Western Refining
GALLUP

ENTERED

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May 10, 2010

James Bearzi
Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive, East, Building 1
Santa Fe, NM, 87505-6303

Re: **Facility Wide Groundwater Monitoring Work Plan**
Western Refining Company, Southwest, Inc., Gallup Refinery
EPA ID # NMD000333211
HWB-GRCC-0-001

Dear Mr. Bearzi:

Attached is the Gallup revised Facility Wide Groundwater Monitoring Work Plan requested in the Notice of Disapproval dated April 1, 2010.

Comment 1
The permittee has revised section 4.0 and Appendix B to address these comments, pages 22-39 and 47-52.

Comment 2
The permittee has moved text to Appendix B as required – pages 47-52.

Comment 3
The permittee has expanded the surface water sample collection section in Appendix B, page 50.

Comment 4
Repetitive information has been removed.

Comment 5
Large scale maps are being submitted with the revised report.

Comment 6
Figure 5 has been revised – page 21.

Comment 7
Appendix C contains the required table – page 53.

Comment 8
The Table of Contents has been revised.

Comment 9
Clarification on the wells elevations being measured from a common datum has been provided on page 22.

Comment 10
Table 1 and the list in section 5, pages 40-42 have been reconciled.

Appendix C provides details of the wells. All the required information has not yet been located and Gallup requests until June 30, 2010 to submit this information as an addendum to this plan.

If you have any further questions, or need more information, please do not hesitate to contact me.

Sincerely,

Ed Riege
Environmental Manager
Gallup Refinery, Western Refining

Cc: H. Monzeglio, NMED HWB
K. Van-Horn, NMED HWB
C. Chavez, OCD
G. Rajen, Gallup Refinery

/Enclosure

Facility-wide Groundwater Monitoring Plan: Gallup Refinery

Western Refining
Gallup, New Mexico

May 2010

Facility-wide Groundwater Monitoring Plan
Gallup Refinery

Western Refining
Gallup, New Mexico

March 2010

Prepared by:

Gaurav Rajen, Ph.D.
Environmental Engineer

Reviewed by:

Ed Riege, M.P.H.
Environmental Manager

Executive Summary

This Site-Wide Groundwater Monitoring Plan (Plan) has been prepared in response to requirements stated in a letter from the New Mexico Environment Department's Hazardous Waste Bureau dated February 9, 2009 (see Appendix A.)

This Plan has been prepared to collect data that will be used to characterize the nature and extent of potential impacts to groundwater at the Gallup Refinery owned by Western Refining ("Gallup Refinery" or "Facility"). The monitoring plan is also designed to make the facility quickly aware of any levels of contaminants that exceed compliance standards.

This Plan divides the Facility into two areas for periodic monitoring: the East Side and the West Side. The East Side includes the Refinery Complex, recovery wells from which free products have been principally removed, but continue to be recovered in small quantities, and the North-East set of observation wells and monitoring wells. The West Side includes a cluster of wells in and around the wastewater treatment system, boundary wells, shallow monitoring wells in and around land treatment areas, and produced water wells. This plan also includes sampling requirements for aeration lagoons, influents, and evaporation ponds located in the West Side. Designated wells and sample points in these two areas will be monitored on an annual, semi-annual, quarterly, monthly, and weekly basis following the procedures presented in this Plan.

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.

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

Refinery Manager
- Mark Turri

Environmental Manager
- Ed Riege

Environmental Engineer
- Gaurav Rajen

Environmental Technicians
- Cheryl Johnson
- Alvin Dorsey

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LIST OF ACRONYMS

BMP	Best Management Practices
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
EPA	Environmental Protection Agency
GPM	Gallons per minute
HWB	Hazardous Waste Bureau
MTBE	Methyl Tert Butyl Ether
NAPIS	New American Petroleum Institute Separator
NMED	New Mexico Environment Department
OCD	Oil Conservation Division
PPE	Physical protective equipment
VOC	Volatile Organic Compounds
SVOC	Semi-volatile Organic Compounds
SWMU	Solid Waste Management Unit
SWPP	Storm Water Pollution Prevention program
WWTP	Wastewater treatment plant

1.0 Introduction

This Facility-Wide Groundwater Monitoring Plan (Plan) has been prepared for the implementation of a groundwater monitoring program at the Gallup Refinery owned by Western Refining ("Gallup Refinery" or "Facility"). The Plan follows the requirements of the February 9, 2009 letter issued by the New Mexico Environment Department's Hazardous Waste Bureau (NMED/HWB) (a copy of this letter is provided in Appendix A):

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 groundwater at the Gallup Refinery. The monitoring plan is also designed to make the facility quickly aware of any levels of contaminants that exceed compliance standards.

This Plan divides the Facility into two areas for periodic monitoring: the East Side and the West Side. The East Side includes the Refinery Complex, recovery wells from which free products have been principally removed, but continue to be recovered in small quantities, and the North-East set of observation wells and monitoring wells. The West Side includes a cluster of wells in and around the wastewater treatment system, boundary wells, shallow monitoring wells in and around land treatment areas, and produced water wells. This plan also includes sampling requirements for aeration lagoons, influents, and evaporation ponds located in the West Side. Designated wells and sample points in these two areas will be monitored on an annual, semi-annual, quarterly, monthly, and weekly basis following the procedures presented in this Plan.

Gallup Refinery will periodically review facility-wide monitoring data, and assess the monitoring program presented in this Plan. Annual revisions to the Plan, as necessary, will then 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)
Route 3, Box 7
Gallup, New Mexico 87301
Western Refining Southwest Inc (physical address)
I-40, Exit 39
Jamestown, New Mexico 87347

SIC code 2911 (petroleum refining) applies to the Gallup Refinery.

The following regulatory identification and permit governs the Gallup Refinery:

U.S. EPA ID Number NMD000333211
OCD Discharge Permit No. GW-032

The facility status is corrective action/compliance. Annual and quarterly groundwater 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 substantially 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.

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

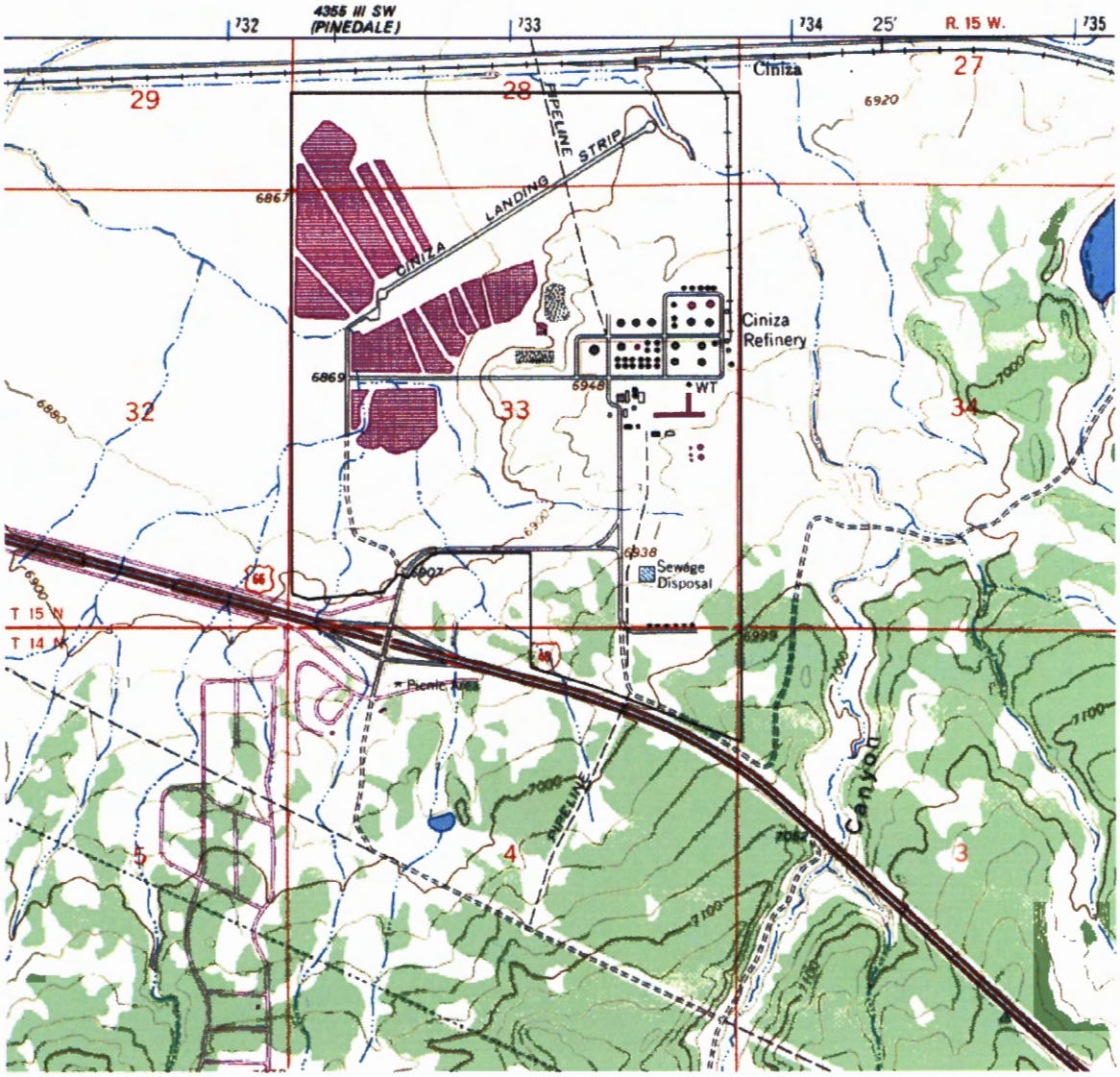

Figure 2: Topographic Map of the Gallup Refinery Site - USGS Topographical Map - Gallup Quadrangle (Revised 1980)

2.0 Background Information

2.1 Historical and current site uses

The Gallup Refinery is located within a rural and sparsely populated section of McKinley County in Jamestown New Mexico. The setting is a high desert plain on the western slope of the continental divide. The nearest population centers are the Pilot (formerly Giant) 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 at a density of less than six cattle or 30 sheep per section. Except for the City of Gallup, McKinley County is a predominantly rural area, as are the adjoining portions of neighboring counties.

Historically, this area has been populated by Native Americans, as it is even today with the contemporary Navajo Nation and the Pueblo of Zuni located in the region. The area has always been a crossroads for East to West and North to South trade routes; and many modern highways in the area, such as Interstate-40, trace routes established well over a thousand years ago. Irrigated agriculture in the area also dates back to several thousands of years, and continues to this day. There are remnants of an irrigation ditch in the north-central portion of the site which attests to farming having occurred on the site.

Since the arrival of the Spanish in 1540, grazing of livestock became another major land use. In the early 1900s, highly intensive livestock grazing occurred in this region that led to severe degradation of the land.

Along with irrigated farming and livestock, artisan work has been a mainstay of the local economy and continues till current times. In 1880, coal mining began to be a major land use in the region; and in 1881 the railroad arrived. The railroad carried Indian made goods for sale across the nation. Today, a railroad line runs just north of the facility, and a rail spur brings railroad cars into the north-east end of the facility to deliver crude oil, ethanol and other feedstock.

From the early 1900s to the 1940s extensive logging occurred in the region, especially thirty miles to the south-west of the facility in the Zuni Mountains. This aggravated the forming of arroyos from erosion, and impacted the local watersheds.

From the 1950s to the early 1980s, uranium mining was a major extractive industry in the region with a large number of mines located in the general area of the facility, with the nearest mines being around 20 miles distant towards the east. No historical mining has ever occurred on the facility. It is important to note that impacts have occurred to groundwater in the area from the mining and processing of uranium ore.

Today, built in the 1950s, and refurbished and expanded over time, a petroleum refinery is located on a man-made terrace towards the central and southern portions of the facility.

The refinery primarily receives crude oil via two 6 inch diameter pipelines; Bisti Pipeline comes down from the Four Corners Area and enters the refinery property from the north and Hospah Pipeline comes in from the northeast and is an interconnection with a main interstate pipeline. In addition, the refinery also receives natural gasoline feedstocks via a 4-inch diameter pipeline that comes in from the west along the Interstate 40 corridor from the Conoco gas plant. Crude oil and other products also arrive at the site via railroad cars. These feedstocks are then stored in tanks until refined into products. The refinery has an overall capacity to process up to 23,000 barrels per day of crude oil and additional petroleum hydrocarbon feedstocks.

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

The Refinery receives and processes crude oil and other feedstocks, and then produces various finished products. These include propane, butane, naphtha, unleaded gasoline, diesel (low sulfur and ultra-low sulfur), and residual fuel. Ammonium Thiosulfate and elemental sulfur are also produced as by-products through our desulfurization processes as described below.

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

- The crude distillation unit separates crude oil into various fractions; including gas, naphtha, light oil, heavy oil, and residuum.

- The fluidized catalytic cracking (FCC) unit breaks up long-chain hydrocarbon molecules into smaller molecules, and essentially converts heavier oils into naphtha and lighter oils.

- The alkylation unit combines specific types of hydrocarbon molecules into a high octane gasoline blending component.

- The reforming unit recombines low octane naphtha molecules to form high octane naphtha.

- The hydrotreating unit removes undesirable sulfur and nitrogen compounds from intermediate feedstocks, and also saturates these feedstocks with hydrogen.

- The isomerization unit converts low octane hydrocarbon molecules into high octane molecules.

- The treater units remove impurities from various intermediate and blending feedstocks in order to produce finished products that comply with sales specifications.

- The 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.

- The 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 product. This unit only operates when the ammonium thiosulfate unit is inoperable or cannot handle incoming loads.

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.

Storage tanks are used throughout the refinery to hold and store crude oil, natural gasoline, intermediate feedstocks, finished products, chemicals, and water. These tanks are all located aboveground and range in size from 80,000 barrels to less than a 1,000 barrels. A grouping of tanks is commonly referred to as a "tank farm" such as the hot oil "tank farm".

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 may receive crude oil, other feedstocks, additives, and chemicals.

A pipeline from the refinery carries diesel fuel to the Pilot (formerly Giant) Travel Center. Gasoline is delivered to the Pilot Center via tanker truck.

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 leading to the New API Separator (NAPIS).

The process wastewater system is a network of curbing, paving, catch basins, and underground piping that collects waste water effluent from various processing areas within the refinery and then conveys this wastewater to the NAPIS.

The NAPIS is a two compartment oil water separator. 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 oil is passed to a collection chamber where it is

pumped back into the refinery process. The clarified water is piped to the top of dual stripping columns where benzene is removed. The stripped water flows into the first aeration lagoon. Sludge sinks to the bottom of the NAPIS which is periodically vacuumed out by a vacuum truck and disposed as hazardous waste at an approved landfill or recycled and reused in refineries that have this allowable exemption under RCRA.

At the stripping columns, ambient air is blown upwards through the falling cascade of clarified wastewater as it passes through distillation column packing. Countercurrent desorption of benzene from the water occurs due to the high volume of air passing over the relatively large surface area provided by the packing. The desorbed benzene is absorbed into the air stream and vented to the atmosphere. Effluent from the stripper columns gravity flows through piping into the first aeration lagoon.

At the aeration basins, the treated wastewater is mixed with air in order to oxidize any remaining organic constituents and increase the dissolved oxygen concentration available in the water for growth of bacteria and other microbial organisms. The microbes degrade hydrocarbons into carbon dioxide and water. Three 15-hp mechanical aerators provide aeration in the first aeration lagoon with two 15-hp aerators providing aeration in the second lagoon. Effluent from the second aeration lagoon flows onward into the first of several evaporation ponds of various sizes.

At the evaporation ponds, wastewater is converted into vapor via solar and mechanical wind-effect evaporation. No wastewater is discharged from the refinery to surface waters of the state because all of the waste water evaporates. Therefore, the refinery is not required to have a NPDES discharge permit for discharge of treated process water. However, the Gallup refinery does have a NPDES permit for storm water discharge.

The storm water system is a network of valves, gates, berms, embankments, culverts, trenches, ditches, natural arroyos, and retention ponds that collect, convey, control, treat, 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 wastewater and is sent through the NAPIS, benzene strippers and wastewater treatment system for retention in evaporation ponds. Strom water that falls on undeveloped land is allowed to leave the property. Storm water discharge from the refinery is very infrequent due to the arid desert-like nature of the surrounding geographical area. The Gallup Refinery maintains a storm water pollution prevention plan (SWPPP) that includes Best Management Practices (BMPs) for effective storm water pollution prevention. The refinery has constructed several new berms in various areas and improved outfalls to minimize the possibility of contaminated runoff leaving the 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 groundwater, raising crops and vegetables with contaminated groundwater, or getting exposed to or fishing in surface water that has commingled with shallow groundwater. Exposure can also occur through contact with soils and/or plants that have become contaminated themselves through contact with contaminated groundwater. However, drinking water wells remain the primary route of exposure

At this time, the nearest drinking water wells are located on-site at the south-west areas of the facility, at depths of approximately 3000 feet. These wells are designated PW-2, PW-3 and PW-4. Figure 3 shows the locations of these wells. These wells are operated by the facility to provide the refinery's process water, drinking water to nearby refinery-owned houses, to the refinery itself, and to the Pilot Travel Center. These wells are monitored and no contaminants have been detected in the deep aquifer that these wells are screened within.

[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.

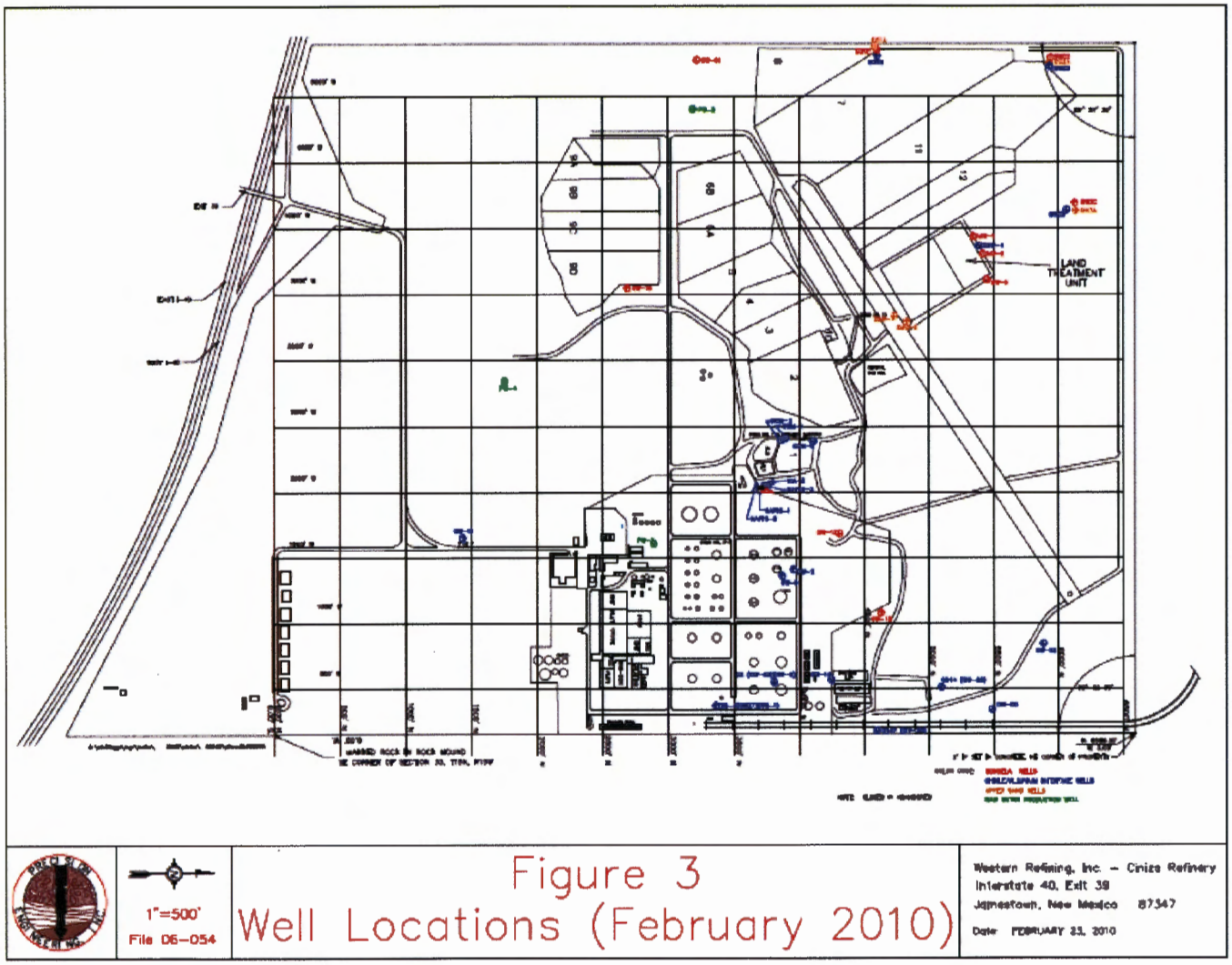

Figure 3: Locations of wells

Other than the on-site wells, there are no 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 north-west 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 north-west of the South Fork of the Puerco River which heads towards the south-east from immediately north of the facility. As the shallowest groundwater will generally flow in the direction of surface water flow, any shallow groundwater contamination that left the facility either now or in the future would tend towards the south-east after leaving the facility and away from the community of Iyanbito. "Flowing Well" is a well marked on the USGS Quadrangle map approximately 2-miles north-west from the facility. The Flowing Well is likely a livestock watering well as it does not have any houses adjacent to it. However, residents of the area are known to use livestock water for human consumption if their houses do not have running water – such consumption is decreasing as residents in the area are increasingly getting connected to drinking water systems provided by local governments. The Flowing Well, too, is north of and across the South Fork of the Puerco River - shallow groundwater is unlikely to ever reach this well as it will tend towards the south-east along with the South Fork of the Puerco River. 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 south-west to north-west perimeter of the facility have not shown any evidence of contaminants having left the facility in shallow groundwater.

Artesian conditions at some locations of the site lead to the possibility of groundwater 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 groundwater that has exhibited elevated levels of contaminants, the Plan will detect any commingling of groundwater and surface waters.

Fluctuating groundwater 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.

In the future, if the land use became residential, and there were on-site residents, there would be increased potential to impact humans through a variety of uses of water from shallow groundwater wells (drinking, showering, etc.), produce grown in gardens that might be exposed to shallow groundwater, and construction activities that might reach shallow groundwater. However, if there is contamination, the site will remain zoned for industrial use even after the closure of the facility. In effect, the site will remain in perpetuity designated for industrial purposes. Therefore, while there is contamination at the site, future on-site residents are not a possibility.

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 wastewater. These wastes could be in the form of wastewater, spent chemicals destined for off-site shipping and disposal packed in drums, sludge, and dry solids. Dry wastes could stem from wind-blown metallic powders used as catalysts, and regular municipal solid wastes stored in covered containers destined for municipal landfills.

Most of the wastes and contaminants that could possibly reach groundwater have the characteristic that they would biodegrade and naturally attenuate. However, any heavy metals present in dirt and sludge could possibly leach into groundwater and would not attenuate. There is a possibility also that certain long-lived chemicals would not biodegrade, or, if they did, it would be at a very slow pace.

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 also within berms to contain spills. The NAPIS has double walls and a leak detection system. This situation did not exist in the past. So, past spills and leaks could be a source of groundwater contamination.

Similarly, surface impoundments can serve as a source of groundwater contamination. In the past, liquids from the Railroad Rack lagoon in the north-east end of the facility were allowed to discharge into a field and drain into the ground and evaporate – this led to subsurface soil contamination that is currently in the process of being cleaned up. Such disposal of wastewater into open fields is not practiced at the Gallup Refinery.

There are fourteen Sold Waste Management Units (SWMU) identified at the Gallup Refinery, and one closed Land Treatment Area. These are –

RCRA Regulated Units

- Land Treatment Unit

SWMUs

- 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 Landfarm

- 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

Existing groundwater monitoring wells effectively surround all these SWMUs.

2.4 Summary of contaminant releases that could contribute to groundwater contamination

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

Separate Phase Hydrocarbons (SPH) floating on shallow groundwater have been found at the north-east end of the facility. A system of recovery wells has been created and SPH has been pumped out for several years. Recovery through hand-bailing is still underway, with the volumes recovered dropping substantially every year. Trace levels of Benzene have also been found in wells in this area possibly linked to this spilled material.

A small tank that held Methyl Tert Butyl Ether (MTBE) has leaked and created a plume of MTBE in the shallow groundwater at the north-east end of the refinery. This tank is no longer in service and has been removed. MTBE has not been used at the refinery since April 2006.

A unit at the south-west end of the facility that is used to recover oil and recycle this oil back into the process has also – through leakage and spills – caused some MTBE and hydrocarbon contamination in shallow groundwater. This unit is known as the New American Petroleum Institute Separator (NAPIS) and has up-gradient and down-gradient shallow monitoring wells around it.

There has always been the possibility that the wastewater treatment system of the facility based on aeration lagoons and evaporation ponds may have leaked contaminants into shallow groundwater. The first aeration lagoon, known as AL-1, has received wastewater with benzene at levels greater than 0.5 ppm – either through ineffective treatment farther upstream in the process, or through overflows – making these liquids a hazardous waste; however the aeration process and biological action within this lagoon has brought the benzene levels to well below 0.5 ppm and of the order of 0.1 ppm and less.

The fact remains, however, that the facility's aeration lagoons and ponds could be a possible source of groundwater contamination and this possibility is considered in this Plan.

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 lands and is used for cattle and sheep grazing at low densities[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.

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 ricegrass, 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, needleandthread, oneseed juniper, sand dropseed, spineless horsebrush, rabbitbrush, and twoneedle pinyon.

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

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 reduced.

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 Mentmore-Gish 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, 2-72 inches various kinds of clay loam.

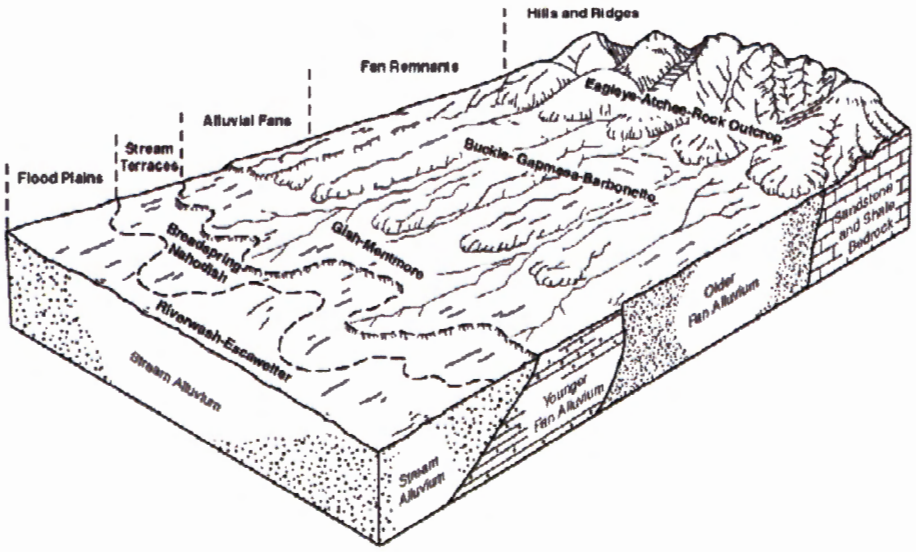

Figure 4: Generalized relationship of soils in the Gallup Refinery area: from NRCS/USDA Soil Survey of McKinley County.

[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

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 formation, Petrified Forest group) and siltstone start to appear.

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 Formation, which consists of low permeability claystones and siltstones that comprise the shales of this formation. As such, the Chinle Formation effectively serves as an aquiclude. Inter-bedded within the Chinle Formation 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 Formation. 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 Chinle Formation aquiclude, 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 groundwater

Groundwater flow within the Chinle Formation is extremely slow and typically averages less than 10^{-10} centimeters per second (less than 0.01 feet per year). Groundwater flow within the surface soil layer above the Chinle 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 Chinle Formation up to 10^{-8} centimeters per second in the clay soil layers located near the surface.

Shallow groundwater located under refinery property generally flows along the upper contact of the Chinle Formation. The prevailing flow direction is from the southeast and toward the northwest. In the past, a subsurface ridge has been identified that was thought to deflect some flow in a northeasterly direction in the vicinity of the refinery tank farm. This is not clear from the present data. The NMED has required maps to be developed for various seasons and varying depths. At this time, the Gallup refinery is still developing such maps. We will provide such additional maps by June 30, 2010, and include such additional maps in future Annual Groundwater Monitoring reports.

Figure 5 provides a corrected map of groundwater flow in the vicinity of the facility.

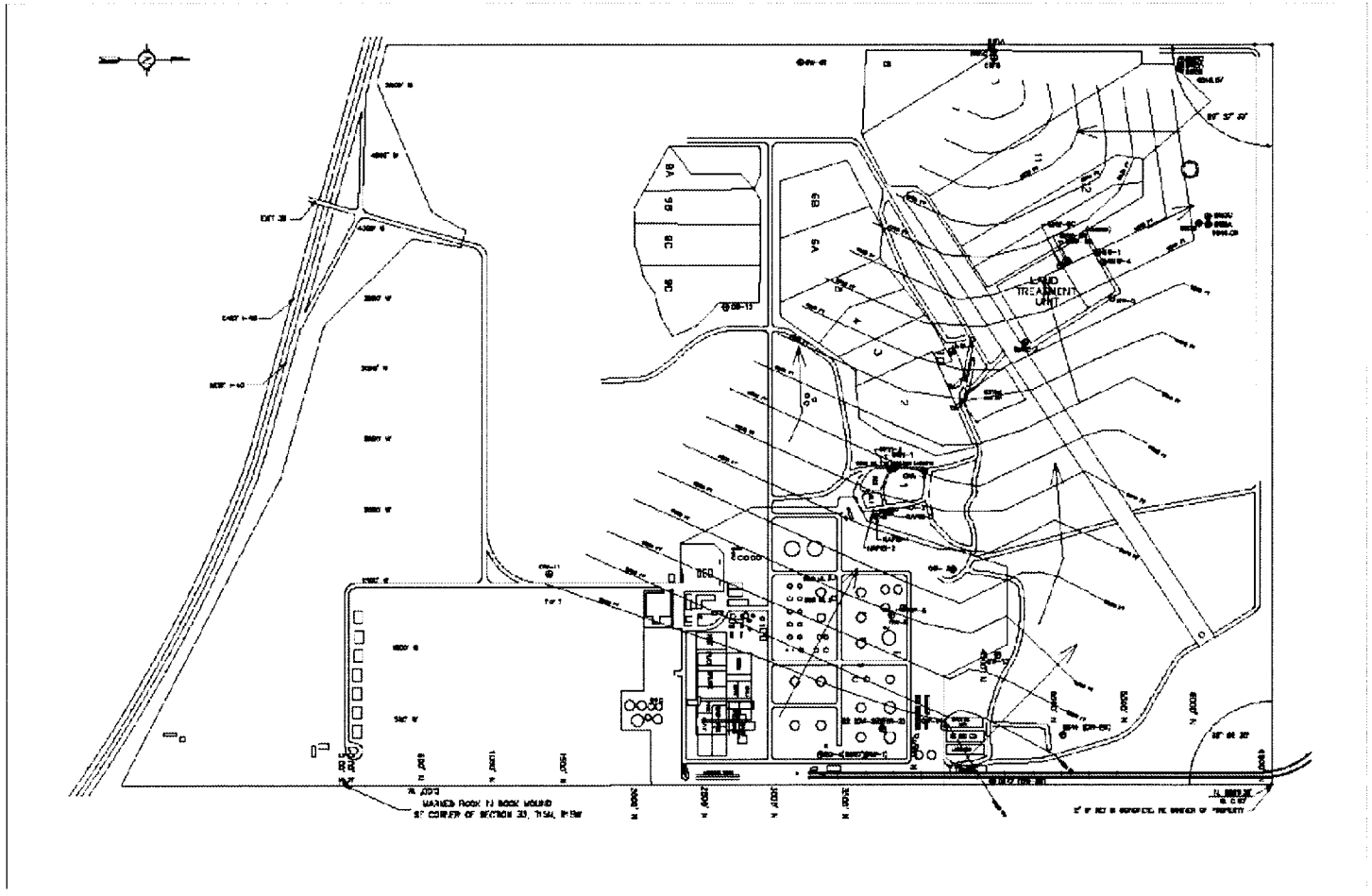

Figure 5: Map of groundwater flow

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 B provides more detailed information on actual sampling procedures that will be used.

4.1 Groundwater Sampling Methodology

All monitoring wells scheduled for sampling during a groundwater sampling event will be sampled within 15 working days of the start of the monitoring and sampling event.

Appendix C provides details of the wells to be sampled – including their date of establishment, ground elevation, top of casing elevation, well casing stick-up length, well depth, well casing diameter, screened interval, screen length, and stratigraphic units. Please note that not all of the required information has been identified by the Gallup refinery at this time. We are in the process of locating this information, and will include it in a subsequent submission by June 30, 2010.

4.1.1 Well Gauging

At the beginning of each quarterly, semi-annual, or annual sampling event, all monitoring and recovery wells listed in Table 1 will be gauged to record the depth to SPH (if present), the depth to water, and the total depth 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. All measurements will be made relative to the same datum for all wells.

Gauging measurements will be recorded on a field gauging form. Data obtained from the gauging will be reported in the annual groundwater 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 groundwater 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) 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, and temperature. Field water quality measurement stability will be determined as 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 groundwater 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 disposable bailers and/or appropriate sampling pumps.

4.2 Groundwater Sample Collection

Groundwater 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 procedures are described in more detail in Appendix B. Decontamination procedures for reusable water sampling equipment are described in Appendix B.

All purged groundwater and decontamination water from contaminated wells will be disposed in the refinery wastewater treatment system upstream of the API Separator. The procedures for disposing materials are described in Appendix B. If the wells are known to be clean, purged groundwater will be disposed off onto the surface soils near the wells.

Groundwater samples intended for metals analysis will be submitted to the laboratory as total metals samples. Groundwater samples obtained for dissolved metals analysis will be filtered using disposable filters with a 0.45 micrometers mesh size.

4.2.1 Sample Handling

Sample containers and procedures for storage and shipping will be according to test method protocols and as recommended by the testing laboratory approved. 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 Appendix B 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. Details of the general sample handling procedures are provided in Appendix B.

Table 1: Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation DTW, DTP	Water Quality Parameters	Analytical Suite
Pilot Effluent	Quarterly (Q)			VOC/ DRO extended/GRO/BOB/COD/WQCC Metals
NAPIS Effluent	Q			Gen Chem/VOC/SVOC(phenol)/DRO extended//GRO/WQCC Metals
AL2 to EP-1	Q			Major cations/major anions/VOC/SVOC (phenol)/DRO extended/GRO/WQCC Metals
Influent to AL-1	Q			VOC/BOD/COD/chlorides/DRO extended/GRO/pH/phenol
Influent to AL-2	Q			VOC/BOD/COD/chlorides/DRO extended/GRO/pH/phenol
Influent to Evaporation Pond 1	Q			Major cations/ major anions/pH/BOD/COD/chlorides/VOC/SVOC (phenol)/DRO extended/GRO/WQCC metals
NAPI 2ndary Containment	Q			BTEX/DRO extended/GRO/WQCC Metals or check for fluids
RW-1	Q	X		Measure DTW,DTP
RW-2	Q	X		Measure DTW,DTP
RW-5	Q	X		Measure DTW,DTP
RW-6	Q	X		Measure DTW,DTP

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
OW-1	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Visual check for artesian flow conditions; Major cations/major anions/ VOC/DRO extended / WQCC Metals
OW-10	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Water level measurement of the Sonsela Aquifer water table Major cations /major anions/ VOC/DRO extended/ WQCC Metals
OW-13	Q	X	pH , E.C., D.O, ORP, Temp, TDS	VOC
OW-14	Q	X	pH , E.C., D.O, ORP, Temp, TDS	VOC
OW-29	Q	X	pH , E.C., D.O, ORP, Temp, TDS	VOC
OW-30	Q	X	pH , E.C., D.O, ORP, Temp, TDS	VOC

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
GWM-2	Q	X		Check for water – if water is detected report to OCD & NMED within 24 hours; sample for BTEX + MTBE/GRO/DRO extended/major cations/ Major anions.
GWM-3	Q	X		Check for water – if water is detected report to OCD & NMED within 24 hours; sample for BTEX + MTBE/GRO/DRO extended/major cations/ Major anions.
GWM-1	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC Metals
NAPIS-1(**a**)	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/SVOCs/DRO/GRO WQCC Metals
NAPIS-2 (**a**)	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/SVOCs/DRO/GRO WQCC Metals
NAPIS-3(**a**)	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/SVOCs/DRO/GRO WQCC Metals

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
KA- 3 (a)	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/ SVOCs /DRO/GRO WQCC Metals
Boiler Water & Cooling Tower Blowdown inlet To EP-2	Semi Annual (SA)		pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions
Evaporation Pond 1 (b)	Semi Annual		pH , E.C., D.O, ORP, Temp, TDS	General Chemistry / VOC/SVOC/WQCC 20.6.2.3103 constituents/BOD/COD/E-coli Bacteria/RCRA 8 Metals
Evaporation Pond 2 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 3 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 4 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.

Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
Evaporation Pond 5 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 6 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 7 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 8 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 9A (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 11 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
Evaporation Pond 12A (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 12B (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Any temporary Pond containing fluid	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
BW-1-A	Annual (A)	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
Evaporation Pond 9A (b)	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
Evaporation Pond 11 (b)	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
BW-2-A	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
BW-2-B	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
BW-2-C	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
BW-3-A	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
BW-3-B	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
BW-3-C	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
Pond 2 Inlet	A			VOC/DRO extended/GRO/BOD/COD/TDS

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
MW-1	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC metals
MW-4	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC metals
MW-5	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC metals
OW-11	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
OW-12	A	X	pH , E.C., D.O, ORP, Temp, TDS	VOC
SWM-2	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC metals

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
SWM-4	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC metals
PW-2	Every 3 yrs Starting in 2008			VOC/SVOC/ WQCC metals/cyanide/nirates
PW-3	Every 3 yrs Starting in 2008			VOC/SVOC/ WQCC metals/cyanide/nirates
PW-4	Every 3 yrs Starting in 2007			VOC/SVOC/ WQCC metals/cyanide/nirates
Effluent from Old API (storm Water separator effluent	Monthly flow rate Measurements To New API Separator			Collect monthly flow rate readings from the Old API to the New API Separator. If effluent is re-routed to any other location than the New API Separator, NMED/OCD must be contracted to determine whether additional sampling and analysis is required.

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
All Wells Including the Recovery wells Containing Separate phase hydrocarbons	Annual Sampling Event			Major cations/major anions/VOC/SVOC/WQCC 20.6.2.3103

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table Notes

Pilot Effluent - Effluent from the Pilot Gas Station to the Aeration Lagoon

Pond 2 Inlet- Sample collected at the inlet to Evaporation Pond 2 from Evaporation Pond 1

NAPIS Effluent – Effluent leaving the New API Separator

AL-2 to EP-1- sample collection at the inlet from Aeration Lagoon 2 to Evaporation Pond 1 (influent location into EP 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 E.C. – electrical or specific conductivity

TDS- total dissolved solids VOCs- volatile organic compounds – EPA Method 8260, must include MTBE

SVOCs- semi volatile organic compounds- EPA Method 8720, 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 Tertiary-Butyl Ether (MTBE) – EPA Method 8021 + MTBE

DTW- Depth to water DTP-depth to product EP- Evaporation Pond

BW wells – boundary wells GWM wells – are located around the aeration lagoons to detect leakage

MW – Monitor Well OW- observation well RW- recovery well PW- raw water production well

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 chain-of-custody form and sample request form will be shipped inside the sealed storage container to be delivered to the laboratory.
- Signed and dated chain-of-custody seals will be applied to each cooler prior to transport of samples from the site.

4.3. Analytical Methods

Groundwater and surface water samples collected during the monitoring events will be analyzed for the constituents listed in Table 1. In addition, for various locations the list of metals is modified to either be the Skinner list of the NM Water Quality Control Commission list. Table 1 provides a summary of target analytes for each EPA analytical method.

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 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 and SOP manuals. All instruments and equipment used by the laboratory will be operated, calibrated, and maintained according to 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 4.2.3.

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, matrix spike/matrix spike duplicates (MS/MSDs), blank spike/blank spike duplicates (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 chain-of-custody documentation;
- Holding times and conditions;
- Conformance with required analytical protocol(s);
- Instrument calibration;
- Blanks;
- Detection/quantitation limits;
- Recoveries of surrogates and/or matrix spikes (MS/MSDs);
- Variability for duplicate analyses;
- Completeness;
- 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/quantitation 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,
- 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), and

Gallup Refinery will present summary tables of these data in the formats suggested in the NMED/HWB letter of February 9 as an Appendix to the Periodic Groundwater Monitoring Report.

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 duplicates will not be collected on a routine basis, as there is sufficient data to establish outliers or suspect results through a trends analysis. Field duplicate samples may be collected for confirmation if a sample establishes the presence of a contaminant in an unexpected location, such as a deep aquifer, or at unexpected levels.

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 groundwater 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
The sampling, extraction, and analysis dates will be reviewed to confirm that extraction and analyses were completed within the recommended holding times, as specified by EPA protocol. Appropriate data qualifiers will be noted if holding times were 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 groundwater 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
- 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 groundwater monitoring is to provide data which will be used to assess groundwater quality at and near the Facility. Groundwater elevation data will also be collected to evaluate groundwater flow conditions. The groundwater 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 two investigation areas (East Side and West Side). The sampling frequency, analyses and target analytes will vary for each investigation area and well/outfall/evaporation pond location. The combined data from these investigation areas will be used to assess groundwater quality beneath and immediately down-gradient of the Facility, and evaluate local groundwater 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. East Side
5.1.1. Sampling Locations

The location of the East Side monitoring and recovery wells are shown in Figure 3. The following wells will be sampled (as described in Table 1) within the East Side area:

These wells are –
<u>Recovery wells</u>

- RW-1
- RW-2
- RW-5
- RW-6

<u>Monitoring wells</u>

- OW-29
- OW-30
- OW-13
- OW-14
- OW-50
- OW-52

5.2. West Side
5.2.1. Sampling Locations

The locations of wells on the West Side are shown in Figure 3.

The following wells, outfalls, and ponds will be sampled (as described in Table 1) within the West Side area:

(Note: these outfalls are from one section of the wastewater treatment system to another – they do not discharge to any location outside the facility.)

Monitoring wells

- NAPIS 1
- NAPIS 2
- NAPIS 3
- KA-3
- GWM-1
- GWM-2
- GWM-3
- SMW-2
- SMW-4
- MW-1
- MW-4
- MW-5
- OW-1
- OW-10
- OW-11
- OW-12
- BW-1A
- BW-1B
- BW-1C
- BW-2A
- BW-2B
- BW-2C
- BW-3A
- BW-3B
- BW-3C
- PW-2
- PW-3
- PW-4

Outfalls

- AL1 Inlet
- AL2 Inlet
- EP1 Inlet
- AL2 to EP-1
- Pilot Travel Center effluent

- NAPIS effluent
- Boiler water Inlet to EP-2

Ponds

- EP1 Inlet
- EP2 Inlet
- Pond 1
- Pond 2
- Pond 3
- Pond 4
- Pond 5
- Pond 6
- Pond 7
- Pond 8
- Pond 9
- Pond 11
- Pond 12A
- Pond 12B
- Any temporary pond containing liquid

Containment

- NAPIS secondary containment

5.3. 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.

Appendix A: Letter from NMED/HWB February 9

NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

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RON CURRY
Secretary

JON GOLDSTEIN
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

February 9, 2009

Mr. Ed Riege
Environmental Superintendent
Western Refining, Southwest Inc., Gallup Refinery
Route 3, Box 7
Gallup, New Mexico 87301

RE: FACILITY WIDE GROUNDWATER MONITORING WORK PLAN
WESTERN REFINING COMPANY, SOUTHWEST, INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-GRCC-09-001

Dear Mr. Riege:

The New Mexico Environment Department (NMED) requires Western Refining Company, Southwest Inc., Gallup Refinery (Permittee) to submit a Facility Wide Groundwater Monitoring Plan (Monitoring Plan). The purpose of this Monitoring Plan is to characterize the nature and extent of groundwater contamination at, and migrating from the facility and provide one plan that contains all groundwater monitoring activities that will satisfy both NMED and the New Mexico Energy Minerals and Natural Resource Department Oil Conservation Division (OCD) requirements. The Monitoring Plan must be revised on an annual basis to accommodate monitoring changes at the facility and to alleviate the need to update NMED and OCD permits.

Currently, the groundwater monitoring requirements are established in the OCD Discharge Plan dated August 23, 2007, specifically items 16 (the Sampling Schedule Resulting from historical New API Separator Spills), 19, 20 (A & B), and 25.

The Permittee must use Attachment 1 of this letter as a general guide for preparing the Monitoring Plan. The Monitoring Plan must include, but is not limited to the following:

a. A general description of the hydrogeologic system beneath the facility.

b. A section or table to include, but not limited to, a description of all existing monitoring wells, recovery wells, and any other required sampling locations specifying their exact location, date the wells were installed including ground elevation, top of casing elevation, well casing stick up length, well depth, well casing diameter, screened interval, screen length, and stratigraphic unit(s) intersected by the well screen.

c. The initial submittal must include a section or appendix that includes all well construction diagrams.

d. A facility map showing all monitoring well locations. This map must be revised as necessary to reflect any well additions and well abandonments that occur during the year.

e. The current groundwater monitoring/sampling requirements found in the OCD Discharge Plan (items 16 (the Sampling Schedule Resulting from historical New API Separator Spills), 19, 20 (A & B), and 25).

f. The sampling requirements must include the proposed frequency of sampling, sampling methodology, field water quality parameters to be measured, and chemical analytical methods.

g. A description of all sampling methods and procedures that will be applied during each monitoring event.

h. Identification of all field instruments proposed for use as well as calibration procedures.

The Permittee must continue to submit their Annual Groundwater Monitoring Report to NMED and the OCD by September 1 of each subsequent year to include the specified items found in the OCD Discharge Permit and describe all groundwater monitoring activities. The annual updates to this Monitoring Plan must be submitted by April 1 of each year beginning in 2010, so that any changes will be implemented prior to the groundwater monitoring summaries provided in the Annual Groundwater Monitoring Report.

Once this Monitoring Plan is approved, this plan will include and replace the requirements of the OCD Discharge Plan. The information gathered per the Monitoring Plan will then be included in the Annual Groundwater Monitoring Report. The Annual Groundwater Monitoring Report is considered a Periodic Monitoring Report for the purpose of compliance with NMED requirements and the OCD Discharge Plan items 20 (A and B) and 25. Attachment 2 provides general guidance for the preparation of Periodic Monitoring Reports.

The Permittee must submit the Monitoring Plan to NMED and the OCD on or before May 11, 2009. If you have questions regarding this letter please contact Hope Monzeglio of my staff at 505-476-6045.

Sincerely,

John E. Kieling
Program Manager
Permits Management Program
Hazardous Waste Bureau

cc: D. Cobrain NMED HWB
H. Monzeglio, NMED HWB
W. Price, OCD
B. Jones, OCD
G. Rajen, Gallup
File: Reading File and GRCC 2009 File
HWB-GRCC-09-001

ATTACHMENT 1
GENERAL GUIDE FOR COMPOSING THE MONITORING PLAN

- An Executive Summary (Abstract) must be included to provide a brief summary of the purpose and scope of the Monitoring Plan. This section must include the facility name and portions of the facility including any areas of concern (AOCs), Solid Waste Management Units (SWMUs) or other locations that the Monitoring Plan will be addressing.

- A Table of Contents must be included that lists all text sections, subsections, tables, figures, and appendices or attachments included in the Monitoring Plan.

- An Introduction must be included in the Monitoring Plan to include general information on the current facility and a brief description of the purpose of the proposed groundwater monitoring and the types of activities that will be conducted.

- A Background section must be added that briefly describes relevant general background information, including historical site uses, potential receptors, the type and characteristics of the waste or contaminants and any known and possible source(s), and a summary of the history of contaminant releases which could be contributing to groundwater contamination.

- The Permittee must include a Site Conditions section to provide a detailed description of current site topography and locations of natural features and manmade structures. This section must include a description of drainages, vegetation types, erosional features, and current site uses, in addition to, descriptions of features located in surrounding sites (i.e. SWMUs, AOCs) that may have an impact on the subject site regarding recharge sediment transport, surface water runoff, or contaminant fate and transport. A description of subsurface conditions must also be included that provides a discussion of the conditions observed during previous subsurface investigations, including but not limited to soil types and associations, stratigraphy, and the presence and flow direction of groundwater.

- A Scope of Activities section must include a list of all anticipated activities to be performed during the facility-wide groundwater monitoring sampling events.

- A section must be included that provides a description of all anticipated locations to be sampled and methods for conducting the activities during the facility wide groundwater monitoring events. This section must include, but is not limited to, descriptions of sampling methods, sample handling procedures, procedures for collecting field water quality measurements, any field equipment and calibration procedures, water level measurement, purging activities, and decontamination procedures. This section must also address Investigation Derived Waste (IDW).

- The Permittee must include a Schedule section that proposes a schedule for the groundwater monitoring.

- Tables, Figures, and Appendices must be included.

Appendix B: 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 through the year. Gallup does not have any recovery well pumps that need to be shut off and removed prior to water elevation measurements.

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. 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.

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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.

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 DipperT electric water depth tape. If product is present, a ground water sample is typically 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, and specific conductivity. The well will be retested for pH, temperature and specific conductivity 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, and SMW-4 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.

Purged well water from wells that have shown prior contamination is collected in fifty five gallon drums. The water is treated in the refinery's waste water treatment system. Purged water from historically non-contaminated wells is drained onto the ground.

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 syringe 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.

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
Volatile Organics	VOA vials with septa cap of Teflon™
TOC, Phenols, Nitrate, Ammonia	Quart glass jar, H2SO4
Extractable Organics	Quart glass jar with Teflon™ cap
Chloride and Sulfate	Quart plastic, no preservative
Metals*	Pint plastic

* Prefiltration bottle for dissolved metals which is subsequently filtered and transferred to a pint plastic bottle with HNO3.

Filtration

Ground water samples are filtered prior to *dissolved 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 groundwater 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 4.4.2 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 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 show repeat previous sentence. 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 the appropriate shipping.

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/ bailer are used to then 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 b noted.

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 way 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 groundwater 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 4.2.2. 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 known contaminated wells generated during sampling and decontamination activities will be temporarily stored in labeled 55-gallon drums until disposed in the refinery wastewater treatment system upstream of the API separator. Water generated from known clean wells may be disposed off on the surface soils near the well site. 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 C: Wells Table

(See attached table)

WELL DATA 2008 SUMMARY TABLE
2008 ANNUAL GROUNDWATER DISCHARGE REPORT

Well ID Number	Measurement date	A Well Casing Rim Elevations (ft)	Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	Depth to SPH (ft)	B SPH Thickness (ft)	C Depth to Water	D = A-C Groundwater Elevation (ft)	= 0.8B + D Corrected Water Table Elevation (ft)	Screened Interval Depth Top to Bottom (ft)	Purge Volume = 3 Well Vol (gal)
BW-1A	7/30/2008	6,876.73	6,836.73	40.00	NA	NA	DRY	DRY	NA	30 - 35	DRY
BW-1B	7/30/2008	6,876.91	6,811.71	67.55	NA	NA	DRY	DRY	NA	54.6 - 64.6	DRY
BW-1C	7/30/2008	6,876.75	6,719.75	157.00	NA	NA	6.84	6,869.91	NA	125 -135	73.43
BW-2A	7/30/2008	6,874.72	6,809.22	65.50	NA	NA	31.97	6,842.75	NA	55 - 65	161.5
BW-2B	7/30/2008	6,874.58	6,784.08	90.50	NA	NA	27.91	6,846.67	NA	80 - 90	39.36
BW-2C	7/30/2008	6,875.40	6,724.40	151.00	NA	NA	20.64	6,854.76	NA	139.5 - 149.5	73.03
BW-3A	7/30/2008	6,878.22	6,828.22	52.60	NA	NA	DRY	DRY	NA	39.5 - 49.5	DRY
BW-3B	7/31/2008	6,878.79	6,803.79	75.00	NA	NA	32.73	6,846.06	NA	63 - 73	20.67
BW-3C	7/31/2008	6,878.08	6,723.08	155.00	NA	NA	8.08	6,870.00	NA	144.5 - 154.5	71.84
OW-1	2/18/2008	6,868.00	6,773.96	94.04	NA	NA	1.75	6,866.25	NA	89.3 - 99.3	NA
OW-1	5/21/2008	6,868.00	6,773.96	94.04	NA	NA	1.75	6,866.25	NA	89.3 - 99.3	NA
OW-1	9/15/2008	6,868.00	6,773.96	94.04	NA	NA	1.78	6,866.22	NA	89.3 - 99.3	NA
OW-1	11/3/2008	6,868.00	6,773.96	94.04	NA	NA	2.78	6,865.22	NA	89.3 - 99.3	NA
OW-10	2/18/2008	6,872.00	6,804.00	68.00	NA	NA	1.25	6,870.75	NA	40 - 60	NA
OW-10	5/21/2008	6,872.00	6,804.00	68.00	NA	NA	1.61	6,870.39	NA	40 - 60	NA
OW-10	9/10/2008	6,872.00	6,804.00	68.00	NA	NA	1.59	6,870.41	NA	40 - 60	NA
OW-10	11/3/2008	6,872.00	6,804.00	68.00	NA	NA	2.04	6,869.96	NA	40 - 60	NA
OW-11	8/14/2008	6,923.89	6,857.27	66.62	NA	NA	20.91	6,902.98	NA	43 - 65	101.5
OW-12	8/18/2008	6,940.43	6,795.43		NA	NA	49.05	6,891.38	NA	117.8 - 137.8	213.01
OW-13	8/18/2008	6,920.12	6,820.12	100.00	NA	NA	24.41	6,895.71	NA	78.2 - 98.2	167.81
OW-14	8/21/2008	6,926.64	6,881.64	45.00	NA	NA	27.13	6,899.51	NA	35 - 45	39.67
OW-29	8/19/2008	6,913.50	6,864.50	49.00	NA	NA	21.95	6,891.55	NA	Not Available	66.71
OW-30	8/20/2008	6,921.60	6,873.20	48.40	NA	NA	26.34	6,895.26	NA	37.9 - 47.9	48.3
MW-1	8/4/2008	6,878.52	6,746.50	132.02	NA	NA	7.28	6,871.24	NA	Not Available	381.7
MW-4	8/4/2008	6,882.54	6,760.40	122.14	NA	NA	7.95	6,874.59	NA	101 - 121	349.42
MW-5	8/14/2008	6,883.32	6,750.30	133.02	NA	NA	11.37	6,871.95	NA	115 - 125	270.06
RW-1	2/18/2008	6,943.50			30.18	4.59	34.77	6,908.73	6912.402	Not Available	NA
(OW-27)	5/21/2008	6,943.50			30.40	4.17	34.57	6,908.93	6912.266		NA
	9/12/2008	6,943.50			30.03	4.56	34.59	6,908.91	6912.558		NA
	11/3/2008	6,943.50			30.02	4.61	34.63	6,908.87	6912.558		NA
RW-2	2/18/2008	6,927.20				NA	28.16	6,899.04	N/A	Not Available	NA
(OW-28)	5/21/2008	6,927.20				NA	27.22	6,899.98	N/A		NA
	9/12/2008	6,927.20				NA	27.03	6,900.17	N/A		NA
	11/3/2008	6,927.20				NA	27.10	6,900.10	N/A		NA
RW-5	2/18/2008	6,942.50	6,902.50	40.00	33.1875	0.7604	33.9479	6,908.55	6909.16042	29.5 - 39.5	NA

Well ID Number	Measurement date	A Well Casing Rim Elevations (ft)	Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	Depth to SPH (ft)	B SPH Thickness (ft)	C Depth to Water	D = A-C Groundwater Elevation (ft)	= 0.8B + D Corrected Water Table Elevation (ft)	Screened Interval Depth Top to Bottom (ft)	Purge Volume = 3 Well Vol (gal)
	5/21/2008	6,942.50	6,902.50	40.00	32.77	1.07	33.84	6,908.66	6909.516	29.5 - 39.5	NA
	9/10/2008	6,942.50	6,902.50	40.00	32.62	0.23	32.85	6,909.65	6909.834	29.5 - 39.5	NA
	11/3/2008	6,942.50	6,902.50	40.00	31.05	1.29	32.34	6,910.16	6911.192	29.5 - 39.5	NA
RW-6	2/18/2008	6,972.60	6,933.80	38.80	33.4375	0.9165	34.354	6,938.25	6938.9792	28.5 - 38.5	NA
	5/21/2008	6,972.60	6,933.80	38.80	33.02	1.1	34.12	6,938.48	6939.36	28.5 - 38.5	NA
	9/10/2008	6,972.60	6,933.80	38.80	32.83	0.29	33.12	6,939.48	6939.712	28.5 - 38.5	NA
	11/3/2008	6,972.60	6,933.80	38.80	32.46	0.23	32.69	6,939.91	6940.094	28.5 - 38.5	NA
SMW-2	8/14/2008	6,884.44	6,827.10	57.34	NA	NA	25.89	6,858.55	N/A	34.31 - 54.31	14.04
SMW-4	8/13/2008	6,882.54	6,760.40	122.14	NA	NA	29.57	6,852.97	N/A	51.7 - 71.7	20.85
GWM-1	2/18/2008	6,912.65	6,888.95	23.70	NA	NA	19.91	6,892.74	N/A	17.5 - 23.5	NA
	5/21/2008	6,912.65	6,888.95	23.70	NA	NA	19.47	6,893.18	N/A	17.5 - 23.5	NA
	9/10/2008	6,912.65	6,888.95	23.70	NA	NA	20.24	6,892.41	N/A	17.5 - 23.5	NA
	11/3/2008	6,912.65	6,888.95	23.70	NA	NA	20.55	6,892.10	N/A	17.5 - 23.5	NA
GWM-2	2/18/2008	6,913.17	6,896.97	18.97	NA	NA	18.45	6,894.72	N/A	3.2 - 16.2	NA
	3/17/2008	6,913.17	6,896.97	18.97	NA	NA	DRY	NA	N/A	3.2 - 16.2	DRY
	5/21/2008	6,913.17	6,896.97	18.97	NA	NA	DRY	NA	N/A	3.2 - 16.2	DRY
	9/10/2008	6,913.17	6,896.97	18.97	NA	NA	DRY	NA	N/A	3.2 - 16.2	DRY
	11/3/2008	6,913.17	6,896.97	18.97	NA	NA	DRY	NA	N/A	3.2 - 16.2	DRY
GWM-3	2/18/2008	6,912.65	6,896.15	17.94	NA	NA	DRY	NA	N/A	Not Available	DRY
	5/21/2008	6,912.65	6,896.15	17.94	NA	NA	DRY	NA	N/A		DRY
	9/10/2008	6,912.65	6,896.15	17.94	NA	NA	DRY	NA	N/A		DRY
	11/3/2008	6,912.65	6,896.15	17.94	NA	NA	DRY	NA	N/A		DRY
NAPIS 1 (KA-1R)	4/11/2008	6,918.43	6,904.40	14.00	NA	NA	8.58	6,909.85	N	3.7 -13.7	2.65
	7/11/2008	6,918.43	6,904.40	14.00	NA	NA	8.98	6,909.45	N	3.7 - 13.7	2.45
	11/4/2008	6,918.43	6,904.40	14.00	NA	NA	8.83	6,909.60	N	3.7 - 13.7	2.52
NAPIS 2 (KA-2R)	4/11/2008	6,917.27	6,902.80	14.50	NA	NA	8.83	6,908.44	N	4.2 - 14.2	2.78
	7/11/2008	6,917.27	6,902.80	14.50	NA	NA	8.96	6,908.31	N	4.2 - 14.2	2.71
	11/4/2008	6,917.27	6,902.80	14.50	NA	NA	9.23	6,908.04	N	4.2 - 14.2	2.58
NAPIS 3 (KA-3R)	4/11/2008	6,917.31	6,886.60	30.70	NA	NA	14.98	6,902.33	N	25.4 - 30-4	7.69
	7/11/2008	6,917.31	6,886.60	30.70	NA	NA	9.72	6,907.59	N	25.4 - 30-4	10.26
	11/4/2008	6,917.31	6,886.60	30.70	NA	NA	8.71	6,908.60	N	25.4 - 30-4	10.75
KA-3	11/4/2008	6,917.17	6,892.40	25.00	NA	NA	9.01	6,908.16	N	15 - 25	7.82

NAPIS 1(KA-1R), NAPIS 2 (KA-2R), NAPIS 3 (KA-3R): NAPIS wells installed on 3/15/08. Quarterly monitoring began third quarter of 2008.

KA-3: Began sampling 4th Quarter 2008.

SPH = Separate Phase Hydrocarbons

NA = If no SPH was detected then this is shown on the table as NA (not applicable)

Corrected water table elevations are only provided if SPH was detected.

*OW-12: Annual inspection revealed well depth measurement to be 126 feet instead of 145 feet as listed.

Not Available - Information not available.

Facility-wide Groundwater Monitoring Plan: Gallup Refinery

Western Refining
Gallup, New Mexico

May 2010

Facility-wide Groundwater Monitoring Plan
Gallup Refinery

Western Refining
Gallup, New Mexico

March 2010

Prepared by:

Gaurav Rajen, Ph.D.
Environmental Engineer

Reviewed by:

Ed Riege, M.P.H.
Environmental Manager

Executive Summary

This Site-Wide Groundwater Monitoring Plan (Plan) has been prepared in response to requirements stated in a letter from the New Mexico Environment Department's Hazardous Waste Bureau dated February 9, 2009 (see Appendix A.)

This Plan has been prepared to collect data that will be used to characterize the nature and extent of potential impacts to groundwater at the Gallup Refinery owned by Western Refining ("Gallup Refinery" or "Facility"). The monitoring plan is also designed to make the facility quickly aware of any levels of contaminants that exceed compliance standards.

This Plan divides the Facility into two areas for periodic monitoring: the East Side and the West Side. The East Side includes the Refinery Complex, recovery wells from which free products have been principally removed, but continue to be recovered in small quantities, and the North-East set of observation wells and monitoring wells. The West Side includes a cluster of wells in and around the wastewater treatment system, boundary wells, shallow monitoring wells in and around land treatment areas, and produced water wells. This plan also includes sampling requirements for aeration lagoons, influents, and evaporation ponds located in the West Side. Designated wells and sample points in these two areas will be monitored on an annual, semi-annual, quarterly, monthly, and weekly basis following the procedures presented in this Plan.

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.

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

Refinery Manager
- Mark Turri

Environmental Manager
- Ed Riege

Environmental Engineer
- Gaurav Rajen

Environmental Technicians
- Cheryl Johnson
- Alvin Dorsey

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LIST OF ACRONYMS

BMP	Best Management Practices
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
EPA	Environmental Protection Agency
GPM	Gallons per minute
HWB	Hazardous Waste Bureau
MTBE	Methyl Tert Butyl Ether
NAPIS	New American Petroleum Institute Separator
NMED	New Mexico Environment Department
OCD	Oil Conservation Division
PPE	Physical protective equipment
VOC	Volatile Organic Compounds
SVOC	Semi-volatile Organic Compounds
SWMU	Solid Waste Management Unit
SWPP	Storm Water Pollution Prevention program
WWTP	Wastewater treatment plant

1.0 Introduction

This Facility-Wide Groundwater Monitoring Plan (Plan) has been prepared for the implementation of a groundwater monitoring program at the Gallup Refinery owned by Western Refining ("Gallup Refinery" or "Facility"). The Plan follows the requirements of the February 9, 2009 letter issued by the New Mexico Environment Department's Hazardous Waste Bureau (NMED/HWB) (a copy of this letter is provided in Appendix A):

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 groundwater at the Gallup Refinery. The monitoring plan is also designed to make the facility quickly aware of any levels of contaminants that exceed compliance standards.

This Plan divides the Facility into two areas for periodic monitoring: the East Side and the West Side. The East Side includes the Refinery Complex, recovery wells from which free products have been principally removed, but continue to be recovered in small quantities, and the North-East set of observation wells and monitoring wells. The West Side includes a cluster of wells in and around the wastewater treatment system, boundary wells, shallow monitoring wells in and around land treatment areas, and produced water wells. This plan also includes sampling requirements for aeration lagoons, influents, and evaporation ponds located in the West Side. Designated wells and sample points in these two areas will be monitored on an annual, semi-annual, quarterly, monthly, and weekly basis following the procedures presented in this Plan.

Gallup Refinery will periodically review facility-wide monitoring data, and assess the monitoring program presented in this Plan. Annual revisions to the Plan, as necessary, will then 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)
Route 3, Box 7
Gallup, New Mexico 87301
Western Refining Southwest Inc (physical address)
I-40, Exit 39
Jamestown, New Mexico 87347

SIC code 2911 (petroleum refining) applies to the Gallup Refinery.

The following regulatory identification and permit governs the Gallup Refinery:

U.S. EPA ID Number NMD000333211
OCD Discharge Permit No. GW-032

The facility status is corrective action/compliance. Annual and quarterly groundwater 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 substantially 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.

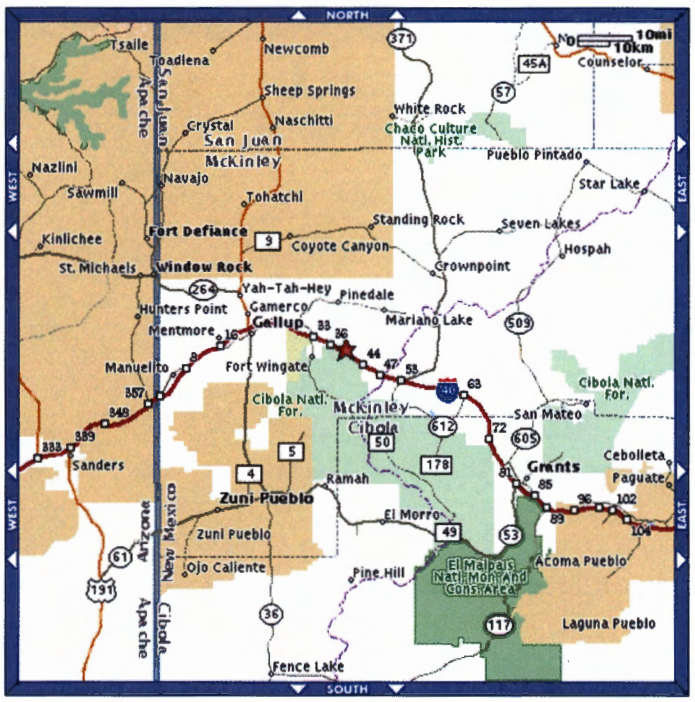

Figure 1: Regional map showing the location of the Gallup Refinery (red star along Interstate-40, 20 miles east of the City of Gallup).

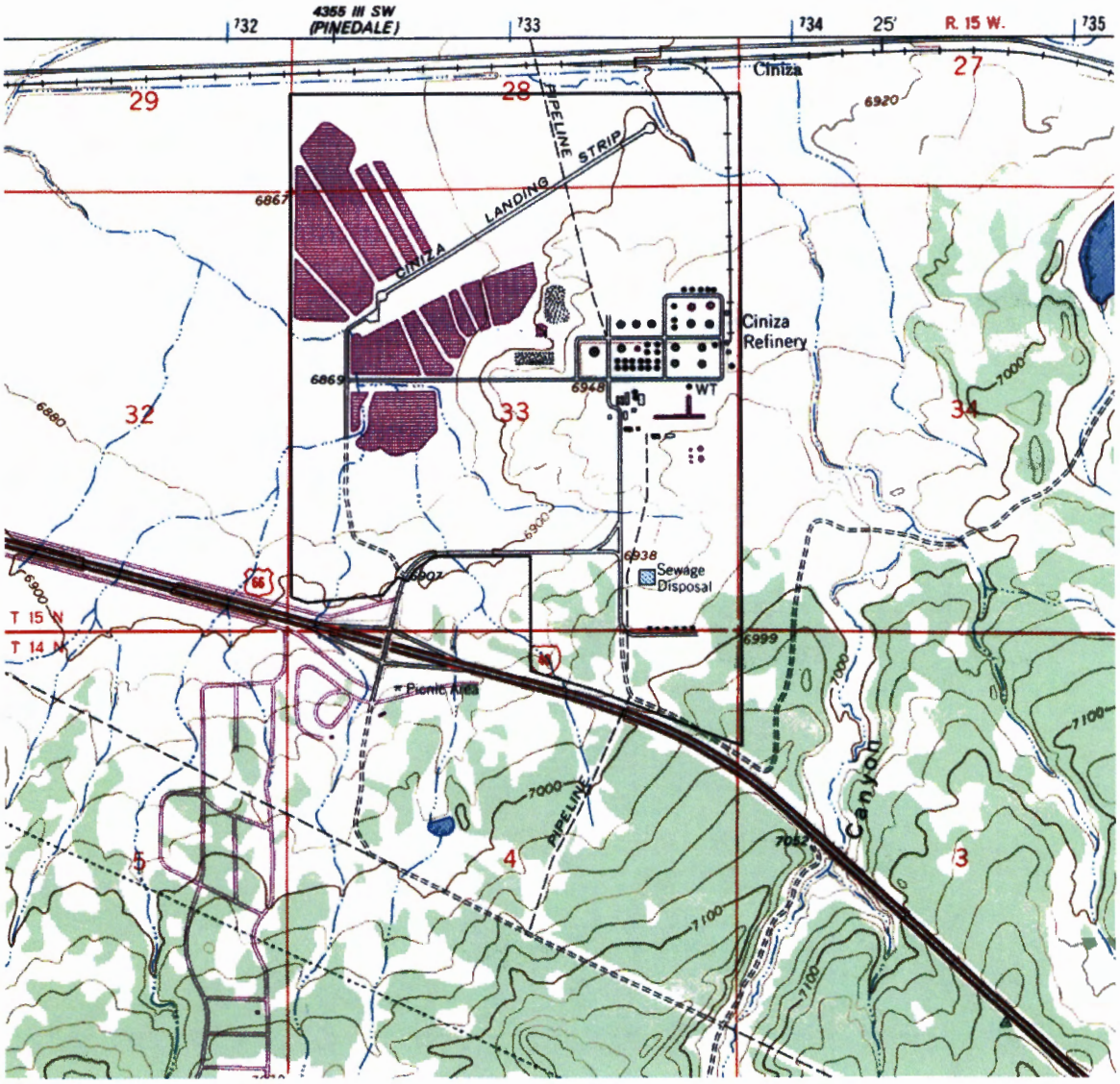

Figure 2: Topographic Map of the Gallup Refinery Site - USGS Topographical Map - Gallup Quadrangle (Revised 1980)

2.0 Background Information

2.1 Historical and current site uses

The Gallup Refinery is located within a rural and sparsely populated section of McKinley County in Jamestown New Mexico. The setting is a high desert plain on the western slope of the continental divide. The nearest population centers are the Pilot (formerly Giant) 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 at a density of less than six cattle or 30 sheep per section. Except for the City of Gallup, McKinley County is a predominantly rural area, as are the adjoining portions of neighboring counties.

Historically, this area has been populated by Native Americans, as it is even today with the contemporary Navajo Nation and the Pueblo of Zuni located in the region. The area has always been a crossroads for East to West and North to South trade routes; and many modern highways in the area, such as Interstate-40, trace routes established well over a thousand years ago. Irrigated agriculture in the area also dates back to several thousands of years, and continues to this day. There are remnants of an irrigation ditch in the north-central portion of the site which attests to farming having occurred on the site.

Since the arrival of the Spanish in 1540, grazing of livestock became another major land use. In the early 1900s, highly intensive livestock grazing occurred in this region that led to severe degradation of the land.

Along with irrigated farming and livestock, artisan work has been a mainstay of the local economy and continues till current times. In 1880, coal mining began to be a major land use in the region; and in 1881 the railroad arrived. The railroad carried Indian made goods for sale across the nation. Today, a railroad line runs just north of the facility, and a rail spur brings railroad cars into the north-east end of the facility to deliver crude oil, ethanol and other feedstock.

From the early 1900s to the 1940s extensive logging occurred in the region, especially thirty miles to the south-west of the facility in the Zuni Mountains. This aggravated the forming of arroyos from erosion, and impacted the local watersheds.

From the 1950s to the early 1980s, uranium mining was a major extractive industry in the region with a large number of mines located in the general area of the facility, with the nearest mines being around 20 miles distant towards the east. No historical mining has ever occurred on the facility. It is important to note that impacts have occurred to groundwater in the area from the mining and processing of uranium ore.

Today, built in the 1950s, and refurbished and expanded over time, a petroleum refinery is located on a man-made terrace towards the central and southern portions of the facility.

The refinery primarily receives crude oil via two 6 inch diameter pipelines; Bisti Pipeline comes down from the Four Corners Area and enters the refinery property from the north and Hospah Pipeline comes in from the northeast and is an interconnection with a main interstate pipeline. In addition, the refinery also receives natural gasoline feedstocks via a 4-inch diameter pipeline that comes in from the west along the Interstate 40 corridor from the Conoco gas plant. Crude oil and other products also arrive at the site via railroad cars. These feedstocks are then stored in tanks until refined into products. The refinery has an overall capacity to process up to 23,000 barrels per day of crude oil and additional petroleum hydrocarbon feedstocks.

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

The Refinery receives and processes crude oil and other feedstocks, and then produces various finished products. These include propane, butane, naphtha, unleaded gasoline, diesel (low sulfur and ultra-low sulfur), and residual fuel. Ammonium Thiosulfate and elemental sulfur are also produced as by-products through our desulfurization processes as described below.

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

- The crude distillation unit separates crude oil into various fractions; including gas, naphtha, light oil, heavy oil, and residuum.

- The fluidized catalytic cracking (FCC) unit breaks up long-chain hydrocarbon molecules into smaller molecules, and essentially converts heavier oils into naphtha and lighter oils.

- The alkylation unit combines specific types of hydrocarbon molecules into a high octane gasoline blending component.

- The reforming unit recombines low octane naphtha molecules to form high octane naphtha.

- The hydrotreating unit removes undesirable sulfur and nitrogen compounds from intermediate feedstocks, and also saturates these feedstocks with hydrogen.

- The isomerization unit converts low octane hydrocarbon molecules into high octane molecules.

- The treater units remove impurities from various intermediate and blending feedstocks in order to produce finished products that comply with sales specifications.

- The 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.

- The 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 product. This unit only operates when the ammonium thiosulfate unit is inoperable or cannot handle incoming loads.

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.

Storage tanks are used throughout the refinery to hold and store crude oil, natural gasoline, intermediate feedstocks, finished products, chemicals, and water. These tanks are all located aboveground and range in size from 80,000 barrels to less than a 1,000 barrels. A grouping of tanks is commonly referred to as a "tank farm" such as the hot oil "tank farm".

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 may receive crude oil, other feedstocks, additives, and chemicals.

A pipeline from the refinery carries diesel fuel to the Pilot (formerly Giant) Travel Center. Gasoline is delivered to the Pilot Center via tanker truck.

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 leading to the New API Separator (NAPIS).

The process wastewater system is a network of curbing, paving, catch basins, and underground piping that collects waste water effluent from various processing areas within the refinery and then conveys this wastewater to the NAPIS.

The NAPIS is a two compartment oil water separator. 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 oil is passed to a collection chamber where it is

pumped back into the refinery process. The clarified water is piped to the top of dual stripping columns where benzene is removed. The stripped water flows into the first aeration lagoon. Sludge sinks to the bottom of the NAPIS which is periodically vacuumed out by a vacuum truck and disposed as hazardous waste at an approved landfill or recycled and reused in refineries that have this allowable exemption under RCRA.

At the stripping columns, ambient air is blown upwards through the falling cascade of clarified wastewater as it passes through distillation column packing. Countercurrent desorption of benzene from the water occurs due to the high volume of air passing over the relatively large surface area provided by the packing. The desorbed benzene is absorbed into the air stream and vented to the atmosphere. Effluent from the stripper columns gravity flows through piping into the first aeration lagoon.

At the aeration basins, the treated wastewater is mixed with air in order to oxidize any remaining organic constituents and increase the dissolved oxygen concentration available in the water for growth of bacteria and other microbial organisms. The microbes degrade hydrocarbons into carbon dioxide and water. Three 15-hp mechanical aerators provide aeration in the first aeration lagoon with two 15-hp aerators providing aeration in the second lagoon. Effluent from the second aeration lagoon flows onward into the first of several evaporation ponds of various sizes.

At the evaporation ponds, wastewater is converted into vapor via solar and mechanical wind-effect evaporation. No wastewater is discharged from the refinery to surface waters of the state because all of the waste water evaporates. Therefore, the refinery is not required to have a NPDES discharge permit for discharge of treated process water. However, the Gallup refinery does have a NPDES permit for storm water discharge.

The storm water system is a network of valves, gates, berms, embankments, culverts, trenches, ditches, natural arroyos, and retention ponds that collect, convey, control, treat, 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 wastewater and is sent through the NAPIS, benzene strippers and wastewater treatment system for retention in evaporation ponds. Strom water that falls on undeveloped land is allowed to leave the property. Storm water discharge from the refinery is very infrequent due to the arid desert-like nature of the surrounding geographical area. The Gallup Refinery maintains a storm water pollution prevention plan (SWPPP) that includes Best Management Practices (BMPs) for effective storm water pollution prevention. The refinery has constructed several new berms in various areas and improved outfalls to minimize the possibility of contaminated runoff leaving the 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 groundwater, raising crops and vegetables with contaminated groundwater, or getting exposed to or fishing in surface water that has commingled with shallow groundwater. Exposure can also occur through contact with soils and/or plants that have become contaminated themselves through contact with contaminated groundwater. However, drinking water wells remain the primary route of exposure

At this time, the nearest drinking water wells are located on-site at the south-west areas of the facility, at depths of approximately 3000 feet. These wells are designated PW-2, PW-3 and PW-4. Figure 3 shows the locations of these wells. These wells are operated by the facility to provide the refinery's process water, drinking water to nearby refinery-owned houses, to the refinery itself, and to the Pilot Travel Center. These wells are monitored and no contaminants have been detected in the deep aquifer that these wells are screened within.

[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.

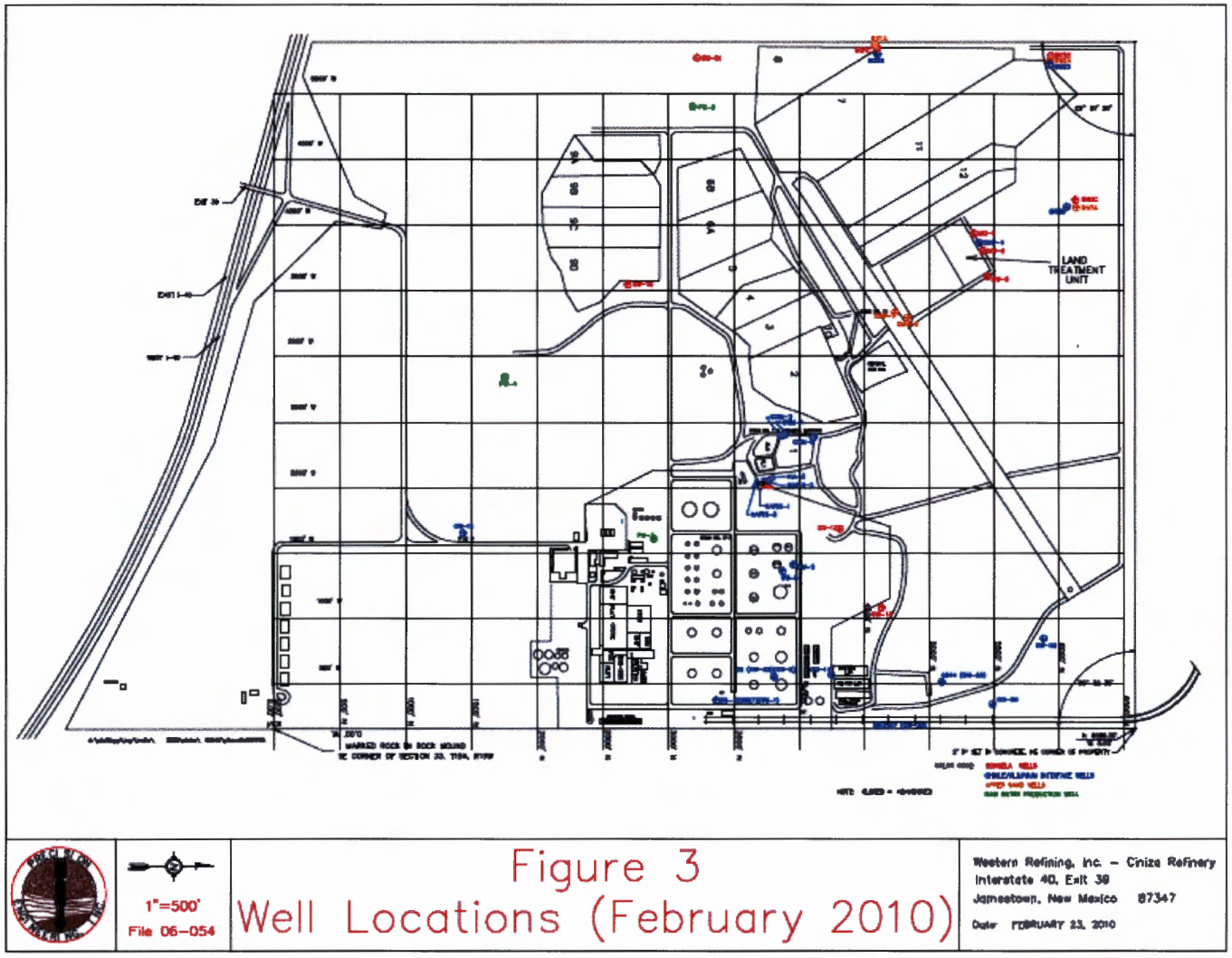

Figure 3: Locations of wells

Other than the on-site wells, there are no 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 north-west 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 north-west of the South Fork of the Puerco River which heads towards the south-east from immediately north of the facility. As the shallowest groundwater will generally flow in the direction of surface water flow, any shallow groundwater contamination that left the facility either now or in the future would tend towards the south-east after leaving the facility and away from the community of Iyanbito. "Flowing Well" is a well marked on the USGS Quadrangle map approximately 2-miles north-west from the facility. The Flowing Well is likely a livestock watering well as it does not have any houses adjacent to it. However, residents of the area are known to use livestock water for human consumption if their houses do not have running water – such consumption is decreasing as residents in the area are increasingly getting connected to drinking water systems provided by local governments. The Flowing Well, too, is north of and across the South Fork of the Puerco River - shallow groundwater is unlikely to ever reach this well as it will tend towards the south-east along with the South Fork of the Puerco River. 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 south-west to north-west perimeter of the facility have not shown any evidence of contaminants having left the facility in shallow groundwater.

Artesian conditions at some locations of the site lead to the possibility of groundwater 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 groundwater that has exhibited elevated levels of contaminants, the Plan will detect any commingling of groundwater and surface waters.

Fluctuating groundwater 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.

In the future, if the land use became residential, and there were on-site residents, there would be increased potential to impact humans through a variety of uses of water from shallow groundwater wells (drinking, showering, etc.), produce grown in gardens that might be exposed to shallow groundwater, and construction activities that might reach shallow groundwater. However, if there is contamination, the site will remain zoned for industrial use even after the closure of the facility. In effect, the site will remain in perpetuity designated for industrial purposes. Therefore, while there is contamination at the site, future on-site residents are not a possibility.

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 wastewater. These wastes could be in the form of wastewater, spent chemicals destined for off-site shipping and disposal packed in drums, sludge, and dry solids. Dry wastes could stem from wind-blown metallic powders used as catalysts, and regular municipal solid wastes stored in covered containers destined for municipal landfills.

Most of the wastes and contaminants that could possibly reach groundwater have the characteristic that they would biodegrade and naturally attenuate. However, any heavy metals present in dirt and sludge could possibly leach into groundwater and would not attenuate. There is a possibility also that certain long-lived chemicals would not biodegrade, or, if they did, it would be at a very slow pace.

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 also within berms to contain spills. The NAPIS has double walls and a leak detection system. This situation did not exist in the past. So, past spills and leaks could be a source of groundwater contamination.

Similarly, surface impoundments can serve as a source of groundwater contamination. In the past, liquids from the Railroad Rack lagoon in the north-east end of the facility were allowed to discharge into a field and drain into the ground and evaporate – this led to subsurface soil contamination that is currently in the process of being cleaned up. Such disposal of wastewater into open fields is not practiced at the Gallup Refinery.

There are fourteen Sold Waste Management Units (SWMU) identified at the Gallup Refinery, and one closed Land Treatment Area. These are –
RCRA Regulated Units

- Land Treatment Unit

SWMUs

- 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 Landfarm

- 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

Existing groundwater monitoring wells effectively surround all these SWMUs.

2.4 Summary of contaminant releases that could contribute to groundwater contamination

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

Separate Phase Hydrocarbons (SPH) floating on shallow groundwater have been found at the north-east end of the facility. A system of recovery wells has been created and SPH has been pumped out for several years. Recovery through hand-bailing is still underway, with the volumes recovered dropping substantially every year. Trace levels of Benzene have also been found in wells in this area possibly linked to this spilled material.

A small tank that held Methyl Tert Butyl Ether (MTBE) has leaked and created a plume of MTBE in the shallow groundwater at the north-east end of the refinery. This tank is no longer in service and has been removed. MTBE has not been used at the refinery since April 2006.

A unit at the south-west end of the facility that is used to recover oil and recycle this oil back into the process has also – through leakage and spills – caused some MTBE and hydrocarbon contamination in shallow groundwater. This unit is known as the New American Petroleum Institute Separator (NAPIS) and has up-gradient and down-gradient shallow monitoring wells around it.

There has always been the possibility that the wastewater treatment system of the facility based on aeration lagoons and evaporation ponds may have leaked contaminants into shallow groundwater. The first aeration lagoon, known as AL-1, has received wastewater with benzene at levels greater than 0.5 ppm – either through ineffective treatment farther upstream in the process, or through overflows – making these liquids a hazardous waste; however the aeration process and biological action within this lagoon has brought the benzene levels to well below 0.5 ppm and of the order of 0.1 ppm and less.

The fact remains, however, that the facility's aeration lagoons and ponds could be a possible source of groundwater contamination and this possibility is considered in this Plan.

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 lands and is used for cattle and sheep grazing at low densities[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.

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 ricegrass, 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, needleandthread, oneseed juniper, sand dropseed, spineless horsebrush, rabbitbrush, and twoneedle pinyon.

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

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 reduced.

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 Mentmore-Gish 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, 2-72 inches various kinds of clay loam.

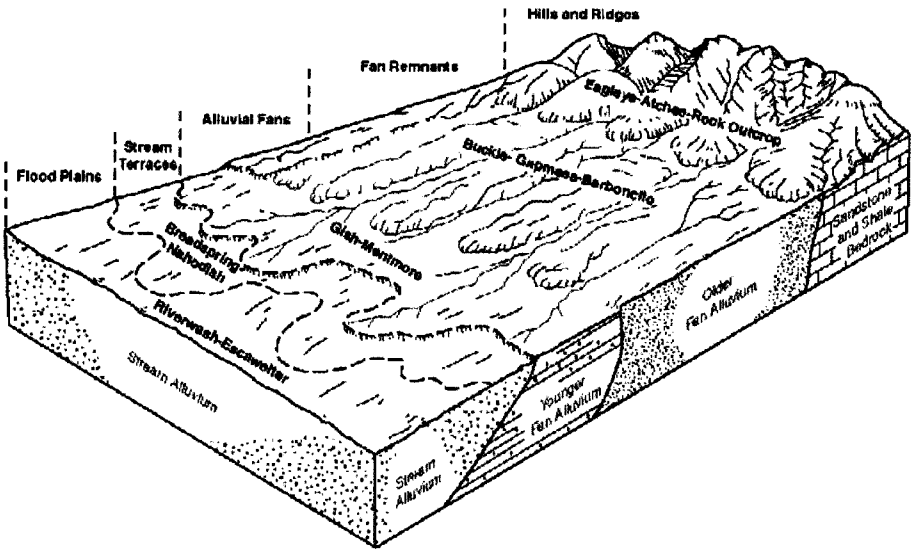

Figure 4: Generalized relationship of soils in the Gallup Refinery area: from NRCS/USDA Soil Survey of McKinley County.

[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

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 formation, Petrified Forest group) and siltstone start to appear.

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 Formation, which consists of low permeability claystones and siltstones that comprise the shales of this formation. As such, the Chinle Formation effectively serves as an aquiclude. Inter-bedded within the Chinle Formation 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 Formation. 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 Chinle Formation aquiclude, 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 groundwater

Groundwater flow within the Chinle Formation is extremely slow and typically averages less than 10^{-10} centimeters per second (less than 0.01 feet per year). Groundwater flow within the surface soil layer above the Chinle 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 Chinle Formation up to 10^{-8} centimeters per second in the clay soil layers located near the surface.

Shallow groundwater located under refinery property generally flows along the upper contact of the Chinle Formation. The prevailing flow direction is from the southeast and toward the northwest. In the past, a subsurface ridge has been identified that was thought to deflect some flow in a northeasterly direction in the vicinity of the refinery tank farm. This is not clear from the present data. The NMED has required maps to be developed for various seasons and varying depths. At this time, the Gallup refinery is still developing such maps. We will provide such additional maps by June 30, 2010, and include such additional maps in future Annual Groundwater Monitoring reports.

Figure 5 provides a corrected map of groundwater flow in the vicinity of the facility.

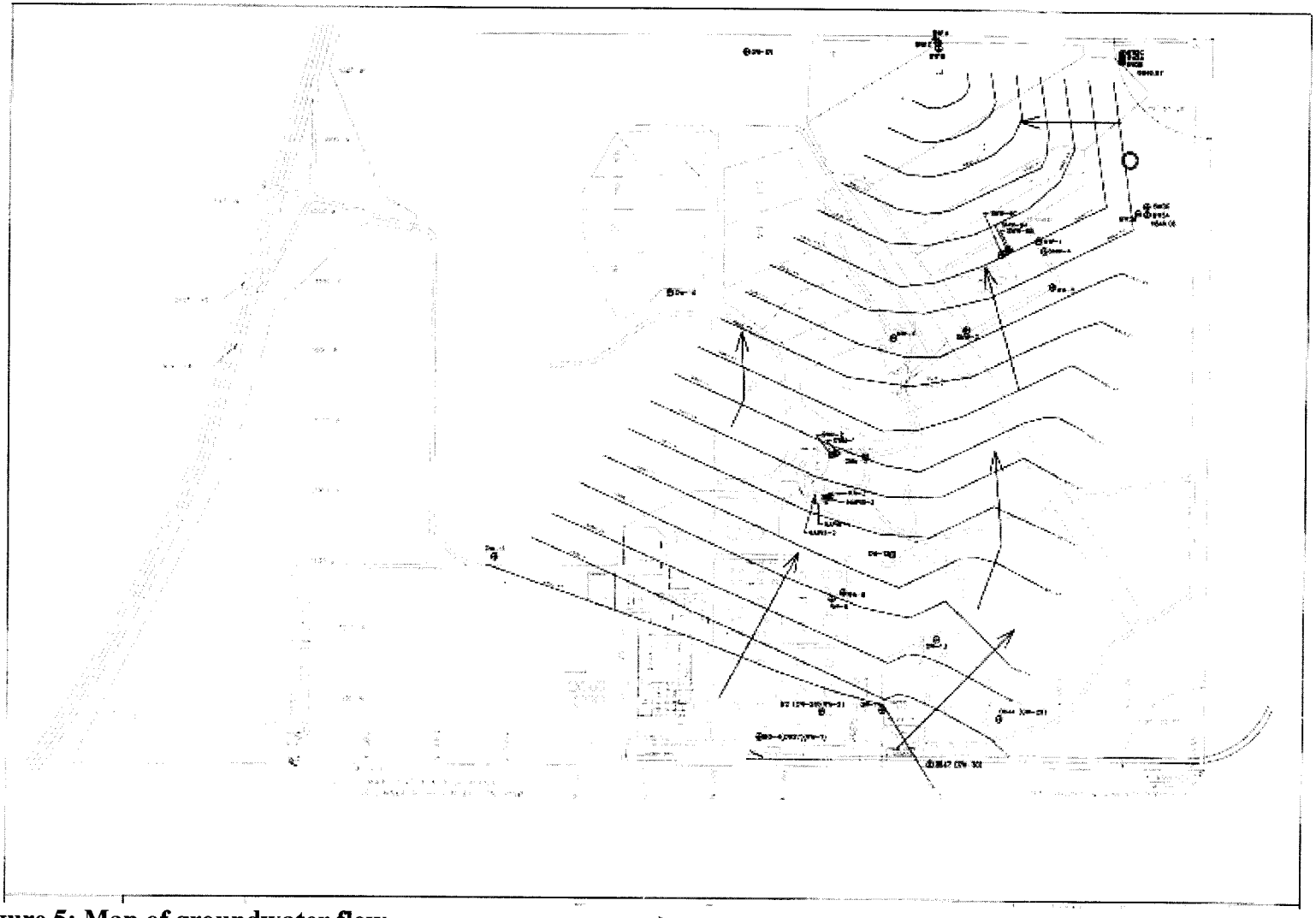

Figure 5: Map of groundwater flow

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 B provides more detailed information on actual sampling procedures that will be used.

4.1 Groundwater Sampling Methodology

All monitoring wells scheduled for sampling during a groundwater sampling event will be sampled within 15 working days of the start of the monitoring and sampling event.

Appendix C provides details of the wells to be sampled – including their date of establishment, ground elevation, top of casing elevation, well casing stick-up length, well depth, well casing diameter, screened interval, screen length, and stratigraphic units. Please note that not all of the required information has been identified by the Gallup refinery at this time. We are in the process of locating this information, and will include it in a subsequent submission by June 30, 2010.

4.1.1 Well Gauging

At the beginning of each quarterly, semi-annual, or annual sampling event, all monitoring and recovery wells listed in Table 1 will be gauged to record the depth to SPH (if present), the depth to water, and the total depth 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. All measurements will be made relative to the same datum for all wells.

Gauging measurements will be recorded on a field gauging form. Data obtained from the gauging will be reported in the annual groundwater 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 groundwater 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) 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, and temperature. Field water quality measurement stability will be determined as 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 groundwater 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 disposable bailers and/or appropriate sampling pumps.

4.2 Groundwater Sample Collection

Groundwater 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 procedures are described in more detail in Appendix B. Decontamination procedures for reusable water sampling equipment are described in Appendix B.

All purged groundwater and decontamination water from contaminated wells will be disposed in the refinery wastewater treatment system upstream of the API Separator. The procedures for disposing materials are described in Appendix B. If the wells are known to be clean, purged groundwater will be disposed off onto the surface soils near the wells.

Groundwater samples intended for metals analysis will be submitted to the laboratory as total metals samples. Groundwater samples obtained for dissolved metals analysis will be filtered using disposable filters with a 0.45 micrometers mesh size.

4.2.1 Sample Handling

Sample containers and procedures for storage and shipping will be according to test method protocols and as recommended by the testing laboratory approved. 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 Appendix B 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. Details of the general sample handling procedures are provided in Appendix B.

Table 1: Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation DTW, DTP	Water Quality Parameters	Analytical Suite
Pilot Effluent	Quarterly (Q)			VOC/ DRO extended/GRO/BOB/COD/WQCC Metals
NAPIS Effluent	Q			Gen Chem/VOC/SVOC(phenol)/DRO extended//GRO/WQCC Metals
AL2 to EP-1	Q			Major cations/major anions/VOC/SVOC (phenol)/DRO extended/GRO/WQCC Metals
Influent to AL-1	Q			VOC/BOD/COD/chlorides/DRO extended/GRO/pH/phenol
Influent to AL-2	Q			VOC/BOD/COD/chlorides/DRO extended/GRO/pH/phenol
Influent to Evaporation Pond 1	Q			Major cations/ major anions/pH/BOD/COD/chlorides/VOC/SVOC (phenol)/DRO extended/GRO/WQCC metals
NAPI 2ndary Containment	Q			BTEX/DRO extended/GRO/WQCC Metals or check for fluids
RW-1	Q	X		Measure DTW,DTP
RW-2	Q	X		Measure DTW,DTP
RW-5	Q	X		Measure DTW,DTP
RW-6	Q	X		Measure DTW,DTP

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
OW-1	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Visual check for artesian flow conditions; Major cations/major anions/ VOC/DRO extended / WQCC Metals
OW-10	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Water level measurement of the Sonsela Aquifer water table Major cations /major anions/ VOC/DRO extended/ WQCC Metals
OW-13	Q	X	pH , E.C., D.O, ORP, Temp, TDS	VOC
OW-14	Q	X	pH , E.C., D.O, ORP, Temp, TDS	VOC
OW-29	Q	X	pH , E.C., D.O, ORP, Temp, TDS	VOC
OW-30	Q	X	pH , E.C., D.O, ORP, Temp, TDS	VOC

The Analyte list for EPA Method 8260 must include MTBE

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WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
GWM-2	Q	X		Check for water – if water is detected report to OCD & NMED within 24 hours; sample for BTEX + MTBE/GRO/DRO extended/major cations/ Major anions.
GWM-3	Q	X		Check for water – if water is detected report to OCD & NMED within 24 hours; sample for BTEX + MTBE/GRO/DRO extended/major cations/ Major anions.
GWM-1	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC Metals
NAPIS-1(a)	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/SVOCs/DRO/GRO WQCC Metals
NAPIS-2 (a)	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/SVOCs/DRO/GRO WQCC Metals
NAPIS-3(a)	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/SVOCs/DRO/GRO WQCC Metals

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

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WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
KA- 3 (a)	Q	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/ SVOCs /DRO/GRO WQCC Metals
Boiler Water & Cooling Tower Blowdown inlet To EP-2	Semi Annual (SA)		pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions
Evaporation Pond 1 (b)	Semi Annual		pH , E.C., D.O, ORP, Temp, TDS	General Chemistry / VOC/SVOC/WQCC 20.6.2.3103 constituents/BOD/COD/E-coli Bacteria/RCRA 8 Metals
Evaporation Pond 2 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 3 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 4 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.

Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
Evaporation Pond 5 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 6 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 7 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 8 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 9A (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 11 (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
Evaporation Pond 12A (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 12B (b)	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
Any temporary Pond containing fluid	SA		pH , E.C., D.O, ORP, Temp, TDS	Same as Evaporation Pond 1
BW-1-A	Annual (A)	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
Evaporation Pond 9A (b)	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
Evaporation Pond 11 (b)	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
BW-2-A	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
BW-2-B	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
BW-2-C	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
BW-3-A	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
BW-3-B	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
BW-3-C	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
Pond 2 Inlet	A			VOC/DRO extended/GRO/BOD/COD/TDS

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
MW-1	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC metals
MW-4	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC metals
MW-5	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC metals
OW-11	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/SVOC/WQCC metals
OW-12	A	X	pH , E.C., D.O, ORP, Temp, TDS	VOC
SWM-2	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC metals

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
SWM-4	A	X	pH , E.C., D.O, ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC metals
PW-2	Every 3 yrs Starting in 2008			VOC/SVOC/ WQCC metals/cyanide/nirates
PW-3	Every 3 yrs Starting in 2008			VOC/SVOC/ WQCC metals/cyanide/nirates
PW-4	Every 3 yrs Starting in 2007			VOC/SVOC/ WQCC metals/cyanide/nirates
Effluent from Old API (storm Water separator effluent	Monthly flow rate Measurements To New API Separator			Collect monthly flow rate readings from the Old API to the New API Separator. If effluent is re-routed to any other location than the New API Separator, NMED/OCD must be contracted to determine whether additional sampling and analysis is required.

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table 1 (continued): Gallup Refinery - Groundwater Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
All Wells Including the Recovery wells Containing Separate phase hydrocarbons	Annual Sampling Event			Major cations/major anions/VOC/SVOC/WQCC 20.6.2.3103

The Analyte list for EPA Method 8260 must include MTBE

(a) NAPIS 1, NAPIS-2, NAPIS 3: detection of product during quarterly monitoring must comply Section II.F.2(Twenty-Four Hour Reporting) of NMED Post – Closure Care Permit.

(b) 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 ColiBlue 24,membrane filter method)). Parameters are subject to change.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved.
Evaporation Pond samples must be collected at the inlet where wastewater flows into the evaporation pond.

Table Notes

Pilot Effluent - Effluent from the Pilot Gas Station to the Aeration Lagoon

Pond 2 Inlet- Sample collected at the inlet to Evaporation Pond 2 from Evaporation Pond 1

NAPIS Effluent – Effluent leaving the New API Separator

AL-2 to EP-1- sample collection at the inlet from Aeration Lagoon 2 to Evaporation Pond 1 (influent location into EP 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 E.C. – electrical or specific conductivity

TDS- total dissolved solids VOCs- volatile organic compounds – EPA Method 8260, must include MTBE

SVOCs- semi volatile organic compounds- EPA Method 8720, 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 Tertiary-Butyl Ether (MTBE) – EPA Method 8021 + MTBE

DTW- Depth to water DTP-depth to product EP- Evaporation Pond

BW wells – boundary wells GWM wells – are located around the aeration lagoons to detect leakage

MW – Monitor Well OW- observation well RW- recovery well PW- raw water production well

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 chain-of-custody form and sample request form will be shipped inside the sealed storage container to be delivered to the laboratory.
- Signed and dated chain-of-custody seals will be applied to each cooler prior to transport of samples from the site.

4.3. Analytical Methods

Groundwater and surface water samples collected during the monitoring events will be analyzed for the constituents listed in Table 1. In addition, for various locations the list of metals is modified to either be the Skinner list of the NM Water Quality Control Commission list. Table 1 provides a summary of target analytes for each EPA analytical method.

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 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 and SOP manuals. All instruments and equipment used by the laboratory will be operated, calibrated, and maintained according to 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 4.2.3.

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, matrix spike/matrix spike duplicates (MS/MSDs), blank spike/blank spike duplicates (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 chain-of-custody documentation;
- Holding times and conditions;
- Conformance with required analytical protocol(s);
- Instrument calibration;
- Blanks;
- Detection/quantitation limits;
- Recoveries of surrogates and/or matrix spikes (MS/MSDs);
- Variability for duplicate analyses;
- Completeness;
- 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/quantitation 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,
- 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), and

Gallup Refinery will present summary tables of these data in the formats suggested in the NMED/HWB letter of February 9 as an Appendix to the Periodic Groundwater Monitoring Report.

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 duplicates will not be collected on a routine basis, as there is sufficient data to establish outliers or suspect results through a trends analysis. Field duplicate samples may be collected for confirmation if a sample establishes the presence of a contaminant in an unexpected location, such as a deep aquifer, or at unexpected levels.

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 groundwater 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

The sampling, extraction, and analysis dates will be reviewed to confirm that extraction and analyses were completed within the recommended holding times, as specified by EPA protocol. Appropriate data qualifiers will be noted if holding times were 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 groundwater 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
- 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 groundwater monitoring is to provide data which will be used to assess groundwater quality at and near the Facility. Groundwater elevation data will also be collected to evaluate groundwater flow conditions. The groundwater 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 two investigation areas (East Side and West Side). The sampling frequency, analyses and target analytes will vary for each investigation area and well/outfall/evaporation pond location. The combined data from these investigation areas will be used to assess groundwater quality beneath and immediately down-gradient of the Facility, and evaluate local groundwater 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. East Side
5.1.1. Sampling Locations

The location of the East Side monitoring and recovery wells are shown in Figure 3. The following wells will be sampled (as described in Table 1) within the East Side area:

These wells are –
<u>Recovery wells</u>

- RW-1
- RW-2
- RW-5
- RW-6

<u>Monitoring wells</u>

- OW-29
- OW-30
- OW-13
- OW-14
- OW-50
- OW-52

5.2. West Side
5.2.1. Sampling Locations

The locations of wells on the West Side are shown in Figure 3.

The following wells, outfalls, and ponds will be sampled (as described in Table 1) within the West Side area:

(Note: these outfalls are from one section of the wastewater treatment system to another – they do not discharge to any location outside the facility.)

Monitoring wells

- NAPIS 1
- NAPIS 2
- NAPIS 3
- KA-3
- GWM-1
- GWM-2
- GWM-3
- SMW-2
- SMW-4
- MW-1
- MW-4
- MW-5
- OW-1
- OW-10
- OW-11
- OW-12
- BW-1A
- BW-1B
- BW-1C
- BW-2A
- BW-2B
- BW-2C
- BW-3A
- BW-3B
- BW-3C
- PW-2
- PW-3
- PW-4

Outfalls

- AL1 Inlet
- AL2 Inlet
- EP1 Inlet
- AL2 to EP-1
- Pilot Travel Center effluent

- NAPIS effluent
- Boiler water Inlet to EP-2

Ponds

- EP1 Inlet
- EP2 Inlet
- Pond 1
- Pond 2
- Pond 3
- Pond 4
- Pond 5
- Pond 6
- Pond 7
- Pond 8
- Pond 9
- Pond 11
- Pond 12A
- Pond 12B
- Any temporary pond containing liquid

Containment

- NAPIS secondary containment

5.3. 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.

Appendix A: Letter from NMED/HWB February 9

NEW MEXICO ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

BILL RICHARDSON
Governor

DIANE DENISH
Lieutenant Governor

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RON CURRY
Secretary

JON GOLDSTEIN
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

February 9, 2009

Mr. Ed Riege
Environmental Superintendent
Western Refining, Southwest Inc., Gallup Refinery
Route 3, Box 7
Gallup, New Mexico 87301

RE: FACILITY WIDE GROUNDWATER MONITORING WORK PLAN
WESTERN REFINING COMPANY, SOUTHWEST, INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-GRCC-09-001

Dear Mr. Riege:

The New Mexico Environment Department (NMED) requires Western Refining Company, Southwest Inc., Gallup Refinery (Permittee) to submit a Facility Wide Groundwater Monitoring Plan (Monitoring Plan). The purpose of this Monitoring Plan is to characterize the nature and extent of groundwater contamination at, and migrating from the facility and provide one plan that contains all groundwater monitoring activities that will satisfy both NMED and the New Mexico Energy Minerals and Natural Resource Department Oil Conservation Division (OCD) requirements. The Monitoring Plan must be revised on an annual basis to accommodate monitoring changes at the facility and to alleviate the need to update NMED and OCD permits.

Currently, the groundwater monitoring requirements are established in the OCD Discharge Plan dated August 23, 2007, specifically items 16 (the Sampling Schedule Resulting from historical New API Separator Spills), 19, 20 (A & B), and 25.

The Permittee must use Attachment 1 of this letter as a general guide for preparing the Monitoring Plan. The Monitoring Plan must include, but is not limited to the following:

a. A general description of the hydrogeologic system beneath the facility

b. A section or table to include, but not limited to, a description of all existing monitoring wells, recovery wells, and any other required sampling locations specifying their exact location, date the wells were installed including ground elevation, top of casing elevation, well casing stick up length, well depth, well casing diameter, screened interval, screen length, and stratigraphic unit(s) intersected by the well screen.

c. The initial submittal must include a section or appendix that includes all well construction diagrams.

d. A facility map showing all monitoring well locations. This map must be revised as necessary to reflect any well additions and well abandonments that occur during the year.

e. The current groundwater monitoring/sampling requirements found in the OCD Discharge Plan (items 16 (the Sampling Schedule Resulting from historical New API Separator Spills), 19, 20 (A & B), and 25)

f. The sampling requirements must include the proposed frequency of sampling, sampling methodology, field water quality parameters to be measured, and chemical analytical methods.

g. A description of all sampling methods and procedures that will be applied during each monitoring event.

h. Identification of all field instruments proposed for use as well as calibration procedures.

The Permittee must continue to submit their Annual Groundwater Monitoring Report to NMED and the OCD by September 1 of each subsequent year to include the specified items found in the OCD Discharge Permit and describe all groundwater monitoring activities. The annual updates to this Monitoring Plan must be submitted by April 1 of each year beginning in 2010, so that any changes will be implemented prior to the groundwater monitoring summaries provided in the Annual Groundwater Monitoring Report.

Once this Monitoring Plan is approved, this plan will include and replace the requirements of the OCD Discharge Plan. The information gathered per the Monitoring Plan will then be included in the Annual Groundwater Monitoring Report. The Annual Groundwater Monitoring Report is considered a Periodic Monitoring Report for the purpose of compliance with NMED requirements and the OCD Discharge Plan items 20 (A and B) and 25. Attachment 2 provides general guidance for the preparation of Periodic Monitoring Reports.

The Permittee must submit the Monitoring Plan to NMED and the OCD on or before May 11, 2009. If you have questions regarding this letter please contact Hope Monzeglio of my staff at 505-476-6045.

Sincerely,

John E. Kieling
Program Manager
Permits Management Program
Hazardous Waste Bureau

cc: D. Cobrain NMED HWB
H. Monzeglio, NMED HWB
W. Price, OCD
B. Jones, OCD
G. Rajen, Gallup
File: Reading File and GRCC 2009 File
HWB-GRCC-09-001

ATTACHMENT 1
GENERAL GUIDE FOR COMPOSING THE MONITORING PLAN

- An Executive Summary (Abstract) must be included to provide a brief summary of the purpose and scope of the Monitoring Plan. This section must include the facility name and portions of the facility including any areas of concern (AOCs), Solid Waste Management Units (SWMUs) or other locations that the Monitoring Plan will be addressing.

- A Table of Contents must be included that lists all text sections, subsections, tables, figures, and appendices or attachments included in the Monitoring Plan.

- An Introduction must be included in the Monitoring Plan to include general information on the current facility and a brief description of the purpose of the proposed groundwater monitoring and the types of activities that will be conducted.

- A Background section must be added that briefly describes relevant general background information, including historical site uses, potential receptors, the type and characteristics of the waste or contaminants and any known and possible source(s), and a summary of the history of contaminant releases which could be contributing to groundwater contamination.

- The Permittee must include a Site Conditions section to provide a detailed description of current site topography and locations of natural features and manmade structures. This section must include a description of drainages, vegetation types, erosional features, and current site uses, in addition to, descriptions of features located in surrounding sites (i.e SWMUs, AOCs) that may have an impact on the subject site regarding recharge sediment transport, surface water runoff, or contaminant fate and transport. A description of subsurface conditions must also be included that provides a discussion of the conditions observed during previous subsurface investigations, including but not limited to soil types and associations, stratigraphy, and the presence and flow direction of groundwater.

- A Scope of Activities section must include a list of all anticipated activities to be performed during the facility-wide groundwater monitoring sampling events

- A section must be included that provides a description of all anticipated locations to be sampled and methods for conducting the activities during the facility wide groundwater monitoring events. This section must include, but is not limited to, descriptions of sampling methods, sample handling procedures, procedures for collecting field water quality measurements, any field equipment and calibration procedures, water level measurement, purging activities, and decontamination procedures. This section must also address Investigation Derived Waste (IDW).

- The Permittee must include a Schedule section that proposes a schedule for the groundwater monitoring.

- Tables, Figures, and Appendices must be included.

Appendix B: 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 through the year. Gallup does not have any recovery well pumps that need to be shut off and removed prior to water elevation measurements.

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. 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.

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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.

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 DipperT electric water depth tape. If product is present, a ground water sample is typically 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, and specific conductivity. The well will be retested for pH, temperature and specific conductivity 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, and SMW-4 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.

Purged well water from wells that have shown prior contamination is collected in fifty five gallon drums. The water is treated in the refinery's waste water treatment system. Purged water from historically non-contaminated wells is drained onto the ground.

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 syringe 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.

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
Volatile Organics	VOA vials with septa cap of Teflon™
TOC, Phenols, Nitrate, Ammonia	Quart glass jar, H2SO4
Extractable Organics	Quart glass jar with Teflon™ cap
Chloride and Sulfate	Quart plastic, no preservative
Metals*	Pint plastic

* Prefiltration bottle for dissolved metals which is subsequently filtered and transferred to a pint plastic bottle with HNO3.

Filtration

Ground water samples are filtered prior to *dissolved 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 groundwater 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 4.4.2 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 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 show repeat previous sentence. 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 the appropriate shipping.

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/ bailer are used to then 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 b noted.

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 way 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 groundwater 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 4.2.2. 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 known contaminated wells generated during sampling and decontamination activities will be temporarily stored in labeled 55-gallon drums until disposed in the refinery wastewater treatment system upstream of the API separator. Water generated from known clean wells may be disposed off on the surface soils near the well site. 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 C: Wells Table

(See attached table)