.928*

FLARE

MW-17 *0.435*

LSAU 10

LPU 84

MW-14 *0.918*

LOVINGTON PIPELINE STATION

LPU 21

LEGEND:

MW-9 • MONITOR WELL
1.63 WITH TOTAL FLUORIDE (mg/L)
BOLD – EXCEEDS GROUNDWATER STANDARD 1.6 mg/L

♦ OIL AND GAS WELLS

GROUNDWATER FLOW DIRECTION (FEBRUARY, 2011)

NOTE:
SAMPLES COLLECTED FEBRUARY 24 – MARCH 3, 2011.

N W E S

150' 100' 50' 0 150' 300' 600'
SCALE

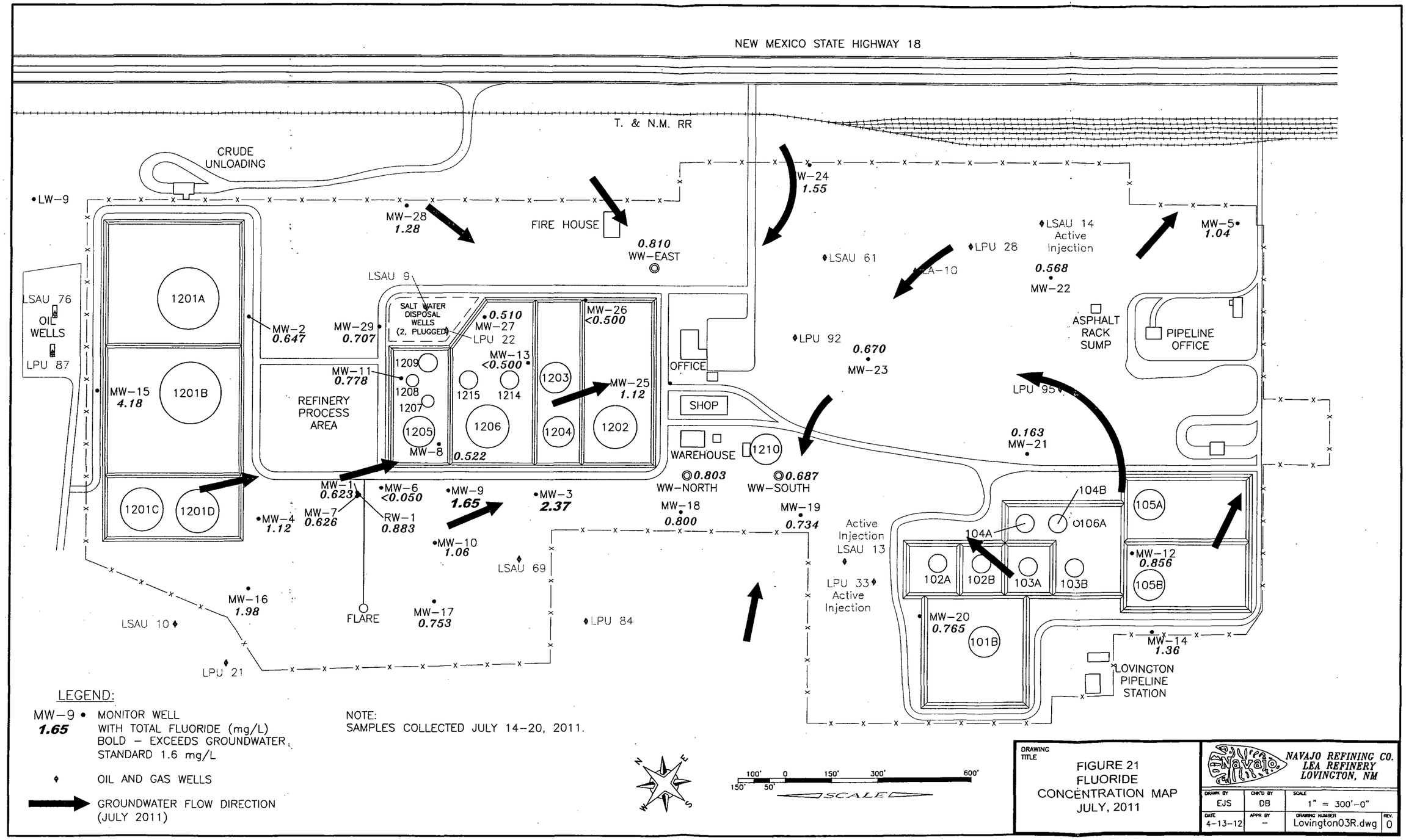
DRAWING TITLE

FIGURE 20
FLUORIDE
CONCENTRATION MAP
FEBRUARY - MARCH, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE	
EJS	DB	1" = 300'-0"	
DATE	APPR BY	DRAWING NUMBER	REV.
4-13-12	–	Lovington03U.dwg	0

Figure 21. Fluoride Concentration Map, July 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico



LEGEND:

MW-9 • **1.65** MONITOR WELL WITH TOTAL FLUORIDE (mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD 1.6 mg/L

♦ OIL AND GAS WELLS

GROUNDWATER FLOW DIRECTION (JULY 2011)

NOTE:
SAMPLES COLLECTED JULY 14–20, 2011.

N E W S

100' 0 150' 300' 600'
150' 50'
SCALE

DRAWING TITLE

FIGURE 21
FLUORIDE
CONCENTRATION MAP
JULY, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'-0"
DATE 4-13-12	APPR BY –	DRAWING NUMBER Lovington03R.dwg REV. 0

Figure 22. Fluoride Concentration Map, January 30-February 2, 2012, Navajo Refining Company, Lea Refinery, Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

LW-9

MW-28 **1.68**

FIRE HOUSE

0.967 WW-EAST

MW-24 **2.42**

LSAU 14 Active Injection

LPU 28

MW-5 **1.05**

LSAU 61

LA-10

0.570 MW-22

LSAU 9

LSAU 76 OIL WELLS

LPU 87

1201A

1201B

1201C

1201D

MW-2 **0.784**

MW-29 **0.769**

SALT WATER DISPOSAL WELLS (2, PLUGGED)

0.691 MW-27

LPU 22

MW-26 **0.568**

MW-13 **0.322**

MW-11 **0.749**

MW-15 **0.840**

1209

1208

1207

1205

1215

1214

1206

1203

1204

1202

MW-25 **0.813**

MW-8 **0.498**

REFINERY PROCESS AREA

OFFICE

SHOP

WAREHOUSE

1210

LPU 92

0.697 MW-23

ASPHALT RACK SUMP

PIPELINE OFFICE

LPU 95

0.229 MW-21

0.977 WW-NORTH

0.756 WW-SOUTH

MW-1 **0.773**

MW-6 **0.313**

MW-9 **2.22**

MW-3 **2.94**

MW-4 **1.08**

MW-7 **0.633**

RW-1 **1.11**

MW-18 **0.722**

MW-19 **0.568**

MW-10 **1.00**

LSAU 69

Active Injection LSAU 13

LPU 33 Active Injection

104B

105A

104A

106A

102A

102B

103A

103B

MW-1

105B

MW-20 **0.641**

101B

MW-14 **0.984**

LOVINGTON PIPELINE STATION

MW-16 **0.994**

LSAU 10

FLARE

MW-17

LPU 84

LPU 21

LEGEND:

MW-9 **2.22** • MONITOR WELL WITH TOTAL FLUORIDE (mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD 1.6 mg/L

♦ OIL AND GAS WELLS

→ GROUNDWATER FLOW DIRECTION (JANUARY 2012)

N E S W

150' 50' 0 100' 150' 300' 600'

SCALE

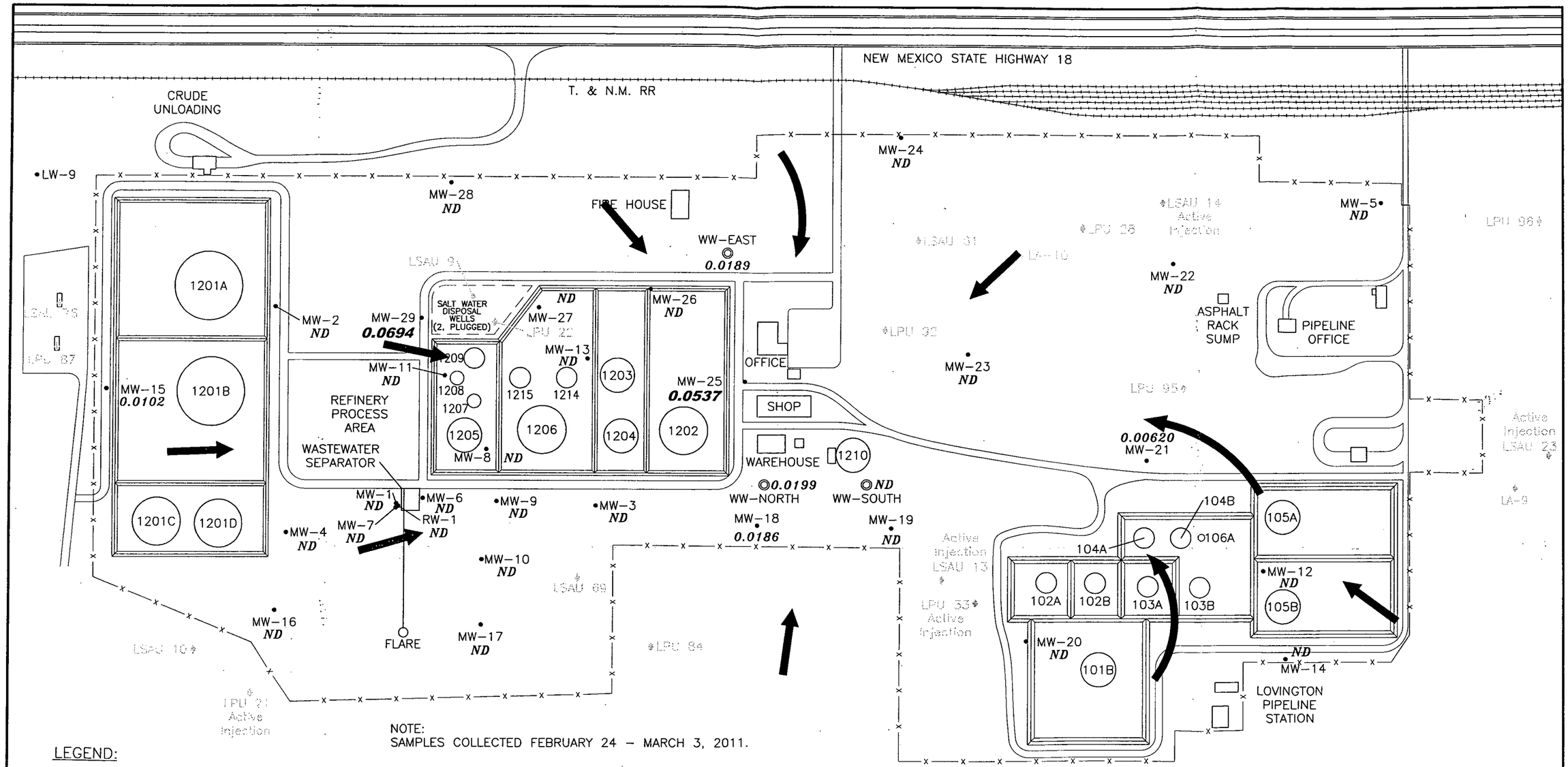
DRAWING TITLE

FIGURE 22
FLUORIDE
CONCENTRATION MAP
JANUARY 30 -
FEBRUARY 2, 2012

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE	
EJS	DB	1" = 300'-0"	
DATE	APPR BY	DRAWING NUMBER	REV.
4-13-12	–	Lovington03R.dwg	0

Figure 23. Chromium Concentration Map, February-March 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico



NOTE:
SAMPLES COLLECTED FEBRUARY 24 – MARCH 3, 2011.

LEGEND:

MW–15 • 0.0102	MONITOR WELL WITH TOTAL CHROMIUM (mg/L)
ND	NOT DETECTED REPORTING LIMIT 0.0050 mg/L
0.0537	BOLD – EXCEEDS GROUNDWATER STANDARD: 0.05 mg/L
→	GROUNDWATER FLOW DIRECTION (FEBRUARY 2011)

DRAWING TITLE

FIGURE 23
CHROMIUM
CONCENTRATION MAP
FEBRUARY - MARCH, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 300'-0"
DATE	APPR BY	DRAWING NUMBER / REV.
4-13-12	–	Lovington03V.dwg / 0

Figure 24. Chromium Concentration Map, July 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

LW-9

MW-28 *ND*

FIRE HOUSE

WW-EAST *0.0200*

MW-24 *ND*

MW-5 *ND*

LSAU 14 Active Injection

LPU 23

LSAU 61

LA-10

LPU 99

MW-22 *ND*

ASPHALT RACK SUMP

PIPELINE OFFICE

LPU 92

MW-23 *ND*

LPU 95

LSAU 9

LSAU 75

LPU 87

1201A

1201B

1201C

1201D

MW-2 *ND*

MW-29 *0.162*

SALT WATER DISPOSAL WELLS (2, PLUGGED)

0.0353

MW-27

LPU 22

MW-26 *ND*

MW-13 *ND*

MW-11 *ND*

MW-15 *0.0132*

REFINERY PROCESS AREA

1209

1208

1207

1205

1215

1214

1206

1203

1204

1202

MW-25 *0.00252*

MW-8 *ND*

OFFICE

SHOP

WAREHOUSE

1210

WASTEWATER SEPARATOR

MW-1 *ND*

MW-6 *0.00972*

RW-1 *ND*

MW-9 *0.00741*

MW-3 *ND*

MW-4 *0.00619*

MW-7 *ND*

MW-10 *ND*

WW-NORTH *0.014*

WW-SOUTH *ND*

MW-18 *0.0111*

MW-19 *ND*

MW-21 *ND*

Active Injection LSAU 13

LPU 33 Active Injection

104B

105A

104A

106A

MW-12 *ND*

105B

102A

102B

103A

103B

MW-20 *ND*

101B

MW-14 *12.5*

LOVINGTON PIPELINE STATION

LSAU 10

LPU 21 Active Injection

LSAU 59

LPU 34

MW-16 *0.0251*

FLARE

MW-17 *ND*

LA-9

NOTE:
SAMPLES COLLECTED JULY 14–20, 2011.

LEGEND:

MW–15 *0.0132* — MONITOR WELL WITH TOTAL CHROMIUM (mg/L)

ND — NOT DETECTED REPORTING LIMIT 0.0050 mg/L

0.162 — BOLD – EXCEEDS GROUNDWATER STANDARD: 0.05 mg/L

GROUNDWATER FLOW DIRECTION (JULY, 2011)

N E S W

100' 0 150' 300' 600'
150' 50'
SCALE

DRAWING TITLE

FIGURE 24
CHROMIUM CONCENTRATION MAP
JULY, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE	
EJS	DB	1" = 300'-0"	
DATE 4-13-12	APPR BY –	DRAWING NUMBER Lovington03S.dwg	REV. 0

Figure 25. Chromium Concentration Map, January 30-February 2, 2012, Navajo Refining Company, Lea Refinery, Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

FIRE HOUSE

LW-9

MW-28 *ND*

MW-24 *ND*

MW-5 *ND*

WW-EAST *0.0166*

LSAU 9

SALT WATER DISPOSAL WELLS (2. PLUGGED)

MW-2 *ND*

MW-29 *0.106*

MW-27 *ND*

MW-26 *ND*

MW-13 *ND*

MW-11 *ND*

MW-15 *0.00644*

MW-25 *0.00744*

MW-8 *ND*

1201A

1201B

1201C

1201D

1209

1208

1207

1205

1215

1214

1206

1203

1204

1202

REFINERY PROCESS AREA

WASTEWATER SEPARATOR

OFFICE

SHOP

WAREHOUSE

1210

MW-1 *ND*

MW-6 *ND*

RW-1 *ND*

MW-4 *ND*

MW-7 *ND*

MW-9 *ND*

MW-3 *ND*

MW-10 *ND*

MW-16 *ND*

MW-17

FLARE

WW-NORTH *0.0145*

WW-SOUTH *ND*

MW-18 *ND*

MW-19 *ND*

LSAU 85

LPU 34

LPU 31 Active Injection

LSAU 10

LSAU 14 Active Injection

LPU 38

LSAU 61

LPU 96

MW-22 *ND*

ASPHALT RACK SUMP

PIPELINE OFFICE

LPU 93

MW-23 *ND*

LPU 95

MW-21 *ND*

Active Injection LSAU 23

LA-9

Active Injection LSAU 13

LPU 33 Active Injection

104B

105A

106A

104A

MW-1

102A

102B

103A

103B

105B

MW-20 *ND*

101B

MW-14 *ND*

LOVINGTON PIPELINE STATION

LEGEND:

MW-15 *0.00644* — MONITOR WELL WITH TOTAL CHROMIUM (mg/L)

ND — NOT DETECTED REPORTING LIMIT 0.0050 mg/L

0.106 — BOLD – EXCEEDS GROUNDWATER STANDARD: 0.05 mg/L

GROUNDWATER FLOW DIRECTION (JANUARY, 2012)

N E S W

100' 0 150' 300' 600'

150' 50'

SCALE

DRAWING TITLE

FIGURE 25
CHROMIUM
CONCENTRATION MAP
JANUARY 30 -
FEBRUARY 2, 2012

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE	
EJS	DB	1" = 300'-0"	
DATE 4-13-12	APPR BY –	DRAWING NUMBER Lovington03S.dwg	REV. 0

Figure 26. Iron and Manganese Concentration Map, February-March 2011, Navajo Refining Company, Lea Refinery, Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

LW-9

MW-28 ND/ND

FIRE HOUSE

ND/ND WW-EAST

MW-24 <0.20/<0.00500

LSAU 14 Active Injection

LPU 28

MW-5 ND/0.0142

LSAU 6

LA-10

MW-22 ND/0.0108

ASPHALT RACK SUMP

PIPELINE OFFICE

LSAU 9

LSAU 76 OIL WELLS

LPU 87

1201A

MW-2 ND/ND

SALT WATER DISPOSAL WELLS (2, PLUGGED)

MW-29 ND/ND

MW-27 ND/0.0336

LPU 22

MW-13 ND/0.225

MW-26 ND/0.00890

LPU 92

MW-23 ND/0.00831

OFFICE

1209

1208

1207

MW-11 ND/0.0101

1215

1214

1203

MW-25 ND/0.00715

LPU 95

MW-15 ND/ND

1201B

REFINERY PROCESS AREA

1205

1206

1204

1202

SHOP

ND/0.101 MW-21

ND/1.62 MW-1

MW-8 ND/0.281

WAREHOUSE

1210

WW-NORTH ND/ND MW-18 ND/0.00536

WW-SOUTH ND/0.0226 MW-19 ND/ND

Active Injection LSAU 13

LPU 33 Active Injection

104B

105A

0106A

104A

MW-12 ND/ND

105B

102A

102B

103A

103B

1201C

1201D

ND/ND MW-4

MW-9 ND/ND

MW-3 ND/ND

MW-6 0.711/5.58

MW-7 ND/0.441

MW-10 ND/ND

LSAU 69

RW-1 ND/0.00933

MW-16 ND/0.00671

FLARE

MW-17 ND/ND

LSAU 10

LPU 84

MW-20 ND/ND

101B

MW-14 ND/0.0234

LOVINGTON PIPELINE STATION

LPU 21

LEGEND:

MW-6 • 0.711/5.58 — MONITOR WELL WITH IRON(mg/L)/MANGANESE(mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD: IRON 1.0 mg/L MANGANESE 0.20 mg/L

ND — NOT DETECTED REPORTING LIMITS: IRON 0.200 mg/l MANGANESE 0.0050 mg/l

♦ OIL AND GAS WELLS

GROUNDWATER FLOW DIRECTION (FEBRUARY 2011)

NOTE:
SAMPLES COLLECTED FEBRUARY 24 – MARCH 3, 2011.

N E W S

100' 0 150' 300' 600'
150' 50'
SCALE

DRAWING TITLE

FIGURE 26
IRON & MANGANESE CONCENTRATION MAP
FEBRUARY - MARCH, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 200'-0"
DATE	APPR BY	DRAWING NUMBER / REV.
4-13-12	–	Lovington03U.dwg / 0

Figure 27. Iron and Manganese Concentration Map, July 2011, Navajo Refining Company, Lea Refinery Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

LW-9

MW-28
ND/0.00658

FIRE HOUSE

ND/ND
WW-EAST

W-24
ND/ND

LSAU 14
Active Injection

MW-5
ND/ND

LSAU 61

LPU 28

LA-10

MW-22
ND/0.00721

ASPHALT RACK SUMP

PIPELINE OFFICE

LPU 92

LSAU 9

0.393/0.0179

SALT WATER DISPOSAL WELLS (2, PLUGGED)

MW-26
ND/ 0.00679

MW-27

LPU 22

MW-13

ND/ 0.302

ND/ 0.00608
MW-25

LSAU 76
OIL WELLS
LPU 87

1201A

MW-2
ND/ND

MW-29
ND/0.00532

1209
1208
1207
1205
MW-8
ND/ND
1215
1214
1206
1203
1204
1202

MW-11
1.77/ 1.05

MW-15
ND/ND

1201B

REFINERY PROCESS AREA

ND/ 0.485
MW-1

OFFICE

SHOP

MW-23
ND/0.00647

LPU 95

ND/0.0346
MW-21

WAREHOUSE

1210

1201C

1201D

ND/0.0114
MW-4

MW-9
ND/ND

MW-6
1.57/ 4.51

MW-7
ND/ 0.617

MW-10
ND/ND

MW-3
ND/ND

WW-NORTH
ND/ND
MW-18
ND/ND

WW-SOUTH
ND/ND
MW-19
ND/0.00781

Active Injection
LSAU 13

LPU 33
Active Injection

104B

105A

104A

0106A

MW-12
ND/0.00976

105B

102A

102B

103A

103B

LSAU 69

RW-1
ND/ND

MW-16
0.613/0.0164

FLARE

MW-17
ND/ND

LSAU 10

LPU 84

MW-20
ND/ND

101B

MW-14
54.9/1.45

LOVINGTON PIPELINE STATION

LPU 21

LEGEND:

MW-6 • *1.57/ 4.51* — MONITOR WELL WITH IRON(mg/L)/MANGANESE(mg/L) BOLD – EXCEEDS GROUNDWATER STANDARD: IRON 1.0 mg/L, MANGANESE 0.20 mg/L

ND — NOT DETECTED
REPORTING LIMITS:
IRON 0.200 mg/l
MANGANESE 0.0050 mg/l

♦ — OIL AND GAS WELLS

→ — GROUNDWATER FLOW DIRECTION (JULY 2011)

NOTE:
SAMPLES COLLECTED JULY 14–20, 2011.

N W E S

150' 50' 0 100' 150' 300' 600'
SCALE

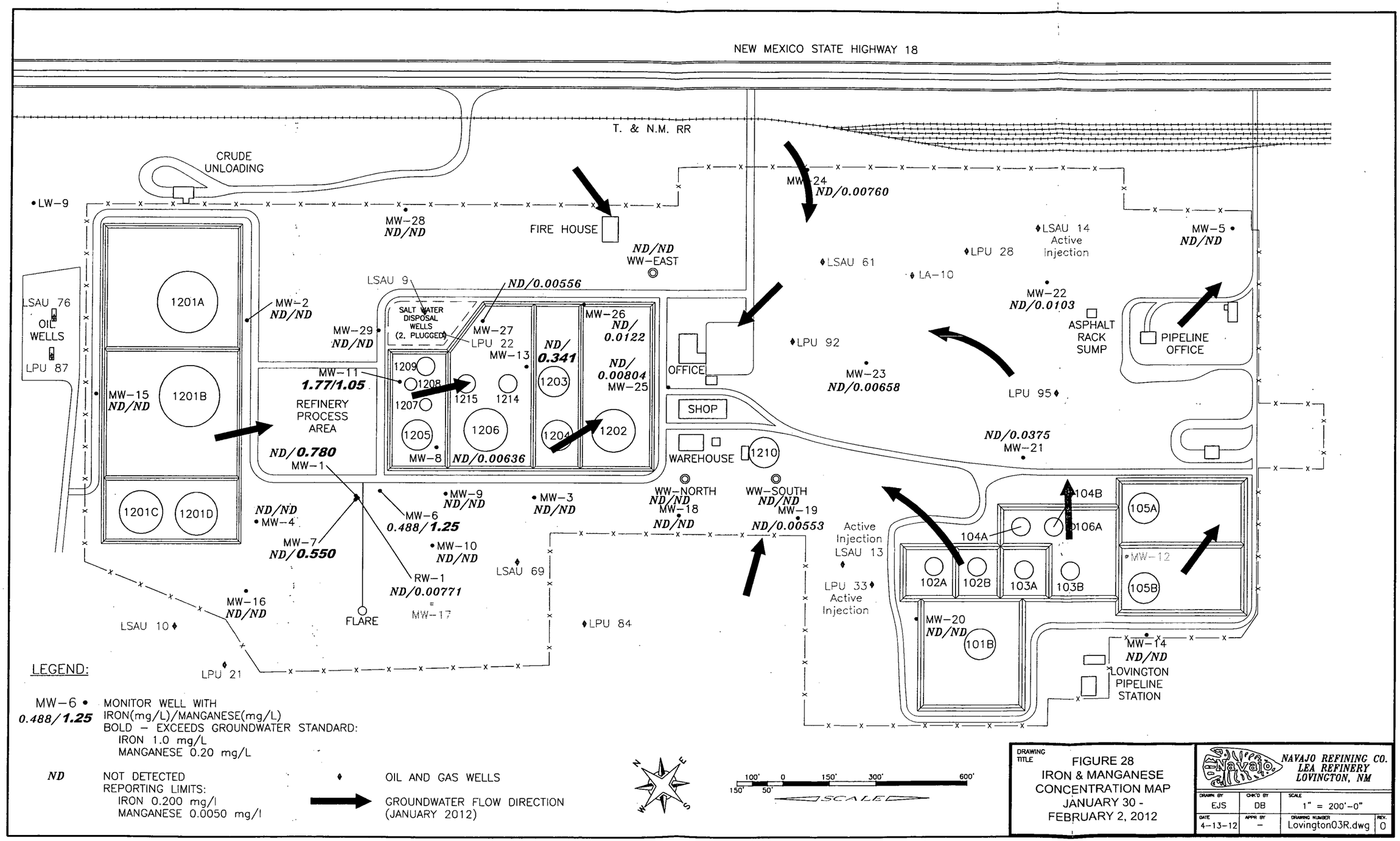
DRAWING TITLE

FIGURE 27
IRON & MANGANESE CONCENTRATION MAP
JULY, 2011

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE
EJS	DB	1" = 200'–0"
DATE	APPR BY	DRAWING NUMBER / REV.
4–13–12	–	Lovington03R.dwg / 0

Figure 29. Status of Nearby Oil and Gas Wells, April 2010, Navajo Refining Company, Lea Refinery Lovington, New Mexico



DRAWING TITLE

FIGURE 28
IRON & MANGANESE CONCENTRATION MAP
JANUARY 30 - FEBRUARY 2, 2012

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE	
EJS	DB	1" = 200'-0"	
DATE	APPR BY	DRAWING NUMBER	REV.
4-13-12	–	Lovington03R.dwg	0

Figure 28. Iron and Manganese Concentration Map, January 30-February 2, 2012, Navajo Refining Company, Lea Refinery, Lovington, New Mexico

NEW MEXICO STATE HIGHWAY 18

T. & N.M. RR

CRUDE UNLOADING

FIRE HOUSE

WW-EAST

WW-NORTH

WW-SOUTH

OFFICE

SHOP

WAREHOUSE

REFINERY PROCESS AREA

WASTEWATER SEPARATOR

SALT WATER DISPOSAL WELLS (2, PLUGGED)

ASPHALT RACK SUMP

PIPELINE OFFICE

LOVINGTON PIPELINE STATION

FLARE

RW-1

MW-1 MW-2 MW-3 MW-4 MW-5 MW-6 MW-7 MW-8 MW-9 MW-10 MW-11 MW-12 MW-13 MW-14 MW-15 MW-16 MW-17 MW-18 MW-19 MW-20 MW-21 MW-22 MW-23 MW-24 MW-25 MW-26 MW-27 MW-28 MW-29

LW-9

1201A 1201B 1201C 1201D

1202 1203 1204 1205 1206 1207 1208 1209 1210 1214 1215

101B 102A 102B 103A 103B 104A 104B 105A 105B 106A

LSAU 76 TA

LPU 87 TA

LSAU 9 I,P&A

LPU 22 I,P&A

LSAU 61 P&A

LA-10 SI

LPU 28 I,P&A

LSAU 14 I Active Injection

LPU 92 P&A

LPU 95 P&A

LPU 96 A

LSAU 23 Active Injection I

LA-9 A

LPU 38 P&A

LSAU 13 I,P&A

LPU 33 I Active Injection

LSAU 69 A

LPU 84 TA

LSAU 10 I,P&A

LPU 21 I Active Injection

LPU 39 I,P&A

LSAU 70 A

LPU 94 P&A

LSAU 24 I Active Injection

LEGEND:

- • MW-8 Monitor Well
- ■ MW-16 Locations of new monitor wells (May-June, 2010)

Oil and Gas Wells

- ♦ LPU Lovington Paddock Unit
- ♦ LSAU Lovington San Andres Unit
- ♦ LA Lovington Abo Unit

A	Active producing
I	Injection
TA	Temporarily Abandoned
P&A	Plugged and Abandoned
SI	Shut-In

SCALE 100' 0 150' 300' 600' (150' 50')

DRAWING TITLE

FIGURE 29
STATUS OF NEARBY
OIL AND GAS WELLS
APRIL, 2012

NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM

DRAWN BY	CHK'D BY	SCALE	
EJS	DB	1" = 300'-0"	
DATE	APPR BY	DRAWING NUMBER	REV.
4-13-12	–	Lovington03T.dwg	0

15. APPENDICES

Appendix A
Copies of Investigated Spill Reports, Navajo Refining Company, Lea Refinery Lovington, New Mexico

P.O. Box 1613
703 E. Clinton
Hobbs, New Mexico 88240
575/397-0510
FAX 575/393-4388
www.sesi-nm.com

Safety & Environmental Solutions, Inc.

January 10, 2012

Mr. Darrell Moore
Environmental Manager for Water and Waste
Navajo Refining Company
P.O. Box 159
Artesia, New Mexico 88211

RE: Report of Investigation, Tank 1215 Release, Navajo Lea Refinery, Lovington, NM

Dear Darrell:

This letter report presents the results of a subsurface investigation conducted to ascertain impacts to soil and possible groundwater effects from a release of crude tank bottoms from Tank 1215 at the Navajo Lea Refinery. The refinery location and site plan are shown in Figures 1 and 2. The investigation involved drilling four boreholes in the vicinity of the subject tank, sampling the soil for volatile and semi volatile organic constituents, and comparing analytical results with soil screening guidance from the New Mexico Environment Department.

Background

On August 1, 2011, during routine rounds an operator at the Lovington facility noticed a small pool of hydrocarbon on the south side of Tank 1215 estimated to be a volume of three barrels. The material was a mixture of asphalt and vacuum gas oil. Because the source of the leak was suspected to be a leak in the floor, the tank was emptied by pumping the to the adjacent 1214 tank. Before emptying was completed, an estimated 280 barrels of material, made more mobile by the heat of the day, had been released to the ground surface and almost completely encircled the tank.

The New Mexico Oil Conservation Division was notified of the release by email to Mr. Carl Chavez on August 1 at 7:35 a.m. A form C-141 was prepared and submitted to the OCD on August 2, 2011.

Cleanup involved use of two vacuum trucks to remove the spilled material. In addition two small dikes were constructed to contain the material into smaller areas. The final action involved picking up contaminated soil and placing into roll-off bins. In addition to the released material surrounding Tank 1215 and the northwest side of Tank 1214, some liquid flowed in a small stream to the east about 140 feet and ponded in a shallow depression inside the bermed area. This material was also vacuumed and underlying soil removed.

Work Performed

Safety and Environmental Solutions (SESI) was requested to advance soil borings and collect samples in area of the release and at the location of the shallow depression to the east. Because the earth material immediately beneath the surface soil is hard, consolidated caliche a hollow-stem auger drilling rig was employed to drill the soil borings.

On October 25, 2011 after having performed NM one-call notification and receiving a Navajo excavation permit SESI drilled four boreholes in the interior of the berm that surrounds tank 1215 and others. The holes were drilled on the west, south and east sides of the tank. Due to piping and other infrastructure, no borings were possible on the north side of the tank. Borehole locations are shown on Figure 3.

Drilling was performed using a Foremost-Mobile B-57 hollow-stem auger with a bit diameter of 8 ¼ inches. Drilling was performed by Eco-Enviro Drilling of Lovington, NM which is a licensed New Mexico water well drilling company. The boreholes were drilled to a depth of 20 to 25 feet and soil samples collected for analysis. The boreholes were plugged back to surface with bentonite and hydrated. Borehole logs with lithologic information, drilling details and chemical testing results are included as an attachment.

Samples were collected every 5 feet for PID screening and submitted to the analytical laboratory (ALS Environmental, Houston Texas) for analysis. The results of the PID screening are shown in Table 1. Laboratory analyses were performed for total petroleum hydrocarbons (GRO, DRO and MORO TPH), and volatile and low-level semi-volatile hydrocarbons.

Results

The analytical results are shown in Table 2 together with reporting limits, EPA methods used and NMED soil screening levels. In general, analyses of the soil samples did not detect elevated levels of volatile or semi-volatile hydrocarbons except in the top 4 to 5 feet of two of the four boreholes.

The soil sample from the 4 to 5 feet interval in BH-1 (located adjacent to the west side of tank 1215) detected numerous low-level semi-volatiles all of which were below NMED industrial soil screening levels. The highest concentrations, exceeding 1.0 mg/Kg, were of chrysene, fluoranthene and pyrene with the highest being fluoranthene at 1.8 mg/Kg. These three constituents were also detected (together with Benzo(b)fluoranthene) in the 14-15 feet though at concentrations about 100 times less than in the upper interval. At 19 to 20 feet, only fluoranthene at 0.0077 mg/Kg was detected. No volatiles or gasoline range TPH organics were detected in the sample though diesel and motor oil range TPH organics were detected; total TPH organics were below the industrial soil screening level for fuel oils, which is most representative of the material released.

BH-2 was located near the northeast side of nearby tank 1214. No detections of volatiles or semi-volatiles were seen in this borehole except for a phthalate detected at the reporting level at 19-20 feet which may be a laboratory artifact. However a motor oil TPH of 340 mg/Kg was seen in the five foot sample which may be from stained caliche as no other organics were detected.

BH-3 located on the east side of the tank and about 30 feet away did not show any detections of volatile or semi-volatile organics in any soil interval from 10 to 20 feet (no sample was present in the sample tube at 5 feet). However a detection of diesel range organics slightly above the reporting limit was seen in the 19 to 20 feet interval.

Detections in BH-4 were dissimilar from the other boreholes in that volatiles were seen in the upper 4 to 5 feet interval including ethylbenzene, toluene and total xylenes. No benzene was detected and only two semivolatiles (benzo(g,h,i)perylene and naphthalene). Though xylenes and 1,2,4-trimethylbenzene were at or above 1.0 mg/Kg, these and other analytical values were below soil

screening values for industrial soil. Total TPH (449 mg/Kg) included a low level detection for GRO (8.5 mg/Kg) with the majority of the TPH being in the motor oil range.

Semi-volatiles in BH-4 in the 4 to 5 feet interval were naphthalene and 2-methylnaphthalene, and Benzo(g,h,i)perylene. All detections were in parts per billion range and well below the associated soil screening level for industrial soil. The only detection below 5 feet was Benzo(b)fluoranthene in the sample from 24 to 25 feet. The level of 0.0092 mg/Kg was over 2,000 times less than the soil screening value.

With one exception, all results in all boreholes were below associated soil screening levels for groundwater protection. The exception was 1,2,4-trimethylbenzene in the 4 to 5 foot interval in BH-4. The detection value was 1.5 mg/Kg and the groundwater soil screening value was 1.42 mg/Kg. Addition discussion of this is provided below.

Discussion:

The New Mexico Environment Department has developed a methodology for evaluating releases of hydrocarbons into the environment. Below is their rationale for its use:

> *Soil Screening Guidance provides site managers with a framework for developing and applying the SSLs, and is likely to be most useful for determining whether areas or entire sites are contaminated to an extent that warrants further investigation. It is intended to assist and streamline the site investigation and corrective action process by focusing resources on those sites or areas that pose the greatest risk to human health and the environment. Implementation of the methodologies outlined within this SSG may significantly reduce the time necessary to complete site investigations and cleanup actions at certain sites, as well as improve the consistency of these investigations.*
>
> *Between various sites there can exist a wide spectrum of contaminant types and concentrations. The level of concern associated with those concentrations depends on several factors, including the likelihood of exposure to levels of potential concern to human health or to ecological receptors. At one end of the spectrum are levels that clearly warrant a response action; at the other end are levels that are below regulatory concern. Appropriate cleanup goals for a site may fall anywhere within this range depending on site-specific conditions. It is important to note that SSLs do not in themselves represent cleanup standards, and the SSLs alone do not trigger the need for a response action or define "unacceptable" levels of contamination in soil. Screening levels such as SSLs identify the lower end of this spectrum – levels below which there is generally no need for further concern—provided the conditions associated with the development of the SSLs are consistent.*

The borehole soil samples showed semi-volatile hydrocarbons to be generally present only in the upper 4 to 5 feet interval in boreholes BH-1 and BH-4. Lower intervals showed only isolated impacts and all were well below soil screening levels for soil at industrial locations. Volatiles were present only in the 4 to 5 feet interval in BH-4.

As mentioned above, one volatile detection in BH-4 was slightly above the soil screening level for groundwater protection. However, the groundwater protection levels are very conservative and site

conditions at the Lea Refinery do not approach the assumptions provided for use. In the guidance, the screening levels assume a continuous leak to groundwater with no dilution or attenuation in the vadose zone and only dilution in the saturated zone. The leak at the refinery was a one time event, depth to groundwater is in excess of 100 feet, and drilling investigation showed no or only minor impacts at depths from 20 to 25 feet. Therefore the detection of 1,2,4-trimethylbenzene in the 4 to 5 feet interval in BH-4 will have no impact in groundwater given that detection is limited to that interval.

Conclusion:
The investigation showed that impacts of the release were limited in vertical extent and that removal of liquid and severely impacted near-surface soil material mitigated downward migration of hydrocarbons. The remaining hydrocarbons, mostly present at a depth of 4 to 5 feet interval are below soil screening guidance levels for industrial soil.

Therefore, based on the comparison and evaluation of the analytical results with the associated soil screening levels, no further subsurface investigation is necessary or cleanup required for soils surrounding the tank from which the release occurred. However it is suggested that clean fill material be used to fill in areas excavated to prevent ponding of rainwater or in the event of a reoccurrence.

If you have any questions regarding this report, please contact me at (575) 397-0510.

Sincerely yours,

David G. Boyer, P.G.

Encl. (tables, figures analytical results, form C-141)

Table 1. Soil PID Measurements, Tanks 834-838 Investigation, May 2001, Navajo Refining Company, Artesia, NM

BH-1			
Time	**Depth (feet)**	**PID (ppm)**	**Selected for Analysis?**
10:30	4-5	- -	Yes
- -	9-10	15.1	No (insufficient amount)
10:55	14-15	33.2	Yes
11:05	19-20	33.8	Yes
BH-2			
Time	**Depth (feet)**	**PID (ppm)**	**Selected for Analysis?**
11:45	4-5	30.9	Yes
11:55	9-10	43.1	Yes
12:05	14-15	30.6	Yes
12:15	19-20	- -	Yes
BH-3			
Time	**Depth (feet)**	**PID (ppm)**	**Selected for Analysis?**
- -	4-5	- -	No returns
12:50	9-10	26.7	Yes
13:05	14-15	35.6	Yes
13:15	19-20	43.4	Yes
BH-4			
Time	**Depth (feet)**	**PID (ppm)**	**Selected for Analysis?**
13:30	4-5	126	Yes (from cuttings)
13:40	9-10	44.9	Yes
13:50	14-15	39.0	Yes
15:05	19-20	42.3	Yes
14:15	24-25	44.0	Yes
Note:			
Sampling date October 25, 2011			
PID measurements made using a MiniRae 2000 calibrated with			
100 ppm of isobutylene.			
PID value not shown: Insufficient sample for analysis			

Table 2. Summary of Soil Constituent Concentrations in Boreholes, Tank 1215 Release Investigation, October 2011, Navajo Lea Refinery

Borehole	BH-1			NMED Soil Screening Levels	
Depth	4-5 feet	14-15 feet	19-20 feet	Industrial Soil	Groundwater DAF 20
ALS laboratory ID	1110902-01	1110902-02	1110902-03	(mg/Kg)	(mg/Kg)
Total Petroleum Hydrocarbons					
TPH-GRO (mg/Kg)	<0.050	<0.050	<0.050	--	--
TPH-DRO (mg/Kg)	**35**	<1.7	<1.7	--	--
TPH-MORO (mg/Kg)	**310**	<3.4	<3.4	--	--
Total TPH	**345**	--	--	890 (fuel oil)	--
Volatiles					
Benzene (mg/Kg)	<0.0050	<0.0050	<0.0050	25.8	0.0201
Ethylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	128	20.2
Toluene (mg/Kg)	<0.0050	<0.0050	<0.0050	252	21.7
Total Xylenes (mg/Kg)	<0.015	<0.015	<0.015	82.0	2.06
1,2,4-Trimethylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	213	1.42
1,3,5-Trimethyl-benzene (mg/Kg)	<0.0050	<0.0050	<0.0050	69.2	0.355
2-Butanone (MEK, mg/Kg)	<0.010	<0.010	<0.010	48700	25.5
4-Isopropyltoluene (mg/Kg)	<0.0050	<0.0050	<0.0050	--	--
Acetone (mg/Kg)	<0.020	<0.020	<0.020	100000	19.1
Carbon disulfide (mg/Kg)	<0.010	<0.010	<0.010	460	7.89
Isopropylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	--	--
MTBE (mg/Kg)	<0.0050	<0.0050	<0.0050	984	--
Naphthalene (8260, mg/Kg)	<0.0050	<0.0050	<0.0050	300	0.394
n-Butylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	62.1	5.40
n-Propylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	62.1	5.40
sec-Butylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	60.6	4.33
Notes:					
	1. Sampling date: October 25, 2011				
	2. Complete list of organic constituents analyzed and reporting limits included				
	with analytical results				
	3. Methods: TPH SW8015, Volatiles SW8260, Low-level semi-volatiles SW8270				
	4. Analyses performed by ALS Environmental, Houston, Texas				

Table 2. Summary of Soil Constituent Concentrations in Boreholes, Tank 1215 Release Investigation, October 2011, Navajo Lea Refinery

Borehole	BH-1			NMED Soil Screening Levels	
Depth	4-5 feet	14-15 feet	19-20 feet	Industrial Soil	Groundwater DAF 20
ALS laboratory ID	1110902-01	1110902-02	1110902-03	(mg/Kg)	(mg/Kg)
Semivolatiles					
1,1-Biphenyl (mg/Kg)	<0.0066	<0.0066	<0.0066	27,300	72.2
2-Methylnaphthalene (mg/Kg)	**0.0092**	<0.0066	<0.0066	1,000	--
Acenaphthlene (mg/Kg)	**0.0078**	<0.0066	<0.0066	33,500	54.9
Acenaphthylene (mg/Kg)	<0.0066	<0.0066	<0.0066	--	--
Acetophenone (mg/Kg)	<0.0066	<0.0066	<0.0066	1,480	2.95
Anthracene (mg/Kg)	**0.083**	<0.0066	<0.0066	100,000	1,620
Atrazine (mg/Kg)	<0.0066	<0.0066	<0.0066	--	--
Benz(a)anthracene (mg/Kg)	**0.59**	<0.0066	<0.0066	23.4	10.9
Benzo(a)pyrene (mg/Kg)	**0.36**	<0.0066	<0.0066	2.3	2.78
Benzo(b)fluoranthene (mg/Kg)	**0.92**	**0.0077**	<0.0066	23.4	33.5
Benzo(g,h,i)perylene (mg/Kg)	**0.27**	<0.0066	<0.0066	--	--
Benzo(k)fluoranthene (mg/Kg)	**0.32**	<0.0066	<0.0066	234	335
Bis(2-ethylhexyl)phthalate (mg/Kg)	<0.0066	<0.0066	<0.0066	1,370	21,500
Carbazole (mg/Kg)	**0.016**	<0.0066	<0.0066	--	--
Chrysene (mg/Kg)	**1.0**	**0.0081**	<0.0066	2,310	348
Dibenz(a,h)anthracene (mg/Kg)	**0.1**	<0.0066	<0.0066	2.34	10.4
Dibenzofuran (mg/Kg)	**0.011**	<0.0066	<0.0066	1,620	2.87
Fluoranthene (mg/Kg)	**1.8**	**0.010**	**0.0077**	24,400	4,690
Fluorene (mg/Kg)	**0.033**	<0.0066	<0.0066	26,500	58.5
Indeno(1,2,3-c,d)pyrene (mg/Kg)	**0.26**	<0.0066	<0.0066	23.4	94.6
Naphthalene (8270, mg/Kg)	<0.0066	<0.0066	<0.0066	300	0.394
Phenanthrene (mg/Kg)	**0.54**	<0.0066	<0.0066	20,500	464
Pyrene (mg/Kg)	**1.6**	**0.0079**	<0.0066	30,900	373
Notes:					
	1. Sampling date: October 25, 2011				
	2. Complete list of organic constituents analyzed and reporting limits included				
	with analytical results				
	3. Methods: TPH SW8015, Volatiles SW8260, Low-level semi-volatiles SW8270				
	4. Analyses performed by ALS Environmental, Houston, Texas				

Table 2. Summary of Soil Constituent Concentrations in Boreholes, Tank 1215 Release Investigation, October 2011, Navajo Lea Refinery

Borehole	BH-2				NMED Soil Screening Levels	
Depth	4-5 feet	9-10 feet	14-15 feet	19-20 feet	Industrial Soil	Groundwater DAF 20
ALS laboratory ID	1110902-04	1110902-05	1110902-06	1110902-07	(mg/Kg)	(mg/Kg)
Total Petroleum Hydrocarbons						
TPH-GRO (mg/Kg)	<0.050	<0.050	<0.050	<0.050	--	--
TPH-DRO (mg/Kg)	<34	<1.7	<1.7	<1.7	--	--
TPH-MORO (mg/Kg)	340	<3.4	<3.4	<3.4	--	--
Total TPH	340	--	--	--	890 (fuel oil)	--
Volatiles						
Benzene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	25.8	0.0201
Ethylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	128	20.2
Toluene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	252	21.7
Total Xylenes (mg/Kg)	<0.015	<0.015	<0.015	<0.015	82.0	2.06
1,2,4-Trimethylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	213	1.42
1,3,5-Trimethyl-benzene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	69.2	0.355
2-Butanone (MEK, mg/Kg)	<0.010	<0.010	<0.010	<0.010	48700	25.5
4-Isopropyltoluene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	--	--
Acetone (mg/Kg)	<0.020	<0.020	<0.020	<0.020	100000	19.1
Carbon disulfide (mg/Kg)	<0.010	<0.010	<0.010	<0.010	460	7.89
Isopropylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	--	--
MTBE (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	984	--
Naphthalene (8260, mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	300	0.394
n-Butylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	62.1	5.40
n-Propylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	62.1	5.40
sec-Butylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	60.6	4.33
Notes:						
	1. Sampling date: October 25, 2011					
	2. Complete list of organic constituents analyzed and reporting limits included					
	with analytical results					
	3. Methods: TPH SW8015; Volatiles SW8260, Low-level semi-volatiles SW8270					
	4. Analyses performed by ALS Environmental, Houston, Texas					

Table 2. Summary of Soil Constituent Concentrations in Boreholes, Tank 1215 Release Investigation, October 2011, Navajo Lea Refinery

Borehole	BH-2				NMED Soil Screening Levels	
Depth	4-5 feet	9-10 feet	14-15 feet	19-20 feet	Industrial Soil	Groundwater DAF 20
ALS laboratory ID	1110902-04	1110902-05	1110902-06	1110902-07	(mg/Kg)	(mg/Kg)
Semivolatiles						
1,1-Biphenyl (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	27,300	72.2
2-Methylnaphthalene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	1,000	--
Acenaphthlene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	33,500	54.9
Acenaphthylene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	--	--
Acetophenone (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	1,480	2.95
Anthracene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	100,000	1,620
Atrazine (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	--	--
Benz(a)anthracene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	23.4	10.9
Benzo(a)pyrene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	2.3	2.78
Benzo(b)fluoranthene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	23.4	33.5
Benzo(g,h,i)perylene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	--	--
Benzo(k)fluoranthene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	234	335
Bis(2-ethylhexyl)phthalate (mg/Kg)	<0.0066	<0.0066	<0.0066	**0.0068**	1,370	21,500
Carbazole (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	--	--
Chrysene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	2,310	348
Dibenz(a,h)anthracene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	2.34	10.4
Dibenzofuran (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	1,620	2.87
Fluoranthene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	24,400	4,690
Fluorene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	26,500	58.5
Indeno(1,2,3-c,d)pyrene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	23.4	94.6
Naphthalene (8270, mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	300	0.394
Phenanthrene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	20,500	464
Pyrene (mg/Kg)	<0.0066	<0.0066	<0.0066	<0.0066	30,900	373
Notes:						
	1. Sampling date: October 25, 2011					
	2. Complete list of organic constituents analyzed and reporting limits included					
	with analytical results					
	3. Methods: TPH SW8015, Volatiles SW8260, Low-level semi-volatiles SW8270					
	4. Analyses performed by ALS Environmental, Houston, Texas					

Table 2. Summary of Soil Constituent Concentrations in Boreholes, Tank 1215 Release Investigation, October 2011, Navajo Lea Refinery

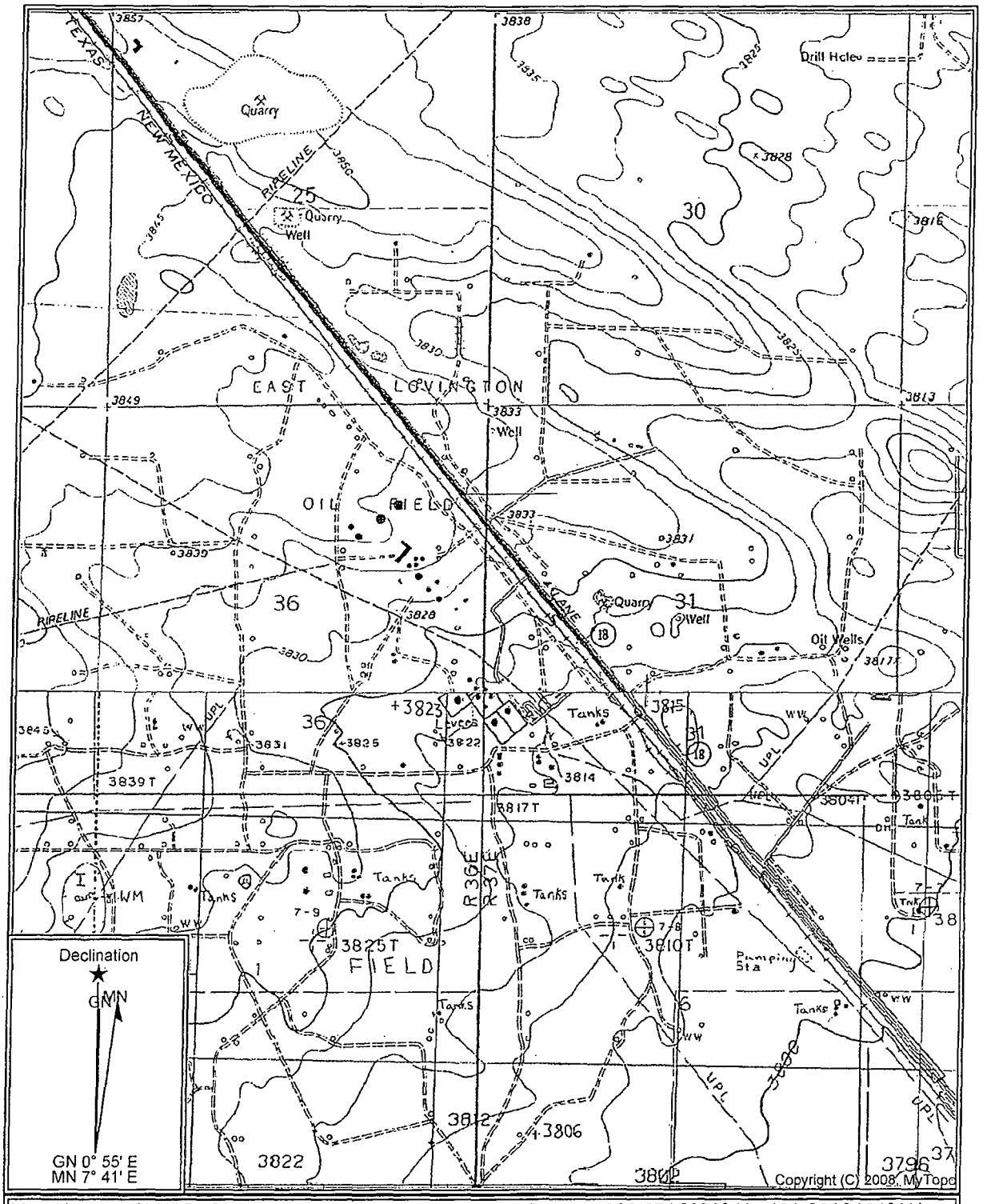
Borehole	BH-3			NMED Soil Screening Levels	
Depth	9-10 feet	14-15 feet	19-20 feet	Industrial Soil	Groundwater DAF 20
ALS laboratory ID	1110902-08	1110902-09	1110902-10	(mg/Kg)	(mg/Kg)
Total Petroleum Hydrocarbons					
TPH-GRO (mg/Kg)	<0.050	<0.050	<0.050	--	--
TPH-DRO (mg/Kg)	<1.7	<1.7	**2.4**	--	--
TPH-MORO (mg/Kg)	<3.4	<3.4	<3.4	--	--
Total TPH	--	--	--	890 (fuel oil)	--
Volatiles					
Benzene (mg/Kg)	<0.0050	<0.0050	<0.0050	25.8	0.0201
Ethylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	128	20.2
Toluene (mg/Kg)	<0.0050	<0.0050	<0.0050	252	21.7
Total Xylenes (mg/Kg)	<0.015	<0.015	<0.015	82.0	2.06
1,2,4-Trimethylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	213	1.42
1,3,5-Trimethyl-benzene (mg/Kg)	<0.0050	<0.0050	<0.0050	69.2	0.355
2-Butanone (MEK, mg/Kg)	<0.010	<0.010	<0.010	48700	25.5
4-Isopropyltoluene (mg/Kg)	<0.0050	<0.0050	<0.0050	--	--
Acetone (mg/Kg)	<0.020	<0.020	<0.020	100000	19.1
Carbon disulfide (mg/Kg)	<0.010	<0.010	<0.010	460	7.89
Isopropylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	--	--
MTBE (mg/Kg)	<0.0050	<0.0050	<0.0050	984	--
Naphthalene (8260, mg/Kg)	<0.0050	<0.0050	<0.0050	300	0.394
n-Butylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	62.1	5.40
n-Propylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	62.1	5.40
sec-Butylbenzene (mg/Kg)	<0.0050	<0.0050	<0.0050	60.6	4.33
Notes:					
	1. Sampling date: October 25, 2011				
	2. Complete list of organic constituents analyzed and reporting limits included				
	with analytical results				
	3. Methods: TPH SW8015, Volatiles SW8260, Low-level semi-volatiles SW8270				
	4. Analyses performed by ALS Environmental, Houston, Texas				

Table 2. Summary of Soil Constituent Concentrations in Boreholes, Tank 1215 Release Investigation, October 2011, Navajo Lea Refinery

Borehole	BH-3			NMED Soil Screening Levels	
Depth	9-10 feet	14-15 feet	19-20 feet	Industrial Soil	Groundwater DAF 20
ALS laboratory ID	1110902-08	1110902-09	1110902-10	(mg/Kg)	(mg/Kg)
Semivolatiles					
1,1-Biphenyl (mg/Kg)	<0.0066	<0.0066	<0.0066	27,300	72.2
2-Methylnaphthalene (mg/Kg)	<0.0066	<0.0066	<0.0066	1,000	--
Acenaphthlene (mg/Kg)	<0.0066	<0.0066	<0.0066	33,500	54.9
Acenaphthylene (mg/Kg)	<0.0066	<0.0066	<0.0066	--	--
Acetophenone (mg/Kg)	<0.0066	<0.0066	<0.0066	1,480	2.95
Anthracene (mg/Kg)	<0.0066	<0.0066	<0.0066	100,000	1,620
Atrazine (mg/Kg)	<0.0066	<0.0066	<0.0066	--	--
Benz(a)anthracene (mg/Kg)	<0.0066	<0.0066	<0.0066	23.4	10.9
Benzo(a)pyrene (mg/Kg)	<0.0066	<0.0066	<0.0066	2.3	2.78
Benzo(b)fluoranthene (mg/Kg)	<0.0066	<0.0066	<0.0066	23.4	33.5
Benzo(g,h,i)perylene (mg/Kg)	<0.0066	<0.0066	<0.0066	--	--
Benzo(k)fluoranthene (mg/Kg)	<0.0066	<0.0066	<0.0066	234	335
Bis(2-ethylhexyl)phthalate (mg/Kg)	<0.0066	<0.0066	<0.0066	1,370	21,500
Carbazole (mg/Kg)	<0.0066	<0.0066	<0.0066	--	--
Chrysene (mg/Kg)	<0.0066	<0.0066	<0.0066	2,310	348
Dibenz(a,h)anthracene (mg/Kg)	<0.0066	<0.0066	<0.0066	2.34	10.4
Dibenzofuran (mg/Kg)	<0.0066	<0.0066	<0.0066	1,620	2.87
Fluoranthene (mg/Kg)	<0.0066	<0.0066	<0.0066	24,400	4,690
Fluorene (mg/Kg)	<0.0066	<0.0066	<0.0066	26,500	58.5
Indeno(1,2,3-c,d)pyrene (mg/Kg)	<0.0066	<0.0066	<0.0066	23.4	94.6
Naphthalene (8270, mg/Kg)	<0.0066	<0.0066	<0.0066	300	0.394
Phenanthrene (mg/Kg)	<0.0066	<0.0066	<0.0066	20,500	464
Pyrene (mg/Kg)	<0.0066	<0.0066	<0.0066	30,900	373
Notes:					
	1. Sampling date: October 25, 2011				
	2. Complete list of organic constituents analyzed and reporting limits included				
	with analytical results				
	3. Methods: TPH SW8015, Volatiles SW8260, Low-level semi-volatiles SW8270				
	4. Analyses performed by ALS Environmental, Houston, Texas				

Table 2. Summary of Soil Constituent Concentrations in Boreholes, Tank 1215 Release Investigation, October 2011, Navajo Lea Refinery

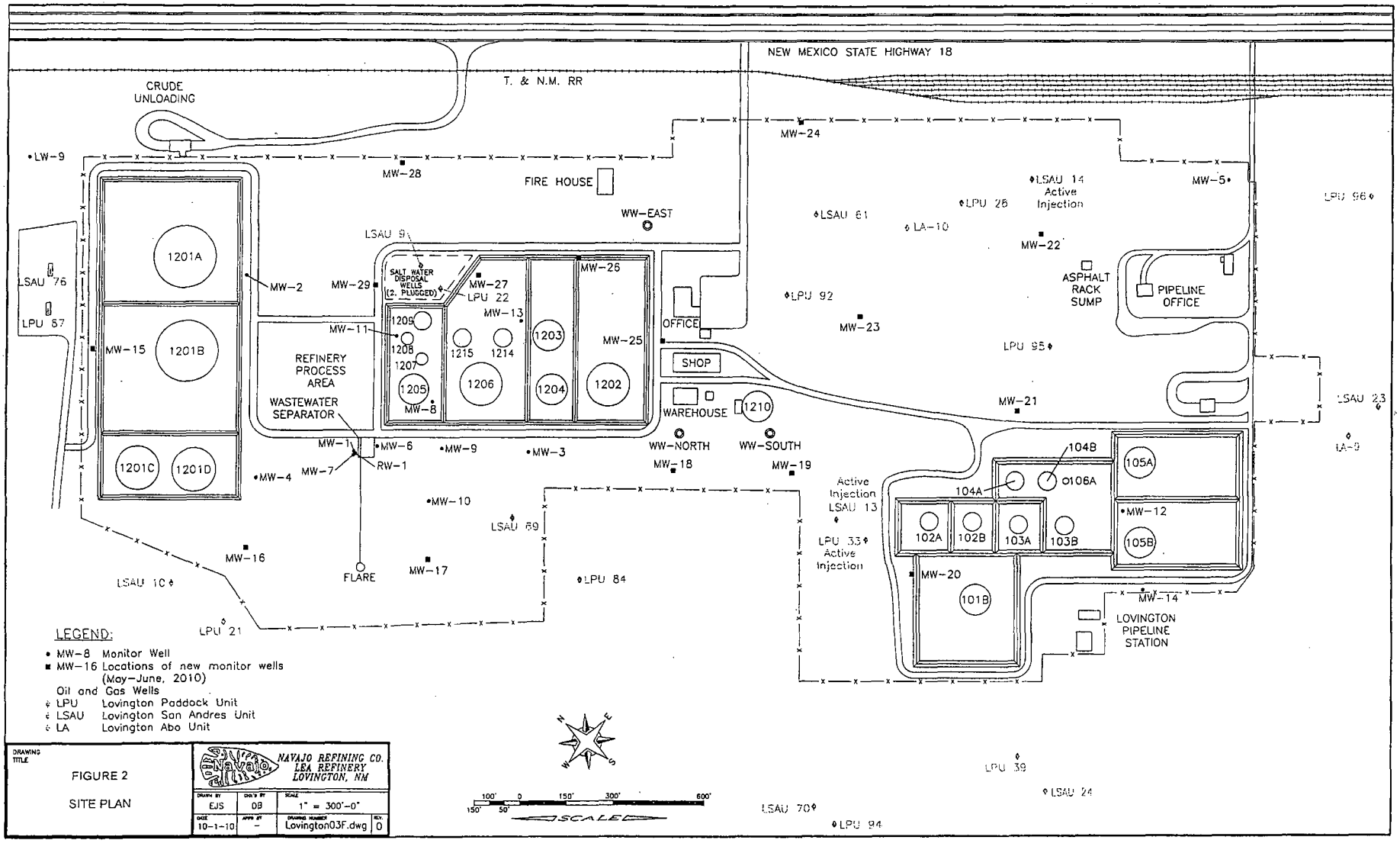
Borehole	BH-4					NMED Soil Screening Levels	
Depth	4-5 feet	9-10 feet	14-15 feet	19-20 feet	24-25 feet	Industrial Soil	Groundwater DAF 20
ALS laboratory ID	1110902-11	1110902-12	1110902-13	1110902-14	1110902-15	(mg/Kg)	(mg/Kg)
Total Petroleum Hydrocarbons							
TPH-GRO (mg/Kg)	**8.5**	<0.050	<0.050	<0.050	<0.050	--	--
TPH-DRO (mg/Kg)	**170**	<1.7	<1.7	<1.7	<1.7	--	--
TPH-MORO (mg/Kg)	**270**	<3.4	<3.4	<3.4	<3.4	--	--
Total TPH	**449**	--	--	--	--	890 (fuel oil)	--
Volatiles							
Benzene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	25.8	0.0201
Ethylbenzene (mg/Kg)	**0.58**	<0.0050	<0.0050	<0.0050	<0.0050	128	20.2
Toluene (mg/Kg)	**0.0079**	<0.0050	<0.0050	<0.0050	<0.0050	252	21.7
Total Xylenes (mg/Kg)	**1.0**	<0.015	<0.015	<0.015	<0.015	82.0	2.06
1,2,4-Trimethylbenzene (mg/Kg)	**1.5**	<0.0050	<0.0050	<0.0050	<0.0050	213	1.42
1,3,5-Trimethyl-benzene (mg/Kg)	**0.10**	<0.0050	<0.0050	<0.0050	<0.0050	69.2	0.355
2-Butanone (MEK, mg/Kg)	<0.010	<0.010	<0.010	<0.010	<0.010	48700	25.5
4-Isopropyltoluene (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--
Acetone (mg/Kg)	<0.020	<0.020	<0.020	<0.020	<0.020	100000	19.1
Carbon disulfide (mg/Kg)	<0.010	<0.010	<0.010	<0.010	<0.010	460	7.89
Isopropylbenzene (mg/Kg)	**0.088**	<0.0050	<0.0050	<0.0050	<0.0050	--	--
MTBE (mg/Kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	984	--
Naphthalene (8260, mg/Kg)	**0.095**	<0.0050	<0.0050	<0.0050	<0.0050	300	0.394
n-Butylbenzene (mg/Kg)	**0.072**	<0.0050	<0.0050	<0.0050	<0.0050	62.1	5.40
n-Propylbenzene (mg/Kg)	**0.13**	<0.0050	<0.0050	<0.0050	<0.0050	62.1	5.40
sec-Butylbenzene (mg/Kg)	**0.046**	<0.0050	<0.0050	<0.0050	<0.0050	60.6	4.33
Notes:							
	1. Sampling date: October 25, 2011						
	2. Complete list of organic constituents analyzed and reporting limits included						
	with analytical results						
	3. Methods: TPH SW8015, Volatiles SW8260, Low-level semi-volatiles SW8270						
	4. Analyses performed by ALS Environmental, Houston, Texas						



Map Name: LOVINGTON,
Scale: 1 inch = 2,000 ft.

Map Center: 032.8785358° N 103.2992131° W
Horizontal Datum: WGS84

Figure 1. Location Map, Navajo Lea Refinery, Lovington, New Mexico


NEW MEXICO STATE HIGHWAY 18
T. & N.M. RR
CRUDE UNLOADING
FIRE HOUSE
WW-EAST
MW-24
MW-28
LW-9
MW-5
LSAU 14 Active Injection
LPU 26
LSAU 61
LA-10
LPU 98
MW-22
ASPHALT RACK SUMP
PIPELINE OFFICE
LSAU 9
SALT WATER DISPOSAL WELLS (2, PLUGGED)
MW-27
LPU 22
MW-26
MW-29
MW-2
LSAU 76
LPU 87
1201A
1201B
1201C
1201D
MW-15
MW-11
1209
1208
1207
1205
1215
1214
1206
1203
1204
1202
MW-13
MW-25
OFFICE
LPU 92
MW-23
LPU 95
SHOP
REFINERY PROCESS AREA
WASTEWATER SEPARATOR
MW-8
WAREHOUSE
1210
MW-21
LSAU 23
LA-9
MW-1
MW-6
MW-9
MW-3
RW-1
MW-7
MW-4
WW-NORTH
WW-SOUTH
MW-18
MW-19
104B
105A
0106A
104A
MW-12
102A
102B
103A
103B
105B
Active Injection LSAU 13
LPU 33 Active Injection
MW-10
LSAU 69
MW-16
MW-17
FLARE
LSAU 10
LPU 84
MW-20
101B
MW-14
LOVINGTON PIPELINE STATION
LPU 21
LPU 39
LSAU 24
LSAU 70
LPU 94
LEGEND:
• MW-8 Monitor Well
■ MW-16 Locations of new monitor wells (May-June, 2010)
Oil and Gas Wells
LPU Lovington Paddock Unit
LSAU Lovington San Andres Unit
LA Lovington Abo Unit
N
E
S
W
100' 0 150' 300' 600'
150' 50'
SCALE
DRAWING TITLE
FIGURE 2
SITE PLAN
NAVAJO REFINING CO.
LEA REFINERY
LOVINGTON, NM
DRAWN BY EJS
CHK'D BY DB
SCALE 1" = 300'-0"
DATE 10-1-10
APP'D BY -
DRAWING NUMBER Lovington03F.dwg
REV. 0

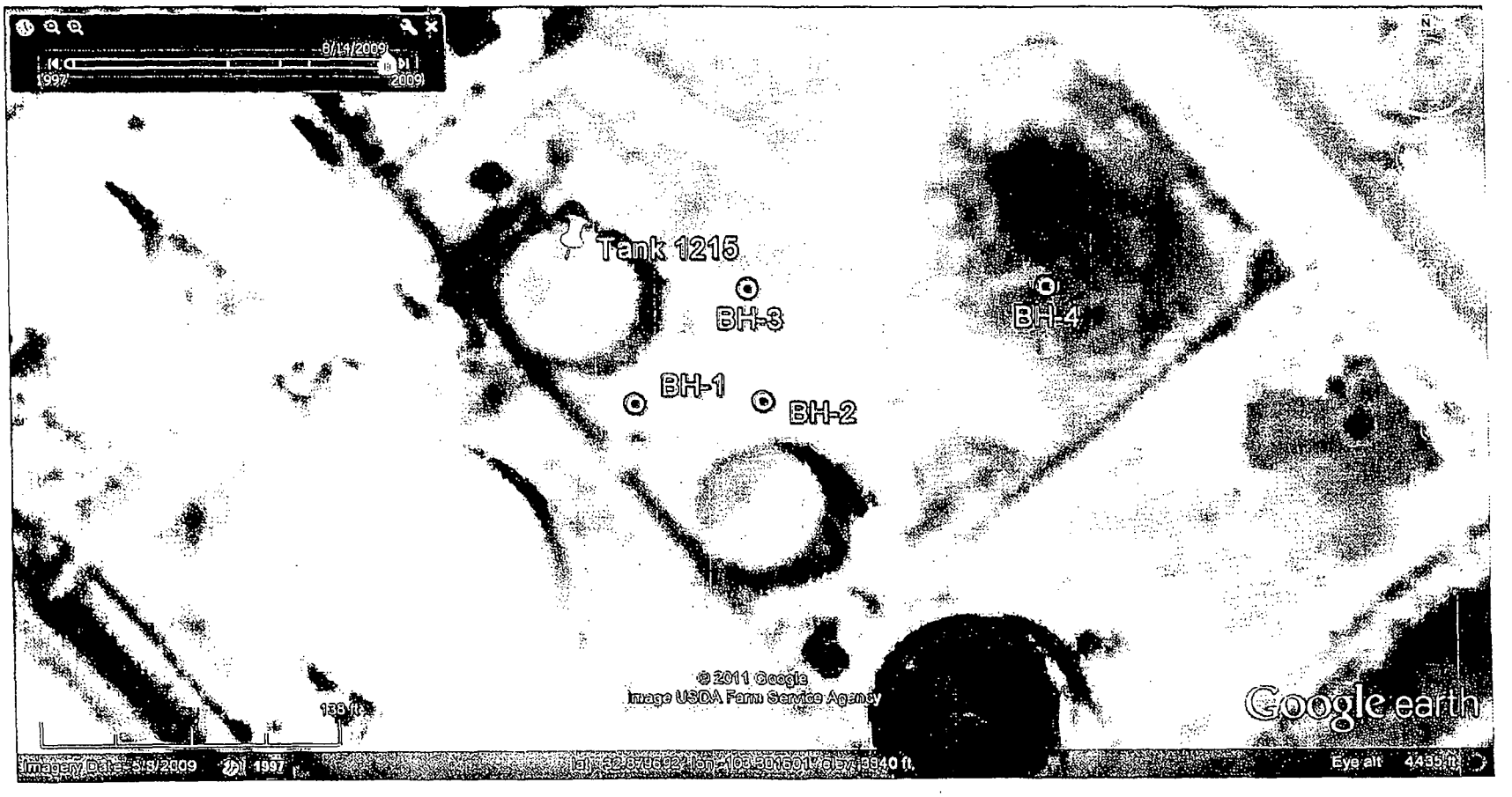


Figure 3. Location of Exploratory Boreholes, Tank 1215 Release Investigation, Navajo Lea Refinery, Lovington, New Mexico

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 1, 2011

Submit 2 Copies to appropriate District Office in accordance with Rule 116 on back side of form

Release Notification and Corrective Action

OPERATOR

x Initial Report ☐ Final Report

Name of Company Navajo Lea Refining Co	Contact Darrell Moore
Address 7401 South Main Lovington NM 88260	Telephone No. 575-746-5281
Facility Name	Facility Type Petroleum Refinery

Surface Owner	Mineral Owner	Lease No.

LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County

Latitude_____ **Longitude**_____

NATURE OF RELEASE

Type of Release Crude Bottoms (Asphalt, vacuum gas oil)	Volume of Release est. 350 bbls	Volume Recovered 280 bbls
Source of Release Tk 1215	Date and Hour of Occurrence 8/1/11 1 am	Date and Hour of Discovery 8/1/11 1 am
Was Immediate Notice Given? ☐ Yes ☐ No x Not Required	If YES, To Whom? Carl Chavez by email	
By Whom? Darrell Moore	Date and Hour 8/1/11 7:35 am	
Was a Watercourse Reached? ☐ Yes x No	If YES, Volume Impacting the Watercourse.	

If a Watercourse was Impacted, Describe Fully.*

Describe Cause of Problem and Remedial Action Taken.*
At 1 am on August 1, 2011, during routine rounds, an operator at the Lovington facility noticed a small pool of hydrocarbon on the south side of Tk 1215 estimated at 3 bbls.. He notified environmental and it was determined that the tank may have a hole in the floor. We then started emptying the tank into Tk 1214. The tank, which is a 20,000 bbl tank, was about ¾ full. By 7 am the leak had spread to almost all the way around the tank. We think that the heat of the day was making the product, which is an asphalt and vacuum gas oil mixture, more mobile. We did not immediately report the spill because we thought at the time it was a small 3 bbl leak from a pinhole in the floor of the tank.

Describe Area Affected and Cleanup Action Taken.*
The area affected is inside the dike that contains Tk 1214 and Tk 1215. The spill has almost entirely encircled Tk 1215 and then run southeast inside the dike and pooled up southeast of Tk 1215. Two vacuum trucks were called and began vacuuming up the spilled material. In addition we immediately started emptying Tk 1215 into Tk 1214. We also built small dikes to contain the spilled material into smaller areas. Tk 1215 should be empty by noon on August 2, 2011. We will then finish the vacuuming operation and begin picking up contaminated soil and placing into roll-off bins. Once we have picked up contaminated soil we will do drilling and sampling to insure cleanup.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Signature: Darrell Moore	OIL CONSERVATION DIVISION	
Printed Name: Darrell Moore	Approved by District Supervisor:	
Title: Environmental Manager for Water and Waste	Approval Date:	Expiration Date:
E-mail Address: Darrell.moore@hollyfrontier.com	Conditions of Approval:	Attached ☐
Date: 8/2/11 Phone: 575-746-5281		

Safety & Environmental Solutions, Inc.

LOG OF BORING BH-1

Tank 1215 Gas Oil Release Investigation
Navajo Refining Company, Lea Refinery
NE/4 Section 36, T16S, R36E
Lea County, New Mexico
N32.879681°, W103.301773°

Date, Time Started	: 10/25/11, 1015	Drilled By	: Eco/Enviro Drilling
Date, Time Complete	: 10/25/11, 1105	Sampling Method	: 5 ft. core barrel
Hole Diameter	: 8 1/4 in.	Logged By	: David Boyer, P.G.
Drilling Method	: Hollow Stem Auger	Company Rep.	:
Drilling Equipment	: Foremost-Mobile B-57		

Sample Type
SS Split Spoon (18" or 24")
CB Core Barrel (2.5' or 5')
CT Auger Cuttings
NR No recovery

Depth in Feet	Sample Type	Recovery (ft.)	USCS	GRAPHIC	DESCRIPTION	PID (ppm)	Lab No.	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethyl Benzene (mg/Kg)	Total Xylenes (mg/Kg)	Total Naphthalene 8270 (mg/Kg)	TPH 8015 (mg/Kg)
0-4	CB	~1	CA		0-4 ft. CALICHE,								
4-5			SP		4-5 ft. SAND, very light brown, very fine grained, little or no H/C odor. Sample at 5 ft., no PID not enough sample.	--	1110902-01	<0.0050	<0.0050	<0.0050	<0.015	0.0092	345
5-10	CB	1.0	SP/CA		5-10 ft. SAND and CALICHE/SANDSTONE fragments, very light brown, very fine grained, PID only, no sample taken								
10			SS		10-10.7 ft. SANDSTONE, soft, poorly cemented	15.1	--	--	--	--	--	--	--
10.7-11.4	CB	1.4			10.7-11.4 ft. SAND with SANDSTONE fragments light brown, very fine grained, dry, no H/C staining or odor								
15-16.3			SP/SS		15-16.3 ft. SAND with SANDSTONE fragments 0.5-1 in., generally soft, sand light brown, very fine grained, dry, no H/C staining or odor	33.2	1110902-02	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	<3.4
20	CB	1.3				33.8	1110902-03	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	<3.4

Notes:
Boring backfilled with 10 bags bentonite, hydrated.
Other semi-volatiles detected; see report table
H/C - Petroleum hydrocarbons

Z:\Company Files\Navajo\2011 Cleanups\NAV-11-012 Tank 1215 Release Delineation\Boring Logs\BH-1 Tank 1215.bor

Safety & Environmental Solutions, Inc.

LOG OF BORING BH-2

Tank 1215 Gas Oil Release Investigation
Navajo Refining Company, Lea Refinery
NE/4 Section 36, T16S, R36E
Lea County, New Mexico
N32.879684°, W103.301577°

Date, Time Started	: 10/25/11, 1130	Drilled By	: Eco/Enviro Drilling
Date, Time Complete	: 10/25/11, 1230	Sampling Method	: 5 ft. core barrel
Hole Diameter	: 8 1/4 in.	Logged By	: David Boyer, P.G.
Drilling Method	: Hollow Stem Auger	Company Rep.	:
Drilling Equipment	: Foremost-Mobile B-57		

Sample Type
SS Split Spoon (18" or 24")
CB Core Barrel (2.5' or 5')
CT Auger Cuttings
NR No recovery

Depth in Feet	Sample Type	Recovery (ft.)	USCS	GRAPHIC	DESCRIPTION	PID (ppm)	Lab No.	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethyl Benzene (mg/Kg)	Total Xylenes (mg/Kg)	Total Naphthalene 8270 (mg/Kg)	TPH 8015 (mg/Kg)
0-4	CB	1.0	CA		0-4 ft. CALICHE,								
4-5			CA/SP		4-5 ft. CALICHE and SAND, sand very light brown. Possible slight odor includes stained caliche.	30.9	1110902-04	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	340
5-10	CB	1.2	SP/CA		5-10 ft. SAND and CALICHE/SANDSTONE fragments, very light brown, very fine grained	43.1	1110902-05	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	<3.4
10-15	CB	1.5	SP		10-15 ft. SAND, light brown, very fine *grained, slightly damp,*	30.6	1110902-06	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	<3.4
15-20	CB	0.5	SP/SS		15-20 ft. SAND and soft SANDSTONE, very light brown, very fine grained, dry, no H/C staining or odor, no PID - not enough sample	--	1110902-07	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	<3.4

Notes:
Boring backfilled with 10 bags bentonite, hydrated.
Other semi-volatiles detected; see report table
H/C - Petroleum hydrocarbons

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Safety & Environmental Solutions, Inc.

LOG OF BORING BH-3

Tank 1215 Gas Oil Release Investigation
Navajo Refining Company, Lea Refinery
NE/4 Section 36, T16S, R36E
Lea County, New Mexico
N32.879829°, W103.301597°

Date, Time Started	: 10/25/11, 1240	Drilled By	: Eco/Enviro Drilling
Date, Time Complete	: 10/25/11, 1315	Sampling Method	: 5 ft. core barrel
Hole Diameter	: 8 1/4 in.	Logged By	: David Boyer, P.G.
Drilling Method	: Hollow Stem Auger	Company Rep.	:
Drilling Equipment	: Foremost-Mobile B-57		

Sample Type
SS Split Spoon (18" or 24")
CB Core Barrel (2.5' or 5')
CT Auger Cuttings
NR No recovery

Depth in Feet	Sample Type	Recovery (ft.)	USCS	GRAPHIC	DESCRIPTION	PID (ppm)	Lab No.	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethyl Benzene (mg/Kg)	Total Xylenes (mg/Kg)	Total Naphthalene 8270 (mg/Kg)	TPH 8015 (mg/Kg)
0-5	CB	0	CA		0-5 ft. CALICHE, no returns in core barrel	--	--	--	--	--	--	--	--
5-10	CB	5.0	SP/SS		5-10 ft. SAND with CALICHE/SANDSTONE fragments at top grading to sand and soft sandstone at base, no H/C staining or odor	26.7	1110902-08	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	<3.4
10-15	CB	3.4	SP/SS		10-15 ft. SAND and SANDSTONE, sand light brown, very fine grained, dry, sandstone soft to well cemented, *sandstone "cookies", no H/C staining* or odor	35.6	1110902-09	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	<3.4
15-20	CB	2.4			SAND, as above and SANDSTONE, soft to hard	43.4	1110902-10	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	2.4

Notes:
Boring backfilled with 10 bags bentonite, hydrated.
Other semi-volatiles detected; see report table
H/C - Petroleum hydrocarbons

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Safety & Environmental Solutions, Inc.

LOG OF BORING BH-4

Tank 1215 Gas Oil Release Investigation
Navajo Refining Company, Lea Refinery
NE/4 Section 36, T16S, R36E
Lea County, New Mexico
N32.879831°, W103.301144°

Date, Time Started	: 10/25/11, 1320	Drilled By	: Eco/Enviro Drilling
Date, Time Complete	: 10/25/11, 1430	Sampling Method	: 5 ft. core barrel
Hole Diameter	: 8 1/4 in.	Logged By	: David Boyer, P.G.
Drilling Method	: Hollow Stem Auger	Company Rep.	:
Drilling Equipment	: Foremost-Mobile B-57		

Sample Type
SS Split Spoon (18" or 24")
CB Core Barrel (2.5' or 5')
CT Auger Cuttings
NR No recovery

Depth in Feet	Sample Type	Recovery (ft.)	USCS	GRAPHIC	DESCRIPTION	PID (ppm)	Lab No.	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethyl Benzene (mg/Kg)	Total Xylenes (mg/Kg)	Total Naphthalene 8270 (mg/Kg)	TPH 8015 (mg/Kg)
0-5	CT	--	CA		0-5 ft. No recovery, sample from cuttings, SAND, SILT, and ground CALICHE. Sand light brown, very fine grained, H/C odor, no staining	126	1110902-11	<0.0050	0.0079	0.58	1.0	0.0312	448.5
5-7	CB	5.0	SS/CA		5-7 ft. SANDSTONE and CALICHE, hard, with fragments								
7-10			SP/SS		7-10 ft. SAND and SANDSTONE, sand light brown, very fine grained, dry. Sandstone soft with some frag.5ments, no H/C staining or odor	44.9	1110902-12	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	<3.4
10-11.4					10-11.4 ft. SAND and SANDSTONE, as above								
11.4-12.9	CB	3.1	SP		11.4-12.9 ft. SAND, brown, very fine grained, uniform, dry, no H/C staining or odor	39.0	1110902-13	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	<3.4
15-15.9			SP/SS		15-15.9 ft. SAND and SANDSTONE, as above								
15.9-18.6	CB	3.6	SS		15.9-18.6 ft. SANDSTONE, medium to well consolidated, soft to medium cemented, sample from crushed fragments.	42.3	1110902-14	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	<3.4
20-21			SP/SS		20-21 ft. SAND and SANDSTONE								
21-22.3	CB	2.3	SP		21-22.3 ft. SAND, brown, fine grained, uniform, occasional small sandstone fragments, no H/C staining or odor	44.0	1110902-15	<0.0050	<0.0050	<0.0050	<0.015	<0.0066	<3.4

Notes:
BH-4 dug out approximately 1.5 ft below land surface, values are from bottom of hole
Boring backfilled with 12 bags bentonite, hydrated.
Other semi-volatiles detected; see report table
H/C - Petroleum hydrocarbons

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P.O. Box 1613
703 E. Clinton
Hobbs, New Mexico 88240
575/397-0510
FAX 575/393-4388
www.sesi-nm.com

Safety & Environmental Solutions, Inc.

March 13, 2012

Mr. Robert Combs, Ph.D
Environmental Specialist
Navajo Refining Company
PO Box 159
Artesia, New Mexico 88211

RE: Report of Interior Investigation, Tank 1215 Release, Navajo Lea Refinery, Lovington, NM

Dear Robert:

This letter report presents the results of a follow-up subsurface investigation conducted to ascertain impacts to soil and possible groundwater effects from a release of tank bottoms (asphalt, vacuum gas oil) from Tank 1215 at the Navajo Lea Refinery. The refinery location and site plan are shown in Figures 1 and 2. The initial investigation (results presented in a letter report to Mr. Darrell Moore dated January 10, 2012) involved drilling four boreholes in the vicinity of the subject tank, sampling the soil for volatile and semi volatile organic constituents, and comparing analytical results with soil screening guidance from the New Mexico Environment Department.

This subsequent report presents results of interior investigation of the release, specifically drilling and sampling of two boreholes drilled beneath the tank floor.

Background

On August 1, 2011, during routine rounds an operator at the Lovington facility noticed a small pool of hydrocarbon on the south side of Tank 1215 estimated to be a volume of three barrels. The material was a mixture of asphalt and vacuum gas oil. Because the source of the leak was suspected to be a leak in the floor, the tank was emptied by pumping to the adjacent 1214 tank. Before emptying was completed, an estimated 280 barrels of material, made more mobile by the heat of the day, had been released to the ground surface and almost completely encircled the tank.

The New Mexico Oil Conservation Division was notified of the release by email to Mr. Carl Chavez on August 1 at 7:35 a.m. A form C-141 was prepared and submitted to the OCD on August 2, 2011.

Cleanup involved use of two vacuum trucks to remove the spilled material. In addition two small dikes were constructed to contain the material into smaller areas. The final action involved picking up contaminated soil and placing into roll-off bins. In addition to the released material surrounding Tank 1215 and the northwest side of Tank 1214, some liquid flowed in a small stream to the east about 140 feet and ponded in a shallow depression inside the bermed area. This material was also vacuumed and underlying soil removed.

On October 25, 2011 SESI drilled three boreholes 20 feet in accessible areas surrounding the tank and one borehole to 25 feet in an area to the east where ponding of liquid had occurred. The results of that investigation were presented in the report referenced above.

Work Performed

Safety and Environmental Solutions (SESI) was requested to advance soil borings and collect samples inside Tank 1215. Because the earth material immediately beneath the surface soil is hard, consolidated caliche a hollow-stem auger drilling rig was employed to drill the soil borings.

On February 24, 2012 after receiving approval from Navajo and after performing safety checks of the tank interior, SESI drilled two (2) test borings in the interior of Tank 1215.. The holes were drilled on the west and east sides of the tank, each approximately 15 feet from the center of the tank.. Borehole locations are shown on Figure 3.

Drilling was performed using a Foremost-Mobile B-57 hollow-stem auger with a bit diameter of 8 ¼ inches. Drilling was performed by Eco-Enviro Drilling of Lovington, NM which is a licensed New Mexico drilling company. The boreholes were drilled to a depth of 20 feet and soil samples collected for analysis. Samples were collected every 5 feet for PID screening and submitted to the analytical laboratory (Cardinal Laboratories, Hobbs, NM) for analysis. Laboratory analyses were performed for total petroleum hydrocarbons (GRO, DRO and MORO TPH), and volatile and low-level semi-volatile hydrocarbons. The boreholes were plugged back to surface with bentonite and hydrated. Borehole logs with lithologic information, drilling details and chemical testing results are included as an attachment.

Results

The results of the PID screening are shown in Table 1. No PID samples were taken from the 0-5 foot interval in either borehole as the artificial fill exhibited severe H/C staining and/or strong odor. The maximum PID reading for the lower intervals was 12 ppm.

The analytical results are shown in Table 2 together with reporting limits, EPA methods used and the February 2012 NMED soil screening levels*. In general, analyses of the soil samples did not detect elevated levels of volatile or semi-volatile hydrocarbons except in the top 4 to 5 feet of the two boreholes.

No gasoline range TPH organics were detected in the TB-1 samples (located on the interior east side of tank 1215) though diesel and motor oil range TPH organics were detected. Total TPH organics in the lower intervals were below the industrial soil screening level for fuel oils, which is most representative of the material released. The highest TPH levels were found in the sample at 4 to 5 feet and the total TPH level for this sample exceeds the NMED Soil Screening Level.

The soil sample from the 4 to 5 feet interval in TB-1 detected numerous low-level volatiles and semi-volatiles all of which were below NMED industrial soil screening levels. The highest concentrations, exceeding 1.0 mg/Kg, were of total xylenes, methylene chloride, 1,2,4-trimethylbenzene, and naphthalene, 2-methylnaphalene, 1-methylnaphthalede and phenanthrene. The levels of 1.0 mg/Kg were only found in the first sample taken at a depth of 4 to 5 feet. At 19 to 20 feet, only methylene chloride, and 1,4 dichlorobenzene were detected at low levels. Methylene chloride is a common laboratory chemical and considered a laboratory artifact when detected in low-level analyses.

* The 2012 NMED screening levels do not include listings for all volatiles or semi-volatiles detected in the sampling. Table 2 shows which constituents do not have screening level values.

I,4 dichlorobenzene, a deodorant/disinfectant commonly used in restrooms and in mothballs, may also be a laboratory artifact but needs further consideration as discussed below.

TB-2 was located on the interior west side of tank 1215. The soil sample at 4 to 5 feet detected low levels of gasoline range TPH organics, and moderate to high levels of diesel and motor oil range TPH organics. The total TPH level for this sample exceeds the NMED Soil Screening Level for fuel oil.

Detections of low-level volatiles and semi-volatiles were also found in this sample; however, none of the detections were above the soil screening limits for industrial soil. The remaining samples from TB-2 detected only minor levels of diesel and motor oil range TPH and all were below the soil screening limits for industrial soils. No detections of volatiles or semi-volatiles were seen in this borehole below the 5 foot depth except for a methylene chloride and 1,4 dichlorobenzene.

With one exception, all results below the 5 foot depth in both boreholes were below associated soil screening levels for groundwater DAF 20 protection. The exception was 1,4-dicholrobenzene. Additional discussion of this constituent is provided below.

Discussion:

The New Mexico Environment Department has developed a methodology for evaluating releases of hydrocarbons into the environment. Below is their rationale for its use:

> *Soil Screening Guidance provides site managers with a framework for developing and applying the SSLs, and is likely to be most useful for determining whether areas or entire sites are contaminated to an extent that warrants further investigation. It is intended to assist and streamline the site investigation and corrective action process by focusing resources on those sites or areas that pose the greatest risk to human health and the environment. Implementation of the methodologies outlined within this SSG may significantly reduce the time necessary to complete site investigations and cleanup actions at certain sites, as well as improve the consistency of these investigations.*
>
> *Between various sites there can exist a wide spectrum of contaminant types and concentrations. The level of concern associated with those concentrations depends on several factors, including the likelihood of exposure to levels of potential concern to human health or to ecological receptors. At one end of the spectrum are levels that clearly warrant a response action; at the other end are levels that are below regulatory concern. Appropriate cleanup goals for a site may fall anywhere within this range depending on site-specific conditions. It is important to note that SSLs do not in themselves represent cleanup standards, and the SSLs alone do not trigger the need for a response action or define "unacceptable" levels of contamination in soil. Screening levels such as SSLs identify the lower end of this spectrum – levels below which there is generally no need for further concern—provided the conditions associated with the development of the SSLs are consistent.*

The borehole soil samples showed volatile and semi-volatile hydrocarbons to be generally present only in the upper 4 to 5 feet interval in boreholes TB-1 and TB-2. Lower intervals showed only isolated impacts and all were well below soil screening levels for soil at industrial locations.

As mentioned above, one volatile detection (1,4 Dichlorobenzene) was slightly above the soil screening level for groundwater protection This constituent was detected in both interior borehole samples below the 5 foot interval. It was not seen in the four exterior boreholes drilled in October of 2011. To eliminate the possibility that it was present in a cleaning solution used to remove hydrocarbon residue prior to checking for leaks, a copy of the MSDS for the cleaning media was obtained from the refinery. The product, Baker Petrolite BPR44231 cleaner, contains D-limonene, alkylarylsulfonate amine salt, propylene glycol and glycol ethers. Consultation with a laboratory chemist does not indicate these ingredients contain dichlorobenzene or could result in misidentification by laboratory analytical. Therefore, it is concluded that the detections are a laboratory artifact from an unknown source at the facility.

The groundwater protection levels shown in Table 2 are very conservative and site conditions at the Lea Refinery do not approach the assumptions provided for use. In the guidance, the screening levels assume a continuous leak to groundwater with no dilution or attenuation in the vadose zone and only dilution in the saturated zone. The leak at the refinery was a one time event, depth to groundwater is in excess of 100 feet, and drilling investigation showed no or only minor impacts at depths from 20 to 25 feet. Therefore the detection of elevated hydrocarbon volatiles and semi-volatiles in the 4 to 5 feet interval in the borehole will have no impact in groundwater given that detection is limited to that interval.

Conclusion:

1. There are two laboratory artifacts in most of the sample analyses, namely methylene chloride and 1,4-dichlorobenzene; there are no chlorinated solvents in the material that was in the tank or in the cleaning media used to remove hydrocarbon residue from the tank.

2. There are DRO and MORO hits in TB-1 at 20 ft. with total TPH of 130 mg/Kg. The Industrial Direct Expose soil screening level for #3 and #6 Fuel Oil is 1,600 mg/Kg which is over 10 times the level found. The lab chemist at Cardinal says it appears to be weathered material.

3. The only PAH found at depth was Phenanthrene in TB-1 at 20 ft. The value was 0.054 mg/Kg. The 2012 soil screening level for Industrial/occupational soil is 20,500 mg/Kg. The level found in the sample is 300,000 times less than the soil screening value.

4. In the area of tank 1215 there have been several releases during the past ten years. These were investigated and reports made to OCD. There may be minor traces of hydrocarbon as a result in the shallow subsurface (such as in TB-1 at 20 ft.).

5. Sample intervals TB-1 at 15 ft. and TB-2 at 20 ft. show no evidence of any contamination (except by the lab artifacts listed above). So with this exception there is at least one 5 ft. zone in both samples with no contamination that demonstrates the leak did not migrate past these zones to depth. Investigation showed that impacts of the release were limited in vertical extent and that removal of liquid mitigated downward migration of hydrocarbons. The remaining hydrocarbons, mostly present at a depth of 4 to 5 feet interval are below soil screening guidance levels for industrial soil use.

Therefore, based on the comparison and evaluation of the analytical results with the associated soil screening levels, no further subsurface investigation is necessary or cleanup required for soils surrounding the tank from which the release occurred. However it is suggested that clean fill material

be used to fill in exterior areas excavated to prevent ponding of rainwater and downward movement of any remaining hydrocarbon constituents.

If you have any questions regarding this report, please contact me at (575) 397-0510.

Sincerely yours,

David G. Boyer, P.G.

Encl. (tables, figures analytical results, form C-141, soil boring logs)

Table 1. Soil PID Measurements, Tank 1215 Interior Boreholes, February 24, 2012, Navajo Lea Refinery, Lovington, NM

TB-1			
Time	**Depth (feet)**	**PID (ppm)**	**Selected for Analysis?**
1:55	4-5	None	Yes
2:08	9-10	12	Yes
2:15	14-15	6	Yes
2:30	19-20	3	Yes
TB-2			
Time	**Depth (feet)**	**PID (ppm)**	**Selected for Analysis?**
3:05	4-5	None	Yes
3:20	9-10	4.1	Yes
3:40	14-15	2.6	Yes
4:00	19-20	1.9	Yes
Note:			
Sampling date February 24, 2012			
PID measurements made using a MiniRae 2000 calibrated with			
100 ppm of isobutylene.			

Table 2. Summary of Soil Constituent Concentrations in Boreholes, Tank 1215 Release Investigation, February 2012, Navajo Lea Refinery

Borehole	TB-1				NMED Soil Screening Levels 02-27-12	
Depth	4-5 feet	9-10 feet	14-15 feet	19-20 feet	Industrial Soil	Groundwater DAF 20
Cardinal laboratory ID	H200499-01	H200499-02	H200499-03	H200499-04	(mg/Kg)	(mg/Kg)
Total Petroleum Hydrocarbons						
TPH-GRO (mg/Kg)	<100	<10.0	<10.0	<10.0	--	--
TPH-DRO (mg/Kg)	**4,250**	**15.8**	<10.0	**90.2**	--	--
TPH-MORO (mg/Kg)	**1,900**	**12.7**	<10.0	**40.3**	--	--
Total TPH	**6,150**	**28.5**	<10.0	**130.5**	890 (fuel oil)	--
Volatiles						
Benzene (mg/Kg)	<0.500	<0.050	<0.050	<0.050	84.7	0.0324
Ethylbenzene (mg/Kg)	**1.99**	<0.050	<0.050	<0.050	378	26.0
Toluene (mg/Kg)	**1.66**	<0.050	<0.050	<0.050	57,700	25.3
Total Xylenes (mg/Kg)	**2.64**	<0.150	<0.150	<0.150	3,980	3.13
Isopropylbenzene (mg/Kg)	<0.500	<0.050	<0.050	<0.050	N/A	NA
Methylene Chloride (mg/Kg)	**5.42**	**0.0581**	**0.483**	**0.539**	4,700	82.4
n-Propylbenzene (mg/Kg)	**0.894**	<0.050	<0.050	<0.050	N/A	N/A
1,2,4-Trimethylbenzene (mg/Kg)	**2.18**	<0.050	<0.050	<0.050	N/A	N/A
1,3,5-Trimethylbenzene (mg/Kg)	**0.566**	<0.050	<0.050	<0.050	N/A	N/A
1,4 Dichlorobenzene	<0.500	**0.233**	**0.238**	**0.136**	177.0	0.064
p-Isopropyltoluene (mg/Kg)	**0.731**	<0.050	<0.050	<0.050	N/A	N/A
Naphthalene (8260, mg/Kg)	**2.55**	<0.050	<0.050	<0.050	241	0.071
n-Butylbenzene (mg/Kg)	**0.946**	<0.050	<0.050	<0.050	N/A	N/A
sec-Butylbenzene (mg/Kg)	**0.529**	<0.050	<0.050	<0.050	N/A	N/A
Notes:						
	1. N/A - constituent value not shown in SSG.					
	2. Sampling date: February 24, 2012					
	3. Only constituents detected shown; complete list of organic constituents analyzed					
	and reporting limits included with analytical results					
	4. Methods: TPH SW8015, Volatiles SW8260, Low-level semi-volatiles SW8270					
	5. Analyses performed by Cardinal Laboratories, Hobbs, New Mexico					

Table 2. Summary of Soil Constituent Concentrations in Boreholes, Tank 1215 Release Investigation, February 2012, Navajo Lea Refinery

Borehole	TB-1					NMED Soil Screening Levels 02-27-12	
Depth	4-5 feet	9-10 feet	14-15 feet	19-20 feet		Industrial Soil	Groundwater DAF 20
Cardinal laboratory ID	H200499-01	H200499-02	H200499-03	H200499-04		(mg/Kg)	(mg/Kg)
Semivolatiles							
2-Methylnaphthalene (mg/Kg)	**1.90**	<0.040	<0.040	<0.040		N/A	N/A
1-Methylnaphthalene (mg/Kg)	**2.09**	<0.040	<0.040	<0.040		N/A	N/A
Chrysene (mg/Kg)	**0.658**	<0.040	<0.040	<0.040		2,340	160
Phenanthrene (mg/Kg)	**2.18**	<0.040	<0.040	**0.054**		20,500	571
Fluorene (mg/Kg)	**0.479**	<0.040	<0.040	<0.040		24,400	406
Naphthalene (8270, mg/Kg)	**0.394**	<0.040	<0.040	<0.040		241	0.071
Pyrene (mg/Kg)	**0.211**	<0.040	<0.040	<0.040		18,300	1,790
Notes:							
	1. N/A - constituent value not shown in SSG.						
	2. Sampling date: February 24, 2012						
	3. Only constituents detected shown; complete list of organic constituents analyzed						
	and reporting limits included with analytical results						
	4. Methods: TPH SW8015, Volatiles SW8260, Low-level semi-volatiles SW8270						
	5. Analyses performed by Cardinal Laboratories, Hobbs, New Mexico						

Table 2. Summary of Soil Constituent Concentrations in Boreholes, Tank 1215 Release Investigation, February 2012, Navajo Lea Refinery

Borehole	TB-2					NMED Soil Screening Levels 02-27-12	
Depth	4-5 feet	9-10 feet	14-15 feet	19-20 feet		Industrial Soil	Groundwater DAF 20
Cardinal laboratory ID	H200499-05	H200499-06	H200499-07	H200499-08		(mg/Kg)	(mg/Kg)
Total Petroleum Hydrocarbons							
TPH-GRO (mg/Kg)	**239**	<10.0	<10.0	<10.0		- -	- -
TPH-DRO (mg/Kg)	**7,030**	**27.5**	**104**	<10.0		- -	- -
TPH-MORO (mg/Kg)	**3,380**	**26.7**	**50.9**	<10.0		- -	- -
Total TPH	**10,649**	**54.2**	**154.9**	<10.0		890 (fuel oil)	- -
Volatiles							
Benzene (mg/Kg)	**0.504**	<0.050	<0.050	<0.050		84.7	0.0324
Ethylbenzene (mg/Kg)	**4.61**	<0.050	<0.050	<0.050		378	26.0
Toluene (mg/Kg)	**4.00**	<0.050	<0.050	<0.050		57,700	25.3
Total Xylenes (mg/Kg)	**5.70**	<0.150	<0.150	<0.150		3,980	3.13
Isopropylbenzene (mg/Kg)	**0.929**	<0.050	<0.050	<0.050		N/A	NA
Methylene Chloride (mg/Kg)	**4.99**	**0.607**	**0.493**	**0.505**		4700	82.4
n-Propylbenzene (mg/Kg)	**1.79**	<0.050	<0.050	<0.050		N/A	N/A
1,2,4-Trimethylbenzene (mg/Kg)	**3.63**	<0.050	<0.050	<0.050		N/A	N/A
1,3,5-Trimethylbenzene (mg/Kg)	**0.918**	<0.050	<0.050	<0.050		N/A	N/A
1,4 Dichlorobenzene	**0.572**	**0.243**	**0.181**	**0.182**		177.0	0.064
p-Isopropyltoluene (mg/Kg)	<0.500	<0.050	<0.050	<0.050		N/A	N/A
Naphthalene (8260, mg/Kg)	**4.03**	<0.050	<0.050	<0.050		241	0.071
n-Butylbenzene (mg/Kg)	**1.60**	<0.050	<0.050	<0.050		N/A	N/A
sec-Butylbenzene (mg/Kg)	**0.818**	<0.050	<0.050	<0.050		N/A	N/A
Notes:							
	1. N/A - constituent value not shown in SSG.						
	2. Sampling date: February 24, 2012						
	3. Only constituents detected shown; complete list of organic constituents analyzed						
	and reporting limits included with analytical results						
	4. Methods: TPH SW8015, Volatiles SW8260, Low-level semi-volatiles SW8270						
	5. Analyses performed by Cardinal Laboratories, Hobbs, New Mexico						

Table 2. Summary of Soil Constituent Concentrations in Boreholes, Tank 1215 Release Investigation, February 2012, Navajo Lea Refinery

Borehole	TB-2					NMED Soil Screening Levels 02-27-12	
Depth	4-5 feet	9-10 feet	14-15 feet	19-20 feet		Industrial Soil	Groundwater DAF 20
Cardinal laboratory ID	H200499-05	H200499-06	H200499-07	H200499-08		(mg/Kg)	(mg/Kg)
Semivolatiles							
2-Methylnaphthalene (mg/Kg)	**4.87**	<0.040	<0.040	<0.040		N/A	N/A
1-Methylnaphthalene (mg/Kg)	**4.88**	<0.040	<0.040	<0.040		N/A	N/A
Chrysene (mg/Kg)	**1.04**	<0.040	<0.040	<0.040		2,340	160
Phenanthrene (mg/Kg)	**3.45**	<0.040	<0.040	<0.040		20,500	571
Fluorene (mg/Kg)	**1.06**	<0.040	<0.040	<0.040		24,400	406.0
Naphthalene (8270, mg/Kg)	**1.48**	<0.040	<0.040	<0.040		241	0.071
Pyrene (mg/Kg)	<0.200	<0.040	<0.040	<0.040		18,300	1,790
Notes:							
	1. N/A - constituent value not shown in SSG.						
	2. Sampling date: February 24, 2012						
	3. Only constituents detected shown; complete list of organic constituents analyzed						
	and reporting limits included with analytical results						
	4. Methods: TPH SW8015, Volatiles SW8260, Low-level semi-volatiles SW8270						
	5. Analyses performed by Cardinal Laboratories, Hobbs, New Mexico						

Safety & Environmental Solutions, Inc.

LOG OF BORING TB-1

Tank 1215 Gas Oil Release Investigation
Navajo Refining Company, Lea Refinery
NE/4 Section 36, T16S, R36E
Lea County, New Mexico
Interior Tank Boring

Date, Time Started	: 02/24/11, 1130	Drilled By	: Eco/Enviro Drilling
Date, Time Complete	: 02/24/11, 1445	Sampling Method	: 5 ft. core barrel
Hole Diameter	: 8 1/4 in.	Logged By	: Bob Allen, SESI
Drilling Method	: Hollow Stem Auger	Company Rep.	: Steve Terry
Drilling Equipment	: Foremost-Mobile B-57		

Sample Type
SS Split Spoon (18" or 24")
CB Core Barrel (2.5' or 5')
CT Auger Cuttings
NR No recovery

Depth in Feet	Sample Type	Recovery (in.)	USCS	GRAPHIC	DESCRIPTION	PID (ppm)	Lab No.	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethyl Benzene (mg/Kg)	Total Xylenes (mg/Kg)	Total Naphthalene 8270 (mg/Kg)	TPH 8015 (mg/Kg)
0-5	CB	24	AR		0-5 ft. Loose 1/2 to 3/4 in. gravel fill for base of tank, severe H/C staining and strong odor	--	H200499-01	<0.500	1.66	1.99	2.64	4.38	6,150
5-10	CB	25	SP/CA		5-10 ft. SAND, tan, very fine grained, with frequent CALICHE fragments to 3/4", no H/C staining or odor	12	H200499-02	<0.050	<0.050	<0.050	<0.150	<0.040	28.5
10-15	CB	12	SP/SS		10-15 ft. SAND, tan, very fine grained, with frequent soft SANDSTONE fragments, no H/C staining or odor	6	H200499-02	<0.050	<0.050	<0.050	<0.150	<0.040	<10.0
15-20	CB	9			15-20 ft. SAND, tan, very fine grained, with frequent soft SANDSTONE fragments, no H/C staining or odor	3	H200499-04	<0.050	<0.050	<0.050	<0.150	<0.040	130

Notes:
Samples collected with 5 ft. core barrel. Boring backfilled with 9 bags bentonite, hydrated.
Other semi-volatiles detected; see report table
H/C - Petroleum hydrocarbons

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Safety & Environmental Solutions, Inc.

LOG OF BORING TB-2

Tank 1215 Gas Oil Release Investigation
Navajo Refining Company, Lea Refinery
NE/4 Section 36, T16S, R36E
Lea County, New Mexico
Interior Tank Boring

Date, Time Started	: 02/24/11, 1450	Drilled By	: Eco/Enviro Drilling
Date, Time Complete	: 02/24/11, 1615	Sampling Method	: 5 ft. core barrel
Hole Diameter	: 8 1/4 in.	Logged By	: Bob Allen, SESI
Drilling Method	: Hollow Stem Auger	Company Rep.	: Steve Terry
Drilling Equipment	: Foremost-Mobile B-57		

Sample Type
SS Split Spoon (18" or 24")
CB Core Barrel (2.5' or 5')
CT Auger Cuttings
NR No recovery

Depth in Feet	Sample Type	Recovery (in.)	USCS	GRAPHIC	DESCRIPTION	PID (ppm)	Lab No.	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethyl Benzene (mg/Kg)	Total Xylenes (mg/Kg)	Total Naphthalene 8270 (mg/Kg)	TPH 8015 (mg/Kg)
0-5	CB	6	AR		0-5 ft. Loose gravel fill for base of tank, gravels to 1", severe H/C staining and strong odor	--	H200499-05	0.504	4.00	4.61	5.70	11.23	10,649
5-10	CB	32	SP/CA		5-10 ft. SAND, tan, very fine grained, with occasional CALICHE fragments to 1/2", no H/C staining or odor	4.1	H200499-06	<0.050	<0.050	<0.050	<0.150	<0.040	54.2
10-15	CB	23	SP/SS		10-15 ft. SAND, tan, very fine grained, with occasional soft SANDSTONE fragments, no H/C staining or odor	2.6	H200499-07	<0.050	<0.050	<0.050	<0.150	<0.040	154.9
15-20	CB	17			15-20 ft. SAND, tan, very fine grained, with occasional soft SANDSTONE fragments, no H/C staining or odor	1.9	H200499-08	<0.050	<0.050	<0.050	<0.150	<0.040	<10.0

Notes:
Samples collected with 5 ft. core barrel. Boring backfilled with 10 bags bentonite, hydrated.
Other semi-volatiles detected; see report table
H/C - Petroleum hydrocarbons

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Material Safety Data Sheet

1. Product and company identification

Product name : BPR 44231 CLEANER

Supplier : Baker Petrolite
A Baker Hughes Company
12645 W. Airport Blvd.
Sugar Land, TX 77478
For Product Information/MSDSs Call: 800-231-3606
(8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400

Material Uses : Special: Cleaner.

Code : BPR44231

Validation date : 1/27/2010.

Print date : 1/27/2010.

Version : 10

Responsible name : Global Regulatory Affairs - Telephone 281-276-5400 or 800-231-3606

In case of emergency : CHEMTREC: 800-424-9300 (U.S. 24 hour)
Baker Petrolite: 800-231-3606
(001)281-276-5400
CANUTEC: 613-996-6666 (Canada 24 hours)
CHEMTREC Int'l 01-703-527-3887 (International 24 hour)

2. Hazards identification

Physical state : Liquid. [Clear to hazy.]

Odor : Sweet.

Color : Yellow to dark brown. [Light]

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

COMBUSTIBLE LIQUID AND VAPOR. HARMFUL IF INHALED. INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Static discharges can cause ignition or explosion when container is not bonded. Keep away from heat, sparks and flame. Do not breathe vapor or mist. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Vapors can travel to a source of ignition and flashback. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Routes of entry : Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Inhalation : Toxic by inhalation. Can cause central nervous system (CNS) depression. Irritating to respiratory system.

Ingestion : Can cause central nervous system (CNS) depression.

Skin : Irritating to skin. May cause sensitization by skin contact.

Eyes : Severely irritating to eyes. Risk of serious damage to eyes.

Potential chronic health effects

2 . Hazards identification

Chronic effects : Contains material that may cause target organ damage, based on animal data. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Target organs : Contains material which may cause damage to the following organs: upper respiratory tract, central nervous system (CNS), eye, lens or cornea.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, nausea or vomiting, coughing, headache, drowsiness/fatigue, dizziness/vertigo, unconsciousness

Ingestion : None known.

Skin : irritation, redness

Eyes : pain or irritation, watering, redness

Medical conditions aggravated by over-exposure : Pre-existing skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
D-limonene	5989-27-5	30 - 60
Alkylarylsulfonate amine salt	Trade secret.	10 - 30
Propylene glycol ether	34590-94-8	5 - 10
Glycol ether	57018-52-7	1 - 5

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

Additional information

If breathing has stopped or the heart has stopped, trained personnel should immediately administer artificial respiration or cardiopulmonary resuscitation, as required.

5 . Fire-fighting measures

Flammability of the product : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide,nitrogen oxides,sulfur oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Water polluting material. May be harmful to the environment if released in large quantities.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during

7 . Handling and storage

transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Propylene glycol ether	US ACGIH	100	606	-	150	909	-	-	-	-	[1]
	OSHA PEL	100	600	-	-	-	-	-	-	-	[1]
	OSHA PEL 1989	100	600	-	150	900	-	-	-	-	[1]

[1]Absorbed through skin.

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before re-use.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves: Nitrile or Neoprene gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Liquid. [Clear to hazy.]

Flash point : Closed cup: 47°C (116.6°F)

Auto-ignition temperature : Not available.

Flammable limits : Lower: 1.8%
Upper: 6.8%

Color : Yellow to dark brown. [Light]

9 . Physical and chemical properties

Odor	:	Sweet.
pH	:	6 to 9 [Conc. (% w/w): 5%]
	:	5% of product in 75% water / 25% isopropanol solution
Boiling/condensation point	:	38 to 151°C (100.4 to 303.8°F)
Initial Boiling Point	:	Not available.
Melting/freezing point	:	Not available.
Relative density	:	0.9422 (15.6°C)
Density	:	7.8485 (lbs/gal)
Vapor density	:	>1 [Air = 1]
Odor threshold	:	Not available.
Evaporation rate	:	Not available.
VOC	:	Not available.
Viscosity	:	Dynamic (15.6°C): 17 cP
Solubility (Water)	:	Dispersible
Vapor pressure	:	2 kPa (15.2 mm Hg) at 21.1°C (Calculated Value for all Components.)
Pour Point	:	-34.4°C (-29.9°F)
Partition coefficient (LogKow)	:	Not available.

10 . Stability and Reactivity

Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	:	Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.
Materials to avoid	:	Reactive or incompatible with the following materials: oxidizing materials and acids.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Conditions of reactivity	:	Flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
D-limonene	LD50 Dermal	Rabbit	>5 g/kg	-
	LD50 Oral	Rat	4400 mg/kg	-
Propylene glycol ether	LD50 Dermal	Rabbit	10 mL/kg	-
	LD50 Oral	Rat	5.5 ml/kg	-
	LD50 Oral	Rat	5400 uL/kg	-
Glycol ether	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	3770 mg/kg	-
	LC50 Inhalation Vapor	Rat	>496 ppm	4 hours

Carcinogenicity Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
D-limonene	-	3	-	-	-	-
Glycol ether	-	3	-	-	-	-

11 . Toxicological information

Chronic toxicity Remarks

1) D-limonene

D-Limonene is a component of this product. In experimental animal studies, limonene produced nausea, lower weight gain, lowered blood sugar and cholesterol, and some kidney damage in dogs exposed for 6 months (Tsuji et al, 1975b).

Limonene has been found in human breast milk (HSDB; Von Burg, 1995). In rats, a high dose of limonene delayed ossification and produced lower fetal weights, results interpreted as signs of fetotoxicity, but it was not teratogenic (Tsuji et al, 1975). In mice, limonen caused abnormal bone formation at a similarly high dose (Kodama et al, 1977).

2) Alkylarylsulfonate amine salt

Not available.

3) Propylene glycol ether

Propylene glycol ether is a component of this product. In rats, a relatively high dose of 1 gm/kg for 35 days had no apparent effect, while 10 mL/kg for 90 days produced no hematological changes, but did cause some kidney effects (Clayton & Clayton, 1982).

Inhalation of an airborne concentration of 200 ppm for 13 weeks had no effect in rats (Landry & Yano, 1984), while inhalation exposure to 300 ppm for 6 to 8 months caused liver changes in rabbits, guinea pigs, and monkeys (Clayton & Clayton, 1982).

4) Glycol ether

The National Toxicology Program (NTP) has conducted a two year inhalation study in mice and rats on propylene glycol mono-t-butyl ether. There was equivocal evidence of carcinogenic activity in male F344/N rats based on marginally increased incidences of renal tubule and liver neoplasms. There was no evidence of carcinogenic activity in female F344/N rats exposed to 75, 300 or 1200 ppm. There was clear evidence of carcinogenic activity in male and female B6C3F1 mice based on increases of liver neoplasms.

The International Agency for Research on Cancer (IARC) concluded that propylene glycol mono-t-butyl ether was not classifiable as to carcinogenic activity to humans (Group 3) on the basis of limited evidence in experimental animals and inadequate evidence in animals.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
BPR 44231 CLEANER	Acute LC50 18.8 mg/L	Daphnia - Daphnia pulex	48 hours
	Acute LC50 10.6 mg/L	Fish - Fathead minnow	96 hours

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN1993	FLAMMABLE LIQUID, N.O.S. (Contains: D-limonene, Propylene glycol ether)	3	III		Marine pollutant **Remarks** DOT Marine Pollutant if shipped in bulk or by vessel.
TDG Classification	UN1993	FLAMMABLE LIQUID, N.O.S. (Contains: D-limonene, Propylene glycol ether)	3	III		Marine pollutant **Remarks** TDG Marine Pollutant if transported on a ship in Canadian waters.
IMDG Class	UN1993	FLAMMABLE LIQUID, N.O.S. (Contains: D-limonene,)	3	III		**Emergency schedules (EmS)** F-E S-E Marine pollutant

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Alkylarylsulfonate amine salt.

North-America NAERG : 128

15 . Regulatory information

HCS Classification : Combustible liquid
Toxic material
Irritating material
Sensitizing material
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.
TSCA 12(b) one-time export: (2-methoxymethylethoxy)propanol

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: D-limonene; (2-methoxymethylethoxy)propanol
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: BPR 44231 CLEANER: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: No products were found.
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: No products were found.
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) : Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

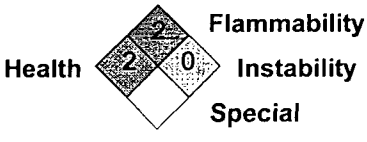
WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOR. HARMFUL IF INHALED. INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

National Fire Protection Association (U.S.A.) :



Date of printing : **1/27/2010.**

Indicates information that has changed from previously issued version.

Notice to reader

16 . Other information

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

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