AP - 111

FWGWMWP

2018

NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

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Cabinet Secretary
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Acting Deputy Secretary

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

December 20, 2018

John Moore
Environmental Superintendent
Western Refining, Southwest Inc., Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87301

RE: RESPONSE TO APPROVAL WITH MODIFICATIONS
REVISED FACILITY WIDE GROUNDWATER MONITORING WORK PLAN
2018 – UPDATES FOR 2018
WESTERN REFINING SOUTHWEST INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-WRG-18-002

Dear Mr. Moore:

The New Mexico Environment Department (NMED) has reviewed the *Response to Approval with Modifications Revised Facility Wide Groundwater Monitoring Work Plan 2018 – Updates for 2018* (Response), dated November 28, 2018, submitted on behalf of Marathon Petroleum Company dba Western Refining Southwest Inc., Gallup Refinery (the Permittee). The Permittee must address the following comments provided by NMED.

Comment 1

The Permittee's response to NMED's *Approval with Modifications* Comment 9 states, "Table 1 has been modified to reflect the addition of OAPIS-1 (Attachment E)." Table 1 lists OAPIS-1 twice. Remove one of the listings from the table. In addition, Comment 9 requires the Permittee to add analysis for 1,2-dibromoethane (EDB) using the EPA Method 8011. The required change for OAPIS-1 is not included in Table 1. Include the required change in the table. Revise the table accordingly.

Comment 2
The analytical method for volatile organic compounds (VOC) is indicated as the EPA Method 8060 for MKTF-1 in Table 1. The analytical method was incorrectly referenced. The analytical method must be corrected to reference the EPA Method 8260. Correct the error in the table.

Comment 3
As stated by Comment 26 in the January 31, 2018 *Disapproval for the 2015 Annual Groundwater Monitoring Report,* the Permittee is required to conduct EDB analysis using the EPA Method 8011 for all wells where 1,2-dichloroethane (EDC) is detected. Although well GMW-1 has not been sampled recently due to the detection of separate phase hydrocarbons (SPH), EDC was detected from the well in the past. Therefore, the Permittee must collect groundwater samples for EDB analysis from well GMW-1. Tables 1 and 2 did not include EDB analysis for GMW-1. Revise Tables 1 and 2 to address the change.

Address all comments in this letter and provide replacement tables. Additionally, an electronic version of the updated Work Plan including the replaced tables must be submitted to NMED. The response letter, replacement tables, and electronic version, including a redline-strikeout version of the modified tables, of the updated Work Plan must be submitted to NMED no later than **January 28, 2019**.

If you have questions regarding this letter, please contact Michiya Suzuki of my staff at 505-476-6059.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: K. Van Horn, NMED HWB
D. Cobrain, NMED HWB
M. Suzuki, NMED HWB
C. Chavez, OCD
L. King, EPA Region 6
B. Moore, WRG

File: Reading File and WRG 2018 File
HWB-WRG-18-002

Chavez, Carl J, EMNRD

From:	O'Brien, Jessica L <Jessica.L.OBrien@andeavor.com>
Sent:	Tuesday, October 2, 2018 11:58 AM
To:	VanHorn, Kristen, NMENV
Cc:	Moore, John; Moore, Brian; Chavez, Carl J, EMNRD
Subject:	[EXT] Approval w/ Modifications - 2018 Facility-wide Ground Water Monitoring Work Plan
Attachments:	2018-09-21 NMED Approval w_Modifications 2018 FWGWMWP.pdf; Attachment 1 - Gallup Response to Comments.pdf

WESTERN REFIING SOUTHWEST INC., GALLUP REFINERY
EPA ID# NMD000333211
HWB-WRG-18-002

Dear Ms. Van Horn,

Western Refining, Southwest, Inc., Gallup Refinery ("Gallup Refinery) is in receipt of the New Mexico Environment Department's ("NMED") letter dated September 21, 2018 and is hereby submitting this e-mail in response to NMED Comment 1 shown below:

NMED Comment 1
The Permittee submitted one hard copy and one electronic version of the revised [2018 Facility-Wide Ground Water Monitoring] Work Plan. RCRA Permit Section II.C.7 (Submissions to the Environment Department) requires that two hard copies and an electronic version of submittals must be submitted to NMED. The Permittee submitted another hard copy of the revised Work Plan on August 24, 2018. The submission due date was July 31, 2018. All required documents must be submitted on or before the due date to comply with the Permit. The Permittee must seek an extension of time in accordance with the Permit Section I.J.12. In addition, the Permittee did not submit an electronic version of the response to NMED comments (RTC). The Permittee must submit an electronic version of the RTC no later than ***October 12, 2018.***

Gallup Refinery Response
The requested electronic version of the RTC is being submitted as Attachment 1 of this e-mail. The New Mexico Energy Minerals and Natural Resources Department Oil Conservation Division ("OCD") has also been provided a copy of this response via e-mail sent to Carl Chavez (Carl.J.Chavez@state.nm.us).

Please feel free to contact me if you have any trouble receiving the attachments or viewing its contents.

Thank you,

Jessica O'Brien
Senior Environmental Specialist
HES – Environmental Department
Jessica.L.Obrien@andeavor.com

Andeavor
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San Antonio, Texas 78259
o: 210 626 7774
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Facility Wide Ground Water Monitoring Work Plan – Updates for 2018

Western Refining Company
Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87301
505-722-3833

Submitted: March 31, 2018
Revised July 2018

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____ _____

Daniel J. Statile
VP Refining

Date

Reviewed by:

_____

Jessica L. O'Brien
Environmental Supervisor

Executive Summary

Western Refining conducts quarterly, semi-annual and annual ground water monitoring at its Gallup facility on a site wide basis. The Ground Water Monitoring Work Plan (Plan) documents any additions or revisions in ground water monitoring and also details the sampling procedures used.

This Plan divides the facility into six monitoring groups. Group A consists of the boundary wells situated along the northwest corner of the refinery property and monitoring wells around the land treatment area (LTU). Five new boundary wells (BW-4A, BW-4B, BW-5A, BW-5B, and BW-5C) were installed in 2017. Group B consists of a cluster of wells at the aeration basin and at the sanitary treatment pond 1 (STP-1) near the Waste Water Treatment Unit. Two new wells (OW-59 and OW-60) were installed in this area in 2017. Group C consists of the observation wells on the northeast section of the refinery including four product recovery wells. Six new wells (OW-53, OW-54, OW-55, OW-56, OW-57, and OW-58) were installed in this area in 2016 and were initially included as new wells for monitoring in Appendix B, Table 2 of the 2017 updates of the Monitoring Plan. Group D includes the process/production wells and the four observation wells located on the south-southwest section of the property. Group E includes 44 permanent monitoring wells installed to delineate the extent of a hydrocarbon plume associated with a seep discovered in 2013 directly west of the crude tanks (T-101, 102); included in this group is a pre-existing well located directly west of the truck loading terminal. No visible markings or drill logs were available to identify this well and Western has labeled this well as MKTF-45 as this well is located in the vicinity of the seep investigation. Group F includes the sampling requirements for the evaporation ponds and effluent from the sanitary treatment pond (STP-1).

Gallup Refinery will periodically review facility-wide monitoring data and assess the monitoring program presented in this Plan. Revisions to the Plan, as necessary, will then be presented annually for agency review and approval. These revisions may include, but not be limited to a reduction or change in monitoring locations, monitoring frequency, and/or target chemicals to be analyzed.

Gallup follows the most current approved sampling/monitoring schedule from NMED: *Disapproval Annual Groundwater Monitoring Report, Gallup Refinery – 2015*, dated January 21, 2018; *Approval With Modifications – Facility Wide Ground Water Monitoring Report, Gallup Refinery*, HWB-WRG-14-006, dated May 18, 2016; *Revised Facility Wide Ground Water Monitoring Work Plan - 2012 updates, 2013 updates, 2014 updates for 2015*, dated March 11, 2016; and *NMED Approval with Modification – Facility Wide Ground Water Monitoring Work Plan 2014 updates for 2015,* dated August 22, 2016.

We have created a monitoring work plan with quality assurance practices and controls as well as standard procedures for sampling, and a schedule of activities to monitor ground water and surface water at select locations of the Gallup Refinery. The persons responsible for the implementation and oversight of this plan are:

Vice President Refining
- Daniel J. Statile

Environmental Supervisor
- Jessica L. O'Brien

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List of Acronyms

AL	Aeration Lagoon
API	American Petroleum Institute
BMP	Best Management Practices
BS	Blank Spike
BSD	Blank Spike Duplicate
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CFR	Code of Federal Regulations
DQO	Data Quality Objective
DRO	Diesel Range Organics
DTB	Depth to Bottom
DTW	Depth to Water
EP	Evaporation Pond
EPA	Environmental Protection Agency
FT.	Foot
FWGWMP	Facility Wide Ground Water Monitoring Plan
GPM	Gallons per minute
GRO	Gasoline Range Organics
HNO3	Nitric Acid
HWB	Hazardous Waste Bureau
IDW	Investigation Derived Waste
LDU	Leak Detection Unit
LTU	Land Treatment Unit
ML	Milliliter
MCL	Maximum Contaminant Level
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MTBE	Methyl Tert Butyl Ether
NAICS	North American Industry Classification System

List of Acronyms – Continued

NAPIS	New American Petroleum Institute Separator
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NOI	Notice of Intent
OAPIS	Old American Petroleum Institute Separator
OW	Observation Well
OCD	Oil Conservation Division
ORP	Oxidation-Reduction Potential
PPE	Personal Protective Equipment
PPM	Parts per million
PSTB	Petroleum Storage Tank Bureau
PVC	Polyvinyl Chloride
PW	Process Well
QA	Quality Assurance
QC	Quality Control
RW	Recovery Well
RCRA	Resource Conservation and Recovery Act
SIC	Standard Industrial Classification
SOP	Standard Operating Procedure
SPH	Separate Phase Hydrocarbon
STP	Sanitary Treatment Pond
SVOC	Semi-volatile Organic Compound
SWMU	Solid Waste Management Unit
SWPP	Storm Water Pollution Prevention Program
TOC	Total Organic Content
VOC	Volatile Organic Compound
WQCC	Water Quality Control Commission
WWTP	Waste water treatment plant

1.0 Introduction

This Facility-Wide Ground Water Monitoring Work Plan (Plan) has been prepared for the implementation of a ground water monitoring program at the Gallup Refinery owned by Western Refining ("Gallup Refinery" or "Facility").

1.1 Scope of Activities

This Plan has been prepared to collect data that will be used to characterize the nature and extent of potential impacts to ground water at the Gallup Refinery. The monitoring plan is designed to assist the facility in evaluating any levels of contaminants that exceed compliance standards. This Plan divides the facility into six groups for periodic monitoring:

GROUP A	GROUP B	GROUP C	GROUP D	GROUP E	GROUP F
BW-1A, B, C	GWM-1, 2, 3	OW-13, 14, 29, 30	PW-2, 3, 4	MKTF- 1 thru 45	EP-2, 3, 4, 5, 6, 7, 8, 9
BW-2A, B, C	NAPIS 1, 2, 3, KA-3	OW-50, 52, 53, 54, OW-55, 56, 57, 58	OW-1, 10		EP-11, 12A, 12B
BW-3A, B, C BW-4A, 4B BW-5A, 5B, 5C	OAPIS-1 OW-59, 60	RW-1, 2, 5, 6	OW-11, 12		
MW-1, 2, 4, 5	LDU (3)				
SMW-2, 4	STP1-NW, SW				

Group A consists of the boundary wells situated along the northwest corner of the refinery property and the monitoring wells around the LTU. Group B consists of a cluster of monitoring wells and leak detection units for the NAPIS at the aeration basin and at the sanitary treatment pond. Group C includes the observation wells located on the northeast section of the plant and includes recovery wells from which small quantities of free product has been continually removed.

Group D includes the process/production wells and four observation wells located on the south, southwest section of the refinery property. Group E includes a total of 44 new monitoring wells installed to delineate a hydrocarbon plume associated with a seep discovered west of the crude tank (Tank 101); included in this group is a pre-existing well located directly west of the truck loading terminal. This well has been labeled as MKTF-45 as no markings or boring logs have been located to identify when this well was installed. Group F includes sampling requirements for the evaporation ponds and for the effluent from the sanitary treatment pond. Designated wells and sample points identified are monitored on a quarterly, semi-annual and annual basis following the procedures presented in this Plan.

Gallup Refinery periodically reviews facility-wide monitoring data and evaluates the monitoring program presented in this Plan. Annual revisions to the Plan will be presented for agency review and approval. These revisions may include, but not be limited to, a reduction or change in monitoring locations, monitoring frequency, and/or target chemicals to be analyzed.

1.2 Facility Ownership and Operation

This Plan pertains to the Western Refining Southwest Inc., Gallup Refinery located at Exit 39 on Interstate I-40. This refinery is known as the Gallup Refinery and is located at Jamestown, New Mexico, approximately 17 miles east of Gallup. Figure 1 shows the regional location of the Gallup Refinery.

The owner is:

Western Refining (Parent Corporation)
123 W. Mills Avenue
El Paso, TX 79901

Operator: Western Refining Southwest Inc. (Postal Address)
Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87301

Western Refining Southwest Inc. (physical address)
Gallup Refinery
I-40, Exit 39 (17 Miles East of Gallup, NM)

Jamestown, New Mexico 87347

The following regulatory identification and permit governs the Gallup Refinery:

- SIC code 2911 (petroleum refining) applies to the Gallup Refinery
- U.S. EPA ID Number NMD000333211
- OCD Discharge Case Number AP-111.
- 2015 NPDES MSGP, ID #NMR053168

The facility status is corrective action/compliance. Quarterly, semi-annual and annual ground water sampling is conducted at the facility to evaluate present contamination.

The refinery is situated on an 810 acre irregular shaped tract of land that is largely located within the lower one quarter of Section 28 and throughout Section 33 of Township 15 North, Range 15 West of the New Mexico Prime Meridian. A small component of the property lies within the northeastern one quarter of Section 4 of Township 14 North, Range 15 West. Figure 2 is a topographic map showing the general layout of the refinery in comparison to the local topography.

2.0 Background Information

2.1 Historical and Current Site Use

Built in the 1950's, the Gallup Refinery is located within a rural and sparsely populated section of McKinley County in Jamestown, New Mexico, 17 miles east of Gallup, New Mexico. The setting is a high desert plain on the western slope of the Continental Divide. The nearest population centers are the Flying J Travel Center (Travel Center) refueling plaza, the Interstate 40 highway corridor, and a small cluster of residential homes located on the south side of Interstate 40 approximately 2 miles southwest of the refinery (Jamestown). The surrounding land is comprised primarily of public lands and is used for cattle and sheep grazing.

The refinery primarily receives crude oil via two 6-inch diameter pipelines; two pipelines from the Four Corners Area enter the refinery property from the north. In addition, the refinery also receives natural gasoline feed stock via a 4-inch diameter pipeline that comes in from the west along the Interstate 40 corridor from the Western Refining - Wingate Facility (formerly Conoco gas plant). Crude oil and other products also arrive at the site via railroad cars. These feed stocks are then stored in tanks until refined into products.

The Gallup Refinery is a crude oil refining and petroleum products manufacturing facility. The Standard Industrial Classification (SIC) code is 2911 and the North American Industry Classification System Code (NAICS) is 32411. There are no organic chemicals, plastics, or synthetic fibers manufactured that contribute to our process flow of waste water. We do not manufacture lubricating oils.

The refinery incorporates various processing units that convert crude oil and natural gasoline into finished products. These units are briefly described as follows.

- Crude Distillation Unit - separates crude oil into various fractions; including gas, naphtha, light oil, heavy oil, and residuum.

- Fluidized Catalytic Cracking Unit (FCCU) - dissociates long-chain hydrocarbon molecules into smaller molecules, and essentially converts heavier oils into naphtha and lighter oils.
- Alkylation Unit - combines specific types of hydrocarbon molecules into a high octane gasoline blending component.
- Reforming Unit - breaks up and reforms low octane naphtha molecules to form high octane naphtha.
- Hydro-Treating Unit - removes undesirable sulfur and nitrogen compounds from intermediate feed stocks, and also saturates these feed stocks with hydrogen to make diesel fuel.
- Treater Unit - remove impurities from various intermediate and blending feed stocks to produce finished products that comply with sales specifications.
- Ammonium Thiosulfate Unit - accepts high H2S and ammonia containing gas streams from the Amine and the Sour Water Stripper units, and converts these into a useful fertilizer product, ammonium thiosulfate.
- Sulfur Recovery Unit - converts and recovers various sulfur compounds from the gases and liquids produced in other processing units to create a solid elemental sulfur byproduct.
- Waste Water Treatment Plant - process and treat refinery waste and storm water before releasing to treatment ponds.

As a result of these processing steps, the refinery produces a wide range of petroleum products including propane, butane, unleaded gasoline, diesel, and residual fuel. In addition to the afore-mentioned processing units, various other equipment and systems support the operation of the refinery and are briefly described as follows.

Storage tanks are used throughout the refinery to hold and store crude oil, natural gasoline, intermediate feed stocks, finished products, chemicals, and water and are all located above ground. Capacity of these tanks range in size from 80,000 barrels to less than 1,000 barrels.

Pumps, valves, and piping systems are used throughout the refinery to transfer various liquids among storage tanks and processing units. A railroad spur track and a railcar loading rack are used to transfer feed stocks and products from refinery storage tanks into and out of railcars. Several tank truck loading racks are used at the refinery to load out finished products and also receive crude oil, other feed stocks, additives, and chemicals.

Gasoline is delivered to the Travel Center via tanker truck. An underground diesel pipeline exits between the refinery and the Travel Center. In 2013 the underground diesel line from Gallup

Refinery to the Travel Center was replaced and put back in service on February 3, 2014. The replaced line runs above ground from the marketing area of the refinery for approximately 150 feet and continues underground to the Travel Center.

A firefighting training facility is used to conduct employee firefighting training. Waste water from the facility, when training is conducted, is pumped into a tank which is then pumped out by a vacuum truck. The vacuum truck pumps the oily water into a process sewer upstream of the New API Separator (NAPIS).

The process waste water system is a network of curbing, paving, catch basins, and underground piping used to collect waste water from various processing areas within the refinery. The waste water effluent then flows into the equalization tanks and the NAPIS where the oil is separated from water based on the principle that, given a quiet surface, oil will float to the water surface where it can be skimmed off. The skimmed slop is passed to a collection chamber where it is pumped back into the refinery process. The clarified water is routed to a waste water treatment plant (WWTP) where benzene is removed via granular activated carbon (GAC) canisters that are placed at the effluent of the dissolved gas flotation (DGF) unit. WWTP operations alternate the configuration of these GAC canisters from a single setup to an in-series setup (i.e. primary and secondary canister). To help monitor the breakthrough of these GAC canisters, several waste water samples are taken at the effluent of the last GAC canister. Specifically, results from benzene analysis of the waste water samples sent to the Refinery's internal lab are monitored to manage the breakthrough from the GAC canisters. When benzene values exceed 0.4 ppm, one or more of the following actions are taken: GAC canister configuration is modified to an in-series set-up; GAC canister is replaced with fresh carbon; GAC canister effluent is recirculated back through the WWTP. The treated water flows from the GAC canisters into pond STP-1. STP-1 consists of two bays, north and south and each bay is equipped with five aerators per bay. Effluent from STP-1 then flows into Evaporation Pond 2 and gravitated to the rest of the ponds.

During episodes of unit upsets or major storm events, the waste water is held in one of the three equalization tanks, T-35, T-27 and T-28 which are used to handle large process and storm water

flows allowing the flow to the NAPIS to be controlled. These tanks are also used to store waste water if problems are encountered with the downstream equipment, i.e., NAPIS and the WWTP.

The storm water system is a network of valves, gates, berms, embankments, culverts, trenches, ditches, natural arroyos, and retention ponds that collect, convey, control, and release storm water that falls within or passes through refinery property. Storm water that falls within the processing areas is considered equivalent to process waste water and is sent to tanks T-35, T-27 and T-28 when needed before it reaches the NAPIS, WWTP, STP-1 and into Evaporation Pond 2 where flow is gravitated to the rest of the ponds. Storm water discharge from the refinery is very infrequent due to the arid desert-like nature of the surrounding geographical areas.

At the evaporation ponds, waste water is converted into vapor via solar and mechanical wind-effect evaporation via two 80 gallons per minute electrically driven evaporation pond spraying snow machines located between ponds 4 and 5. Two additional 66 GPM (gallons per minute) evaporation pond sprayers were installed in October 2014 between ponds 3 and 4 for a total of four evaporators. No waste water is discharged from the refinery to surface waters of the state. In September 2015, Gallup Refinery submitted a Notice of Intent requesting continued coverage under the 2015 NPDES Multi-Sector General Permit which was approved on October 8, 2015 (NMR0531685). The refinery maintains a Storm Water Pollution Prevention Plan (SWPPP) that includes Best Management Practices (BMPs) for effective storm water pollution prevention (updated September 2015). The refinery has constructed several new berms in various areas and improved outfalls (installed barrier dams equipped with gate valves) to minimize the possibility of potentially impacted runoff leaving the refinery property and also to minimize the stormwater run-on from the I-40 interchange and the Travel Center onto refinery property.

2.2 Potential Receptors

Potential receptors at the facility also include those that may arise from future land uses. Currently, these include on-site workers, nearby residents, wildlife, and livestock.[1] The major route to exposure of humans would be from contaminants reaching a drinking water well. Other routes could be from showering, cooking, etc. with contaminated ground water, raising crops and vegetables with contaminated ground water, or getting exposed to or fishing in surface water that has commingled with shallow ground water. Exposure can also occur through contact with soils and/or plants that have become contaminated through contact with contaminated ground water. However, drinking water wells remain the primary route of possible exposure.

At this time, the nearest drinking water wells are located on-site at the southwest areas of the facility, at depths of approximately 3000 feet which are identified as process or production (PW) wells. These wells are designated as PW-2, PW-3 and PW-4 (See Figure 4 for location). These wells are operated by the facility to provide the refinery's process water and drinking water to nearby refinery-owned houses, to the refinery itself, and to the Travel Center. Currently, PW-2 is sampled every three years, PW-4 is sampled semi-annually and PW-3 is sampled on an annual basis. Annual sampling results from 2009 through 2016 have indicated concentrations above screening levels in a single detection of sulfate in a sample collected at PW-3, a single detection of iron in a sample collected at PW-4, a single detection of Tetrachloroethene in a sample collected from PW-2 and a single detection of phenol in a sample collected at PW-3 all .

Other than the on-site wells, there is no known drinking water wells located within a 4-mile radius of the site. The nearest drinking water wells that could be used by off-site residents are located to the northwest of the site at a distance slightly greater than 4-miles located within the Navajo community of Iyanbito (shown on the USGS Topographical Map - Gallup Quadrangle (Revised 1980)). These wells are northwest of the South Fork of the Puerco River which heads towards the southwest from immediately north of the facility. As the shallowest ground water will generally

[1] Note: There is extensive and regular patrolling by security personnel of the facility which operates 24-hours – therefore, we can discount the possibility of an inadvertent or deliberate intruder becoming exposed to contamination in groundwater that has reached the surface in some form.

flow in the direction of surface water flow, any possible shallow ground water contamination that left the facility either now or in the future would flow towards the southwest after leaving the facility and away from the community of Iyanbito. The Cibola National Forest lies in the south-east direction and there are no wells or residents in this protected area. Boundary monitoring wells along the southwest to northwest perimeter of the facility have not shown any evidence of contaminants except for low concentrations of bis(2-ethylhexyl)phthalate detected in the following wells: BW-3B in 2009, BW-3C in 2011 and BW-1C in 2013. The contaminant detected is suspected to be a laboratory contaminant or possibly from the PVC pipe materials used as casing for these wells. No detection of bis(2-ethylhexyl)phthalate was detected in any of the boundary wells in 2016.

Artesian conditions at some locations of the site lead to the possibility of ground water emerging onto the surface and thus being able to affect wildlife. No surface water on the site is used for human consumption or primary contact, such as immersion, or secondary contact, such as recreation. The man-made ponds on the site are routinely monitored and are a part of this Plan. Therefore, if they are in contact with shallow ground water that has exhibited elevated levels of contaminants, the Plan will detect any commingling of ground water and surface waters.

Fluctuating ground water elevations can smear contaminants into subsurface soil and rocks, and there is a possibility that plant roots could reach such contaminated soils and bio-concentrate contaminants creating another route of exposure to potential receptors, such as birds and animals that eat the plants. No food crops are currently grown on the site.

2.3 Type and characteristics of the waste and contaminants and any known and possible sources

The types of waste likely include – volatile and semi-volatile organic compounds, primarily hydrocarbons, but could include various other industrial chemicals such as solvents, acids, spent caustic solutions, and heavy metals present in spent chemicals and waste water. These wastes could be in the form of waste water, spent chemicals destined for off-site shipping and disposal packed in drums, sludge, and dry solids.

Most of the wastes and contaminants that could possibly reach ground water have the characteristic that they would biodegrade and naturally attenuate. However, any heavy metals present in dirt and sludge could possibly leach into ground water and would not biodegrade. There is a possibility also that certain long-lived chemicals would not biodegrade, or, if they did, it would be at a very slow rate. Possible sources include leaks from buried pipes, tanks, surface spills, and historical dumping of wastes in remote areas of the site.

All above-ground large tanks have leak detection or equivalent systems, such as radar gauges. Pumps that could leak hydrocarbons are within containment areas, and all tanks are located inside earthen bermed areas to contain spills. The NAPIS has double walls and a leak detection system installed.

Similarly, surface impoundments can serve as a source of possible ground water contamination. In the past, waste water from the railroad loading rack flowed to a settling and separation lagoon north of the rack and flow exited at the north end where water leaving the lagoon was distributed across a flat open site known as the fan-out area. The free flow of liquids led to subsurface soil contamination. This area is identified as SWMU No. 8 and has been cleaned up for a corrective action complete with controls status. Disposal of waste water into open fields is not practiced at the Gallup Refinery.

There are fourteen Solid Waste Management Units (SWMU) identified at the Gallup Refinery, and one closed land treatment area. On December 31, 2013, the RCRA Post-Closure Care Permit ("Permit") became effective under §20.4.1.901A(10) NMAC and identified an additional 20 Areas of Concern (AOCs) requiring corrective action as listed below.

RCRA (Resource Conservation and Recovery Act) Regulated Units

- Land Treatment Unit (LTU)

SWMUs (Solid Waste Management Units)

- SWMU 1 – Aeration Basin

- SWMU 2 – Evaporation Ponds
- SWMU 3 – Empty Container Storage Area
- SWMU 4 – Old Burn Pit
- SWMU 5 – Landfill Areas
- SWMU 6 – Tank Farm
- SWMU 7 – Fire Training Area
- SWMU 8 – Railroad Rack Lagoon
- SWMU 9 – Drainage Ditch and the Inactive Land farm
- SWMU 10 – Sludge Pits
- SWMU 11 – Secondary Oil Skimmer
- SWMU 12 – Contact Wastewater Collection System
- SWMU 13 – Drainage Ditch between North and South Evaporation Ponds
- SWMU 14 – API Separator

AOCs (Areas of Concern)

- AOC 15 – New API Separator
- AOC 16 – New API Separator Overflow Tanks
- AOC 17 – Railroad Loading/Unloading Facility
- AOC 18 – Asphalt Tank Farm (tanks 701-709, 713, 714)
- AOC 19 – East Fuel Oil Loading Rack
- AOC 20 – Crude Slop and Ethanol Unloading Facility
- AOC 21 – Main Loading Racks
- AOC 22 – Loading Rack Additive Tank Farm
- AOC 23 – Retail Fuel Tank Farm (tanks 1-7, 912, 913, 1001, 1002)
- AOC 24 – Crude Oil Tank Farm (tanks 101 and 102)
- AOC 25 – Tank 573 (Kerosene Tank)
- AOC 26 – Process Units
- AOC 27 – Boiler and Cooling Unit Area
- AOC 28 – Warehouse and Maintenance Shop Area
- AOC 29 – Equipment Yard and Drum Storage Area
- AOC 30 – Laboratory
- AOC 31 – Tanks 27 and 28
- AOC 32 – Flare and Ancillary Tanks (tanks Z85V2, Z85V3, Z84-T105)
- AOC 33 – Storm Water Collection System
- AOC 34 – Scrap Yard

Existing ground water monitoring wells effectively surround all of the above listed SWMUs and AOCs. The Permit was subsequently modified in September 2017, with SWMU 8 and AOCs 19 and 25 granted Corrective Action Complete status. AOC 32 was combined with SWMU 14 and AOC 33 was combined with SWMU 12. AOCs 20, 21, 22, and 23 are combined to make new AOC 35. The

schedule in Appendix E, Table E-1 was amended to reflect prior submittals, revised due dates and deferral of other units. A new Consent Order was executed in January 2017 and this resulted in 11 AOCs (AOC 16, 17, 18, 24, 26, 27, 28, 29, 30, 31, and 34) being removed from the Permit and transferred to the Consent Order for further evaluation.

2.4 Summary of contaminant releases that could contribute to possible ground water contamination.

Spills and leaks are known to have occurred on the site in various locations. Although most hydrocarbons are immediately picked up for recovery and contaminated soil is removed, some of the liquids present in a spill may enter the subsurface. With precipitation, there is the possibility that some of the contaminants could leach and reach ground water.

2.4.1 Separate Phase Hydrocarbons (SPH)

2.4.1.1 Main Tank Farm

Separate-Phase Hydrocarbons (SPH) floating on shallow ground water was found in the mid 1990s at the northeast end of the facility in the main tank farm. A series of recovery wells were installed and SPH has been recovered since the initial discovery. Recovery through hand-bailing continues on a quarterly basis and the volume of SPH recovered has declined from year to year in several of these recovery wells. In 2016, Recovery Well RW-1 was the only recovery well in the tank farm that had measurable levels of hydrocarbons. Elevated levels of benzene have also been found in the wells near RW-1 and possibly linked to past spills. Recovery wells in the main tank farm are listed as follows:

RECOVERY WELLS			
RW-1	RW-2	RW-5	RW-6

2.4.1.2 Hydrocarbon Seep

In June of 2013 during a routine inspection, a hydrocarbon seep was discovered in an isolated area approximately 100 yards west of Tank 101/102. A series of excavations were completed in the area of the seep including installation of six (6) temporary sumps for bi-weekly hydrocarbon

recovery. Through 2017 a total of 1,288,931 gallons of liquid (hydrocarbon and ground water) have been recovered from these sumps. To date a total of 44 permanent monitoring wells have been installed with an addition of one pre-existing well, which has been labeled as MKTF-45, and is located in the vicinity of the site investigation. SPH has been measured in Marketing Tank Farm (MKTF) wells located west and northwest of the truck loading rack and marketing tank farm, extending northwest to the location of the hydrocarbon seep. Western continues to further characterize potential source areas, recovery of liquids from the temporary sumps, and continued sampling of the monitoring wells for characterization and delineation purposes. All 45 wells were added to the Ground Water Monitoring Schedule (see Appendix B).

Additional soil staining was observed north, northwest of the sumps and these sites were excavated of approximately 38.26 tons of soil, which was sent to the Painted Desert Landfill for disposal.

Temporary retention ditches were installed to recover liquids from this area. From April 1, 2016 through December 31, 2017, approximately 534,750 gallons of liquid (hydrocarbon and ground water) have been recovered from this area via vacuum truck. Additional sumps are planned for installation in this area similar to the original six sumps installed for recovery of liquids.

RECOVERY WELLS
MKTF-1 THRU MKTF-45

2.4.1.3 Aeration Basin

A measureable level of SPH was identified in GWM-1 during the fourth quarter sampling event in 2015.

2.4.2 Methyl Tert Butyl Ether (MTBE)

Methyl Tert Butyl Ether (MTBE) has not been used at the refinery since April 2006. Several monitoring wells were installed at various depths to monitor SPH and MTBE contaminant plumes from historical contamination. Historical analytical data for the observation wells (OW-14, 29 and 30) indicate the contaminant, MTBE has slowly been increasing over the years in these wells. Based

on this information, New Mexico Environmental Department – Hazardous Waste Bureau (NMED-HWB) requested two Work Plans to further investigate the known MTBE plume at the Facility and investigate a suspected plume north of the tank farm (SWMU 6). Pursuant to NMED's February 23, 2016 Approval with Modifications of the *Investigation Work Plan OW-29 & OW-30 and North Drainage Ditch Areas*, wells OW-53, OW-54, OW-55, and OW-56 were installed. These observation wells (OW) are located downstream on the northeast section of the plant and are designated as follows.

OBSERVATION WELLS					
OW-13	OW-14	OW-29	OW-30	OW-50	OW-52
OW-53	OW-54	OW-55	OW-56		

2.4.3 NAPIS UNIT

A unit at the southwest end of the facility that is used to recover and recycle oil back into the process has also – through leakage and spills – caused some MTBE and hydrocarbon contamination in shallow ground water. This unit is known as the NAPIS and was put into service in October 2004. The NAPIS has one up-gradient well NAPIS-1, located on the east side and three down-gradient shallow monitoring wells, NAPIS-2, NAPIS-3 and KA-3, which are located along the west side. The NAPIS unit is also equipped with three leak detection units on the east and west bays and also at the oil sump section on the east bay and are designated as follows:

NAPIS WELLS				LEAK DETECTION UNITS		
NAPIS-1	NAPIS-2	NAPIS-3	KA-3	EAST LDU	WEST LDU	OIL SUMP LDU

2.4.4 Aeration Basin

The Aeration Basin, which is designated as SWMU No. 1 in the facility's RCRA Post-Closure Care Permit includes three cells, known as AL-1, AL-2 (lagoons) and holding pond 1 which is currently referred to as EP-1, although it is not an evaporation pond and is not part of the area covered by SWMU No. 2 – Evaporation Ponds. All three of these cells are no longer in service since the startup

of the Waste Water Treatment Plant in 2012. All refinery waste water flow was diverted to the WWTP bypassing the lagoons and pond 1. Western has experienced intermittent discharges of oil and oily water into the lagoons and spills to ground surface while it was in operation. Most of these occurrences were the result of unit upsets and or large storm events affecting the old API Separator.

Two ground water monitoring wells (GWM-1, GWM-2) were installed immediately down gradient of the aeration lagoons in 2004 and 2005 in order to detect potential leakage from the aeration basin. GWM-3 was installed in 2005 on the northwest corner of pond 1 (EP-1).

Analysis of ground water samples collected at GWM-1 and GWM-2 have indicated several organic constituents at concentrations above the screening levels in ground water, which would indicate a potential for historical releases from the lagoons. In the third quarter of 2015, quarterly inspection of GWM-1 indicated the presence of an oily substance during gauging activities. NMED was notified of this finding and Gallup was instructed to collect an oil sample for fingerprint analysis (DRO/GRO and MRO). Gallup was also instructed to purge and gauge the well on a weekly basis to check the recharge rate. The initial measurement was made without the use of an oil/interface probe and the thickness of the hydrocarbon layer in the well was not immediately known. Measured separate phase hydrocarbon (SPH) thickness ranged from 0.35 to 0.45 feet in September, October and November 2015. Weekly gauging/purging of GWM-1 has recorded no measurable hydrocarbon layer since the end of November through December 2015 although an odor and sheen has been observed on the water purged. Depth to water has remained around 21 feet and Western continued to observe a hydrocarbon layer ranging from 0.30 to 1.00 feet in the quarterly monitoring events in 2017. On December 10, 2015, Gallup sent a response to NMED–HWB concurring that the source of the hydrocarbons observed in GWM-1 is from the adjacent aeration lagoon.

GWM-2 and 3 upon installation in 2005 were found to be dry. Water was first detected in GWM-2 in the first quarter of 2008 and in GWM-3 in the third quarter of 2010. 24-hour notification of the finding was given to NMED and OCD respectively. Analyses of ground water samples collected

from GWM-2 and GWM-3 have detected the presence of several constituents at concentration levels above applicable water quality standards such as fluoride, chloride, nitrates, and sulfates. MTBE is the only VOC to have been detected in GWM-2 or GWM-3, but at concentrations well below the screening level.

Quarterly inspections in 2011 and 2012 continued to indicate an increase in measurable water levels in GWM-2 and GWM-3, which was consistent with the increased levels in the lagoons and pond 1. In the second half of 2012 through early 2013 the levels in the lagoons and pond 1 began to decrease with cessation of gravitational flow between lagoons to pond 1 due in part to the start-up of the WWTP. Continued quarterly inspections indicated no water present in GWM-2 and GWM-3 in 2013 through 2017.

Both GWM-2 and GWM-3 have been included in the Aeration Basin Corrective Action Work Plan which began investigative soil and water sampling near the aeration basin in the third quarter of 2012 to support selection of a remedy for SWMU NO. 1 and determine the source of water detected in GWM-2 and GWM-3. Figure 4 shows the location of all of the active monitoring wells on the facility.

In February of 2012, Western submitted a "Revised Investigation Work Plan Solid Waste Management Unit (SWMU) No. 1 Aeration Basin" to include sampling of soils and ground water surrounding the Aeration Basin to determine if there has been a release to the environment and to delineate any such release. In addition, information was collected to help determine the source of ground water that had been observed in monitoring wells GWM-2 and GWM-3. The work plan also included SWMU No. 14 Old API Separator soil and ground water sampling. A new well OAPIS-1 (SWMU 14-2) was installed on the northwest corner where the benzene strippers were located on July 17, 2012 by Enviro-Drill Inc. OAPIS-1 (SWMU 14-2) was added to the 2014 Monitoring Schedule.

In February of 2013, the influent to the aeration lagoons was routed to the new Waste Water Treatment Plant (WWTP) and rerouting of the Travel Center sanitary effluent was completed in June of 2013. The aeration lagoons and pond 1 (EP-1), are no longer in service.

WELLS AT THE AERATION BASIN			
GWM-1	GWM-2	GWM-3	OAPIS-1

2.4.5 North Drainage Ditch

On April 22, 2015, Gallup notified NMED-HWB of the discovery of hydrocarbons in a drainage ditch in the northern portion of the refinery property. Surface water samples were collected from the standing water in the drainage ditch and concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) were detected as well as methyl tert-butyl ether (MTBE), gasoline range organics (GRO) and diesel range organics (DRO). An investigation work plan was submitted to NMED for review on August 13, 2015 and was subsequently implemented in May 2016 with installation of well OW-56. A request to add this well to the Facility Wide Ground Water Monitoring Work Plan was included in the April 2017 Facility Wide Ground Water Monitoring Work Plan. Boring logs for new wells are provided in Appendix D.

2.4.6 OW-14 Source Area

In correspondence dated May 11, 2015, NMED requested submittal of a work plan to investigate the source of contaminants present in groundwater monitoring well OW-14. Subsequently, wells OW-57 and OW-58 were installed in 2016 pursuant to NMED's May 12, 2016 Approval with Modifications of the *Revised OW-14 Source Area Investigation Work Plan*. A request to add these wells to the Facility Wide Ground Water Monitoring Work Plan was included in the April 2017 Facility Wide Ground Water Monitoring Work Plan. Boring logs for new wells are provided in Appendix D.

3.0 Site Conditions

The Gallup Refinery is located within a rural and sparsely populated section of McKinley County. It is situated in the high desert plain on the western flank of the Continental Divide approximately 17 miles east of Gallup. The surrounding land is comprised primarily of public and private lands used for cattle and sheep grazing.[2]

3.1 Current site topography and location of natural and manmade structures

Local topography consists of a gradually inclined down-slope from high ground in the southeast to a lowland fluvial plain in the northwest. The highest point on refinery property is located at the southeast corner boundary (elevation approximately 7,040 feet) and the lowest point is located at the northwest corner boundary (elevation approximately 6,860 feet). The refinery processing facility is located on a flat man-made terrace at an elevation of approximately 6,950 feet.

3.2 Drainages

Surface water in this region consists of the man-made evaporation ponds and aeration basins located within the refinery, a livestock watering pond (Jon Myer's Pond) located east of the refinery, two small unnamed spring fed ponds located south of the refinery, and the South Fork of the Puerco River and its tributary arroyos. The various ponds and basins typically contain water consistently throughout the year. The South Fork of the Puerco River and its tributaries are intermittent and generally contain water only during, and immediately after, the occurrence of precipitation.

There are several stormwater conveyance ditches located throughout the refinery which are directed to discharge into contained basins where it is collected and recycled for use as process water; collected and allowed to evaporate; diverted around regulated industrial activity or into two designated outfalls located on the east and west section of the property, identified as Outfall 001 and Outfall 002 (Figure 7). Outfall 001 is located directly south of evaporation pond 8 on the western edge of the refinery's property boundary and equipped with four separate small diameter

[2] See, for example, the web site of McKinley County at http://www.co.mckinley.nm.us/

overflow pipelines, each with a manual flow valve for independent control. Outfall 002 is located north of the rail road loading rack on the eastern section of the facility. This outfall consists of a concrete barrier with a valve to control discharges from a deep ditch that collects/ponds the runoff from the rail rack loading area.

Directly west of the crude tank area, there is also a concrete barrier with a valve to control discharges from a culvert that carries stormwater flow from the truck loading rack area. This concrete barrier is located downstream of the "hydrocarbon seep area". The flow from this concrete barrier continues in a north-northwest direction alongside the southern bermed areas of evaporation ponds 3, 4, 5 and 6 and outward towards the Outfall 001 area. At the new waste water treatment plant, there are three storm drains located on the south, southwest and west side of the waste water treatment plant which is connected to an underground storm culvert that exits on the northwest section of STP-1 into a conveyance ditch along the northern edge of pond 2 into a holding pond equipped with manual flow valves, located north of evaporation pond 3. The discharge from this holding pond then flows north-northwest towards the Outfall 001 area.

3.3 Vegetation types

Surface vegetation consists of native xerophytic vegetation including grasses, shrubs, small junipers, and some prickly pear cacti. Average rainfall at the refinery is less than 7 inches per year, although it can vary to slightly higher levels elsewhere in the county depending on elevation.

On alluvial fans on valley sides and drainage ways, the existing vegetation is usually alkali sacaton, western wheatgrass, Indian rice grass, blue grama, bottlebrush squirreltail, broom snakeweed, fourwing saltbush, threeawn, winterfat, mat muhly and spike muhly. On fan remnants on valley sides we usually find blue grama, western wheatgrass, Indian ricegrass, big sagebrush, galleta, bottlebrush squirreltail, fourwing saltbrush, needle and thread, one seed juniper, sand dropseed, spineless horsebrush, rabbitbrush, and twoneedle pinyon.

3.4 Erosion features

The impacts of historic overgrazing are visible at the north-side of the facility, in the form of arroyos that formed when surface run-off cut through the ground and washed away soils that were not able to hold water with their ground cover lost to overgrazing. Now that the facility is fenced and no livestock grazing occurs on the site, vegetation has recovered in these areas. With the facility helping to bring back vegetation in its undeveloped areas the formation and deepening of erosion features on its land has decreased.

3.5 Subsurface conditions

3.5.1 Soil types and associations

Most of the soils found at the surface in the locations where wells are located consist of the Gish-Mentmore complex.[3] These soils occur in alluvial fans on valley sides and fan remnants on valley sides. The parent material for these soils is slope and fan alluvium derived from sandstone and shale. These are well drained soils with moderately slow (0.2 in/hr) to slow permeability (0.06 in/hr). In this association, the Gish and similar soils make up about 45 percent, the Mentmore and similar soils 35 percent, and minor components 20 percent. These minor components are - Berryhill and similar soils 10 percent and Anodize and similar soils 10 percent. The typical profile for these soils is – 0 to 2 inches fine sandy loam, 2 to 72 inches of various kinds of clay loam.

Drill logs for various wells have been provided electronically to the NMED-HWB. From these well logs we can infer that the soils in the subsurface are generally composed of clays starting at the immediate subsurface, interbedded with narrow sand and silt layers. At about 100 to 150 feet, layers of mudstone, sandstone (from the Chinle Group, Petrified Forest Formation) and siltstone start to appear. Figure 3 shows a generalized relationship of soils in and around the Gallup Refinery.

[3] Soil Survey of McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties, Natural Resources Conservation Service (NRCS), US Department of Agriculture, available at - http://soildatamart.nrcs.usda.gov/Manuscripts/NM692/0/McKinley.Area%20NM.pdf

3.5.2 Stratigraphy

The 810-acre refinery property site is located on a layered geologic formation. Surface soils generally consist of fluvial and alluvial deposits; primarily clay and silt with minor inter-bedded sand layers. Below this surface layer is the Chinle Group, which consists of low permeability clay stones and siltstones. As such, the Chinle Group (Petrified Forest Formation) effectively serves as an aquiclude. Inter-bedded within the Chinle Group is the Sonsela Sandstone bed, which represents the uppermost potential aquifer in the region.

The Sonsela Sandstone bed lies within and parallels the dip of the Chinle Group. As such, its high point is located southeast of the refinery and it slopes downward to the northwest as it passes under the refinery. Due to the confinement of the Petrified Forest Formation aquitard, the Sonsela Sandstone bed acts as a water-bearing reservoir and is artesian at its lower extremis. Artesian conditions exist through much of the central and western portions of the refinery property.

3.5.3 Presence and flow direction of ground water

Ground water flow within the Petrified Forest Formation is extremely slow and typically averages less than 10^{-10} centimeters per second (less than 0.01 feet per year). Ground water flow within the surface soil layer above the Petrified Forest Formation is highly variable due to the presence of complex and irregular stratigraphy; including sand stringers, cobble beds, and dense clay layers. As such, hydraulic conductivity may range from less than 10^{-2} centimeters per second in the gravelly sands immediately overlying the Petrified Forest Formation down to 10^{-8} centimeters per second in the clay soil layers located near the surface.

Shallow ground water located under refinery property generally flows along the upper contact of the Petrified Forest Formation. The prevailing flow direction is from the southeast and toward the northwest.

4.0 Investigation Methods

The purpose of this section is to describe the types of activities that will be conducted and the methods that will be used as part of this Plan. Appendix A provides a thorough discussion on actual sampling methods that will be used.

4.1 Ground Water Sampling Methodology

All monitoring wells scheduled for sampling during a ground water sampling event will be sampled within 15 working days of the start of the monitoring and sampling event, weather permitting.

Appendix C contains the well data summary tables for 2017 which includes the annual and quarterly depth to water (DTW) and depth to bottom (DTB) measurements as well as corrected water table elevation with respect to wells that have SPH levels. Appendix C-1 and C-1.1 provides the corrected well elevation summary table for 2017 which includes date of establishment, ground elevation, top of casing elevation, well casing stick-up length, well depth, screening intervals, and stratigraphic units in which the wells are located. Appendix C-2 includes well elevation summary information for wells other than the MKTF wells, which includes date of establishment, ground elevation, top of casing elevation, well casing stick-up length, well depth, screening intervals and stratigraphic units in which the wells are located. Appendix C-3 includes well elevations for the artesian wells also known as Process or Production wells (PW). Information provided for the artesian wells was gathered from well boring logs. These wells are encased and therefore measurement for depth to bottom was not field verified. Table C-2 is revised to include new monitoring wells installed in 2016 and 2017.

4.1.1 Well Gauging

At the beginning of each quarterly, semi-annual, or annual sampling event, all monitoring and recovery wells listed in Appendix B, Ground Water Monitoring Schedule, will be gauged to record the depth to SPH, if present, the DTW and the DTB of the well. The gauging will be performed using an oil/water interface probe attached to a measuring tape capable of recording

measurements to the nearest 0.01 foot. Each monitoring well is field verified with the well number on the well casing or adjacent to the well to ensure that samples are collected at the correct well location. Wells also have a permanent marked reference point on the well casing from which ground water levels and well depths are measured.

Gauging measurements will be recorded on a field gauging form. Data obtained from the gauging will be reported in the annual ground water monitoring report. The data will be used to develop groundwater contour maps and SPH thickness isopleths which will also be included in the annual report.

4.1.2 Well Purging

Each monitoring well will be purged by removing ground water prior to sampling in order to ensure that formation water is being sampled. Generally, at least three well volumes (or a minimum of two if the well has low recharge rate) will be purged from each well prior to sampling. Field water quality measurements must stabilize for a minimum of three consecutive readings before purging will be discontinued. Field water quality measurements will include pH, electrical conductivity, temperature, dissolved oxygen (DO) mg/l, and oxidation-reduction potential (ORP). Field water quality measurement stability will be determined when field parameter readings stabilize to within ten percent between readings for three consecutive measurements. Once the readings are within ten percent, purging will stop and the well is ready for sample collection. The volume of ground water purged, the instruments used, and the readings obtained at each interval will be recorded on the field-monitoring log. Well purging and sampling will be performed using 1.5 inch x 3 foot and/or 3 inch x 3 foot disposable polyethylene bailers for ground water sampling and/or appropriately decontaminated portable sampling pumps.

4.2 Ground water Sample Collection

Ground water samples will be obtained from each well 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. Sample handling and chain-of-custody (COC) procedures are described in more detail in Appendix A as well as decontamination procedures for reusable water sampling equipment.

All purged ground water and decontamination water from monitoring wells will be drained into the refinery waste water treatment system upstream of the NAPIS. The procedures for disposing materials are described in Appendix A.

Ground water samples are collected and analyzed for both total and dissolved. Ground water samples obtained for dissolved metals analysis will be filtered through disposable filters with a 0.45 micrometers mesh size.

4.2.1 Sample Handling

All sample containers are supplied by the contracted analytical laboratory and shipped to Western in sealed coolers. Chemical preservation is also provided by the laboratory through pre-preserved bottle ware. Collection of containerized ground water samples are in the order of most volatile to least volatile, such as: VOCs, SVOCs, metals, phenols, cyanide, sulfate, chloride, nitrate and nitrite. Immediately after the samples are collected, they will be stored in a cooler with ice or other appropriate storage method until they are delivered to the analytical laboratory. Standard COC procedures as detailed in Appendix A will be followed for all samples collected. All samples will be submitted to the laboratory as soon as possible to allow the laboratory to conduct the analyses within the specified method holding times. Details of the general sample handling procedures are provided in Appendix A.

The following shipping procedures will be performed during each sampling event:

- Individual sample containers will be packed to prevent breakage and transported in a sealed cooler with ice or other suitable coolant or other EPA or industry-wide accepted method. The drainage hole at the bottom of the cooler will be sealed and secured in case of sample container leakage.
- Each cooler or other container will be delivered directly to the analytical laboratory.

- Glass bottles will be separated in the shipping container by cushioning material to prevent breakage.
- Plastic containers will be protected from possible puncture during shipping using cushioning material.
- The COC form and sample request form will be shipped inside the sealed storage container to be delivered to the laboratory.
- Signed and dated COC seals will be applied to each cooler prior to transport of samples from the site.

4.3 Analytical Methods

Ground water and surface water samples collected during the monitoring events will be analyzed using the specified analytical methods and for the constituents listed in Appendix B.

4.4 Quality Assurance Procedures

Contract analytical laboratories will maintain internal quality assurance programs in accordance with EPA and industry accepted practices and procedures. At a minimum, the laboratories will use a combination of standards, blanks, surrogates, duplicates, matrix spike/matrix spike duplicates (MS/MSD), blank spike/blank spike duplicates (BS/BSD), and laboratory control samples to demonstrate analytical Quality Assurance/Quality Control (QA/QC). The laboratories will establish control limits for individual chemicals or groups of chemicals based on the long-term performance of the test methods. In addition, the laboratories will establish internal QA/QC that meets EPA's laboratory certification requirements. The specific procedures to be completed are identified in the following sections.

4.4.1 Equipment Calibration Procedures and Frequency

The laboratory's equipment calibration procedures, calibration frequency, and calibration standards will be in accordance with the EPA test methodology requirements and documented in the laboratory's quality assurance (QA) and Standard Operating Procedures (SOP) manuals. All instruments and equipment used by the laboratory will be operated, calibrated, and maintained according to the manufacturers' guidelines and recommendations. Operation, calibration, and maintenance will be performed by personnel who have been properly trained in these procedures.

A routine schedule and record of instrument calibration and maintenance will be kept on file at the laboratory.

4.4.2 Field QA/QC Samples

Field duplicates and trip blanks may be obtained for quality assurance during sampling activities. The samples will be handled as described in Section 4.4.3.

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 de-ionized water placed in an appropriate sample container. Trip blanks will be analyzed at a frequency of one for each shipping event involving twenty or more samples. Generally, a trip blank will only be placed in one of the containers, if more than one container is used to ship the set of samples.

4.4.3 Laboratory QA/QC Samples

Analytical procedures will be evaluated by analyzing reagent or method blanks, surrogates, MS/MSDs, BS/BSDs and/or laboratory duplicates, as appropriate for each method. The laboratory QA/QC samples and frequency of analysis to be completed will be documented in the cited EPA or other test methodologies. At a minimum, the laboratory will analyze laboratory blanks, MS/MSDs, BS/BSDs and laboratory duplicates at a frequency of one in twenty for all batch runs requiring EPA test methods and a frequency of one in ten for non-EPA test methods. Laboratory batch QA/QC samples will be project specific.

4.4.4 Laboratory Deliverables

The analytical data package will be prepared in accordance with EPA-established Level II analytical support protocol which will include:

- Transmittal letter, including information about the receipt of samples, the testing methodology performed, any deviations from the required procedures, any problems encountered in the analysis of the samples, any data quality exceptions, and any corrective actions taken by the laboratory relative to the quality of the data contained in the report;
- Sample analytical results, including sampling date; date of sample extraction or preparation; date of sample analysis; dilution factors and test method identification; water

sample results in consistent units (milligrams per liter or micrograms per liter (µg/L)); and detection limits for undetected analytes. Results will be reported for all field samples, including field duplicates and blanks, submitted for analysis;

- Method blank results, including reporting limits for undetected analytes;
- Surrogate recovery results and corresponding control limits for samples and method blanks (organic analyses only);
- Laboratory duplicate results for inorganic analyses, including relative percent differences and corresponding control limits;
- Sample COC documentation;
- Holding times and conditions;
- Conformance with required analytical protocol(s);
- Instrument calibration;
- Blanks;
- Detection/quantitative limits;
- Recoveries of surrogates and/or matrix spikes (MS/MSDs);
- Variability for duplicate analyses;
- Completeness; and,
- Data report formats.

Data deliverables provided by the laboratory that include analysis of organic compounds will also include the following:

- A cover letter referencing the procedure used and discussing any analytical problems, deviations, and modifications, including signature from authority representative certifying to the quality and authenticity of data as reported;
- A report of sample collection, extraction, and analysis dates, including sample holding conditions;
- Tabulated results for samples in units as specified, including data qualification in conformance with EPA protocol, and definition of data descriptor codes;
- Final extract volumes (and dilutions required), sample size, wet-to-dry weight ratios, and instrument practical detection/quantitative limit for each analyte;
- Analyte concentrations with reporting units identified, including data qualification and a description of the qualifiers;
- Quantification of analytes in all blank analyses, as well as identification of method blank associated with each sample; and,
- Recovery assessments and a replicate sample summary, including all surrogate spike recovery data with spike levels/concentrations for each sample and all MS/MSD results (recoveries and spike amounts).

4.4.5 Review of Field and Laboratory QA/QC Data

The sample data, field, and laboratory QA/QC results will be evaluated for acceptability with respect to the data quality objectives (DQOs). Each group of samples will be compared with the DQOs and evaluated using data validation guidelines contained in EPA guidance documents: Guidance Document for the Assessment of RCRA Environmental Data Quality, National Functional Guidelines for Organic Data Review, and Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses, and the most recent version of SW-846, and industry-accepted QA/QC methods and procedures.

The laboratory will notify the Gallup Refinery Project Manager of data quality exceptions within one business day of identifying the data quality exception in order to allow for sample re-analysis, if possible. The Gallup Refinery Project Manager will contact NMED within one business day of receipt of laboratory notification of data quality exceptions in order to discuss the implementations and determine whether the data will still be considered acceptable, or if sample re-analysis or re-sampling is necessary.

4.4.6 Blanks, Field Duplicates, Reporting Limits and Holding Times

4.4.6.1 Blanks

The analytical results of field blanks and field rinsate blanks will be reviewed to evaluate the adequacy of the equipment decontamination procedures and the possibility of cross-contamination caused by decontamination of sampling equipment. The analytical results of trip blanks will be reviewed to evaluate the possibility for contamination resulting from the laboratory-prepared sample containers or the sample transport containers. The analytical results of laboratory blanks will be reviewed to evaluate the possibility of contamination caused by the analytical procedures. If contaminants are detected in field or laboratory blanks, the sample data will be qualified, as appropriate.

4.4.6.2 Field Duplicates

Field duplicates will consist of two samples either split from the same sample device or collected sequentially. Field duplicate ground water samples will be collected at a frequency of one per ten regular samples and will be analyzed for the full set of analyses used for the regular sample collected. At a minimum, one duplicate sample per sampling day must always be obtained.

4.4.6.3 Method Reporting Limits

Method reporting limits for sample analyses will be established at the lowest level practicable for the method and analyte concentrations and will not exceed ground water or surface water cleanup standards and screening levels. Detection limits that exceed established standards or screening levels and are reported as "not detected" will be considered data quality exceptions and an explanation for its acceptability for use will be provided.

4.4.6.4 Holding Times

Per EPA protocol the sampling, extraction, and analysis dates will be reviewed to confirm that extraction and analyses were completed within the recommended holding times. Appropriate data qualifiers will be noted if holding times are exceeded.

4.4.7 Representativeness and Comparability

4.4.7.1 Representativeness

Representativeness is a qualitative parameter related to the degree to which the sample data represent the relevant specific characteristics of the media sampled. Procedures will be implemented to assure representative samples are collected and analyzed, such as repeated measurements of the same parameter at the same location over several distinct sampling events. Any procedures or variations that may affect the collection or analysis of representative samples will be noted and the data will be qualified.

4.4.7.2 Comparability

Comparability is a qualitative parameter related to whether similar sample data can be compared. To assure comparability, analytical results will be reported in appropriate units for comparison with other data (past studies, comparable sites, screening levels, and cleanup standards), and standard collection and analytical procedures will be implemented. Any procedure or variation that may affect comparability will be noted and the data will be qualified.

4.4.8 Laboratory Reporting, Documentation, Data Reduction, and Corrective Action

Upon receipt of each laboratory data package, data will be evaluated against the criteria outlined in the previous sections. Any deviation from the established criteria will be noted and the data will be qualified. A full review and discussion of analytical data QA/QC and all data qualifiers will be submitted as appendices or attachments to the ground water monitoring reports. Data validation procedures for all samples will include checking the following, when appropriate:

- Holding times;
- Detection limits;
- Field equipment rinsate blanks;
- Field blanks;
- Field Duplicates;
- Trip blanks;
- Reagent blanks;
- Laboratory duplicates;
- Laboratory blanks;
- Laboratory matrix spikes;
- Laboratory matrix spike duplicates;
- Laboratory blank spikes;
- Laboratory blank spike duplicates; and
- Surrogate recoveries.

If significant quality assurance problems are encountered, appropriate corrective action will be implemented. All corrective action will be reported and the corrected data will be qualified.

5.0 Monitoring and Sampling Program

The primary objective of ground water monitoring is to provide data which will be used to assess ground water quality at and near the facility. Ground water elevation data will also be collected to evaluate ground water flow conditions. The ground water monitoring program for the facility will consist of sample collection and analysis from a series of monitoring wells, recovery wells, outfalls, and evaporation pond locations.

The monitoring network is divided into six investigation areas (Groups A, B, C, D, E, and F). The sampling frequency, analyses and target analytes will vary for each investigation area and the combined data from these investigation areas will be used to assess ground water quality beneath and immediately down-gradient of the facility and evaluate local ground water flow conditions.

Samples will not be collected from monitoring wells that have measurable SPH. For wells that are purged dry, samples will be collected if recharge volume is sufficient for sample collection within 24 hours. Wells not sampled due to insufficient recharge will be documented in the field log.

The following sections outline the monitoring program for each investigation area.

5.1 Group A Through Group F Sampling Locations

The location of the monitoring, recovery wells and leak detection units are shown in Figure 4. The following wells will be sampled (as described in Appendix B):

GROUP A	GROUP B	GROUP C	GROUP D	GROUP E
BW-1A, B, C	GWM-1, 2, 3	OW-13, 14, 29, 30	PW-2, 3, 4	MKTF- 1 thru 45
BW-2A, B, C	NAPIS 1, 2, 3, KA-3	OW-50, 52, 53, 54 OW-55, 56, 57, 58	OW-1, 10	
BW-3A, B, C BW-4A, 4B	OAPIS-1 OW-59, 60	RW-1, 2, 5, 6	OW-11, 12	

BW-5A, 5B, 5C	
MW-1, 2, 4, 5	LDU (3)
SMW-2, 4	STP1-NW, SW

The Group F outfalls and ponds will be sampled (as described in Appendix B, Table 1). (Note: these outfalls are from one section of the waste water treatment system to another – they do not discharge to any location outside the facility).

GROUP F OUTFALLS
STP-1 to EP-2
Boiler Water Inlet to EP-2

GROUP F EVAPORATION PONDS		
Pond 1 – No longer in service	EP-5	EP-9
EP-2	EP-6	EP-11
EP-3	EP-7	EP-12A
EP-4	EP-8	EP-12B

6.0 Monitoring Program Revisions

Upon review of the analytical results from the monitoring events under this Plan, historic facility-wide monitoring data, available soil boring data, and other related information Western Refining will assess the monitoring program presented in this Plan. Revisions to the Plan, as necessary, will then be presented for agency review and approval on an annual basis. These revisions may include, but not be limited to, a reduction or change in monitoring locations, monitoring frequency, and/or target analytes listed in Appendix B, Table 1.

6.1 Requests for Modifications to Sampling Plan

Water quality parameters were added for the MKTF wells pursuant to NMED's August 22, 2016 *Approval with Modifications 2014 Updates Facility-Wide Groundwater Monitoring Plan*.

New monitoring wells OW-59 and OW-60 have been included pursuant to NMED's directive in the March 17, 2017 *Approval with Modifications Work Plan SMW-2 Area Investigation and Boundary Well Installation*. The new boundary wells (BW-4A, BW-4B, BW-5A, BW-5B, and BW-5C) were included pursuant to the New Mexico Oil Conservation Division's comments dated February 21, 2017 on the same document, which are acknowledged by NMED in your letter of March 17, 2017.

The following modifications are in response to NMED correspondence (HWB-WRG-17-007), Disapproval Annual Ground Water Monitoring Report: Gallup Refinery – 2015, dated January 31, 2018:

- Comment 3: Permittee may discontinue the analysis of uranium in ground water samples (this same comment was previously received from NMED and addressed in 2017 updates).
- Comment 13: Collect an influent sample to the NAPIS when LDUs are sampled during future sampling events.
- Comment 26: Permittee must add analysis for 1,2-Dibromoethane (EDB) in all monitoring wells where EDC has been detected. Analytical method used must be capable of detecting EDB at concentrations less than 0.004 micrograms per liter (e.g., EPA Method 8011) (this comment was previously received from NMED and addressed in 2017 updates).

Additional modifications as listed below have been made to address NMED correspondence (HWB-WRG-16-003, HWB-WRG-17-005, HWB-18-002), Disapproval Facility-Wide Groundwater Monitoring Work Plans – Updates for 2016, 2017, and 2018, dated June 5, 2018.

- Comment 2: address earlier removal of SVOC analyses;
- Comment 4: the monitoring frequency at wells OW-50 and OW-52 is changed to quarterly from annual sampling
- Comment 10: increased monitoring frequency at PW-3 and PW-4 to quarterly samples;
- Comment 21: nitrite has been added in addition to the analyses for nitrate;
- Comment 26: added method 8011 for 1,2-dibromoethane;
- Comment 27: add metals analyses for the outfall from STP-1
- Comment 28: add analysis for pesticides using EPA Method 8081A for samples collected at EP-3, EP-12A and EP-12B in the 2018 sampling event. Future analyses dependent upon results of 2018 analyses.

Appendix A
Gallup Field Sampling Collection and Handling Standard Procedures

Field Data Collection: Elevation and Purging

All facility monitoring wells and recovery wells are gauged as required throughout the year. Gallup does not have any recovery well pumps that need to be shut off and removed prior to water elevation measurements.

Each monitoring well is field verified with the well number on the well casing or adjacent to the well to ensure that samples are collected from the correct well location. Wells also have a permanent marked reference point on the well casing from which ground water levels and well depths are measured. The portable pump intake is lowered to the midpoint of the listed screened interval for each specific well using the markings identified on the pump hose which are set every ten feet. In wells with dedicated pumps, the pumps have been installed at the midpoint of the screened interval.

All water/product levels are measured to an accuracy of the nearest 0.01 foot using an electrical conductivity based meter, the Heron Instruments 100 ft. DipperT electric water depth tape complying with US GGG-T-106E, EEC Class II and a WaterMark Oil Water Interface Meter (100 ft), Model 101L/SMOIL. After determining water levels, well volumes are calculated using the appropriate conversion factors for a given well based on its internal diameter. Volume is equal to the height of the liquid column times the internal cross-sectional area of the well.

Generally, at least three well volumes (or a minimum of two if the well has low recharge) are purged from each well prior to sampling. Field water quality parameters measured during purging (pH, electrical conductivity, temperature, and dissolved oxygen), must stabilize to within 10% for a minimum of three consecutive measurements before collection of ground water samples from each well.

Before sample collection can begin, the water collected from each monitoring well must be fresh aquifer water. Well evacuation replaces stagnant well water with fresh aquifer water. The water level in the well, total depth of well and thickness of floating product (if any) will be measured using the WaterMark Oil Water Interface Meter depth tape. If product is present, a ground water sample is not obtained.

If a well is pumped or bailed dry before two or three well volumes can be evacuated, it requires only that sufficient time elapse for an adequate volume of water to accumulate for the sampling event. The first sample will be tested for pH, temperature, specific conductivity and dissolved oxygen (%). The well will be retested for pH, temperature, specific conductivity and dissolved oxygen (%) after sampling as a measure of purging efficiency and as a check on the stability of the water samples over time. All well evacuation information will be recorded in a log book.

Wells MW-1, MW-2, MW-4, MW-5, BW-1C, BW-2A, BW-2B, BW-3B, SMW-4, OW-1, OW-10, OW-13, OW-14, OW-29 and OW-30 are each equipped with a dedicated electrical pump. The remaining wells are purged using a portable Grundfos pump. Recovery wells and NAPIS-1, NAPIS-2, NAPIS-3 and KA-3 are hand-bailed as well as GWM-1, GWM-2, GWM-3 and OAPIS-1 is hand-bailed if the presence of water is detected.

New wells MKTF 1 thru 45 and STP1-NW and STP1-SW are all hand-bailed if the presence of water is detected. If SPH is detected in any of these wells, no samples are collected.

Purged well water from wells is collected in fifty-five gallon drums or totes and drained to the process sewer upstream of the NAPIS. The water is treated in the refinery's waste water treatment system.

Sampling Equipment at Gallup

The following sampling equipment is maintained at Gallup and used by the sampling personnel:

- Heron Instruments 100 ft. DipperT electric water depth tape complying with US GGG-T-106E, EEC Class II.

- Pall Corporation Acro 50A 0.45 micron disposable filter used with 60 ml disposable syringes for filtering water in the field.
- YSI pH/Conductivity meter Model 63, calibrated with a one-point, two-point, or three-point calibration procedure using pH standards of 7, 4 and 10.
- IQ Scientific Instruments, pH/Temperature/Conductivity/ Dissolved Oxygen meter, Model IQ1806LP.
- Grundfos 2-inch pumps with Grundfos 115-volt AC–to-DC converter.
- WaterMark Oil Water Interface Meter (100 ft), Model 101L/SMOIL, S/N 01-5509.

Calibration and maintenance procedures will be performed according to the manufacturer's specifications.

Order of Collection

Samples will be collected in the order listed below:

Parameter	**Bottle Type**
VOC, SVOC	40 ml VOA vials, (H2SO4)
TOC	1 liter glass jar, H2SO4
Extractable Organics	1 liter glass jar with Teflon™ cap
Metals* Total and Dissolved	500 ml, 125 ml plastic, HNO3
Phenols, Cyanide	1 liter glass jar
Chloride, Sulfate, Nitrate, and Nitrite	1 liter plastic, no preservative

*Pre-filtration bottle for dissolved metals which is subsequently filtered in the field and transferred to a pint plastic bottle with HNO3 preservative.

Filtration

Ground water samples are filtered prior to dissolve metals analysis. For dissolved metals, sample water is poured into a jar and then extracted with a syringe. The syringe is then used to force the sample water through a 0.45 micron pore filter paper filter into the proper sample bottle to collect dissolved metals samples. Filtration must be performed within two hours of sample collection. Pour the filtrate into a sample bottle containing HNO3 preservative.

For samples destined for total metals analysis, do not filter the sample, and preserve with HNO3 to pH <2 in the field.

Gallup sampling personnel carry a cell phone when gathering ground water and other water samples. While sampling procedures are generally well known and the appropriate sample bottles are ordered to match each sampling event, occasional questions do arise from unforeseen circumstances which may develop during sampling. At such times, sampling personnel contact Hall Environmental Analytical Laboratory to verify that sampling is correctly performed.

Sample Handling Procedures

At a minimum, the following procedures will be used when collecting samples:

- Neoprene, nitrile, or other protective gloves will be worn when collecting samples. New disposable gloves will be used to collect each sample.
- All samples collected for chemical analysis will be transferred into clean sample containers supplied by the analytical laboratory. The sample container will be clearly marked. Sample container volumes and preservation methods will be in accordance with the most recent standard EPA and industry accepted practices for use by accredited analytical laboratories. Sufficient sample volume will be obtained for the laboratory to complete the method-specific QC analyses on a laboratory-batch basis.
- Sample labels and documentation will be completed for each sample.

Immediately after the samples are collected, they will be stored in a cooler with ice or other appropriate storage method until they are delivered to the analytical laboratory. Standard chain-of-custody procedures, as described in Section 4.2.1 of this Plan, will be followed for all samples collected. All samples will be submitted to the laboratory to allow the laboratory to conduct the analyses within the method holding times.

General Well Sampling Procedures

For safety protection and sampling purity, rubber gloves or disposable nitrile gloves are worn and changed between each activity.

Prepare for sampling event by making out sample bottle labels and have bottles separated into plastic bags for each well to be sampled and placed in an ice chest ready to take into the field. Bring along a note book and sample log. Document weather conditions, sample date and time. Fill in label with location, date, time, analysis, preservative, and your name. Start sampling by adjusting converter speed for each well. Affix sample label and fill bottle according to lab

instructions. For samples intended for VOC analysis, use bottles with septa lids, fill bottle to neck and add final amount of water with cap to form meniscus. Turn bottles upside down to examine for bubbles, if bubbles are detected in the vial, repeat collection procedure. If no bubbles show, secure lids and pack in bubble wrap and place in cooler until sampling is completed.

Decontaminate equipment that is not dedicated for use in a particular well. Refrigerate completed samples until shipping to lab. Be sure to check holding times and arrange for appropriate shipping method. Be sure that the field effort is adequately staffed and equipped. Check QC requirements before departing—QC samples require additional equipment and supplies.

Surface Water Sample Collection

At the evaporation ponds, samples will be collected as a grab sample at the pond edge near the inlets. This location will be noted in the field notebooks. The sampler will avoid disturbing sediment and gently allow the sample container to fill making sure that undue disturbance does not allow volatile contaminants to be lost. The sample bottle will be used for the sample collection in a shallow location near the bank. If a separate bottle and/or bailer are used to refill the sample container, this will be duly noted in the field log books. The decision to use a separate bottle/bailer will be made, if at all, by the sampler and the reasons for doing so will be noted in the field log book.

Upon arrival at the field site, the sampler will set out safety equipment such as traffic cones and signs (if required). The vehicle will be parked a sufficient distance away so as to prevent sample contamination from emissions. Appropriate sample containers and gloves must be used for the type of analyses to be performed.

Decontamination Procedures

The objective of the decontamination procedures is to minimize the potential for cross-contamination.

The majority of field equipment used for ground water sampling will be disposable and, therefore, not require decontamination. In order to prevent cross-contamination, field equipment that comes into contact with water or soil will be decontaminated between each sampling location. The decontamination procedure will consist of washing the equipment with a non-phosphate detergent solution (examples include Fantastik™, Liqui-Nox®), followed by two rinses of distilled water and air dried.

Decontamination water and rinsate will be contained and disposed of the same way as purge water, as described in Section 4.2. Decontamination procedures and the cleaning agents used will be documented in the daily field log.

Field Equipment Calibration Procedures

Field equipment requiring calibration will be calibrated to known standards, in accordance with the manufacturers' recommended schedules and procedures. Calibration checks will be conducted daily and the instruments will be recalibrated if necessary. Calibration measurements will be recorded in the daily field logs.

If field equipment becomes inoperable, its use will be discontinued until the necessary repairs are made. A properly calibrated replacement instrument will be used in the interim. Instrumentation used during sampling events will be recorded in the daily field logs.

Collection and Management of Investigation Derived Waste

Investigation derived waste (IDW) generated during each groundwater sampling event may include purge water, decontamination water, excess sample material, and disposable sampling equipment. All water from all wells generated during sampling and decontamination activities will be temporarily stored in labeled 55-gallon drums until placed in the refinery wastewater treatment system upstream of the API separator. All other solid waste generated during sampling activities (including sampling gloves, tubing, etc.) will be disposed of with the Refinery's general municipal waste.

Documentation of Field Activities

Daily field activities, including observations and field procedures, will be recorded using indelible ink on field sampling forms. The original field forms will be maintained at Gallup Refinery. Completed forms will be maintained in a bound and sequentially numbered field file for reference during field activities. The daily record of field activities will include the following information:

- Well ID/ Evaporation pond location/ Outfall
- Date
- Start and finish sampling time
- Field team members, including visitors
- Weather conditions
- Daily activities and times conducted
- Observations
- Record of samples collected with sample designations
- Photo log (if needed)
- Field monitoring data, including health and safety monitoring (if needed)
- Equipment used and calibration records, if appropriate
- List of additional data sheets and maps completed
- An inventory of the waste generated and the method of storage or disposal
- Signature of personnel completing the field record

Sample Custody

All samples collected for analysis will be recorded in the field report or data sheets. Chain-of-custody forms will be completed at the end of each sampling day, prior to the transfer of samples off site, and will accompany the samples during shipment to the laboratory. A signed and dated custody seal will be affixed to the lid of the shipping container. Upon receipt of the samples at the laboratory, the custody seals will be broken, the chain-of-custody form will be signed as received by the laboratory, and the conditions of the samples will be recorded on the form. The original chain-of-custody form will remain with the laboratory. Gallup Refinery will maintain copies of all chain-of-custody forms generated as part of sampling activities. Copies of the chain-of-custody records will be included with all draft and final laboratory reports submitted to NMED and OCD.

APPENDIX B

APPENDIX C

APPENDIX D

FIGURES

State of New Mexico
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

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Santa Fe, New Mexico 87505-6313
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SUSANA MARTINEZ
Governor
JOHN A. SANCHEZ
Lieutenant Governor

BUTCH TONGATE
Cabinet Secretary
J. C. BORREGO
Deputy Secretary

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

September 21, 2018

Jessica L. O'Brien
Environmental Supervisor
Western Refining, Southwest Inc., Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87301

RE: APPROVAL WITH MODIFICATIONS
REVISED FACILITY-WIDE GROUND WATER MONITORING WORK PLAN – UPDATES FOR 2018
WESTERN REFINING SOUTHWEST INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-WRG-18-002

Dear Ms. O'Brien:

The New Mexico Environment Department (NMED) has reviewed the *Revised Facility-Wide Ground Water Monitoring Work Plan – Updates for 2018* (Work Plan) dated July 2018, submitted on behalf of Western Refining Southwest Inc., Gallup Refinery (the Permittee). NMED hereby issues this Approval with Modifications. The Permittee must address the following comments provided by both NMED and the New Mexico Energy Minerals and Natural Resources Department Oil Conservation Division (OCD).

Comment 1
The Permittee submitted one hard copy and one electronic version of the revised Work Plan. RCRA Permit Section II.C.7 (Submissions to the Environment Department) requires that two hard copies and an electronic version of submittals must be submitted to NMED. The Permittee submitted another hard copy of the revised Work Plan on August 24, 2018. The submission due date was July 31, 2018. All required documents must be submitted on or before the due date to comply with the Permit. The Permittee must seek an extension of time in accordance with the Permit Section I.J.12. In addition, the Permittee did not submit an electronic version of the

response to NMED comments (RTC). The Permittee must submit an electronic version of the RTC no later than **October 12, 2018**.

Comment 2
The Permittee's response to NMED's *Disapproval* Comment 2 states that an entry was added to Table 2 to note SVOC analyses were previously removed in 2016 pursuant to the July 24, 2015 approval. A note in Table 2 states, "[p]ursuant to NMED's July 24, 2015 Approval with Modifications, SVOC analyses were previously discontinued with the addition of ORO and DRO-extended." The correct analysis required is GRO, rather than ORO. Revise the note in the table and provide a replacement table.

Comment 3
The Permittee's response to NMED's *Disapproval* Comment 10 states, "[s]ulfate, iron, phenol, and tetrachloroethene (PCE) have been detected above screening levels [in PW wells]." The tetrachloroethene concentration in the groundwater sample collected from well PW-2 was detected above the screening level in October 26, 2011; however, the detection was likely false-positive because the field blank was contaminated during the sampling event. In addition, PCE was not detected during the successive sampling events conducted on December 15, 2011 and September 10, 2014. The Permittee is not required to discuss the PCE detection in PW-2 in future reports or work plans. No response is necessary.

Comment 4
The Permittee's response to NMED's *Disapproval* Comment 13 states that the NMED's direction to "[c]orrect the statements in the revised 2018 Work Plan" is somewhat vague as to exactly which statement NMED is referring. The NMED is referring to the Permittee's statements quoted in NMED's Comment 13. The referenced statements were "[r]ecovery through hand-bailing continues on a quarterly basis indicating that the volume of SPH has continued to drop substantially from year to year in several of these recovery wells. In 2016, only Recovery Well (RW-1) and GMW-1 had measurable levels of hydrocarbons." The Permittee's statement that separate phase hydrocarbon (SPH) dropped substantially is not accurate because SPH measurements may not accurately reflect site conditions as pointed out in NMED's *Disapproval* Comment 13. The Permittee revised Section 2.4.1.1, *Main Tank Farm,* to change "continued to drop substantially" to "declined" which also is not accurate. Include a statement noting the fact that SPH measurements may not accurately reflect site conditions and provide a replacement page.

Comment 5
The Permittee's response to NMED's *Disapproval* Comment 14 states, "[w]e assume per NMED's comment the wells are approved for inclusion." To clarify, NMED approves inclusion of wells OW-53, OW-54, OW-55, OW-56, OW-57 and OW-58 in the groundwater monitoring schedule. No response is necessary.

Comment 6
The Permittee's response to NMED's *Disapproval* Comment 19 states, "[t]he discussion in Section 4.1.2 has been revised to specify DO to be reported in mg/l..." The revision has not

been addressed in Appendix A, *Gallup Field Sampling Collection and Handling Standard Procedures*. Revise the units for DO reporting in Appendix A and provide the appropriate revised replacement page.

Comment 7

The Permittee's response to NMED's *Disapproval* Comment 21 states, "[t]he references to nitrates in Section 4.2.1, Appendix A and Appendix B – Table 1 have been changed to nitrate and nitrite." According to Appendix B – Table 1, the change was only addressed in the PW wells. It should be noted that the change (inclusion of nitrite analysis) in the analytical suite applies to all monitoring wells where anions are included as a sampling requirement. No response is necessary.

Comment 8

The Permittee's response to NMED's *Disapproval* Comment 24 states, "[t]he rational[e] refers to the fact that the particular well is a "new well". On multiple previous occasions, NMED has specified that all new monitoring/observation wells should be included in the Monitoring Plan and thus Permittee included the new wells... We do not understand how the rationale to add new wells could possibly be ambiguous based on the history of this requirement." To clarify, the intent of Comment 24 is not to change or remove the requirement to add new wells to the Monitoring Plan. Comment 24 states, "[a]ll proposed monitoring schedule and modifications must be discussed." Accordingly, the Permittee made a revision to Section 6.1, *Requests for Modifications to Sampling* to provide information regarding why these new wells (BW-4A, BW-4B, BW-5A, BW-5B, BW-5C, OW-59, and BW-60) are added to the Monitoring Plan by referencing NMED and OCD directives. The references provide the rationale for the new wells. Consequently, Comment 24 was appropriately addressed in the revised Work Plan. However, simply stating that a rationale for adding a well to the Monitoring Plan because the well is new lacks detail with regard to reasons for installation. No response is necessary.

Comment 9

The Permittee's response to NMED's *Disapproval* Comment 26 states, "Appendix B Tables 1 and 2 have been revised to add analyses by method 8011 for OW-13. OW-50, OW-52, NAPIS-3, OAPIS-1, and MKTF wells MKTF-01, 04, 18, 19, 23, 27, 33, 34, 40 and 42." The revision was not made for OAPIS-1 in Table 1. Provide a replacement table that addresses the revision for OAPIS-1.

The Permittee must submit an electronic version of the RTC required by Comment 1 no later than **October 12, 2018**. Address all other comments in this Approval with Modifications in a separate response letter. Provide replacement pages and tables, where applicable. Additionally, an electronic version of the Work Plan that includes replaced pages and tables must be submitted to NMED. The response letter, replacement pages and tables, and electronic version of the updated Work Plan must be submitted to NMED no later than **November 30, 2018**.

This approval is based on the information presented in the document as it relates to the objectives of the work identified by NMED at the time of review. Approval of this document does not constitute agreement with all information or every statement presented in the document.

If you have questions regarding this Approval with Modifications, please contact Kristen Van Horn of my staff at 505-476-6046.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: K. Van Horn NMED HWB
M. Suzuki NMED HWB
C. Chavez OCD
L. King EPA Region 6

File: Reading File and WRG 2018 File
HWB-WRG-18-002

Table 1: Gallup Refinery - Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
NAPI Secondary Containment (3 units)	Q	NA	NA	BTEX+MTBE, GRO/DRO extended, WQCC Metals or check for fluids
NAPI Inlet	Q	NA	NA	BTEX+MTBE, GRO/DRO extended, WQCC Metals
RW-1	Q	X	NA	Measure DTW, DTP (Hydrocarbon recovery). Sample for BTEX, MTBE, GRO/DRO if no SPH is detected
RW-2	Q	X	NA	Same as RW-1
RW-5	Q	X	NA	Same as RW-1
RW-6	Q	X	NA	Same as RW-1
OW-1	Q	X	pH , EC, DO, ORP, Temp, TDS	Visual check for artesian flow conditions: Sample for major cations/anions, WQCC Metals, VOCs (method 8260 & 8011 for 1,2-dibromethane), GRO/DRO extended
OW-10	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-1
OW-13	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCs (methods 8260 & 8011 for 1,2-dibromoethane) , WQCC Metals, GRO/DRO extended
OW-14	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCs (methods 8260 & 8011 for 1,2-dibromoethane), WQCC Metals, GRO/DRO extended
OW-29	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14
OW-30	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14
OW-53	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14
OW-54	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14
OW-55	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14
OW-56	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14
OW-57	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14
OW-58	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14
OW-59	Q	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals
OW-60	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-59
GWM-1	Q	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOC, GRO/DRO extended, WQCC Metals
GWM-2	Q	X	NA	Check for Water - if water is detected report to OCD & NMED within 24 hours. Sample for GRO/DRO extended, major cations/anions, VOCs
GWM-3	Q	X	NA	Check for Water - if water is detected report to OCD & NMED within 24 hours. Sample for GRO/DRO extended, major cations/anions, VOCs
NAPIS-1 [1]	Q	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, BTEX+MTBE, SVOC, GRO/DRO EXTENDED. WQCC Metals
NAPIS-2 [1]	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as Napis-1
NAPIS-3 [1]	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as Napis-1, addition of 8011 for 1,2-dibromoethane
KA- 3 [1]	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as Napis-1
OAPIS-1	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCs, SVOC, GRO/DRO EXTENDED, WQCC Metals, Major cations/anions, Cyanide
STP1-NW	Q	X	NA	Major cations/anions, VOCs, SVOCs, GRO/DRO extended, WQCC Metals
STP1-SW	Q	X	NA	Major cations/anions, VOCS, SVOCs, GRO/DRO extended, WQCC Metals
STP-1 TO EP-2 (EP-2 Inlet)	Q	NA	NA	VOC, GRO/DRO extended, BOD, COD, TDS, WQCC Metals

Boiler Water (Reverse Osmosis) inlet to EP-2	SA	NA	pH , EC, DO, ORP, Temp, TDS	Major Cations/Anions
Pond 1 [2]				NO LONGER IN SERVICE
Evaporation Pond 2 [2]	SA		pH , EC, DO, ORP, Temp, TDS	General Chemistry, VOC, SVOC, BOD, COD, E-Coli Bacteria, WQCC Metals
Evaporation Pond 3 [2]	SA		pH , EC, DO, ORP, Temp, TDS	Same as EP-2 with addition of pesticides by method 8081A
Evaporation Pond 4 [2]	SA		pH , EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 5 [2]	SA		pH , EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 6 [2]	SA		pH , EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 7 [2]	SA		pH , EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 8 [2]	SA		pH , EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 9 [2]	SA		pH , EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 11 [2]	SA		pH , EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 12A [2]	SA		pH , EC, DO, ORP, Temp, TDS	Same as EP-3
Evaporation Pond 12B [2]	SA		pH , EC, DO, ORP, Temp, TDS	Same as EP-3
Any temporary Pond containing fluid	SA		pH , EC, DO, ORP, Temp, TDS	Same as EP-2
BW-1A	Annual (A)	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOC,WQCC METALS, GRO/DRO extended
BW-1B	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-1C	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-2A	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-2B	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-2C	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-3A	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-3B	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-3C	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-4A	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-4B	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-5A	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-5B	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-5C	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A
MW-1	Annual and every 10 years beginning in 2009 per RCRA Post Closure Permit	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCs, GRO/DRO extended, WQCC Metals, Cyanide, SVOCs
MW-2	Annual and every 10 years beginning in 2009 per RCRA Post Closure Permit	X	pH , EC, DO, ORP, Temp, TDS	Same as MW-1
MW-4	Annual and every 10 years beginning in 2009 per RCRA Post Closure Permit	X	pH , EC, DO, ORP, Temp, TDS	Same as MW-1
MW-5	Annual and every 10 years beginning in 2009 per RCRA Post Closure Permit	X	pH , EC, DO, ORP, Temp, TDS	Same as MW-1
OW-11	A	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCS, WQCC Metals, GRO/DRO extended
OW-12	A	X	pH , EC, DO, ORP, Temp, TDS	VOCS, WQCC METALS, GRO/DRO extended
OW-50	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCS(methods 8260 & 8011 for 1,2-dibromoethane) , GRO/DRO EXTENDED, WQCC METALS, GEN CHEM
OW-52	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCS(methods 8260 & 8011 for 1,2-dibromoethane) , GRO/DRO EXTENDED, WQCC METALS, GEN CHEM

SMW-2	A	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCS, GRO/DRO extended, WQCC Metals, Cyanide, SVOCs
SMW-4	Annual and every 10 years beginning in 2009 per RCRA Post Closure Permit	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals, Cyanide
PW-3	Q	X	pH , EC, DO, ORP, Temp, TDS	VOC, SVOC, WQCC Metals, Cyanide, Nitrate, Nitrite
PW-2	Every 3 years. Starting in 2008	X	pH , EC, DO, ORP, Temp, TDS	VOC, SVOC, WQCC Metals, Cyanide, Nitrate, Nitrite
PW-4	Q	X	pH , EC, DO, ORP, Temp, TDS	VOC, SVOC, WQCC Metals, Cyanide, Nitrate, Nitrite
MKTF-01	Q	X	pH , EC, DO, ORP, Temp, TDS	VOC (method 8060 & 8011 for 1,2-dibromoethane), SVOC, WQCC Metals, GRO/DRO extended, Major cations/anions.
MKTF-02	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-03	Q	X	pH , EC, DO, ORP, Temp, TDS	VOC, SVOC, WQCC Metals, GRO/DRO extended, Major cations/anions.
MKTF-04	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-05	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-06	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-07	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-08	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-09	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-10	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-11	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-12	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-13	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-14	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-15	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-16	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-17	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-18	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-19	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-20	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-21	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-22	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-23	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-24	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-25	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-26	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-27	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-28	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-29	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-30	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-31	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-32	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-33	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-34	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01

MKTF-35	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-36	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-37	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-38	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-39	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-40	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-41	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-42	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-43	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-44	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-45	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03

DEFINITIONS:

DO- Dissolved Oxygen	DTW - Depth to Water	MW - Monitor Well	DRO - Diesel Range Organics	BTEX - Benzene, Toluene, Ethylbenzene, Xylene, plus Methyl Tert-Butyl Ether (MTBE) - EPA Method 8021+MTBE
ORP - Oxygen Reduction Potential	DTP - Depth to Product	OW - Observation Well	MRO - Motor oil range organics	General Chemistry - pH, specific conductance, cations, Anions
Temp - Temperature	DTB - Depth to Bottom	RW - Recovery Well	GRO - Gasoline Range Organics	WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved
EC - Electrical or Specific Conductivity	EP - Evaporation Pond	NA - Not Applicable	MKTF - Marketing Tank Farm Well	VOC - Volatile Organic Compounds-EPA Method 8260, must include MTBE
TDS - Total Dissolved Solids	BW - Boundary Well		PW - Raw Water Production Well	SVOC - Semi-Volatile Organic Compounds - EPA Method 8270, must include phenol

NOTES:

1. NAPIS 1, NAPIS 2, NAPIS 3, and KA-3: Detection of product during quarterly monitoring must comply with Section II.F.2 (24-hour reporting) of NMED Post-Closure Care Permit
2. Sample using the State of New Mexico approved analytical methods as required by 20.6.4.14 NMAC, as amended through February 16, 2006 (use methods 9221-E, until EPA approves 40 CFR 136 Methods (Colilert, Colilert-18, m-Coliblue24, membrane filter method)). Parameters are subject to change. Evaporation pond samples must be collected at the inlet where waste water flows into the evaporation ponds.

Table 2: Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2018 Requested Changes	Rationale for Requested Changes
NAPI Secondary Containment (3 units)	Q	NA	NA	BTEX+MTBE, GRO/DRO extended, WQCC Metals or check for fluids	None	
NAPI Inlet	Q	NA	NA	Same as above (SAA)	Add sampling point	Per NMED comments (HWB-WRG-17-007)
RW-1	Q	X	NA	Measure DTW, DTP (Hydrocarbon recovery) Sample for BTEX + MTBE, GRO/DRO extended. Sample only if no SPH is detected.	None	
RW-2	Q	X	NA	Same as RW-1	None	
RW-5	Q	X	NA	Same as RW-1	None	
RW-6	Q	X	NA	Same as RW-1	None	
OW-1	Q	X	pH , EC, DO, ORP, Temp, TDS	Visual check for artesian flow conditions: Sample for major cations/anions, WQCC Metals, VOCS (methods 8260 & 8011), GRO/DRO extended	None	
OW-10	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-1	None	
OW-13	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCS (method 8260 & 8011), WQCC Metals, GRO/DRO extended	add method 8011	NMED Comment 26 in 6-5-18 Disapproval of Facility-Wide Groundwater Monitoring Plans, updates for 2016, 2017 and 2018
OW-14	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCS (method 8260 & 8011), WQCC Metals, GRO/DRO extended	None	
OW-29	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14	None	
OW-30	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14	None	
OW-53	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14	None [6]	See note #6.
OW-54	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14	None [6]	See note #6.
OW-55	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14	None [6]	See note #6.
OW-56	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14	added quarterly [6]	See note #6.
OW-57	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14	None [6]	See note #6.
OW-58	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-14	None [6]	See note #6.
OW-59	Q	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals	Add to Monitoring Schedule	New well per NMED approval/Mods Work Plan SMW-2 Area Inv & Boundary Well Install. (3/17/17)
OW-60	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-59	Add to Monitoring Schedule	New well per NMED approval/Mods Work Plan

Table 2: Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2018 Requested Changes	Rationale for Requested Changes
						SMW-2 Area Inv & Boundary Well Install. (3/17/17)
GWM-1	Q	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCS, GRO/DRO extended, WQCC Metals	None	
GWM-2	Q	X	NA	Check for Water - if water is detected report to OCD & NMED within 24 hours. Sample for GRO/DRO extended, major cations/anions, VOCS	None	
GWM-3	Q	X	NA	Same as GWM-2	None	
NAPIS-1 [1]	Q	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, BTEX+MTBE, SVOCS, GRO/DRO EXTENDED. WQCC Metals	None	
NAPIS-2 [1]	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as Napis-1	None	
NAPIS-3 [1]	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as Napis-1 with addition of method 8011 for 1,2-dibromoethane	add method 8011	NMED Comment 26 in 6-5-18 Disapproval of Facility-Wide Groundwater Monitoring Plans, updates for 2016, 2017 and 2018
KA-3 [1]	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as Napis-1	None	
OAPIS-1	Q	X	pH , EC, DO, ORP, Temp, TDS	Major Cations/anions, VOCS (methods 8260 and 8011), SVOCS, GRO/DRO EXTENDED, WQCC Metals, Cyanide	add method 8011	NMED Comment 26 in 6-5-18 Disapproval of Facility-Wide Groundwater Monitoring Plans, updates for 2016, 2017 and 2018
STP1-NW	Q	X	NA	Major cations/anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals	None	
STP1-SW	Q	X	NA	Same as STP1-NW	None	
Boiler Water (Reverse Osmosis)inlet to EP-2	SA	NA	pH , EC, DO, ORP, Temp, TDS	Major Cations/Anions	None	NMED Comment 22 in 6-5-18 Disapproval of Facility-Wide Groundwater Monitoring Plans, updates for 2016, 2017 and 2018
Pond 1 [2]		NA		NO LONGER IN SERVICE	None	
Evaporation Ponds 2 - 9 [2]	SA	NA	pH , EC, DO, ORP, Temp, TDS	General Chemistry, VOCS, SVOCS, BOD, COD, E-Coli Bacteria, WQCC Metals (add pesticides by method 8081A for EP-3)	add pesticides at EP-3	Per NMED comment 28 in 6-5-2018 Disapproval of Facility-Wide Groundwater Monitoring Plans, updates for 2016, 2017 and 2018
Evaporation Pond 11 [2]	SA	NA	pH , EC, DO, ORP, Temp, TDS	Same as EP-2	None	

Table 2: Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2018 Requested Changes	Rationale for Requested Changes
Evaporation Pond 12a [2]	SA	NA	pH , EC, DO, ORP, Temp, TDS	Same as EP-2, with addition of pesticides by method 8081A	add pesticides	Per NMED comment 28 in 6-5-2018 Disapproval of Facility-Wide Groundwater Monitoring Plans, updates for 2016, 2017 and 2018
Evaporation Pond 12b [2]	SA	NA	pH , EC, DO, ORP, Temp, TDS	Same as EP-2, with addition of pesticides by method 8081A	add pesticides	Per NMED comment 28 in 6-5-2018 Disapproval of Facility-Wide Groundwater Monitoring Plans, updates for 2016, 2017 and 2018
Any temporary Pond containing fluid	SA	NA	pH , EC, DO, ORP, Temp, TDS	Same as EP-2	None	
STP-1 TO EP-2 (EP-2 Inlet)	Q	NA	NA	VOCS, GRO/DRO extended, BOD, COD, TDS, WQCC Metals	add metals analyses	Per NMED comment 27 in 6-5-2018 Disapproval of Facility-Wide Groundwater Monitoring Plans, updates for 2016, 2017 and 2018
BW-1A	A	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCS, WQCC METALS, GRO/DRO-extended	None [4]	
BW-1B	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	None [4]	
BW-1C	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	None [4]	
BW-2A	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	None [4]	
BW-2B	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	None [4]	
BW-2C	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	None[4]	
BW-3A	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	None [4]	
BW-3B	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	None [4]	
BW-3C	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	None [4]	
BW-4A	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	Add to schedule	New well
BW-4B	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	Add to schedule	New well
BW-5A	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	Add to schedule	New well

Table 2: Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2018 Requested Changes	Rationale for Requested Changes
BW-5B	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	Add to schedule	New well
BW-5C	A	X	pH , EC, DO, ORP, Temp, TDS	Same as BW-1A	Add to schedule	New well
MW-1	A	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCS, SVOCs, GRO/DRO extended, WQCC Metals, Cyanide	None	
MW-2	A	X	pH , EC, DO, ORP, Temp, TDS	Same as MW-1	None	
MW-4	A	X	pH , EC, DO, ORP, Temp, TDS	Same as MW-1	None	
MW-5	A	X	pH , EC, DO, ORP, Temp, TDS	Same as MW-1	None	
OW-11	A	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCS, WQCC Metals, GRO/DRO-extended	None [4]	
OW-12	A	X	pH , EC, DO, ORP, Temp, TDS	VOCS, WQCC METALS, GRO/DRO extended	None	
OW-50	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCS(methods 8260 & 8011 for 1,2-dibromoethane) , GRO/DRO EXTENDED, WQCC METALS, GEN CHEM.	add method 8011 & change frequency [4]	NMED directive 6-5-2018[5]
OW-52	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as OW-50	add method 8011 & change frequency [4]	NMED directive 6-5-2018[5]
SMW-2	A	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCS, SVOCs, GRO/DRO extended, WQCC Metals, Cyanide	None	
SMW-4	A	X	pH , EC, DO, ORP, Temp, TDS	Major cations/anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals, Cyanide	None	
PW-3	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, Cyanide, Nitrate, Nitrite	change frequency & add nitrite	NMED directive 6-5-2018[5]
PW-2	Every 3 years. Starting in 2008	X	pH , EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, Cyanide, Nitrate, Nitrite	add nitrite	NMED directive 6-5-2018[5]
PW-4	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, Cyanide, Nitrate, Nitrite	change frequency & add nitrite	NMED directive 6-5-2018[5]
MKTF-01	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCS (method 8260 & 8011 for 1,2-dibromoethane [3]), SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/anions. Ground water samples will not be collected if SPH is present in any of the wells.	add water quality parameters & method 8011	NMED (8/22/16) approval/mods 2014 updates to Facility-Wide Ground Water Monitoring Plan for water quality parameters and NMED Comment 26 in 6-5-18 Disapproval of Facility-Wide Groundwater Monitoring Plans, updates for 2016, 2017 and 2018 for addition of method 8011

Table 2: Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2018 Requested Changes	Rationale for Requested Changes
MKTF-02	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	add water quality parameters	NMED (8/22/16) approval/mods 2014 updates to Facility-Wide Ground Water Monitoring Plan
MKTF-03	Q	X	pH , EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/anions	SAA	SAA
MKTF-04	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	Same as MKTF-01	Same as MKTF-01
MKTF-05	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-06	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-07	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-08	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-09	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-10	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-11	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-12	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-13	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-14	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-15	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-16	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-17	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-18	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-01	same as MKTF-01
MKTF-19	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-01	same as MKTF-01
MKTF-20	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-21	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-22	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-23	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-01	same as MKTF-01

Table 2: Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2018 Requested Changes	Rationale for Requested Changes
MKTF-24	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-02	same as MKTF-02
MKTF-25	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-02	same as MKTF-02
MKTF-26	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-02	same as MKTF-02
MKTF-27	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-01	same as MKTF-01
MKTF-28	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-29	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-30	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-02	same as MKTF-02
MKTF-31	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-02	same as MKTF-02
MKTF-32	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-02	same as MKTF-02
MKTF-33	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-01	same as MKTF-01
MKTF-34	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-01	same as MKTF-01
MKTF-35	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-02	same as MKTF-02
MKTF-36	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-02	same as MKTF-02
MKTF-37	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-02	same as MKTF-02
MKTF-38	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-39	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-40	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-01	same as MKTF-01
MKTF-41	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-02	same as MKTF-02
MKTF-42	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-01	same as MKTF-01	same as MKTF-01
MKTF-43	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-44	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03
MKTF-45	Q	X	pH , EC, DO, ORP, Temp, TDS	Same as MKTF-03	Same as MKTF-03	Same as MKTF-03

Table 2: Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2018 Requested Changes	Rationale for Requested Changes

DEFINITIONS:

STP-1 TO EP-2 - Sample collected at the inlet to Evaporation Pond 2 from STP-1
NAPIS 1 = (KA-1R); NAPIS-2 = (KA-2R), NAPIS-3 = KA-3R) - monitor wells positioned around NAPIS to detect leakage
DO- Dissolved Oxygen; ORP - Oxygen Reduction Potential; Temp - Temperature; EC - Electrical or Specific Conductivity
TDS - Total Dissolved Solids; VOC - Volatile Organic Compounds-EPA Method 8260, must include MTBE
SVOC - Semi-Volatile Organic Compounds - EPA Method 8270, must include phenol
DRO - Diesel Range Organics - EPA Method 8015B (or as modified); GRO - Gasoline Range Organics - EPA Method 8015B (or as modified)
BTEX - Benzene, Toluene, Ethylbenzene, Xylene, plus Methyl Tert-Butyl Ether (MTBE) - EPA Method 8021+MTBE
General Chemistry - pH, specific conductance, cations, Anions
DTW - Depth to Water; DTP - Depth to Product; EP - Evaporation Pond; BW - Boundary Wells
GWM wells - located around the aeration lagoons to detect leakage
MW - Monitor Well; OW - Observation Well; RW - Recovery Well; PW - Raw Water Production Well
WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved
NA - Not Applicable

NOTES:

1) NAPIS 1, NAPIS 2, NAPIS 3, KA-3: Detection of product during quarterly monitoring must comply with Section II.F.2 (twenty-four hour reporting) of NMED Post-Closure Care Permit

2) Sample using the State of New Mexico approved analytical methods as required by 20.6.4.14 NMAC, as amended through February 16, 2006 (use methods 9221-E and 9221-F, until EPA approves 40 CFR 136 methods. (Colilert, Colilert - 18, m-Coliblue24, membrane filter method)). Parameters are subject to change. Evaporation Pond samples must be collected at the inlet where waste water flows into the evaporation ponds.

3. EPA Method 8011 for 1,2-dibromethane(EDB) capable of detecting at concentrations less than 0.004 micrograms per liter.
4. Pursuant to NMED's July 24, 2015 Approval with Modifications, SVOC analyses were previously discontinued with the addition of ORO and DRO-extended.
5. See discussion in Section 6.1 regarding NMED's June 5, 2018 Disapproval Facility-Wide Groundwater Monitoring Work Plans – Updates for 2016, 2017, and 2018 regarding increased frequency and analysis for nitrite.
6. The changes were previously requested in the 2017 Work Plan Updates and there are no additional changes requested in the 2018 Work Plan Updates. Per NMED's comment 14 in the June 5, 2018 Disapproval Facility-Wide Groundwater Monitoring Work Plans – Updates for 2016, 2017, and 2018, it appears these wells are approved for inclusion in the Monitoring Plan .

Appendix C-1

WELL DATA 2017 ANNUAL/QUARTERLY SAMPLING
DTB/DTW MEASUREMENTS

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	2011 Survey [1] Ground Level Elevations (ft)	2011 Survey [1] Well Casing Rim Elevations (ft)	Stick-up length (ft)	2011 Survey [1] Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground water Elevation [3] (ft)	Corrected Water Table [4] Elevation (factor 0.8) (ft)	Screened Interval Depth Top to Bottom (ft)
11/10/2003	BW-1A [5]	09/13/17	2.00	6,883.17	6,885.12	1.95	6,847.50	46.06	N/A	N/A	DRY	DRY	N/A	30 - 35
10/28/2003	BW-1B [5]	09/13/17	2.00	6,883.17	6,885.78	2.61	6,818.33	76.29	N/A	N/A	DRY	DRY	N/A	54.6 - 64.6
11/10/2003	BW-1C [5]	09/13/17	2.00	6,883.17	6,885.68	2.51	6,749.29	145.29	N/A	N/A	12.60	6,873.08	N/A	125 -135
11/10/2003	BW-2A	09/13/17	2.00	6,871.88	6,874.69	2.81	6,807.12	67.57	N/A	N/A	32.44	6,842.25	N/A	55 - 65
10/28/2003	BW-2B	09/13/17	2.00	6,871.66	6,874.50	2.84	6,782.24	92.26	N/A	N/A	28.28	6,846.22	N/A	80 - 90
10/28/2003	BW-2C	09/13/17	2.00	6,872.90	6,875.30	2.40	6,722.46	152.84	N/A	N/A	20.90	6,854.40	N/A	139.5 - 149.5
6/15/2004	BW-3A	09/13/17	2.00	6,875.94	6,878.39	2.45	6,826.04	52.35	N/A	N/A	DRY	DRY	N/A	39.5 - 49.5
10/15/2003	BW-3B	09/13/17	2.00	6,876.16	6,878.59	2.43	6,809.19	69.40	N/A	N/A	33.38	6,845.21	N/A	63 - 73
7/20/2004	BW-3C	09/13/17	2.00	6,875.72	6,877.95	2.23	6,723.40	154.55	N/A	N/A	7.80	6,870.15	N/A	144.5 - 154.5
9/25/1981	OW-11	09/18/17	4.00	6,922.05	6,923.51	1.46	6,857.72	65.79	N/A	N/A	18.08	6,905.43	N/A	43 - 65
12/15/1980	OW-12	09/19/17	4.00	6,939.57	6,940.69	1.12	6,811.84	128.85	N/A	N/A	46.74	6,893.95	N/A	117.8 - 137.8
10/14/1981	MW-1	09/20/17	5.00	6,876.63	6,878.12	1.49	6,747.29	130.83	N/A	N/A	7.02	6,871.10	N/A	117.72 - 127.72
10/15/1981	MW-2	09/20/17	5.00	6,878.39	6,880.30	1.91	6,742.82	137.48	N/A	N/A	15.64	6,864.66	N/A	112 - 122
10/16/1981	MW-4	09/21/17	5.00	6,879.89	6,881.63	1.74	6,759.91	121.72	N/A	N/A	7.56	6,874.07	N/A	101 - 121
7/21/1986	MW-5	09/11/17	4.00	6,880.20	6,882.83	2.63	6,752.00	130.83	N/A	N/A	11.22	6,871.61	N/A	115 - 125
9/26/1985	SMW-2	09/11/17	2.00	6,881.63	6,883.97	2.34	6,831.17	52.80	N/A	N/A	24.79	6,859.18	N/A	34.31 - 54.31
9/25/1985	SMW-4	09/11/17	2.00	6,877.63	6,879.52	1.89	6,809.84	69.68	N/A	N/A	29.33	6,850.19	N/A	51.7 - 71.7
10/5/2009	OW-50	09/11/17	2.00	6,912.63	6,914.21	1.58	6,850.21	64.00	N/A	N/A	15.60	6,898.61	N/A	48 - 63
10/5/2009	OW-52	09/11/17	2.00	6,906.53	6,907.68	1.15	6,829.94	77.74	N/A	N/A	14.85	6,892.83	N/A	64 - 79
1/5/1981	OW-1*	02/27/17	4.00	6,866.32	6,866.62	0.30	6,772.07	94.55	N/A	N/A	1.71	6,864.91	N/A	89.3 - 99.3
		05/31/17	4.00	6,866.32	6,866.62	0.30	6,772.07	94.55	N/A	N/A	1.77	6,864.85	N/A	89.3 - 99.3
		09/06/17	4.00	6,866.32	6,866.62	0.30	6,772.07	94.55	N/A	N/A	1.70	6,864.92	N/A	89.3 - 99.3
		12/08/17	4.00	6,866.32	6,866.62	0.30	6,772.07	94.55	N/A	N/A	1.71	6,864.91	N/A	89.3 - 99.3
11/25/1980	OW-10*	02/27/17	4.00	6,873.67	6,874.91	1.24	6,814.58	60.33	N/A	N/A	0.56	6,874.35	N/A	40 - 60
		05/31/17	4.00	6,873.67	6,874.91	1.24	6,814.58	60.33	N/A	N/A	1.07	6,873.84	N/A	40 - 60
		09/07/17	4.00	6,873.67	6,874.91	1.24	6,814.58	60.33	N/A	N/A	1.88	6,873.03	N/A	40 - 60
		12/07/17	4.00	6,873.67	6,874.91	1.24	6,814.58	60.33	N/A	N/A	2.25	6,872.66	N/A	40 - 60
12/10/1980	OW-13	02/27/17	4.00	6,918.95	6,920.07	1.12	6,820.92	99.15	N/A	N/A	21.11	6,898.96	N/A	78.2 - 98.2
		05/31/17	4.00	6,918.95	6,920.07	1.12	6,820.92	99.15	N/A	N/A	21.45	6,898.62	N/A	78.2 - 98.2
		09/06/17	4.00	6,918.95	6,920.07	1.12	6,820.92	99.15	N/A	N/A	21.41	6,898.66	N/A	78.2 - 98.2
		12/11/17	4.00	6,918.95	6,920.07	1.12	6,820.92	99.15	N/A	N/A	21.00	6,899.07	N/A	78.2 - 98.2
12/17/1980	OW-14	02/27/17	4.00	6,924.55	6,926.65	2.10	6,880.13	46.52	N/A	N/A	22.83	6,903.82	N/A	35 - 45
		05/30/17	4.00	6,924.55	6,926.65	2.10	6,880.13	46.52	N/A	N/A	23.18	6,903.47	N/A	35 - 45
		09/06/17	4.00	6,924.55	6,926.65	2.10	6,880.13	46.52	N/A	N/A	22.56	6,904.09	N/A	35 - 45
		12/11/17	4.00	6,924.55	6,926.65	2.10	6,880.13	46.52	N/A	N/A	22.20	6,904.45	N/A	35 - 45
8/23/1996	OW-29	02/27/17	4.00	6,913.89	6,917.00	3.11	6,865.92	51.08	N/A	N/A	17.82	6,899.18	N/A	37.5 - 47.5
		05/30/17	4.00	6,913.89	6,917.00	3.11	6,865.92	51.08	N/A	N/A	18.16	6,898.84	N/A	37.5 - 47.5
		09/06/17	4.00	6,913.89	6,917.00	3.11	6,865.92	51.08	N/A	N/A	18.05	6,898.95	N/A	37.5 - 47.5

Appendix C-1 - Ground Water Measurements

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	2011 Survey [1] Ground Level Elevations (ft)	2011 Survey [1] Well Casing Rim Elevations (ft)	Stick-up length (ft)	2011 Survey [1] Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground water Elevation [3] (ft)	Corrected Water Table [4] Elevation (factor 0.8) (ft)	Screened Interval Depth Top to Bottom (ft)
		12/11/17	4.00	6,913.89	6,917.00	3.11	6,865.92	51.08	N/A	N/A	17.50	6,899.50	N/A	37.5 - 47.5
8/28/1996	OW-30	02/27/17	4.00	6,921.81	6,924.69	2.88	6,874.79	49.90	N/A	N/A	22.24	6,902.45	N/A	37.9 - 47.9
		05/31/17	4.00	6,921.81	6,924.69	2.88	6,874.79	49.90	N/A	N/A	22.64	6,902.05	N/A	37.9 - 47.9
		09/06/17	4.00	6,921.81	6,924.69	2.88	6,874.79	49.90	N/A	N/A	22.28	6,902.41	N/A	37.9 - 47.9
		12/12/17	4.00	6,921.81	6,924.69	2.88	6,874.79	49.90	N/A	N/A	21.75	6,902.94	N/A	37.9 - 47.9
7/8/2004	GWM-1	03/16/17	2.00	6,910.22	6,912.61	2.39	6,886.41	26.20	21.74	0.30	22.04	6,890.57	6890.81	17.5 - 23.5
		06/02/17	2.00	6,910.22	6,912.61	2.39	6,886.41	26.20	21.54	0.44	21.98	6,890.63	6890.98	17.5 - 23.5
		09/08/17	2.00	6,910.22	6,912.61	2.39	6,886.41	26.20	21.49	0.22	21.71	6,890.90	6891.08	17.5 - 23.5
		12/04/17	2.00	6,910.22	6,912.61	2.39	6,886.41	26.20	19.70	1.00	20.70	6,891.91	6892.71	17.5 - 23.5
9/25/2005	GWM-2	03/16/17	2.00	6,910.32	6,913.09	2.77	6,894.28	18.81	N/A	N/A	DRY	DRY	N/A	3.2 - 16.2
		06/02/17	2.00	6,910.32	6,913.09	2.77	6,894.28	18.81	N/A	N/A	DRY	DRY	N/A	3.2 - 16.2
		09/05/17	2.00	6,910.32	6,913.09	2.77	6,894.28	18.81	N/A	N/A	DRY	DRY	N/A	3.2 - 16.2
		12/04/17	2.00	6,910.32	6,913.09	2.77	6,894.28	18.81	N/A	N/A	DRY	DRY	N/A	3.2 - 16.2
9/25/2005	GWM-3	03/16/17	2.00	6,907.35	6,910.25	2.90	6,892.45	17.80	N/A	N/A	DRY	DRY	N/A	3 - 15
		06/02/17	2.00	6,907.35	6,910.25	2.90	6,892.45	17.80	N/A	N/A	DRY	DRY	N/A	3 - 15
		09/05/17	2.00	6,907.35	6,910.25	2.90	6,892.45	17.80	N/A	N/A	DRY	DRY	N/A	3 - 15
		12/04/17	2.00	6,907.35	6,910.25	2.90	6,892.45	17.80	N/A	N/A	DRY	DRY	N/A	3 - 15
3/14/2008	NAPIS-1	02/21/17	2.00	6,913.62	6,913.86	0.24	6,900.33	13.53	N/A	N/A	6.70	6,907.16	N/A	3.7 - 13.7
		06/02/17	2.00	6,913.62	6,913.86	0.24	6,900.33	13.53	N/A	N/A	6.85	6,907.01	N/A	3.7 - 13.7
		09/05/17	2.00	6,913.62	6,913.86	0.24	6,900.33	13.53	6.32	0.86	7.18	6,906.68	6907.37	3.7 - 13.7
		12/04/17	2.00	6,913.62	6,913.86	0.24	6,900.33	13.75	6.20	0.65	6.85	6,907.01	6907.53	3.7 - 13.7
3/14/2008	NAPIS-2 [6]	02/21/17	2.00	6,913.40	6,912.65	-0.75	6,899.04	13.61	N/A	N/A	7.89	6,904.76	N/A	4.2 - 14.2
		06/01/17	2.00	6,913.40	6,912.65	-0.75	6,899.04	13.61	N/A	N/A	8.35	6,904.30	N/A	4.2 - 14.2
		09/05/17	2.00	6,913.40	6,912.65	-0.75	6,899.04	13.61	N/A	N/A	8.32	6,904.33	N/A	4.2 - 14.2
		12/04/17	2.00	6,913.40	6,912.65	-0.75	6,899.04	14.60	N/A	N/A	7.98	6,904.67	N/A	4.2 - 14.2
3/14/2008	NAPIS-3 [6]	02/21/17	2.00	6,913.38	6,912.76	-0.62	6,882.34	30.42	N/A	N/A	9.20	6,903.56	N/A	25.4 - 30-4
		06/01/17	2.00	6,913.38	6,912.76	-0.62	6,882.34	30.42	N/A	N/A	10.20	6,902.56	N/A	25.4 - 30-4
		09/08/17	2.00	6,913.38	6,912.76	-0.62	6,882.34	30.42	N/A	N/A	9.10	6,903.66	N/A	25.4 - 30-4
		12/14/17	2.00	6,913.38	6,912.76	-0.62	6,882.34	31.58	N/A	N/A	9.00	6,903.76	N/A	25.4 - 30-4
6/11/2007	KA-3 [6]	02/21/17	2.00	6,913.29	6,912.52	-0.77	6,889.32	23.20	N/A	N/A	7.37	6,905.15	N/A	15 - 25
		06/01/17	2.00	6,913.29	6,912.52	-0.77	6,889.32	23.20	N/A	N/A	8.22	6,904.30	N/A	15 - 25
		09/05/17	2.00	6,913.29	6,912.52	-0.77	6,889.32	23.20	N/A	N/A	8.21	6,904.31	N/A	15 - 25
		12/04/17	2.00	6,913.29	6,912.52	-0.77	6,889.32	24.28	N/A	N/A	8.00	6,904.52	N/A	15 - 25
7/17/2012	OAPIS-1	02/21/17	2.00	6,914.37	6,916.73	2.36	6,888.37	28.30	N/A	N/A	11.60	6,905.13	N/A	16 - 26
		06/01/17	2.00	6,914.37	6,916.73	2.36	6,888.37	28.30	N/A	N/A	11.46	6,905.27	N/A	17 - 26
		09/05/17	2.00	6,914.37	6,916.73	2.36	6,888.37	28.30	N/A	N/A	11.09	6,905.64	N/A	18 - 26
		12/04/17	2.00	6,914.37	6,916.73	2.36	6,888.37	27.78	N/A	N/A	11.88	6,904.85	N/A	19 - 26
3/28/1995	RW-1	03/16/17	4.00	6,942.86	6,946.06	3.20	6,903.02	43.04	27.05	3.50	30.55	6,915.51	6918.31	25 - 40
		06/20/17	4.00	6,942.86	6,946.06	3.20	6,903.02	43.04	26.77	1.65	28.42	6,917.64	6918.96	25 - 40
		09/19/17	4.00	6,942.86	6,946.06	3.20	6,903.02	43.04	26.52	1.08	27.60	6,918.46	6919.32	25 - 40

Appendix C-1 - Ground Water Measurements

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	2011 Survey [1] Ground Level Elevations (ft)	2011 Survey [1] Well Casing Rim Elevations (ft)	Stick-up length (ft)	2011 Survey [1] Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground water Elevation [3] (ft)	Corrected Water Table [4] Elevation (factor 0.8) (ft)	Screened Interval Depth Top to Bottom (ft)
		12/12/17	4.00	6,942.86	6,946.06	3.20	6,903.02	43.04	26.50	1.00	27.50	6,918.56	6919.36	25 - 40
3/29/1995	RW-2	03/16/17	4.00	6,926.40	6,928.53	2.13	6,888.73	39.80	N/A	N/A	21.65	6,906.88	N/A	26.1 - 36.1
		06/20/17	4.00	6,926.40	6,928.53	2.13	6,888.73	39.80	N/A	N/A	21.19	6,907.34	N/A	26.1 - 36.1
		09/19/17	4.00	6,926.40	6,928.53	2.13	6,888.73	39.80	N/A	N/A	20.71	6,907.82	N/A	26.1 - 36.1
		12/05/17	4.00	6,926.40	6,928.53	2.13	6,888.73	40.00	N/A	N/A	20.34	6,908.19	N/A	26.1 - 36.1
8/27/1997	RW-5	03/16/17	4.00	6,941.53	6,943.57	2.04	6,903.98	39.59	N/A	N/A	27.53	6,916.04	N/A	29.5 - 39.5
		06/20/17	4.00	6,941.53	6,943.57	2.04	6,903.98	39.59	25.30	8.00	33.30	6,910.27	6916.67	29.5 - 39.5
		09/19/17	4.00	6,941.53	6,943.57	2.04	6,903.98	39.59	25.46	6.19	31.65	6,911.92	6916.87	29.5 - 39.5
		12/12/17	4.00	6,941.53	6,943.57	2.04	6,903.98	39.59	24.75	9.25	34.00	6,909.57	6916.97	29.5 - 39.5
8/27/1997	RW-6	03/16/17	4.00	6,941.96	6,944.01	2.05	6,903.11	40.90	N/A	N/A	27.57	6,916.44	N/A	28.5 - 38.5
		06/20/17	4.00	6,941.96	6,944.01	2.05	6,903.11	40.90	25.50	8.12	33.62	6,910.39	6916.89	28.5 - 38.5
		09/19/17	4.00	6,941.96	6,944.01	2.05	6,903.11	40.90	25.89	5.08	30.97	6,913.04	6917.10	28.5 - 38.5
		12/12/17	4.00	6,941.96	6,944.01	2.05	6,903.11	40.90	24.83	9.02	33.85	6,910.16	6917.38	28.5 - 38.5
5/6/2014	STP1-NW	02/21/17	2.00	6,904.50	6,904.47	-0.03	6,854.47	50.00	N/A	N/A	20.47	6,884.00	N/A	20 - 50
		06/02/17	2.00	6,904.50	6,904.47	-0.03	6,854.47	50.00	N/A	N/A	20.66	6,883.81	N/A	20 - 50
		09/05/17	2.00	6,904.50	6,904.47	-0.03	6,854.47	50.00	N/A	N/A	20.81	6,883.66	N/A	20 - 50
		12/04/17	2.00	6,904.50	6,904.47	-0.03	6,854.47	49.74	N/A	N/A	20.55	6,883.92	N/A	20 - 50
5/6/2014	STP1-SW	02/21/17	2.00	6,912.40	6,912.38	-0.02	6,880.38	29.10	N/A	N/A	DRY	N/A	N/A	15 - 30
		06/02/17	2.00	6,912.40	6,912.38	-0.02	6,880.38	29.10	N/A	N/A	NA	N/A	N/A	15 - 30
		09/05/17	2.00	6,912.40	6,912.38	-0.02	6,880.38	29.10	N/A	N/A	DRY	N/A	N/A	15 - 30
		12/04/17	2.00	6,912.40	6,912.38	-0.02	6,880.38	29.10	N/A	N/A	N/A	N/A	N/A	15 - 30
5/31/2016	OW-53	03/29/17	2.00	6,911.93	6,914.38	2.45	6,945.83	33.90	N/A	N/A	DRY	N/A	N/A	16 - 31
		06/21/17	2.00	6,911.93	6,914.38	2.45	6,945.83	33.90	N/A	N/A	DRY	N/A	N/A	16 - 31
		09/11/17	2.00	6,911.93	6,914.38	2.45	6,945.83	33.90	N/A	N/A	DRY	N/A	N/A	16 - 31
		12/05/17	2.00	6,911.93	6,914.38	2.45	6,945.83	33.90	N/A	N/A	DRY	N/A	N/A	16 - 31
6/1/2016	OW-54	03/29/17	2.00	6,916.36	6,918.92	2.56	6,947.40	31.04	N/A	N/A	18.44	6,900.48	N/A	13 - 28
		06/21/17	2.00	6,916.36	6,918.92	2.56	6,947.40	31.04	N/A	N/A	18.63	6,900.29	N/A	13 - 28
		09/11/17	2.00	6,916.36	6,918.92	2.56	6,947.40	31.04	N/A	N/A	18.70	6,900.22	N/A	13 - 28
		12/05/17	2.00	6,916.36	6,918.92	2.56	6,947.42	31.06	N/A	N/A	18.27	6,900.65	N/A	13 - 28
6/1/2016	OW-55	03/29/17	2.00	6,921.01	6,923.25	2.24	6,951.71	30.70	N/A	N/A	18.39	6,904.86	N/A	13 - 28
		06/21/17	2.00	6,921.01	6,923.25	2.24	6,951.71	30.70	N/A	N/A	18.47	6,904.78	N/A	13 - 28
		09/11/17	2.00	6,921.01	6,923.25	2.24	6,951.71	30.70	N/A	N/A	18.49	6,904.76	N/A	13 - 28
		12/05/17	2.00	6,921.01	6,923.25	2.24	6,951.91	30.90	N/A	N/A	18.05	6,905.20	N/A	13 - 28
6/1/2016	OW-56	03/29/17	2.00	6,917.79	6,920.18	2.39	6,936.38	18.59	N/A	N/A	12.29	6,907.89	N/A	6 - 16
		06/21/17	2.00	6,917.79	6,920.18	2.39	6,936.38	18.59	N/A	N/A	13.53	6,906.65	N/A	6 - 16
		09/11/17	2.00	6,917.79	6,920.18	2.39	6,936.38	18.59	N/A	N/A	14.50	6,905.68	N/A	6 - 16
		12/05/17	2.00	6,917.79	6,920.18	2.39	6,936.37	18.58	N/A	N/A	13.43	6,906.75	N/A	6 - 16
10/5/2016	OW-57	03/30/17	2.00	6,930.64	6,933.10	2.46	6,958.99	28.35	N/A	N/A	NM	N/A	N/A	15 - 25
		06/20/17	2.00	6,930.64	6,933.10	2.46	6,958.99	28.35	N/A	N/A	20.52	6,912.58	N/A	15 - 25
		09/19/17	2.00	6,930.64	6,933.10	2.46	6,958.99	28.35	N/A	N/A	20.15	6,912.95	N/A	15 - 25

Appendix C-1 - Ground Water Measurements

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	2011 Survey [1] Ground Level Elevations (ft)	2011 Survey [1] Well Casing Rim Elevations (ft)	Stick-up length (ft)	2011 Survey [1] Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground water Elevation [3] (ft)	Corrected Water Table [4] Elevation (factor 0.8) (ft)	Screened Interval Depth Top to Bottom (ft)
		12/05/17	2.00	6,930.64	6,933.10	2.46	6,958.99	28.35	N/A	N/A	20.11	6,912.99	N/A	15 - 25
10/3/2016	OW-58	03/29/17	2.00	6,934.71	6,934.50	-0.21	6,982.26	47.55	N/A	N/A	26.00	6,908.50	N/A	38 - 48
		06/21/17	2.00	6,934.71	6,934.50	-0.21	6,982.26	47.55	N/A	N/A	25.14	6,909.36	N/A	38 - 48
		09/19/17	2.00	6,934.71	6,934.50	-0.21	6,982.26	47.55	N/A	N/A	25.04	6,909.46	N/A	38 - 48
		12/06/17	2.00	6,934.71	6,934.50	-0.21	6,982.21	47.50	N/A	N/A	24.67	6,909.83	N/A	38 - 48
6/29/2017	OW-59	09/21/17	2.00	6,887.63	6,889.73	2.10	6,925.93	38.30	N/A	N/A	24.30	6,865.43	N/A	20 - 35
		12/05/17	2.00	6,887.63	6,889.73	2.10	6,926.13	38.50	N/A	N/A	24.30	6,865.43	N/A	20 - 35
6/29/2017	OW-60	09/21/17	2.00	6,891.06	6,893.51	2.45	6,936.61	45.55	N/A	N/A	16.45	6,877.06	N/A	25 - 45
		12/05/17	2.00	6,891.06	6,893.51	2.45	6,936.76	45.70	N/A	N/A	16.40	6,877.11	N/A	25 - 45
6/29/2017	BW-4A	09/21/17	2.00	6,870.67	6,873.18	2.51	6,909.47	38.80	N/A	N/A	DRY	N/A	N/A	21 - 36
		12/08/17	2.00	6,870.67	6,873.18	2.51	6,908.97	38.30	N/A	N/A	DRY	N/A	N/A	21 - 36
6/29/2017	BW-4B	09/21/17	2.00	6,870.62	6,873.23	2.61	6,934.12	63.50	N/A	N/A	31.58	6,841.65	N/A	41 - 61
		12/08/17	2.00	6,870.62	6,873.23	2.61	6,934.12	63.50	N/A	N/A	37.95	6,835.28	N/A	41 - 61
6/29/2017	BW-5A	09/21/17	2.00	6,874.39	6,877.00	2.61	6,897.39	23.00	N/A	N/A	DRY	N/A	N/A	10 - 20
		12/08/17	2.00	6,874.39	6,877.00	2.61	6,897.41	23.02	N/A	N/A	DRY	N/A	N/A	10 - 20
6/29/2017	BW-5B	09/21/17	2.00	6,874.32	6,876.82	2.50	6,935.77	61.45	N/A	N/A	8.65	6,868.17	N/A	48 - 58
		12/08/17	2.00	6,874.32	6,876.82	2.50	6,935.77	61.45	N/A	N/A	9.00	6,867.82	N/A	48 - 58
6/29/2017	BW-5C	09/21/17	2.00	6,874.22	6,876.85	2.63	6,950.57	76.35	N/A	N/A	2.99	6,873.86	N/A	64.3-74.30
		12/08/17	2.00	6,874.22	6,876.85	2.63	6,950.57	76.35	N/A	N/A	2.80	6,874.05	N/A	64.3-74.30

DEFINITIONS:

DTB - Depth to Bottom
DTW - Depth to Water
SPH = Separate Phase Hydrocarbons
* Wells also checked for Artesian flow conditions.
N/A = Not Applicable NS = Not Surveyed
Negative number in Stick up Length column indicates well is flushmount and located at or below ground level.
Depth to Water Column - if 0.00 is indicated - means water is at top of casing (full) under artesian flow conditions.
Dry indicates no water was detected.

NOTES:

1. Elevation data from NMED's "Approval with Modifications, Requirement to Resurvey Ground water Monitoring Wells and Recovery Wells", dated 9/26/12.
2. Ground water elevation - Depth to SPH = SPH Column Thickness.
3. 2011 Survey Well Casing Rim elevation - depth to water measurement.
4. Corrected Water Table Elevation applies only if SPH thickness column measurement exists. (0.8 X SPH thickness + Ground Water Elevation)
5. Casings extended due to increased height from berm work. Changes in ground elevation, casing rim elevations, and well bottom casing elevations. Resurveyed on 9/15/2014 by HEI (Hammon Enterprises Inc.).
6. Napis-2, Napis-3, KA-3 - flush mount casings extended to prevent water from entering inside the vault on August 8, 2016.
7. OW-53 thru BW-5C - all new installations with new surveys

APPENDIX C-1.1 - Ground Water Measurements MKTF Wells

WELL DATA 2017 ANNUAL/QUARTERLY SAMPLING
DTB/DTW MEASUREMENTS FOR MKTF 1 - MKTF 45 WELLS

Date of Installation	Date of Survey [1]	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	Ground Level Elevations (ft)	Well Casing Rim Elevations (ft)	Ground Elevation Inside Steel Sleeve (ft)	Stick-up length (ft)	Well Casing Bottom Elevation (ft)	Total Well Depth (ft)	Depth to [2] SPH (ft)	SPH [3] Column Thickness (ft)	Depth to Water (ft)	Ground water Elevation (ft)	Corrected [4] Water Table Elevation (Factor 0.8) (ft)	Screened Interval Depth Top to Bottom (ft)	Stratigraphic unit in which screen exists
11/14/2013	1/21/2014	MKTF-01	03/14/17	4.00	6,918.28	6,920.67	6,920.67	2.39	6,903.25	17.42	4.65	0.16	4.81	6,915.86	6915.99	5 - 15	Chinle/Alluvium Interface
			06/07/17	4.00	6,918.28	6,920.67	6,920.67	2.39	6,903.25	17.42	4.89	0.53	5.42	6,915.25	6915.67	5 - 15	Chinle/Alluvium Interface
			10/03/17	4.00	6,918.28	6,920.67	6,920.67	2.39	6,903.25	17.42	6.20	0.36	6.56	6,914.11	6914.40	5 - 15	Chinle/Alluvium Interface
			11/20/17	4.00	6,918.28	6,920.67	6,920.67	2.39	6,903.25	17.42	4.62	0.33	4.95	6,915.72	6915.98	5 - 15	Chinle/Alluvium Interface
11/14/2013	1/21/2014	MKTF-02	03/16/17	4.00	6,915.00	6,917.45	6,917.18	2.45	6,896.97	20.48	N/A	N/A	7.34	6,910.11	N/A	7 - 17	Chinle/Alluvium Interface
			06/07/17	4.00	6,915.00	6,917.45	6,917.18	2.45	6,896.97	20.48	17.10	0.01	17.11	6,900.34	6900.35	7 - 17	Chinle/Alluvium Interface
			10/03/17	4.00	6,915.00	6,917.45	6,917.18	2.45	6,896.97	20.48	N/A	N/A	6.67	6,910.78	N/A	7 - 17	Chinle/Alluvium Interface
			11/20/17	4.00	6,915.00	6,917.45	6,917.18	2.45	6,897.10	20.35	N/A	N/A	7.00	6,910.45	N/A	7 - 17	Chinle/Alluvium Interface
11/7/2013	1/21/2014	MKTF-03	03/02/17	4.00	6,931.73	6,931.69	6,930.85	-0.04	6,913.24	18.45	6.42	1.17	7.59	6,924.10	6925.04	3 - 18	Chinle/Alluvium Interface
			06/07/17	4.00	6,931.73	6,931.69	6,930.85	-0.04	6,913.24	18.45	6.95	1.30	8.25	6,923.44	6924.48	3 - 18	Chinle/Alluvium Interface
			09/26/17	4.00	6,931.73	6,931.69	6,930.85	-0.04	6,913.24	18.45	6.35	0.80	7.15	6,924.54	6925.18	3 - 18	Chinle/Alluvium Interface
			11/28/17	4.00	6,931.73	6,931.69	6,930.85	-0.04	6,913.24	18.45	7.00	0.95	7.95	6923.74	6924.50	3 - 18	Chinle/Alluvium Interface
11/12/2013	1/21/2014	MKTF-04	03/02/17	4.00	6,933.90	6,933.57	6,933.24	-0.33	6,911.42	22.15	N/A	N/A	8.31	6,925.26	N/A	10 - 22	Chinle/Alluvium Interface
			06/07/17	4.00	6,933.90	6,933.57	6,933.24	-0.33	6,911.42	22.15	N/A	N/A	9.28	6,924.29	N/A	10 - 22	Chinle/Alluvium Interface
			09/26/17	4.00	6,933.90	6,933.57	6,933.24	-0.33	6,911.42	22.15	N/A	N/A	8.80	6,924.77	N/A	10 - 22	Chinle/Alluvium Interface
			11/29/17	4.00	6,933.90	6,933.57	6,933.24	-0.33	6,911.27	22.30	N/A	N/A	9.30	6,924.27	N/A	10 - 22	Chinle/Alluvium Interface
11/12/2013	1/21/2014	MKTF-05	03/02/17	4.00	6,939.49	6,942.22	6,941.95	2.73	6,924.47	17.75	13.33	0.29	13.62	6,928.60	6928.83	4 - 14	Chinle/Alluvium Interface
			06/07/17	4.00	6,939.49	6,942.22	6,941.95	2.73	6,924.47	17.75	13.79	0.46	14.25	6,927.97	6928.34	4 - 14	Chinle/Alluvium Interface
			09/26/17	4.00	6,939.49	6,942.22	6,941.95	2.73	6,924.47	17.75	13.01	0.49	13.50	6,928.72	6929.11	4 - 14	Chinle/Alluvium Interface
			11/28/17	4.00	6,939.49	6,942.22	6,941.95	2.73	6,924.47	17.75	13.98	0.77	14.75	6,927.47	6928.09	4 - 14	Chinle/Alluvium Interface
11/11/2013	1/21/2014	MKTF-06	03/15/17	4.00	6,944.24	6,946.81	6,946.63	2.57	6,923.04	23.77	15.95	0.10	16.05	6,930.76	6930.84	8 - 20	Chinle/Alluvium Interface
			06/12/17	4.00	6,944.24	6,946.81	6,946.63	2.57	6,923.04	23.77	16.60	0.64	17.24	6,929.57	6930.08	8 - 20	Chinle/Alluvium Interface
			09/26/17	4.00	6,944.24	6,946.81	6,946.63	2.57	6,923.04	23.77	16.01	0.71	16.72	6,930.09	6930.66	8 - 20	Chinle/Alluvium Interface
			11/28/17	4.00	6,944.24	6,946.81	6,946.63	2.57	6,923.04	23.77	16.55	1.15	17.70	6,929.11	6930.03	8 - 20	Chinle/Alluvium Interface
11/11/2013	1/21/2014	MKTF-07	03/15/17	4.00	6,944.40	6,947.18	6,947.06	2.78	6,929.56	17.62	10.63	1.97	12.60	6,934.58	6936.16	4 - 14	Chinle/Alluvium Interface
			06/12/17	4.00	6,944.40	6,947.18	6,947.06	2.78	6,929.56	17.62	10.20	1.30	11.50	6,935.68	6936.72	4 - 14	Chinle/Alluvium Interface
			09/26/17	4.00	6,944.40	6,947.18	6,947.06	2.78	6,929.56	17.62	9.80	1.30	11.10	6,936.08	6937.12	4 - 14	Chinle/Alluvium Interface
			11/28/17	4.00	6,944.40	6,947.18	6,947.06	2.78	6,929.56	17.62	10.40	1.40	11.80	6,935.38	6936.50	4 - 14	Chinle/Alluvium Interface
11/11/2013	1/21/2014	MKTF-08	03/15/17	4.00	6,944.02	6,947.09	6,942.67	3.07	6,925.11	21.98	11.99	0.61	12.60	6,934.49	6934.98	8 - 18	Chinle/Alluvium Interface
			06/12/17	4.00	6,944.02	6,947.09	6,942.67	3.07	6,925.11	21.98	11.98	0.42	12.40	6,934.69	6935.03	8 - 18	Chinle/Alluvium Interface
			09/26/17	4.00	6,944.02	6,947.09	6,942.67	3.07	6,925.11	21.98	12.15	0.45	12.60	6,934.49	6934.85	8 - 18	Chinle/Alluvium Interface
			11/28/17	4.00	6,944.02	6,947.09	6,942.67	3.07	6,925.11	21.98	12.68	0.52	13.20	6,933.89	6934.31	8 - 18	Chinle/Alluvium Interface
11/11/2013	1/21/2014	MKTF-09	03/15/17	4.00	6,943.57	6,946.50	6,945.90	2.93	6,923.80	22.70	N/A	N/A	12.64	6,933.86	N/A	7 - 19	Chinle/Alluvium Interface
			06/12/17	4.00	6,943.57	6,946.50	6,945.90	2.93	6,923.80	22.70	N/A	N/A	12.64	6,933.86	N/A	7 - 19	Chinle/Alluvium Interface
			09/28/17	4.00	6,943.57	6,946.50	6,945.90	2.93	6,923.80	22.70	N/A	N/A	12.69	6,933.81	N/A	7 - 19	Chinle/Alluvium Interface
			11/29/17	4.00	6,943.57	6,946.50	6,945.90	2.93	6,923.75	22.75	N/A	N/A	13.15	6,933.35	N/A	7 - 19	Chinle/Alluvium Interface
10/31/2013	1/21/2014	MKTF-10	03/02/17	4.00	6,937.51	6,937.16	6,936.63	-0.35	6,921.17	15.99	N/A	N/A	7.47	6,929.69	N/A	7 - 17	Chinle/Alluvium Interface
			06/07/17	4.00	6,937.51	6,937.16	6,936.63	-0.35	6,921.17	15.99	N/A	N/A	7.02	6,930.14	N/A	7 - 17	Chinle/Alluvium Interface
			09/27/17	4.00	6,937.51	6,937.16	6,936.63	-0.35	6,921.17	15.99	N/A	N/A	6.78	6,930.38	N/A	7 - 17	Chinle/Alluvium Interface
			11/29/17	4.00	6,937.51	6,937.16	6,936.63	-0.35	6,921.17	15.99	N/A	N/A	7.00	6,930.16	N/A	7 - 17	Chinle/Alluvium Interface
10/31/2013	1/21/2014	MKTF-11	03/02/17	4.00	6,931.61	6,931.34	6,930.86	-0.27	6,913.20	18.14	N/A	N/A	6.96	6,924.38	N/A	8 - 18	Chinle/Alluvium Interface
			06/07/17	4.00	6,931.61	6,931.34	6,930.86	-0.27	6,913.20	18.14	N/A	N/A	7.39	6,923.95	N/A	8 - 18	Chinle/Alluvium Interface
			09/26/17	4.00	6,931.61	6,931.34	6,930.86	-0.27	6,913.20	18.14	N/A	N/A	6.70	6,924.64	N/A	8 - 18	Chinle/Alluvium Interface
			11/29/17	4.00	6,931.61	6,931.34	6,930.86	-0.27	6,913.20	18.14	N/A	N/A	8.00	6,923.34	N/A	8 - 18	Chinle/Alluvium Interface

APPENDIX C-1.1 - Ground Water Measurements MKTF Wells

Date of Installation	Date of Survey [1]	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	Ground Level Elevations (ft)	Well Casing Rim Elevations (ft)	Ground Elevation Inside Steel Sleeve (ft)	Stick-up length (ft)	Well Casing Bottom Elevation (ft)	Total Well Depth (ft)	Depth to [2] SPH (ft)	SPH [3] Column Thickness (ft)	Depth to Water (ft)	Ground water Elevation (ft)	Corrected [4] Water Table Elevation (Factor 0.8) (ft)	Screened Interval Depth Top to Bottom (ft)	Stratigraphic unit in which screen exists
11/7/2013	1/21/2014	MKTF-12	03/15/17	4.00	6,939.70	6,942.11	6,941.88	2.41	6,916.51	25.60	17.75	0.06	17.81	6,924.30	6924.35	12 - 22	Chinle/Alluvium Interface
			06/07/17	4.00	6,939.70	6,942.11	6,941.88	2.41	6,916.51	25.60	18.60	0.19	18.79	6,923.32	6923.47	12 - 22	Chinle/Alluvium Interface
			10/03/17	4.00	6,939.70	6,942.11	6,941.88	2.41	6,916.51	25.60	17.30	0.13	17.43	6,924.68	6924.78	12 - 22	Chinle/Alluvium Interface
			11/27/17	4.00	6,939.70	6,942.11	6,941.88	2.41	6,916.51	25.60	18.43	0.13	18.56	6,923.55	6923.65	12 - 22	Chinle/Alluvium Interface
11/12/2013	1/21/2014	MKTF-13	03/15/17	4.00	6,933.67	6,935.18	6,934.83	1.51	6,913.93	21.25	N/A	N/A	12.60	6,922.58	N/A	8 - 18	Chinle/Alluvium Interface
			06/07/17	4.00	6,933.67	6,935.18	6,934.83	1.51	6,913.93	21.25	13.35	0.06	13.41	6,921.77	6921.82	8 - 18	Chinle/Alluvium Interface
			10/03/17	4.00	6,933.67	6,935.18	6,934.83	1.51	6,913.93	21.25	11.91	0.03	11.94	6,923.24	6923.26	8 - 18	Chinle/Alluvium Interface
			11/27/17	4.00	6,933.67	6,935.18	6,934.83	1.51	6,913.93	21.25	13.14	0.01	13.15	6,922.03	6922.04	8 - 18	Chinle/Alluvium Interface
11/12/2013	1/21/2014	MKTF-14	03/08/17	4.00	6,925.65	6,928.02	6,927.80	2.37	6,910.56	17.46	5.77	0.98	6.75	6,921.27	6922.05	4 - 14	Chinle/Alluvium Interface
			06/07/17	4.00	6,925.65	6,928.02	6,927.80	2.37	6,910.56	17.46	6.68	0.84	7.52	6,920.50	6921.17	4 - 14	Chinle/Alluvium Interface
			10/03/17	4.00	6,925.65	6,928.02	6,927.80	2.37	6,910.56	17.46	5.70	0.41	6.11	6,921.91	6922.24	4 - 14	Chinle/Alluvium Interface
			11/27/17	4.00	6,925.65	6,928.02	6,927.80	2.37	6,910.56	17.46	6.56	0.37	6.93	6,921.09	6921.39	4 - 14	Chinle/Alluvium Interface
10/29/2013	1/21/2014	MKTF-15	03/02/17	2.00	6,943.74	6,943.48	6,943.19	-0.26	6,924.00	19.48	N/A	N/A	12.15	6,931.33	N/A	9 - 19	Chinle/Alluvium Interface
			06/07/17	2.00	6,943.74	6,943.48	6,943.19	-0.26	6,924.00	19.48	N/A	N/A	11.93	6,931.55	N/A	9 - 19	Chinle/Alluvium Interface
			09/26/17	2.00	6,943.74	6,943.48	6,943.19	-0.26	6,924.00	19.48	12.00	0.10	12.10	6,931.38	6931.46	9 - 19	Chinle/Alluvium Interface
			11/29/17	2.00	6,943.74	6,943.48	6,943.19	-0.26	6,924.00	19.48	N/A	N/A	12.13	6,931.35	N/A	9 - 19	Chinle/Alluvium Interface
11/7/2013	1/21/2014	MKTF-16	03/14/17	2.00	6,951.00	6,950.58	6,950.58	-0.42	6,936.48	14.10	N/A	N/A	7.45	6,943.13	N/A	4 - 14	Chinle/Alluvium Interface
			06/07/17	2.00	6,951.00	6,950.58	6,950.58	-0.42	6,936.48	14.10	N/A	N/A	7.66	6,942.92	N/A	4 - 14	Chinle/Alluvium Interface
			09/26/17	2.00	6,951.00	6,950.58	6,950.58	-0.42	6,936.48	14.10	N/A	N/A	8.00	6,942.58	N/A	4 - 14	Chinle/Alluvium Interface
			11/28/17	2.00	6,951.00	6,950.58	6,950.58	-0.42	6,936.48	14.10	N/A	N/A	8.22	6,942.36	N/A	4 - 14	Chinle/Alluvium Interface
11/14/2013	1/21/2014	MKTF-17	03/08/17	2.00	6,945.79	6,945.76	6,945.64	-0.03	6,921.65	24.11	N/A	N/A	8.20	6,937.56	N/A	14 - 24	Chinle/Alluvium Interface
			06/14/17	2.00	6,945.79	6,945.76	6,945.64	-0.03	6,921.65	24.11	N/A	N/A	9.98	6,935.78	N/A	14 - 24	Chinle/Alluvium Interface
			09/26/17	2.00	6,945.79	6,945.76	6,945.64	-0.03	6,921.65	24.11	N/A	N/A	9.33	6,936.43	N/A	14 - 24	Chinle/Alluvium Interface
			11/30/17	2.00	6,945.79	6,945.76	6,945.64	-0.03	6,921.11	24.65	N/A	N/A	13.68	6,932.08	N/A	14 - 24	Chinle/Alluvium Interface
11/15/2013	1/21/2014	MKTF-18	03/01/17	2.00	6,950.97	6,950.65	6,950.17	-0.32	6,925.27	25.38	N/A	N/A	7.81	6,942.84	N/A	17 - 27	Chinle/Alluvium Interface
			06/14/17	2.00	6,950.97	6,950.65	6,950.17	-0.32	6,925.27	25.38	N/A	N/A	6.30	6,944.35	N/A	17 - 27	Chinle/Alluvium Interface
			09/27/17	2.00	6,950.97	6,950.65	6,950.17	-0.32	6,925.27	25.38	6.35	0.02	6.37	6,944.28	6944.30	17 - 27	Chinle/Alluvium Interface
			11/30/17	2.00	6,950.97	6,950.65	6,950.17	-0.32	6,925.27	25.38	6.29	0.01	6.30	6,944.35	6944.36	17 - 27	Chinle/Alluvium Interface
11/5/2013	4/30/2014	MKTF-19	03/08/17	2.00	6,944.89	6,944.67	6,944.34	-0.22	6,927.20	17.47	N/A	N/A	9.82	6,934.85	N/A	10 - 20	Chinle/Alluvium Interface
			06/14/17	2.00	6,944.89	6,944.67	6,944.34	-0.22	6,927.20	17.47	N/A	N/A	10.58	6,934.09	N/A	10 - 20	Chinle/Alluvium Interface
			09/26/17	2.00	6,944.89	6,944.67	6,944.34	-0.22	6,927.20	17.47	N/A	N/A	11.00	6,933.67	N/A	10 - 20	Chinle/Alluvium Interface
			11/30/17	2.00	6,944.89	6,944.67	6,944.34	-0.22	6,926.47	18.20	N/A	N/A	11.70	6,932.97	N/A	10 - 20	Chinle/Alluvium Interface
2/10/2014	4/30/2014	MKTF-20	03/14/17	4.00	6,951.89	6,951.78	6,951.17	-0.11	6,941.89	9.89	N/A	N/A	5.70	6,946.08	N/A	2 - 10	Chinle/Alluvium Interface
			06/12/17	4.00	6,951.89	6,951.78	6,951.17	-0.11	6,941.89	9.89	N/A	N/A	5.57	6,946.21	N/A	2 - 10	Chinle/Alluvium Interface
			09/26/17	4.00	6,951.89	6,951.78	6,951.17	-0.11	6,941.89	9.89	N/A	N/A	6.23	6,945.55	N/A	2 - 10	Chinle/Alluvium Interface
			11/28/17	4.00	6,951.89	6,951.78	6,951.17	-0.11	6,942.20	9.58	N/A	N/A	6.53	6,945.25	N/A	2 - 10	Chinle/Alluvium Interface
2/10/2014	4/30/2014	MKTF-21	03/14/17	4.00	6,952.68	6,952.57	6,952.00	-0.11	6,942.68	9.89	N/A	N/A	5.50	6,947.07	N/A	2 - 10	Chinle/Alluvium Interface
			06/21/17	4.00	6,952.68	6,952.57	6,952.00	-0.11	6,942.68	9.89	N/A	N/A	5.09	6,947.48	N/A	2 - 10	Chinle/Alluvium Interface
			09/26/17	4.00	6,952.68	6,952.57	6,952.00	-0.11	6,942.68	9.89	N/A	N/A	5.69	6,946.88	N/A	2 - 10	Chinle/Alluvium Interface
			11/28/17	4.00	6,952.68	6,952.57	6,952.00	-0.11	6,943.76	8.81	N/A	N/A	6.25	6,946.32	N/A	2 - 10	Chinle/Alluvium Interface
11/8/2013	4/30/2014	MKTF-22	03/08/17	2.00	6,939.76	6,942.31	6,938.57	2.55	6,907.06	35.25	N/A	N/A	25.10	6,917.21	N/A	22 - 32	Chinle/Alluvium Interface
			06/07/17	2.00	6,939.76	6,942.31	6,938.57	2.55	6,907.06	35.25	N/A	N/A	25.31	6,917.00	N/A	22 - 32	Chinle/Alluvium Interface
			10/03/17	2.00	6,939.76	6,942.31	6,938.57	2.55	6,907.06	35.25	N/A	N/A	25.19	6,917.12	N/A	22 - 32	Chinle/Alluvium Interface
			11/27/17	2.00	6,939.76	6,942.31	6,938.57	2.55	6,906.71	35.60	N/A	N/A	25.18	6,917.13	N/A	22 - 32	Chinle/Alluvium Interface
11/4/2013	4/30/2014	MKTF-23	03/08/17	2.00	6,927.23	6,929.98	6,925.79	2.75	6,909.62	20.36	N/A	N/A	14.20	6,915.78	N/A	7 - 17	Chinle/Alluvium Interface
			06/07/17	2.00	6,927.23	6,929.98	6,925.79	2.75	6,909.62	20.36	14.20	0.70	14.90	6,915.08	6915.64	7 - 17	Chinle/Alluvium Interface
			10/03/17	2.00	6,927.23	6,929.98	6,925.79	2.75	6,909.62	20.36	14.19	0.06	14.25	6,915.73	6915.78	7 - 17	Chinle/Alluvium Interface
			11/27/17	2.00	6,927.23	6,929.98	6,925.79	2.75	6,909.62	20.36	13.93	0.01	13.94	6,916.04	6916.05	7 - 17	Chinle/Alluvium Interface
10/29/2013	4/30/2014	MKTF-24	03/06/17	2.00	6,926.07	6,928.72	6,924.62	2.65	6,898.25	30.47	N/A	N/A	20.61	6,908.11	N/A	18 - 28	Chinle/Alluvium Interface
			06/05/17	2.00	6,926.07	6,928.72	6,924.62	2.65	6,898.25	30.47	N/A	N/A	21.07	6,907.65	N/A	18 - 28	Chinle/Alluvium Interface
			10/03/17	2.00	6,926.07	6,928.72	6,924.62	2.65	6,898.25	30.47	N/A	N/A	21.52	6,907.20	N/A	18 - 28	Chinle/Alluvium Interface
			11/20/17	2.00	6,926.07	6,928.72	6,924.62	2.65	6,897.90	30.82	N/A	N/A	21.53	6,907.19	N/A	18 - 28	Chinle/Alluvium Interface

APPENDIX C-1.1 - Ground Water Measurements MKTF Wells

Date of Installation	Date of Survey [1]	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	Ground Level Elevations (ft)	Well Casing Rim Elevations (ft)	Ground Elevation Inside Steel Sleeve (ft)	Stick-up length (ft)	Well Casing Bottom Elevation (ft)	Total Well Depth (ft)	Depth to [2] SPH (ft)	SPH [3] Column Thickness (ft)	Depth to Water (ft)	Ground water Elevation (ft)	Corrected [4] Water Table Elevation (Factor 0.8) (ft)	Screened Interval Depth Top to Bottom (ft)	Stratigraphic unit in which screen exists
10/30/2013	4/30/2014	MKTF-25	03/06/17	2.00	6,913.35	6,916.19	6,911.79	2.84	6,896.76	19.43	N/A	N/A	9.52	6,906.67	N/A	6 - 16	Chinle/Alluvium Interface
			06/05/17	2.00	6,913.35	6,916.19	6,911.79	2.84	6,896.76	19.43	N/A	N/A	10.23	6,905.96	N/A	6 - 16	Chinle/Alluvium Interface
			09/25/17	2.00	6,913.35	6,916.19	6,911.79	2.84	6,896.76	19.43	N/A	N/A	11.04	6,905.15	N/A	6 - 16	Chinle/Alluvium Interface
			11/21/17	2.00	6,913.35	6,916.19	6,911.79	2.84	6,896.39	19.80	N/A	N/A	11.11	6,905.08	N/A	6 - 16	Chinle/Alluvium Interface
10/30/2013	4/30/2014	MKTF-26	03/06/17	2.00	6,912.55	6,915.31	6,911.35	2.76	6,898.16	17.15	7.44	0.75	8.19	6,907.12	6907.72	4 - 14	Chinle/Alluvium Interface
			06/05/17	2.00	6,912.55	6,915.31	6,911.35	2.76	6,898.16	17.15	8.03	0.96	8.99	6,906.32	6907.09	4 - 14	Chinle/Alluvium Interface
			10/03/17	2.00	6,912.55	6,915.31	6,911.35	2.76	6,898.16	17.15	7.77	0.83	8.60	6,906.71	6907.37	4 - 14	Chinle/Alluvium Interface
			11/20/17	2.00	6,912.55	6,915.31	6,911.35	2.76	6,898.16	17.15	8.09	0.84	8.93	6,906.38	6907.05	4 - 14	Chinle/Alluvium Interface
10/30/2013	4/30/2014	MKTF-27	03/06/17	2.00	6,915.36	6,917.90	6,914.18	2.54	6,903.18	14.72	N/A	N/A	6.02	6,911.88	N/A	1 - 12	Chinle/Alluvium Interface
			06/05/17	2.00	6,915.36	6,917.90	6,914.18	2.54	6,903.18	14.72	N/A	N/A	6.32	6,911.58	N/A	1 - 12	Chinle/Alluvium Interface
			10/03/17	2.00	6,915.36	6,917.90	6,914.18	2.54	6,903.18	14.72	N/A	N/A	5.90	6,912.00	N/A	1 - 12	Chinle/Alluvium Interface
			11/20/17	2.00	6,915.36	6,917.90	6,914.18	2.54	6,903.18	14.72	N/A	N/A	5.98	6,911.92	N/A	1 - 12	Chinle/Alluvium Interface
4/2/2014	4/30/2014	MKTF-28	03/06/17	2.00	6,918.67	6,921.52	6,917.51	2.85	6,905.36	16.16	N/A	N/A	4.68	6,916.84	N/A	3 - 13	Chinle/Alluvium Interface
			06/05/17	2.00	6,918.67	6,921.52	6,917.51	2.85	6,905.36	16.16	N/A	N/A	7.90	6,913.62	N/A	3 - 13	Chinle/Alluvium Interface
			10/03/17	2.00	6,918.67	6,921.52	6,917.51	2.85	6,905.36	16.16	N/A	N/A	4.28	6,917.24	N/A	3 - 13	Chinle/Alluvium Interface
			11/20/17	2.00	6,918.67	6,921.52	6,917.51	2.85	6,905.39	16.13	N/A	N/A	7.90	6,913.62	N/A	3 - 13	Chinle/Alluvium Interface
4/2/2014	4/30/2014	MKTF-29	03/06/17	2.00	6,898.83	6,901.62	6,897.67	2.79	6,878.78	22.84	N/A	N/A	0.99	6,900.63	N/A	10 - 20	Chinle/Alluvium Interface
			06/05/17	2.00	6,898.83	6,901.62	6,897.67	2.79	6,878.78	22.84	N/A	N/A	0.95	6,900.67	N/A	10 - 20	Chinle/Alluvium Interface
			10/03/17	2.00	6,898.83	6,901.62	6,897.67	2.79	6,878.78	22.84	N/A	N/A	1.59	6,900.03	N/A	10 - 20	Chinle/Alluvium Interface
			11/20/17	2.00	6,898.83	6,901.62	6,897.67	2.79	6,878.82	22.80	N/A	N/A	1.91	6,899.71	N/A	10 - 20	Chinle/Alluvium Interface
4/1/2014	4/30/2014	MKTF-30	03/06/17	2.00	6,898.10	6,900.80	6,896.68	2.70	6,877.60	23.20	N/A	N/A	14.13	6,886.67	N/A	10 - 20	Chinle/Alluvium Interface
			06/05/17	2.00	6,898.10	6,900.80	6,896.68	2.70	6,877.60	23.20	N/A	N/A	13.87	6,886.93	N/A	10 - 20	Chinle/Alluvium Interface
			10/03/17	2.00	6,898.10	6,900.80	6,896.68	2.70	6,877.60	23.20	N/A	N/A	15.03	6,885.77	N/A	10 - 20	Chinle/Alluvium Interface
			11/20/17	2.00	6,898.10	6,900.80	6,896.68	2.70	6,877.61	23.19	N/A	N/A	14.91	6,885.89	N/A	10 - 20	Chinle/Alluvium Interface
4/1/2014	4/30/2014	MKTF-31	03/07/17	2.00	6,904.26	6,906.87	6,903.11	2.61	6,884.06	22.81	N/A	N/A	7.84	6,899.03	N/A	6 - 21	Chinle/Alluvium Interface
			06/05/17	2.00	6,904.26	6,906.87	6,903.11	2.61	6,884.06	22.81	N/A	N/A	7.58	6,899.29	N/A	6 - 21	Chinle/Alluvium Interface
			09/25/17	2.00	6,904.26	6,906.87	6,903.11	2.61	6,883.06	23.81	N/A	N/A	8.29	6,898.58	N/A	6 - 21	Chinle/Alluvium Interface
			11/21/17	2.00	6,904.26	6,906.87	6,903.11	2.61	6,887.57	19.30	N/A	N/A	8.15	6,898.72	N/A	6 - 21	Chinle/Alluvium Interface
3/31/2014	4/30/2014	MKTF-32	03/07/17	2.00	6,908.44	6,911.11	6,907.16	2.67	6,883.36	27.75	N/A	N/A	13.70	6,897.41	N/A	9 - 24	Chinle/Alluvium Interface
			06/06/17	2.00	6,908.44	6,911.11	6,907.16	2.67	6,883.36	27.75	N/A	N/A	13.79	6,897.32	N/A	9 - 24	Chinle/Alluvium Interface
			09/25/17	2.00	6,908.44	6,911.11	6,907.16	2.67	6,882.36	28.75	N/A	N/A	14.11	6,897.00	N/A	9- 24	Chinle/Alluvium Interface
			11/27/17	2.00	6,908.44	6,911.11	6,907.16	2.67	6,883.36	27.75	N/A	N/A	13.57	6,897.54	N/A	9 - 24	Chinle/Alluvium Interface
4/3/2014	4/30/2014	MKTF-33	03/08/17	2.00	6,936.59	6,939.75	6,936.59	3.16	6,906.55	33.20	N/A	N/A	22.16	6,917.59	N/A	20 - 30	Chinle/Alluvium Interface
			06/07/17	2.00	6,936.59	6,939.75	6,936.59	3.16	6,906.55	33.20	N/A	N/A	22.07	6,917.68	N/A	20 - 30	Chinle/Alluvium Interface
			09/25/17	2.00	6,936.59	6,939.75	6,936.59	3.16	6,906.55	33.20	N/A	N/A	22.50	6,917.25	N/A	20 - 30	Chinle/Alluvium Interface
			11/27/17	2.00	6,936.59	6,939.75	6,936.59	3.16	6,906.53	33.22	N/A	N/A	22.27	6,917.48	N/A	20 - 30	Chinle/Alluvium Interface
3/31/2014	4/30/2014	MKTF-34	03/01/17	2.00	6,942.42	6,945.35	3,943.52	2.93	6,917.67	27.68	N/A	N/A	16.50	6,928.85	N/A	9 - 24	Chinle/Alluvium Interface
			06/14/17	2.00	6,942.42	6,945.35	3,943.52	2.93	6,917.67	27.68	N/A	N/A	17.63	6,927.72	N/A	9 - 24	Chinle/Alluvium Interface
			09/26/17	2.00	6,942.42	6,945.35	3,943.52	2.93	6,917.67	27.68	N/A	N/A	17.62	6,927.73	N/A	9 - 24	Chinle/Alluvium Interface
			11/30/17	2.00	6,942.42	6,945.35	3,943.52	2.93	6,917.65	27.70	N/A	N/A	18.03	6,927.32	N/A	9 - 24	Chinle/Alluvium Interface
11/19/2014	12/16/2014	MKTF-35	03/01/17	2.00	6,951.90	6,951.65	6,951.25	-0.25	6,935.20	16.45	N/A	N/A	6.18	6,945.47	N/A	6 - 16	Chinle/Alluvium Interface
			06/14/17	2.00	6,951.90	6,951.65	6,951.25	-0.25	6,935.20	16.45	N/A	N/A	7.12	6,944.53	N/A	6 - 16	Chinle/Alluvium Interface
			09/27/17	2.00	6,951.90	6,951.65	6,951.25	-0.25	6,935.20	16.45	N/A	N/A	7.70	6,943.95	N/A	6 - 16	Chinle/Alluvium Interface
			11/30/17	2.00	6,951.90	6,951.65	6,951.25	-0.25	6,935.20	16.45	N/A	N/A	8.15	6,943.50	N/A	6 - 16	Chinle/Alluvium Interface
11/19/2014	12/16/2014	MKTF-36	03/01/17	2.00	6,950.67	6,950.12	6,949.87	-0.55	6,934.67	15.45	N/A	N/A	5.56	6,944.56	N/A	5 15	Chinle/Alluvium Interface
			06/14/17	2.00	6,950.67	6,950.12	6,949.87	-0.55	6,934.67	15.45	N/A	N/A	5.40	6,944.72	N/A	5 15	Chinle/Alluvium Interface
			09/27/17	2.00	6,950.67	6,950.12	6,949.87	-0.55	6,934.67	15.45	N/A	N/A	5.80	6,944.32	NA	5 15	Chinle/Alluvium Interface
			11/30/17	2.00	6,950.67	6,950.12	6,949.87	-0.55	6,934.67	15.45	N/A	N/A	6.45	6,943.67	N/A	5 15	Chinle/Alluvium Interface

APPENDIX C-1.1 - Ground Water Measurements MKTF Wells

Date of Installation	Date of Survey [1]	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	Ground Level Elevations (ft)	Well Casing Rim Elevations (ft)	Ground Elevation Inside Steel Sleeve (ft)	Stick-up length (ft)	Well Casing Bottom Elevation (ft)	Total Well Depth (ft)	Depth to [2] SPH (ft)	SPH [3] Column Thickness (ft)	Depth to Water (ft)	Ground water Elevation (ft)	Corrected [4] Water Table Elevation (Factor 0.8) (ft)	Screened Interval Depth Top to Bottom (ft)	Stratigraphic unit in which screen exists
11/18/2014	12/16/2014	MKTF-37	03/01/17	2.00	6,959.07	6,958.87	6,958.62	-0.20	6,934.27	24.60	N/A	N/A	6.90	6,951.97	N/A	4 - 24	Chinle/Alluvium Interface
			06/14/17	2.00	6,959.07	6,958.87	6,958.62	-0.20	6,934.27	24.60	7.20	0.04	7.24	6,951.63	6951.66	4 - 24	Chinle/Alluvium Interface
			09/27/17	2.00	6,959.07	6,958.87	6,958.62	-0.20	6,934.27	24.60	7.83	0.06	7.89	6,950.98	6951.03	4 - 24	Chinle/Alluvium Interface
			11/30/17	2.00	6,959.07	6,958.87	6,958.62	-0.20	6,934.27	24.60	8.39	0.02	8.41	6,950.46	6950.48	4 - 24	Chinle/Alluvium Interface
11/20/2014	12/16/2014	MKTF-38	03/14/17	2.00	6,955.17	6,954.89	6,954.54	-0.28	6,934.60	20.29	N/A	N/A	6.41	6,948.48	N/A	5 - 20	Chinle/Alluvium Interface
			06/21/17	2.00	6,955.17	6,954.89	6,954.54	-0.28	6,934.60	20.29	N/A	N/A	6.40	6,948.49	N/A	5 - 20	Chinle/Alluvium Interface
			09/28/17	2.00	6,955.17	6,954.89	6,954.54	-0.28	6,934.60	20.29	N/A	N/A	6.32	6,948.57	N/A	5 - 20	Chinle/Alluvium Interface
			11/30/17	2.00	6,955.17	6,954.89	6,954.54	-0.28	6,934.60	20.29	N/A	N/A	7.83	6,947.06	N/A	5 - 20	Chinle/Alluvium Interface
11/14/2014	12/16/2014	MKTF-39	03/14/17	2.00	6,953.97	6,953.75	6,953.12	-0.22	6,938.55	15.20	N/A	N/A	6.44	6,947.31	N/A	5 - 15	Chinle/Alluvium Interface
			06/08/17	2.00	6,953.97	6,953.75	6,953.12	-0.22	6,938.55	15.20	N/A	N/A	6.25	6,947.50	N/A	5 - 15	Chinle/Alluvium Interface
			09/28/17	2.00	6,953.97	6,953.75	6,953.12	-0.22	6,938.55	15.20	N/A	N/A	7.32	6,946.43	N/A	5 - 15	Chinle/Alluvium Interface
			11/28/17	2.00	6,953.97	6,953.75	6,953.12	-0.22	6,938.57	15.18	N/A	N/A	7.55	6,946.20	N/A	5 - 15	Chinle/Alluvium Interface
11/13/2014	12/16/2014	MKTF-40	03/07/17	2.00	6,891.35	6,894.33	6,890.48	2.98	6,870.69	23.64	N/A	N/A	13.14	6,881.19	N/A	5 - 20	Chinle/Alluvium Interface
			06/05/17	2.00	6,891.35	6,894.33	6,890.48	2.98	6,870.69	23.64	N/A	N/A	13.29	6,881.04	N/A	5 - 20	Chinle/Alluvium Interface
			09/25/17	2.00	6,891.35	6,894.33	6,890.48	2.98	6,870.69	23.64	N/A	N/A	13.28	6,881.05	N/A	5 - 20	Chinle/Alluvium Interface
			11/21/17	2.00	6,891.35	6,894.33	6,890.48	2.98	6,870.71	23.62	N/A	N/A	13.71	6,880.62	N/A	5 - 20	Chinle/Alluvium Interface
11/14/2014	12/16/2014	MKTF-41	03/07/17	2.00	6,891.11	6,893.64	6,889.80	2.53	6,853.54	40.10	N/A	N/A	19.60	6,874.04	N/A	22 - 37	Chinle/Alluvium Interface
			06/06/17	2.00	6,891.11	6,893.64	6,889.80	2.53	6,853.54	40.10	N/A	N/A	18.49	6,875.15	N/A	22 - 37	Chinle/Alluvium Interface
			09/25/17	2.00	6,891.11	6,893.64	6,889.80	2.53	6,853.54	40.10	N/A	N/A	20.25	6,873.39	N/A	22 - 37	Chinle/Alluvium Interface
			11/27/17	2.00	6,891.11	6,893.64	6,889.80	2.53	6,853.93	39.71	N/A	N/A	19.81	6,873.83	N/A	22 - 37	Chinle/Alluvium Interface
11/12/2014	12/16/2014	MKTF-42	03/07/17	2.00	6,890.42	6,892.95	6,888.75	2.53	6,859.80	33.15	N/A	N/A	15.72	6,877.23	N/A	10 - 30	Chinle/Alluvium Interface
			06/06/17	2.00	6,890.42	6,892.95	6,888.75	2.53	6,859.80	33.15	N/A	N/A	17.12	6,875.83	N/A	10 - 30	Chinle/Alluvium Interface
			09/25/17	2.00	6,890.42	6,892.95	6,888.75	2.53	6,859.80	33.15	N/A	N/A	16.83	6,876.12	N/A	10 - 30	Chinle/Alluvium Interface
			11/27/17	2.00	6,890.42	6,892.95	6,888.75	2.53	6,859.77	33.18	N/A	N/A	16.81	6,876.14	N/A	10 - 30	Chinle/Alluvium Interface
11/11/2014	12/16/2014	MKTF-43	03/08/17	2.00	6,874.12	6,876.90	6,873.22	2.78	6,861.47	15.43	N/A	N/A	5.34	6,871.56	N/A	2 - 12	Chinle/Alluvium Interface
			06/06/17	2.00	6,874.12	6,876.90	6,873.22	2.78	6,861.47	15.43	N/A	N/A	3.62	6,873.28	N/A	2 - 12	Chinle/Alluvium Interface
			09/25/17	2.00	6,874.12	6,876.90	6,873.22	2.78	6,861.47	15.43	N/A	N/A	4.14	6,872.76	N/A	2 - 12	Chinle/Alluvium Interface
			11/27/17	2.00	6,874.12	6,876.90	6,873.22	2.78	6,861.52	15.38	N/A	N/A	5.65	6,871.25	N/A	2 - 12	Chinle/Alluvium Interface
11/11/2014	12/16/2014	MKTF-44	03/08/17	2.00	6,867.41	6,869.95	6,866.06	2.54	6,818.80	51.15	N/A	N/A	25.39	6,844.56	N/A	38 - 48	Chinle/Alluvium Interface
			06/05/17	2.00	6,867.41	6,869.95	6,866.06	2.54	6,818.80	51.15	N/A	N/A	32.90	6,837.05	N/A	38 - 48	Chinle/Alluvium Interface
			09/25/17	2.00	6,867.41	6,869.95	6,866.06	2.54	6,818.80	51.15	N/A	N/A	30.18	6,839.77	N/A	38 - 48	Chinle/Alluvium Interface
			11/27/17	2.00	6,867.41	6,869.95	6,866.06	2.54	6,818.79	51.16	N/A	N/A	33.70	6,836.25	N/A	38 - 48	Chinle/Alluvium Interface
Pre-existing	12/16/2014	MKTF-45	03/01/17	4.00	6,948.63	6,949.59	6,948.27	0.96	6,919.35	30.24	10.32	0.31	10.63	6,938.96	6939.21	Unknown	Chinle/Alluvium Interface
			06/14/17	4.00	6,948.63	6,949.59	6,948.27	0.96	6,919.35	30.24	11.50	0.50	12.00	6,937.59	6937.99	Unknown	Chinle/Alluvium Interface
			10/03/17	4.00	6,948.63	6,949.59	6,948.27	0.96	6,919.35	30.24	11.48	0.53	12.01	6,937.58	6938.00	Unknown	Chinle/Alluvium Interface
			11/30/17	4.00	6,948.63	6,949.59	6,948.27	0.96	6,919.35	30.24	12.76	0.47	13.23	6,936.36	6936.74	Unknown	Chinle/Alluvium Interface

DEFINITIONS:

DTB - Depth to Bottom
DTW - Depth to Water
N/A - Not Applicable
SPH - Separate Phase Hydrocarbons

Negative number in Stick up Length column indicates well is flush mount and located at or below ground level
Depth to Water Column - if a measurement of 0.00 is indicated - means water level is at top of casing - Full.
Dry indicates no water was detected in the well.
All measurements points for the MKTF wells are on the north side of the casing rim, except MKTF-11 is on the south side.

NOTES:

1) Wells surveyed by a licensed professional surveyor-Hammon Enterprises, Inc. (HEI) and Depauli Engineering
2) "0" indicates no SPH level.
3) Depth to SPH - Depth to Water Measurement = SPH Column Thickness.
4) Corrected Water Table Elevaton applies only if SPH thickness column measurement exists. (0.8 X SPH thickness + Ground Water Elevation)
5) 10/3/17 - Samples collected after end of third quarter due to rain storms and monitor well accessibility

APPENDIX D

DiSorbo
Environmental Consulting Firm

Western Refining SW, Inc.
Gallup Refinery - Well Installations
Job No. WEST16006

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc. / Cohagan
Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger 7 1/4
Sampling Method	: Split Spoon 2'
Comments	:
Total Depth	: 34'
Ground Water	: Not Encountered
Start Date	: 05/26/2016
Finish Date	: 05/26/2016

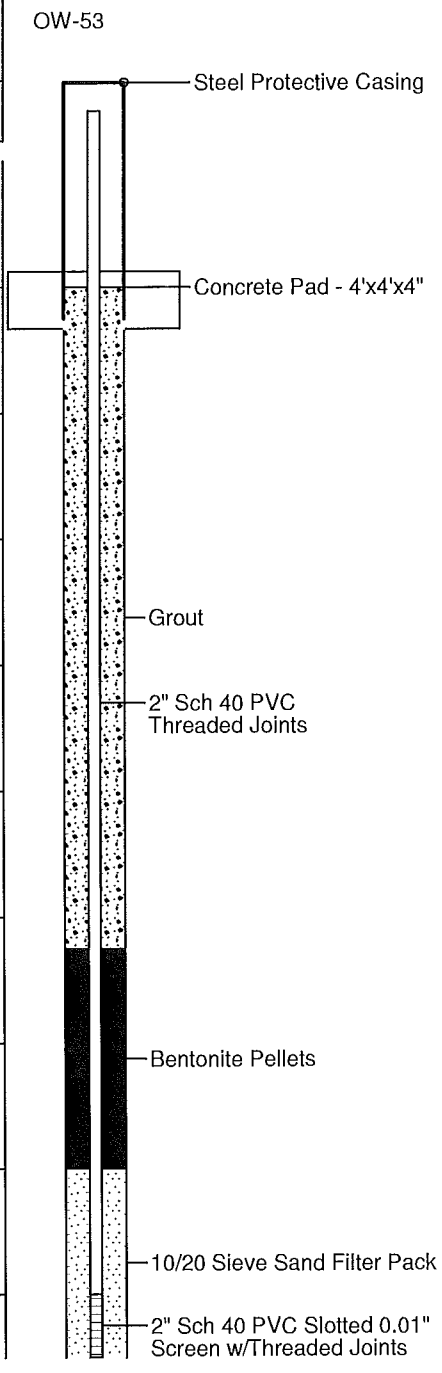
WELL NO. OW-53
(Sheet 1 of 2)

Elev., TOC (ft.msl)	: 6914.38
Elev., PAD (ft. msl)	: 6911.93
Elev., GL (ft. msl)	: NA
Site Coordinates	:
N	: N 35° 29' 44.59"
E	: W 108° 25' 30.34"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0							SILT, low, soft, damp, brown, no odor,
1	5.3			ML	100		
2							SILTY CLAY, low, very stiff, damp, brown, no odor,
3	4.8			CL	100		
4							SILTY SAND, fine to medium, dry, brown, no odor,
5	2.4			SM	90		
6							SILTY CLAY, low, very stiff, damp, brown, no odor,
7	5.5			CL	90		
8							SILTY CLAY, SIMILAR TO ABOVE (STA),
9	2.3			CL	50		
10							SILTY CLAY, STA,
11	2.3			CL	50		
12							SILTY CLAY, STA,
13	5.3			CL	50		
14							SILTY CLAY, STA,
15	2.1			CL	50		
16							SILTY CLAY, STA,
17	5.3			CL			

Saturation
▼ Saturation

Completion Results



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DiSorbo
Environmental Consulting Firm

Western Refining SW, Inc.
Gallup Refinery - Well Installations
Job No. WEST16006

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc. / Cohagan
Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger 7 1/4
Sampling Method	: Split Spoon 2'
Comments	:
Total Depth	: 34'
Ground Water	: Not Encountered
Start Date	: 05/26/2016
Finish Date	: 05/26/2016

WELL NO. OW-53

(Sheet 2 of 2)

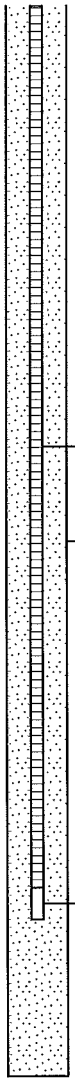
Elev., TOC (ft.msl)	: 6914.38
Elev., PAD (ft. msl)	: 6911.93
Elev., GL (ft. msl)	: NA
Site Coordinates	:
N	: N 35° 29' 44.59"
E	: W 108° 25' 30.34"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
17	5.3			CL	50		
18							SILTY CLAY, STA,
19	4.3			CL	50		
20							SILTY CLAY, STA,
21	4.6			CL	50		
22							SILTY CLAY, STA,
23	9.9			CL	60		
24							SILTY CLAY, STA, becomes sandy at base,
25	5.6			CL	60		light tan silt,
26							SILTY CLAY, STA, light tan silt in seams and
27	7.5			CL	60		occassional fine grain sand seam, damp to dry, no odor,
28							SILTY CLAY, low, very stiff, brown, damp,
29	2.6			CL	60		calcareous, no odor,
30							CLAYSTONE, very stiff, dry, reddish purple,
31	3.3			CLST	50		no odor,
32							CLAYSTONE, STA, pink, no odor.
33	3.8			CLST	50		
34							
35							
36							

Saturation
▼ Saturation

Completion Results

OW-53



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DiSorbo
Environmental Consulting Firm

Western Refining SW, Inc.
Gallup Refinery - Well Installations
Job No. WEST16006

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc. / Cohagan
Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger
Sampling Method	: Split Spoon
Comments	:
Total Depth	: 30'
Ground Water	: 16'
Start Date	: 05/25/2016
Finish Date	: 05/25/2016

WELL NO.OW-54
(Sheet 1 of 3)

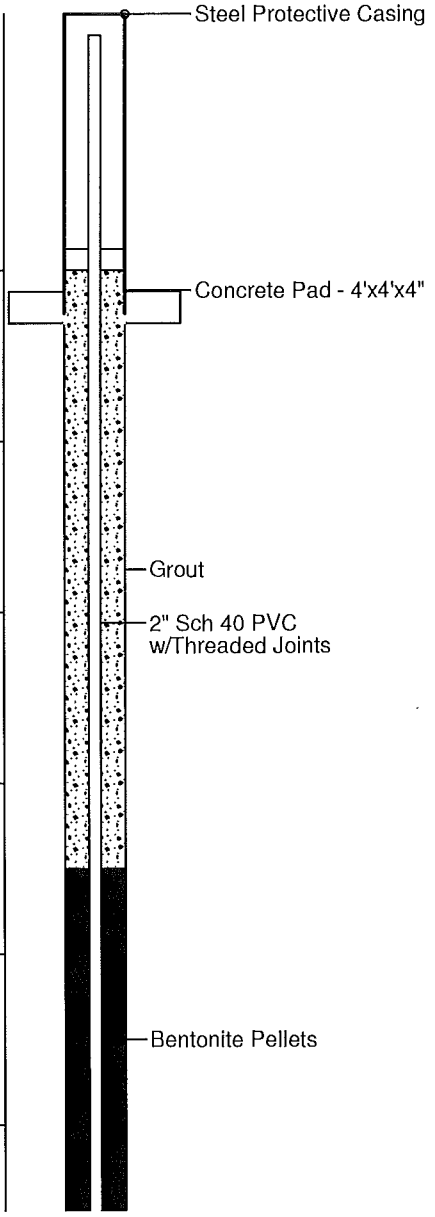
Elev., TOC (ft.msl)	: 6918.92
Elev., PAD (ft. msl)	: 6916.36
Elev., GL (ft. msl)	: NA
Site Coordinates	:
N	: N 35° 29' 41.13"
E	: W 108° 25' 30.30"

Saturation
- Saturation
- Saturation

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0							SILT, low, firm, damp, brown, no odor,
1	4.5			ML	100		
2							SILT, SIMILAR TO ABOVE (STA),
3	5.7			ML	100		
4							SILTY CLAY, low, very stiff, brown, damp, no odor,
5	10.2			CL	60		
6							SILTY CLAY, STA,
7	7.3			CL	60		
8							SANDY SILTY CLAY, low, very stiff, brown, damp, fine to coarse sand, no odor,
9	8.3			CL	50		
10							SILTY CLAY, low, very stiff, brown, damp, no odor,
11	13.6			CL			

Completion Results

OW-54



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Western Refining SW, Inc.
Gallup Refinery - Well Installations
Job No. WEST16006

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc. / Cohagan
Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger
Sampling Method	: Split Spoon
Comments	:
Total Depth	: 30'
Ground Water	: 16'
Start Date	: 05/25/2016
Finish Date	: 05/25/2016

WELL NO.OW-54
(Sheet 2 of 3)

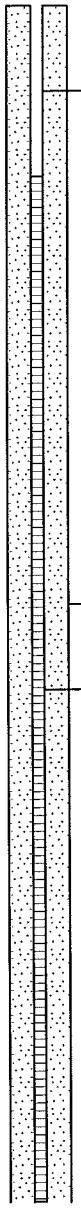
Elev., TOC (ft.msl)	: 6918.92
Elev., PAD (ft. msl)	: 6916.36
Elev., GL (ft. msl)	: NA
Site Coordinates	:
N	: N 35° 29' 41.13"
E	: W 108° 25' 30.30"

Saturation
▼ Saturation
◆ Saturation

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
11	13.6			CL	50		
12							SILTY CLAY, STA,
13	12.6			CL	50		
14							SILTY CLAY, low, soft, dark brown with black streaks, damp to moist to very moist at 16 feet sandy seam, odor,
15	216			CL	90		
16		▼					SANDY CLAY, low, soft, brown, moist to saturated in fine to medium grain sand seams, strong hydrocarbon (hc) odor,
17	1538			CL	80		
18							SANDY CLAY, STA,
19	370			CL	80		
20							SILTY CLAY, low, soft, damp, brown, faint hc odor,
21	49.4			CL	90		
22		◆					SANDY CLAY, low, soft, moist to saturated, brown, faint odor,
23				CL	90		
24							SANDY CLAY, STA, moist to saturated, gravel present,
25				CL			

Completion Results

OW-54



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Gallup Refinery - Well Installations
Job No. WEST16006

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc. / Cohagan
Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger
Sampling Method	: Split Spoon
Comments	:
Total Depth	: 30'
Ground Water	: 16'
Start Date	: 05/25/2016
Finish Date	: 05/25/2016

WELL NO.OW-54

(Sheet 3 of 3)

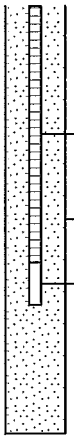
Elev., TOC (ft.msl)	: 6918.92
Elev., PAD (ft. msl)	: 6916.36
Elev., GL (ft. msl)	: NA
Site Coordinates	:
N	: N 35° 29' 41.13"
E	: W 108° 25' 30.30"

Saturation
▼ Saturation
◆ Saturation

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
25				CL	10		
26							SANDY CLAY, STA, saturated,
27				CL	40		
28							SANDY CLAY, STA, gravelly, saturated to moist at 30'.
29				CL	70		
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							

Completion Results

OW-54



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Western Refining SW, Inc.
Gallup Refinery - Well Installations
Job No. WEST16006

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc. / Cohagan
Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger
Sampling Method	: Split Spoon
Comments	:
Total Depth	: 32' BGL
Ground Water	: 18.25' BGL
Start Date	: 05/24/2016
Finish Date	: 05/24/2016

WELL NO.OW-55
(Sheet 1 of 3)

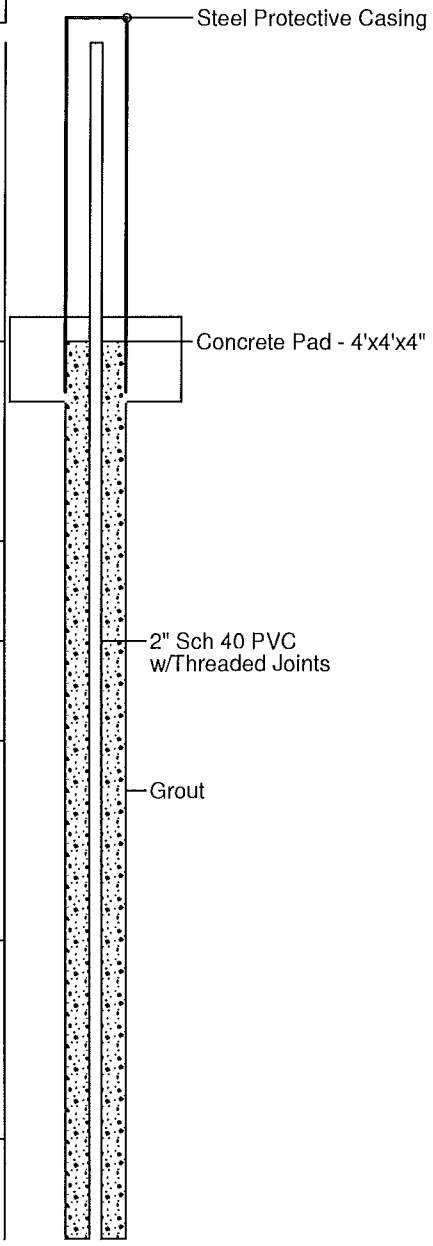
Elev., TOC (ft.msl)	: 6923.25
Elev., PAD (ft. msl)	: 0921.01
Elev., GL (ft. msl)	: NA
Site Coordinates	:
N	: N 35° 29' 36.57"
E	: W 108° 25' 29.16"

Saturation
▼ Saturation
▽ Saturation (cont)

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0							SILT, low, soft, dry, brown, no odor,
1	9.4			ML	100		
2				ML	100		SILT, SIMILAR TO ABOVE (STA),
3	11.2			CL	100		SILTY CLAY, very stiff, low, damp, brown, silt and very fine grain sand present, no odor,
4				CL	50		SILTY CLAY, STA,
5	16.8						
6				CL	50		SILTY CLAY, STA,
7	13.3						
8				CL			SILTY CLAY, STA,
9	19.2						

Completion Results

OW-55



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Western Refining SW, Inc.
Gallup Refinery - Well Installations
Job No. WEST16006

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc. / Cohagan
Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger
Sampling Method	: Split Spoon
Comments	:
Total Depth	: 32' BGL
Ground Water	: 18.25' BGL
Start Date	: 05/24/2016
Finish Date	: 05/24/2016

WELL NO.OW-55

(Sheet 2 of 3)

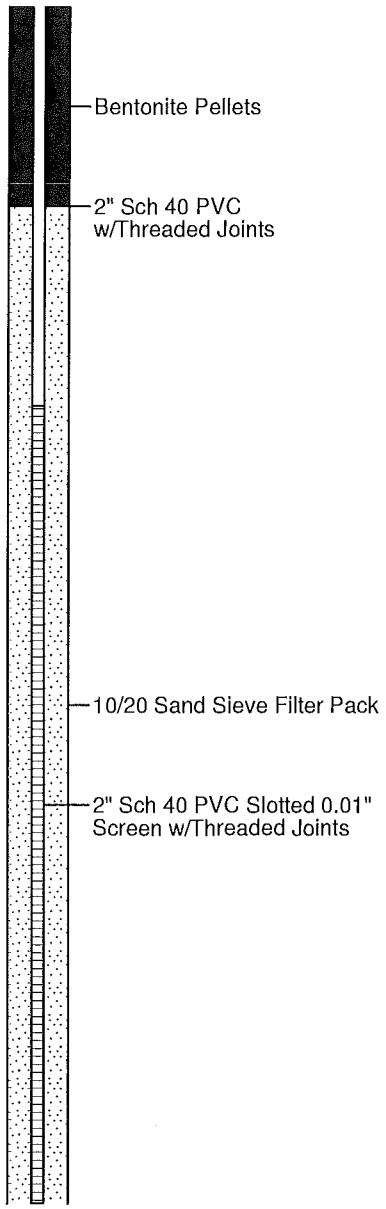
Elev., TOC (ft.msl)	: 6923.25
Elev., PAD (ft. msl)	: 0921.01
Elev., GL (ft. msl)	: NA
Site Coordinates	:
N	: N 35° 29' 36.57"
E	: W 108° 25' 29.16"

Saturation
▼ Saturation
▽ Saturation (cont)

Depth (ft.)	PID (ppm)	USCS	Recovery (%)	DESCRIPTION
9				
	19.2	CL	50	
10				SILTY CLAY, STA,
	18.5	CL	50	
11				
12				SILTY CLAY, STA,
	17.3	CL	50	
13				
14				SILTY CLAY, STA, gravel present,
	14.9	CL	60	
15				
16				SILTY CLAY, low, soft, damper than above, brown, odor,
	2530	CL	70	
17				
18		CL	90	SILTY CLAY, STA, odor,
		SM	90	SILTY SAND, fine to medium grained, loose, saturated, brown, strong hydrocarbon (hc) odor,
19		CL	90	SILTY CLAY, low, soft, moist to very moist, brown, hc odor,
20		CL		GRAVELLY SANDY CLAY, low, very soft, very moist to saturated, brown to greenish yellow gravel, strong hc odor,
21				

Completion Results

OW-55



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Job No. WEST16006

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc. / Cohagan
Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger
Sampling Method	: Split Spoon
Comments	:
Total Depth	: 32' BGL
Ground Water	: 18.25' BGL
Start Date	: 05/24/2016
Finish Date	: 05/24/2016

WELL NO.OW-55

(Sheet 3 of 3)

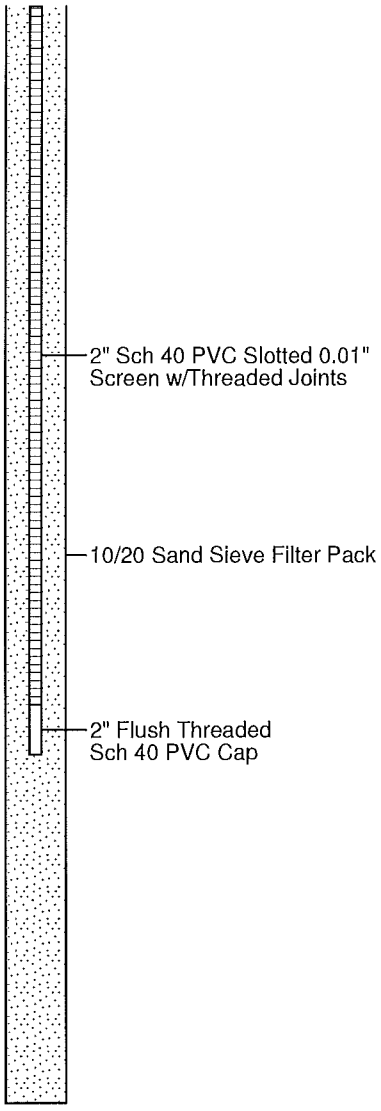
Elev., TOC (ft.msl)	: 6923.25
Elev., PAD (ft. msl)	: 0921.01
Elev., GL (ft. msl)	: NA
Site Coordinates	:
N	: N 35° 29' 36.57"
E	: W 108° 25' 29.16"

Saturation
▼ Saturation
▽ Saturation (cont)

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
21				CL	90		
22							SANDY CLAY, low, soft, moist to saturated in sand seams throughout, hc odor,
23				CL	90		
24							SILTY CLAY, low, soft, damp, hc odor,
25	185			CL	70		
26		▽					SANDY SILTY CLAY, low, soft, saturated to very moist in sand seams, brown, hc odor,
27				CL	80		
28							CLAY, moderate, stiff, damp, brown, hc odor,
29	125.9			CL	50		
30							CLAY, moderate to high, stiff, damp, brown, hc odor.
31	47.5			CL	50		
32							
33							

Completion Results

OW-55



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Western Refining SW, Inc.
Gallup Refinery - OW-14 Area Investigation
Job No. WEST16006

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc. / Cohagan
Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger 7.5"
Sampling Method	: 2' Split Spoon - 2" Diameter
Comments	: N 35° 29.493' / W 108° 25.501'
Total Depth	: 27'
Ground Water	: 18'
Start Date	: 09/21/2016
Finish Date	: 09/21/2016

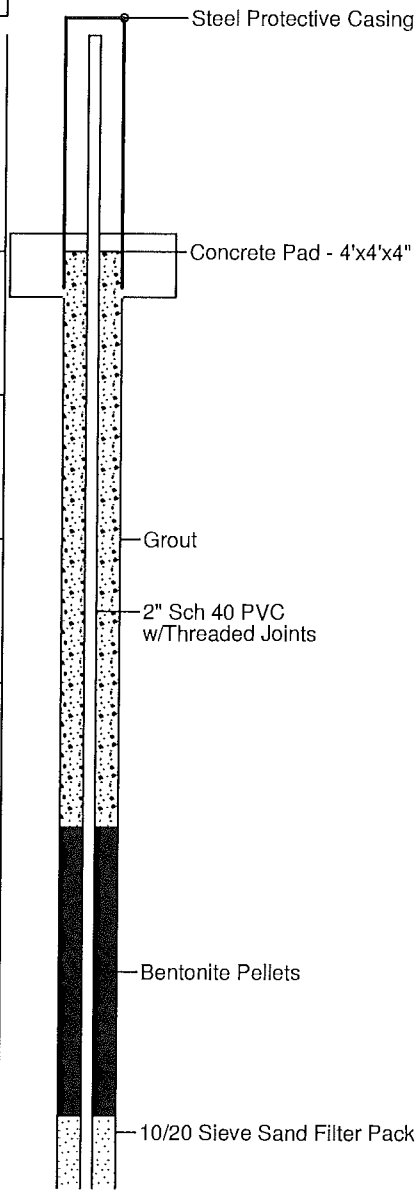
WELL NO. OW-57
(Sheet 1 of 2)

Elev., TOC (ft.msl)	: 6933.10
Elev., PAD (ft. msl)	: 6930.64
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 1634751.52
E	: E 2546961.79

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0							SILTY CLAY, moderate, firm, damp, brown, no odor,
1	0.6			CL	100		
2							SILTY CLAY, SIMILAR TO ABOVE (STA),
3	0.6			CL	100		
4							SILTY CLAY, STA,
5	2.6			CL	100		
6							SILTY CLAY, STA, darker brown,
7	6.2			CL	100		
8							SILTY CLAY, STA, no odor,
9	23.7			CL	90		
10							SANDY CLAY, low, soft, damp, brown, odor,
11	118			CL	90		
12							SANDY CLAY, STA, brown/tan silt at base, odor,
13	85			CL			

Saturation
▼ Saturation

Completion Results
OW-57



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Western Refining SW, Inc.
Gallup Refinery - OW-14 Area Investigation
Job No. WEST16006

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc. / Cohagan
Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger 7.5"
Sampling Method	: 2' Split Spoon - 2" Diameter
Comments	: N 35° 29.493' / W 108° 25.501'
Total Depth	: 27'
Ground Water	: 18'
Start Date	: 09/21/2016
Finish Date	: 09/21/2016

WELL NO. OW-57
(Sheet 2 of 2)

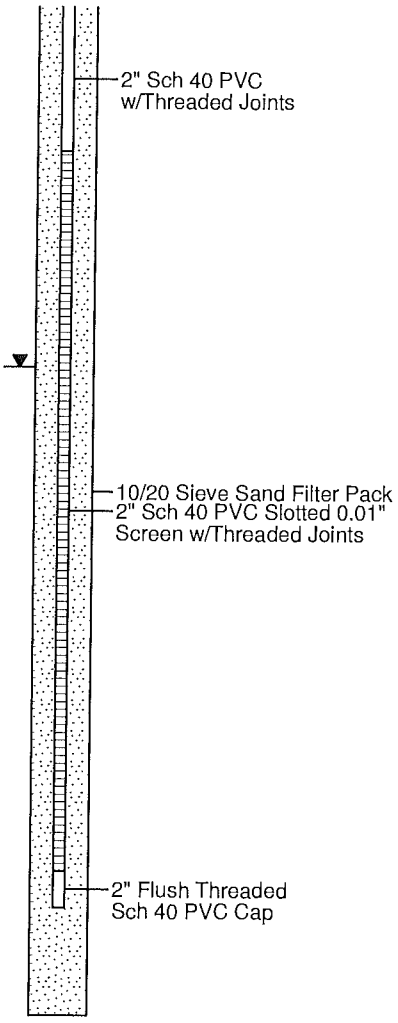
Elev., TOC (ft.msl)	: 6933.10
Elev., PAD (ft. msl)	: 6930.64
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 1634751.52
E	: E 2546961.79

Saturation
▼ Saturation

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
13							
14	85			CL	80		
15	197			ML	90		CLAYEY SILT, very fine, soft, damp, brown and tan, odor,
16							
17	205			CL	60		SILTY CLAY, low, firm, tan and brown, damp, odor,
18		▼					
19	58			CL	20		GRAVELLY CLAY, low, soft, damp to slightly moist to saturated, sandstone gravel, sandy, odor,
20							
21	243			SS	10		SANDSTONE/SAND, fine, dense, llight greenish white,very moist to saturated,
22							
23	846			CL	70		GRAVELLY SANDY CLAY, low, soft, very moist to saturated, grey, green sandstone, calcareous, odor,
24				CL	70		GRAVELLY SANDY CLAY, STA, odor,
25	44			CL/ST	70		CLAYSTONE, very dense, dry, purple, grey at base, faint odor,
26	39			CL/ST	30		CLAYSTONE, STA, faint odor.
27							
28							
29							

Completion Results

OW-57



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Western Refining SW, Inc.
Gallup Refinery - OW-14 Area Investigation
Job No. WEST16006

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc. / Cohagan
Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger 7.5"
Sampling Method	: 2' Split Spoon - 2" Diameter
Comments	: N 35° 29.500' / W 108° 28.410'
Total Depth	: 48.5'
Ground Water	: 29'
Start Date	: 09/22/2016
Finish Date	: 09/22/2016

WELL NO. OW-58
(Sheet 1 of 4)

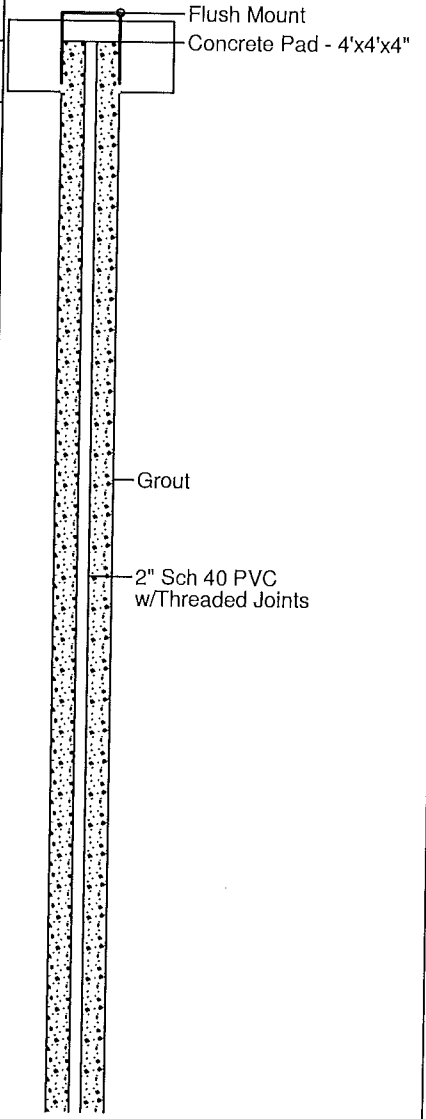
Elev., TOC (ft.msl)	: 6934.50
Elev., PAD (ft. msl)	: 6943.71
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 1634800.15
E	: E 2547414.91

Saturation
▼ Saturation
▽ Saturation

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0				AR	100		ASPHALT/BASE,
1	110			CL	100		SILTY CLAY, moderate, firm to stiff, damp, brown, odor,
2							
3	40			CL	100		SILTY CLAY, SIMILAR TO ABOVE (STA),
4							
5	11.2			CL	100		SILTY CLAY, STA, moist, faint odor,
6							
7	2.2			CL	90		SILTY CLAY, low, soft, damp, brown, faint odor,
8							
9	5.3			CL	60		SILTY CLAY, STA, no odor,
10							
11	37			CL	80		SILTY CLAY, STA, sticky, black discoloration, odor,
12	42			CL			SILTY CLAY, STA,
13							

Completion Results

OW-58



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Job No. WEST16006

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Drilling Rig	: CME 75
Drilling Method	: Hollw Stem Auger 7.5"
Sampling Method	: 2' Split Spoon - 2" Diameter
Comments	: N 35° 29.500' / W 108° 28.410'
Total Depth	: 48.5'
Ground Water	: 29'
Start Date	: 09/22/2016
Finish Date	: 09/22/2016

WELL NO. OW-58
(Sheet 2 of 4)

Elev., TOC (ft.msl)	: 6934.50
Elev., PAD (ft. msl)	: 6943.71
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 1634800.15
E	: E 2547414.91

Saturation
▼ Saturation
▽ Saturation

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
13							
	42			CL	70		
14							SILTY CLAY, low, stiff, damp, brown with black discoloration, faint odor,
15	25			CL	60		
16							SANDY CLAY, low, stiff, very fine grain sand, damp, brown, odor,
17	226			CL	60		
18							SANDY CLAY, STA, odor,
19	240			CL	50		
20							SANDY CLAY, STA, odor,
21	200			CL	60		
22							SILTY CLAY, low, very stiff, damp, brown, tan silt pockets/seams present, odor,
23	2020			CL	90		
24							SILTY CLAY, low, firm, soft/ crumbly, damp, brown, strong odor, outside of core is oily/phase separated hydrocarbon (PSH),
25	1980			CL	90		
26							SILTY CLAY, STA, firm to stiff, odor, outside of core is oily/PSH,
	973			CL			
27							

Completion Results

OW-58

Grout

2" Sch 40 PVC w/Threaded Joints

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Total Depth	: 48.5'
Ground Water	: 29'
Start Date	: 09/22/2016
Finish Date	: 09/22/2016

WELL NO. OW-58
(Sheet 3 of 4)

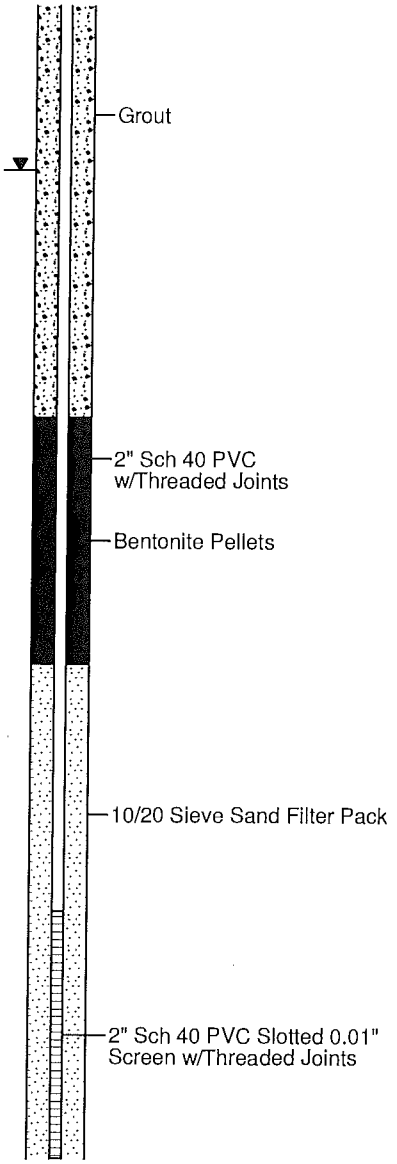
Elev., TOC (ft.msl)	: 6934.50
Elev., PAD (ft. msl)	: 6943.71
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 1634800.15
E	: E 2547414.91

Saturation
▼ Saturation
▽ Saturation

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
27							
	973			CL	90		
28				CL	90		SILTY CLAY, STA, damp to moist, odor,
29	2784	▼		CL/SC	90		SANDY CLAY/CLAYEY SAND, low, soft, very moist to saturated, dark brown, odor,
30							SANDY SILTY CLAY, low, firm, damp, saturated sand at base, grey/brown, odor,
31	2350			CL	90		
32							SILTY SAND, fine, loose, saturated, grey/brown, odor,
33	1775			SM	90		
				CL	90		SILTY CLAY, low, soft, damp, greyish brown, odor,
34							SILTY CLAY, STA, damp to very moist, odor,
35	575			CL	90		
36							SILTY CLAY, low, firm, damp, greyish brown, odor,
37	227			CL	80		
38							SILTY CLAY, STA, brown, odor,
39	545			CL	50		
40							CLAY, high, firm, damp, brown, odor,
	531			CH			
41							

Completion Results

OW-58



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Job No. WEST16006

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Drilling Rig	: CME 75
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Sampling Method	: 2' Split Spoon - 2" Diameter
Comments	: N 35° 29.500' / W 108° 28.410'
Total Depth	: 48.5'
Ground Water	: 29'
Start Date	: 09/22/2016
Finish Date	: 09/22/2016

WELL NO. OW-58

(Sheet 4 of 4)

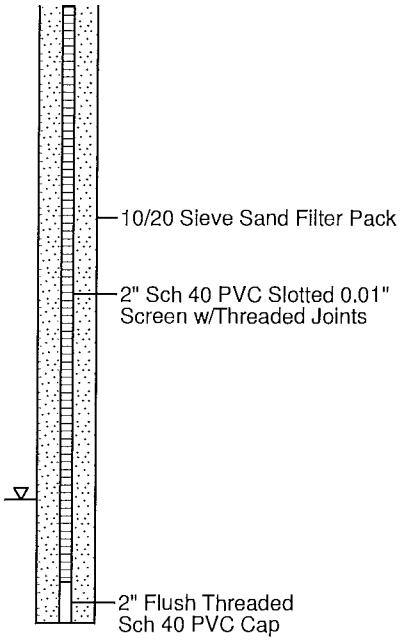
Elev., TOC (ft.msl)	: 6934.50
Elev., PAD (ft. msl)	: 6943.71
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 1634800.15
E	: E 2547414.91

Saturation
▼ Saturation
▽ Saturation

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
41	531			CH	50		
42							CLAY, STA, odor,
43	288			CH	50		
44							SILTY CLAY, low to moderate, firm, occasional gravel, damp, brown, odor,
45	357			CL	50		
46				CL	50		SILTY CLAY, STA, odor,
47	204	▽		SP	50		SANDY GRAVEL, medium to coarse sand with 1/4 to 1/2 inch gravel, very moist to saturated, trace silt/clay, brown, odor,
48	250			SH	10		SHALE, very dense/hard, dry, dark grey, odor.
49							
50							
51							
52							
53							
54							
55							

Completion Results

OW-58



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DiSorbo
Environmental Consulting Firm

Western Refining SW, Inc
Gallup Refinery
Job No. WEST17020

Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	: Hand Auger to 5 BGL
Total Depth	: 40'
Ground Water	: 26'
Start Date	: 06/12/2017
Finish Date	: 06/12/2017

WELL NO. OW-59

(Sheet 1 of 3)

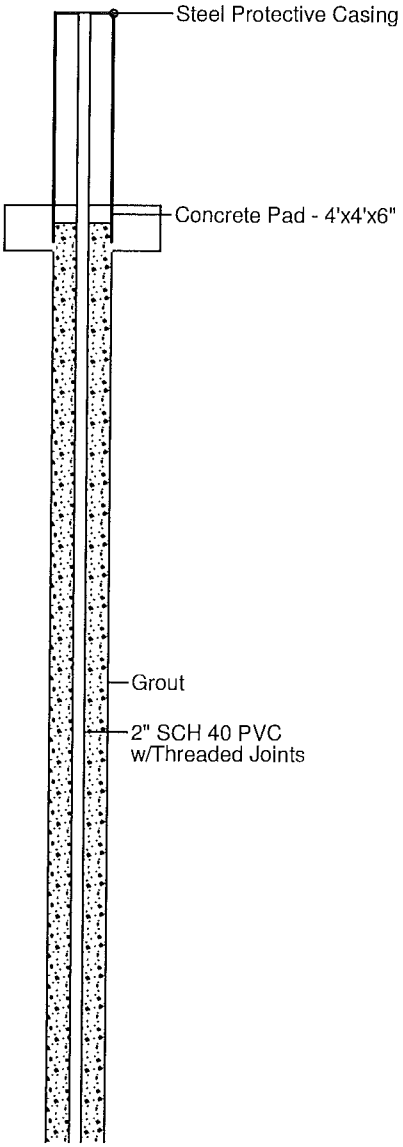
Elev., TOC (ft.msl)	: 6689.73
Elev., PAD (ft. msl)	: 6887.63
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1635547.14
E	: W2544633.00

Saturation
▼ Saturation

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0							SILTY CLAY, low, firm, damp, brown, no odor,
1	0.0			CL	100		
2							SILTY CLAY, SIMILAR TO ABOVE (STA),
3	0.0			CL	100		
4							SILTY CLAY, STA,
5	0.0			CL	100		
6							CLAY, high, stiff, damp, brown, no odor,
7	2.0			CH	70		
8							SILTY CLAY, low, stiff, damp, light brown, no odor, sandy at base,
9	1.0			CL	80		
10							SILT, low, compact, damp, brown, no odor,
11	0.3			ML	70		
12							SILTY CLAY, low, very stiff, damp, brown, no odor, trace sand,
13	0.5			CL			

Completion Results

Well No. OW-59



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Western Refining SW, Inc
Gallup Refinery
Job No. WEST17020

Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	: Hand Auger to 5 BGL
Total Depth	: 40'
Ground Water	: 26'
Start Date	: 06/12/2017
Finish Date	: 06/12/2017

WELL NO. OW-59

(Sheet 2 of 3)

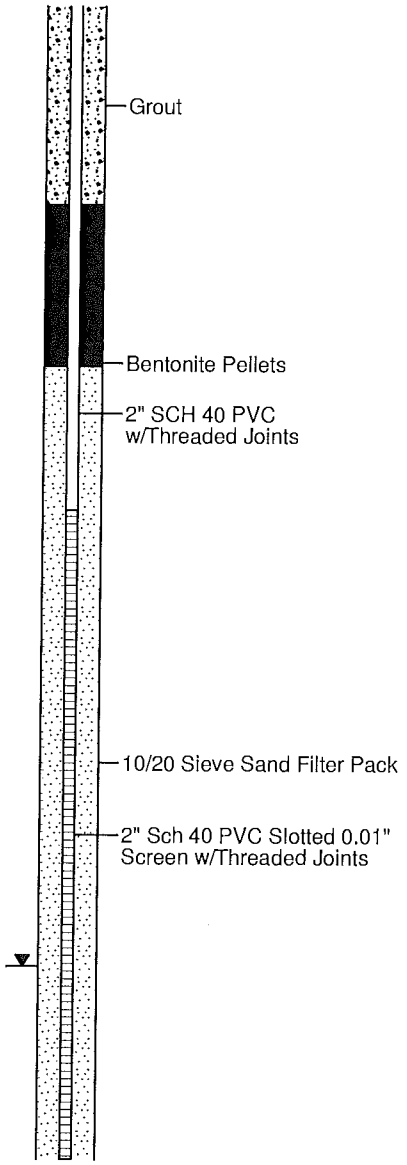
Elev., TOC (ft.msl)	: 6689.73
Elev., PAD (ft. msl)	: 6887.63
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1635547.14
E	: W2544633.00

Saturation
▼ Saturation

Depth (ft.)	PID (ppm)	USCS	Recovery (%)	DESCRIPTION
13	0.5	CL	50	
14				SILTY CLAY, high, very stiff, damp, brown, no odor,
15	1.3	CH	50	
16				SILTY CLAY, STA, no odor,
17	1.7	CH	60	
18				SILTY CLAY, low to moderate, stiff, damp, brown, no odor,
19	1.1	CL	50	
20				SANDY SILTY CLAY, low, firm to soft, damp, brown, no odor,
21	1.2	CL	50	
22				SANDY CLAY, low, soft, damp, brown, no odor,
23	0.2	CL	60	
24				SILTY CLAY, low, soft, damp, brown, no odor,
25	3.3	CL	70	
26				SANDY SILT, very fine, very moist, brown, no odor,
27	10.9	ML	80	
28				SANDY SILT, STA, very moist, no odor,
29	11.6	ML		

Completion Results

Well No. OW-59



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Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	: Hand Auger to 5 BGL
Total Depth	: 40'
Ground Water	: 26'
Start Date	: 06/12/2017
Finish Date	: 06/12/2017

WELL NO. OW-59

(Sheet 3 of 3)

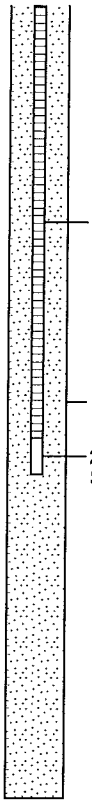
Elev., TOC (ft.msl)	: 6689.73
Elev., PAD (ft. msl)	: 6887.63
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1635547.14
E	: W2544633.00

Saturation
▼ Saturation

Depth (ft.)	PID (ppm)	USCS	Recovery (%)	DESCRIPTION
29	11.6	ML	80	
30				SILTY CLAY, low, firm, damp, brown, no odor,
31	11.4	CL	90	
32	14.9	CL	90	SILTY CLAY, STA, no odor,
33	16.3	SM	90	SILTY SAND, very fine, compact, saturated, brown, no odor,
34				SILTY CLAY, low, firm, damp, brown, no odor,
35	10.5	CL	60	
36				SILTY CLAY, STA, no odor,
37	7.3	CL	70	
38		CH	70	CLAY, high, firm, damp, brown, no odor,
39	10.0	CL	70	SILTY CLAY, low, firm to soft, grey and white, no odor, trace sand and white nodules.
40				
41				
42				
43				
44				
45				

Completion Results

Well No. OW-59



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Western Refining SW, Inc
Gallup Refinery
Job No. WEST17020

Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	: Hand Auger to 5' BGL
Total Depth	: 48'
Ground Water	: Not Encountered
Start Date	: 6/13/2017
Finish Date	: 6/13/2017

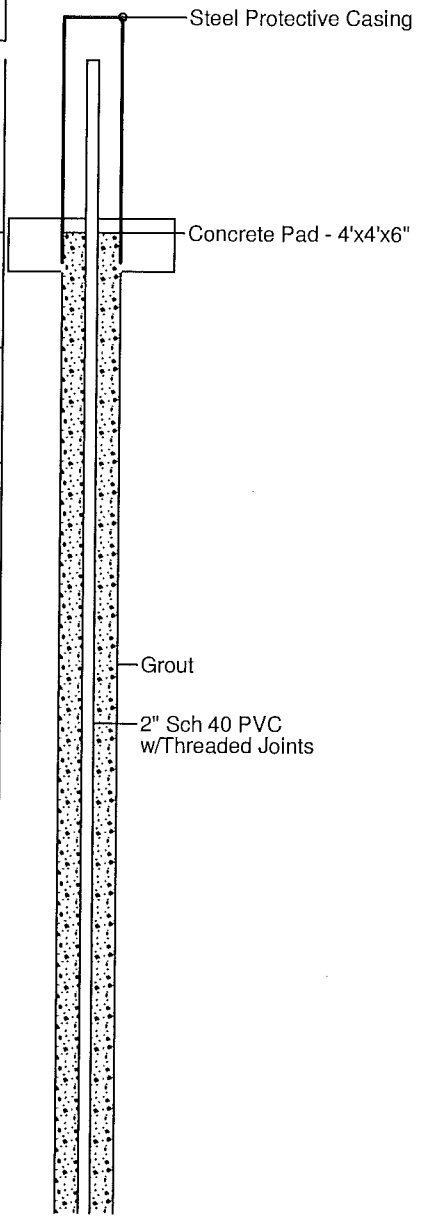
WELL NO. OW-60
(Sheet 1 of 3)

Elev., TOC (ft.msl)	: 6893.51
Elev., PAD (ft. msl)	: 6891.06
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1635335.02
E	: W2545018.21

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
1	6.5			CL	100		SILTY CLAY, low, firm, damp, brown, no odor,
3	5.8			CH	100		CLAY, high, firm to stiff, damp, brown, no odor,
5	6.3			CH	100		CLAY, SIMILAR TO ABOVE (STA), no odor,
7	8.1			CH	90		CLAY, STA, no odor,
9	9.6			CH	100		CLAY, STA, no odor,
11	9.1			CL	50		SILTY CLAY, moderate, firm, damp, brown, no odor,
13	8.2			CL	50		SILTY CLAY, STA, soft, no odor,
15	7.9			CL	70		SILTY CLAY, STA, firm, no odor,
16	8.3			CL			SILTY CLAY, STA, no odor,

Completion Results

Well No. OW-60



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Geologist	: Tracy Payne
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Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	: Hand Auger to 5' BGL
Total Depth	: 48'
Ground Water	: Not Encountered
Start Date	: 6/13/2017
Finish Date	: 6/13/2017

WELL NO. OW-60

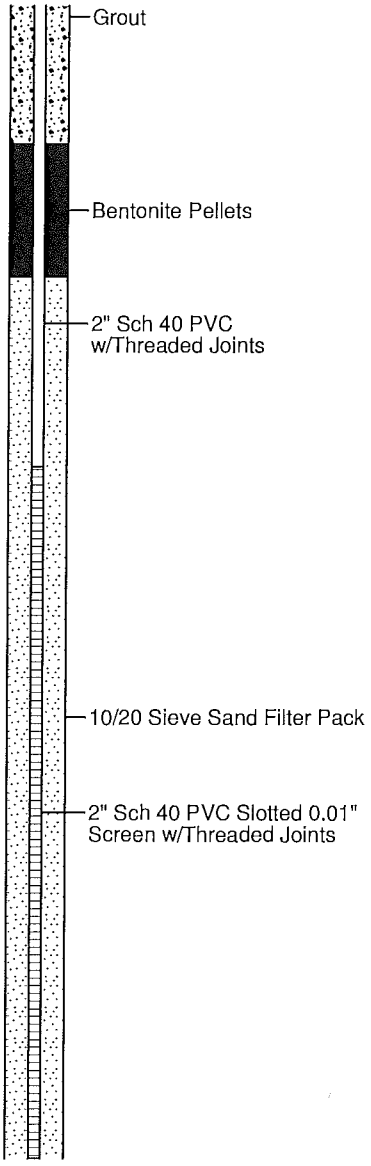
(Sheet 2 of 3)

Elev., TOC (ft.msl)	: 6893.51
Elev., PAD (ft. msl)	: 6891.06
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1635335.02
E	: W2545018.21

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
17	8.3			CL	70		
18							SILTY CLAY, STA, no odor,
19	10.1			CL	50		
20							SILTY CLAY, moderate, soft, damp, brown, no odor,
21	15.3			CL	60		
22							SILTY CLAY, STA, firm, no odor,
23	12.1			CL	70		
24							SILTY CLAY, STA,calcareous nodules (white) present, trace gravel, no odor,
25	11.6			CL	80		
26							SILTY CLAY, STA, tan-silt pockets throughout, no odor,
27	10.9			CL	80		
28							CLAYEY SILT, low, soft/crumbly, damp, light brown and grey, no odor,
29	10.5			ML	80		
30							SILTY CLAY, low, firm to crumbly, damp, light reddish brown with trace grey, no odor,
31	11.1			CL	70		
32							SILTY CLAY, STA, no odor,
33	15.0			CL	70		
34							SILTY CLAY, STA, no odor,
35	12.8			CL	80		
36	12.7			CL			SILTY CLAY, low, very stiff, crumbly, damp, light reddish brown, grey, no odor,
37							

Completion Results

Well No. OW-60



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Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	: Hand Auger to 5' BGL
Total Depth	: 48'
Ground Water	: Not Encountered
Start Date	: 6/13/2017
Finish Date	: 6/13/2017

WELL NO. OW-60

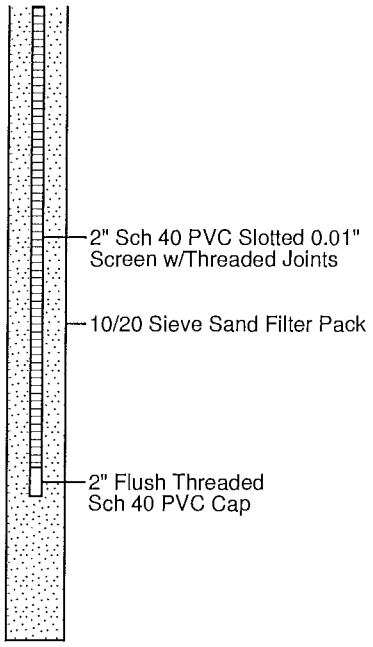
(Sheet 3 of 3)

Elev., TOC (ft.msl)	: 6893.51
Elev., PAD (ft. msl)	: 6891.06
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1635335.02
E	: W2545018.21

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
37	12.7			CL	70		
38							SILT, low, compact to dense/stiff crumbly, damp, light grey, no odor,
39	10.4			ML	50		
40							SILT, STA, no odor,
41	9.9			ML	60		
42							SILT, STA, trace very fine sand, no odor,
43	10.7			ML	60		
44							SILT, STA, no odor,
45	10.1			ML	50		
46							SILT, STA, trace reddish brown clay with grey, no odor.
47	9.6			ML	50		
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							

Completion Results

Well No. OW-60



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Western Refining SW, Inc
Gallup Refinery
Job No. WEST17020

Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon/
Comments	: Hand Auger to 5' BGL
Total Depth	: 44'
Ground Water	: Not Encountered
Start Date	: 6/14/2017
Finish Date	: 6/14/2017

WELL NO. BW-4A

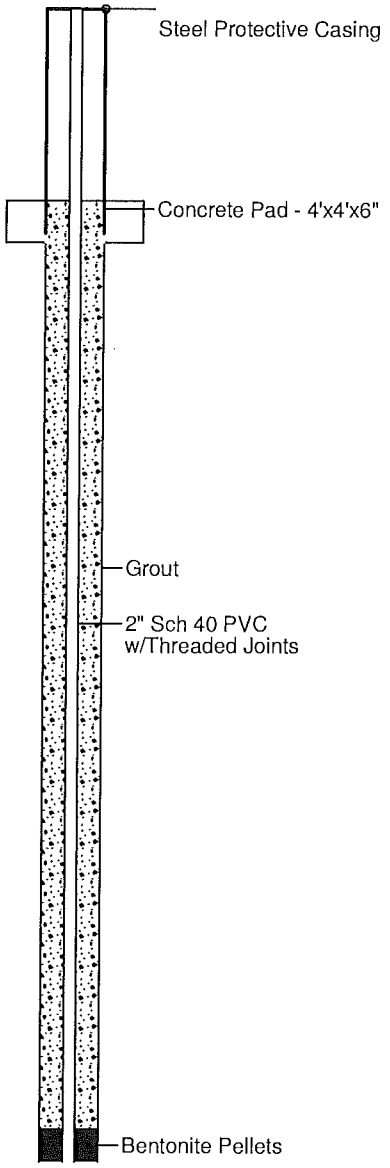
(Sheet 1 of 3)

Elev., TOC (ft.msl)	: 6873.18
Elev., PAD (ft. msl)	: 6870.67
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1634063.05
E	: W2542465.22

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0							SILTY CLAY, low, firm, dry to damp, brown, no odor,
1	7.7			CL	100		
2							CLAY, high, stiff, damp, brown, no odor,
3	9.5			CH	100		
4							CLAY, SIMILAR TO ABOVE (STA), very stiff, no odor,
5	9.0			CH	100		
6							CLAY, STA, no odor,
7	6.8			CH	90		
8							CLAY, STA, no odor,
9	5.4			CH	80		
10							CLAY, STA, no odor,
11	3.3			CH	80		
12							CLAY, STA, no odor,
13	5.8			CH	50		
14							CLAY, STA, no odor,
15	4.0			CH			

Completion Results

Well No. BW-4A



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Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon/
Comments	: Hand Auger to 5' BGL
Total Depth	: 44'
Ground Water	: Not Encountered
Start Date	: 6/14/2017
Finish Date	: 6/14/2017

WELL NO. BW-4A

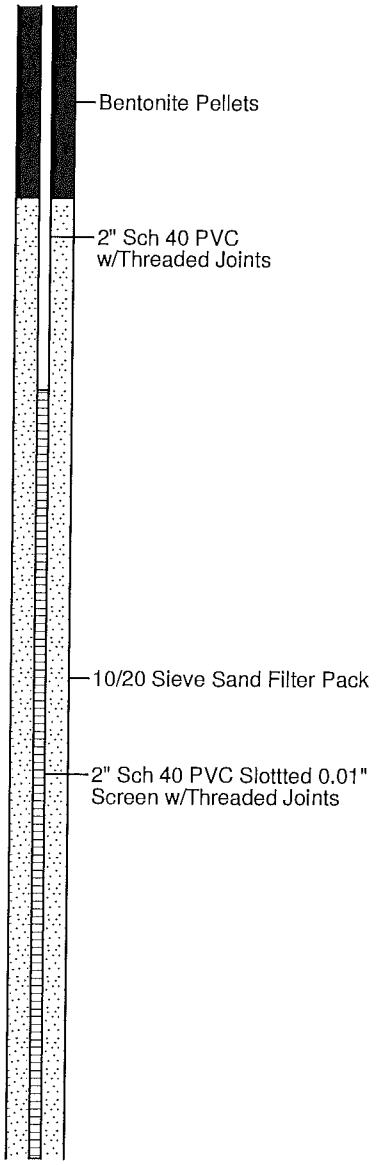
(Sheet 2 of 3)

Elev., TOC (ft.msl)	: 6873.18
Elev., PAD (ft. msl)	: 6870.67
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1634063.05
E	: W2542465.22

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
15							
	4.0			CH	60		
16							CLAY, STA, no odor,
17	2.0			CH	80		
18							CLAYEY SILT, low, firm/crumbly, damp, light brown/tan, no odor,
19	6.9			ML	40		
20							CLAYEY SILT/SILTY CLAY, STA, interbedded, no odor,
21	5.0			ML/CL	70		
22							CLAYEY SILT, low, firm/crumbly,damp, tan, no odor,
23	3.6			ML	50		
24							CLAYEY SILT/SILTY CLAY, STA, interbedded, no odor,
25	3.7			ML/CL	60		
26							CLAY, high, very stiff, damp, brown, no odor,
27	6.2			CH	60		
28							CLAY, STA, darker brown, no odor,
29	3.5			CH	70		
30							CLAY, STA, no odor,
31	6.1			CH	80		
32							SILTY CLAY, low, very stiff, damp, no odor, light brown (reddish), trace very fine grain sand,
33	6.1			CL			

Completion Results

Well No. BW-4A



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Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon/ Hand Auger to 5' BGL
Comments	:
Total Depth	: 44'
Ground Water	: Not Encountered
Start Date	: 6/14/2017
Finish Date	: 6/14/2017

WELL NO. BW-4A

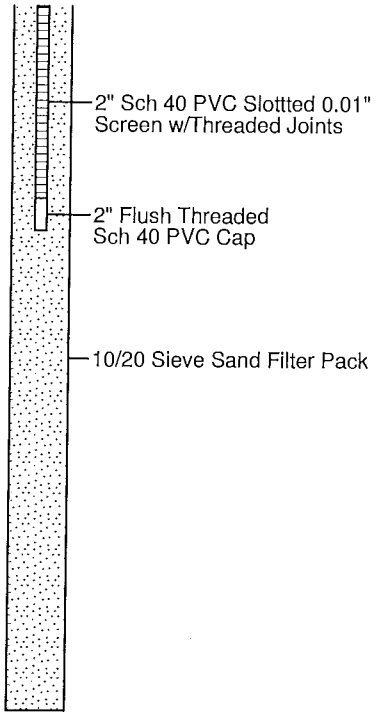
(Sheet 3 of 3)

Elev., TOC (ft.msl)	: 6873.18
Elev., PAD (ft. msl)	: 6870.67
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1634063.05
E	: W2542465.22

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
33	6.1			CL	60		
34							CLAYEY SILT/SILTY CLAY, low, firm to stiff, damp, reddish brown and grey, alternating silt/clay, no odor,
35	3.8			ML/CL	80		
36							SILTY CLAY, low, stiff, damp, reddish brown and grey (less grey than above), no odor,
37	6.1			CL	60		
38							SILTY CLAY, STA, no odor,
39	5.2			CL	60		
40							SILTY CLAY, STA, reddish brown and grey, no odor,
41	4.2			CL	70		
42							SILTY CLAY, STA, no odor.
43	3.9			CL	60		
44							
45							
46							
47							
48							
49							
50							
51							

Completion Results

Well No. BW-4A



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Western Refining SW, Inc
Gallup Refinery
Job No. WEST17020

Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon -
Comments	: Hand Auger to 5' BGL
Total Depth	: 90'
Ground Water	: Not Encountered
Start Date	: 6/15/2017
Finish Date	: 6/16/2017

WELL NO. BW-4B

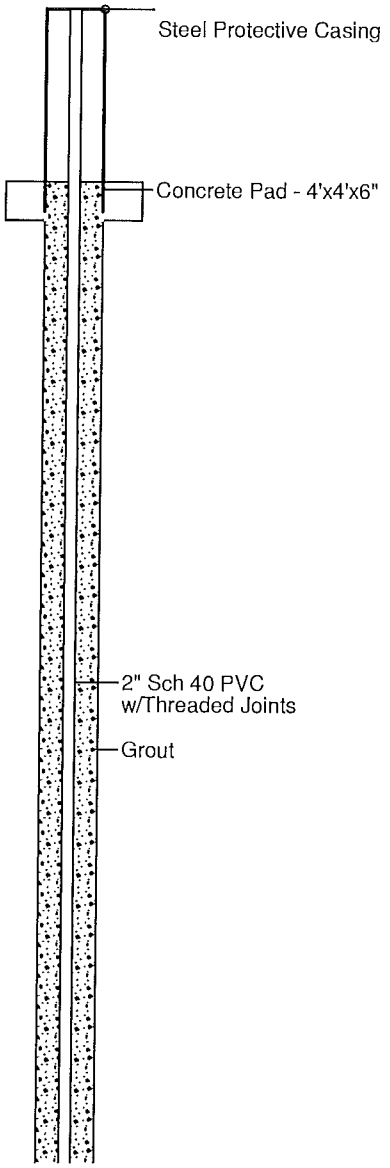
(Sheet 1 of 5)

Elev., TOC (ft.msl)	: 6873.23
Elev., PAD (ft. msl)	: 6870.62
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1634043.22
E	: W2542462.98

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
0							
1	1.3			CL	100		SILTY CLAY, low, firm, dry to damp, brown, no odor,
3	1.2			CH	100		CLAY, high, stiff, damp, brown, no odor,
5	1.3			CH	100		CLAY, SIMILAR TO ABOVE (STA), very stiff, no odor,
7	1.7			CH	90		CLAY, STA, no odor,
9	2.0			CH	80		CLAY, STA, no odor,
11	2.1			CH	80		CLAY, STA, no odor,
13	3.1			CH	80		CLAY, STA, no odor,
15	3.4			CH	80		CLAY, STA, no odor,
16	5.1			CH			CLAY, STA, no odor,

Completion Results

Well No. BW-4B



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Gallup Refinery
Job No. WEST17020

Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon -
Comments	: Hand Auger to 5' BGL
Total Depth	: 90'
Ground Water	: Not Encountered
Start Date	: 6/15/2017
Finish Date	: 6/16/2017

WELL NO. BW-4B

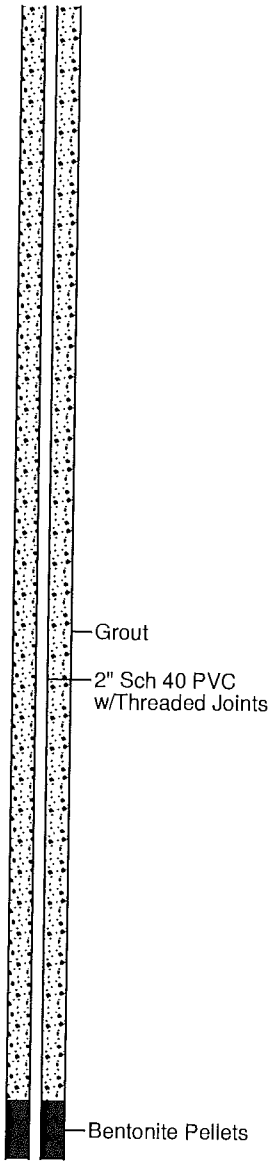
(Sheet 2 of 5)

Elev., TOC (ft.msl)	: 6873.23
Elev., PAD (ft. msl)	: 6870.62
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1634043.22
E	: W2542462.98

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
17							
18	5.1			CH	70		
19	3.2			ML	60		CLAYEY SILT, low, firm/crumbly, damp, light brown/tan, no odor,
20							
21	3.9			ML/CL	70		CLAYEY SILT/SILTY CLAY, STA, no odor, interbedded,
22							
23	3.5			ML	60		CLAYEY SILT, low, firm/crumbly, damp, brown and tan, no odor,
24				ML/CL	60		CLAYEY SILT/SILTY CLAY, STA, no odor,
25	3.9			CH	60		CLAY, high, very stiff, damp, brown, no odor,
26							
27	1.8			CH	70		CLAY, STA, darker brown, no odor,
28							
29	1.8			CL	80		SILTY CLAY, moderate to low, very stiff, damp, dark brown grading to light reddish brown, trace fine grain sand at base, no odor,
30				CL	80		SILTY CLAY, STA,
31	2.0			CL	80		SANDY GRAVELLY CLAY, low, stiff, dry to damp, light grey and brown, no odor,
32				CL	80		SILTY CLAY, low, stiff, damp, reddish brown, no odor,
33	2.2			ML/CL	80		CLAYEY SILT/SILTY CLAY, low, firm/crumbly, damp, reddish brown and grey,
34							
35	5.6			CL	80		SILTY CLAY, STA, no odor,
36							
37	3.6			CL			SILTY CLAY, STA, no odor,

Completion Results

Well No. BW-4B



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512-693-4190

DiSorbo
Environmental Consulting Firm

Western Refining SW, Inc
Gallup Refinery
Job No. WEST17020

Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon -
Comments	: Hand Auger to 5' BGL
Total Depth	: 90'
Ground Water	: Not Encountered
Start Date	: 6/15/2017
Finish Date	: 6/16/2017

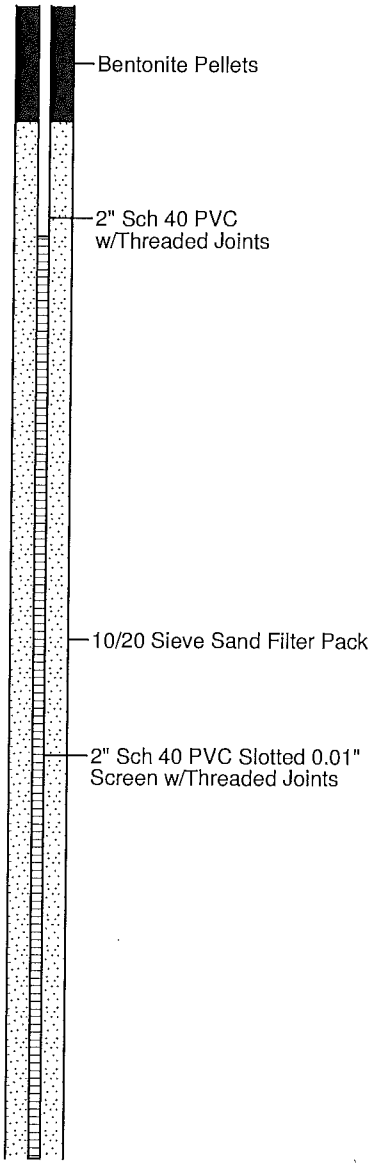
WELL NO. BW-4B
(Sheet 3 of 5)

Elev., TOC (ft.msl)	: 6873.23
Elev., PAD (ft. msl)	: 6870.62
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1634043.22
E	: W2542462.98

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
37	3.6			CL	80		
38				CL	80		SILTY CLAY, STA, no odor,
39	2.3			CL	80		
40				CL	80		SILTY CLAY, STA, no odor,
41	6.2			CL	80		
42				CL	70		SILTY CLAY, STA, no odor,
43	5.0			CL	80		
44				CL	80		SILTY CLAY, STA, no odor,
45	2.6			CL	80		GRAVELLY SILTY CLAY, low, firm/crumbly, dry-calcium carbonate nodules, grey and reddish brown, no odor,
46				CL	80		SANDY CLAY, low, firm/crumbly, dry, grey and reddish brown, very fine grain sand, no odor,
47	3.5			CL	80		SILTY CLAY, low, very stiff, dry to damp, reddish brown, no odor,
48				CL	80		SILTY CLAY, STA, no odor,
49	1.9			CL	80		
50				CL	80		SILTY CLAY, STA, no odor,
51	5.1			CL	80		
52				CL	70		SILTY CLAY, STA, trace grey clay, occasional gravel, no odor,
53	5.6			CL	70		
54				CL	70		SILTY CLAY, low, very stiff, dry to damp, reddish brown, no odor,
55	3.8			CL			
56				CL			SILTY CLAY, STA, trace grey clay, no odor,
57	3.4						

Completion Results

Well No. BW-4B



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Gallup Refinery
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Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon - Hand Auger to 5' BGL
Comments	:
Total Depth	: 90'
Ground Water	: Not Encountered
Start Date	: 6/15/2017
Finish Date	: 6/16/2017

WELL NO. BW-4B

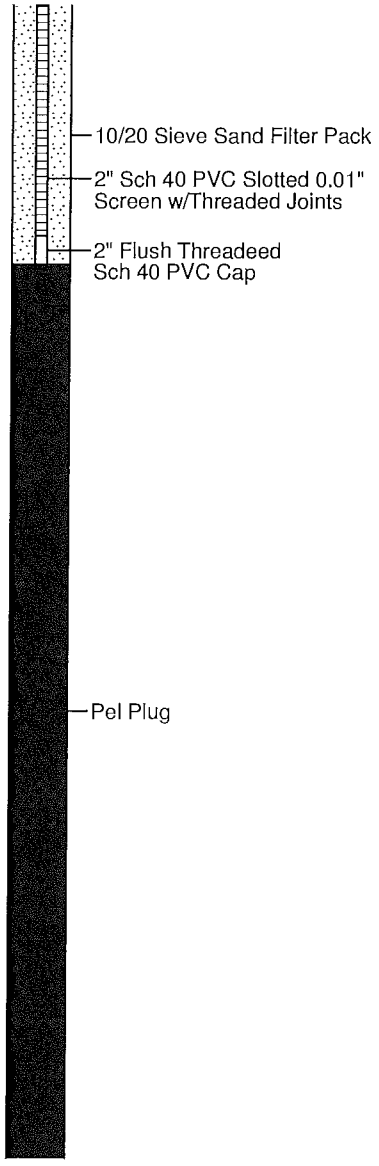
(Sheet 4 of 5)

Elev., TOC (ft.msl)	: 6873.23
Elev., PAD (ft. msl)	: 6870.62
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1634043.22
E	: W2542462.98

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
57							
58	3.4			CL	60		
59	2.4			CL	80		SILTY CLAY, STA, no odor,
60							
61	4.9			CL	80		SILTY CLAY, low, very stiff, dry to damp, reddish brown grey clay, no odor,
62							
63	1.7			CL	80		SILTY CLAY, STA, no odor,
64							
65	5.8			CL	80		SILTY CLAY, STA, no odor,
66							
67	2.7			CL	80		SILTY CLAY, STA,
68							
69	3.9			CL	80		SILTY CLAY, low, very stiff, calcareous, dry to damp, brown and blueish grey, no odor,
70							
71	1.6			CL	80		SILTY CLAY, low, firm/crumbly, damp, reddish brown, no odor,
72							
73	1.7			CL	60		SILTY CLAY, STA, no odor,
74							
75	1.0			CL	60		SILTY CLAY, STA, no odor,
76							
77	0.1			CL			SILTY CLAY, STA, no odor,

Completion Results

Well No. BW-4B



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Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon - Hand Auger to 5' BGL
Comments	
Total Depth	: 90'
Ground Water	: Not Encountered
Start Date	: 6/15/2017
Finish Date	: 6/16/2017

WELL NO. BW-4B

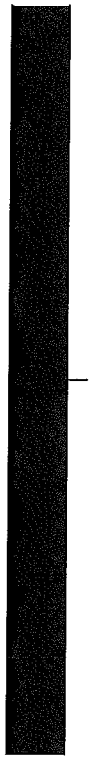
(Sheet 5 of 5)

Elev., TOC (ft.msl)	: 6873.23
Elev., PAD (ft. msl)	: 6870.62
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1634043.22
E	: W2542462.98

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
77							
78	0.1			CL	70		
79	0.4			CL	60		SILTY CLAY, STA, no odor,
80							
81	0.1			CL	70		SILTY CLAY, STA, no odor,
82							
83	0.2			CL	60		SILTY CLAY, STA, no odor,
84							
85	0.0			CL	70		SILTY CLAY, STA, very stiff, trace grey clay, no odor,
86							
87	0.1			CL	40		SILTY CLAY, STA, no odor,
88							
89	0.2			CL/SS	40		SILTY CLAY, STA, imbedded with fine grain sandstone, hard/dense, white.
90							
91							
92							
93							
94							
95							
96							
97							

Completion Results

Well No. BW-4B



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Western Refining SW, Inc
Gallup Refinery
Job No. WEST17020

Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 20.5'
Ground Water	: Not Encountered
Start Date	: 06/23/2017
Finish Date	: 06/23/2017

WELL NO. BW-5A

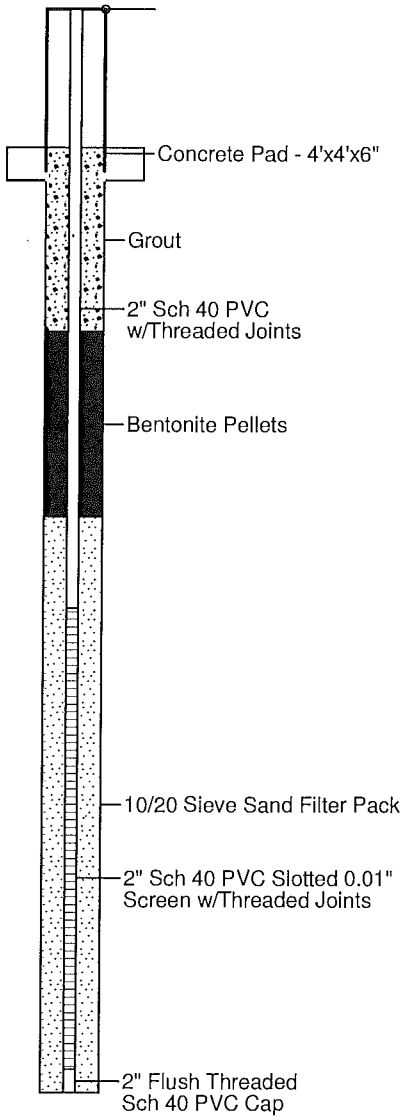
(Sheet 1 of 1)

Elev., TOC (ft.msl)	: 6877.00
Elev., PAD (ft. msl)	: 6874.39
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1633259.56
E	: W2542551.45

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
1	0.0			CL	100		SILTY CLAY, low, firm, dry, brown, no odor,
3	0.1			CL	100		SILTY CLAY, SIMILAR TO ABOVE (STA), no odor,
5	0.0			CL	100		SILTY CLAY, STA, no odor,
7	0.0			CH	40		CLAY, high, very stiff, dry, brown, no odor,
9	0.1			CH	80		CLAY, STA, no odor,
11	0.0			CL	60		CLAY, moderate, very stiff, gravel at base, dry, brown, no odor,
13	0.0			SP	80		GRAVELLY SILT/SAND, very fine, 5-10 mm gravel-clay at base - stiff, dry, tan, no odor,
15	0.0			CL	70		SILTY CLAY, low, stiff, dry, light reddish brown, tan and grey, trace very fine grain sand,
17	0.0			CL	60		SILTY CLAY, STA,
19	0.0			CL	80		SANDY SILTY CLAY, low, very stiff, very fine sand, light reddish brown, occasional grey, no odor.

Completion Results

Well No. BW-5A



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Gallup Refinery
Job No. WEST17020

Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	: Hand Auger to .5'
Total Depth	: 58'
Ground Water	: Not Encountered
Start Date	: 06/23/2017
Finish Date	: 06/23/2017

WELL NO. BW-5B

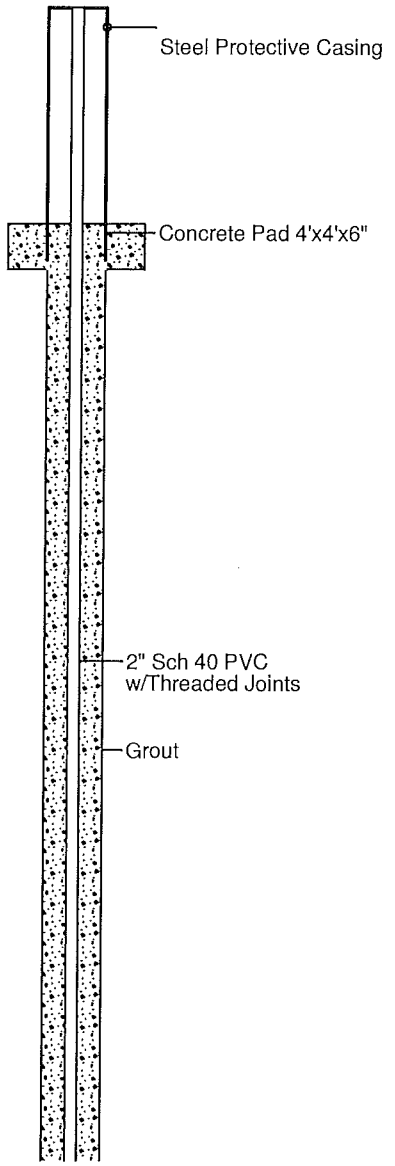
(Sheet 1 of 4)

Elev., TOC (ft.msl)	: 6876.82
Elev., PAD (ft. msl)	: 6874.32
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1633269.31
E	: W2542551.84

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
0							
1	0.0			CL	100		SILTY CLAY, low, firm, dry, brown, no odor,
2							
3	0.1			CL	100		SILTY CLAY, SIMILAR TO ABOVE (STA), no odor,
4							
5	0.0			CL	100		SILTY CLAY, STA, no odor,
6							
7	0.0			CH	40		CLAY, high, very stiff, dry, brown, no odor,
8							
9	0.1			CH	80		CLAY, STA, no odor,
10							
				CH	60		CLAY, STA, no odor,
11	0.0						
				CL	60		SILTY CLAY, low, very stiff, dry, calcareous, tan to light brown, no odor,
12							
	0.1			SP			GRAVELLY SILT/SAND, very fine, very dense, dry, tan, no odor, sandstone and chert gravel,
13							

Completion Results

Well No. BW-5B



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Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	: Hand Auger to .5'
Total Depth	: 58'
Ground Water	: Not Encountered
Start Date	: 06/23/2017
Finish Date	: 06/23/2017

WELL NO. BW-5B

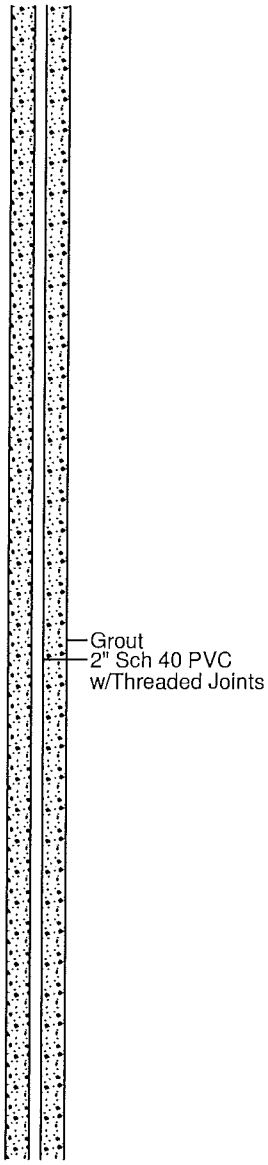
(Sheet 2 of 4)

Elev., TOC (ft.msl)	: 6876.82
Elev., PAD (ft. msl)	: 6874.32
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1633269.31
E	: W2542551.84

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
13	0.1			SP	90		
14							SILTY CLAY, low, firm to stiff/crumbly, dry to damp, reddish brown and grey, trace gravel and very fine grain sand, no odor,
15	0.0			CL	90		
16							CLAYEY SILT/SAND, very fine grain, firm/crumbly, dry, light brown and grey, no odor,
17	0.0			SP	50		
18							CLAYEY SILT/SAND, STA, dry, light reddish brown, no odor,
19	0.0			SP	50		
20							SANDY SILTY CLAY, low, very stiff, dry, light reddish brown and light grey, no odor, very fine grain sand,
21	0.0			CL	60		
22							SANDY SILTY CLAY, STA, no odor,
23	0.0			CL	90		
24							SANDY SILTY CLAY, STA, no odor,
25	0.0			CL	60		
26							SANDY SILTY CLAY, STA, no odor,
27	0.0			CL	70		
28							SANDY SILTY CLAY, STA, no odor,
29	0.0			CL			

Completion Results

Well No. BW-5B



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Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	: Hand Auger to .5'
Total Depth	: 58'
Ground Water	: Not Encountered
Start Date	: 06/23/2017
Finish Date	: 06/23/2017

WELL NO. BW-5B

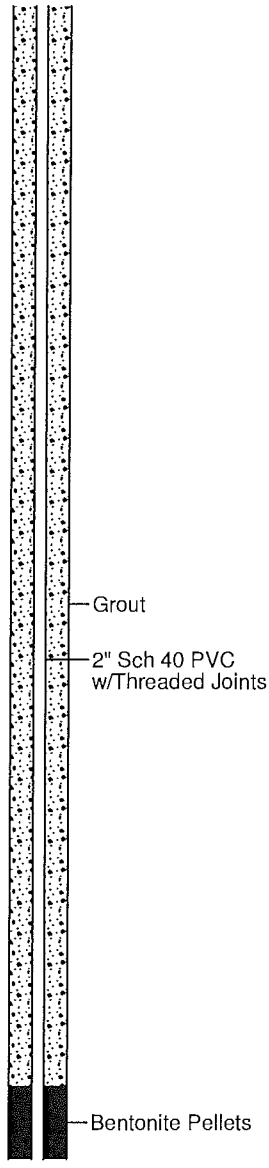
(Sheet 3 of 4)

Elev., TOC (ft.msl)	: 6876.82
Elev., PAD (ft. msl)	: 6874.32
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1633269.31
E	: W2542551.84

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
29	0.0			CL	60		
30							SILTY CLAY, low, firm to stiff, damp, reddish brown, no odor, softer than above,
31	0.0			CL	60		
32							SILTY CLAY, STA, no odor, trace grey clay,
33	0.0			CL	70		
34							SILTY CLAY, STA, no odor, trace grey clay,
35	0.0			CL	70		
36							SILTY CLAY, STA, no odor,
37	0.0			CL	60		
38							SILTY CLAY, low, stiff to very stiff, damp, reddish brown, no odor,
39	0.0			CL	70		
40							SILTY CLAY, STA, stiff, damp, no odor,
41	0.0			CL	70		
42							SILTY CLAY, STA,
43	0.0			CL	60		
44							SILTY CLAY, STA, calcareous,
45	0.0			CL			

Completion Results

Well No. BW-5B



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Geologist	: Tracy Payne
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Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	: Hand Auger to .5'
Total Depth	: 58'
Ground Water	: Not Encountered
Start Date	: 06/23/2017
Finish Date	: 06/23/2017

WELL NO. BW-5B

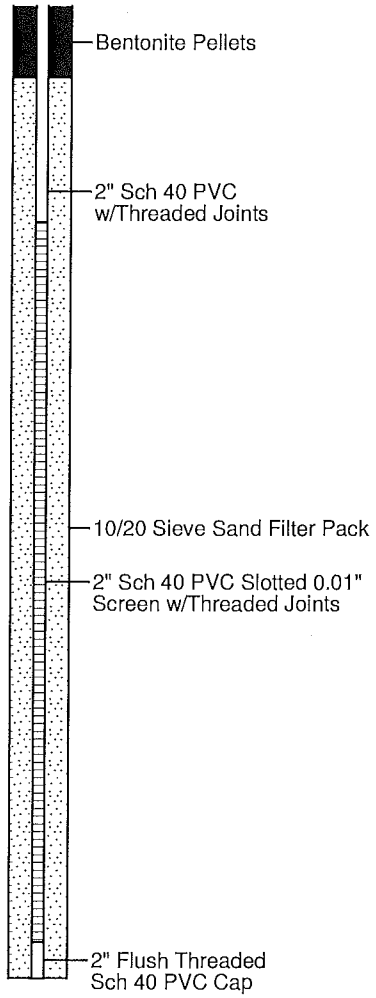
(Sheet 4 of 4)

Elev., TOC (ft.msl)	: 6876.82
Elev., PAD (ft. msl)	: 6874.32
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1633269.31
E	: W2542551.84

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
45	0.0			CL	60		
46							SILTY CLAY, STA,
47	0.1			CL	60		
48							SILTY CLAY, low, very stiff, damp, light reddish brown, no odor, trace pink sandstone at base,
49	0.0			CL	80		
50							SILTY CLAY, STA, trace grey clay and sandstone present,
51	0.0			CL	70		
52							SILTY CLAY, STA, sandstone present,
53	0.0			CL	20		
54							SILTY CLAY, low, very stiff, damp/dry, reddish brown and grey, bluish grey at base, no odor,
55	0.0			CL	80		
56							SILTY CLAY, STA, increase in bluish grey clay, damp.
57	0.0			CL	90		
58							
59							
60							
61							

Completion Results

Well No. BW-5B



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Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 76'
Ground Water	: 68'
Start Date	: 06/19/2017
Finish Date	: 06/21/2017

WELL NO. BW-5C

(Sheet 1 of 4)

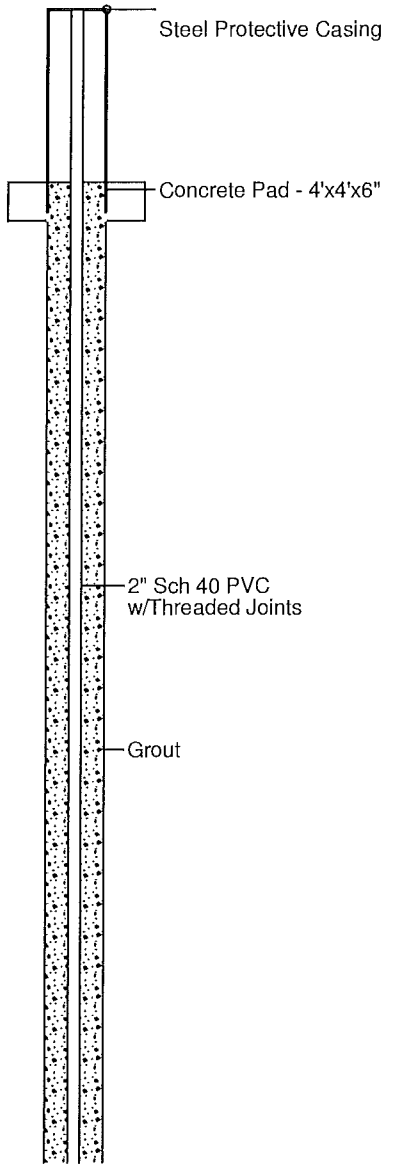
Elev., TOC (ft.msl)	: 6876.85
Elev., PAD (ft. msl)	: 6874.22
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1633279.54
E	: W2542553.04

Saturation
▼ Saturation

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
0							SILTY CLAY, low, firm, dry, brown, no odor,
1	0.0			CL	100		
2							SILTY CLAY, SIMILAR TO ABOVE (STA), no odor,
3	0.1			CL	100		
4							SILTY CLAY, STA, no odor,
5	0.0			CL	100		
6							CLAY, high, very stiff, dry, brown, no odor,
7	0.0			CH	40		
8							CLAY, STA, no odor,
9	0.1			CH	80		
10				CH	60		CLAY, STA, no odor,
11	0.0			CL	60		SILTY CLAY, low, very stiff, dry, calcareous, tan to light brown, no odor,
12							GRAVELLY SILT/SAND, very fine, very
13	0.1			SP	90		dense, dry, tan, no odor, sandstone and chert gravel,
14							SILTY CLAY, low, firm to stiff/crumbly, dry to
15	0.0			CL	90		damp, reddish brown and grey, trace gravel and very fine grain sand, no odor,
16	0.0			SP			CLAYEY SILT/SAND, very fine grain,
17							firm/crumbly, dry, light brown and grey, no odor,

Completion Results

Well No. BW-5C



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Gallup Refinery
Job No. WEST17020

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Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 76'
Ground Water	: 68'
Start Date	: 06/19/2017
Finish Date	: 06/21/2017

WELL NO. BW-5C

(Sheet 2 of 4)

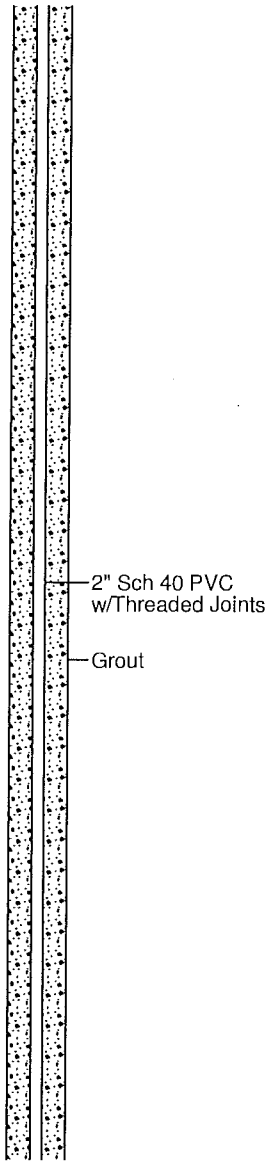
Elev., TOC (ft.msl)	: 6876.85
Elev., PAD (ft. msl)	: 6874.22
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1633279.54
E	: W2542553.04

Saturation
▼ Saturation

Depth (ft.)	PID (ppm)	USCS	Recovery	DESCRIPTION
17				
18	0.0	SP	50	
19	0.0	SP	50	CLAYEY SILT/SAND, STA, dry, light reddish brown, no odor,
20				
21	0.0	CL	60	SANDY SILTY CLAY, low, very stiff, dry, light reddish brown and light grey, no odor, very fine grain sand,
22				
23	0.0	CL	90	SANDY SILTY CLAY, STA, no odor,
24				
25	0.0	CL	60	SANDY SILTY CLAY, STA, no odor,
26				
27	0.0	CL	70	SANDY SILTY CLAY, STA, no odor,
28				
29	0.0	CL	60	SANDY SILTY CLAY, STA, no odor,
30				
31	0.0	CL	60	SILTY CLAY, low, firm to stiff, damp, reddish brown, no odor, softer than above,
32				
33	0.0	CL	70	SILTY CLAY, STA, no odor, trace grey clay,
34				
35	0.0	CL	70	SILTY CLAY, STA, no odor, trace grey clay,
36				
37	0.0	CL		SILTY CLAY, STA, no odor,

Completion Results

Well No. BW-5C



DiSorbo
Environmental Consulting Firm

Western Refining SW, Inc
Gallup Refinery
Job No. WEST17020

Geologist	: Tracy Payne
Driller	: Enviro-Drill Inc/Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow Stem Auger 7 1/4"
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 76'
Ground Water	: 68'
Start Date	: 06/19/2017
Finish Date	: 06/21/2017

WELL NO. BW-5C

(Sheet 3 of 4)

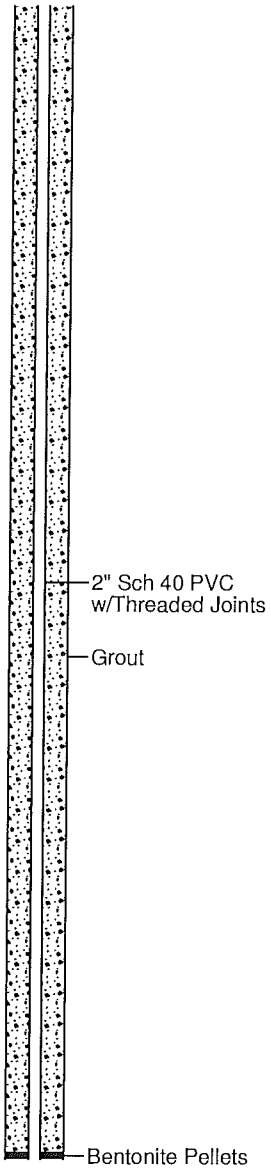
Elev., TOC (ft.msl)	: 6876.85
Elev., PAD (ft. msl)	: 6874.22
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1633279.54
E	: W2542553.04

Saturation
▼ Saturation

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
37	0.0			CL	60		
38							SILTY CLAY, low, stiff to very stiff, damp, reddish brown, no odor,
39	0.0			CL	70		
40							SILTY CLAY, STA, stiff, damp, no odor,
41	0.0			CL	70		
42							SILTY CLAY, STA,
43	0.0			CL	60		
44							SILTY CLAY, STA, calcareous,
45	0.0			CL	60		
46							SILTY CLAY, STA,
47	0.1			CL	60		
48							SILTY CLAY, STA, pink sandstone at base, very dense, dry, no odor,
49	0.0			CL	60		
50							SILTY CLAY, low, stiff, calcareous, dry, reddish brown and grey, no odor,
51	0.0			CL	90		
52							SILTY CLAY, STA, sandstone lense present near base, very dense, white,
53	0.0			CL	60		
54							SILTY CLAY, low, very stiff, dry, reddish brown, occasional grey, no odor,
55	0.0			CL	80		
56							SILTY CLAY, STA, increase in grey clay, no odor,
57	0.0			CL			

Completion Results

Well No. BW-5C



1010 Travis Street
Houston, Texas 77002
713-955-1230

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Austin, Texas 78759
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WELL NO. BW-5C
(Sheet 4 of 4)

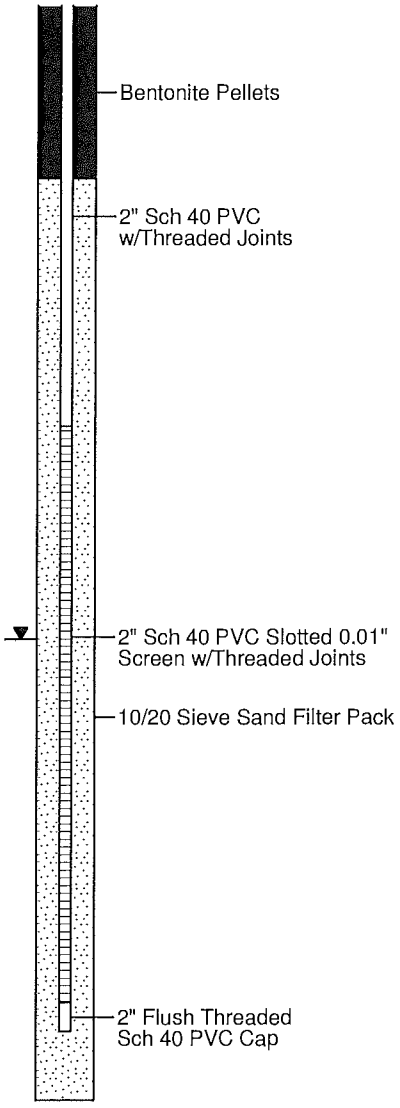
Elev., TOC (ft.msl)	: 6876.85
Elev., PAD (ft. msl)	: 6874.22
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N1633279.54
E	: W2542553.04

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery	Sample	DESCRIPTION
57							
58	0.0			CL	60		
59	0.0				60		SHALE, very dense, damp to saturated in cracks, fissle, light brown and grey, no odor,
60							
61	0.0				50		SHALE, STA, very fine grain sand, dry, brown, no odor,
62							
63	0.0				40		SHALE, STA, sand increases with interbedded clays, dry,
64							
65	0.0			SST	40		SANDSTONE, very dense, fine grain, interbedded with clay lenses, dry, brown,
66							
67	0.0			SST	40		SANDSTONE, STA, interbedded with clay, damp in fractures, weathered, soft, micaceous, light purple brown,
68		▼					
69	0.0			SP	80		SAND, fine to medium, loose, saturated, brown,
70				SP	80		SILTSTONE, dense, dry/damp, brown,
71				SST	80		SANDSTONE, firm/dense, damp to moist, grey, no odor,
72				SST	20		SANDSTONE, STA, moist,
73				SST	10		SANDSTONE, STA, moist,
74							
75				SST	10		SANDSTONE, STA, moist, shale at base, stiff, damp, dark grey to black.
76							
77							

Saturation
▼ Saturation

Completion Results

Well No. BW-5C



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Austin, Texas 78759
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FIGURES

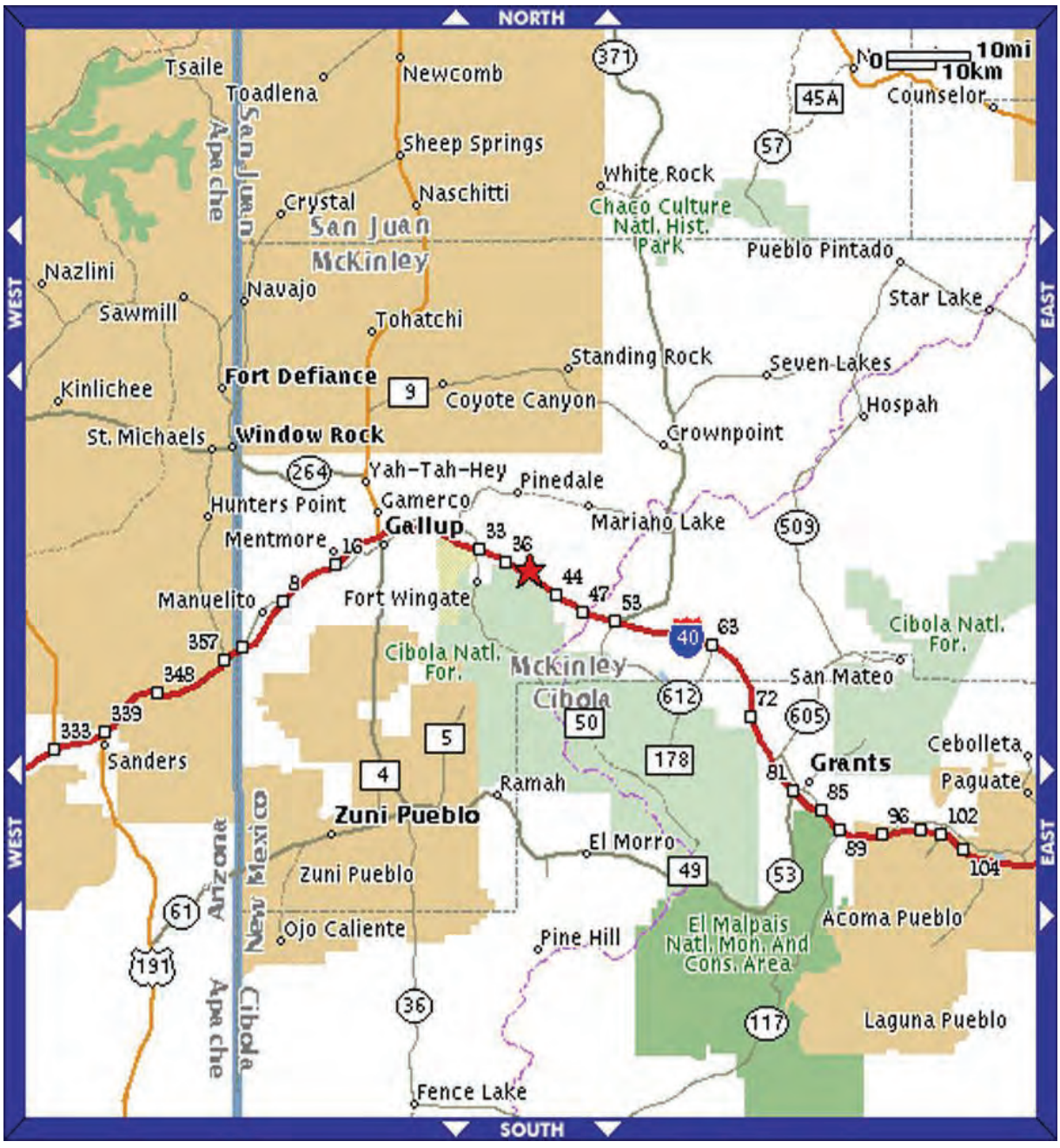


Figure 1: Regional map showing the location of the Gallup Refinery (red star along Interstate-40, 20 miles east of the City of Gallup).

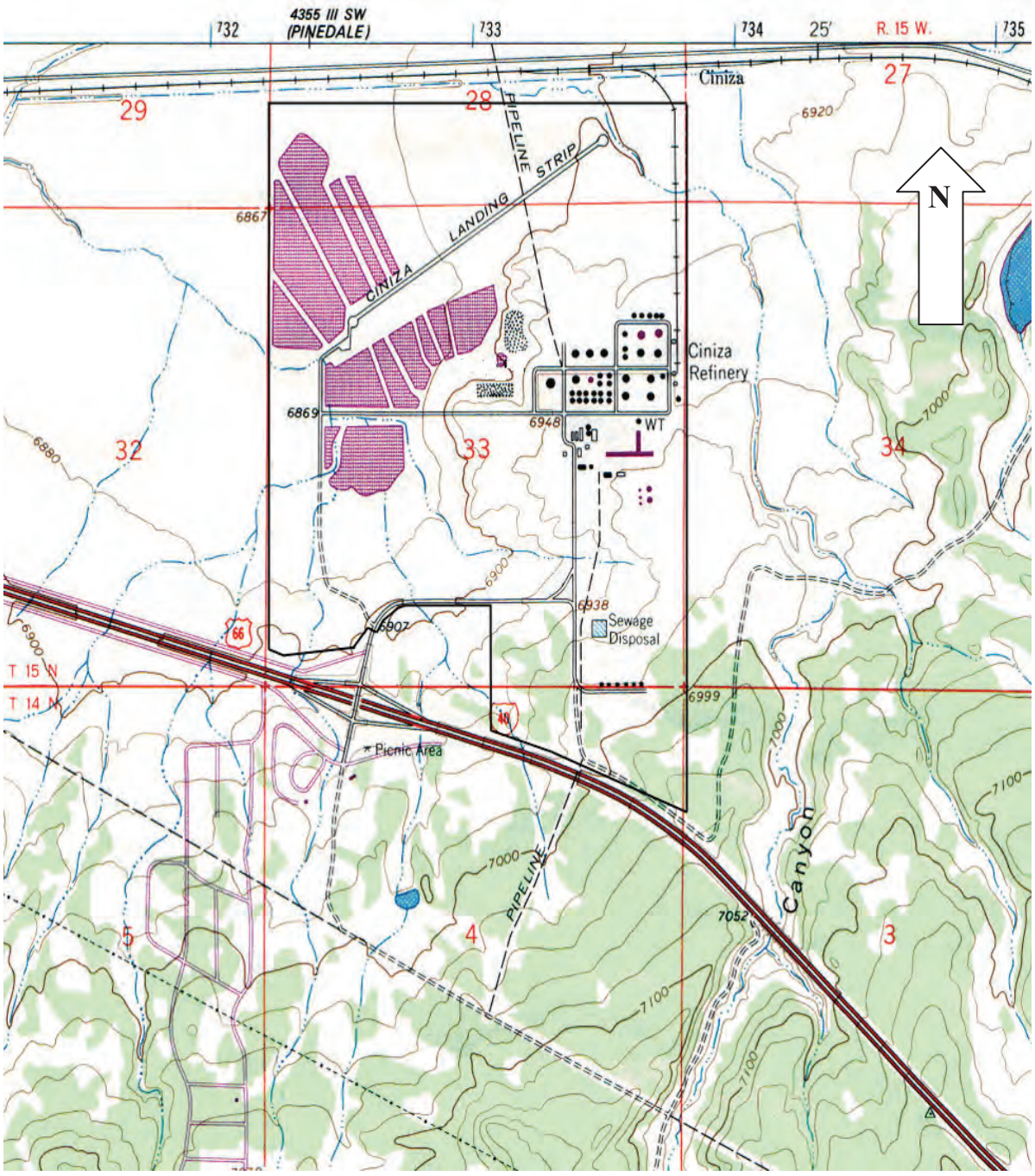


Figure 2: Topographic Map of the Gallup Refinery Site - USGS Topographical Map - Gallup Quadrangle (Revised 1980)

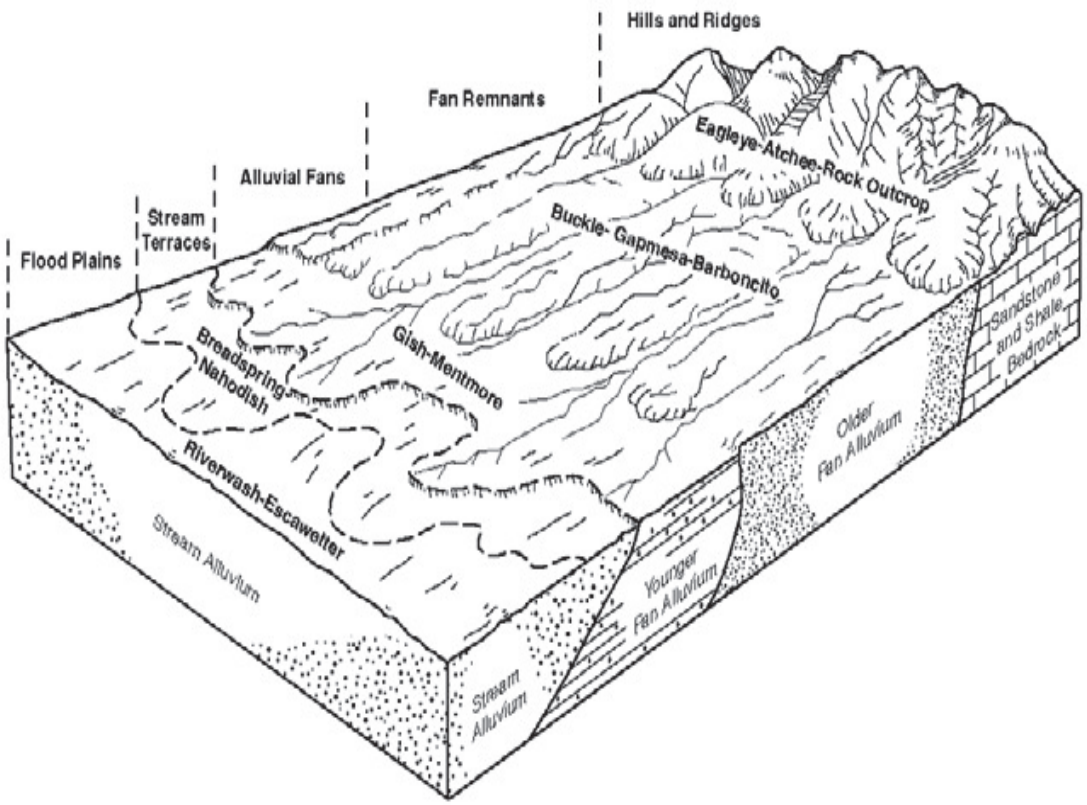
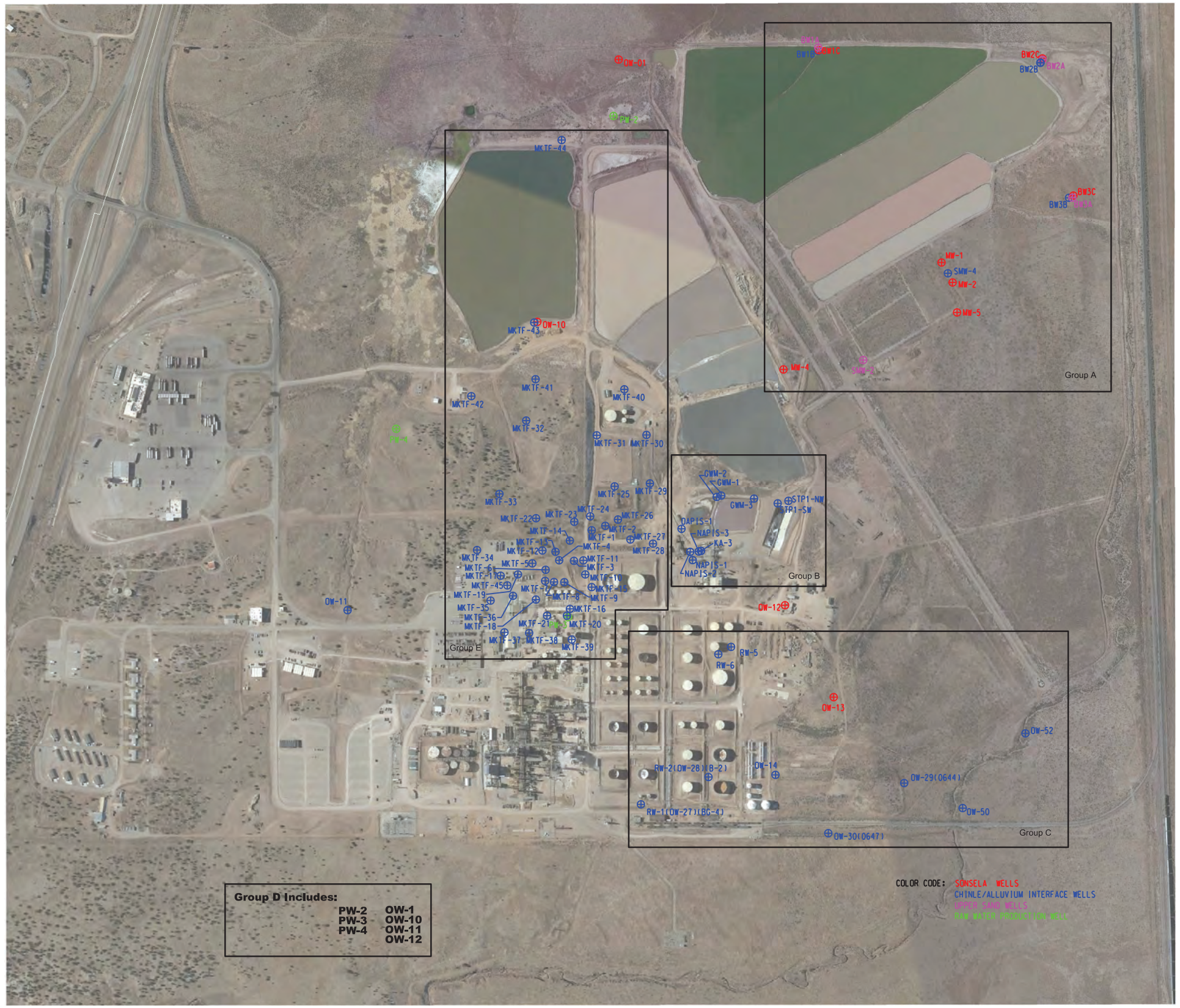


Figure 3: Generalized relationship of soils in the Gallup Refinery area: from NRCS/USDA Soil Survey of McKinley County.



4601 Ripley
El Paso, Texas
79922
915-584-1317

1"=500'

Project #: 0625859

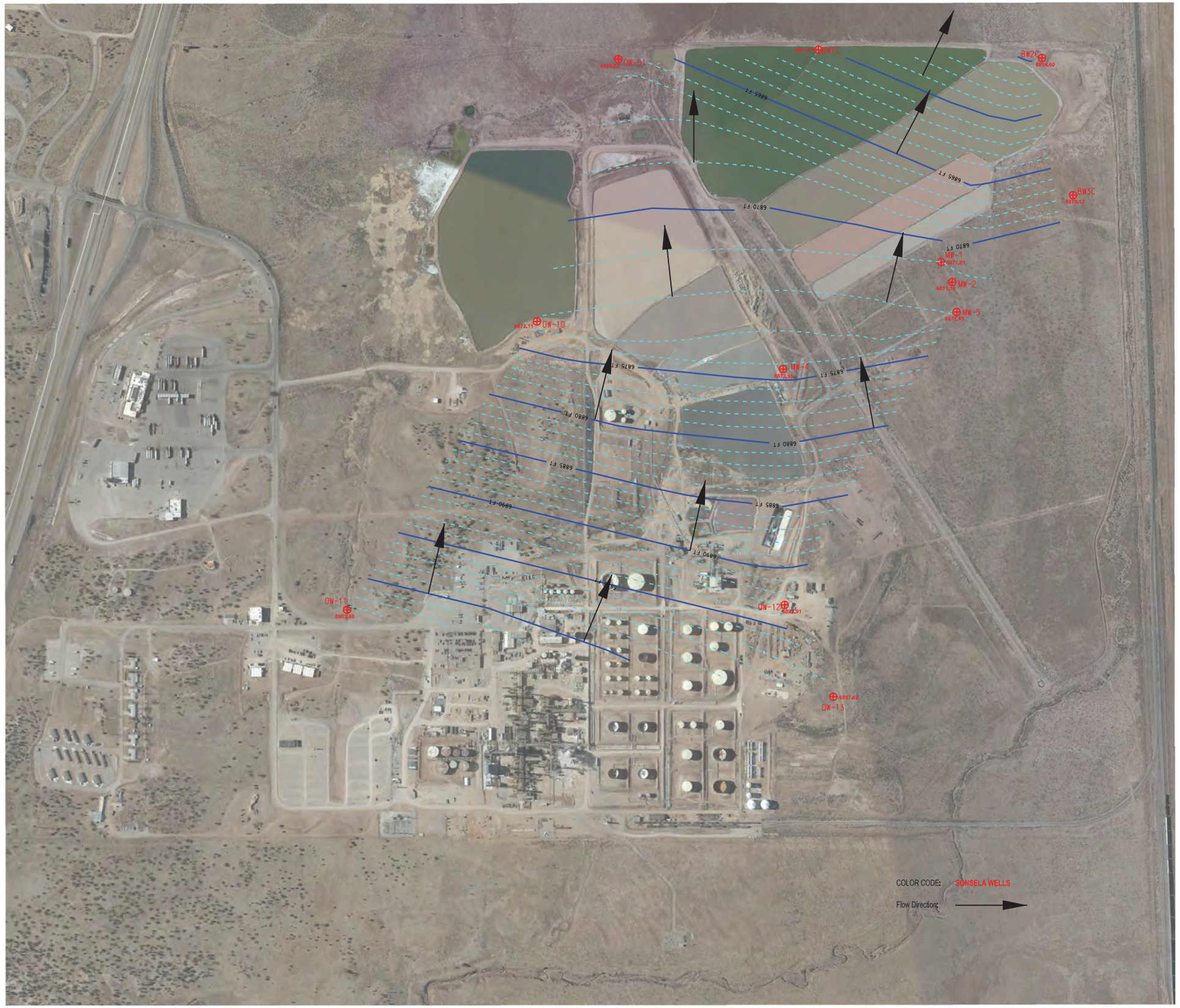
Figure 4

FACILITIES AND WELL GROUPS

WESTERN REFINING - GALLUP REFINERY

Western Refining - Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87347

Date: February 26, 2015



4601 Ripley
El Paso, Texas
79922
915-584-1317

1"=500'

Project #: 0625859

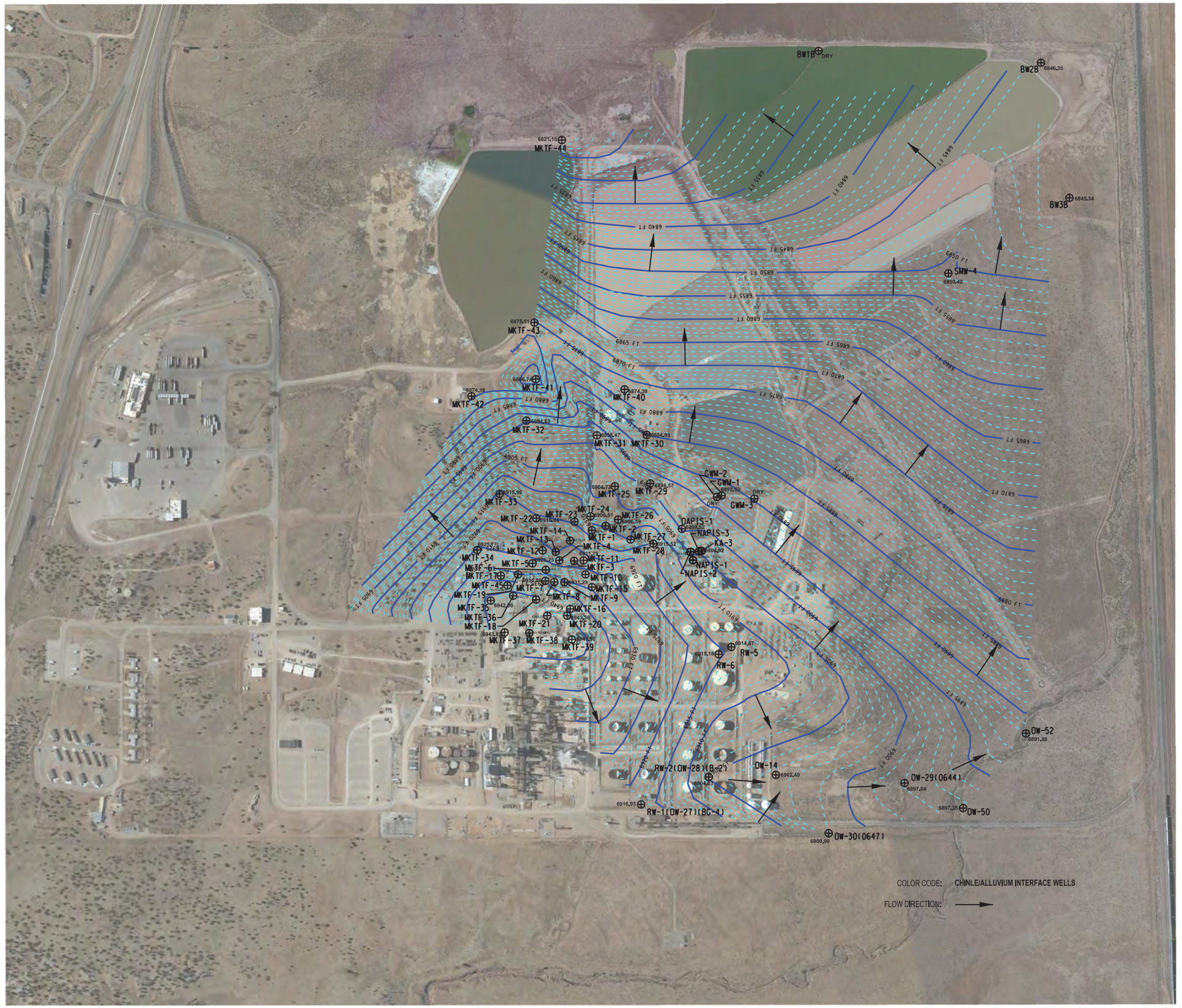
Figure 5

Sonsela Water Elevation Map 2014

WESTERN REFINING - GALLUP REFINERY

Western Refining - Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87347

Date: February 26, 2015



psi
4601 Ripley
El Paso, Texas
79922
915-584-1317

1"=500'

Project #: 0625859

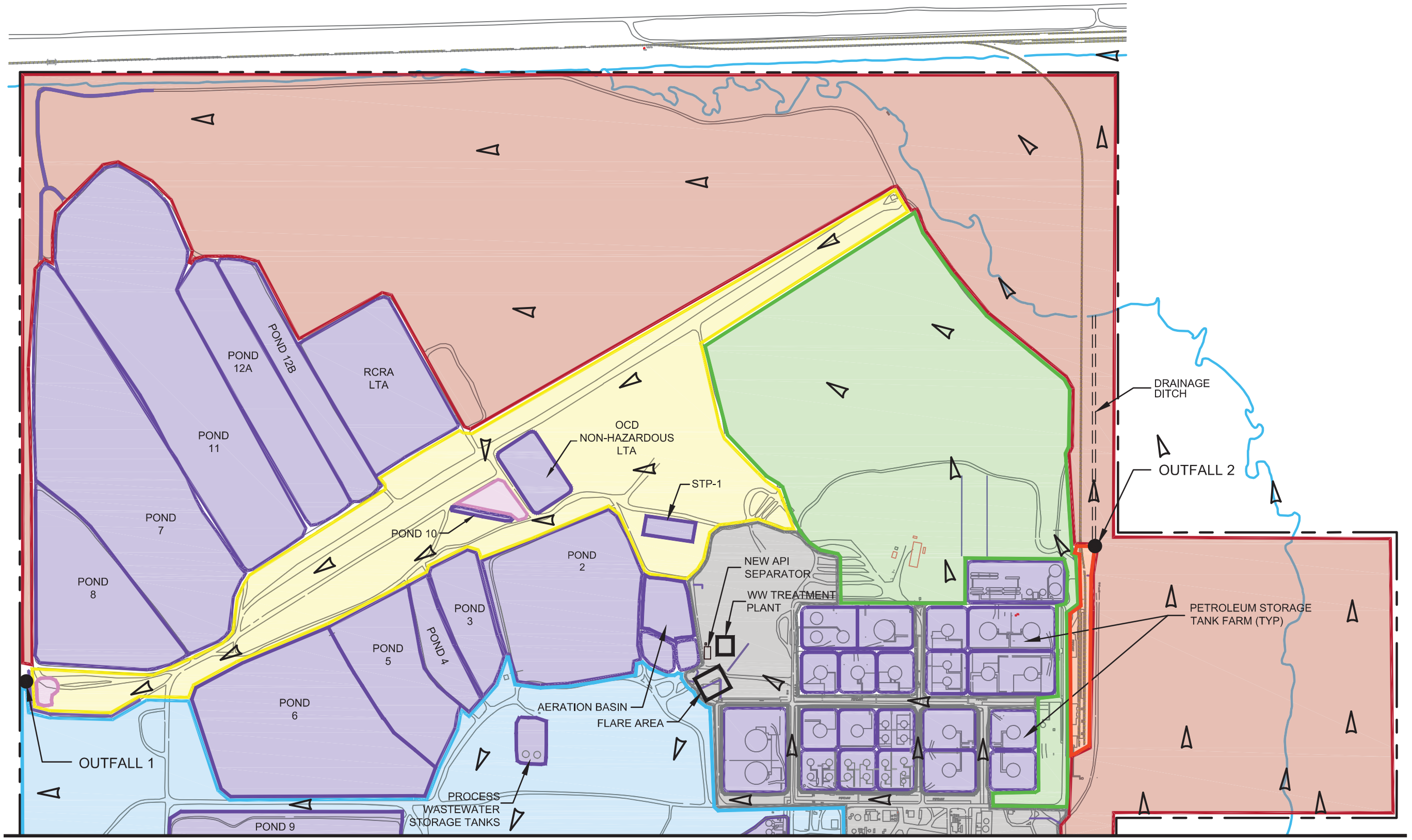
Figure 6

Alluvium/Chinle Gp Interface Water Elevation Map

WESTERN REFINING - GALLUP REFINERY

Western Refining - Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87347

Date: February 26, 2015



MATCHLINE SEE SHEET 2

LEGEND

- CONTAINED/BERMED AREA NO STORMWATER RUN OFF DISCHARGED TO ANOTHER POINT
- AREA CONTRIBUTING FLOW TO OUTFALL 2
- DRAINS TO "GRASSY AREA" DOES NOT LEAVE SITE
- STORMWATER COLLECTION BASIN
- PROCESS AREA–STORMWATER DRAINS TO AERATION BASIN
- AREA DISCHARGING DIRECTLY INTO THE TRIBUTARY OF THE SOUTH FORK RIO PUERCO LOCATED ALONG WEST BOUNDARY OF PROPERTY
- AREA DISCHARGING DIRECTLY INTO THE TRIBUTARY OF THE SOUTH FORK RIO PUERCO LOCATED ALONG NORTH AND EAST BOUNDARY OF PROPERTY
- AREA CONTRIBUTING FLOW TO OUTFALL 1
- DRAINAGE CHANNEL/WATER
- PROPERTY BOUNDARY
- EARTHEN BERM
- FLOW DIRECTION
- PIPED RUN–ON FROM ADJACENT PROPERTY

NOTES

TOTAL PROPERTY AREA – 880 ACRES

LOCATION OF POTENTIAL POLLUTANTS AND SIGNIFICANT MATERIALS CAN BE FOUND IN FIGURE B – PLANT LAYOUT

N

250 0 250 500
scale feet
HORIZ: 1"=250' VERT: N/A

REVISIONS:

AMEC Environment & Infrastructure, Inc.
4600 E. WASHINGTON STREET, STE 600
PHOENIX, ARIZONA 85034
PHONE: 602.733.6000
FAX: 602.733.6100
amec foster wheeler

STORMWATER POLLUTION PREVENTION PLAN
FIGURE 7 SITE PLAN

WESTERN REFINING
GALLUP REFINERY
Gallup, NM

PROJECT:

DRAWN BY: HMR
CHECKED BY: EL
DATE: 8-27-13

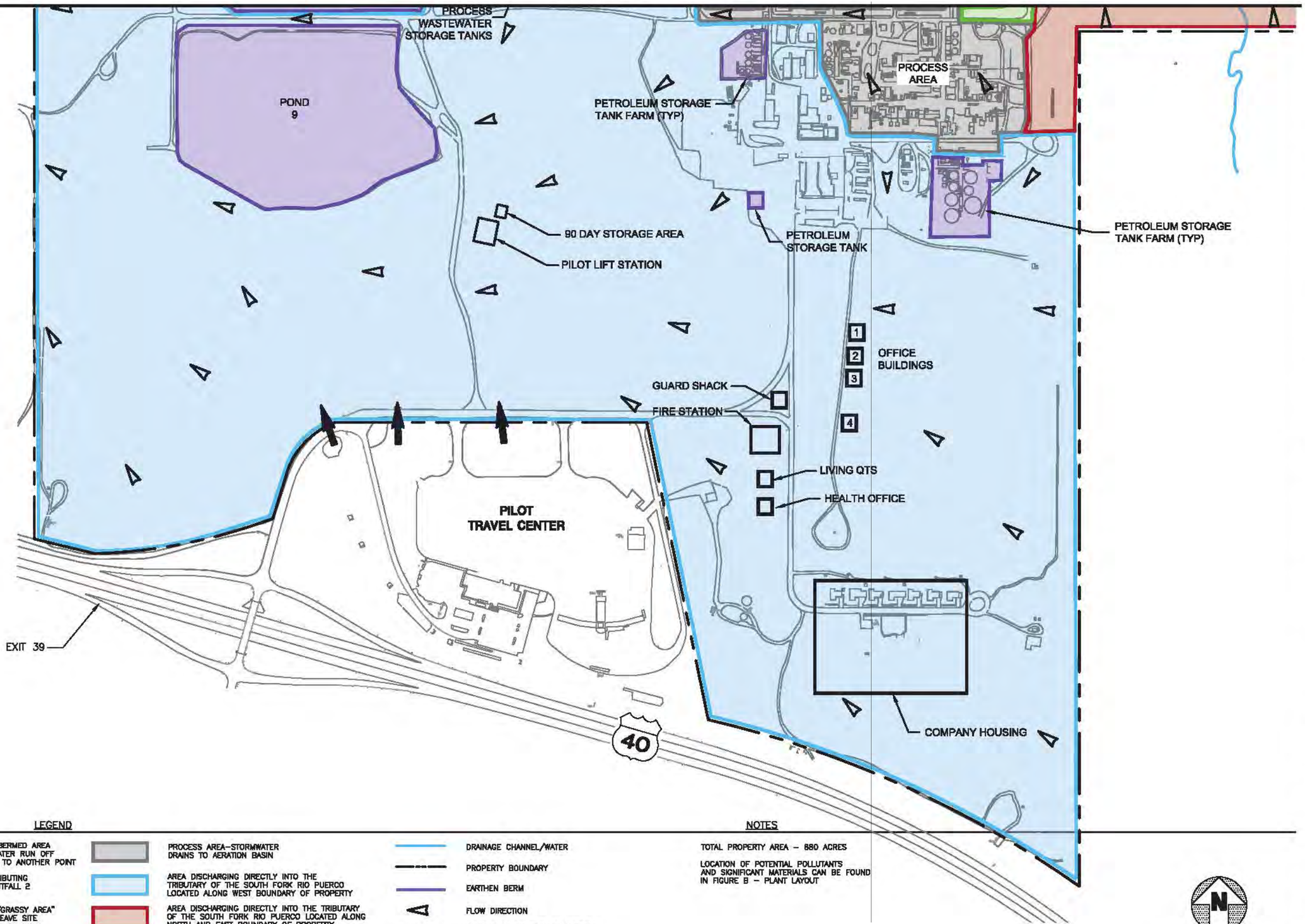
PROJECT NO.
15-2013-3010

SWPPP-01

SHEET NO.
1
of 2

File: C:\Users\brandy.rodriguez\appdata\local\temp\AcPublish_4432\Stormwater Maps.dwg

MATCHLINE
SEE SHEET 1



LEGEND

- CONTAINED/BERMED AREA NO STORMWATER RUN OFF DISCHARGED TO ANOTHER POINT
- AREA CONTRIBUTING FLOW TO OUTFALL 2
- DRAINS TO "GRASSY AREA" DOES NOT LEAVE SITE
- STORMWATER COLLECTION BASIN
- PROCESS AREA–STORMWATER DRAINS TO AERATION BASIN
- AREA DISCHARGING DIRECTLY INTO THE TRIBUTARY OF THE SOUTH FORK RIO PUERCO LOCATED ALONG WEST BOUNDARY OF PROPERTY
- AREA DISCHARGING DIRECTLY INTO THE TRIBUTARY OF THE SOUTH FORK RIO PUERCO LOCATED ALONG NORTH AND EAST BOUNDARY OF PROPERTY
- AREA CONTRIBUTING FLOW TO OUTFALL 1
- DRAINAGE CHANNEL/WATER
- PROPERTY BOUNDARY
- EARTHEN BERM
- FLOW DIRECTION
- PIPED RUN–ON FROM ADJACENT PROPERTY

NOTES

TOTAL PROPERTY AREA – 880 ACRES

LOCATION OF POTENTIAL POLLUTANTS AND SIGNIFICANT MATERIALS CAN BE FOUND IN FIGURE B – PLANT LAYOUT

N

250 0 250 500
scale feet
HORIZ: 1"=250' VERT: N/A

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PHOENIX, ARIZONA 85034
PHONE: 602.733.6000
FAX: 602.733.6100
amec foster wheeler

STORMWATER POLLUTION PREVENTION PLAN
FIGURE 7 – SITE PLAN

PROJECT: WESTERN REFINING
GALLUP REFINERY
Gallup, NM

DRAWN BY: HMR
CHECKED BY: EL
DATE: 6-27-13

PROJECT NO.
15-2013-3010

SWPP-02

SHEET NO.
2
of 2

File: C:\Users\brandy.rodriguez\appdata\local\temp\AcPublish_4432\Stormwater Maps.dwg

Comment Number	NMED Comment	Gallup Refinery Response	2018 Work Plan Section
1	[2016 Work Plan (HWB-WRG-16-003)] The titles for several sections (e.g., Sections 2.4.1 and 2.4.2) are missing from the 2016 Work Plan. However, these errors were corrected in the 2017 and 2018 Work Plans. No revisions are necessary.	None required.	n/a
2	[2016 Work Plan (HWB-WRG-16-003)] Comment 7.b in the July 24, 2015 Approval with Modifications states, "[t]he Permittee may discontinue sampling for SVOCs, but must add analysis for ORO and DRO-extended [for groundwater monitoring wells BW-lA, BW-IB, BW-lC, BW-2A, BW-2B, BW-2C, BW-3A, BW-3B, BW-3C]." The approved analytical suites for these wells (major cations/anions, VOC, WQCC metals, GRO/DRO extended) are appropriately updated in Appendix B Table 1 and Table 2 in the 2018 Work Plan; however, discontinuation of SVOCs analysis is not addressed in the table. Similarly, Comments 7.c and 7.d allow discontinuation of SVOC analysis for the OW wells. The change (elimination of SVOC analysis) must be addressed in the revised 2018 Work Plan.	The change to remove the SVOC analysis did not occur from the 2017 Work Plan to the 2018 Work Plan and therefore was not identified as a requested or approved change in the 2018 Work Plan. As noted by NMED, the approval for this change occurred on July 24, 2015 and as such was previously updated in Appendix B-Table 2 of the 2016 Work Plan. The 2018 Work Plan (Appendix B-Table 2) carries forward the same sampling requirements for these wells as included in the previous work plan; however, an entry was added to Table 2 to note the SVOCs were previously removed in 2016 pursuant to the July 24, 2015 approval.	App B - Table 2
3	[2016 Work Plan (HWB-WRG-16-003)] Comment 12.b in the July 24, 2015 Approval with Modifications states, "[t]he Permittee lists "DRY" for several wells and "0.00" for several other wells. For the wells with 0.00 reported in the Depth to Water (ft) column, there are groundwater elevations listed in the Groundwater Elevation (ft) column. A reading of 0.00 indicates that groundwater is at the top of the well casing. NMED suspects that 0.00 is not an indicator that groundwater is at the top of casing. Either explain the difference between a dry well and a well with 0.00 recorded for the depth to water (ft) or revise the table to display the correct data." Neither explanation or revision is found in Appendix C-1, Annual, Quarterly Measurements in the 2016 Work Plan; however, the discrepancy was corrected in the 2018 Work Plan. No revisions are necessary.	None required.	n/a

Comment Number	NMED Comment	Gallup Refinery Response	2018 Work Plan Section
4	[2017 Work Plan (HWB-WRG-17-005)] In Section 6.3.2 of the 2016 Annual Groundwater Monitoring Report (2016 Report), dated August 31, 2017, the Permittee states, "BTEX, DRO, ORO, and MRO constituents have not been detected in either OW-50 or OW-52 since 2010 through 2016, however a low concentration of MTBE was detected in both wells in 2016 (Tables 8.5 and 8.5.1)." Current sampling frequency for wells OW-50 and OW-52 is on an annual basis according to Appendix B, Table 1, Groundwater Monitoring Schedule in the 2017 Work Plan. However, MTBE is observed in both wells according to the 2016 Report; therefore, the wells must be monitored more frequently. Future groundwater monitoring and sampling for wells OW-50 and OW-52 must be conducted on a quarterly basis. Update the sampling frequency in the revised 2018 Work Plan accordingly.	Section 6.1 and Appendix B-Tables 1 and 2 have been updated to reflect a change to quarterly sampling at OW-50 and OW-52.	Section 6.1, App B - Table 1 and 2
5	[2017 Work Plan (HWB-WRG-17-005)] In Section 6.1, Modifications to Sampling Plan, the Permittee states, "[t]he following are required changes to the Facility Wide Groundwater Monitoring Work Plan taken from NMED correspondence (HWB-WRG-14-006), Approval with Modifications Annual Facility Wide Groundwater Monitoring Report: Gallup refinery 2013, dated May 18, 2006." The correspondence is dated May 18, 2016. In addition, the Permittee states, "Comment 6: Permittee must sample the EP-2 inlet on a quarterly basis to monitor the level of benzene being discharged from STP-2 to EP-2." The discharge is from STP-1, not STP-2. The errors were corrected in the 2018 Work Plan. No revisions are necessary.	None required.	
6	[2018 Work Plan (HWB-WRG-18-002)] The Permittee included a red-line strikeout version with the 2018 Work Plan. A red-line strikeout version is only required to be submitted with a revised document. The 2018 Work Plan was a first-time submittal. Generally, when NMED disapproves a document, it must be re- submitted as a revised document with a red-line strikeout version that illustrates where all changes to text, tables and figures were made to aid in review of the revised document. When the revised 2018 Work Plan is submitted pursuant to this correspondence, the Permittee must submit a red-line strikeout version showing the revisions to the Work Plan along with the revised 2018 Work Plan.	Permittee acknowledges such direction.	n/a

Comment Number	NMED Comment	Gallup Refinery Response	2018 Work Plan Section
7	[2018 Work Plan (HWB-WRG-18-002)] In Section 1.1, Scope of Activities, the Permittee states, "[t]his plan also includes sampling requirements for the evaporation ponds and for the effluent from the sanitary treatment pond." The facility is divided into five groups (Group A, B, C, D and E) for periodic monitoring; however, evaporation ponds are not categorized. Revise the 2018 Work Plan to include the evaporation ponds as a monitoring group (i.e., Group F).	The discussion on monitoring at the evaporation ponds and effluent from the sanitary treatment pond has been moved into a new Group F. This is reflected in the Executive Summary (page iii), Section 1.1, Section 5.0, and the removal of Section 5.2 Evaporation Ponds and Outfall with the content moved to Section 5.1 Group A Through Group F.	Exec. Summary, Section 1.1, Section 5.0, Section 5.1
8	[2018 Work Plan (HWB-WRG-18-002)] In Section 1.2, Facility Ownership and Operation, the owner and operator are listed as Permittee Refining. During the May 2, 2018 meeting, the Permittee notified NMED that the owner had changed. Accordingly, update the owner and operator information in the revised 2018 Work Plan.	At this time, the names of the owner and operator remain unchanged. The proposed name change to Andeavor has been canceled. The Marathon merger has been announced, but not completed.	n/a
9	[2018 Work Plan (HWB-WRG-18-002)] In Section 2.1, Historical Site Use, the Permittee states, "[t]he clarified water is routed to the new waste water treatment plant (WWTP) where benzene is removed and the treated water flows into the new pond STP-1. STP-1 consists of two bays, north and south and each bay is equipped with five aerators per bay. Effluent from STP-1 then flows into Evaporation Pond 2 and gravitated to the rest of the ponds." The new waste water treatment plant (WWTP) uses granular activated carbon (GAC) to remove organic constituents from wastewater; however, it is not clear how the Permittee determines the timing of contaminant breakthrough from the GAC. Discuss in the revised Work Plan how the timing of breakthrough is monitored and whether the carbon is either replaced with fresh or virgin carbon, or removed, reactivated at high temperatures and returned to the vessel when the GAC is exhausted and constituents begin to break through. Water samples are collected at the pond EP-2 inlet on a quarterly basis; however, the sampling frequency may not be sufficient to monitor the timing of breakthrough from the GAC system. Revise the sampling frequency in the revised 2018 Work Plan to correspond to the observed breakthrough frequency.	There are two GAC canisters placed at the effluent from the Dissolved Gas Flotation (DGF) unit that are utilized to remove the organic constituents from wastewater discharging into STP-1. Wastewater treatment plant operations alternate the configuration of these GAC canisters from a single setup to an in-series setup (primary and secondary canister). To help monitor the breakthrough of these GAC canisters, several water samples are taken at the effluent from the end GAC canister. Specifically, wastewater treatment plant operations take three samples per shift (day shift samples are taken at 8:00 am, 12:00 pm, 4:00 pm and night shift samples are taken at 8:00 pm, 12:00 am and 4:00 am). These samples are sent to Permittee's internal lab for analysis of benzene, toluene, ethylene and xylene (BTEX). In addition to the aforementioned samples, another daily sample is taken around 8:00am at the effluent from the end GAC canister and sent to an off-site lab for analysis. Specifically, a single daily grab sample of wastewater effluent from the end GAC canister is sent to Hall Analytical Lab to be analyzed for the following parameters: DRO-extended, benzene, toluene, ethylbenzene, total xylenes, general chemistry, and pH. Results from benzene analysis of the daily BTEX samples sent to Permittee's internal lab are monitored to manage the breakthrough from the GAC canisters. When benzene values exceed 0.4 ppm, one or more of the following actions are taken: GAC canister configuration is modified to an in-series set-up (primary and secondary canister); GAC canister is replaced with fresh carbon; GAC canister effluent is recirculated to the API. Before revising the sampling frequency per the above-mentioned breakthrough monitoring, Permittee requests such sampling be discussed with NMED during the next quarterly progress meeting that is scheduled to be held on September 19, 2018.	Section 2.1

Comment Number	NMED Comment	Gallup Refinery Response	2018 Work Plan Section
10	[2018 Work Plan (HWB-WRG-18-002)] In Section 2.2, Potential Receptors, the Permittee states, "[c]urrently, PW-2 is sampled every three years, PW-4 is sampled semi-annually and PW-3 is sampled on an annual basis. Annual sampling results from 2009 through 2016 have indicated no detections of volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs) above screening levels." In Section 6.4.1 of the 2016 Report, the Permittee states, "[t]here were a total of five organic constituents detected in PW-3 all at concentrations below the applicable standards in 2016 ... 10 organic compounds were detected at concentrations levels below the applicable standards in PW- 4." Revise the statement regarding the VOC detections in the revised 2018 Work Plan. In addition, the number of constituent detections is increasing and the water from these wells is used for human consumption; therefore, the contaminant concentrations must be monitored more frequently. Both wells PW-4 and PW-3 must be sampled on a quarterly basis to monitor for changes in VOC detections and concentrations. Propose the change in sampling frequency in the revised 2018 Work Plan.	The statement in Section 2.2 has been revised to reflect the number of detections above screening levels. Sulfate, iron, phenol, and tetrachloroethene have been detected above screening levels. Section 6.1 and Tables 1 and 2 in Appendix B have been revised to increase the monitoring frequency at PW-3 and PW-4.	Section 2.1, Section 6.1, App B - Table 1 and 2
11	[2018 Work Plan (HWB-WRG-18-002)] In Section 2.3, Type and Characteristics of the Waste and Contaminants and Any Known and Possible Sources, the Permittee states, "[d]ry wastes could stem from wind-blown metallic powders used as catalysts, and regular municipal solid wastes stored in covered containers destined for municipal landfills." Provide information as to what metals are used as catalysts in the refining process at the facility and describe how wastes stored in covered containers could be a source (e.g., leaks, spills) in the revised 2018 Work Plan.	Covered containers are not possible sources and the discussion in Section 2.3 has been revised accordingly. Based on the manner in which the refinery manages catalyst, there is not a potential for metallic powders to be wind-blown. Fresh and spent catalyst is stored in closed containers, with the exception of the removal and refilling process. Small amounts of catalyst inadvertently spilled to the ground surface during the removal or refill process is immediately cleaned up, placed in appropriate disposal containers and sent for proper disposal. The revised 2018 Work Plan has been revised to remove the statements related to wind-blown powders from catalyst.	Section 2.3
12	[2018 Work Plan (HWB-WRG-18-002)] In Section 2.4.1, Separate Phase Hydrocarbons (SPH), the Permittee states, "Separate-Phase Hydrocarbons (SPH) floating on shallow ground water has been found at the northeast end of the facility." The presence of SPH is not limited to the northeast end of the facility; revise the 2018 Work Plan to identify the presence of SPH across the facility (e.g., MKTF wells).	The discussion in Section 2.4.1 has been revised to explain the presence of SPH in other areas of the refinery.	Section 2.4.1

Comment Number	NMED Comment	Gallup Refinery Response	2018 Work Plan Section
13	[2018 Work Plan (HWB-WRG-18-002)] In Section 2.4.1, Separate Phase Hydrocarbons (SPH), the Permittee states, "[r]ecovery through hand-bailing continues on a quarterly basis indicating that the volume of SPH has continued to drop substantially from year to year in several of these recovery wells. In 2016, only Recovery Well (RW-1) and GMW-1 had measurable levels of hydrocarbons." Although the volume of SPH recovery may have dropped, SPH has not likely been eliminated. The screened intervals for some wells are submerged and these wells cannot properly assess the presence of SPH (e.g., RW-2). During the May 2, 2018 meeting, the Permittee asserted that well RW-2 was installed in artesian conditions; therefore, it was screened below the confining layer and the position of the screened interval was appropriate. However, most confined aquifers are not totally isolated from sources of vertical recharge, often referred as a semipermeable or leaky confining layer. Well RW-2 is most likely installed in a leaky confined aquifer. SPH will accumulate at the water table in a leaky confined aquifer. Well RW-1 also may exhibit the conditions of a leaky confined aquifer. In order to assess the presence of SPH at the site, wells must be screened across the water table. Furthermore, the elevated benzene, toluene, ethylbenzene and xylenes (BTEX) concentrations in groundwater samples collected from wells RW-2, OW-57 and OW-58 in September 2016 suggest potential presence of SPH. Correct the statements in the revised 2018 Work Plan.	NMED's direction to "[C]orrect the statements in the revised 2018 Work Plan" is somewhat vague as to exactly which statements NMED is referring; however, the discussion regarding the presence of SPH in Section 2.4.1 has been revised to more accurately reflect the presence of SPH.	Section 2.4.1
14	[2018 Work Plan (HWB-WRG-18-002)] In Section 2.4.2, Methyl Tert Butyl Ether (MTBE), five new monitoring wells (OW-53, OW-54, OW-55, OW-57, and OW-58) are listed as observation wells. These wells have not been included in the previous groundwater monitoring plans. Revise the 2018 Work Plan to indicate that the wells are newly added to the monitoring plan. In addition, well boring logs for OW-57 and OW-58 are included in Appendix D; however, the logs for OW-53, OW-54 and OW-55 are not included. Provide well boring logs and well construction diagrams for OW-53, OW-54 and OW-55 in the revised 2018 Work Plan. If these well boring logs and construction diagrams were previously submitted, provide a reference to the submittal. The Permittee must submit a well completion report for each new well installed at the facility or must include the information in the associated investigation report.	Wells OW-53, OW-54, OW-55, OW-56, OW-57, and OW-58 were included in Appendix B, Table 2 of the 2017 Monitoring Plan to request they be added to the monitoring schedule. We assume per NMED's comment the wells are approved for inclusion. The inclusion of the new wells is discussed in the Executive Summary (page iii), Section 2.4.2 and a new Section 2.4.6 – OW-14 Source Area. The boring/well completion logs for OW-53, OW-54, and OW-55 have been added to Appendix D. It was noted that well OW-56 was left out of the listing of wells in Section 2.4.2 and this is corrected. Also, the reference to OW-57 and OW-58 has been removed from the list of wells in Section 2.4.2 as they are now discussed in new Section 2.4.6.	Exec. Summary Section 2.4.2, Section 2.4.6 App B - Table 2

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15	[2018 Work Plan (HWB-WRG-18-002)] In Section 2.4.5, North Drainage Ditch, the Permittee states, "[a]n investigation work plan was submitted to NMED for review on August 13, 2015 and was subsequently implemented in May 2016 with installation of well OW-56." Although the Permittee states that investigation was implemented in 2016, the investigation report has not been submitted and reviewed by NMED. The Permittee must submit the investigation report no later than **August 17, 2018**.	The report will be submitted as requested by NMED.	n/a
16	[2018 Work Plan (HWB-WRG-18-002)] In Section 3.2, Drainages, storm water flow paths and drainage locations are described. However, it is difficult to understand the description without a figure. In order for readers to understand the description, provide a figure showing the flow paths and drainage locations in the revised 2018 Work Plan.	A new Figure 7 has been added to show the surface drainage flow paths.	Figure 7
17	[2018 Work Plan (HWB-WRG-18-002)] In Section 4.1, Ground Water Sampling Methodology, the Permittee states, "Appendix C-2 includes [a] well elevation summary for all the Marketing (MKTF) wells which includes date of establishment, ground elevation, top of casing elevation, well casing stick-up length, well depth, screening intervals and stratigraphic units in which the wells are located." Appendix C-1.1 includes well elevation and groundwater measurement data for MKTF wells. Appendix C-2.1 similarly includes well elevation data for MKTF wells. Appendix C-2.1 appears to be redundant; remove Appendix C-2.1 from the revised 2018 Work Plan or explain the purpose for Appendix C-2.1. In addition, Appendix C-2 does not include well elevation summary for MKTF wells. Appendix C-2 includes the elevation summary for all wells except the MKTF wells. Revise the 2018 Work Plan accordingly.	There is only one column of information (measuring point description) that is unique to Table C-2.1, thus this information has been added as a footnote to Table C-1.1 and Table C-2.1 has been removed. The description of Appendix C-2 has been revised in Section 4.1.	Section 4.1 App C, Table C-1.1
18	[2018 Work Plan (HWB-WRG-18-002)] In Section 4.1, Ground Water Sampling Methodology, the Permittee states, "[n]o changes were made to Tables in C-2 and C-2.1 for 2016 as there were no new monitoring wells added to the list." Appendix C-2 includes several wells that were installed in 2016 and 2017. These wells were added to the table in Appendix C-2. Revise the statement in the 2018 Work Plan accordingly.	The statement has been revised to reflect the addition of new wells installed in 2016 and 2017.	Section 4.1

Comment Number	NMED Comment	Gallup Refinery Response	2018 Work Plan Section
19	[2018 Work Plan (HWB-WRG-18-002)] In Section 4.1.2, Well Purging, the Permittee states, "[f]ield water quality measurements will include pH, electrical conductivity, temperature, and dissolved oxygen (DO) %." The unit of dissolved oxygen concentration is shown as a percent (%). It is conventional to report the DO concentration with a unit in milligrams per liter (mg/L). Use mg/L when reporting DO values in future reports. Revise the 2018 Work Plan accordingly. In addition, include Oxidation- Reduction Potential (ORP) to the field water quality testing suite in the revised 2018 Work Plan. All water quality parameters must be tabulated and presented in an organized manner in all future groundwater monitoring reports.	The discussion in Section 4.1.2 has been revised to specify DO to be reported in mg/l and we have added ORP to the discussion. ORP has also been added to the list of acronyms. It is noted that ORP was already included Appendix B Tables 1 and 2, thus the change in only Section 4.1.2.	Acronyms Section 4.1.2
20	[2018 Work Plan (HWB-WRG-18-002)] In Section 4.1.2, Well Purging, the Permittee states, "[a]ll purged ground water and decontamination water from monitoring wells will be drained into the refinery waste water treatment system upstream of the NAPIS." Although one of the sewer leaks was repaired in October 23, 2013, unidentified sewer leaks were still present in the sewer system according to the results of the September 2013 and May 2016 dye tests. The Permittee must not discharge wastewater into the sewer system upstream of the New American Petroleum Institute Separator (NAPIS) until the Permittee demonstrates that the sewer system has been adequately repaired. In addition, various organic and metal constituent concentrations in the samples collected from the leak detection units (LDU) exceeded their respective standards in 2016 according to the 2016 Report. These results indicate that the NAPIS has on-going leakage; therefore, the source of the leaks must be identified and repaired in the NAPIS. The Permittee must not dispose any investigation-derived waste (IDW) into the refinery sewer system until the issues are resolved. During the May 2, 2018 meeting, the Permittee indicated to NMED and OCD that the NAPIS was repaired; however, no documentation demonstrating the completion of repairs has been officially submitted. The documentation must be submitted to OCD and NMED by no later than **July 16, 2018.**	The information requested to be submitted to NMED no later than July 16, 2018 documenting repairs to the NAPI was submitted.	n/a

Comment Number	NMED Comment	Gallup Refinery Response	2018 Work Plan Section
21	[2018 Work Plan (HWB-WRG-18-002)] In Section 4.2.1, Sample Handling, the Permittee states, "[c]ollection of containerized ground water samples are in the order of most volatile to least volatile, such as: VOCs, SVOCs, metals, phenols, cyanide, sulfate, chloride, and nitrates." Comment 4 in the Disapproval letter for the 2015 Annual Groundwater Monitoring Report, dated January 31, 2018 states, "[a]ctual nitrate and nitrite concentrations provide valuable information to evaluate groundwater conditions." Further, Comment 11 in the Disapproval letter states, "[f]or all future monitoring, the method must be revised to provide actual and separate nitrate and nitrite concentrations." Revise the analytical suite to include separate analysis for nitrate and nitrite in the 2018 Work Plan.	The references to nitrates in Section 4.2.1, Appendix A, and Appendix B – Table 1 have been changed to nitrate and nitrite. The change is reflected in Section 6.1.	Section 4.2.1 Section 6.1 App A App B - Table 1
22	[2018 Work Plan (HWB-WRG-18-002)] In Section 5.2.1, Sampling Locations, "Boiler Water Inlet to EP-2" is indicated as one of the outfall sampling locations. However, the record indicates that boiler water is no longer discharged to pond EP-2. Provide clarification whether the water is still discharged to pond EP-2; otherwise, revise the 2018 Work Plan accordingly.	Boiler Reverse Osmosis (RO) water is discharged into EP-2, thus Section 5.2.1 (now Section 5.1) has not been revised to remove the reference to the sampling location for the boiler water inlet. Appendix B, Table 2 has been revised to reflect the RO water discharge.	App B - Table 2
23	[2018 Work Plan (HWB-WRG-18-002)] In Section 6.1, Requests for Modifications, the separate analysis for nitrate and nitrite addressed in Comments 4 and 11 in the January 31, 2018 Disapproval letter was not included. The Permittee must individually report the concentrations of nitrate and nitrite. Revise the 2018 Work Plan to include the modification. Refer to Comment 21.	As described above in the response to Comment 21, the Work Plan has been revised to include analyses for both nitrate and nitrite.	Section 6.1

Comment Number	NMED Comment	Gallup Refinery Response	2018 Work Plan Section
24	[2018 Work Plan (HWB-WRG-18-002)] In Section 6.1, Requests for Modifications, all changes that were made to the previous sampling plan must be presented. Some changes are not addressed in Section 6.1. For example, several new wells (e.g., OW-60) were added to the 2018 Work Plan. However, the changes were not discussed in this section. All proposed monitoring schedule and modifications must be discussed. Appendix B, Table 2, Requested/Approved Changes to the Ground Water Monitoring Schedule, lists these new wells. Rationale for the requested changes is provided in Appendix B, Table 2; however, the description lacks detail and is ambiguous. Revise the 2018 Work Plan to include a discussion of all changes that were made from the previous plan.	Additional discussion has been added to Section 6.1 regarding changes from the 2017 Work Plan. NMED references new wells (e.g., OW-60) as being added to the plan and the description provided in Appendix B, Table "lacks detail and is ambiguous." The 2018 Requested Changes column states, "add to monitoring schedule" to explain what is requested. Permittee is requesting to add these new wells to the monitoring schedule. That is the only requested change for the listed wells for which this change is described. In total, it includes BW-4A, BW-4B, BW-5A, BW-5B, BW-5C, OW-59, and OW-60. The rational refers to the fact that the particular well is a "new well." On multiple previous occasions, NMED has specified that all new monitoring/observation wells should be included in the Monitoring Plan and thus Permittee included the new wells. For OW-59 and OW-60, we have further included a specific reference to the exact comment letter in which NMED directed Permittee to add these wells to the Monitoring Plan (NMED Comment 2 – "The new wells must be added to the Facility-Wide Groundwater Monitoring Plan."). We do not understand how the rationale to add new wells could possibly be ambiguous based on the history of this requirement. However, if we have misunderstood and it is not a requirement to add these new wells to the Monitoring Plan, please advise and Permittee will remove them. The duplicate entry for OW-59 and OW-60 was removed in Appendix B Table 2.	Section 6.1 App B - Table 2
25	[2018 Work Plan (HWB-WRG-18-002)] In Section 6.1, Requests for Modifications, the Permittee states, "[p]ursuant to previous discussions and agreement with NMED, the sampling frequency at the MKTF wells is being changed from quarterly to either semi-annual or annual. NMED requested that samples be collected quarterly at the MKTF wells for two years and this requirement has been satisfied. The monitoring data has been reviewed and wells that showing potentially increasing concentration trends and/or are located near the leading edge of the plume have been selected for semi-annual monitoring. The remaining wells have been changed to annual monitoring." In general, contaminant plumes in the vicinity of MKTF wells remain and have been expanding. The proposed reduction in sampling frequency is not appropriate at this time. Groundwater samples must continue to be collected from all MKTF wells on a quarterly basis. Revise the 2018 Work Plan accordingly.	The request to change the monitoring frequency at the MKTF wells has been removed from Section 6.1 and associated revisions made to Appendix B Tables 1 and 2.	Section 6.1 App B - Table 1 and 2

Comment Number	NMED Comment	Gallup Refinery Response	2018 Work Plan Section
26	[2018 Work Plan (HWB-WRG-18-002)] According to the analytical data tables in the 2016 Report, 1,2-dichloroethane (EDC) was detected in the groundwater samples collected from wells OW-50, OW52, OW-13, NAPIS-3, OAPIS-1, and MKTF wells MKTF-01, 04, 18, 19, 23, 27, 33, 34, 40 and 42 in 2016. The Permittee must add analysis for 1,2-dibromoethane (EDB) to all monitoring wells where EDC has been detected. The analysis of EDB for the groundwater samples collected these wells are not included in Appendix, Table 1. The analytical method must be capable of detecting EDB at concentrations less than 0.004 micrograms per liter (e.g., EPA Method 8011). Revise the 2018 Work Plan accordingly.	Appendix B Tables 1 and 2 have been revised to add analyses by method 8011 for OW-13, OW-50, OW-52, NAPI-3, OAPIS-1, and MKTF wells MKTF-01, 04, 18, 19, 23, 27, 33, 34, 40 and 42. References to this comment are included in Table 2 to distinguish between wells for which method 8011 was already included in earlier versions of the monitoring plans.	App B - Table 1 and 2
27	[2018 Work Plan (HWB-WRG-18-002)] According to Table 8.16.3 of the 2016 Report, analysis for total and dissolved metals have not been conducted for samples collected from the STP-1 outfall since 2014. Since several metals concentrations exceed their respective standards in the evaporation ponds, effluent from STP-1 may contain metals. Resume analyses for total and dissolved metals for the samples collected from the STP-1 outfall. Update Appendix B, Table 1 and Table 2 in the revised 2018 Work Plan.	The requested analyses have been included in revised Section 6.1 and Appendix B, Tables 1 and 2.	Section 6.1 App B - Table 1 and 2
28	[2018 Work Plan (HWB-WRG-18-002)] The bromomethane concentrations in the water samples collected from ponds EP-3, EP-12A and EP-12B are recorded as 0.016, 0.04 and 0.038 mg/L, respectively exceeding the standard of 0.00754 mg/L in 2016 according to Table 8.15.4 of the 2016 Report. Since bromomethane is highly volatile, nearly all environmental releases of bromomethane partition into the air. When bromomethane is detected in surface water bodies, pesticides may have been used intensely nearby. Collect water samples from ponds EP-3, EP-12A and EP-12B for pesticides analysis using EPA Method 8081A during the 2018 sampling events. Unless pesticide constituents are detected, the pesticides analysis may be discontinued in 2019. Update the analytical suite in the 2018 Work Plan accordingly.	The analysis for pesticides using method 8081A has been added in Section 6.1 and Appendix B Tables 1 and 2 for ponds EP-3, EP-12A and EP-12B.	Section 6.1 App B - Table 1 and 2
29	[2018 Work Plan (HWB-WRG-18-002)] The Permittee lists "0.00" for wells RW-2, RW-5, and RW-6 in the Depth to SPH column in Appendix C-1, Groundwater Measurements. Correct the typographical errors in the revised 2018 Work Plan.	The reference to 0.00 for the depth to SPH has been changed to N/A to be consistent with the other wells in Appendix C- Tables C-1 and C-1.1. Also, the definition in C-1 for N/A has been changed to “Not Applicable” from Not Available” to avoid possible confusion that the measurement was not available. The fact is the reading is not applicable because no SPH was identified in the well. Appendix C-1.1 already has N/A defined as not applicable.	App C - Table C-1 and C 1.1

Comment Number	NMED Comment	Gallup Refinery Response	2018 Work Plan Section
30	[2018 Work Plan (HWB-WRG-18-002)] In Appendix B, Table 2, the sampling frequency for well OW-56 is not specified. Groundwater samples must be collected from well OW-56 on a quarterly basis. Revise the table accordingly in the 2018 Work Plan.	Appendix B, Table 2 has been revised to show quarterly monitoring at OW-56.	App B - Table 1 and 2
31	[2018 Work Plan (HWB-WRG-18-002)] In Appendix C-1, the screened interval of new well OW-58 is indicated as 38 to 48 feet below ground surface (bgs) while the depth to water was measured as 24.67 feet bgs during the December 2017 gauging event. Although well OW-58 is appropriately positioned to monitor the SPH plume, its screened interval is submerged approximately 12 feet below the water table. Submerged well screens hinder investigation of SPH. Refer to Comment 13. A work plan to install well OW-58 was not submitted to NMED and the Permittee conducted the investigation at risk. Propose to install new well with an appropriate screened interval at the location of OW-58 in a separate work plan. The Work Plan must be submitted no later than August 3, 2018.	The requested work plan will be submitted as requested. It is noted that well OW-58 was installed pursuant to NMED's May 12, 2016 approval with mods of the OW-14 Source Area Investigation Work Plan dated April 2016.	n/a
32	[2018 Work Plan (HWB-WRG-18-002)] Appendix D, Well Boring Logs presents the boring logs for new wells. It should be noted that NMED will conduct a full review of the new well installations when investigation reports and well completion reports are submitted. Review of this report does not constitute review of the newly installed wells.	None required.	n/a