GW - 28

WORK PLANS

NAVAJO REFINING COMPANY
ARTESIA REFINERY

SWMU-1/AOC Group 1
Additional Corrective Action Investigation Workplan
RCRA Permit No. D048918817

December 2006

Navajo Refining Company
501 East Main Street, P.O. Drawer 159
Artesia, New Mexico 88210
505-748-3311

ARCADIS
Infrastructure, environment, facilities

Ms. Hope Monzeglio
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Subject:
Response to New Mexico Environmental Department Comments Letter (September 15, 2006) on the *SWMU/AOC Group 1 Corrective Action Investigation Report* (January, 2006).
Navajo Refining Company, Artesia Refinery, Artesia, New Mexico
EPA ID # NMDO48918817
HWB-NRC-06-002

ENVIRONMENTAL

Midland, Texas,
18 December 2006

Contact:
Kuohui Lowrie

Extension: 135
432 687-5400

Dear Ms. Monzeglio:

On behalf of Navajo Refining Company, please accept this written response to your letter, dated September 15, 2006, regarding the Artesia Refinery.

Comment 1

Some constituents required for analysis under the approved work plan, were not because the laboratory inadvertently did not perform the analysis and the analysis was not identified on the chain-of-custody form by the Permittee (e.g. Oil Range Organics by EPA Method 8015B and Gasoline Range Organics by Method 8015B for soils samples collected at the AOC-1 Diesel Tank Farm Investigation and AOC-3 Southeast Tank Farm Area, respectively). The Permittee must ensure that all analyses required by the approved work plan are performed during future investigations.

Response 1

Assurances will be made that all analyses required by approved work plans are performed during future investigations. Chain-of-custodies will be prepared and reviewed to ensure that the required analyses are included on the forms prior to use in the field. Subsequent to sampling, the chain-of-custodies will be reviewed to ensure that the required analyses are identified for each sample. Preliminary analysis results will be provided from the laboratories and reviewed to ensure that all the required constituents are analyzed and reported and any analyses that are lacking can be analyzed within holding times.

Comment 2

According to Table 7D, (AOC-1, Soil Data Table), ethylbenzene was detected at 100,000 (1E+5) µg/kg in sampled AOC1-B-1 (5-7.5 ft). The detection was highlighted in red indicating the detection was above the Residential New Mexico Soil Screening Level (NM SSL) of 128,000 µg/kg (1.28E+05). The ethylbenzene detected in sample AOC-1-B-1 was not above Residential NM SSL and therefore does not need to be highlighted in red.

Ethylbenzene and total xylenes were detected above the New Mexico Water Quality Control Commission (WQCC) standards of 700 µg/l and 620 µg/l, respectively in groundwater samples AOC-2 (MW-62) and AOC-2 (MW-63). The detections were not highlighted in red in Table 8E (AOC-2 Groundwater Data Table). Red shading "indicates that the result exceeds the applicable Soil Screening Level or Groundwater Standard."

The Permittee does not need to revise the tables but should be aware of possible errors. This should be corrected in future reports.

Response 2

The concentration of ethylbenzene in AOC1-B-1 (5-7.5') in soil was actually 146,000 µg/kg, which does exceed the Residential NM SSL of 128,000 µg/kg. However since the value was reported in scientific notation and truncated at the whole number, the reported result of 1E+5 µg/kg did not reflect the actual value of 1.48E+5 µg/kg. Correction to significant digits for ethylbenzene in AOC1-B-1 (5-7.5') has been made in Table 7D for future reports.

Correction to shading classification for ethylbenzene and total xylenes has been made for AOC-2 (MW-62) and AOC-2 (MW-63) in Table 8E for future reports.

Comment 3

Section 3.5 (AOC-3 Southeast Tank Farm Area) of the Report makes reference to Figure 7 in bullet 2, page 3-5 which appears to be a typographical error and should reference Figure 8. The Permittee must confirm if bullet 2 should reference Figure 8 and provide replacement pages as necessary.

Response 3

The typographical errors in bullet 2 of Sections 3.4 and 3.5 have been corrected to reflect the appropriate figure numbers. Replacement pages are provided with this response letter.

Comment 4

The Permittee discusses background borings in Section 6.7 (Analytical Results for Background Borings) of the Report.

NMED would like to clarify that the ten background borings drilled during the Three Mile Ditch and Evaporation Ponds Corrective Action Investigation Report, (December 2005) provide the Permittee with a range of background metals concentrations in soils at the facility, and are not specific background values. To determine background values at the facility, the Permittee must use NMED's guidance document Determination of Background (see Attachment 1).

Response 4

The soil samples from ten (10) background borings were collected and submitted for inorganic constituents to establish area-wide background metal concentrations. Borings were installed in areas not impacted by facility operations in the vicinity of the refinery. The specific proposed background sample locations were submitted to the NMED for approval prior to sampling. A revised version of Table-5A to include all summary statistics for background metal concentrations as required by NMED's guidance document *Determination of Background*, is provided with this response letter.

Comment 5

The Permittee states in Section 6.8.1.2 (Organics), page 6-14, paragraph two of the Report "Twelve (12) semivolatile compounds were detected in 1-7 samples from four borings." The fourth bullet below this sentence states "Chrysene was detected in all seven borings."

The Permittee must confirm if the reference to seven borings is a typographical error because only four borings were referenced in the first sentence and drilled around SWMU-1. The Permittee must provide replacement pages as necessary.

Response 5

The typographical errors in the second and fourth bullets of Section 6.8.1.2 (Organics) have been corrected to reflect the four borings that were drilled around SWMU-1. Replacement pages are provided with this response letter.

Comment 6

The Permittee states in Section 7.1.2 (Groundwater Results), page 7-2 of the Report "As suspected based on historical drilling and well logs, the depth that groundwater was first encountered while drilling (as indicated by moist-to-wet-core samples) was deeper than measured several days later, indicating a confined shallow aquifer."

It is NMED's opinion that a "confined shallow aquifer" is unlikely in the shallow zone but that local semi-confining conditions could be present.

Response 6

It is likely that local semi-confining conditions may exist in the uppermost zone. The near subsurface is dominated by fine-grained silts and clays and using moist-to-wet-core samples to determine depth to groundwater is an approximation. Experience has shown that groundwater is partially confined and may rise in the well to an elevation several feet above the saturated zone days after installation of a well.

A supplemental work plan for SWMU/AOC Group 1 separate from this response letter will be provided to the NMED in response to Comment 7.

If you have any questions concerning this response letter, please contact me or Steve Tischer at 432 687-5400.

Very truly yours,

ARCADIS

Kuohui Lowrie

Kuohui Lowrie
Project Engineer

Enclosures:
Section 3.4, page 3.4 (replacement page)
Section 3.5, page 3-5 (replacement page)
Table-5A (replacement page)
Section 6.8.1.2, page 6-14 (replacement page)

3.4 AOC-2 Former Diesel Tanks in North Plant Area Investigation

The scope of work for AOC-2 included a limited soil and groundwater investigation of the perimeter of AOC-2 and to the east to determine the source of diesel range hydrocarbons in the vicinity of the closed TEL unit. This area is a highly hazardous area of the operating facility with access limited to perimeter locations. The scope of the investigation is summarized as follows:

- Soil gas samples were obtained from 13 locations around the FCCU, Alky and CCR areas as shown on Figure 7. Soil gas samples were screened in the field for methane, CO_2 and oxygen.
- Four soil borings and three monitor wells were installed with a direct push or auger rig at the locations indicated on Figure 7. Three borings were installed upgradient along the western and southern perimeter of the FCCU: at the northwest corner, the southwest corner and near the southeast corner of the unit (completed as a monitor well). Four borings were installed downgradient: at the northeast corner of the FCCU (completed as a monitor well), north of the CCR and Alky units (between the two units), along the eastern side of the Alky unit and east of the Gas-Oil Hydrotreater (completed as a monitor well).
- Each boring (and monitor well) was installed from the surface to a depth 5 feet below the water table surface, or the maximum depth of contamination based on field screening, whichever was deeper. Each boring/monitor well was continuously sampled and field screened using a PID, by visual observation and odor.
- Soil samples selected for analysis as described in Section 4.2.3 and Appendix A were analyzed for BETX, Diesel Range Organics (DRO) and lead. Samples exhibiting DRO concentrations exceeding 1,000 mg/kg were analyzed for SVOCs.
- Groundwater samples were collected from two borings and analyzed for BETX, DRO and TDS. If the DRO was greater than 5mg/l, the sample was analyzed for SVOCs. Free product was present in two borings and the recovered product was analyzed by gas chromatography.
- Groundwater samples from the three monitor wells were obtained by low-flow sampling and analyzed for VOCs, SVOCs, 8 RCRA metals, major cations/anions (Ca, Mg, K, Na, Cl, Fl, sulfates), cyanide and other general water quality parameters (specific conductance, pH, TDS) using EPA methods 8260B, 8270C, 6010/7471, 325.2, 300.0, 375.4, 335.2 and 160.1 respectively.

3.5 AOC-3 Southeast Tank Farm Area

The scope of work for AOC-3 included performing a limited soil and groundwater investigation along and within the perimeter of AOC-3 to determine if it is the source of the off-site hydrocarbon plume and identify possible current and/or historic sources of subsurface contamination. The scope of the investigation is summarized as follows:

- Soil gas samples were obtained from 73 locations throughout the tank farm area as shown on Figure 8. Samples were generally obtained from at least 3 locations near each tank inside the tank berm. Soil gas samples were screened in the field for methane, CO_2 and oxygen.
- Eight soil borings (5 direct push borings and 3 monitor wells) were installed with a direct push or auger rig at the locations indicated on Figure 8, three of which were completed as monitor wells. Two borings were placed along the northern and southern perimeter of the tank farm (one on southern side completed as a monitor well) and one each on the eastern (completed as a monitor well) and western side. One boring was placed east of Tank 433 near the northwest side of the tank farm and one boring was placed south of Tank 431 near the southwest corner of the tank farm (completed as a monitor well). All borings and monitor wells were placed outside the tank berms.
- Each boring was installed from the surface to a depth 5 feet below the water table surface, or the maximum depth of contamination based on field screening, whichever was deeper Each boring was continuously sampled and field screened using a PID, by visual observation and odor.
- Soil samples selected for analysis as described in Section 4.2.3 and Appendix A were analyzed for BTEX, Diesel Range Organics (DRO) and lead. Samples exhibiting DRO concentrations exceeding 1,000 mg/kg were analyzed for SVOCs. The sample collected from the monitor well location south of Tank 431 exhibiting the highest apparent contaminant concentration, based on field screening, was to be analyzed for GRO by method 8015B. This analysis was not identified on the chain-of-custody and was not run.
- Groundwater samples were collected from four of the borings and analyzed for BTEX, DRO and TDS. One boring was dry and a water sample could not be obtained for analysis. If the DRO was greater than 5mg/l, the sample was analyzed for SVOCs except that in two of the borings insufficient water sample could be obtained for the SVOC analysis. If free product is present, the groundwater will not be analyzed, but the product will be analyzed by gas chromatography.

Table-5A. **Occurrence Summary for Background Soil Borings, Total Soil Data, Navajo Refinery, Artesia, New Mexico.**

Constituent	Frequency Detects / Total	Percent Detects	Range of SQLs Min - Max	Range of Detects Min - Max	Total Range Min - Max	All Detect Mean	All Sample Mean	Detect Median	All Sample Median	Standard Deviation	CV	95% UCL	NUMBER OF SOIL SCREENING LEVEL EXCEEDANCES[1] DAF 20 SSL Detects	DAF 20 SSL SQL	RS SSL Detects	RS SSL SQL	I/O SSL Detects	I/O SSL SQL	CW SSL Detects	CW SSL SQL
Metals (mg/kg)																				
Arsenic	8 / 24	33%	0.261 - 0.56	0.87 - 4.5	0.261 - 4.5	2.3	0.9	2.7	2.4	1.4	0.60	1.4	8	0	2	0	0	0	0	0
Barium	23 / 24	96%	0.068 - 0.07	20 - 213	0.068 - 213	130	130	116	107	58	0.44	147	0	0	0	0	0	0	0	0
Cadmium	6 / 24	25%	0.116 - 0.25	0.42 - 0.874	0.116 - 0.874	0.58	0.21	0.65	0.50	0.23	0.40	0.29	0	0	0	0	0	0	0	0
Chromium (as Chromium VI)	24 / 24	100%	NA	3.44 - 21.7	3.44 - 21.7	12	12	13	13	4.9	0.41	14	0	0	0	0	0	0	0	0
Lead[(a)]	23 / 23	100%	NA	2.39 - 22.9	2.39 - 22.9	9.1	9.1	13	13	5.7	0.62	11	0	0	0	0	0	0	0	0
Selenium	19 / 24	79%	0.445 - 0.61	1.45 - 5.1	0.445 - 5.1	3.1	2.5	3.3	2.8	1.5	0.48	3.1	0	0	0	0	0	0	0	0
Silver	4 / 24	17%	0.046 - 0.1	0.9 - 1.8	0.046 - 1.8	1.3	0.24	1.3	0.92	0.49	0.38	0.41	0	0	0	0	0	0	0	0
Mercury	1 / 24	4%	0.0109 - 0.02	0.05	0.0109 - 0.05	0.05	0.009	0.05	0.03	0.0087	0.17	0.012	0	0	0	0	0	0	0	0

(a) Lead value of 108 mg/kg for BSB-7 (0-2.5 feet below ground surface) has been excluded from the statistics in this table.

Shading indicates that one-half the SQL exceeds the applicable Soil Sceening Level or that there is no SSL.

Shading indicates that the Result exceeds the applicable Soil Screening Level.

SQL Sample Quantitation Limits for the non-detects. The Method Detection Limit (MDL) adjusted for sample dilution .

Detect Mean Arithmetic average of the Result only for samples where the analyte was detected.

All Sample Mean Arithmetic average of the total number of samples, using proxy concentrations (1/2 the SQL), for non-detects.

Detect Median Median of the Result only for samples where the analyte was detected.

All Sample Median Median of the total number of samples, using proxy concentrations (1/2 the SQL), for non-detects.

Standard Deviation Square root of the variance, based on all samples including proxy concentrations (1/2 the SQL), for non-detects.

CV Coefficient of variation, ratio of standard deviation to mean, based on all samples including proxy concentrations (1/2 the SQL), for non-detects.

95% UCL 95 percent confidence that 95 percent of all samples will not exceed the upper tolerance limit (UTL).

NA Not applicable.

Metals Metals listed are the 8 RCRA metals

mg/kg Milligrams per kilogram.

ug/kg Micrograms per kilogram.

[1] **Number of Soil Screening Level (SSL) Exceedences** - the number of samples for which the detected analyte concentration or one-half the SQL exceeds each of the four soil screening levels (i.e., DAF20, Residential (RS), Industrial/Occupational (I/O), Construction Worker (CW)).

SSL Soil Screening Levels

DAF-20 Soil Screening Level for Soil-to-Groundwater.

RS Residential Soil Screening Level.

I/O Industrial/Occupational Soil Screening Level.

CW Construction Worker Soil Screening Level.

SSLs are from the New Mexico Technical Background Document for Development of Soil Screening Levels (Rev.3, August 2005); if no value exists, the value is from the EPA Region 6 Human Health Screening Levels; carcinogens adjusted to 10-5 risk (Version 8, November 2005).

Benzene, ethylbenzene, toluene, xylenes (BETX) and three additional VOCs (ethylene dichloride, methyl ethyl ketone and carbon disulfide) were detected in one to six of the 13 samples:

- No VOCs were detected above any of the four SSLs from B-4. The detected values for carbon disulfide were not above any SSL.
- Ethylene dichloride (2 detections), benzene (3 detections), ethyl benzene (6 detections), toluene (3 detections) and xylenes (5 detections) were present in at least one sample from three borings, above the DAF20 SSL. Only MEK (1 sample) and benzene (2 samples) were present above the RS SSL.
- MEK was present in one sample (B-3 0-2.5') above the I/O and CW SSLs (70 ug/kg vs. 4.9 ug/kg).
- Benzene was present in one sample (B-2 0-2.5') above the I/O SSL (13.6 mg/kg vs. 8.1 mg/kg).

Twelve (12) semivolatile compounds were detected in 1-7 samples from all four borings:

- Nine of the detected semivolatiles were present at maximum concentrations that did not exceed any of the four SSLs.
- Naphthalene was detected in all four borings and was the only semivolatile that exceeded DAF20 SSLs, in five samples from all four borings. Naphthalene concentrations did not exceed any of the other three SSLs (RS, I/O or CW).
- Benzo(a)pyrene was detected in two of the samples. It was present in one sample (B-3 0-2.5') at a concentration (2.58 mg/kg) that exceeded RS (0.6 mg/kg) or I/O (2.34 mg/kg) SSLs.
- Chrysene was detected in all four borings. It was present in one sample (B-3 0-2.5') at a concentration (1.73 mg/kg) that exceeded the RS, I/O and C/W SSLs (0.95 mg/kg for all three).

6.8.1.3 Metals

Boring samples were analyzed for eight (8) RCRA metals. Sample results are provided in Table 6B and 6D.

Arsenic was detected in two samples at concentrations of 1.5 mg/kg (B-3 0-2.5') and 7.8 mg/kg (B-1 0-2.5'). Both concentrations exceeded the DAF20 SSL (0.29 mg/kg) and the higher concentration exceeded the RS SSL (3.9 mg/kg). The lower concentration is within the range of arsenic background (0.87 – 4.5 mg/kg).

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Infrastructure, environment, facilities

Imagine the result

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ENVIRONMENTAL

Hope Monzeglio
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East Building 1
Santa Fe, New Mexico 87505-6303

Subject:
Submittal of SWMU-1/AOC Group 1 Additional Corrective Action Investigation Work Plan; Navajo Refining Company, Artesia, New Mexico; RCRA Permit No. D048918817

Date:
December 15, 2006

Dear Ms. Martin:

On behalf of Navajo Refining Company, ARCADIS G&M respectfully submits four copies of the above-referenced Additional Corrective Action Investigation Workplan. If you need additional copies of the workplan or require additional information please contact Mr. Darrell Moore of Navajo Refining Company at (505) 746-5281 or me at (432) 687-5400.

Sincerely,

ARCADIS G&M, Inc.

Brady T. Kolb
Task Manager

Copies:
Darrell Moore- Navajo Refining Company

Contact:
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Navajo Refining Company
Artesia, New Mexico

SWMU-1/AOC Group 1

Additional Corrective Action
Investigation Workplan

RCRA Permit No.
DO48918817

Prepared for:
Navajo Refining Company

Prepared by:
ARCADIS G&M, Inc.
1004 North Big Spring Street, Suite 300
Midland, Texas 79701
Tel 432 687-5400
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Our Ref.:
MT000936.0001

Date:
December 15, 2006

Table of Contents

Figures

Appendices

1.0 Executive Summary

The Secretary of the New Mexico Environment Department (NMED) issued a Post-Closure Care Permit to the Navajo Refining Company, owner and operator of the Artesia Refinery Facility (EPA ID number NMD 048918817) effective October 5, 2003. The Permit authorizes and requires Navajo (the Permittee) to conduct post-closure care at closed surface impoundments (i.e. the Evaporation Ponds) and a closed land treatment unit at the Artesia refinery. The Permit establishes the general and specific standards for these activities, including a schedule to complete the Remedial Investigations at the surface impoundments and other identified solid waste management units (SWMUs) and Areas of Concern (AOCs), pursuant to the New Mexico Hazardous Waste Act (HWA), NMSA 1978, 74-4-1 *et. seq.* (Repl. Pamp. 1993) and the New Mexico Hazardous Waste Management Regulations, 20.4.1.100 NMAC *et seq.*

The Permit specifies a Corrective Action program that the Permittee will follow to address releases to soil and groundwater from the Evaporation Ponds (EPs), North Colony Landfarm (NCL), Tetraethyl Lead Impoundment (TEL) or other units if detected, during the post-closure care period. The investigation approach, sampling strategy, monitoring plan and remediation option, if applicable, for corrective action for detected soil and groundwater contamination is specific to the contaminants and release event(s) and is generally described in the permit.

The Permit requires that a work plan for investigation of the EPs be submitted to the NMED within 90 days of the effective date of the Permit. The Permit also requires submittal of investigation work plans for 14 additional SWMUs/AOCs, including Three-Mile Ditch (TMD), no later than four years from the effective date of the Permit. The initial investigation of SWMUs and AOCs was completed in 2003 and included drilling more than 100 total soil borings to investigate each facility. Soil and groundwater samples were collected from those soil borings. In a letter from the NMED dated September 15, 2006, the agency approved the investigation report with comments and recommendations for a work plan for additional investigation at each area to be submitted to the NMED by November 17, 2006.

This workplan describes the requirements and proposed investigation procedures for the Additional Corrective Action Investigation of the SWMU-1/AOC Group 1, which includes the North API Separator (SWMU-1), Diesel Tank Farm (AOC-1), Former Diesel Storage Tank Area (AOC-2) and Southeast Tank Farm (AOC-3). The Additional Corrective Action Investigation will provide further information regarding

characterization of potential releases of petroleum-related substances, hazardous waste or hazardous waste constituents from these facilities into the environment at the site and provides long-term groundwater monitor points. Results from the Investigation will be reported to the NMED within 150 days of the completion of field activities following the Investigation Report format in the Permit. If the Secretary determines that corrective measures are necessary, results of the Investigation will be used to evaluate potential remedial alternatives and recommend a preferred remedy that will be protective of human health and the environment and attain the appropriate cleanup goals. Following completion of the corrective actions study, Navajo will prepare and submit to the NMED an Additional Corrective Investigation Study report that follows the format outlined in the Appendix E, Section E.2 of the Post-Closure Care Permit.

2.0 Introduction

Conditions of the Part B Permit for the Navajo Refining Company Artesia Refinery as required by the NMED and the New Mexico Oil Conservation Division (NMOCD) include the assessment of various facilities and solid waste management units (SWMUs) associated with historical operations. The Permit specified the workplan to assess the EPs (approximately 100 acres) be submitted within 90 days of the effective permit date of October 5, 2003 (by January 3, 2004). The Permit also requires Navajo to submit workplans for investigation of all other identified SWMUs and Areas of Concern (AOCs) over the next four years. This workplan for SWMU-1/AOC Group 1 additional Corrective Action Investigation details the remedial measures and methodologies for activities to be conducted at each of these facilities based on requirements from the September 15, 2006 letter described previously.

The letter provides specific soil and groundwater investigation requirements for the SWMU and AOC including:

SWMU-1 (North API Separator)

- Locations for collecting additional soil vapor, soil and groundwater data to determine the horizontal and vertical extent of contamination surrounding SWMU-1 to the north, south, east and west; and

- Activities to determine the source(s) of groundwater contamination in this area.

AOC-1 (Diesel Tank Farm)

- Locations for collecting additional soil vapor, soil and groundwater data west of borings AOC-1 (B-2), AOC-1 (B-7) and soil gas sample AOC-1 (SG-7);

- Locations for collecting additional soil vapor, soil and groundwater data north of soil gas locations AOC-1 (SG-6) and AOC-1 (SG-5);

- Additional investigation south of soil boring and soil gas locations AOC-1 (B-7), AOC-1 (B-8), AOC-1 (SG-2, SG-3 and SG-4) in the direction of SWMU-1;

- Additional investigation east of borings AOC-1 (B-4), AOC-1 (B-5), AOC-1

(B-8), soil gas location AOC-1 (SG-01) and monitor well MW-67;

- Installation of monitoring wells north and south of MW-67; and
- Installation of one monitoring well southeast of AOC-1 (B-7).

AOC-2 (Former Diesel Storage Tank Area)

- Determine the source of the "recent or ongoing release of natural gas or very light intermediate product to the west-northwest of the current Fluid Catalytic Cracking Unit (FCCU)";
- Install additional investigation borings north-northwest of boring AOC-2 (B-1) and soil gas sample point AOC-2 (SG-03);
- Install additional investigation borings west of AOC-2 (B-1), AOC-2 (B-2) and soil gas sample location AOC-2 (SG-2)
- Install additional investigation borings south of AOC-2 and MW-61
- North of borings AOC-2 (B-3), soil gas sample locations AOC-2 (SG-6), north and east of AOC-2 (SG-10) and southeast of boring AOC-2 (B-4);
- East of the alkalation unit, the Gas-Oil Hydrotreater, boring AOC-2 (B-4) and MW-63; and
- Install monitor wells north of MW-63 and west of the FCCU.

AOC-3 (Southeast Tank Farm)

- Collect additional soil vapor, soil and groundwater samples east, west, north and south of AOC-3 to delineate the offsite plume;
- Install monitor wells north and south of MW-66;
- Install additional investigation borings south of MW-64, MW-65 and soil gas sample point AOC-3 (SG-48) and boring AOC-3 (B-5);
- Install additional investigation borings west of soil gas sample points AOC-3

(SG-60, 66, 73) and soil boring AOC-3 (B-1);

- Install additional monitor wells west of AOC-3;
- Install additional investigation borings north of AOC-3 (SG-40, 73, 69) and AOC-3 (B-3, 4);
- Install additional monitor wells north of AOC-3;
- Identify potential sources in the vicinity surrounding AOC-3;
- Sample product in RW-15 for fingerprint analysis;
- Investigate possible release near southern perimeter of AOC-3; and
- Determine other separate sources and areas of contamination in the vicinity of the Southeast Tank Farm.

3.0 Background

Navajo Refining Company operates a 80,000 barrel-per-day petroleum refinery located at 501 East Main Street in Artesia, Eddy County, New Mexico. The mailing address is:

Navajo Refining Company
P.O. Box 159
Artesia, NM 88211-0159

The facility has been in operation since the 1920s and processes crude oil into asphalt, fuel oil, gasoline, diesel, jet fuel and liquefied petroleum gas.

The Navajo refinery is regulated under the Resource Conservation and Recovery Act (RCRA), having EPA ID Number NM0048918817. The NMED issued a Hazardous Waste Facility Permit to Navajo effective August 21, 1989. This permit authorized Navajo to operate the North Colony Landfarm as a hazardous waste management unit. The North Colony Landfarm was used to manage hazardous wastes by employing biodegradation and other processes to eliminate or immobilize hazardous constituents. The North Colony Landfarm was used until 1990 when it was taken out of service.

The RCRA Permit was issued effective for ten years with an expiration date in August 1999. The first phase, for a Landfarm Treatment Demonstration, was to be effective for one year. Phase Two was for the landfarm operation and was to be issued for nine years upon completion of the land treatment demonstration. Use of the North Colony Landfarm was discontinued during the land treatment phase; therefore, the second phase for operation of the landfarm was never issued. However, the general permit conditions remained in effect for the original life of the issued permit and until the new permit was issued effective October 5, 2003.

Included as part of the 1989 Hazardous Waste Facility Permit was a Hazardous and Solid Waste Amendment (HSWA) Permit issued by the EPA. This permit required Navajo to identify all historical and current non-hazardous SWMUs and investigate those with the potential to pose a threat to human health or the environment. SWMUs which pose a potential threat must undergo additional investigation (a RCRA Facility Investigation, or RFI) and possibly corrective measures (Corrective Measure Implementation, or CMI) to minimize the threat. This entire process is referred to as Corrective Action.

From an initial list of nineteen SWMUs found at the Navajo refinery, three were identified as requiring further investigation: The Truck Bypass Landfarm, TMD, and the EPs. The Truck Bypass Landfarm had been used for treatment and management of non-hazardous oily wastes. TMD was used to convey treated processed wastewater to a series of ponds, referred to as EPs 1-6, located three miles east of the refinery. The EPs occupied an area of approximately 100 acres and used solar evaporation to eliminate treated wastewater since there was no other feasible option for disposal or discharge. Pond 1 was taken out of service in 1987 when the open ditch was replaced with a closed pipeline.

Intensive investigation of these three SWMUs began in late 1989. Following completion of the Phase I RCRA Facility Investigation (RFI) in December, 1990, the EPA and NMED agreed only annual monitoring was required for the Truck Bypass Landfarm, but that additional investigations were required for TMD and the EPs.

The second phase of investigation of TMD and the EPs was conducted from 1991 through 1993, resulting in the RFI Phase II Report finalized in November, 1993. In 1993, EPs 2-6, which are directly adjacent to Evaporation Pond 1 and were still in service, became the subject of litigation brought by EPA to force their closure. As a result of this litigation, further studies of Pond 1 and Ponds 2-6 were conducted on separate parallel paths with Ponds 2-6 being placed on an accelerated schedule.

Additional investigation work on Ponds 2-6 was completed in September 1993. A preliminary closure approach report was submitted to the EPA and NMED in October, 1993 and served as the basis for determining how Ponds 2-6 would be de-commissioned and closed. The first draft of the Closure Plan for Ponds 2-6 was submitted to the EPA and NMED in March 1995. Following additional human health and ecological risk studies, a final Closure Plan was submitted in August 1996. Details of the risk assessment and closure methodology were developed in conjunction with the EPA and the NMED. The risk assessment results indicated acceptable human health and ecological risks under an agricultural land use scenario.

During this period, studies of TMD, Pond 1 and the groundwater continued. A final Phase III Investigation Report addressing comments from the EPA and NMED was submitted in January 1996 along with a proposed work plan for removal of waste soils from TMD. Risk analyses conducted as part of the CMS Workplan indicated acceptable human health and ecological risk for future agricultural use of the site.

At the request of NMED, Navajo submitted a Post-Closure Permit Application in June

1998. The original intent of this application to address only closure and post-closure activities at the EPs and TMD was expanded to include a complete RCRA Permit renewal application. While the permit application was pending with NMED, no additional site investigation activities were undertaken.

The Secretary of the NMED issued a Post-Closure Care Permit to Navajo Refining Company, the owner and operator of the Artesia Refinery Facility (EPA ID number NMD 048918817) effective October 5, 2003. The Permit authorizes and requires Navajo (the Permittee) to conduct post-closure care at closed surface impoundments and a closed land treatment unit at the Artesia refinery. The permit also requires Navajo to submit workplans for investigation of all other identified SWMUs and Areas of concern (AOCs) within four years. The SWMU and AOCs were grouped into two related packages of areas in order to efficiently address the investigation needs at each SWMU or AOC. Group 1 includes SWMU-1 (North API Separator), AOC-1 (Diesel Tank Farm), AOC-2 (Former Diesel Storage Tanks), AOC-3 (Southeast Tank Farm Area).

Field investigation activities at SWMU-1/AOC Group 1 were conducted in April and May 2005. During this phase of field investigation, more than one-hundred soil gas sample points were drilled in and around the SWMU and AOCs. This workplan for the Additional Corrective Active Investigation will include more in-depth soil and groundwater study of the SWMU and the AOCs. A general map of the area is included as Figure 1. Table 1 contains references for previous investigation reports for SWMU-1/AOC Group 1.

The following section provides additional background and detail regarding the history and site conditions for SWMU-1 and the three Group 1 AOCs.

4.0 Site Conditions

4.1 SWMU-1/AOC Group 1

The North API Separator (SWMU-1), located north-northwest of the active refinery processing units and just south of Eagle Creek, was removed from service in 2001. The initial investigation was intended to determine if there were contaminated soils associated with the unit that may pose a threat of release to groundwater. During the spring 2005 investigation, four soil borings were installed at this AOC. As summarized above further soil and groundwater study in this area will be conducted to delineate existing plume dimensions.

The Diesel Tank Farm (AOC-1) is located in the northwest portion of the refinery. The Diesel Tank Farm is believed to have been the source of groundwater contamination discovered beneath the North Colony Landfarm (NCL), as well as the source of phase-separated hydrocarbons (PSH) discovered in a monitoring well east of the NCL in the early 1990s.

The Former Diesel Storage Tanks (AOC-2) in the north plant processing area were located at the site now occupied by the Fluid Catalytic Cracking Unit (FCCU). Three diesel storage tanks dating back to the 1940s or 1950s were demolished in the 1970s prior to construction of the FCCU. The site lies to the west of the closed tetraethyl lead unit (TEL), which is a closed hazardous waste unit, where contaminants and PSH consistent with diesel have been found in both upgradient and downgradient wells. Four soil borings and thirteen soil gas sample points were installed around AOC-2 during the spring of 2005 investigation.

The Southeast Tank Farm (AOC-3) consist of 26 acres of land occupied by 22 product and intermediate storage tanks ranging in size from about 10,000 barrels (BBL) to over 50,000 bbl. Tanks in this area are primarily used for storage of finished gasoline. PSH consistent with gasoline has been found in nearby and off-site monitor wells and recovery wells, both upgradient and downgradient from AOC-3. Seventy-three soil gas sample points and five soil borings were drilled. Soil samples were obtained and analyzed from the Southeast Tank Farm area during the spring of 2005.

5.0 Scope of Investigation

This work plan describes the requirements and the proposed investigation procedures for the Additional Corrective Action Investigation for SWMU-1/AOC Group 1 as prescribed in the September 15, 2006 letter from the NMED. The Additional Corrective Action Investigation will focus on more in-depth investigation of soil and groundwater conditions and a plan for locating possible source areas. Following completion of the field portion of the investigation and receipt of laboratory results, Navajo will prepare and submit to the NMED an Investigation Report following the format requested in the Permit.

5.1 SWMU-1/AOC Group 1

As prescribed in a letter from NMED dated September 15, 2006, the proposed scope of work for the Additional Corrective Action Investigation for the SWMU-1/AOC Group 1 (Figures 2, 3, 4 and 5) is summarized as follows:

SWMU-1 (North API Separator)

- Will collect additional soil vapor, soil and groundwater data to delineate soil and groundwater impacts in the vicinity of previously drilled soil borings using soil vapor sample points and soil borings;
- Install monitor wells around SWMU-1 to determine extent of contamination surrounding SWMU-1; and
- Determine source(s) of groundwater contamination in this area.

AOC-1 (Diesel Tank Farm)

- Will collect additional soil vapor, soil and groundwater data to further investigate the horizontal and vertical extent of contamination in the following areas using soil vapor sample points and soil borings:
    - West of contamination detected at borings AOC-1 (B-2), AOC-1 (B-7) and soil gas sample AOC-1 (SG-7);
    - North of detected contaminants at soil gas sample locations AOC-1 (SG-6) and AOC-1 (SG-5);

- South of detected contaminants at soil boring and soil gas sample locations AOC-1 (B-7 and B-8), and AOC-1 (SG-2, SG-3 and SG-4), specifically in the direction of SWMU-1;

- East of detected contaminants at borings AOC-1 (B-4, B-5 and B-8), soil gas sample location AOC-1(SG-1) and monitor well MW-67;

- Two monitor wells: one north and one south of existing monitor well MW-67; and

- One monitor well east of the Former Tank Locations.

AOC-2 (Former Diesel Storage Tank Area)

- Will determine the source of "recent or ongoing release of natural gas or very light intermediate product to the west-northwest of the current Fluid Catalytic Cracking Unit (FCCU)" through operations and maintenance record research, historical documents, as-built drawings and other methods;

- Will collect additional soil vapor and soil data using soil gas sample points and soil borings to better delineate horizontally and vertically in the following areas:

  - North-northwest of boring AOC-2 (B-1) and soil gas sample point AOC-2 (SG-3) toward the southeast corner of SWMU-1;

  - West of borings AOC-2 (B-1 and B-2) and soil gas sample location AOC-2 (SG-2);

  - South of AOC-2 and monitor well MW-61;

  - North of boring AOC-2 (B-3) and soil gas sample locations AOC-2 (SG-6), north and east of AOC-2 (SG-10) and southeast of AOC-2 (B-4);

  - Investigate areas east of the alkalation unit, the Gas-Oil Hydrotreater, boring AOC-2 (B-4) and MW-63; and

- Install two monitor wells; one north of MW-63 and one west of the FCCU.

AOC-3 (Southeast Tank Farm)

- Collect additional soil vapor and soil data using soil vapor sample points and soil borings east, west, north and south of AOC-3;
- Install two monitor wells: one north and one south of existing MW-66;
- Collect additional soil vapor and soil data south of MW-64, MW-65, soil gas sample point AOC-3 (SG-48) and boring AOC-3 (B-5);
- Collect additional soil vapor, soil and groundwater data using soil vapor sample points, soil borings and installing one monitor well west of AOC-3 (B-1) and AOC-3 (SG-60, SG-66 and SG-73);
- Collect additional soil vapor, soil and groundwater data using soil vapor sample points, soil borings and installing one monitor well north of AOC-3 including AOC-3 (SG-73, SG-69 and SG-40) and soil borings AOC-3 (B-3 and B-4);
- Identify additional potential sources in the vicinity surrounding AOC-3, including review of current facility operation practices, review of construction drawing/blue prints, surveying and testing of underground utility lines, pipes, other infrastructure and other investigation methods;
- Sample and analyze product found in RW-15; and
- Investigate possible release near southern end of perimeter of AOC-3. Utility and product line information will be reviewed to determine if any transported product matches the soil vapor contamination detected in the initial investigation.

6.0 Investigation Methods

6.1 Soil Gas Survey

Soil gas surveys are useful for delineating the aerial extent of hydrocarbon contamination in soil as well at mapping groundwater contamination plumes. This technique is particularly useful for products such as gasoline, diesel, MTBE and other fuel blending stocks because vapors from specific product types can be differentiated as well as measuring by-products from biological degradation, which can assist with identifying specific locations of historical active releases.

During the initial field investigation conducted in the spring of 2005, soil gas surveys were conducted primarily in the Southeast Tank Farm Area and to a lesser extent in the Former Diesel Storage Tank Area and the Diesel Tank Farm Area. No soil gas samples were collected from the North API Separator. Seventy-three soil gas samples were collected and analyzed from the Southeast Tank Farm Area, thirteen from the Former Diesel Storage Tank Area and eight from the Diesel Tank Farm.

Soil gas sample will be collected at all three AOCs and SWMU-1. Sample results from the Additional Corrective Active Investigation will be used in conjunction with the Spring of 2005 results to delineate soil and groundwater plumes. Soil gas samples will be field screened for methane, carbone dioxide (CO2) and oxygen (O2). After field screening, soil gas samples will be submitted for laboratory analysis of CO2, C_1-C_4 (methane, ethane, propane and butanes) and C_5^+ (pentane-xylenes+) hydrocarbons by high resolution capillary chromatogrpaphy.

6.2 Soil Boring Installation

Soil borings will be installed using direct-push (geoprobe) methods to a depth of five feet below the top of the observed saturated zone or five feet below the deepest observed contamination. Soil borings will be installed at each of the AOCs and SWMU-1 to assist in delineating soil and groundwater contamination. Two to four samples will be collected from each boring. Soils borings will also be completed as temporary monitoring wells. Groundwater samples will be collected from each boring before plugging and abandonment.

Soil samples from SWMU-1 will be analyzed for:

- Volatile organic compounds (VOCs) by method 8260;

- Diesel range organics (DRO) by method 8015;
- RCRA metals by methods 7471 and 6010B;
- Cyanide by method 335.1;
- Semi-volatile organic compounds (SVOCs) by method 8270C, if DRO is greater than 1,000 milligrams per kilogram (mg/kg); and
- The soil sample exhibiting the highest concentration of contaminants based on field screening, collected from any boring will be analyzed for oil range organics (ORO) and gasoline range organics (GRO) by method 8015B.

Groundwater samples from SWMU-1 soil borings will be analyzed for:

- VOCs by method 8260;
- DRO by method 8015B;
- SVOCs by method 8270C, if the DRO result concentrations are greater than 5 milligrams per liter (mg/l);
- RCRA 8 metals by method 6010; and
- Total dissolved solids (TDS) by method 160.1.

Soil samples from AOC-1, AOC-2 and AOC-3 will be analyzed for:

- Benzene, toluene, ethylbenzene and xylenes (BTEX) by method 8021B;
- DRO by method 8015
- Lead by method 6010B; and
- SVOCs by method 8270C, if DRO is greater than 1,000 mg/Kg.

In addition to the analyses described above for samples collected from AOC-1, AOC-2 and AOC-3, the following analyses will be performed:

- From AOC-1, the soil sample exhibiting the highest contaminant concentrations based on field screening, will be analyzed for ORO by method 8015B; and

- From AOC-3, the soil sample exhibiting the highest contaminant concentrations based on field screening will be analyzed for GRO by method 8015B.

Groundwater samples from AOC-1, AOC-2 and AOC-3 soil borings will be analyzed for:

- BTEX by method 8021B;

- DRO by method 8015B;

- SVOCs by method 8270C, if the DRO result is greater than 5 mg/l; and

- TDS by method 160.1.

Groundwater samples will not be collected from any boring if the boring contains more than a sheen of free product. Free product samples will be collected and analyzed for fingerprint analysis to determine source area. Details for soil boring installation and sampling can be found in Appendix A

6.3 Monitor Well Installation

Monitor wells will be installed using a truck-mounted hollow stem auger rig. Monitor well borings will be continuously sampled using a split-spoon sampling device or similar methods. Soil samples from monitor well borings will be field screened with a PID in a similar manner to soil borings. Soil samples will be collected from monitor wells at the same intervals as borings. Each well will be completed to a depth of approximately 30 feet with 15 feet of four-inch mill-slotted screen and blank casing to surface. Details for monitor well drilling, installation, development and sampling can be found in Appendix B.

6.4 Monitor Well Groundwater Samples

Groundwater samples will be collected from the 18 newl- installed monitor wells using low-flow sampling methods. The samples will be submitted for laboratory analysis for:

- VOCs by method 8260B;
- SVOCs by method 8270C;
- RCRA 8 metals by method 6010/7471;
- Major cations (calcium, magnesium., potassium, sodium) by method 6010;
- Major anions by method 325.2 (chloride), method 300.0 (fluoride), method 375.4 (sulfates);
- Cyanide by method 335.2;
- Specific conductance;
- pH by method 150.1; and
- TDS by method 160.1.

Prior to sampling, water levels will be measured. Purging and sampling methodology is detailed in Appendix C. Groundwater samples will not be collected from wells containing more than a sheen of free product. Product samples will be collected and analyzed for fingerprint analysis to determine source area. Appendix D describes management procedures for investigation derived waste (IDW).

7.0 Schedule

As required by the Permit, this workplan for the Additional Corrective Action Investigation for SWMU-1/AOC Group 1 is being submitted by December 15, 2006. Field activities to implement the Workplan should be initiated within 90 days of final approval of the Workplan by the NMED, unless delayed by weather or equipment availability. Navajo will notify the NMED at least one week prior to the expected start of field activities. It is anticipated that completion of field activities will take approximately four to five weeks. Navajo will submit the Investigation Report to NMED within 150 days of completing field activities as required by the Permit.

8.0 Tables and Figures

Table 1

Previous Studies, Reports, and Plans For

SWMU-1/AOC Group 1

1. *SWMU-1/AOC Group 1 Corrective Action Investigation Report;* Navajo Refinery, Artesia, New Mexico, prepared for U.S. EPA, Region VI, Dallas, Texas, ARCADIS G & M, Inc., January 2006.

2. *RCRA Preliminary Assessment Report - Navajo Refining, Artesia, New Mexico*; U.S.EPA Region VI, Dallas Texas; April 1986.

3. *RCRA Facility Investigation Three-Mile Ditch and Evaporation Ponds, Phase I* (Revised); Navajo Refinery, Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. Mariah and Associates, Inc., October 1990 and December 1990.

4. *RCRA Facility Investigation Workplan Three-Mile Ditch and Evaporation Ponds* (Revised); Navajo Refinery, Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. K. W. Brown Environmental Services, June 1992 (original submitted December 1990; revised May 1991).

5. *Evaporation Ponds (2-6) Evaluation Report*; Navajo Refinery, Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. ENSR, September 1993.

6. *Pond 2 Closure and Post-Closure Care Approach*; Navajo Refinery, Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. ENSR, October 1993.

7. *RCRA Facility Investigation Three-Mile Ditch and Evaporation Ponds, Phase II Report*, (Revised); Navajo Refinery, Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. K. W. Brown Environmental Services, November 1993 (original submitted April 1993).

8. *RCRA Facility Investigation Phase III Workplan Three-Mile Ditch and Evaporation Ponds*; Navajo Refinery, Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. RE/SPEC Inc., July 1994.

9. *Evaporation Pond 1 Corrective Measures Study Workplan* (Revised); Navajo Refinery, Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. RE/SPEC Inc., August 1995 (original submittal August 1994; revised, December 1994).

10. *RCRA Facility Investigation Phase III Report Three-Mile Ditch and Evaporation Ponds* (Revised); Navajo Refinery, Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. RE/SPEC Inc., January 1996 (original submitted April 1995, revised October 1995).

11. *Proposed Workplan for Removal of Surficial Waste Deposits at Three-Mile Ditch (Revised) Attachment 2, RFI Phase III report Three-Mile Ditch and Evaporation Pond*; Navajo Refinery, Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. RE/SPEC Inc., January 31, 1996.

12. *Supplemental Pond 1 Soil Sampling Data, Evaporation Pond 1 Corrective Measures Study Workplan*; Navajo Refinery, Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. Navajo Refining Co., January 31, 1996.

13. *Navajo Pond 1 CMS Workplan, Supplemental Soil Sampling Analysis*; Navajo Refining Co., Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. Navajo Refining Co., April 18, 1996.

14. *Evaporation Ponds (2 – 6) Closure Plan*; Navajo Refining Co., Artesia, New Mexico; prepared for U.S. EPA, Region VI, Dallas, TX. ENSR, August 1996 (original submitted March 1995, revised June 1995).

15. *Application for HSWA Permit Modification to Decommission Three-Mile Ditch and Evaporation Ponds*; Navajo Refining Co., Artesia, New Mexico. ENSR, January 1997 (draft, not submitted).

9.0 Appendices

APPENDIX A – SOIL BORING INSTALLATION

Soil borings will be installed using direct-push technology. Drilling equipment will be decontaminated before drilling each boring. Precautions will be taken to prevent the migration of contaminants between geologic, hydrologic or other identifiable zones during drilling.

The drilling and sampling will be accomplished under the direction of a qualified engineer or geologist who will maintain a detailed log of the materials and conditions encountered in each boring. Sample information and visual observations of the cuttings and core samples will be recorded on the boring log. Known site features and/or site survey grid markers will be used as references to locate each boring prior to surveying the location. The boring locations will be measured to the nearest foot, and locations will be recorded on a scale site map upon completion of each investigation.

Relatively undisturbed, discrete soil samples will be obtained during the advancement of each boring for the purpose of logging, field screening and analytical testing. Generally, samples will be collected from the following intervals and depths:

Utilizing direct-push technology, borings will be advanced to a depth of five feet below the maximum depth of contamination as detected by field screening but not deeper than the groundwater interface (except when water samples will be collected from soil borings). Soil samples will be collected every two feet from the ground surface to the maximum depth of the boring. Soil samples will be field screened with a photo-ionization detector (PID), through visual observations of staining and by odor.

The following samples from each boring will be submitted for laboratory chemical analysis:

- A sample will be collected from the near surface soils (surface to two feet below ground surface);
- Below two feet, a sample will be collected from the two-foot interval exhibiting the highest potential contamination based on field screening; or
- If no PID reading above background or other indication of contamination is observed, a sample will be obtained from the 4 to 6 foot interval;

- A sample will be collected from 2 to 4 feet below the deepest positive PID reading or other indication of contamination. This sample could be the same as the previous description if there is no indication of subsurface contamination;

- A sample will be collected from immediately above the saturated zone; and

- Groundwater samples will be collected from soil borings using low-flow sampling techniques.

Following the above criteria, from two to four soil samples and a groundwater sample will be obtained from each boring depending on indications of subsurface contamination and depth to groundwater.

The sampling interval for the borings may be modified, or samples may be obtained from a specific depth, based on field observations. A decontaminated split-barrel sampler lined with brass sleeves, a continuous coring device or other method approved by the Secretary will be used to obtain samples during the drilling of each boring.

The split-barrel sampler lined with brass sleeves or a coring device is the preferred sampling method for borehole soil, rock and sediment sampling. Depending on the type of equipment available by the direct-push contractor, one of the sampling methods will be employed. The following procedures will be followed if a split-barrel sampler is used. Upon recovery of the sample, one or more brass sleeves will be removed from the split-barrel sampler and the open ends of the sleeves will be covered with Teflon tape or foil and sealed with plastic caps fastened to the sleeves with tape for shipment to the analytical laboratory. If brass sleeves are not used, a portion of the sample will be placed in a pre-cleaned, laboratory-provided sample container for laboratory chemical analysis. The remaining portions of the sample will be used for field logging and field screening.

Discrete samples will be collected for field screening and laboratory analyses. Homogenization of discrete samples collected for analyses other than VOCs will be performed by the analytical laboratory, if necessary.

Samples to be submitted for laboratory analyses will be selected based on: 1) the results of the field screening, 2) the position of the sample relative to groundwater, suspected releases, and/or site structures or features, 3) the sample location relative to

former or altered site features or structures, 4) the stratigraphy encountered in the boring as proposed in the work plan.

The physical characteristics of the sediment (such as mineralogy, moisture content, texture, color, presence of stains or odors, and field screening results), depth where each sample was collected, method of sample collection and other observations will be recorded on the field log.

Samples obtained from the borings will be screened in the field for evidence of the presence of contaminants. Field screening results will be recorded on the boring log, used as a general guideline to determine the nature and extent of possible contamination as described in the work plan. In addition, screening results will be used to aid in the selection of soil samples for laboratory analysis.

The primary screening methods will include visual examination and headspace vapor screening for VOCs. Presence of odor will also be noted.

Visual screening includes examination of soil samples for evidence of staining caused by petroleum-related compounds or other substances that may cause staining of natural soils such as elemental sulfur or cyanide compounds.

Headspace vapor screening targets volatile organic compounds and will be conducted by placing a soil sample in a plastic sample bag or foil sealed container allowing space for ambient air. The container will be sealed and then shaken gently to expose the soil to the air trapped in the container. The sealed container will be allowed to rest for a minimum of five minutes while vapor equilibrate. Vapors present within the sample bag's headspace will then be measured by inserting the probe of the PID in a small opening in the bag or through the foil. The maximum value and the ambient air temperature will be recorded on the boring log for each sample. The PID will be calibrated each day to the manufacturer's standard for instrument operation.

Soil samples will be obtained at the depths described in the investigation work plan. The samples collected will be a representative of the media and site conditions being investigated or monitored. QA/QC samples will be collected to monitor the validity of the soil sample collection procedures. Field duplicates will be collected at a rate of 10 percent. Equipment blanks will be collected from all sampling apparatus at a frequency of 10 percent for chemical analysis. Equipment blanks will be collected at a frequency of one per day if disposable sampling equipment is used. Field blanks will be collected at a frequency of one per day. The resulting data will provide information

on the variability associated with sample collection, handling and laboratory analysis operations. The blanks and duplicates will be submitted for laboratory analyses associated with the project-specific contaminants, data quality concerns and media being samples as described in the work plan.

Soil borings will be plugged to surface using a bentonite slurry after all required samples have been collected.

APPENDIX B – MONITOR WELL INSTALLATION

Drilling

Exploratory borings will be installed using a hollow-stem auger rig. All drilling equipment will be in good working condition and capable of performing the assigned task. Drilling rigs and equipment will be operated by properly trained, experienced and responsible crews. The drilling equipment will be decontaminated before drilling each boring.

Exploratory borings will be advanced to location and specific depths specified in this workplan.

The Secretary will be notified as early as is practicable if conditions arise or are encountered that do not allow the advancement of borings to the depths specified in the workplan so that alternative actions may be discussed. Precautions will be taken to prevent the migration of contaminants between geologic, hydrologic or other identifiable zones during drilling and well installation activities.

The drilling and sampling will be accomplished under the direction of a qualified engineer or geologist who will maintain a detailed log of the materials and conditions encountered in each boring. Sample information and visual observations of the cuttings and core samples will be recorded on the boring log. Known site features and/or site survey grid markers will be used as references to locate each boring prior to surveying the location.

Logging of Soil Samples

Samples obtained from all exploratory borings will be visually inspected and the soil or rock type classified in general accordance with ASTM (American Society for Testing and Materials) D2487 [Unified Soil Classification System] and D2488 and/or AGI (American Geological Institute) Methods for soil and rock classification. Detailed logs of each boring will be completed in the field by a qualified engineer or geologist. Additional information, such as the presence of water-bearing zones and any unusual or noticeable conditions encountered during drilling will be recorded on the logs. Field boring, test pit logs and field well construction diagrams will be converted to the format acceptable for use in final reports submitted to the Secretary.

Monitor Well Installation

A subcontracted drilling company, under the supervision of an ARCADIS geologist/engineer and field technician, will install all monitor wells to a maximum depth of 30 feet bgs. The monitor wells will be drilled using a truck-mounted hollow-stem auger drill rig with at least 8.5-inch diameter (OD) auger flights. All augers will be decontaminated prior to drilling, and between advancement of each borehole using dry-scrubbing, a heated pressure washer and laboratory-grade soap solution. Ambient air will be monitored during drilling to protect the health of all workers.

Soil cuttings will be placed in 55-gallon drums, labeled with associated monitor well and stored at each location until soil sample analytical results can be assessed. Drums may be consolidated on-site for storage until disposal.

Each monitor well will be completed with 15 feet of Schedule 40, four-inch diameter, flush-threaded, o-ring sealed, 0.020 machine slotted PVC well screen with a sediment sump bottom cap attached to the base of the screen. The screen will be installed at a depth that ensures approximately seven and one-half feet are above and seven and one-half feet are below the observed ground water level at the time the borehole is drilled. Blank casing of similar construction will be added to each well to reach approximately three feet above surface grade. The top of each well casing will be sealed with a locking, removable compression well cap. The annular space of each well will be filled with clean silica-based filter-pack sand (appropriately sized to prevent fines from entering the well) to a level of approximately two feet above the screened interval. At least a two-foot layer of hydrated bentonite pellets will be placed above the filter pack to prevent surface infiltration. Bentonite/cement grout will be added to reach near surface grade. The casing will extend at least 2 feet above ground surface and be

protected by a locking steel well vault. A four foot by four foot by six inch concrete pad will be set around the well vault.

Development of the monitor wells will be accomplished by repetitive surging and bailing. Development will continue until temperature, pH and conductivity have stabilized to within ten percent of the previous reading.

ARCADIS will mark the north side of each well casing to establish a consistent datum for water level measurements. A New Mexico-licensed surveyor will survey the datum for each well. The location of each well will be surveyed to a vertical and horizontal accuracy of 0.01 feet and 0.1 feet, respectively.

APPENDIX C- GROUNDWATER SAMPLING METHODOLOGY

Monitor Well Groundwater Samples

Groundwater samples will be collected from the newly installed monitor wells using low-flow sampling methods. The samples will be submitted for laboratory analyses as described previously

Prior to sampling, groundwater levels will be measured in all monitoring wells using a water level indicator. Measurement data and the date and time of each measurement will be recorded on a site monitoring data sheet. The depth to ground water will be measured to the nearest 0.01 foot. The depth to groundwater will be recorded relative to the surveyed well casing rim or other surveyed datum.

Each monitoring well will be purged using gas-operated bladder-type pump by removing groundwater prior to sampling in order to ensure that formation water is being sampled. Purge volumes will be determined by monitoring, at a minimum, groundwater pH, specific conductance, temperature, Oxidation Reduction Potential (ORP) and dissolved oxygen concentrations during purging. Water samples will be obtained from the well after the measured parameters of the purge water have stabilized to within ten percent for three consecutive measurements. The groundwater quality parameters will be measured using a multiparameter instrument. The volume of groundwater purged, the instruments used and the readings obtained at each interval will be recorded on the field monitoring log. Well purging will be conducted in accordance with the NMED HWB Draft Position Paper "Use of Micropurging and Low-flow Sampling Techniques for Compliance Groundwater Monitoring" (October 2001).

Groundwater samples will be obtained from each well after a sufficient amount of water has been removed from the well casing to ensure that the sample is representative of formation water. Groundwater samples will be obtained using methods described in this workplan and the NMED HWB Draft Position Paper "Use of Micropurging and Low-flow Sampling Techniques for Compliance Groundwater Monitoring" within 24 hours of the completion of well purging. Sample collection methods will be documented in the field monitoring reports. The samples will be transferred to the appropriate, clean, laboratory-prepared containers provided by the analytical laboratory.

Groundwater samples intended for metals analysis will be submitted to the laboratory as total metals samples. Groundwater samples also may be obtained for dissolved metals analysis and will be filtered using 0.45 micron disposable in-line filters.

Groundwater Sample Types

Field duplicates, field blanks, equipment rinseate blanks and trip blanks will be obtained for quality assurance during ground water and surface water sampling activities.

Field duplicate groundwater samples will be obtained at a frequency of ten percent. At a minimum, one duplicate sample per sampling event will always be obtained.

Field blanks will be obtained at a minimum frequency of one per day per site or unit. Field blanks will be generated by filling sample containers in the field with deionized water and submitting the samples with the groundwater samples to the analytical laboratory for the appropriate analyses.

Equipment rinseate blanks will be obtained for chemical analysis at the rate of ten percent or a minimum of one rinseate blank per sampling day. Equipment rinseate blanks will be collected at a rate of one per sampling day if disposable sampling apparatus is used. Rinseate samples will be generated by rinsing deionized water through unused or decontaminated sampling equipment. The rinseate sample then will be placed in the appropriate sample container and submitted with the groundwater samples to the analytical laboratory for the appropriate analyses.

Trip blanks will accompany laboratory sample bottles and shipping and storage containers intended for VOC analyses. Trip blanks will consist of a sample of analyte-free deionized water prepared by the laboratory and placed in an appropriate sample

container. The trip blank will be prepared by the analytical laboratory prior to the sampling event and will be kept with the shipping containers and placed with other water samples obtained from the site each day. Trip blanks will be analyzed at a frequency of one for each shipping container of samples.

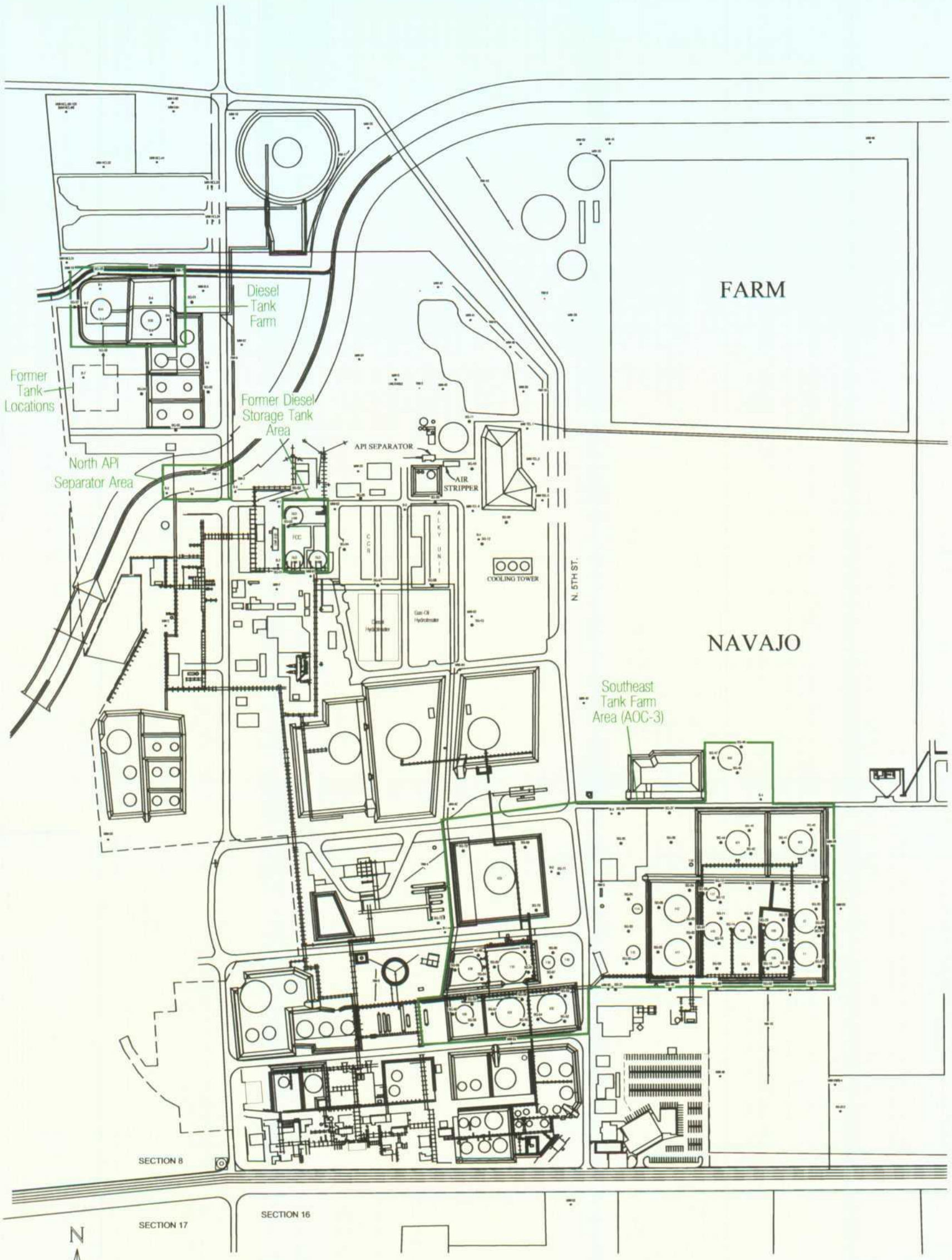
APPENDIX D- INVESTIGATION DERIVED WASTE

Investigation Derived Waste (IDW) includes general refuse, drill cuttings, excess sample material, water (decontamination, development and purge) and disposable equipment generated during the course of investigation. All IDW will be properly characterized and disposed of in accordance with all federal, state and local rules and regulations for storage, labeling, handling, transport and disposal of waste.

Soil boring cuttings generated during sampling activities will be contained in labeled 55-gallon drums and will remain onsite. Prior to placing in drums, a five-point composite soil sample representative of the contents of each drum will be collected and submitted for laboratory analysis for VOCs, SVOCs and RCRA metals. Based on the results of the sample analyses the soil cuttings will either be disposed at an approved waste disposal facility or will be spread on-site.

All water generated during sampling and decontamination activities will be temporarily stored in labeled 55-gallon drums. A water sample from each drum will be collected and submitted for laboratory analysis for SVOCs and VOCs. Based on the results of the sample analyses the water will either be disposed at an approved waste disposal facility, used as process water at the refinery or will be emptied on-site.

FIGURES



Source: Portions of U.S. Geological Survey 7½ Minute Topographic Series, Artesia and Spring Lake QuadrangleS, New Mexico Sheet, Published 1955. Photorevised 1975. 1983 North American Datum, New Mexico Coordinate System, East Zone.

NEW MEXICO

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Navajo Refining Company
SWMU-1 / AOC Group 1 Workplan

Site Overview

Artesia, Eddy County, New Mexico

Project Number	MT000936.0001
Drawing Date	4 December 2006
Figure	1

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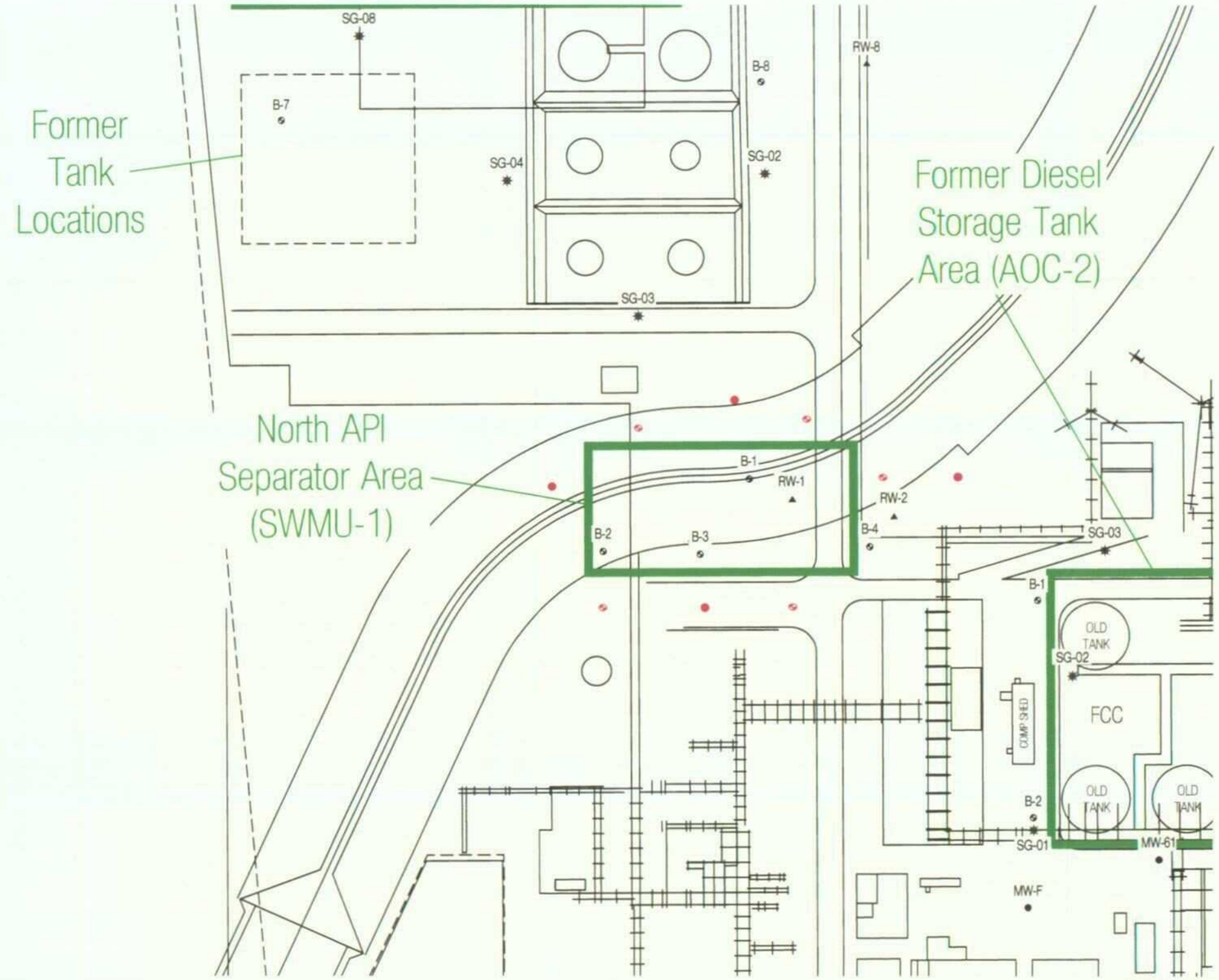
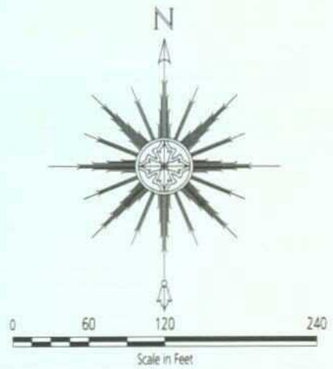
Explanation

- Monitor Well Location
- Proposed Monitor Well Location
- Soil Boring Location
- Proposed Soil Boring Location
- Soil Vapor Test Location
- Proposed Soil Vapor Test Location
- Recovery Well Location
- Irrigation Well Location





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SWMU-1 / AOC Group 1 Workplan

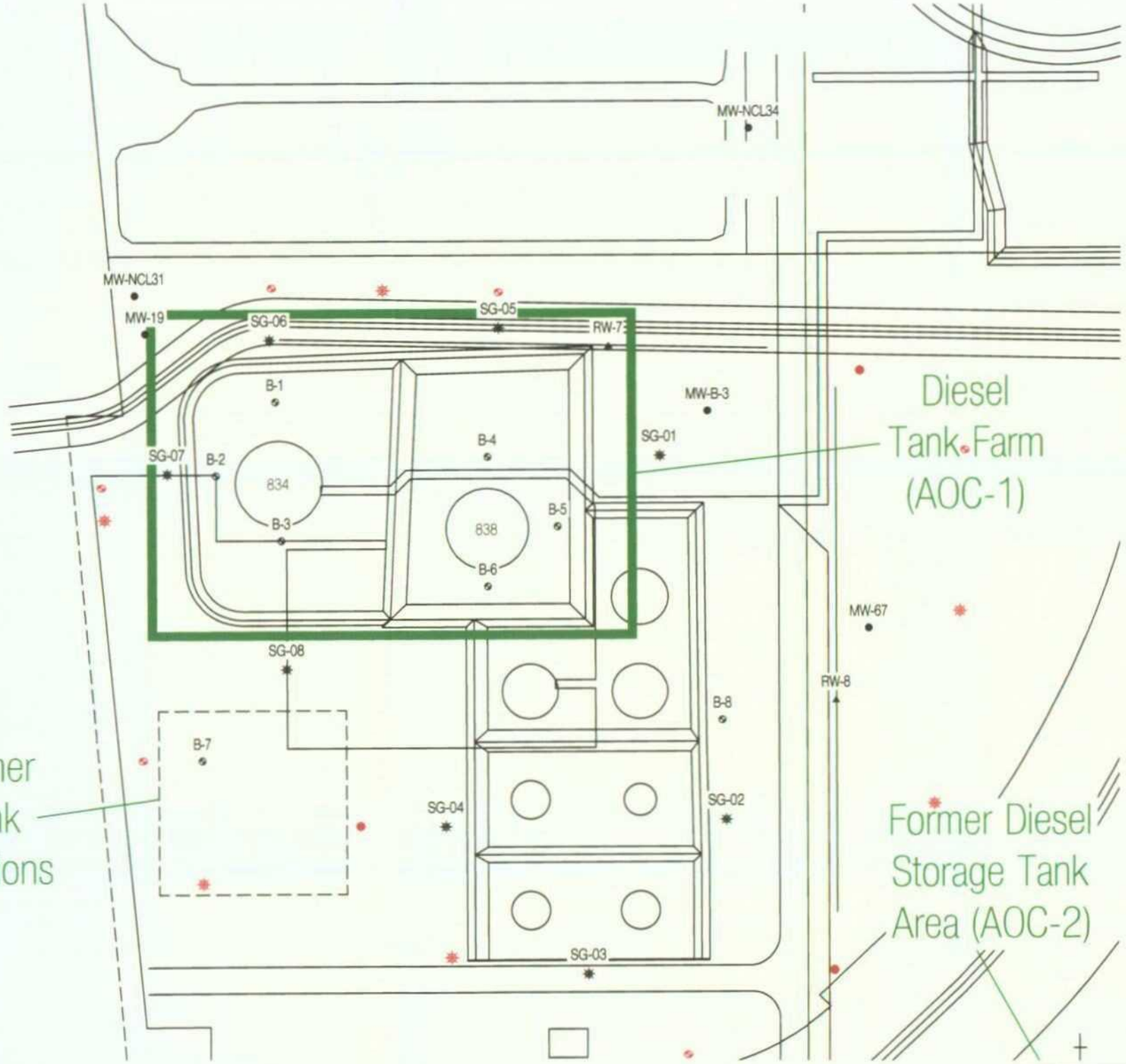
North API Separator
SWMU-1

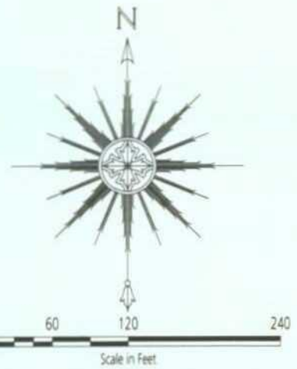
Artesia, Eddy County, New Mexico

Project Number	MT000936.0001
Drawing Date	4 December 2006
Figure	2

Explanation

- Monitor Well Location
- Proposed Monitor Well Location
- Soil Boring Location
- Proposed Soil Boring Location
- Soil Vapor Test Location
- Proposed Soil Vapor Test Location
- Recovery Well Location
- Irrigation Well Location





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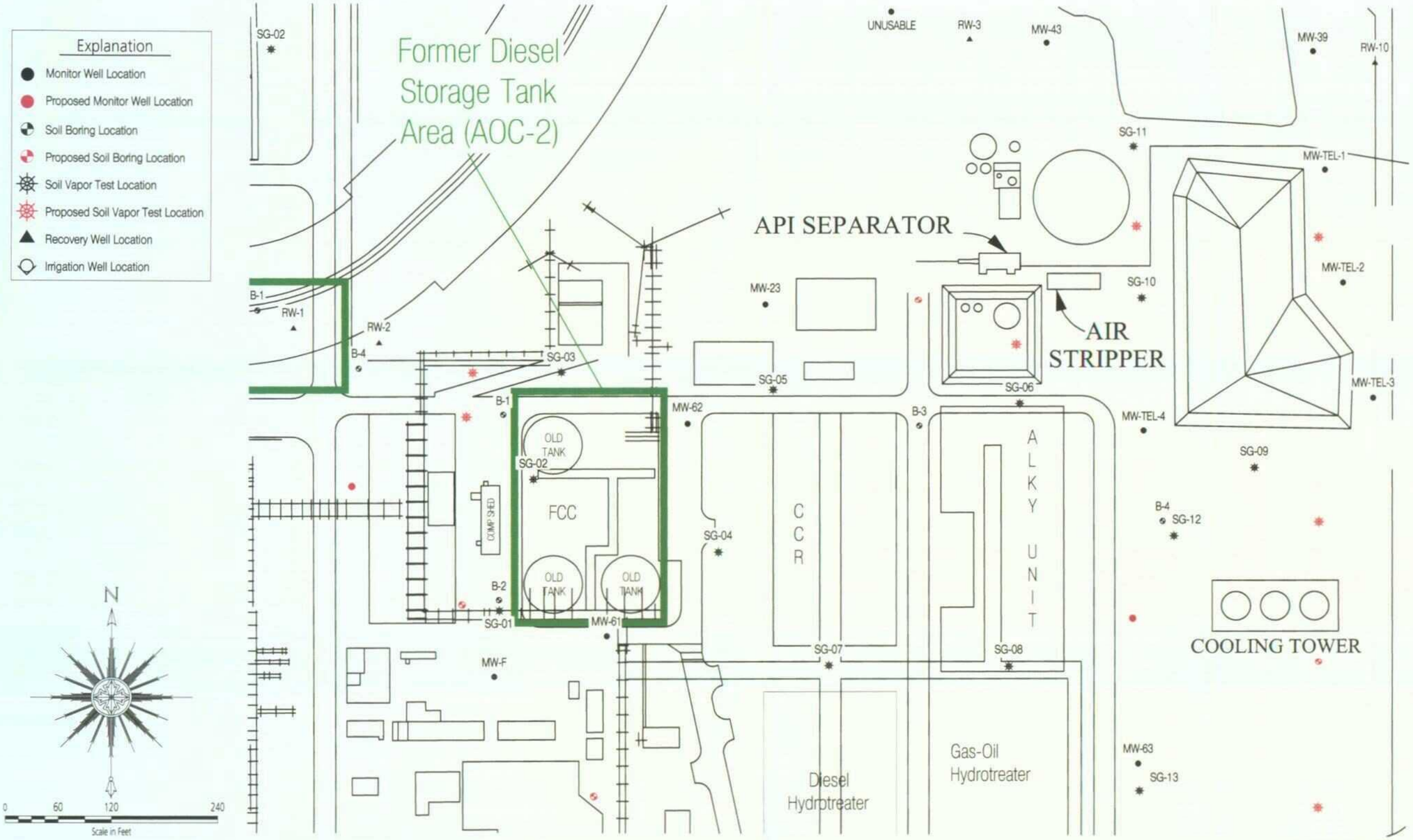
Navajo Refining Company
SWMU-1 / AOC Group 1 Workplan

Diesel Tank Farm
AOC-1

Artesia, Eddy County, New Mexico

Project Number	MT000936.0001
Drawing Date	4 December 2006
Figure	3



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Navajo Refining Company
SWMU-1 / AOC Group 1 Workplan

Former Diesel Storage Tank Area
AOC-2

Artesia, Eddy County, New Mexico

Project Number	MT000936.0001
Drawing Date	4 December 2006
Figure	4

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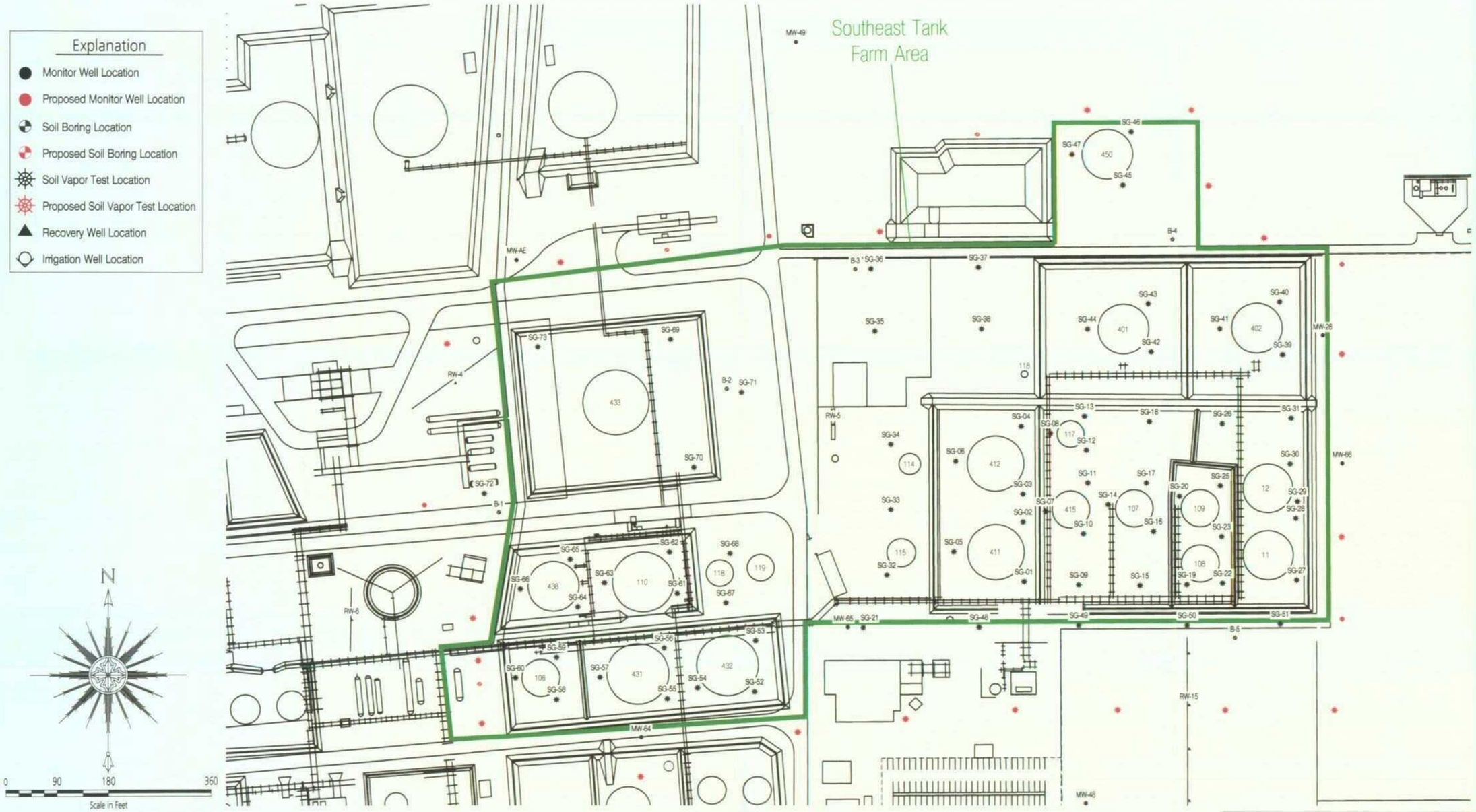

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QUADRANGLE LOCATION

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Navajo Refining Company
SWMU-1 / AOC Group 1 Workplan

Southeast Tank Farm Area
AOC-3

Artesia, Eddy County, New Mexico

Project Number	MT000936.0001
Drawing Date	4 December 2006
Figure	5