GW - ______54______

CLOSURE PLANS

Chavez, Carl J, EMNRD

From: Chavez, Carl J, EMNRD

Sent: Monday, September 08, 2008 9:46 AM

To: 'Cox, Beverly J.'

Cc: Ayers, G. Lane; Price, Wayne, EMNRD

Subject: ConocoPhillips Ground Water Discharge Plan (GW-054) Surety Bond & Evaporation Pond Closure Plan with Cost Estimate

Ms. Cox:

The New Mexico Oil Conservation Division (NMOCD) is in receipt of the ConocoPhillips Surety Bond (letter dated July 21, 2008) and Evaporation Pond Closure Plan (CP) with Cost Estimate (letter dated September 4, 2008).

The NMOCD is currently processing the Surety Bond in the amount of $100,000.00 for evaporation pond closure. A letter of determination and/or approval shall be forthcoming.

The NMOCD hereby approves the Evaporation Pond CP.

Please contact me if you have questions. Thank you.

Please be advised that NMOCD approval of this plan does not relieve ConocoPhillips of responsibility should their operations fail to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD approval does not relieve ConocoPhillips of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
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E-mail: CarlJ.Chavez@state.nm.us
Website: http://www.emnrd.state.nm.us/ocd/index.htm
(Pollution Prevention Guidance is under "Publications")

ConocoPhillips

RECEIVED

2008 SEP 5 PM 2 13

San Juan Business Unit
Beverly J. Cox
Sr. Staff Environmental Technologist
P.O. Box 4289
Farmington, NM 87499
505-324-6194 Fax 505-599-4005

September 4, 2008

State Of New Mexico
Oil Conservation Division
Carl Chavez
1220 South St. Francis Drive
Santa FE, NM 87505

RE: Ground Water Discharge Plan (GW-054) Evaporation Pond Closure Plan

Mr. Chavez,

ConocoPhillips (COP) Wingate Fractionator is submitting a copy of the Evaporation Pond Closure Plan as per the Ground Water Discharge Plan renewal process.

Should you have questions please do not hesitate to call or email me.

Sincerely,

Beverly J. Cox

Beverly Cox

cc: Wingate Plant GWDP File
SJBU GWDP File

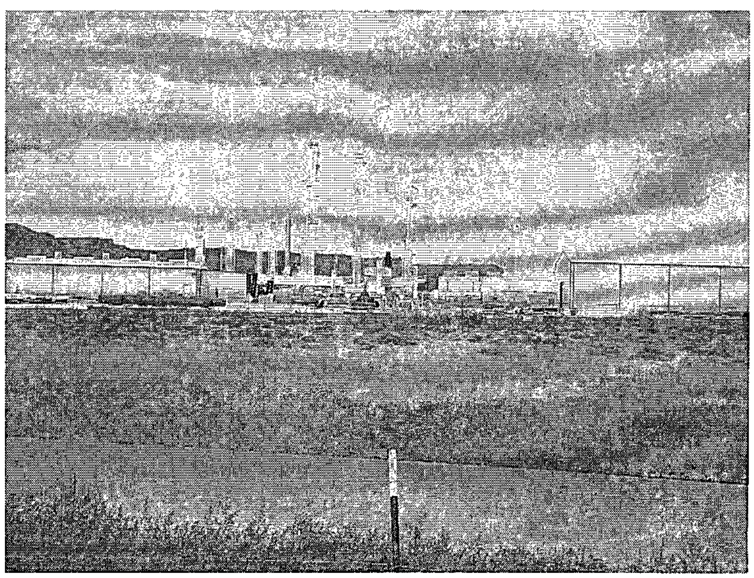
EVAPORATION POND CLOSURE PLAN

ConocoPhillips Wingate Fractionating Gas Plant

August 2008

Prepared for

ConocoPhillips



Prepared By:

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EVAPORATION POND CLOSURE PLAN

ConocoPhillips Wingate Fractionator

August 2008

Project Number 50071

I, Mike Brazie, being a registered Professional Engineer in the state of New Mexico (NMPE #9376) certify that this closure plan was prepared by me or under my direct supervision.

Mike E. Brazie 8/29/08

Mike Brazie Date

MIKE E. BRAZIE
NEW MEXICO
9376
REGISTERED PROFESSIONAL ENGINEER
8/29/08

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SITE LOCATION AND DESCRIPTION

This closure plan has been prepared for the evaporation ponds at the ConocoPhillips Wingate Fractionating Gas Plant near Gallup, New Mexico. The purpose of this closure plan is to comply with the New Mexico Oil Conservation Division (ODC) regulatory requirement for a discharge permit renewal, and the closure and post-closure requirements of 19.15.36.17 NMAC and 19.15.36.18 NMAC, as applicable to the evaporation ponds. In addition, the OCD Guidelines require that the closure plan include all of the information described in New Mexico Water Quality Control Commission (WQCC) Section 3107.A.11, and address the applicable provisions of the OCD Guidelines for Remediation of Leaks, Spills and Releases. Although the evaporation ponds are on property leased from the Navajo Nation, the operation of the fractionating gas plant is regulated by the OCD. Therefore, this closure plan has been prepared to comply with the applicable provisions of the OCD regulations.

The plant is located approximately one mile east of Gallup, New Mexico on US Highway 66. Within the plant site, the evaporation ponds are located on a flat plain northwest of the processing unit of the plant, in the SW¼, Sec. 9, T. 15 N., R. 17 W, McKinley County, New Mexico. **Figure 1** is a location map for the plant. The evaporation ponds are part of the fractionating plant's wastewater collection system, with effluent wastewater from the plant directed to the ponds and allowed to evaporate. The plant separates hydrocarbon liquids from a natural gas liquid stream into propane, n-butane, light gasoline, natural gas, and mixed butane, using a distillation train. Feedstock for the plant is received through pipelines from two natural gas facilities.

Waste streams originate from the following:

- Boiler Blowdown
- Cooling Tower Blowdown
- Reverse Osmosis Unit Waste Stream
- Caustic Waste (pH levels are as per RCRA Standards)
- Domestic Waste (sewage and gray water from septic systems)
- Water Quality Test Waste
- Rain Water

Plant waste streams are discharged to the evaporation ponds for final disposal by evaporation. The streams enter the east pond through a metered line containing effluent from the ConocoPhillips facility. When the east pond is full the west pond receives the overflow. The east pond is contained in a 560-foot by 940-foot area, and has a surface area of 480,000 square feet (11.0 acres). The west pond is contained in a 900-foot by 850-foot area, with a surface area of 693,000 square feet (15.9 acres). The ponds appear to have been constructed by clearing and grubbing, followed by leveling of the pond bottoms and construction of the berms to form the ponds. The ponds have been in continuous operation since construction. Elevation of the ponds is approximately 6,880 feet, and the berms range from about 5 feet to 8 feet in height.

SITE SOILS

The native soils in the area of the evaporation ponds are Rehobeth silty clay loam, which has formed in flood plains and on valley floors (Natural Resources Conservation Service, 2004). It is naturally saline, with salinity up to about 8 mmhos/cm and organic matter content up to about 1 percent. Soil pH ranges from 8 to 9. The soil at the site is bentonite clay and silt with a hydraulic conductivity of less than 10^{-7} cm/sec.

Three groundwater monitoring wells (MW-1, MW-2, and MW-3) were installed in the shallow groundwater around the evaporation ponds, with one upgradient and two downgradient of the ponds. The purpose of these wells was to monitor leakage or contamination coming out of the ponds. Annual groundwater monitoring has been conducted in these wells. Surface water samples have also been collected from the ponds themselves. The results of the recent monitoring are presented elsewhere in this Plan. Two downgradient vadose zone wells (MWS-1 and MWS-2) have also been installed to monitor leakage out of the ponds, but these two monitoring wells have remained dry, indicating fluids have not leaked from the ponds to the surrounding soils.

SITE GEOLOGY

The Wingate Plant is located along the southwestern margin of the San Juan Basin in the Colorado Plateau Physiographic Province. The site lies on the western side of the Zuni Uplift. Surficial geology at the site consists of Quaternary alluvial deposits. The alluvium is underlain by the late Triassic Chinle Formation, which consists primarily of interbedded claystone and siltstone with minor amounts of sandstone and limestone. The Chinle Formation has a total thickness of about 1,500 feet in this area, and is generally not water-bearing, although water has been encountered in some of the minor interbedded sandstone lenses. Generally, the Chinle Formation acts as an aquitard.

SURFACE AND GROUNDWATER HYDROLOGY

The site is located within the Rio Puerco valley, north of the Zuni Uplift. Surface water flow off the site is generally northwest by overland flow to a tributary of the Rio Puerco north of the site (South Fork). The Rio Puerco is a principal tributary of the Rio Grande, which is east of the site.

The primary aquifer in the region is within the San Andres Limestone and Glorieta Sandstone formations, designated as part of the C multiple-aquifer system. The top of the San Andres Formation is at a depth of about 1,670 feet. Based on information on record at the Office of the State Engineer (OSE), groundwater in the area of the site ranges in depth from about 1,700 to 2,000 feet below ground surface, with the aquifer under artesian head. Groundwater has also been found at shallow depths, up to about 300 feet in localized areas within the region. These wells report a very low yield, on the order of less than 10 gallons per minute (gpm).

Monitoring wells MWS-1 and MWS-2 are shallow, vadose zone wells that were installed adjacent to MW-1 and MW-2 to monitor possible leakage from the evaporation ponds. These two wells have remained dry, indicating no leakage has occurred from these two ponds.

POST CLOSURE LAND USE

After closure of the ponds, it is anticipated the land will be returned to natural rangeland, as before construction of the fractionating plant.

CLOSURE PLAN COMPONENTS

At closure, the water remaining in the ponds will be allowed to evaporate, and the ponds will be regraded, and revegetated. This subsection describes these operations.

Potential for Site Remediation

Based on historic sampling results provided to GFW by ConocoPhillips, the need to remediate the evaporation ponds to protect groundwater is not anticipated. Sampling is performed at 3 groundwater monitoring wells in the area of the ponds, and the water within the ponds has been sampled.

Groundwater sampling results from June 2007 (the latest annual monitoring report) for total benzene, toluene, ethylbenzene, and xylenes (BTEX), chloride, sulfate, and Total Dissolved Solids (TDS) are summarized on **Table 1**. These results indicate no contaminants have migrated from the evaporation ponds. In addition, the VADSAT model predicted no salt migration below the ponds. Details of the modeling and the modeling results are in **Appendix A**. See **Figure 2** for the locations of the monitoring wells.

Table 1. Groundwater Sampling Results (in mg/l)

WELL	BETX	CHLORIDE	SULFATE	TDS
MW-1	ND	34.1	58.8	886
MW-2	ND	33.0	13.3	888
MW-3	ND	22.1	17.3	510

Reported concentrations of chloride were 5,720 mg/l in the east pond, and 36,000 mg/l in the west pond (Maxim Technologies, 2007). Based on the groundwater monitoring results and the results of the VADSAT modeling, no over-excavation of the ponds is planned for closure. However, after the ponds have dried and before they are filled, soil samples will be collected to verify that no remediation of the pond bottoms is required at that time. The sampling results will be submitted to OCD to document that the ponds meet closure criteria before filling and grading the ponds.

In addition, the salt concentration in the pond samples was compared to the saturation concentration of NaCl in water. These calculations show that the measured salt concentrations in the pond water are well below saturation, and so no precipitation of NaCl is to be expected on that basis. However, the water levels may decrease through evaporation to the point where the salt concentration reaches saturation and salt is precipitated out. This could result in a thin salt layer that could be buried by sediment carried into the pond when the inflow is resumed. Based on discussions with representatives of the facility and historic photos, it appears that salt has deposited when water levels are low. It is not known whether this salt dissolves again when the ponds fill, or if it remains buried in the pond sediment.

Therefore, although this closure plan has assumed no over-excavation of the ponds will be required, this will have to be verified at the actual time of closure. Under current OCD Rules (as of August 2008), chloride contaminated soil from petroleum sites can be disposed in a solid waste landfill that has a special waste permit which allows such waste to be accepted. The nearest such facility is the Red Rocks Regional Landfill near Thoreau in McKinley County. This facility is currently permitted to accept chloride contaminated soil, and charges $46/ton for disposal. It should be noted, that the OCD is allowing disposal of chloride contaminated soils at landfills with special waste permits on an interim basis, and this rule may change if a special facility for handling petroleum wastes is constructed in this part of the state.

GFW has estimated the cost of over-excavation and disposal of the pond sediment, should that be required at the time of closure. The estimate was made by calculating the amount of salt that would deposit, based on the latest chloride concentrations in the two ponds, and assuming the salt is deposited uniformly over the pond on an annual basis. It was assumed the same amount of salt was deposited annually for 30 years of operation. Although the salt is likely to be found in thicker deposits in parts of the pond and thinner in other parts, this provides an average volume of salt for the purpose of an estimate. GFW estimated a total depth of 3 feet of water in the pond with the reported chloride concentrations, and assumed this volume completely evaporated each year, leaving the salt deposited in the bottom of the pond. This results in a 30-year salt deposit of 0.45 feet in the east pond and 2.8 feet in the west pond. For estimating purposes, it was assumed 6 inches would be excavated from the bottom of the east pond and 3 feet from the west pond.

Water Evaporation

As part of the evaporation pond closure operations, wastewater will cease to be discharged to the evaporation ponds, and all supply lines to the ponds will be disconnected. The water remaining in the ponds will then be allowed to evaporate. Once the water has evaporated and the ponds are dry, the pond bottoms will be sampled to determine if the soil beneath the ponds must be treated or removed due to the presence of contaminants above New Mexico Environment Department (NMED) Soil Screening Levels (SSLs). Based on historic sampling and modeling discussed above, no site remediation is anticipated for closure of the ponds, except for possible salt removal from the pond bottoms

The recovered pond sites are not expected to function as an agricultural area. If remediation is required, it will mostly likely be to treat chlorides. Increased chloride levels may adversely impact vegetation growth. Such contamination may not be a significant issue except for the post-closure revegetation program. Where encountered, soils with chloride concentrations above plant tolerances will be excavated and disposed offsite, and clean fill from designated borrow areas within the facility perimeter will be placed to support plant growth consistent with the revegetation program. Several clean borrow areas are available on site, so there is no need for importing fill. Fill needed to attain final grade and support plants will be obtained from those designated fill sites, as needed. However, this closure plan has assumed no chloride treatment will be required.

Site Grading

Once the water in the ponds has evaporated, the ponds will be graded to closure contours. A plan of the existing ponds is shown on **Figure 2** and the final grade on **Figure 3**. The grading has been designed to restore the area of the ponds approximately back to the natural contours prior to construction of the ponds. Final grade will be attained by grading the bermed soils into the pond areas, supplementing the material requirements by grading soils from the areas immediately adjacent to the ponds, if needed. Additional material for fill areas will be excavated from specific areas designated by the landowner. Although the ponds themselves are located on property leased from the Navajo Nation, the adjacent property is owned by ConocoPhillips, so there will be no need to import soils for the closure grading. Any borrow required for pond closure will be taken from ConocoPhillips property. Based on the existing site topography and proposed grading, the required earthwork volume will be 107,000 cubic yards, which is available from the existing berms surrounding the ponds. Elevation at final grade will range from 6,590 feet to 6,585 feet, with a slope of approximately 0.7 percent to the northwest (**Figure 3**).

Road Reclamation

Most of the roads in the pond area are unpaved surfaces on the berms or between the ponds. These areas will be re-contoured along with the ponds. No paved roadways are present in the area of the ponds, and no structures are present that will need to be demolished

Site Drainage

No drainage structures will be required at closure. The final grade will provide a general slope of about 0.7 percent to the northwest, consistent with the natural contours and drainage patterns of the area. Post-closure site drainage will be by natural sheet flow to the northwestern edge of the property, and then will follow the existing drainage channel (South Fork) off-site. Because of the low grade and the re-vegetation at closure, no erosion protection other than site vegetation is necessary or planned.

Revegetation

Areas impacted by grading and other disturbances during closure operations will be re-vegetated. The re-vegetation is intended to reduce impacts to surface water by establishing a self-sustaining native plant community which will provide protection against soil erosion and enhance the natural aesthetics of the closed site. The need for soil amendments will be determined based on site-specific evaluations at the time of closure. Inorganic fertilizer will be added to increase nitrogen, phosphate, and potassium available to plants, as required by analytical results of the soils. Mulch will be applied after seeding to conserve soil moisture and protect against soil erosion until the plants have taken root. Planting will be performed between May and September.

Amended areas will be seeded with a mixture of native grasses and forbs that will not depend on external application of water or fertilizer. The plant species native to the area, as listed in the 2004 NRCS *Soil Survey of McKinley Area, New Mexico*, are shown on **Table 2**. Specific species, composition percentages, and seeding rates will be determined during a vegetation survey conducted as part of the closure operations.

Table 2. Native Plant Species

Alkalai Sacaton	Fourwing Saltbush	Blue Grama	Inland Saltgrass	Rabbitbrush
Western Wheatgrass	Black Greasewood	Bottlebrush Squirreltail	Mat Muhly	

Regulatory Compliance

A stormwater permit will be required for construction activities during site closure, and must be obtained prior to implementing the closure operations. Temporary erosion control measures, such as silt fence, will be placed around the construction zone during construction, but will be removed upon completion of the site closure. **Figure 3** shows the location of the silt fence for temporary erosion and sediment control. Dust will be controlled periodically during earthmoving operations by watering haul roads and other dust-generating areas, as necessary.

CLOSURE OPERATIONS AND SCHEDULE

Although a specific schedule of operations will be prepared by the construction contractor selected to perform the closure, a general schedule follows.

Week 1:

- Notify OCD that closure operations will commence
- Stop wastewater delivery to the evaporation ponds
- Prepare Storm Water Pollution Prevention Plan (SWPPP)

Weeks 1 – 4:

- Evaporate water from ponds
- Analyze bottom soil in each pond by SW-846
- Mobilize construction equipment
- Install sediment controls

Weeks 5 – 8:

- Excavate and dispose of any contaminated soils
- Regrade ponds
- Perform vegetation survey and soil analysis for amendments and seed mix
- Final contour area

Week 9:

- Revegetate

CLOSURE COST ESTIMATE

The closure costs were estimated by calculating material volumes and using recent unit bid prices available at the time this plan was prepared. Earthwork material volumes were calculated based on the grading plan, resulting in a total of 107,000 cubic yards.

Material Estimates

Earthwork quantities were estimated from the existing contour map of the evaporation ponds, and the final grading plan developed as part of this closure plan. Ground surface elevations were taken from the USGS Gallup East topographic quadrangle map, and confirmed using the monitor well elevations shown on the drilling logs for the groundwater monitoring wells. The bottom elevations of the ponds were assumed from the elevations just outside each pond. Because the ponds were built up by constructing berms at grade, the assumed elevations should be adequate for the purposes of the closure cost estimate for this closure plan. The final contours were then designed integrally with the existing grades around the ponds, with the final contours of the closed ponds tied to those surrounding elevations and contours, with adequate slope to provide drainage by sheet flow into the natural drainage areas to the northwest of the ponds.

The cut and fill requirements were then determined by comparing the existing contours to the proposed final contours, and estimating the material available in the berms. The berm material volumes were estimated from plan drawings provided to GFW and dimensions observed in the field. Based on these calculations, the volumes balance, and there will be no excess or borrow requirements to close the ponds.

Silt fence requirements are shown on **Figure 3**. Silt fence will be placed along the lower gradient of the construction zone. A total of 1,980 linear feet (LF) of silt fence will be required.

Revegetation acreage was determined from the grading plan, based on the area of disturbance. The acreage of each pond is shown on **Figure 2**. The total acreage to be revegetated is estimated to be 31 acres.

The following items were considered incidental, and not separated out in the estimate:

1. Water for dust control, incidental to grading and shaping (Bid Item 5)
2. Silt fence management, incidental to SWPPP (Bid Item 2)
3. Soil analysis, incidental to revegetation (Bid Item 6)
4. Over-seeding, soil amendment, or blending, incidental to revegetation (Bid Item 6)
5. Notifications, permits and clearances, incidental to mobilization (Bid Item 1)

An additional cost was estimated for over-excavation and disposal of salt, based on the calculation method described on page 6, and the current tipping fee provided by the Red Rocks Regional Landfill. It assumes only salt deposits will be removed, and no additional soil removal will be necessary. It is also based on the latest reported chloride concentrations in the ponds, although the concentrations may vary over time.

Cost Estimate

Closure costs for the total site were estimated using the material volumes determined as described above, and applying average unit bid (AUB) prices and an independent estimate of construction unit costs. The earthwork unit costs developed for this estimate are included in **Appendix B**. AUBs were estimated based on the latest bid prices for New Mexico Department of Transportation (NMDOT) construction projects (BidEX), adjusted for McKinley County, project size, and construction season using Estimator® estimating software. An independent estimate of unit costs, developed as part of an earlier assignment in the general project area, was also used in adjusting the NMDOT AUBs, as shown in Appendix B. These estimates are presented in 2008 dollars and based on construction bid prices, supplier quotes, and commodity prices as of August 2008.

The earthwork costs are based on the earthwork material volumes required to close the entire pond site. The revegetation costs are based on the acreages of the ponds and surrounding disturbed areas. The cost for silt fence is based on the placement shown on **Figure 3**. Mobilization and SWPPP costs were estimated as lump sum for the entire project, assuming the entire closure will be performed in a single mobilization. Engineering and construction services (E&C) were assumed to be 10% of construction costs, and include soil sampling and analysis for site remediation, and New Mexico Gross Receipts Tax (NMGRT) was applied at the current (August 2008) McKinley County rate of 6.625 percent. A 15% contingency was added to the base estimate only.

Because no post-closure care or monitoring is anticipated, no costs for those items are included in the estimate. If contamination is found above SSLs at the time of closure, it is expected to be chlorides, based on historic monitoring results, which could impact plant growth. Draft research by the OCD Chlorides Working Group has indicated that salt wicking (migration upward through the soil) occurs within the top five feet of soil, because of the high evaporation rates in New Mexico, and that was the assumption used in the OCD chloride model (WPchloridedeterminationlandfarms.xls). So if chlorides become a problem at closure, additional soil cover will most likely be the appropriate remediation approach for these ponds. Other options may include gypsum treatment or application of other salt-inhibiting materials.

Based on these assumptions and the cost estimating method described, the total estimated closure cost for the evaporation ponds is **$157,132**. Should over-excavation and disposal of salt-contaminated soil be required, an additional cost of **$208,762** is estimated. See Appendix B for a complete breakdown of costs.

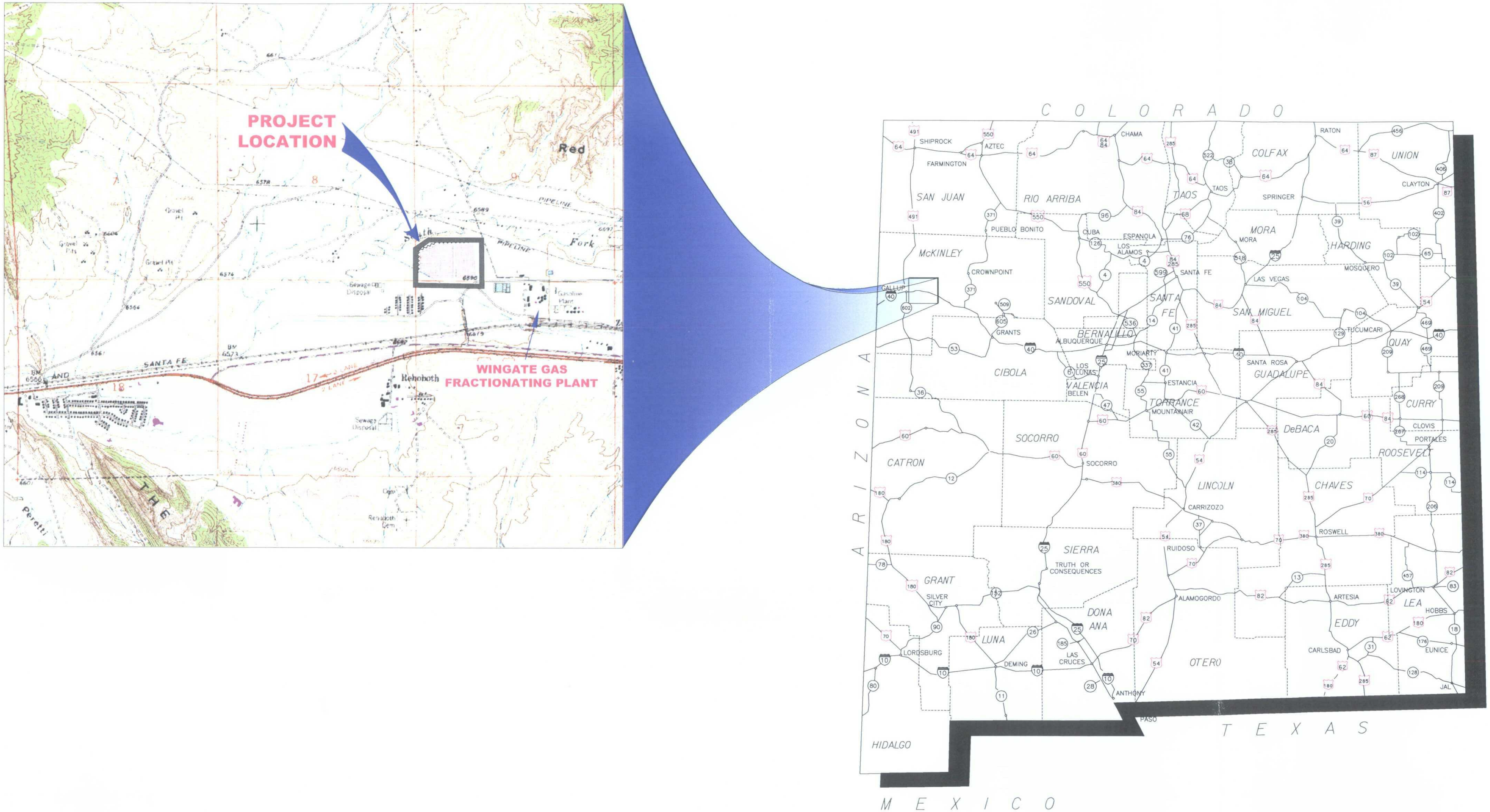
REFERENCES

ConocoPhillips Company, Wingate Fractionating Plant Discharge Plan, (Permit GW-054)

Maxim Technologies, 2007, Groundwater Monitoring Report, ConocoPhillips Wingate Fractionating Plan

Natural Resources Conservation Service, Soil Survey of McKinley Area, New Mexico, 2004

U.S. Geological Survey, 1963 (Photorevised 1979), Gallup East Topographic Quadrangle Map, 1:24,000



Location Map
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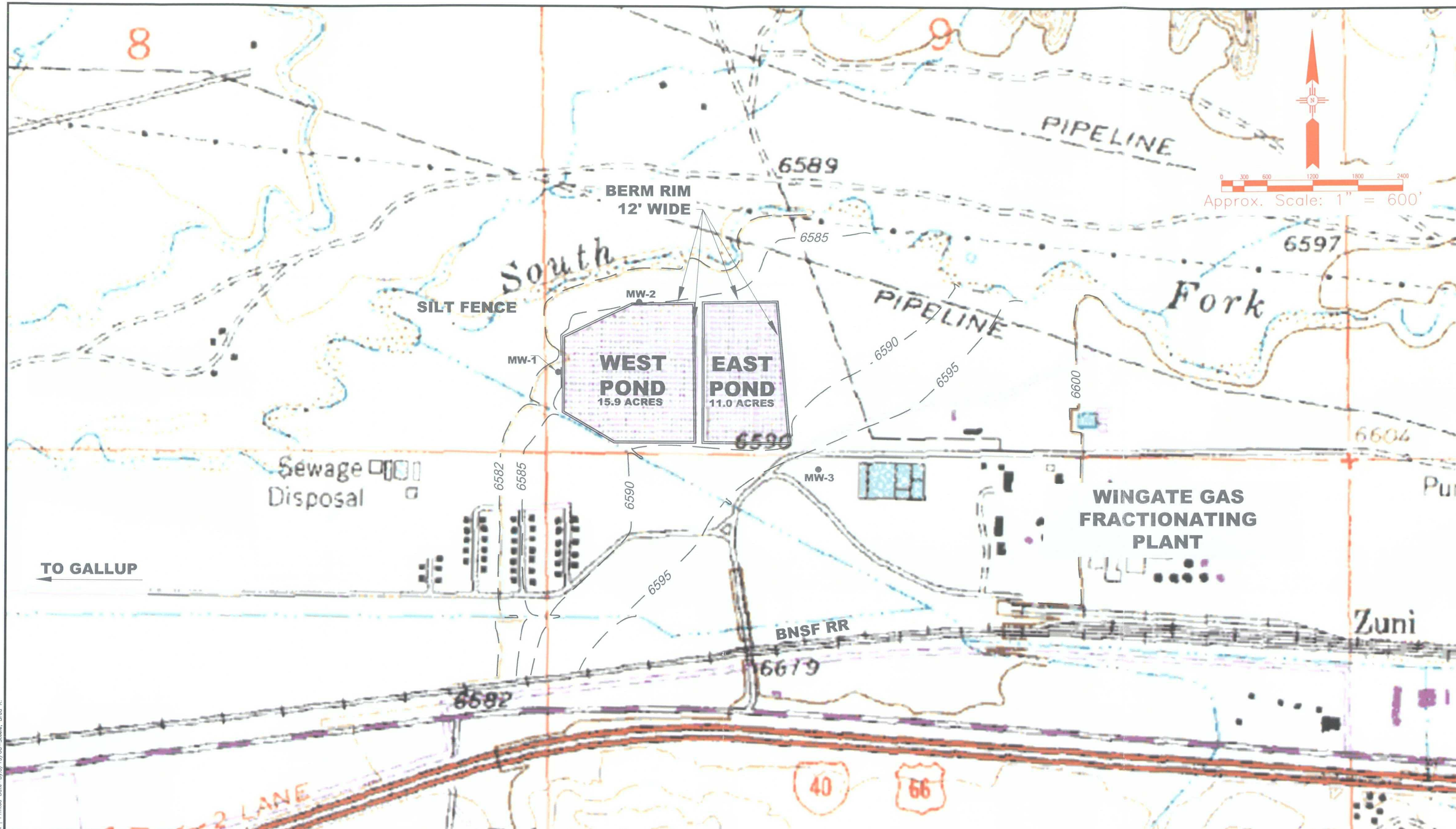
EVAPORATION POND CLOSURE PLAN
LOCATION MAP
FIGURE 1

ConocoPhillips
WINGATE GAS FRACTIONATING PLANT
GALLUP, NEW MEXICO



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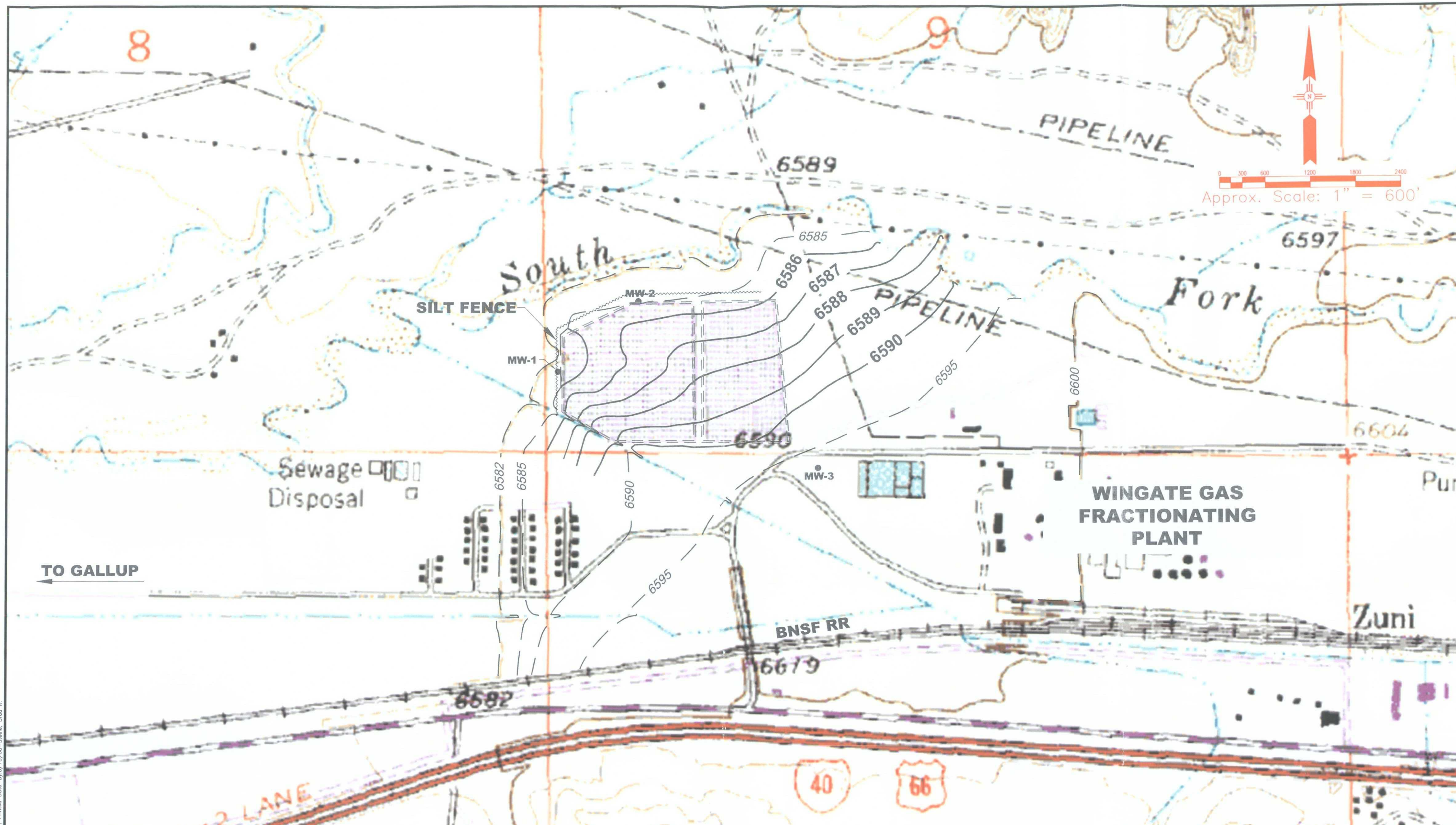
EVAPORATION POND CLOSURE PLAN

EXISTING CONDITIONS

FIGURE 2

ConocoPhillips

WINGATE GAS FRACTIONATING PLANT
GALLUP, NEW MEXICO



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EVAPORATION POND CLOSURE PLAN

PROPOSED CONDITIONS

FIGURE 3

ConocoPhillips

WINGATE GAS FRACTIONATING PLANT
GALLUP, NEW MEXICO

Proposed Conditions
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APPENDIX A

VADSAT MODELING RESULTS

SUMMARY OF VADSAT MODELING

API's VADSAT Model was used to estimate the potential for chloride migration from each of the ponds. Although the model is a groundwater protection risk assessment model, and therefore has limitations to estimating salt concentrations that will remain after the evaporation ponds are dried, it can be used to predict how far the salt might travel through the underlying soils. BTEX compounds were not modeled, since no BTEX was detected in any of the analytical results available for the site.

VADSAT can be used to estimate volatile emissions to outdoor air, leaching to groundwater, and groundwater transport. In this case, it was used to estimate leaching of chlorides through the unsaturated zone beneath the evaporation ponds. VADSAT was developed specifically to handle petroleum hydrocarbons and salt by calculating the mole fraction of each individual constituent being modeled and then calculating the individual chemical solubility.

Each pond was modeled using the available site-specific data for the pond, where available, to supplement the model defaults. Soil data was obtained from the 2004 NRCS *Soil Survey of McKinley Area, New Mexico*. Groundwater data was obtained from the online WATERS data base, available on the OSE website (www.ose.state.nm.us). The salt concentration within the west evaporation ponds is 36,000 mg/l and in the east pond it is 5,700 mg/l, based on analysis of water sampled from the ponds in June 2007 (latest results available), and those values were used as the aqueous salt concentration for the model. Receptor coordinates were assigned depths of 1, 2, and 3, meters directly beneath the pond, and the modeling period was 15 years.

Obtaining data for VADSAT is fairly simple, since some of the input parameters can be looked up in standard databases or found in literature, and there are several default values that can be selected from within the model. The mean thickness of the waste zone was taken as 0.5 m, as an average waste thickness in the ponds. The surface area of each pond was used as the waste zone area. The pond length to width (L/W) ratio was taken from measurements off the site plan. No waste cover was used, and the salt concentrations were taken from the latest pond sampling results. Hydrogeologic parameters were taken from literature and the NRCS soil survey. These included average porosity, hydraulic gradient, and infiltration rate. The depths to groundwater and aquifer thickness were taken from well data on file at the OSE. Model defaults were used for the other parameters. Receptors were designated at the X and Y origins, to represent ground at the pond itself, with Z values at depths of 1, 2, and 3 meters directly beneath the pond. The model was then run over a 15-year period.

The following pages are the VADSAT model output for the two pond runs. These begin with the model header, followed by the waste parameters and hydrogeologic parameters, which provide the model input. The input receptor coordinates are next. Model output follows the receptor inputs. The first output section shows the salt concentration (in mg/l) predicted at the water table and at each of the three receptor depths over time. This is followed by the mass of salt (in g/m^3) and mass fraction remaining in the pond (representing the salt that has not yet leached out) over the same time periods.

The model results show no salt concentrations beneath the pond over the modeled time period, with only an insignificant amount of salt leaching out of the ponds. Therefore, GFW has assumed that any excavation of the ponds to remove salt deposits would only involve the salt layers at the bottom of the ponds, and would not require any excavation of the underlying soil.

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+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
+                                                               +
+                      VADSAT Version 3.0                       +
+                                                               +
+    A Monte Carlo Model for Assessing the Effects of Soil      +
+            Contamination on Groundwater Quality               +
+                                                               +
+                                                               +
+                         Developed by:                         +
+          Environmental Systems and Technologies Inc.          +
+                    Blacksburg, Virginia                       +
+               Tel: 703-552-0685, Fax: 703-951-5307            +
+                                                               +
+                                                               +
+                             For                               +
+               The American Petroleum Institute                +
+                            1995                               +
+                                                               +
+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +

PROJECT TITLE:ConocoPhillips Wingate Plant East Pond

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) =      0.00000
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. =      0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m)    =      0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE =      0.00000

AREAM, MEAN WASTE ZONE AREA (m^2)           = 44770.00000
STDA, STD.DEV. OF WASTE ZONE AREA           =      0.00000

RLWM, MEAN L/W RATIO (-)                    =      1.76000
STDRLW, STD.DEV. OF L/W RATIO               =      0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m)   =      0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS         =      0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)=   537.73584
STD OF MASS FRACTION OF SALT IN WASTE      =     0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) =  5700.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT =     0.00000

CHEMICAL SPECIES                                 Sodium Chloride

HYDROGEOLOGICAL PROPERTIES
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** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day)  =      0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF   =      0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) =      0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. =      0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day)        =      0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY       =        0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m)        =     99.00000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER    =      0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-)       =      0.20000
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SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY          =      0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-)           =      1.09000
SDPARN, STD.DEV. OF VG PARAMETER N                =      0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-)           =      0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT        =      0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
     ** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day)        =      0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF.         =      0.00000

PORM, MEAN SAT. ZONE POROSITY (-)                 =      0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY            =      0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-)        =      0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.=            0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) =           1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. =           0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) =           1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. =           0.00000

CONDS, SAT. HYDRAULIC COND. (m/day)               =      0.00000
SCONDS, STD.DEV. OF SAT HYDRAULIC COND.           =      0.00000

GRADS, HYDRAULIC GRADIENT (m/m)                   =      0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT            =      0.00000

HMEAN, MEAN AQUIFER THICKNESS (m)                 =     20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS               =      0.00000

QINM, MEAN INFILTRATION RATE (m/day)              =      0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE             =      0.00000

LOCATION OF RECEPTORS:

                X (M)          Y (M)          Z (M)
RECEPTOR( 1)     0.0            0.0            1.0
RECEPTOR( 2)     0.0            0.0            2.0
RECEPTOR( 3)     0.0            0.0            3.0

BREAKTHROUGH CURVES

          CONCENTRATIONS (MG/L) AT:

 TIME   WATER TABLE    RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 365.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
 730.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
1095.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
1460.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
1825.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
2190.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
2555.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
2920.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
3285.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
3650.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
4015.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
4380.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
4745.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
5110.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
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MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	569.9999390	0.0005377
365.0000000	569.5838623	0.0005373
730.0000000	569.3757935	0.0005371
1095.0000000	569.1677246	0.0005370
1460.0000000	568.9597168	0.0005368
1825.0000000	568.7516479	0.0005366
2190.0000000	568.5435791	0.0005364
2555.0000000	568.3355103	0.0005362
2920.0000000	568.1275024	0.0005360
3285.0000000	567.9194336	0.0005358
3650.0000000	567.7113647	0.0005356
4015.0000000	567.5033569	0.0005354
4380.0000000	567.2952881	0.0005352
4745.0000000	567.0872192	0.0005350

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+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
+                                                               +
+                     VADSAT Version 3.0                        +
+                                                               +
+   A Monte Carlo Model for Assessing the Effects of Soil       +
+          Contamination on Groundwater Quality                 +
+                                                               +
+                                                               +
+                       Developed by:                           +
+          Environmental Systems and Technologies Inc.          +
+                Blacksburg, Virginia                           +
+           Tel: 703-552-0685, Fax: 703-951-5307                +
+                                                               +
+                                                               +
+                           For                                 +
+             The American Petroleum Institute                  +
+                          1995                                 +
+                                                               +
+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
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PROJECT TITLE:ConocoPhillips Wingate Plant West Pond

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SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) =      0.00000
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. =      0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m)    =      0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE =      0.00000

AREAM, MEAN WASTE ZONE AREA (m^2)           = 64347.00000
STDA, STD.DEV. OF WASTE ZONE AREA           =      0.00000

RLWM, MEAN L/W RATIO (-)                    =      1.07000
STDRLW, STD.DEV. OF L/W RATIO               =      0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m)   =      0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS         =      0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)=  3396.22632
STD OF MASS FRACTION OF SALT IN WASTE      =     0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 36000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT =      0.00000

CHEMICAL SPECIES                                Sodium Chloride

HYDROGEOLOGICAL PROPERTIES
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** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day)  =      0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF   =      0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) =      0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. =      0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day)        =      0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY       =        0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m)        =     99.00000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER    =      0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-)       =      0.20000
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SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY       =     0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-)        =     1.09000
SDPARN, STD.DEV. OF VG PARAMETER N             =     0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-)        =     0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT     =     0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day)     =     0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF.      =     0.00000

PORM, MEAN SAT. ZONE POROSITY (-)              =     0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY         =     0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-)     =     0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.=        0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) =       1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. =       0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) =       1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. =       0.00000

CONDS, SAT. HYDRAULIC COND. (m/day)            =     0.00000
SCONDS, STD.DEV. OF SAT HYDRAULIC COND.        =     0.00000

GRADS, HYDRAULIC GRADIENT (m/m)              =     0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT       =     0.00000

HMEAN, MEAN AQUIFER THICKNESS (m)              =    20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS            =     0.00000

QINM, MEAN INFILTRATION RATE (m/day)           =     0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE          =     0.00000

LOCATION OF RECEPTORS:

                  X (M)          Y (M)          Z (M)
RECEPTOR( 1)       0.0            0.0            1.0
RECEPTOR( 2)       0.0            0.0            2.0
RECEPTOR( 3)       0.0            0.0            3.0

BREAKTHROUGH CURVES

          CONCENTRATIONS (MG/L) AT:

 TIME   WATER TABLE    RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 365.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
 730.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
1095.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
1460.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
1825.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
2190.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
2555.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
2920.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
3285.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
3650.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
4015.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
4380.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
4745.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
5110.0000 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
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MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	3599.9985352	0.0033962
365.0000000	3597.3706055	0.0033937
730.0000000	3596.0566406	0.0033925
1095.0000000	3594.7424316	0.0033913
1460.0000000	3593.4284668	0.0033900
1825.0000000	3592.1145020	0.0033888
2190.0000000	3590.8005371	0.0033875
2555.0000000	3589.4865723	0.0033863
2920.0000000	3588.1726074	0.0033851
3285.0000000	3586.8586426	0.0033838
3650.0000000	3585.5444336	0.0033826
4015.0000000	3584.2304688	0.0033813
4380.0000000	3582.9165039	0.0033801
4745.0000000	3581.6025391	0.0033789

APPENDIX B

DETAILED COST ESTIMATE

APPENDIX B

PRELIMINARY ENGINEER'S OPINION OF PROBABLE COSTS
Project Name:
CONOCOPHILLIPS WINGATE POND CLOSURE

					ENGINEERS ESTIMATE GANNETT FLEMING WEST, INC.	
BID ITEM #	ITEM ID NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
1	621000	MOBILIZATON	LS	1.00	$10,000.00	$10,000.00
2	603000	NPDES PERMITTING AND SWPPP IMPLEMENTATION, COMPLETE	LS	1.00	$2,500.00	$2,500.00
3	801000	CONSTRUCTION STAKING, COMPLETE	LS	1.00	$2,000.00	$2,000.00
5	209000	MISC. GRADING, AND SHAPING, COMPLETE	SY	10700	$5.00	$53,500.00
6	632000	CLASS A SEEDING, COMPLETE	AC	31	$1,500.00	$46,500.00
7	603200	SILT FENCE, COMPLETE	LF	1980	$5.60	$11,088.00
8	000002	ENGINEERING AND CONSTRUCTION SERVICES	LS	1	$12,558.80	$12,558.80
		Subtotal of Base Bid Items				$128,146.80
		Contingency of 15%				$19,222.02
		New Mexico Gross Receipts Tax (NMGRT) at 6.625%				$9,763.18
		TOTAL				**$157,132.00**

Additional Cost for Possible Salt Excavation and Disposal

BID ITEM #	ITEM ID NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
1	203000	SUBEXCAVATION, INCLUDING HAUL, DISPOSAL, COMPLETE	CY	28616	$5.60	$160,249.60
2	000001	TIPPING FEE, LANDFILL, COMPLETE	CY	28616	$0.62	$17,741.92
3	000002	ENGINEERING AND CONSTRUCTION SERVICES	LS	1	$17,799.15	$17,799.15
		Subtotal of Base Bid Items				$195,790.67
		New Mexico Gross Receipts Tax (NMGRT) at 6.625%				$12,971.13
		TOTAL				**$208,761.80**