GW – 022

2009 only PERMIT, Application

Larson & Associates, Inc.
Environmental Consultants

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September 24, 2009

Mr. Leonard Lowe
Environmental Engineer
New Mexico Oil Conservation Division
1220 S St. Francis Drive
Santa Fe, New Mexico 87505

RE: Frontier Field Service Discharge Permit Renewal
Empire Abo Gas Plant - GW-022
Eddy County, New Mexico

Dear Mr. Lowe:

On behalf of Frontier Field Services, Larson & Associates, Inc., submits this renewal permit for the Empire Abo Gas Plant. Please find enclosed the renewal application, public notice (in English and Spanish) and the filing fee.

If you have any questions or require additional information, please call me at 432.687.0901 to discuss.

Sincerely,

LARSON & ASSOCIATES, INC.

Michelle L. Green
Environmental Scientist
michelle@laenvironmental.com

Enclosure
- Discharge Permit Renewal Application
- Public Notice
- Filing Fee

District I
1625 N. French Dr., Hobbs, NM 88240
District II
1301 W. Grand Avenue, Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

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

Revised June 10, 2003

Submit Original
Plus 1 Copy
to Santa Fe
1 Copy to Appropriate
District Office

DISCHARGE PLAN APPLICATION FOR SERVICE COMPANIES, GAS PLANTS, REFINERIES, COMPRESSOR, GEOTHERMAL FACILITES AND CRUDE OIL PUMP STATIONS

(Refer to the OCD Guidelines for assistance in completing the application)

☐ New ☒ Renewal ☐ Modification

1. Type: Gas Plant

2. Operator: Frontier Field Services, LLC

   Address: 257 Empire Road, Artesia, New Mexico, 88210

   Contact Person: David Harris Phone: 505-677-5177

3. Location: Unit I (NE/4, SE/4), Section 3, Township 18, South, Range 27 East
   Submit large scale topographic map showing exact location.

4. Attach the name, telephone number and address of the landowner of the facility site.

5. Attach the description of the facility with a diagram indicating location of fences, pits, dikes and tanks on the facility.

6. Attach a description of all materials stored or used at the facility.

7. Attach a description of present sources of effluent and waste solids. Average quality and daily volume of waste water must be included.

8. Attach a description of current liquid and solid waste collection/treatment/disposal procedures.

9. Attach a description of proposed modifications to existing collection/treatment/disposal systems.

10. Attach a routine inspection and maintenance plan to ensure permit compliance.

11. Attach a contingency plan for reporting and clean-up of spills or releases.

12. Attach geological/hydrological information for the facility. Depth to and quality of ground water must be included.

13. Attach a facility closure plan, and other information as is necessary to demonstrate compliance with any other OCD rules, regulations and/or orders.

14. CERTIFICATION I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

Name: David Harris Title: Plant Manager

Signature: David E Harris Date: 1 Sept 2009

E-mail Address: dharris@frontierfieldservices.com

DISCHARGE PERMIT RENEWAL APPLICATION
GW-022

Frontier Field Services, LLC
Empire Abo Gas Plant
Eddy County, New Mexico

Project No. 9-0111

August 28, 2009

Prepared for:
Frontier Field Services, LLC
257 Empire Road
Artesia, New Mexico 88210

Prepared by:
Michelle L. Green
Environmental Scientist

Larson & Associates, Inc.
507 North Marienfeld, Suite 200
Midland, Texas 79701

August 28, 2009

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1.0 Type of Operation

Frontier Field Services, LLC (Frontier) operates the Empire Abo Gas Plant located in Eddy County, New Mexico. The facility is a 56 MMcfd cryogenic gas plant and gathering system. The facility utilizes a cryogenic process to remove simple alkanes (i.e. ethane, propane, pentane and hexane) from natural gas and third party y-grade (liquid hydrocarbons). The unprocessed material is transported to the facility via pipelines. The gas is compressed and sent to an amine system to remove carbon dioxide and hydrogen sulfide, dehydrated and cooled. Natural gas liquid and residue gas products leave the facility by means of pipelines. The facility uses scrubbers, exchangers, separators, chillers, flash tanks, and compressors for the various processes.

2.0 Name of Operator or Legally Responsible Party and Local Representative

Facility Operator and Responsible Party:	Frontier Field Services, LLC 257 Empire Road Artesia, New Mexico 88210
Local Representatives:	David Harris Plant Manager Office: 575-677-5117 Cell: 575-703-0891

3.0 Location of the Discharge Plan Facility

The facility is located at Latitude 32° 46' 37.4" North and Longitude 104° 15' 32.7" West, in the NE/4, SE/4, (Unit I), Section 3, Township 18 South, Range 27 East, Eddy County, New Mexico. A topographic map, aerial based map and facility drawing are presented in Figures 1, 2, and 3, respectively.

4.0 Landowners

The landowner of record, according to the Eddy County Tax Assessor's Office is:

Frontier Field Services, LLC
4200 E. Skelly Drive
Suite 700
Tulsa, Oklahoma 74135

5.0 Facility Description

The Empire Abo Gas Plant is a cryogenic gas plant and associated gathering system. The plant accepts inlet gas from the various fields. The end products, residue gas and natural gas liquids, are sold to various Petroleum based companies.

A facility diagram depicting locations of storage, disposal and processing areas is presented in Figure 4. Process flow diagrams are presented in Appendix A.

6.0 Material Stored or Used at the Facility

The following materials are stored and used at the Empire Abo Gas Plant facility:

A. Process specific chemicals (TEG, Amine, Lean Oil, etc.)

Material Name	Solid or Liquid	Type of Container	Estimated Volume	Secondary Containment	Location
Monoethanolamine	Liquid	1 – 210 bbl Tank	100 bbls	Plastic lined Earthen berm	East of Evap Pond
MR Solvent, Kerosene	Liquid	1 – 500 gallon tank	500 gallons	Fiberglass with earthen berm	South of Shop

B. Acids/Caustics

Material Name	Solid or Liquid	Type of Container	Estimated Volume	Secondary Containment	Location
Sulfuric acid	Liquid	1000 gallon poly tank	1000 gallon	Concrete berm	East of Cooling Tower
Sodium hydroxide	Liquid	1000 gallon tank	500 gallon	Concrete berm	West of #1 Amine System
Bleach	Liquid	1000 gallon poly tank	1000 gallon	Concrete berm	East of Cooling Tower
Unichem 3941, NaOH based	Liquid	100 gallon tank	100 gallon	Concrete berm	East of Cooling Tower
Sodium Carbonate	Solid	80 lb bag	5 bags	None	Chemical building
Unichem 1304, KOH based	Liquid	100 gallon tank	100 gallon	Concrete berm	East of Cooling Tower
Unichem 1702, Phosphonic acid based	Liquid	100 gallon tank	100 gallon	Concrete berm	East of Cooling Tower
Unichem 3033, TKPP, $K_4P_2O_7$	Liquid	100 gallon tank	100 gallon	Concrete berm	East of Cooling Tower
Caustic Soda Beads, KOH	Solid	2-2500 gallon Old Dehydrator Vessels	28.274 feet^2 per vessel	N/A	North Cryogenic Plant
Citric Acid	Solid	80 lb bag	15 bags	None	Chemical building

C. Detergents/soaps

Material Name	Solid or Liquid	Type of Container	Estimated Volume	Secondary Containment	Location
Bio-degradable Industrial Detergent	Liquid	Poly Tank	500 gallon	Concrete berm	East of Comp Building

D. Solvents, inhibitors and degreasers

Material Name	Solid or Liquid	Type of Container	Estimated Volume	Secondary Containment	Location
Unichem 3270, Volatile based amine	Liquid	110 gallon Tank	100 gallons	Concrete berm	East of Cooling Tower
Methanol	Liquid	1000 gallon Tank	1000 gallon	Concrete berm	West of Comp Engine Room
Carb/Choke Cleaner	Liquid	12 oz aerosol can & 3 gallon pail	15 gallons	Flammable Cabinet	Shop Building
Safety Kleen Solvent 150, Petroleum naptha	Liquid	1 - 15 gallon 1 – 30 gallon	45 gallons	N/A	Comp Building, Welding, Warehouse

E. Paraffin Treatment/Emulsion breakers

Material Name	Solid or Liquid	Type of Container	Estimated Volume	Secondary Containment	Location
Unichem 985, silicone based	Solid	5 gallon pail	1 pail	N/A	Chemical Building

F. Biocides

Material Name	Solid or Liquid	Type of Container	Estimated Volume	Secondary Containment	Location
Unichem 3141, Oxygen scavenger	Liquid	110 gallon Tank	100 gallon	Concrete berm	East of Cooling Tower
Alpha 120	Liquid	5 gallon pail 65 gallon tank	3 pails 60 gallons	Fiberglass	Chemical Bldg East of Cooling Tower
Alpha 512	Liquid	5 gallon pail 65 gallon tank	3 pails 60 gallons	Fiberglass	Chemical Bldg East of Cooling Tower

G. Others (other liquids or solids such as diesel or cement, etc.)

Material Name	Solid or Liquid	Type of Container	Estimated Volume	Secondary Containment	Location
Lubrication Oils	Liquid	2 - 400 bbl tanks	800 bbls	Metal berm with liner	South of Shop building
ISO 22 Oil	Liquid	1000 gallon Tank	700 gallon	Concrete berm	East of Comp building
Rental Lube Oil	Liquid	Tank	500 gallon	Fiberglass	SE corner of plant
Chevron 541 Oil	Liquid	2 – 322 bbl Tanks	400 bbl	Earthen berm	South of Shop
Condensate	Liquid	400-bbl Gunbarrel 2-400 bbl Tank	1200 bbl	Metal berm with liner	Condensate storage area
Diesel	Liquid	2 – 500 gallon Tanks	1000 gallon	Fiberglass	SE of Comp Building
Gasoline	Liquid	1 – 1000 gallon 1 – 500 gallon Tanks	1000 gallon 500 gallon	Fiberglass	South of Comp building
Propane	Liquid	1400 bbl Tank	250 bbls	Earthen berm	Tank Farm
Propylene Glycol	Liquid	55 gallon drum	4 drums	Concrete berm with grates	East of #9 Inlet Gas Comp Building
Methanol	Liquid	1000 gallon Tank	1000 gallon	Concrete berm	Cryo
Ethyl Mercaptan	Liquid	500 gallon Tank	55 gallons	Concrete berm, enclosed system	Loading Rack
Process Drains	Liquid	550 bbls & 210 bbl Tanks	700 bbl	Earthen berm	West side of Plant
Aluminum Oxide	Solid	2000 lb Super Sack	1 super sack	N/A	North of Evap Pond
Sulfur	Molten	Tank	13 short tons	Concrete vault	NW corner of Plant-underground
Engine Lubricant	Liquid	55 gallon drum	4 drums	Concrete berm with grates	East of #9 Inlet Gas Comp Building
Activated Alumina	Solid	2000 lb sack	2 sacks	N/A	Warehouse

Material Name	Solid or Liquid	Type of Container	Estimated Volume	Secondary Containment	Location
Cylinder Oil-680	Liquid	55 gallon drum	2 drums	Concrete berm with grates	East of #9 Inlet Gas Comp Building
Epoxy Resin	Liquid	1 gallon pail	20 pails	N/A	Chemical building
Gear Compound ESP - Oil	Liquid	55 gallon drum	2 drums	Concrete berm with grates	East of #9 Inlet Gas Comp Building
Unichem 2310, Sodium nitrate, corrosion inh.	Liquid	100 gallon	100 gallon	Fiberglass containment	East of #9 Inlet Gas Comp Building
American Industrial Oil #150	Liquid	55 gallon drum	2 drums	Concrete berm with grates	East of #9 Inlet Gas Comp Building
American Industrial Oil #46	Liquid	55 gallon drum	2 drums	Concrete berm with grates	East of #9 Inlet Gas Comp Building
American Industrial Oil #68	Liquid	55 gallon drum	2 drums	Concrete berm with grates	East of #9 Inlet Gas Comp Building
Activated Charcoal	Solid	Filter Towers	N/A	Concrete berm	Amine System Area
Glass Beads, Sodium aluminum silicate	Solid	50 lb bag	5 bags	N/A	Welding Shop
y-Grade	Liquid	1000 gallon tank	1000 gallons	N/A	Holding Tank in Amine System Area
Slop Oil	Liquid	2 - 1000 gallon tanks	2000 gallons	Earthen berm	South of Tank Farm
Sodium chloride	Solid	50 lb bags	147 bags	N/A	R/O Building
Heat Transfer Salt Mixture	Solid	Block	5 blocks	N/A	Salt Bath Heater

7.0 Sources and Quantities of Effluent and Waste Solids Generated at the Facility

The facility generates the following:

1. Separators, Scrubbers, Slug Catchers

Gunbarrel Waste Tank

The facility generates produced water and condensate mixture from the dehydration units, closed header tanks, and inlet scrubbers. The water and condensate mixture is separated out in the gunbarrel. The condensate and oil is recovered as a product and is sold. The waste water is transported via pipeline to an OCD approved Class II Disposal Well operated by BP. The facility generates approximately 3,000 barrels (bbls) per month of waste water. This waste water is considered RCRA exempt.

2. Boilers, Waste Heat Recovery Units, cogeneration facilities, and cooling towers/fans

Amine Drain Tank

The facility uses monoethanolamine (amine) to remove hydrogen sulfide and carbon dioxide gases from the gas stream. The amine is recycled back into the system. Spent amine is transferred to an open drain sump. Contents of the sump are then transferred to the Process Drain Tank. The waste water is disposed quarterly by trucking to an OCD approved disposal facility, I & W, Inc.

Evaporation Pond Water

The facility generates waste water from blow-down of the cooling tower, backwash system processes and back-flush/rejection water from the reverse osmosis system. Approximately 200 to 400 bbls of waste water are generated on a daily basis. The waste water is transferred to the evaporation pond. Excess waste water from the evaporation pond is transferred to the Waste Water Tank located directly north of the pond. The waste water is transported via pipeline to an OCD approved Class II Well, operated by BP.

Representative grab samples from the North and South ends of the Pond were collected on April 30, 2009 and submitted for Benzene, Toluene, Ethylbenzene and Xylenes (BTEX), metals, anions, alkalinity, total dissolved solids (TDS) and pH parameters. The sample was determined to be non-hazardous based on analytical data (work order 0905016) provided by DHL Analytical, Inc. (DHL).

Laboratory analytical reports are presented in Appendix B.

3. Wash down/Steam out effluent from process and storage equipment internals and externals

Process Drain Tank Waste

The facility generates a mixture of amine and waste water from various processes (blow-down and drains in the amine and coolant systems). The amine and waste water from the open drain storage area is transferred to the Process Drain Tank. The facility generates approximately 70 bbls of waste water per month. The waste water is disposed quarterly by trucking to an OCD approved disposal facility, I & W, Inc.

Dirty Slop Oil Tanks

The facility generates waste oil from the compressor engine pit drains. The waste oil is transferred to the Dirty Slop Oil Tanks. The facility generates approximately 400 bbls of oil waste per week.

A representative sample was collected on September 2 and September 23, 2009 and submitted for waste characterization parameters. The waste oil is disposed of weekly at an OCD approved disposal facility, I & W, Inc.

4. Solvent/degreaser use

Safety Kleen 150 Solvent

The solvent (Petroleum naptha) is used in the parts washer to degrease and clean small parts. The facility disposes of approximately 45 gallons of the solvent every three months by Safety Kleen.

Methanol

The facility uses methanol in the cryogenic unit. The methanol is recycled in the process.

5. Spent acids or caustics

Sulfuric Acid

The sulfuric acid is used to control the pH in the cooling tower. The neutralized and spent acid is transferred as cooling tower blow-down to the evaporation pond. The waste water is transported via pipeline to an OCD approved Class II Disposal Well operated by BP.

Sodium carbonate – soda ash

Sodium carbonate is used to neutralize acid spills. The sodium carbonate is spent during the neutralization process.

Sodium hydroxide

Sodium hydroxide is used in boilers for alkalinity treatment. The spent waste is transferred to the evaporation pond and transported via pipeline to an OCD approved Class II Well operated by BP.

Bleach

The facility uses bleach as a chlorine source in the cooling tower. The waste water is transferred to the cooling tower as blow-down to the evaporation pond. The waste water is transported via pipeline to an OCD approved Class II Well operated by BP.

6. Used engine coolants (antifreeze)

Propylene glycol

The facility uses propylene glycol in the Jacket #9 Water Tank. The water and antifreeze mixture is recycled in the process.

7. Used lubrication and motor oils

Lubrication, Gear and Synthetic Oils

The oils are used to lube engines, pumps, and compressors. The used oil is transferred to the Dirty Slop Oil Tanks for proper disposal.

8. Used lube oil and process filters

Process Filters

Process filters (sock filters, pre and after charcoal filters and bag filters) and oil filters are collected and placed in the Used Filter Bin located at the South end of the plant. The filters are recycled by US Filter or Procycle, an approved recycling facility about every six (6) months.

9. Solids and sludges from tanks

Sludges

Sludge waste from the sumps is removed by I & W, Inc. The sludge is disposed "as needed" by trucking to an OCD approved disposal facility, I & W, Inc.

10. Painting wastes

Paint Cans

The facility utilizes paint for marking the safety hazard awareness areas (steps, uneven surfaces, etc.) and for maintaining process equipment. The empty cans and pails are placed in the Scrap Metal recycling bin.

11. Sewage

Septic Tank

The facility is not connected to a publicly owned treatment works; however two septic systems are utilized at the facility. The septic tanks are located near the northeast corner of the office and in the southwest area of the Amine System. Septic system maintenance is performed by J.C. Septic Tank Service Company. The septic tank complies with applicable requirements.

12. Laboratory wastes

Non-applicable

13. Other waste liquids

Stormwater

Stormwater collects in secondary containments and is removed using procedures described in the facility Spill Control and Countermeasures Plan (SPCC). Stormwater is disposed when necessary by trucking to an OCD approved disposal facility, I & W, Inc.

14. Other waste solids

Metal

The facility recycles various un-usable metal parts and metal shavings. These are placed in a metal recycling dumpster.

Aluminum oxide

The plant uses aluminum oxide balls as a catalyst in the sulfur recovery process. Depleted aluminum oxide balls are placed in drums and disposed at an OCD approved disposal facility, CRI, Inc.

Activated carbon

The plant uses activated charcoal in the amine system. Depleted activated charcoal is placed in drums and disposed at an OCD approved disposal facility, CRI, Inc.

Molecular sieve/zeolite

The plant uses molecular sieves during the gas separation process. Depleted molecular sieves are placed in drums and disposed at an OCD approved disposal facility, CRI, Inc.

Oily Soil

The plant personnel remediate oil spills around the yard as they occur. The soil is stockpiled, tested and disposed of at an OCD approved disposal facility, CRI, Inc., or treated onsite.

Sulfur

The plant recovers sulfur from the acid gas. The recovered sulfur is a product that is sold to various customers.

Ceramic balls, Molecular sieves, Aluminum silicate

The plant uses various media: ceramic balls in conjunction with catalysts, molecular sieves and aluminum silicate to increase the production of clean fuels, absorb water from the air, filter various compounds and protect catalysts. Depleted media is placed in drums and disposed at an OCD approved disposal facility, CRI, Inc.

Activated Alumina

The plant uses activated alumina in the sulfur plant reactors. The activated alumina is consumed in the process.

8.0 Description of Current Liquid and Solid Waste Collection/Storage/Disposal Procedures

Gunbarrel Waste Water

The oil and produced water mixture from the dehydration units, closed header tanks and inlet scrubbers are transferred to the Gunbarrel Waste Tank which is located in the Condensate Storage Area near the south end of the plant. The water and oil mixture is separated in the 400 bbl capacity gunbarrel tank. The condensate and oil is recovered as a product and sold to various oil related customers. The plant disposes of approximately of 3,000 bbls of waste water per month. The waste water is sent offsite via pipeline to a permitted OCD Class II disposal well operated by BP.

Process Drain Tank Waste

The spent amine and water is collected in the 500 bbl Process Drain Tank located east of the Evaporation Pond. The plant disposes of approximately of 200 bbls of spent amine and waste water every three months in a permitted OCD Class II disposal well operated by I & W, Inc.

Evaporation Pond Water Waste

The waste water from the blow-down of the cooling towers, backwash system processes and rejection water from the reverse osmosis system is transferred to the evaporation pond. Excess waste water in the pond maybe transferred to the 300 bbl Waste Water Storage Tank located directly north of the pond. The plant disposes of approximately of 200 to 400 bbls of waste water daily which is sent offsite via pipeline to a permitted OCD Class II disposal well operated by BP.

Safety Kleen 150 – Petroleum Naptha

The solvent is used in the parts washer to clean small parts. The parts washer vessels are leased from Safety Kleen. The facility disposes approximately 45 gallons on a quarterly basis by Safety Kleen.

Carb/Choke Cleaner - Aerosol Cans and Pails

The facility utilizes carb/choke cleaner to clean electrical parts and contacts. The cleaner is used according to manufacturer instructions. The empty cans and pails are placed in a trash bin for proper disposal as unregulated solid waste.

Dirty Slop Oil Tank Waste

The used oil generated by the plant and the compressor units is transferred to the Dirty Slop Oil Tanks located south of the tank farm. The plant has two tanks with a capacity of 400 bbls each. The plant disposes of approximately of 40 bbls of used oil and waste water per week. The used oil and waste water is trucked offsite to an OCD approved facility operated by I & W, Inc.

Sludges

Sludge waste from the sumps is removed and disposed of monthly to an OCD approved facility operated by I & W, Inc.

Metal
The facility collects un-usable metal parts and scrap metal. The scrap metal is placed in a metal recycling dumpster located west of the condensate storage tank area. Scrap metal is taken to a local metal recycling facility.

Septic System Waste
The facility is not connected to a publically owned treatment works; however two septic systems are located near the northeast corner of the office and in the southwest area of the Amine System. Septic system maintenance is performed on an "as needed basis", J.C. Septic Tank Service Company.

The septic waste is managed in leach fields on-site.

Aluminum oxide
The plant uses aluminum oxide balls as a catalyst in the sulfur recovery process. Depleted aluminum oxide balls are placed in drums and disposed at an OCD approved disposal facility, CRI, Inc.

Activated carbon
The plant uses activated charcoal in the amine system process. Depleted activated charcoal is placed in drums and disposed at an OCD approved disposal facility, CRI, Inc.

Molecular sieve/zeolite
The plant uses molecular sieves during the gas separation process. Depleted molecular sieves are placed in drums and disposed at an OCD approved disposal facility, CRI, Inc.

Oily Soil
The plant is in the process of remediating oil spills in the vicinity of the flare sump. Removed soil is stockpiled and tested. Oily soil is disposed of at an OCD approved facility, CRI, Inc. or treated onsite.

Ceramic balls, Molecular sieves, Aluminum silicate
The plant uses various media: ceramic balls in conjunction with catalyst, molecular sieves and aluminum silicate to increase the production of clean fuels, absorb water from the air, filter various compounds and protect catalyst. Depleted media is placed in 55 gallons drums and disposed at an OCD approved disposal facility, CRI, Inc. on an "as needed basis".

Process Filters
Process filters (sock filters, pre and after charcoal filters and bag filters) and oil filters are collected and placed in the Used Filter Bin located at the South end of the plant. The filter bin is picked up for recycling every six months by US Filter or Procycle, and transferred to an approved recycling facility.

9.0 Proposed Modifications

Dirty Slop Oil Tanks

The Old Dirty Oil Slop Tanks will be decommissioned in the near future. The tanks are currently located within an earthen berm near the east side of the plant. The plant will remove the two metal tanks. Soil samples will be collected from below the tanks to investigate the potential for a release according to guidelines *"Guidelines for Remediation of Leaks, Spills and Releases, August 13, 1993"*.

A 400 bbl replacement tank has been installed in the lined secondary containment of the condensate storage area located near the south side of the plant.

Condensate Tank Storage Area

The condensate tank storage area has a metal retaining wall with a poly-liner. Four tanks, each with a 400 bbl capacity, are located inside the containment. Two of the tanks are used for condensate storage, which is sold as product. The gunbarrel and the new Dirty Slop Oil tanks are also located inside the containment. The tanks are placed on a raised platform to allow visual inspection of the tank bottoms.

Engine #9 Jacket Water Storage Tank

The leaking water tank for Engine #9 Jacket will be removed from service. A leak was noted during the OCD inspection on April 22, 2009. The water tank will be replaced with a new tank that will be placed inside secondary containment with an impermeable liner.

Sulfur Tank Removal

On April 5, 2009, the plant removed the Sulfur Tank located in the northwest corner. The tank was removed for proper disposal. Confirmation soil samples were collected below the tank. The removal and closure were performed with OCD approval.

Groundwater Sampling Event

On May 8, 2008, LAI requested permission to modify the groundwater sampling schedule from quarterly to semi-annually. This request was approved via email on the same day. A copy of the email requests and approvals are provided as Appendix C.

Frontier request to maintain the semi-annual (twice annular) groundwater monitoring frequency, but reduce the parameter list to BTEX, chloride, sulfate and TDS analyses. Metal samples will also be collected for MW-02 (arsenic) and EB-04 (chromium). Annual groundwater monitoring reports will be submitted to the OCD during the first quarter of the calendar year.

10.0 Inspection, Maintenance and Reporting

Drum Storage Area

The drum storage area is a concrete structure with secondary containment with curbing. The secondary containment stores empty and full drums. Drums are properly labeled and the containment and drums are inspected daily as described in the SPCC Plan.

Underground Lines

The plant has underground lines from various processes and wastewater. The lines were hydrostatically pressure tested to demonstrate mechanical integrity between April 21 and May 10, 2005. Services were provided by TRS Resources, LLC (TRS). All underground lines met the requirements of the mechanical integrity test. All above ground surface piping were visually inspected for leaks after the test pressure was stabilized. The summary report *Hydrostatic Pressure Testing of Underground Drain Piping* conducted by TRS, is presented in Appendix D.

The underground and surface lines will be hydrostatically pressure tested in the first semi-annual of 2010.

Containments and Sumps

All containments and sumps are visually inspected weekly as described in the SPCC Plan.

11.0 Spill/Leak Prevention and Reporting Procedures (Contingency Plan)

The facility has a site specific Contingency Plan. A copy of the plan is located in Appendix E.

12.0 Site Characteristics

1. Surface Water Hydrology

The facility is located approximately nine miles east-southeast of Artesia, on the edge of a plateau's southerly slope. The location is hydrologically bound by Scoggins Draw (aka Coggins Draw on some early maps) to the south, and incised tributary drainages to the west and the east. Scoggins Draw is an ephemeral watercourse flowing southwest about three miles into the ephemeral Chalk Bluff Draw. Approximately 1.8 miles further downstream, Chalk Bluff Draw discharges into the Pecos River approximately two miles south of Brainard Lake and about six miles north of Lake McMillan.

Comparing the elevation of Scoggins Draw and the depth to groundwater from the nearest monitoring points (P-04, EB-07, and EB-01), groundwater is approximately 25 feet below ground surface (bgs) in the drainage. This watercourse is a losing stream without groundwater affecting surface water or discharging to the surface. There are no documented groundwater discharge sites, e.g. springs, seeps, marshes or swamps, within a mile of the outside perimeter of the facility.

A search of the State Engineer's New Mexico Water Rights Reporting System (NMWRRS) database did not identify any points of diversion within ¼-mile of the facility's perimeter. A copy of the database and ancillary documentation of two points of discharge beyond the area of concern is attached in Appendix F.

2. Groundwater Characteristics

1. Groundwater Flux and Gauging Results

Historic groundwater flow direction was reported to be towards the south-southwest consistent with vicinity surface water drainage (Hendrickson and Jones, 1952). During LAI's investigation, groundwater mounding is obvious in the north central portion of the facility, and appears to have affected the groundwater flow direction. Current potentiometric maps depict groundwater south of the mound moving towards the southeast, while groundwater to the north of the mound appears to be moving towards the north. The groundwater mound may be due to perched water in discontinuous clay and silty-clay units present in the north central area of the plant.

Three groundwater gauging events have been performed since the last OCD reporting. These events occurred on September 15, 2008, March 10, 2009, and July 13, 2009, after the installation of additional monitor wells. Groundwater elevations in the more peripheral monitor wells remained relatively stable for this site – about two feet or less fluctuation – between September 2008 and July 2009. This high degree of fluctuation in all wells may indicate a high permeability and response to meteoric influences. Seven central wells (MW-02-03, MW-02-06, MW-02-09, MW-02-10, MW-02-13, MW-06, and MW-07) exhibited fluctuations between 4.21 feet (MW-02-06) and 17.14 feet (MW-02-03), which may indicate a water source artificially recharging the aquifer.

During the most recent gauging event (July 13, 2009), groundwater beneath the facility is encountered between 3.73 (MW-07) and 94.00 (MW-16) feet bgs (3,466.54 and 3,618.66 feet elevation NGVD 1929, respectively). Shallow groundwater was observed near MW-02-02 and MW-02-05 where a repaired leak occurred, while the deepest groundwater was encountered from the well farthest north and upgradient from the site (MW-16). Similar results were observed during the September 2008 and March 2009 monitoring events. Table 1 is a summary of groundwater monitoring data since LAI began investigation activities at this facility in 2007. Figures 5a and 5b are Groundwater Gradient/Potentiometric Maps for the September 2008 and July 2009 gauging events, respectfully. Figures 5c and 5d present Depth to Groundwater Maps for the March 2009 and July 2009 gauging events, respectfully. The groundwater maps presented were generated using Surfer® data contouring program.

Phase-separated hydrocarbons (PSH) found impacting facility groundwater are primarily light-end gas condensates. Some monitor wells have a product emulsion. This emulsion may be the result of high-pH water reacting with hydrocarbons in a saponification process. PSH or emulsion was observed in the following monitor wells during the past three gauging events:

- MW-02-04 – sheen, July 2009
- MW-02-09 – 8.83 feet, September 2008; 3.89 feet, March 2009
- MW-02-10 – 8.78 feet, September 2008; emulsion, March and July 2009
- MW-02-11 – 0.55 feet, September 2008; emulsion, March 2009
- MW-02-12 – emulsion, all three events
- MW-02-13 – sheen, September 2008; 3.17 feet, March 2009
- MW-02-14 – 0.56 feet, September 2008; 0.28 feet, March 2009
- MW-03 – 3.05 feet, September 2008; 2.67 feet, March 2009
- MW-03-01 – 15.49 feet, September 2008; 10.69 feet, March 2009; 11.16 feet, July 2009
- MW-03-02 – emulsion, all three events
- MW-03-03 – 0.01 feet, September 2008; sheen, March 2009
- MW-03-04 – 0.79 feet, September 2008; 0.82 feet, March 2009; 0.83 feet, July 2009
- MW-04 – 5.09 feet, September 2008; 4.65 feet, March 2009; 5.80 feet, July 2009
- MW-06 – 13.39 feet, September 2008; 7.34 feet, March 2009
- MW-07 – 0.11 feet, September 2008; 0.30 feet, March 2009; sheen, July 2009
- MW-09 – 0.23 feet, September 2008; 0.06 feet, March 2009; 0.09 feet, July 2009
- MW-10 – 0.66 feet, September 2008; 16.90 feet, March 2009; 5.61 feet, July 2009
- MW-11 – 19.27 feet, September 2008; 14.86 feet, March 2009; 15.40 feet, July 2009
- MW-12 – 0.01 feet, September 2008; sheen, March 2009
- MW-14 – 0.29 feet, September 2008; 1.65 feet, March 2009; 1.19 feet, July 2009
- MW-15 – sheen, March 2009
- MW-19 – 5.35 feet, July 2009
- MW-20 – 17.29 feet, July 2009
- MW-21 – 0.20 feet, July 2009
- EB-03 – 0.43 feet, September 2008; 0.94 feet, March 2009; 1.67 feet, July 2009
- EB-05 – sheen, March 2009

Figures 6a, 6b and 6c are Apparent PSH Thickness Maps for the September 2008, March 2009, and July 2009 gauging events, respectfully.

2. *Groundwater Chemistry*

Background groundwater quality in the vicinity of the facility is difficult to determine, as the water-bearing strata is within an evaporite dominated lithology that is believed to naturally exceed State of New Mexico Water Quality Control Commission (WQCC) standards. Evaporites are easily dissolved by groundwater, and this area has known secondary porosity voids believed to be a result of groundwater interaction. During the March/July 2009 monitoring events, groundwater total dissolved solids (TDS) concentrations vary from 2,310 (MW-03-03, eastern portion of facility) to 517,000 (MW-02-05, north portion of facility) milligrams per liter (mg/l, aka parts per million, ppm). The lower TDS value water within the plant is considered to be the result of mixing previously lost low-TDS water and connate water, while the high TDS value water is thought to be the result of the same lost water mining a sulfate-based evaporite salt (gypsum) within the subsurface. This "water" is extremely viscous and quickly begins crystallizing when physical parameters are upset, such as when a bailer of water is poured into an aliquot container.

Three monitoring wells placed to the north of the facility, and in the apparent groundwater upgradient direction, have TDS values between 3,190 (MW-17) and 73,200 (MW-15) mg/l. MW-16, the monitor well farthest away (approximately 1,300 feet north and upgradient from the facility) exhibited a TDS concentration of 13,900 mg/l in July 2009.

Groundwater samples were collected from gauged and purged monitor wells, with aliquots being submitted to DHL Analytical, a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory. Laboratory samples were analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX, EPA SW method 8021B), water chemistry cations and RCRA metals (EPA SW method 6020 for As, Ba, Cd, Ca, Pb, Mg, K, Se, Ag, Na, and EPA SW method 7470A for Hg), chloride, nitrate, sulfate, (EPA method E300), alkalinity (Standard Method M2320B, 18th Edition), and TDS (Standard Method M2540C, 18th Edition). Duplicate samples for a quality control (QC) check were submitted as blind samples to DHL. Quantitative laboratory analytical data and QC results for the 2008 and 2009 monitoring events are included as a CDROM (Appendix B).

September 2008 Groundwater Sampling Event

Table 2 presents a summary of the BTEX analyses. Benzene is a common volatile organic compound (VOC) in natural gas condensate and crude oil, but toluene, ethylbenzene, and total xylenes were quantified above the established WQCC human health standard in MW-02, MW-02-06, and EB-08. Analytical data indicates the following samples exhibited benzene concentrations in excess of the 0.01 milligrams per liter (parts per million, mg/l) WQCC human health standard:

- P-01 (0.0127 mg/l)
- MW-08 (0.0254 mg/l)
- MW-02-15 (0.0294 mg/l)
- MW-13 (0.767 mg/l)
- MW-02-07 (4.59 mg/l)
- MW-02-06 (5.36 mg/l)
- EB-08 (5.77 mg/l)
- MW-02 (8.91 mg/l)
- MW-02-18 (15.0 mg/l)

A comparison of benzene in the primary (MW-13, 0.767 mg/l) and Duplicate-01 (0.760 mg/l) samples indicate a deviation of 0.92%; Duplicate-02 has a deviation of 3.7% (4.42 mg/l and 4.59 mg/l for MW-02-07 primary). No data quality exceptions were noted in the DHL case narratives. Figure 7a is a drawing of the observed benzene concentration for the September 2008 monitoring event.

During the September 2008 monitoring event only two metals were detected at concentrations above WQCC human health standards. Arsenic was detected in MW-02 (0.127 mg/l) and chromium was detected in EB-04 (0.0565 mg/l). Table 3 presents a summary of RCRA metals and major cations in groundwater.

Major anions – chloride, nitrate, and sulfate – are a groundwater quality concern. Only nitrate is classified by the WQCC as a human health concern; chloride and sulfate are domestic water supply quality standards. Nitrate concentrations exceeding the 10 mg/l standard were only observed in samples from MW-02-02 (10.7 mg/l). This value may be affected by the high chloride and sulfate concentrations in the parent sample. Observed chloride concentrations exceeding the WQCC standard (250 mg/l) were identified in samples from:

- MW-08 (333 mg/l)
- EB-08 (374 mg/l)
- P-04 (508 mg/l)
- EB-04 (598 mg/l)
- P-03 (659 mg/l)
- MW-15 (1,430 mg/l)
- MW-02-05 (5,490 mg/l)
- MW-02-02 (11,400 mg/l)

Table 4 presents inorganics other metals and groundwater quality parameters. Chloride value distribution is graphically displayed in Figure 8a, Chloride Isocon Map.

Sulfate concentrations – and conversely TDS concentrations – exceed the domestic water quality standards (600 mg/l and 1,000 mg/l, respectfully) for all monitor wells established at the facility. Sulfate concentrations range from 899 mg/l (MW-03-03) to 366,000 mg/l (MW-02-05), while TDS value range from 2,460 mg/l (EB-05) to 517,000 mg/l (MW-02-05).

Although groundwater impacts figure prominently in the elevated sulfate and TDS values, Figure 9a, Sulfate Isocon Map, and Figure 10a, TDS Isocon Map, hint at the possibility of natural groundwater density stratification, particularly apparent in the TDS map.

March 2009 and July 2009 Groundwater Sampling Events

Chemical distribution data for March and July 2009 are combined for graphic presentation. This is not a normal procedure for LAI, but the July data collected for the newly installed MW-16 through MW-23 does not lend to a suitable presentation as a stand-alone data set. Groundwater gradient maps are presented separately for each event.

Ethylbenzene, and total xylenes were quantified above the established WQCC human health standard in EB-08 only (1.43 and 2.31 mg/l, respectfully) during this monitoring event. Analytical data indicates the following samples exhibited benzene concentrations in excess of the 0.01 milligrams per liter (parts per million, mg/l) WQCC human health standard in the following samples:

- MW-18 (0.0130 mg/l)
- MW-08 (0.0174 mg/l)
- MW-20 (0.0176 mg/l)
- MW-05 (0.106 mg/l)
- MW-02-03 (0.0224 mg/l)
- MW-02-15 (0.169 mg/l)
- MW-12 (0.708 mg/l)
- MW-03-03 (1.49 mg/l)
- MW-02 (1.73 mg/l)
- MW-23 (2.26 mg/l)
- EB-08 (5.04 mg/l)
- MW-02-06 (5.35 mg/l)
- MW-02-07 (5.85 mg/l)
- MW-22 (6.35 mg/l)
- MW-02-18 (16.4 mg/l)

A comparison of benzene in the primary (MW-13, 0.00133 mg/l) and Duplicate-01 (0.00148 mg/l) sample for the March 2009 event indicate a deviation of 10.1%; Duplicate-02 has a deviation of 2.1% (0.723 mg/l and 0.708 mg/l for MW-12 primary). During the July 2009 monitoring event there was no deviation between the primary (MW-16) and the duplicate because both samples did not exhibit the benzene above the method detection level. No data quality exceptions were noted in the DHL case narratives. Figure 7b is drawing of the observed benzene concentration for the March/July 2009 monitoring events.

During the March and July 2009 monitoring events no metals were detected above WQCC human health standards. The chromium observed in the down and cross gradient well, EB-04, decreased below the human health standard of 0.05 mg/l.

During the March monitoring event nitrate concentrations exceeding the 10 mg/l standard were observed in samples from MW-02-02 (12.8 mg/l) and MW-02-05 (14.7 mg/l). Again, theses value may be affected by the high chloride and sulfate concentrations in the parent sample. Observed chloride concentrations exceeding the WQCC standard (250 mg/l) were identified in samples from:

- MW-23 (265 mg/l)
- MW-02-15 (280 mg/l)
- MW-08 (290 mg/l)
- EB-08 (358 mg/l)
- P-04 (575 mg/l)
- EB-04 (604 mg/l)
- P-03 (702 mg/l)
- MW-16 (1,500 mg/l)
- MW-15 (3,170 mg/l)
- MW-02-05 (5,440 mg/l)

- MW-02-02 (9,460 mg/l)

Table 4 presents inorganics other metals and groundwater quality parameters. Chloride value distribution is graphically displayed in Figure 8b, Chloride Isocon Map.

Sulfate and TDS concentrations exceed the domestic water quality standards for all monitor wells at the facility. Sulfate concentrations range from 1,340 mg/l (MW-02-07) to 297,000 mg/l (MW-02-05), while TDS value range from 2,310 mg/l (MW-03-03) to 510,000 mg/l (MW-02-02). The elevated TDS and chloride near the cooling tower, northwest corner of the plant, may have been associated with a water leak in the cooling tower basin that has been corrected.

Figure 9b, Sulfate Isocon Map, and Figure 10b, TDS Isocon Map, graphically depict parameter distribution.

3. Soil and Aquifer Information

Surface soils are dominated by gypsite soils derived from evaporite parent rocks. The Natural Resource Conservation Service Soil Survey for Eddy County identify the surface soil underlying most of the facility as "RG", Reeves-Gypsum land complex, 0 to 3 percent slopes, while the exposed flanks of Scoggins Draw and its tributary drains are comprised of Gypsum land-Cottonwood complex, 0 to 3 percent slopes (GC). Both soil types exhibit similar characteristics and properties. However, the calcium carbonate (25%) and gypsum (80%) of the RG soil is much greater than the GC soil, which is 15% calcium carbonate and 5% gypsum. A copy of the *Custom Soil Resource Report* is included in Appendix G.

Typical drilling logs consist of a veneer of detritus-based soil from two to five feet thick, multicolored layers of gypsum with thin beds of clay, sand, or carbonate increasing in frequency with depth, and an aquiclude of red clay/shale/mudstone. Soil boring and monitor well logs from LAI investigation activities are included as Appendix H.

Groundwater occurrence is reported as being within the Permian-aged, Three Twins Member of the Guadalupe Series Chalk Bluff Formation by Hendrickson and Jones (1952). A later interpretation of the water-bearing formations by Kelley (1971) identifies two units, the Artesia Group Tansill Formation and Yates Formation. The younger Tansill Formation (Pat) is described as "Dolomite inter-tonguing northward into gypsum", and the older Yates Formation (Paye) is described as "Gypsum, dolomite and siltstone." The base of the water-bearing strata is interpreted as the red shale encountered between 3,460' and 3,480' elevation. Cross sections depicting interpretations of boring logs are included in Appendix I.

4. Surface Flooding and Protection Measures

The facility is located on a south-facing toe of a plateau, above Scoggins Draw. This location is not within a flood plain, and would not be subject to flooding even during extreme precipitation events. Overland flow from the north is intercepted by the entrance road and diverted to the east and west, away from the facility. Earthen berms protecting the northern portion of the west perimeter and the northeast portion of the facility prevent run-on or run-off. Run-off in the southern portion of the facility is retarded by stone and earthen berms which follows historic overland flow features south to Scoggins Draw.

5. *Geology and Stratigraphy Profile*

The dominant regional feature is the Pecos Slope, a broad, low eastward dip of about 50 to 100 feet per mile. The western extents of the Pecos Slope are the Mescalero Arch, and the Sacramento and Guadalupe uplift structural divides (Kelley, 1971). The eastern extents of the Pecos Slope are the extramontane Delaware and Midland Basins. This monocline is imprinted with other structural features, including the southern flank of the Artesia-Vacuum Arch, which reflects the underlying Abo reef trend.

The Artesia-Vacuum Arch extends from beneath the Pecos Valley fill to the west, extending through Townships 17 to 19 South, eastward to Range 35 East in Lea County (Kelley, 1971). The arch is covered by post-Permian strata, except in a four to five mile stretch near Chalk Bluff Draw, the vicinity of the facility. In the vicinity of the facility, the plunging south limb of Yates and Tansill Formations dip about 4° South 47° East. Brittle deformation of the Artesia Group members causes fractures that are subject to dissolution by meteoric and phreatic groundwater interactions. Process water discharging to the subsurface and interacting with the formation material may be the source of the highest TDS concentrations observed at the facility. Conversely, dissolution from leaked process water may cause "mini-sinks", small sinkholes observed within the facility.

The lowest encountered formation in the facility's vicinity is the aforementioned Permian Artesia Group Yates Formation. The Yates is named for the Ira and An Yates oilfield in Pecos County, Texas, and has wide areal extent in both surface exposures and subsurface wells samples. The 250 to 350 feet thick Yates Formation is documented as siltstone north of Roswell, New Mexico, carbonate and evaporites west and northwest of Carlsbad, and as gypsum north of Lake McMillan to near Roswell (the vicinity of the facility). At the facility it appears that red mudstone/shale/clay reported at the base of monitor well borings is the top of the Yates formation.

Above the Yates Formation is the Permian-aged Artesia Group Tansill Formation. The type section of the Tansill Fm. is found along US Highway 285 about 2 miles north of Carlsbad and is reported to be predominantly dolomite of the reef shelf margin about 300 – 325 feet thick (Kelley, 1971), however, this facies gives way to evaporite facies about 10 miles north of the type section. In the vicinity of the site the Tansill is part of irregularly shaped north-trending belt generally less than a mile wide that is comprised of anhydrite and salt about 100 feet thick in subsurface sections. At the facility the anhydrite, gypsum and salts of the Tansill Fm. appear to be the bulk of the strata encountered during monitor well borings, and is the perched aquifer of concern.

6. *Aquifer Maps and Cross Sections*

Three cross sections have been prepared using primarily LAI subsurface investigation data, filling in with previous consultant data (Appendix I). These cross sections focus on the main processing area, which is the northwest portion of the facility. In, general the cross sections depict a subsurface dominated by gypsum, with a surface veneer of detritus-based silty-clayey soil, while the base of the water-bearing zone is recorded as mudstone, shale, or clay. Figure 3 presents the cross section locations.

Figures depicting the corrected groundwater potentiometric surface, Light non-aqueous liquids (LNAPL) thickness isopachs, and chloride, sulfide and total dissolved solids (TDS) isocons are included in the "Figures" section of this report.

Synthesizing the data depicted in these maps and cross sections confirms the known process water and pipeline leaks at the facility are affecting groundwater movement and its relative quality. Water mounding is obvious in the north central portion of the facility. Current potentiometric maps depict groundwater south of the mounds moving towards the southeast, while groundwater to the north of the mounds appears to be moving towards the north. The mounding may be due to perched water in discontinuous clay and silty-clay units.

The north-south cross section (A to A') depicts what seems to be a natural water bearing system with a 20 foot thickness to the north, thinning to approximately eight feet thick to the south, with a mound in the process area of the facility.

Cross section B to B' is oriented west to east through the process area. This cross section depicts groundwater mounding through the middle of the plant, with an LNAPL "bubble" in the western portion of the facility. Of note in this cross section is the emulsion "bubble" in the middle of the facility. This emulsion has a potentiometric head approximately 8 feet above the top of screen, with no gauge-able groundwater in monitor well MW-02-10.

Cross section C to C' cuts a diagonal from the northwest to the southeast across the facility near the corners. Groundwater mounding is centered about MW-02, with an LNAPL "bubble" in the vicinity of MW-20, based on gauging and boring log interpretations, the southeast portion of the facility may have a connected product sheen on the groundwater extending to MW-14 where greater LNAPL thicknesses have been recorded.

7. *Aquifer Testing Results*

Aquifer slug testing was conducted to provide hydraulic conductivity, transmissivity, and storativity estimates for the design of a remediation plan. Slug tests were conducted on July 31, and August 3, 2009, in five wells that circumscribe the facilities. A total of 13 falling head, and 9 rising head tests were performed. The wells tested include MW-15, MW-17, EB-08, P-01, and P-05. Testing consisted of up to three iterations of falling head and rising head cycles. A synopsis of the procedures and data interpretation follows. Slug test data curves are presented as Appendix J.

Slug Test Introduction

A slug test consists of measuring groundwater head recovery in a well after a near-instantaneous change in head at that well. This is done by rapidly introducing a solid object or a volume of water (the "slug"), or removing the same, into the well causing an abrupt change in water level. The water level in the well returns to static conditions as fluid moves in or out of formation media in response to the gradient forced by the sudden change in head. The hydraulic head changes through time, the response data, can be used to estimate the hydraulic conductivity of the formation through comparisons with theoretical models of test response. This data can be used to predict the subsurface movement of a contaminant, and to design a remediation plan. The analysis of response data from slug tests involves fitting straight lines or type curves to plots of field data. To ensure the quality of response data, LAI used an In-Situ® Troll 700 pressure transducer to log the aquifer response in one-second intervals.

AQTESOLV® Software

AQTESOLV® software provides a variety of slug test response solutions based upon the aquifer conditions encountered. At the Empire Abo Gas Plant, the water bearing zone is multiple thin beds of evaporite sequences. This stratigraphy is considered an unconfined aquifer under water table condition. Based upon the observed aquifer conditions, the Bouwer-Rice slug test solution (1976) was chosen to evaluate the response data.

Bouwer-Rice (1976) developed a method for the analysis of an overdamped slug test in a fully or partially penetrating well in an unconfined aquifer. The Bouwer-Rice method employs a quasi-steady-state model that ignores elastic storage in the aquifer. Assumptions used in the Bouwer-Rice solution include:

- Aquifer has infinite areal extent
- Aquifer is homogeneous and of uniform thickness in the vicinity of the test well
- Test well is fully or partially penetrating
- Flow to well is quasi-steady-state (storage is negligible)
- Volume of the slug is injected into or discharged from the well instantaneously

To perform the slug test analysis, a graph of the slug test data is made by plotting the head difference logarithmically on the Y-axis versus time (t) on the X-axis. The section of the graph which best approximates a straight line slope is used to determine y_o , y_t , and t. Once the values for y_o , y_t , t, and natural logarithm of the effective well radius are obtained, they are used to calculate the hydraulic conductivity (K).

Response Data Interpretation

The falling head conductivity extremes were 0.0593 ft/day (MW-15 Test 2) and 14.92 ft/day (P-01 Test 1); the rising head conductivity extremes were 0.1135 (P-05 Test 3) and 19.24 (P-01 Test 1). Test data from monitor well P-01 were up to two orders of magnitude greater than the highest values returned from the other four monitor wells. Biasing the data to not include the first test of P-01 produces a mean hydraulic conductivity of 0.3574 ft/day; unbiased test data had a mean hydraulic conductivity of 1.8796 ft/day.

These numeric values may be skewed with a low bias. A test curve generally has three curve parts – a near vertical initial segment that represents the forcing of water into/out-of the well bore and the sand filter pack; the main curve that reflects movement of water into/out-of the aquifer; and a near horizontal tailing line that indicates the water table returning to static conditions. Plotted test data from falling head tests lack the vertical and curved response portions in most of these tests. This may indicate secondary porosity – either karstic solution cavities or intercepted normal jointing or fractures – contribute to the migration pathway for groundwater.

Product Recovery Testing

Product recovery testing was conducted on September 17 – 18, 2008 using the method outlined in *Determination of a Realistic Estimate of the Actual Formation Product Thickness Using Monitor Wells: A Field Bailout Test* (Gruszczenski, 1987). "This empirical test is similar to a rising head slug test. Product that has accumulated in a monitor well is bailed out and the rising water/product levels are recorded with time using an oil/water interface probe." (Gruszczenski, 1987) A copy of the test procedure and test result graphs are provided as Appendix K.

The test procedure consists of a nine step process. Steps one, two, and three are field measurement, bailout, and recovery monitoring. The remaining steps are data reduction procedures. Testing was performed on MW-11, MW-10, MW-14, and MW-02-11.

MW-11's test was conducted as a pump-down and recovery test. Initially, 19.7 feet of light non-aqueous phase liquids (LNAPL) was observed on the groundwater in this well. LNAPL (and a small amount of water) was evacuated using a pump until a static fluid level was achieved. The pump was then turned off, and the rising fluid levels were recorded. Using the Gruszczenski correction method, the actual product thickness in this well is 0.55 feet, with a calculated capillary fringe height of 4.49 feet. MW-11's capillary fringe height (53.88 inches) correlates to a silty soil type. Uncorrected LNAPL thickness, calculated actual product thickness, calculated capillary fringe height, and correlated soil for all tests are as follow:

Monitor Well ID	Uncorrected LNAPL Thickness (inches)	Calculated LNAPL Thickness (inches)	Calculated Capillary Fringe Height (inches)	Soil Type Correlation
MW-11	236.4	6.6	53.88	Silt
MW-10	137.88	7.32	1.68	Coarse Sand
MW-14	2.76	1.56	1.32	Coarse Sand
MW-2-11	6.72	0.48	1.92	Coarse Sand

8. Electromagnetic Conductivity Survey Results

On June 4, 2008, LAI personnel performed an electromagnetic (EM-34) terrain conductivity survey of the area north of the cooling tower and plant. The EM survey was performed using an EM-34-3 terrain conductivity meter manufactured by Geonics, Ltd., Toronto, Canada. The survey was performed over an area measuring 800 x 1200 feet or approximately 22 acres for the purpose of assessing the TDS in groundwater. The EM-34-3 measures the electrical properties of soil and rock, as well as the electrical properties of groundwater, which is influenced by TDS concentration of the formation water. The EM-34-3 utilizes current flow induced into the subsurface materials by a surface transmitter that generates an alternating magnetic field to induce current flow through the earth material. The alternating magnetic field creates a secondary magnetic field that is sensed by a surface receiver. The primary magnetic field, current frequency, and coil separation can be accounted for, leaving ground conductivity as the only unknown variable to be measured. The EM-34-3 has exploration capabilities ranging from approximately 0 to 196.9 feet below ground surface (bgs) depending on the separation of the transmitter and receiver coils (i.e., 10, 20 or 40 meters) and coil orientation (i.e., horizontal dipole [HD]) mode or vertical dipole [VD] mode). The EM-34-3 was operated in the HD and VD modes using 10 and 20 meter coil separations. The EM-34-3 20-meter VD survey was selected to assess the TDS since groundwater occurs between about 60 to 90 feet Figure 12 presents the EM-34-3 20 meter VD survey (0 to 98.4 feet) drawing. Appendix L presents the EM-34 survey field sheets.

Referring to Figure 11, an anomaly of elevated EM-34-3, 20-meter VD readings between 107.2 and 153.3 millimhos per meter (mmhos/m) was observed in the area north of the cooling tower and decreased to below 20 mmhos/m approximately 400 feet north of the plant. This anomaly suggests groundwater containing elevated TDS is moving north and deceasing in concentration. An anomaly of elevated EM-34-3 20-meter VD readings was also observed about 1,000 feet northwest of the plant.

Two (2) monitoring wells (MW-15 and MW-16) were installed northwest of the cooling plant and recorded TDS concentrations of 73,200 mg/L (MW-15) and 13,900 mg/L (MW-16) demonstrating that the TDS decreases in concentration northwest of the plant and correlates with the EM-34-3 20-meter VD readings.

References

Gruszczenski, Thomas S., 1987. *Determination of a realistic estimate of the actual formation product thickness using monitor wells: A field bailout test.* Proc. Conf. on Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention, Detection, and Restoration, Natl. Ground Water Assoc., Dublin, OH, 235-253.

Hendrickson, G.E. and Jones, R.S., 1952. *Geology and Ground-Water Resources of Eddy County, New Mexico.* Ground-Water Report 3. Mexico Bureau of Mines & Mineral Resources. Socorro, NM.

Kelley, Vincent C., 1971. *Geology of the Pecos country, southeastern New Mexico.* Memoir 24. New Mexico Bureau of Mines & Mineral Resources. Socorro, NM.

13.0 Other Compliance Information

NM OCD conducted a facility inspection on April 22, 2009.

Table 1
Monitor Well Completion and Gauging Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
MW-02	12/29/1991	37.5	4	3,545.3	19 - 34	2.89	3,548.19				
								2/13/2007	--	32.75	3,515.44
								3/26/2007	--	32.85	3,515.34
								6/18/2007	--	33.90	3,514.29
								9/17/2007	--	33.83	3,514.36
								12/10/2007	--	34.02	3,514.17
								3/11/2008	--	34.03	3,514.16
								9/15/2008	--	33.96	3,514.23
								3/9/2009	--	34.00	3,514.19
								7/13/2009	--	33.91	3,514.28
MW-02-02	10/6/1992	45	4	3,549.3	35 - 45	2.96	3,552.26	10/6/1992	--	39.00	3,513.26
								3/26/2007	--	26.50	3,525.76
								6/18/2007	--	26.86	3,525.40
								9/17/2007	--	27.00	3,525.26
								12/10/2007	--	27.03	3,525.23
								3/11/2008	--	27.13	3,525.13
								9/15/2008	--	27.25	3,525.01
								3/9/2009	--	26.96	3,525.30
								7/13/2009	--	27.06	3,525.20
MW-02-03	9/28/1992	105	4	3,553.0	95 - 105	3.03	3,556.03	9/28/1992	--	97.00	3,459.03
								2/12/2007	63.15	63.20	3,492.87
								3/27/2007	--	62.96	3,493.07
								6/18/2007	--	62.26	3,493.77
								9/17/2007	--	62.08	3,493.95
								12/10/2007	--	62.56	3,493.47
								3/11/2008	--	62.01	3,494.02
								9/15/2008	--	79.15	3,476.88
								3/9/2009	--	64.20	3,491.83
								7/13/2009	--	63.95	3,492.08
MW-02-04	9/30/1992	55	4	3,550.9	45 - 55	2.89	3,553.79	9/30/1992	--	50.00	3,503.79
								3/26/2007	--	53.35	3,500.44
								6/18/2007	--	50.67	3,503.12
								9/17/2007	--	51.69	3,502.10
								12/10/2007	--	52.32	3,501.47
								3/11/2008	--	52.74	3,501.05
								9/15/2008	--	51.52	3,502.27
								3/9/2009	--	53.06	3,500.73
								7/13/2009	sheen	53.20	3,500.59

Table 1
Monitor Well Completion and Gauging Summary
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257 Empire Road
Artesia, New Mexico

Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
MW-02-05	10/6/1992	50	4	3,549.9	40 - 50	2.79	3,552.69	10/6/1992	--	43.00	3,509.69
								3/26/2007	--	27.21	3,525.48
								6/18/2007	--	27.40	3,525.29
								9/17/2007	--	27.56	3,525.13
								12/10/2007	--	27.58	3,525.11
								3/11/2008	--	27.76	3,524.93
								9/15/2008	--	27.50	3,525.19
								3/9/2009	--	27.53	3,525.16
								7/13/2009	--	27.62	3,525.07
MW-02-06	9/29/1992	21	4	3,548.3	11 - 21	2.52	3,550.82	9/29/1992	--	18.00	3,532.82
								3/26/2007	--	18.18	3,532.64
								6/18/2007	--	16.48	3,534.34
								9/17/2007	--	15.60	3,535.22
								12/10/2007	--	16.83	3,533.99
								3/11/2008	--	17.96	3,532.86
								9/15/2008	--	14.98	3,535.84
								3/9/2009	--	17.34	3,533.48
								7/13/2009	--	19.19	3,531.63
MW-02-07	10/5/1992	63	4	3,544.2	53 - 63	2.80	3,547.00	10/5/1992	--	57.00	3,490.00
								3/26/2007	--	46.75	3,500.25
								6/18/2007	--	45.89	3,501.11
								9/17/2007	--	44.31	3,502.69
								12/10/2007	--	46.51	3,500.49
								3/11/2008	--	46.73	3,500.27
								9/15/2008	--	45.78	3,501.22
								3/9/2009	--	48.64	3,498.36
								7/13/2009	--	46.95	3,500.05
MW-02-09	10/7/1992	40	4	3,543.5	30 - 40	3.02	3,546.52	10/7/1992	--	31.00	3,515.52
								3/27/2007	34.84	38.41	3,510.97
								6/18/2007	35.45	35.62	3,511.04
								9/17/2007	35.66	38.72	3,510.25
								12/10/2007	35.78	39.18	3,510.06
								3/11/2008	38.19	39.01	3,508.17
								9/15/2008	25.89	34.72	3,518.86
								3/9/2009	35.18	39.07	3,510.56
								7/14/2009	--	33.11	3,513.41

Table 1
Monitor Well Completion and Gauging Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
MW-02-10	9/29/1992	75	4	3,545.4	65 - 75	3.00	3,548.40	9/29/1992	--	64.00	3,484.40
								3/27/2007	52.38	*	--
								6/18/2007	52.74	58.38	3,494.53
								9/17/2007	52.48	58.76	3,494.66
								12/10/2007	53.18	58.22	3,494.21
								3/11/2008	53.22	55.14	3,494.80
								9/15/2008	54.12	62.90	3,492.52
								3/9/2009	54.60	*	--
								7/14/2009	54.12	*	--
MW-02-11	9/29/1992	20	4	3,544.0	10 - 20	2.79	3,546.79	9/29/1992	--	--	--
								3/26/2007	--	22.62	3,524.17
								6/18/2007	18.05	19.30	3,528.49
								9/17/2007	20.82	22.02	3,525.73
								12/10/2007	21.67	22.18	3,525.02
								3/11/2008	23.79	26.79	3,522.40
								9/15/2008	21.72	22.27	3,524.96
								3/9/2009	22.52	*	--
								7/14/2009	--	22.91	3,523.88
MW-02-12	10/1/1992	80	4	3,540.3	70 - 80	3.02	3,543.32	10/1/1992	--	74.00	3,469.32
								2/12/2007	emulsion	55.15	3,488.17
								3/27/2007	55.10	55.50	3,487.82
								6/18/2007	emulsion	54.20	3,489.12
								9/17/2007	emulsion	54.29	3,489.03
								12/10/2007	emulsion	--	--
								3/11/2008	emulsion	54.32	3,489.00
								9/15/2008	emulsion	55.89	3,487.43
								3/9/2009	emulsion	56.04	3,487.28
								7/14/2009	emulsion	56.23	3,487.09
MW-02-13	10/7/1992	46	4	3,542.7	36 - 46	2.89	3,545.59	10/7/1992	--	40.00	3,505.59
								2/12/2007	41.20	42.65	3,504.10
								3/27/2007	41.25	42.23	3,504.14
								6/18/2007	36.66	39.81	3,508.30
								9/17/2007	38.31	41.44	3,506.65
								12/10/2007	39.90	43.00	3,505.07
								3/11/2008	41.03	43.24	3,504.12
								9/15/2008	sheen	36.65	3,508.94
								3/9/2009	40.81	43.98	3,504.15
								7/14/2009	--	39.61	3,505.98

Table 1
Monitor Well Completion and Gauging Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
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Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
MW-02-14	10/5/1992	73	4	3,541.3	63 - 73	3.23	3,544.53	10/5/1992	--	67.00	3,477.53
								3/27/2007	46.4	46.78	3,498.05
								6/18/2007	46.44	46.89	3,498.00
								9/17/2007	46.09	46.58	3,498.34
								12/10/2007	46.94	47.60	3,497.46
								3/11/2008	47.53	48.01	3,496.90
								9/15/2008	47.31	47.87	3,497.11
								3/9/2009	49.40	49.68	3,495.07
								7/14/2009	--	48.75	3,495.78
MW-02-15	10/2/1992	70	4	3,540.2	60 - 70	3.09	3,543.29	10/2/1992	--	64.00	3,479.29
								3/27/2007	--	50.76	3,492.53
								6/18/2007	--	50.73	3,492.56
								9/17/2007	--	50.78	3,492.51
								12/10/2007	--	51.41	3,491.88
								3/11/2008	--	51.34	3,491.95
								9/15/2008	--	52.09	3,491.20
								3/9/2009	--	53.08	3,490.21
								7/13/2009	--	52.62	3,490.67
MW-02-16	9/30/1992	80	4	3,541.0	70 - 80	3.24	3,544.24	9/30/1992	--	74.00	3,470.24
								2/12/2007	--	55.92	3,488.32
								3/27/2007	--	55.59	3,488.65
								6/18/2007	--	55.09	3,489.15
								9/17/2007	--	55.18	3,489.06
								12/10/2007	--	55.63	3,488.61
								3/11/2008	--	55.53	3,488.71
								9/15/2008	--	56.40	3,487.84
								3/9/2009	--	56.32	3,487.92
								7/13/2009	--	56.50	3,487.74
MW-02-18	10/7/1992	36	4	3,542.7	26 - 36	3.00	3,545.70	10/7/1992	--	30.00	3,515.70
								2/12/2007	--	21.84	3,523.86
								3/26/2007	--	21.36	3,524.34
								6/18/2007	--	17.48	3,528.22
								9/17/2007	--	20.23	3,525.47
								12/10/2007	--	20.69	3,525.01
								3/11/2008	--	21.73	3,523.97
								9/15/2008	--	20.34	3,525.36
								3/9/2009	--	21.65	3,524.05
								7/13/2009	--	22.04	3,523.66

Table 1
Monitor Well Completion and Gauging Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
MW-03	12/20/1991	91.5	4	3,552.4	69 - 89	2.90	3,555.30				
								3/27/2007	--	59.51	3,495.79
								6/18/2007	58.74	59.23	3,496.46
								9/17/2007	58.39	59.46	3,496.70
								12/10/2007	59.10	60.28	3,495.96
								3/11/2008	58.47	61.11	3,496.30
								9/15/2008	60.98	64.03	3,493.71
								3/9/2009	60.93	63.60	3,493.84
								7/13/2009	--	63.36	3,491.94
MW-03-01	5/3/1994	70	4	3,539.9	50 - 70	2.66	3,542.56				
								3/27/2007	--	43.78	3,498.78
								6/18/2007	--	43.65	3,498.91
								9/17/2007	--	43.22	3,499.34
								12/10/2007	--	44.09	3,498.47
								3/11/2008	--	43.98	3,498.58
								9/15/2008	40.88	56.37	3,498.58
								3/9/2009	44.73	55.42	3,495.69
								7/13/2009	44.00	55.16	3,496.33
MW-03-02	5/4/1994	100	4	3,538.6	60 - 100	2.48	3,541.08				
								3/27/2007	--	56.33	3,484.75
								6/18/2007	--	56.13	3,484.95
								9/17/2007	emulsion	56.19	3,484.89
								12/10/2007	--	56.38	3,484.70
								3/11/2008	emulsion	53.91	3,487.17
								9/15/2008	emulsion	56.40	3,484.68
								3/9/2009	emulsion	59.60	3,481.48
								7/14/2009	emulsion	56.60	3,484.48
MW-03-03	5/4/1994	80	4	3,542.3	55 - 80	2.42	3,544.72				3,544.72
								3/26/2007	59.59	59.60	3,485.13
								6/18/2007	--	58.96	3,485.76
								9/17/2007	--	59.28	3,485.44
								12/10/2007	emulsion	59.52	3,485.20
								3/11/2008	emulsion	59.43	3,485.29
								9/15/2008	60.61	60.62	3,484.11
								3/9/2009	sheen	60.69	3,484.03
								7/14/2009	--	60.92	3,483.80

Table 1
Monitor Well Completion and Gauging Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
MW-03-04	5/4/1994	110.0	4	3,555.7	65 - 110	2.75	3,558.45				
								3/26/2007	60.85	60.98	3,497.57
								6/18/2007	60.68	61.51	3,497.60
								9/17/2007	60.28	61.44	3,497.94
								12/10/2007	60.43	61.34	3,497.84
								3/11/2008	61.01	61.98	3,497.25
								9/15/2008	62.16	62.95	3,496.13
								3/9/2009	62.02	62.84	3,496.27
								7/14/2009	61.67	62.50	3,496.61
MW-04	12/21/1991	62.5	4	3,547.8	45 - 60	3.19	3,550.99				
								3/26/2007	--	48.15	3,502.84
								6/18/2007	47.18	48.23	3,503.60
								9/17/2007	emulsion	44.41	3,506.58
								12/10/2007	45.49	47.45	3,505.11
								3/11/2008	47.81	50.18	3,502.71
								9/15/2008	45.57	50.66	3,504.40
								3/9/2009	46.90	51.55	3,503.16
								7/14/2009	42.20	48.00	3,507.63
MW-05	12/22/1991	99.0	4	3,540.6	71 - 96	3.17	3,543.77				
								3/27/2007	--	54.69	3,489.08
								6/18/2007	--	54.18	3,489.59
								9/17/2007	--	54.22	3,489.55
								12/10/2007	--	54.71	3,489.06
								3/11/2008	--	54.58	3,489.19
								9/15/2008	--	55.92	3,487.85
								3/9/2009	--	55.84	3,487.93
								7/13/2009	--	55.97	3,487.80
MW-06	12/22/1991	53.0	4	3,541.8	30 - 50	2.70	3,544.50				3,544.50
								3/27/2007	43.40	44.75	3,500.83
								6/18/2007	35.93	36.10	3,508.54
								9/17/2007	37.89	37.96	3,506.60
								12/10/2007	39.84	40.03	3,504.62
								3/11/2008	40.18	41.09	3,504.14
								9/15/2008	31.74	45.13	3,510.08
								3/9/2009	38.32	45.66	3,504.71
								7/14/2009	--	37.57	3,506.93

Table 1
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257 Empire Road
Artesia, New Mexico

Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
MW-07	12/22/1991	28.5	4	3,546.0	11 - 26	0.49	3,546.49				
								3/26/2007	--	8.20	3,538.29
								6/18/2007	--	8.13	3,538.36
								9/17/2007	--	8.06	3,538.43
								12/10/2007	--	8.58	3,537.91
								3/11/2008	--	9.38	3,537.11
								9/15/2008	7.50	7.61	3,538.97
								3/9/2009	9.20	9.50	3,537.23
								7/13/2009	sheen	3.73	3,542.76
MW-08	12/29/1991	92.0	4	3,540.5	69 - 89	3.23	3,543.73				
								2/13/2007	--	54.19	3,489.54
								3/27/2007	--	54.62	3,489.11
								6/18/2007	--	53.20	3,490.53
								9/17/2007	--	53.29	3,490.44
								12/10/2007	--	53.92	3,489.81
								3/11/2008	--	53.82	3,489.91
								9/15/2008	--	54.42	3,489.31
								3/9/2009	--	55.13	3,488.60
								7/13/2009	--	55.11	3,488.62
MW-09	12/29/1991	74.5	4	3,540.4	52 - 72	2.42	3,542.82				
								2/13/2007	44.05	44.99	3,498.58
								3/27/2007	43.88	44.25	3,498.87
								6/18/2007	43.90	44.18	3,498.86
								9/17/2007	43.34	43.83	3,499.38
								12/10/2007	emulsion	44.25	3,498.57
								3/11/2008	44.28	45.91	3,498.21
								9/15/2008	43.79	44.02	3,498.98
								3/9/2009	46.51	46.57	3,496.30
								7/14/2009	45.60	45.69	3,497.20
MW-10	7/28/2008	50.4	4	3,541.8	15 - 50	2.64	3,544.44	7/31/2008	27.62	53.04	3,511.74
								9/15/2008	25.11	25.77	3,519.20
								3/9/2009	40.96	57.82	3,500.11
								7/14/2009	41.00	46.61	3,502.32
MW-11	7/29/2008	57	4	3,540.2	21 - 56	2.53	3,542.73	7/31/2008	38.70	57.58	3,500.25
								9/15/2008	38.39	57.66	3,500.49
								3/9/2009	42.93	57.79	3,496.83
								7/14/2009	42.10	57.50	3,497.55

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Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
MW-12	7/29/2008	74.1	4	3,522.6	36 - 71	2.65	3,525.25	7/31/2008	47.49	47.55	3,477.75
								9/15/2008	47.81	47.82	3,477.44
								3/9/2009	sheen	47.57	3,477.68
								7/14/2009	--	47.98	3,477.27
MW-13	7/29/2008	88.6	4	3,558.5	50 - 85	2.90	3,561.40	7/31/2008	--	62.80	3,498.60
								9/15/2008	--	63.64	3,497.76
								3/9/2009	--	62.49	3,498.91
								7/13/2009	--	62.18	3,499.22
MW-14	7/30/2008	72.5	4	3,517.7	33 - 68	2.62	3,520.32	7/31/2008	--	44.10	3,476.22
								9/15/2008	44.89	45.18	3,475.37
								3/9/2009	44.55	46.20	3,475.44
								7/13/2009	45.31	46.50	3,474.77
MW-15	7/30/2008	80.2	4	3,559.7	42 - 77	2.75	3,562.45	7/31/2008	--	61.05	3,501.40
								9/15/2008	--	61.62	3,500.83
								3/9/2009	sheen	61.19	3,501.26
								7/13/2009	--	61.35	3,501.10
MW-16	6/24/2009	115	4	3,582.6	80 - 115	2.86	3,585.46	7/13/2009	--	94.00	3,491.46
MW-17	6/23/2009	95	4	3,568.0	60 - 95	2.84	3,570.84	7/13/2009	--	78.61	3,492.23
MW-18	6/24/2009	54	4	3,529.7	33 - 53	2.93	3,532.63	7/13/2009	--	37.33	3,495.30
MW-19	6/17/2009	77	4	3,540.6	41 - 76	2.74	3,543.34	7/14/2009	57.01	62.36	3,485.26
MW-20	6/18/2009	77	4	3,538.7	41 - 76	2.77	3,541.47	7/14/2009	55.71	73.00	3,482.30
MW-21	6/18/2009	78	4	3,540.2	43 - 78	2.95	3,543.15	7/14/2009	56.20	56.40	3,486.91
MW-22	6/19/2009	38	4	3,542.9	13 - 38	2.97	3,545.87	7/13/2009	--	22.31	3,523.56
MW-23	6/19/2009	84	4	3,539.2	49 - 84	3.01	3,542.21	7/13/2009	--	62.42	3,479.79

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Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
EB-01	3/29/2004	40.3	1	3,491.5	33 - 38	0.65	3,492.15				
								3/26/2007	--	23.71	3,468.44
								6/18/2007	--	23.06	3,469.09
								9/17/2007	--	22.81	3,469.34
								12/10/2007	--	22.83	3,469.32
								3/10/2008	--	23.09	3,469.06
								9/15/2008	--	23.18	3,468.97
								3/9/2009	--	22.67	3,469.48
								7/13/2009	--	23.43	3,468.72
EB-02	3/29/2004	55	2	3,522.6	35 - 55	2.74	3,525.34				
								3/26/2007	--	43.83	3,481.51
								6/18/2007	--	43.02	3,482.32
								9/17/2007	--	42.68	3,482.66
								12/10/2007	--	42.29	3,483.05
								3/10/2008	--	40.84	3,484.50
								9/15/2008	--	42.33	3,483.01
								3/9/2009	--	40.88	3,484.46
								7/13/2009	--	40.50	3,484.84
EB-03	3/30/2004	67	2	3,517.8	46 - 66	3.25	3,521.05				
								3/26/2007	46.04	46.35	3,474.95
								6/18/2007	45.41	45.55	3,475.61
								9/17/2007	45.81	46.16	3,475.17
								12/10/2007	45.89	46.28	3,475.08
								3/11/2008	43.27	45.79	3,477.28
								9/15/2008	45.95	46.38	3,475.01
								3/9/2009	45.69	46.63	3,475.17
								7/14/2009	46.03	47.70	3,474.69
EB-04	3/31/2004	62.7	2	3,505.3	31 - 51	3.08	3,508.38				
								3/26/2007	--	40.91	3,467.47
								6/18/2007	--	40.19	3,468.19
								9/17/2007	--	40.51	3,467.87
								12/10/2007	--	40.74	3,467.64
								3/10/2008	--	42.18	3,466.20
								9/15/2008	--	41.14	3,467.24
								3/9/2009	--	40.88	3,467.50
								7/13/2009	--	41.58	3,466.80

Table 1
Monitor Well Completion and Gauging Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
EB-05	3/31/2004	56	2	3,523.7	44 - 54	2.91	3,526.61				
								3/26/2007	--	35.08	3,491.53
								6/18/2007	--	35.61	3,491.00
								9/17/2007	--	35.79	3,490.82
								12/10/2007	--	35.70	3,490.91
								3/10/2008	--	40.84	3,485.77
								9/15/2008	--	33.78	3,492.83
								3/9/2009	sheen	35.60	3,491.01
								7/13/2009	--	35.24	3,491.37
EB-06	3/31/2004	83	1	3,555.6	72 - 82	1.03	3,556.63				
								3/26/2007	--	54.39	3,502.24
								6/18/2007	--	54.37	3,502.26
								9/17/2007	--	54.66	3,501.97
								12/10/2007	--	55.83	3,500.80
								3/10/2008	--	54.73	3,501.90
								9/15/2008	--	55.38	3,501.25
								3/9/2009	--	55.92	3,500.71
								7/13/2009	--	57.51	3,499.12
EB-07	4/1/2004	53	2	3,501.3	43 - 53	2.67	3,503.97				
								3/26/2007	--	35.74	3,468.23
								6/18/2007	--	33.82	3,470.15
								9/17/2007	--	34.64	3,469.33
								12/10/2007	--	34.85	3,469.12
								3/10/2008	--	35.17	3,468.80
								9/15/2008	--	35.48	3,468.49
								3/9/2009	--	35.62	3,468.35
								7/13/2009	--	36.44	3,467.53
EB-08	4/2/2004	81	2	3,533.8	66 - 81	3.27	3,537.07				
								3/26/2007	--	57.19	3,479.88
								6/18/2007	--	56.47	3,480.60
								9/17/2007	--	56.85	3,480.22
								12/10/2007	--	57.03	3,480.04
								3/10/2008	--	56.99	3,480.08
								9/15/2008	--	57.86	3,479.21
								3/9/2009	--	57.68	3,479.39
								7/13/2009	--	58.26	3,478.81

Table 1
Monitor Well Completion and Gauging Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
P-01	12/29/2005	50	2	3,527.9	40 - 50	2.31	3,530.21				
								3/26/2007	--	29.73	3,500.48
								6/18/2007	--	28.93	3,501.28
								9/17/2007	--	29.23	3,500.98
								12/10/2007	--	29.14	3,501.07
								3/10/2008	--	34.78	3,495.43
								9/15/2008	--	30.76	3,499.45
								3/9/2009	--	36.96	3,493.25
								7/13/2009	--	35.32	3,494.89
P-02	12/27/2005	22.5	2	3,542.3	19.5 - 22.5	2.43	3,544.73				
								3/26/2007	--	22.22	3,522.51
								6/18/2007	--	19.90	3,524.83
								9/17/2007	--	20.98	3,523.75
								12/10/2007	--	21.29	3,523.44
								3/10/2008	--	24.01	3,520.72
								9/15/2008	--	21.87	3,522.86
								3/9/2009	--	22.18	3,522.55
								7/13/2009	--	22.33	3,522.40
P-03	12/27/2005	78	2	3,534.4	58 - 78	2.43	3,536.83				
								3/26/2007	--	65.45	3,471.38
								6/18/2007	--	63.15	3,473.68
								9/17/2007	--	63.34	3,473.49
								12/10/2007	--	63.78	3,473.05
								3/10/2008	--	64.12	3,472.71
								9/15/2008	--	65.37	3,471.46
								3/9/2009	--	65.17	3,471.66
								7/13/2009	--	65.69	3,471.14
P-04	12/28/2005	61	2	3,513.5	51 - 61	2.27	3,515.77				
								3/26/2007	--	48.53	3,467.24
								6/18/2007	--	46.02	3,469.75
								9/17/2007	--	47.00	3,468.77
								12/10/2007	--	47.32	3,468.45
								3/10/2008	--	47.78	3,467.99
								9/15/2008	--	48.34	3,467.43
								3/9/2009	--	48.43	3,467.34
								7/13/2009	--	49.23	3,466.54

Table 1
Monitor Well Completion and Gauging Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Well Information								Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Dia. (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
P-05	12/28/2005	48	2	3,504.9	35 - 45	2.58	3,507.48				
								3/26/2007	--	37.60	3,469.88
								6/18/2007	--	36.43	3,471.05
								9/17/2007	--	37.19	3,470.29
								12/20/2007	--	37.29	3,470.19
								3/10/2008	--	37.29	3,470.19
								9/15/2008	--	37.25	3,470.23
								3/9/2009	--	37.68	3,469.80
								7/13/2009	--	38.51	3,468.97

Notes
All values are in feet, unless otherwise noted.
Survey datum based upon NAD 1927/NAVD 1929
bgs - below ground surface
TOC - top of casing
Wells drilled and installed by Alan Eades and Atkins Engineering. Schedule 40 threaded PVC casing and screen set.
* - Groundwater not encountered, NAPL observed for entire screened interval.

Table 2
Groundwater VOC Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Volatile Organic Compounds	Collection Date	Benzene	Ethylbenzene	Toluene	Total Xylenes
NMWQCC Standard (mg/L)		**0.01**	**0.75**	**0.75**	**0.62**
MW-02	3/27/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/17/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/10/2007	**0.0221**	**0.0397**	**0.00746**	**0.06627**
	3/11/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	**8.91**	**2.06**	**3.55**	**2.79**
	3/10/2009	**1.79**	**0.107**	<0.1	<0.150
MW-02-02	3/27/2007	<0.002	<0.003	<0.007	<0.0009
	6/19/2007	**0.00066**	<0.0006	<0.0014	<0.0018
	9/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/11/2007	<0.002	<0.003	<0.007	<0.009
	3/11/2008	<0.0008	<0.002	<0.002	<0.003
	9/17/2008	<0.0008	<0.002	<0.002	<0.003
	3/11/2009	**0.000979**	<0.002	<0.002	<0.003
MW-02-03	3/29/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/20/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/18/2007	**0.00055**	<0.0003	<0.0007	**0.00114**
	12/11/2007	**0.00283**	**0.00137**	<0.0007	**0.0028**
	3/11/2008	<0.0008	<0.002	<0.002	<0.003
	9/17/2008	<0.0008	<0.002	<0.002	<0.003
	3/11/2009	**0.0224**	**0.0035**	<0.002	**0.00595**
MW-02-04	3/28/2007	<0.002	**0.00041**	<0.007	<0.0009
	6/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/10/2007	**0.00021**	<0.0003	<0.0007	**0.00084**
	3/11/2008	**0.00685**	**0.00987**	<0.002	**0.0157**
	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	<0.0008	<0.002	<0.002	<0.003
MW-02-05	3/27/2007	<0.002	<0.003	<0.007	<0.0009
	6/19/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/11/2007	<0.002	<0.003	<0.007	<0.0009
	3/11/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/11/2009	**0.00115**	<0.002	<0.002	<0.003

Table 2
Groundwater VOC Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Volatile Organic Compounds	Collection Date	Benzene	Ethylbenzene	Toluene	Total Xylenes
NMWQCC Standard (mg/L)		0.01	0.75	0.75	0.62
MW-02-06	3/28/2007	**4.58**	**0.148**	<0.035	**0.222**
	6/20/2007	**4.89**	**0.421**	**0.243**	**0.8112**
	9/18/2007	**5.42**	**0.296**	**0.0467**	**0.3636**
	12/11/2007	**8.26**	**0.618**	**0.298**	**0.3636**
	3/11/2008	**6.59**	**1.04**	**0.443**	**1.95**
	9/16/2008	**5.36**	**1.18**	<0.02	**1.37**
	3/10/2009	**5.35**	**0.591**	**0.122**	**0.662**
MW-02-07	3/28/2007	**1.24**	**0.133**	<0.007	**0.276**
	6/19/2007	**1.25**	**0.12**	<0.007	**0.24**
	9/18/2007	**1.5**	**0.138**	**0.0013**	**0.311**
	12/10/2007	**1.75**	**0.124**	<0.007	**0.35**
	3/11/2008	**1.43**	**0.0901**	<0.02	**0.322**
	9/17/2008	**4.59**	**0.115**	<0.04	**0.325**
	3/10/2009	**5.85**	**0.108**	<0.1	**0.387**
MW-02-15	3/29/2007	**0.0193**	<0.0003	<0.0007	**0.00357**
	6/20/2007	**0.0268**	<0.0003	<0.0007	<0.0009
	9/18/2007	**0.041**	**0.00059**	<0.0007	**0.00419**
	12/11/2007	**0.0421**	**0.00104**	<0.0007	**0.00359**
	3/11/2008	**0.0208**	<0.002	<0.002	**0.00366**
	9/17/2008	**0.0294**	**0.00731**	<0.002	**0.0112**
	3/10/2009	**0.169**	**0.00639**	<0.002	**0.0135**
MW-02-16	3/29/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/19/2007	**0.00032**	<0.0003	<0.0007	<0.0009
	9/18/2007	<0.001	<0.0015	<0.0035	<0.0045
	12/11/2007	<0.0002	<0.0003	<0.0007	<0.0009
	3/11/2008	**0.0131**	**0.00247**	<0.002	<0.003
	9/17/2008	<0.0008	<0.002	<0.002	<0.003
	3/11/2009	**0.0055**	<0.002	<0.002	<0.003
MW-02-18	3/28/2007	**8.08**	**0.400**	<0.035	**0.188**
	6/19/2007	**6.63**	**0.405**	<0.07	**0.192**
	9/18/2007	**6.06**	**0.328**	<0.0035	**0.147**
	12/11/2007	**17.2**	**0.481**	<0.007	**0.251**
	3/11/2008	**11**	**0.25**	<0.2	<0.3
	9/16/2008	**15**	**0.362**	<0.2	**0.170**
	3/10/2009	**16.4**	**0.412**	<0.4	<0.6

Table 2
Groundwater VOC Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Volatile Organic Compounds	Collection Date	Benzene	Ethylbenzene	Toluene	Total Xylenes
NMWQCC Standard (mg/L)		0.01	0.75	0.75	0.62
MW-03-01	3/28/2007	**0.32**	**0.0788**	<0.0035	**0.22**
	6/19/2007	**0.0897**	**0.0149**	<0.007	**0.0598**
	9/18/2007	**0.28**	**0.0513**	<0.0007	**0.192**
	12/11/2007	**0.131**	**0.0149**	<0.0007	**0.111**
	3/11/2008	**0.156**	**0.141**	<0.01	**0.103**
MW-03-02	3/29/2007	<0.0002	<0.0003	<0.0007	**0.00077**
	6/19/2007	<0.0002	**0.00086**	<0.0007	<0.0009
	12/11/2007	**0.00233**	**0.00151**	<0.0007	**0.00331**
MW-03-03	3/28/2007	**1.02**	**0.346**	<0.007	**0.396**
	6/17/2007	**0.913**	**0.119**	<0.007	**0.187**
	9/18/2007	**0.983**	**0.110**	<0.007	**0.179**
	3/11/2009	**1.49**	**0.0569**	<0.02	**0.193**
MW-05	3/29/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/19/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/18/2007	**0.0008**	<0.0003	<0.0007	**0.0012**
	12/11/2007	<0.0002	<0.0003	<0.0007	<0.0009
	3/11/2008	**0.00668**	<0.002	<0.002	<0.003
	9/17/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	**0.106**	0.0107	<0.002	0.0188
MW-07	3/28/2007	**0.839**	**0.0211**	<0.007	**0.0178**
	6/19/2007	**0.791**	**0.0304**	<0.007	**0.0175**
	9/18/2007	**1.26**	**0.0369**	<0.007	**0.0291**
	12/10/2007	**1.36**	**0.0479**	<0.007	**0.043**
	3/11/2008	**0.657**	<0.02	<0.02	<0.03
MW-08	3/28/2007	<0.0002	<0.0003	<0.0007	**0.00075**
	6/19/2007	**0.00056**	**0.0005**	<0.0007	<0.0009
	9/18/2007	**0.00044**	<0.0003	<0.0007	**0.00113**
	12/11/2007	**0.00336**	**0.00196**	<0.0007	**0.00553**
	3/11/2008	**0.0311**	**0.00436**	<0.002	<0.003
	9/17/2008	**0.0254**	**0.00684**	<0.002	**0.00916**
	3/11/2009	**0.0174**	**0.00281**	<0.002	**0.0047**
MW-12	3/11/2009	**0.708**	<0.02	<0.02	<0.03

Table 2
Groundwater VOC Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Volatile Organic Compounds	Collection Date	Benzene	Ethylbenzene	Toluene	Total Xylenes
NMWQCC Standard (mg/L)		**0.01**	**0.75**	**0.75**	**0.62**
MW-13	9/16/2008	**0.767**	<0.002	**0.002**	<0.003
	3/10/2009	**0.00133**	<0.002	**0.002**	<0.003
MW-15	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	<0.0008	<0.002	<0.002	<0.003
MW-16	7/15/2009	<0.0008	<0.002	<0.002	<0.003
MW-17	7/15/2009	<0.0008	<0.002	<0.002	<0.003
MW-18	7/15/2009	**0.013**	**0.0101**	<0.002	**0.00703**
MW-20	7/15/2009	**0.0176**	**0.0133**	<0.002	**0.0161**
MW-22	7/15/2009	**6.35**	**0.653**	**0.00458**	**0.466**
MW-23	7/15/2009	**2.26**	**0.164**	<0.002	**0.102**
EB-01	3/27/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/17/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/10/2007	<0.0002	<0.0003	<0.0007	<0.0009
	3/10/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	<0.0008	<0.002	<0.002	<0.003
EB-02	3/27/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/17/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/10/2007	<0.0002	<0.0003	<0.0007	<0.0009
	3/10/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	<0.0008	<0.002	<0.002	<0.003
EB-03	3/27/2007	**0.0115**	**0.00493**	<0.0007	**0.00473**

Table 2
Groundwater VOC Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Volatile Organic Compounds	Collection Date	Benzene	Ethylbenzene	Toluene	Total Xylenes
NMWQCC Standard (mg/L)		**0.01**	**0.75**	**0.75**	**0.62**
EB-04	3/27/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/17/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/10/2007	**0.00091**	<0.0003	<0.0007	<0.0009
	3/10/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	<0.0008	<0.002	<0.002	<0.003
EB-05	3/26/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/17/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/10/2007	**0.00061**	<0.0003	<0.0007	<0.0009
	3/10/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	<0.0008	<0.002	<0.002	<0.003
EB-06	3/26/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/17/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/10/2007	<0.0002	<0.0003	<0.0007	<0.0009
	3/10/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	<0.0008	<0.002	<0.002	<0.003
EB-07	3/27/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/17/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/10/2007	**0.00026**	<0.0003	<0.0007	<0.0009
	3/10/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	<0.0008	<0.002	<0.002	<0.003
EB-08	3/27/2007	**4.59**	**1.3**	**0.524**	**2.029**
	6/18/2007	**4.95**	**1.48**	**0.676**	**2.543**
	9/17/2007	**3.84**	**0.973**	**0.429**	**1.564**
	12/10/2007	**2.58**	**0.656**	**0.243**	**1.036**
	3/10/2008	**3.79**	**0.964**	**0.331**	**1.54**
	9/16/2008	**5.77**	**1.43**	**0.668**	**2.31**
	3/10/2009	**5.04**	**1.37**	**0.619**	**2.21**

Table 2
Groundwater VOC Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Volatile Organic Compounds	Collection Date	Benzene	Ethylbenzene	Toluene	Total Xylenes
NMWQCC Standard (mg/L)		0.01	0.75	0.75	0.62
P-01	3/26/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/17/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/10/2007	**0.00076**	<0.0003	<0.0007	<0.0009
	3/10/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	**0.0127**	<0.002	<0.002	<0.003
	3/10/2009	**0.00148**	<0.002	<0.002	<0.003
P-02	3/27/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/19/2007	<0.0002	**0.45**	<0.0007	**0.206**
	9/17/2007	**0.00206**	**0.00309**	<0.0007	**0.0075**
	12/10/2007	**0.104**	**0.0932**	**0.0230**	**0.1506**
	3/10/2008	**0.016**	**0.0259**	<0.01	**0.0434**
	9/16/2008	**0.104**	**0.0901**	**0.0208**	**0.138**
	3/10/2009	<0.0008	<0.002	<0.002	<0.003
P-03	3/27/2007	**0.00507**	<0.0003	<0.0007	<0.0009
	6/18/2007	**0.0057**	<0.0003	<0.0007	<0.0009
	9/17/2007	**0.0154**	<0.0003	<0.0007	**0.00154**
	12/10/2007	**0.00245**	<0.0003	<0.0007	<0.0009
	3/10/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	**0.00115**	<0.002	<0.002	<0.003
P-04	3/27/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/17/2007	**0.00041**	<0.0003	<0.0007	<0.0009
	12/10/2007	**0.00026**	<0.0003	<0.0007	<0.0009
	3/10/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	<0.0008	<0.002	<0.002	<0.003
P-05	3/27/2007	<0.0002	<0.0003	<0.0007	<0.0009
	6/18/2007	<0.0002	<0.0003	<0.0007	<0.0009
	9/17/2007	<0.0002	<0.0003	<0.0007	<0.0009
	12/10/2007	**0.00033**	<0.0003	<0.0007	**0.00083**
	3/10/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	<0.0008	<0.002	<0.002	<0.003
	3/10/2009	**0.00322**	<0.002	<0.002	<0.003

Notes

Volatiles analyzed via EPA SW846 Method 8021B by DHL Analytical, Inc.
All values reported in Milligrams per liter (mg/L, parts per million).
Blue indicates the compound exceeded NMWQCC standards.
< values - Indicate the value is less than Method Detection Limit MDL.

Table 2a
Groundwater VOC Quality Control Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Volatile Organic Compounds	Collection Date	Benzene	Ethyl benzene	Toluene	Total Xylenes
NMWQCC Standard (mg/L)		**0.01**	**0.75**	**0.75**	**0.62**
Duplicate-01 (P-02)	3/10/2008	**0.0335**	0.0401	0.00827	0.0697
Duplicate-01 (MW-13)	9/16/2008	**0.760**	<0.002	<0.002	<0.003
Duplicate-01 (MW-13)	3/10/2009	0.00148	<0.002	<0.002	<0.003
Duplicate-01 (MW-16)	7/15/2009	<0.0008	<0.002	<0.002	<0.003
Duplicate-02 (MW-02-16)	3/11/2008	0.0109	0.00228	<0.002	<0.003
Duplicate-02 (MW-02-07)	9/17/2008	**4.42**	0.116	0.0293	0.319
Duplicate-02 (MW-12)	3/11/2009	**0.723**	<0.02	<0.02	<0.03
Equipment Rinse	3/11/2008	<0.0008	<0.002	0.0104	<0.003
Equipment Rinse	3/10/2009	<0.0008	<0.002	0.00212	<0.003
Equipment Rinse	3/11/2009	<0.0008	<0.002	0.00204	<0.003
Field Blank	3/10/2008	<0.0008	<0.002	0.00961	<0.003
	9/17/2008	<0.0008	<0.002	0.00528	<0.003
	3/10/2009	<0.0008	<0.002	0.00204	<0.003
Trip Blank-01	3/10/2008	<0.0008	<0.002	<0.002	<0.003
	9/16/2008	0.00122	<0.002	<0.002	<0.003
	3/10/2009	<0.0008	<0.002	<0.002	<0.003
Trip Blank-02	3/11/2008	<0.0008	<0.002	<0.002	<0.003
	9/17/2008	<0.0008	<0.002	<0.002	<0.003
	3/11/2009	<0.0008	<0.002	<0.002	<0.003

Notes

Volatiles analyzed via EPA SW846 Method 8021B by DHL Analytical, Inc.

All values reported in Milligrams per liter (mg/L, parts per million).

Blue indicates the compound exceeded NMWQCC standards.

< values - Indicate the value is less than Method Detection Limit MDL.

Table 3
Groundwater Metals Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Dissolved Metals	Collection Date	Arsenic	Barium	Cadmium	Calcium	Chromium	Lead	Magnesium	Mercury	Potassium	Selenium	Silver	Sodium
NMWQCC Standard (mg/L)		**0.1**	**1**	**0.01**	--	**0.05**	**0.05**	--	**0.002**	--	**0.05**	**0.05**	--
MW-02	3/27/2007	0.0198	0.1550	<0.0003	555	0.00265	<0.0003	65.3	<0.00008	9.72	0.00926	<0.001	131
	6/18/2007	0.0159	0.0982	<0.0003	620	0.00228	<0.0003	77.6	<0.00008	8.25	0.01820	<0.001	113
	9/17/2007	0.00887	0.0677	<0.0003	536	<0.002	<0.0003	40.3	<0.00008	4.68	0.00686	<0.001	51.8
	12/10/2007	0.00991	0.0631	<0.0003	629	0.00427	<0.0003	74.4	<0.00008	9.59	0.00267	<0.001	124
	3/11/2008	0.0048	0.0350	<0.003	561	0.0027	<0.0003	43.6	<0.00008	5.55	0.00390	<0.001	59.2
	9/16/2008	**0.127**	0.0519	<0.0003	564	0.0105	<0.0003	54.9	<0.00008	8.06	<0.002	<0.001	77.2
	3/10/2009	0.0651	0.0593	<0.0003	656	0.0279	<0.0003	77.1	<0.00008	8.32	<0.002	<0.001	110
MW-02-02	3/27/2007	0.0485	<0.03	<0.003	256	<0.02	<0.003	49,500	<0.0008	1,840	<0.02	<0.01	53,600
	6/19/2007	<0.1	<0.15	<0.015	329	<0.2	<0.015	43,200	<0.00008	1,930	**0.10500**	<0.05	30,200
	9/18/2007	<0.02	<0.03	<0.003	263	<0.02	<0.006	39,400	<0.00008	1,910	<0.04	<0.01	25,700
	12/11/2007	<0.2	<0.3	<0.03	258	<0.2	<0.03	45,300	<0.00008	1,730	<0.2	<0.1	42,900
	3/11/2008	0.03950	<0.03	<0.003	223	<0.02	<0.003	53,100	<0.0008	1,720	<0.02	<0.01	58,400
	9/17/2008	0.0401	<0.015	0.00210	199	<0.01	<0.0015	45,200	<0.0008	1,500	0.0198	<0.005	50,700
	3/11/2009	0.0444	<0.03	<0.003	198	<0.01	<0.003	44,300	<0.00008	1480	<0.01	<0.01	41,500
MW-02-03	3/29/2007	0.00369	0.0102	<0.0003	474	0.0484	<0.0003	120	<0.00008	5.02	0.00513	<0.001	55.6
	6/20/2007	0.00283	0.00972	<0.0003	567	0.0467	0.000334	126	<0.00008	4.88	0.00426	<0.001	69.0
	9/18/2007	<0.002	0.0081	<0.0003	561	0.0429	<0.0003	117	<0.00008	3.62	0.00758	<0.001	67.9
	12/11/2007	0.00213	0.00951	<0.0003	550	0.0510	<0.0003	115	<0.00008	4.16	0.00430	<0.001	45.7
	3/11/2008	0.00246	0.00995	<0.0003	561	0.0483	<0.0003	129	<0.00008	5.07	0.00363	<0.001	61.8
	9/17/2008	0.00240	0.01040	<0.0003	542	0.04560	<0.0003	127	<0.00008	4.66	0.00369	<0.001	60.4
	3/11/2009	0.0024	0.00943	<0.0003	510	0.0446	<0.0003	116	<0.00008	4.66	0.00335	<0.001	58.9
MW-02-04	3/28/2007	0.00339	0.0210	<0.0003	510	<0.002	<0.0003	116	<0.00008	13.2	<0.002	<0.001	69.9
	6/18/2007	<0.002	0.0204	<0.0003	612	<0.002	<0.0003	120	<0.00008	11.7	0.00377	<0.001	78.4
	9/17/2007	0.00393	0.0210	<0.0003	574	<0.002	<0.0003	121	<0.00008	10.4	0.00617	<0.001	75.0
	12/10/2007	<0.002	0.0189	<0.0003	616	<0.002	<0.0003	137	<0.00008	12.1	<0.002	<0.001	89.6
	3/11/2008	<0.002	0.0197	<0.0003	598	<0.002	<0.0003	138	<0.00008	12.9	<0.002	<0.001	80.2
	9/16/2008	<0.002	0.0216	<0.0003	506	<0.002	<0.0003	116	<0.00008	10.9	<0.002	<0.001	76.7
	3/10/2009	<0.002	0.0191	<0.0003	532	<0.002	<0.0003	120	<0.00008	11.4	<0.002	<0.001	69.3

Table 3
Groundwater Metals Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Dissolved Metals	Collection Date	Arsenic	Barium	Cadmium	Calcium	Chromium	Lead	Magnesium	Mercury	Potassium	Selenium	Silver	Sodium
NMWQCC Standard (mg/L)		**0.1**	**1**	**0.01**	--	**0.05**	**0.05**	--	**0.002**	--	**0.05**	**0.05**	--
MW-02-05	3/27/2007	0.0422	<0.03	<0.003	260	<0.02	<0.003	50,800	<0.0008	1,190	<0.02	<0.01	53,200
	6/19/2007	<0.1	<0.15	<0.015	325	<0.2	<0.015	43,600	<0.00008	1,180	<0.1	<0.05	28,900
	9/18/2007	<0.02	<0.03	<0.003	288	<0.02	<0.006	42,800	<0.00008	1,180	<0.002	<0.01	28,500
	12/11/2007	<0.2	<0.03	<0.03	295	<0.2	<0.03	49,700	<0.00008	1,280	<0.2	<0.1	42,100
	3/11/2008	0.0358	<0.03	<0.003	248	<0.02	<0.003	53,300	<0.0008	1,160	<0.02	<0.01	59,400
	9/17/2008	0.0350	<0.015	<0.0015	207	<0.01	<0.0015	46,400	<0.0008	955	0.0199	<0.005	53,200
	3/11/2009	0.0366	<0.03	<0.003	211	<0.01	<0.003	44,800	<0.00008	961	<0.01	<0.01	38,700
MW-02-06	3/28/2007	0.00783	0.0245	<0.0003	480	<0.002	<0.0003	206	<0.00008	8.52	<0.002	<0.001	58.4
	6/20/2007	0.00289	0.0243	<0.0003	604	<0.002	0.000413	140	<0.00008	8.08	<0.002	<0.001	31.8
	9/18/2007	0.00214	0.0225	<0.0003	596	0.00233	<0.0003	146	<0.00008	7.17	0.00615	<0.001	29.9
	12/11/2007	0.00381	0.0271	<0.0003	580	<0.002	<0.0003	166	<0.00008	8.57	<0.002	<0.001	40.0
	3/11/2008	0.00316	0.0209	<0.0003	548	0.00286	0.00434	203	0.000317	7.49	<0.002	0.00128	52.9
	9/16/2008	0.00261	0.0221	<0.0003	565	<0.002	<0.0003	156	<0.00008	7.48	<0.002	<0.001	35.0
	3/10/2009	0.00368	0.0200	<0.0003	526	<0.002	<0.0003	183	0.000121	7.20	<0.002	<0.001	45.0
Mw-02-07	3/28/2007	0.00354	0.0262	<0.0003	522	<0.002	<0.0003	71.8	<0.00008	8.85	<0.002	<0.001	114
	6/19/2007	0.00356	0.0267	<0.0003	545	0.00361	<0.0003	67.7	<0.00008	8.94	<0.002	<0.001	111
	9/18/2007	0.00247	0.0238	<0.0003	579	0.00449	<0.0003	64.2	<0.00008	7.28	0.00568	<0.001	112
	12/10/2007	0.00207	0.0265	<0.0003	587	0.00232	<0.0003	74.4	<0.00008	8.51	<0.002	<0.001	128
	3/11/2008	<0.002	0.0255	<0.0003	574	0.00222	<0.0003	80.0	<0.00008	9.23	<0.002	<0.001	136
	9/16/2008	0.00274	0.0259	<0.0003	603	0.00408	<0.0003	72.6	<0.00008	11.2	0.0494	<0.001	143
	3/10/2009	0.00327	0.0220	<0.0003	543	0.00246	<0.0003	70.3	<0.00008	8.41	<0.002	<0.001	139
MW-02-15	3/29/2007	0.0143	0.0188	<0.0003	564	<0.002	<0.0003	68.5	<0.00008	7.15	<0.002	<0.001	150
	6/20/2007	0.0147	0.016	<0.0003	626	<0.002	<0.0003	73.7	<0.00008	6.65	<0.002	<0.001	168
	9/18/2007	0.00978	0.0139	<0.0003	595	<0.002	<0.0003	64.5	<0.00008	5.88	0.00636	<0.001	153
	12/11/2007	0.0111	0.0182	<0.0003	608	<0.002	<0.0003	68.2	<0.00008	6.66	<0.002	<0.001	162
	3/11/2008	0.00948	0.0162	<0.0003	599	<0.002	<0.0003	71.6	<0.00008	7.74	<0.002	<0.001	176
	9/17/2008	0.0155	0.0175	<0.0003	596	<0.002	<0.0003	85.9	<0.00008	7.29	<0.002	<0.001	200
	3/10/2009	0.00963	0.0154	<0.0003	573	<0.002	<0.0003	64.8	<0.00008	6.67	<0.002	<0.001	177

Table 3
Groundwater Metals Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Dissolved Metals	Collection Date	Arsenic	Barium	Cadmium	Calcium	Chromium	Lead	Magnesium	Mercury	Potassium	Selenium	Silver	Sodium
NMWQCC Standard (mg/L)		0.1	1	0.01	--	0.05	0.05	--	0.002	--	0.05	0.05	--
MW-02-16	3/29/2007	0.014	0.01	<0.0003	490	<0.002	<0.0003	126	<0.00008	5.71	<0.002	<0.001	332
	6/19/2007	0.0089	0.01	<0.0003	584	<0.002	<0.0003	138	<0.00008	7.5	<0.002	<0.001	380
	9/18/2007	<0.002	0.0125	<0.0003	569	<0.002	<0.0003	136	<0.00008	5.02	0.00609	<0.001	345
	12/11/2007	0.00437	0.0136	<0.0003	528	<0.002	<0.0003	124	<0.00008	5.14	<0.002	<0.001	331
	3/11/2008	0.00287	0.0133	<0.0003	560	<0.002	<0.0003	134	<0.00008	6.07	<0.002	<0.001	380
	9/17/2008	0.00358	0.0137	<0.0003	565	<0.002	<0.0003	134	<0.00008	5.72	<0.002	<0.001	357
	3/11/2009	0.00274	0.0121	<0.0003	534	<0.002	<0.0003	128	<0.00008	5.24	<0.002	<0.001	342
MW-02-18	3/28/2007	0.00389	0.0182	0.000323	515	<0.002	<0.0003	262	<0.00008	2.76	<0.002	<0.001	115
	6/19/2007	<0.002	0.0193	<0.0003	557	<0.002	<0.0003	260	<0.00008	3.37	<0.002	<0.001	104
	9/18/2007	<0.002	0.0128	<0.0003	535	<0.002	<0.0003	227	<0.00008	2.49	0.00612	<0.001	88.3
	12/11/2007	<0.002	0.0224	<0.0003	610	<0.002	<0.0003	240	<0.00008	2.84	<0.002	<0.001	97.3
	3/11/2008	<0.002	0.0186	<0.0003	572	<0.002	<0.0003	279	<0.00008	3.45	<0.002	<0.001	103
	9/16/2008	0.00292	0.0216	<0.0003	604	<0.002	<0.0003	252	<0.00008	2.89	<0.002	<0.001	99.7
	3/10/2009	<0.002	0.0164	<0.0003	552	<0.002	<0.0003	239	<0.00008	2.70	<0.002	<0.001	96.1
MW-03-01	3/28/2007	0.0072	0.0247	<0.0003	571	<0.002	<0.0003	60.0	<0.00008	7.95	<0.002	<0.001	143
	6/19/2007	0.00677	0.0224	<0.0003	603	0.00201	<0.0003	68.4	<0.00008	7.75	<0.002	<0.001	156
	9/18/2007	0.00341	0.0199	<0.0003	570	<0.002	<0.0003	59.5	<0.00008	6.27	<0.002	<0.001	148
	12/11/2007	0.0043	0.0216	<0.0003	604	<0.002	<0.0003	65.5	<0.00008	7.30	<0.002	<0.001	166
	3/11/2008	<0.002	0.0209	<0.0003	597	<0.002	<0.0003	67.1	<0.00008	8.32	<0.002	<0.001	175
MW-03-02	3/29/2007	0.00259	0.0229	<0.0003	544	<0.002	<0.0003	104	<0.00008	6.46	<0.002	<0.001	276
	6/19/2007	0.00201	0.0181	<0.0003	539	<0.002	<0.0003	113	<0.00008	5.53	<0.002	<0.001	333
	12/11/2007	<0.002	0.0206	<0.0003	518	<0.002	<0.0003	104	<0.00008	4.98	<0.002	<0.001	304
MW-03-03	3/28/2007	0.00512	0.0254	<0.0003	405	<0.002	<0.0003	86.8	<0.00008	9.52	<0.002	<0.001	148
	6/19/2007	0.00328	0.0248	<0.0003	456	<0.002	<0.0003	94.8	<0.00008	8.47	<0.002	<0.001	178
	9/18/2007	0.00276	0.0229	<0.0003	425	<0.002	<0.0003	83.3	<0.00008	7.61	0.00649	<0.001	146
	3/11/2009	0.00419	0.0239	<0.0003	381	<0.002	<0.0003	78.7	<0.00008	7.96	<0.002	<0.001	120

Table 3
Groundwater Metals Summary
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Dissolved Metals	Collection Date	Arsenic	Barium	Cadmium	Calcium	Chromium	Lead	Magnesium	Mercury	Potassium	Selenium	Silver	Sodium
NMWQCC Standard (mg/L)		0.1	1	0.01	--	0.05	0.05	--	0.002	--	0.05	0.05	--
MW-05	3/29/2007	0.00233	0.0145	<0.0003	558	<0.002	<0.0003	136	<0.00008	5.69	<0.002	<0.001	199
	6/19/2007	0.00252	0.0124	<0.0003	555	<0.002	<0.0003	130	<0.00008	5.56	<0.002	<0.001	203
	9/18/2007	<0.002	0.0113	<0.0003	542	<0.002	0.00119	127	<0.00008	4.53	0.00418	<0.001	188
	12/11/2007	<0.002	0.0152	<0.0003	544	<0.002	<0.0003	123	<0.00008	5.23	<0.002	<0.001	194
	3/11/2008	<0.002	0.0127	<0.0003	570	<0.002	<0.0003	145	<0.00008	5.88	<0.002	<0.001	233
	9/17/2008	<0.002	0.0151	<0.0003	564	<0.002	<0.0003	134	<0.00008	5.9	<0.002	<0.001	209
	3/10/2009	<0.002	0.0132	<0.0003	527	<0.002	<0.0003	120	<0.00008	5.27	<0.002	<0.001	186
MW-07	3/28/2007	0.00245	0.016	<0.0003	491	0.0254	<0.0003	128	<0.00008	14.4	<0.002	<0.001	74.2
	6/19/2007	0.00238	0.0258	<0.0003	613	0.0247	<0.0003	33.3	<0.00008	8.94	<0.002	<0.001	74.2
	9/18/2007	<0.002	0.0221	<0.0003	622	0.0374	<0.0003	39.0	<0.00008	7.96	0.00589	<0.001	41.2
	12/10/2007	0.00213	0.0332	<0.0003	630	0.0356	<0.0003	48.8	<0.00008	10.1	<0.002	<0.001	99.1
	3/11/2008	<0.002	0.0187	<0.0003	618	0.0222	0.000721	67.0	<0.00008	13.6	<0.002	<0.001	81.2
	9/17/2008	<0.002	0.0151	<0.0003	564	<0.002	<0.0003	134	<0.00008	5.90	<0.002	<0.001	209
MW-08	3/28/2007	0.00726	0.0205	<0.0003	479	<0.002	<0.0003	122	<0.00008	6.85	<0.002	<0.001	286
	6/19/2007	0.00491	0.0189	<0.0003	496	<0.002	<0.0003	136	<0.00008	6.93	<0.002	<0.001	303
	9/18/2007	0.00436	0.0174	<0.0003	490	<0.002	<0.0003	127	<0.00008	5.39	0.00512	<0.001	288
	12/11/2007	0.00463	0.0221	<0.0003	479	<0.002	<0.0003	122	<0.00008	6.16	<0.002	<0.001	288
	3/11/2008	0.00548	0.0199	<0.0003	506	<0.002	<0.0003	135	<0.00008	7.4	<0.002	<0.001	320
	9/17/2008	0.00535	0.0194	<0.0003	486	<0.002	<0.0003	124	<0.00008	6.63	<0.002	<0.001	280
	3/11/2009	0.00583	0.0188	<0.0003	467	<0.002	<0.0003	121	<0.00008	6.55	<0.002	<0.001	280
MW-12	3/11/2009	<0.002	0.0141	<0.0003	535	<0.002	<0.0003	85.6	<0.00008	5.3	<0.002	<0.001	99.8
MW-13	9/16/2008	0.00853	0.0249	<0.0003	561	<0.002	<0.0003	36.0	<0.00008	5.92	<0.002	<0.001	77.4
	3/10/2009	0.00707	0.0246	<0.0003	546	<0.002	<0.0003	26.4	<0.00008	4.28	<0.002	<0.001	48.5
MW-15	9/16/2008	0.0174	0.0166	<0.0003	404	<0.002	<0.0003	3,560	<0.00008	116	0.00873	<0.001	4,190
	3/10/2009	0.0110	0.0180	<0.0015	424	<0.01	<0.0015	6,160	<0.00008	222	<0.01	<0.005	7,630
MW-16	7/15/2009	0.00683	0.0179	0.000498	513	0.00585	<0.0003	1,240	<0.00008	37.1	0.0104	<0.001	1,890
MW-17	7/15/2009	0.00814	0.0304	<0.0003	568	<0.002	<0.0003	111	<0.00008	5.58	<0.002	<0.001	132

Table 3
Groundwater Metals Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Dissolved Metals	Collection Date	Arsenic	Barium	Cadmium	Calcium	Chromium	Lead	Magnesium	Mercury	Potassium	Selenium	Silver	Sodium
NMWQCC Standard (mg/L)		0.1	1	0.01	--	0.05	0.05	--	0.002	--	0.05	0.05	--
MW-18	7/15/2009	0.00284	0.0320	<0.0003	623	<0.002	<0.0003	21.1	<0.00008	3.14	<0.002	<0.001	44.4
MW-20	7/15/2009	0.0821	0.0150	<0.0003	576	<0.002	<0.0003	117	<0.00008	8.33	<0.002	<0.001	306
MW-22	7/15/2009	0.00906	0.0255	<0.0003	664	<0.002	<0.0003	288	<0.00008	3.95	<0.002	<0.001	77.4
MW-23	7/15/2009	0.00259	0.0228	<0.0003	660	<0.002	<0.0003	145	<0.00008	6.72	<0.002	<0.001	245
EB-01	3/27/2007	0.00298	0.0122	<0.0003	508	<0.002	<0.0003	132	<0.00008	3.56	0.00663	<0.001	22.2
	6/18/2007	0.00232	0.0147	<0.0003	576	<0.002	<0.0003	135	<0.00008	4.39	0.00637	<0.001	94.3
	9/17/2007	0.00308	0.0156	<0.0003	524	<0.002	<0.0003	132	<0.00008	4.13	0.00901	<0.001	131
	12/10/2007	<0.002	0.0118	<0.0003	550	<0.002	<0.0003	124	<0.00008	3.19	0.00388	<0.001	24.9
	3/10/2008	<0.002	0.0119	0.000545	532	<0.002	<0.0003	123	<0.00008	3.50	0.00521	<0.001	22
	9/16/2008	0.00204	0.0105	<0.0003	496	<0.002	<0.0003	112	<0.00008	3.26	0.00507	<0.001	18.7
	3/10/2009	0.00214	0.0118	0.000331	545	<0.002	<0.0003	128	<0.00008	3.67	0.00488	<0.001	21.6
EB-02	3/27/2007	<0.002	0.0124	<0.0003	496	<0.002	<0.0003	198	<0.00008	10.1	0.00328	<0.001	152
	6/18/2007	<0.002	0.0156	<0.0003	531	<0.002	<0.0003	305	<0.00008	9.09	0.00485	<0.001	135
	9/17/2007	<0.002	0.0123	<0.0003	524	<0.002	<0.0003	228	<0.00008	8.77	0.00631	<0.001	152
	12/10/2007	<0.002	0.012	<0.0003	666	<0.002	<0.0003	192	<0.00008	9.13	<0.002	<0.001	164
	3/10/2008	<0.002	0.0107	<0.0003	514	<0.002	<0.0003	194	<0.00008	9.51	0.00203	<0.001	146
	9/16/2008	<0.002	0.0140	<0.0003	519	<0.002	<0.0003	165	<0.00008	9.50	<0.002	<0.001	149
	3/10/2009	<0.002	0.0128	<0.0003	512	<0.002	<0.0003	186	<0.00008	9.56	<0.002	<0.001	141
EB-03	3/27/2007	<0.002	0.0202	<0.0003	545	<0.002	<0.0003	30	<0.00008	3.93	<0.002	<0.001	56.5
EB-04	3/27/2007	0.00342	0.0163	<0.0003	591	**0.0615**	<0.0003	126	<0.00008	6.30	0.00242	<0.001	208
	6/18/2007	0.00277	0.0165	<0.0003	680	**0.0718**	<0.0003	138	<0.00008	6.07	<0.002	<0.001	232
	9/17/2007	0.00288	0.0164	<0.0003	636	**0.0518**	<0.0003	126	<0.00008	5.44	0.00606	<0.001	214
	12/10/2007	<0.002	0.0169	<0.0003	683	**0.0515**	<0.0003	135	<0.00008	5.60	<0.002	<0.001	235
	3/10/2008	0.00214	0.0165	<0.0003	689	**0.0542**	<0.0003	135	<0.00008	5.84	<0.002	<0.001	232
	9/16/2008	0.00245	0.174	<0.0003	625	**0.0565**	<0.0003	122	<0.00008	5.90	<0.002	<0.001	207
	3/10/2009	0.002	0.0165	<0.0003	609	0.0364	<0.0003	118	<0.00008	6.01	<0.002	<0.001	204

Table 3
Groundwater Metals Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Dissolved Metals	Collection Date	Arsenic	Barium	Cadmium	Calcium	Chromium	Lead	Magnesium	Mercury	Potassium	Selenium	Silver	Sodium
NMWQCC Standard (mg/L)		0.1	1	0.01	--	0.05	0.05	--	0.002	--	0.05	0.05	--
EB-05	3/26/2007	<0.002	0.0290	<0.0003	682	<0.002	<0.0003	12.4	<0.00008	3.16	3.16	<0.001	39.7
	6/18/2007	<0.002	0.0281	<0.0003	623	<0.002	<0.0003	14.3	<0.00008	3.27	3.27	<0.001	46.3
	9/17/2007	<0.002	0.0258	<0.0003	602	<0.002	<0.0003	18.8	<0.00008	3.33	3.33	<0.001	48.4
	12/10/2007	<0.002	0.0235	<0.0003	586	<0.002	<0.0003	13.5	<0.00008	2.51	2.51	<0.001	38.7
	3/10/2008	<0.002	0.0304	<0.0003	602	<0.002	<0.0003	11.2	<0.00008	2.73	<0.002	<0.001	32.1
	9/16/2008	<0.002	0.0403	<0.0003	556	<0.002	<0.0003	11.5	<0.00008	3.06	<0.002	<0.001	37.0
	3/10/2009	<0.002	0.0320	<0.0003	553	<0.002	<0.0003	11.0	<0.00008	3.05	<0.002	<0.001	35.3
EB-06	3/26/2007	0.00375	0.0155	0.000301	684	<0.002	<0.0003	142	<0.00008	4.74	0.00411	<0.001	41.6
	6/18/2007	<0.002	0.0174	<0.0003	600	<0.002	0.00474	127	<0.00008	4.85	0.00325	<0.001	39.8
	9/17/2007	<0.002	0.0151	0.000394	573	<0.002	0.00197	118	<0.00008	3.68	0.00676	<0.001	33.8
	12/10/2007	<0.002	0.0148	<0.0003	570	<0.002	<0.0003	117	<0.00008	3.73	0.0031	<0.001	40.1
	3/10/2008	<0.002	0.0158	0.000561	572	<0.002	<0.0003	122	<0.00008	3.86	0.00348	<0.001	47.5
	9/16/2008	<0.002	0.0155	0.000352	556	0.00217	<0.0003	117	<0.00008	4.27	0.00379	<0.001	34.4
	3/10/2009	<0.002	0.0142	0.000419	544	0.00607	<0.0003	112	<0.00008	4.33	0.00280	<0.001	33.9
EB-07	3/27/2007	0.02580	0.0158	<0.0003	562	<0.002	<0.0003	97.2	<0.00008	2.68	<0.002	<0.001	108
	6/18/2007	0.02730	0.0163	<0.0003	643	<0.002	<0.0003	107	<0.00008	2.98	<0.002	<0.001	117
	9/17/2007	0.0211	0.0164	0.000320	612	<0.002	<0.0003	99.6	<0.00008	2.65	<0.002	<0.001	109
	12/10/2007	0.0232	0.0152	<0.0003	614	<0.002	<0.0003	99.6	<0.00008	2.59	<0.002	<0.001	119
	3/10/2008	0.0301	0.0158	<0.0003	594	<0.002	<0.0003	91.4	<0.00008	2.94	<0.002	<0.001	106
	9/16/2008	0.0379	0.0173	<0.0003	589	<0.002	<0.0003	94.8	<0.00008	3.16	<0.002	<0.001	111
	3/10/2009	0.0416	0.0155	<0.0003	572	<0.002	<0.0003	86.6	<0.00008	3.48	<0.002	<0.001	102
EB-08	3/27/2007	0.00543	0.0259	<0.0003	646	<0.002	<0.0003	123	<0.00008	6.78	<0.002	<0.001	238
	6/18/2007	0.0036	0.0239	<0.0003	757	<0.002	<0.0003	130	<0.00008	7.04	**0.0856**	<0.001	262
	9/17/2007	0.00454	0.0209	<0.0003	689	<0.002	<0.0003	128	0.000354	5.61	0.00687	<0.001	223
	12/10/2007	<0.002	0.0198	<0.0003	676	<0.002	<0.0003	139	0.000354	5.19	<0.002	<0.001	177
	3/10/2008	0.00206	0.0209	<0.0003	723	<0.002	<0.0003	133	<0.00008	5.84	**0.0799**	<0.001	203
	9/16/2008	0.0048	0.0236	<0.0003	702	<0.002	<0.0003	120	<0.00008	6.47	<0.002	<0.001	215
	3/10/2009	0.00544	0.0232	<0.0003	704	0.00204	<0.0003	120	<0.00008	6.10	<0.002	<0.001	198

Table 3
Groundwater Metals Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Dissolved Metals	Collection Date	Arsenic	Barium	Cadmium	Calcium	Chromium	Lead	Magnesium	Mercury	Potassium	Selenium	Silver	Sodium
NMWQCC Standard (mg/L)		**0.1**	**1**	**0.01**	--	**0.05**	**0.05**	--	**0.002**	--	**0.05**	**0.05**	--
P-01	3/26/2007	0.00327	0.0262	<0.0003	692	<0.002	<0.0003	17.9	<0.00008	3.20	<0.002	<0.001	42.6
	6/18/2007	0.00355	0.0246	<0.0003	610	<0.002	<0.0003	17.9	<0.00008	3.25	<0.002	<0.001	45.7
	9/17/2007	<0.002	0.0259	0.000644	604	<0.002	<0.0003	23.1	0.000172	3.21	<0.002	<0.001	56.5
	12/10/2007	<0.002	0.0270	<0.0003	584	<0.002	<0.0003	18.8	<0.00008	2.71	<0.002	<0.001	44.8
	3/10/2008	0.00505	0.022	<0.0003	608	<0.002	<0.0003	17.0	<0.00008	2.77	<0.002	<0.001	34.7
	9/16/2008	<0.002	0.051	<0.0003	583	<0.002	<0.0003	20.3	<0.00008	3.50	<0.002	<0.001	42.1
	3/10/2009	<0.002	0.0188	<0.0003	520	<0.002	<0.0003	34.9	<0.00008	3.25	<0.002	<0.001	58.3
P-02	3/27/2007	0.00256	0.0154	<0.0003	512	<0.002	<0.0003	201	<0.00008	4.14	<0.002	<0.001	48.5
	6/19/2007	0.00405	0.0167	<0.0003	564	<0.002	<0.0003	179	<0.00008	4.25	<0.002	<0.001	39.1
	9/17/2007	0.00206	0.0166	<0.0003	553	<0.002	<0.0003	175	<0.00008	3.59	<0.002	<0.001	37.9
	12/10/2007	<0.002	0.0162	<0.0003	601	<0.002	<0.0003	186	<0.00008	3.82	<0.002	<0.001	44.6
	3/10/2008	<0.002	0.0154	<0.0003	546	<0.002	<0.0003	177	<0.00008	3.84	0.00738	<0.001	43.7
	9/16/2008	<0.002	0.0163	<0.0003	529	<0.002	<0.0003	186	<0.00008	3.81	<0.002	<0.001	47.8
	3/10/2009	<0.002	0.0147	<0.0003	545	<0.002	<0.0003	200	<0.00008	3.84	<0.002	<0.001	44.2
P-03	3/27/2007	0.0326	0.0254	<0.0003	549	<0.002	<0.0003	238	<0.00008	4.77	<0.002	<0.001	106
	6/18/2007	0.0280	0.0246	<0.0003	664	<0.002	<0.0003	269	<0.00008	5.32	<0.002	<0.001	151
	9/17/2007	0.0248	0.0230	<0.0003	628	<0.002	<0.0003	256	<0.00008	4.50	0.00521	<0.001	162
	12/10/2007	0.0270	0.0226	<0.0003	623	<0.002	<0.0003	260	<0.00008	4.53	<0.002	<0.001	164
	3/10/2008	0.0319	0.022	<0.0003	603	<0.002	<0.0003	233	<0.00008	4.79	<0.002	<0.001	166
	9/16/2008	0.0390	0.0255	<0.0003	636	<0.002	<0.0003	251	<0.00008	5.13	<0.002	<0.001	207
	3/10/2009	0.0392	0.0233	<0.0003	608	<0.002	<0.0003	236	<0.00008	5.02	<0.002	<0.001	206
P-04	3/27/2007	0.0694	0.0243	<0.0003	592	<0.002	<0.0003	218	<0.00008	7.68	<0.002	<0.001	217
	6/18/2007	0.0496	0.0219	<0.0003	682	<0.002	<0.0003	212	<0.00008	7.84	<0.002	<0.001	225
	9/17/2007	0.0280	0.0198	<0.0003	611	<0.002	<0.0003	178	<0.00008	6.60	<0.002	<0.001	204
	12/10/2007	0.0306	0.0197	<0.0003	629	<0.002	<0.0003	187	<0.00008	6.40	<0.002	<0.001	219
	3/10/2008	0.0267	0.0188	<0.0003	674	<0.002	<0.0003	182	<0.00008	7.13	<0.002	<0.001	219
	9/16/2008	0.0591	0.0216	<0.0003	611	<0.002	<0.0003	206	<0.00008	6.94	<0.002	<0.001	210
	3/10/2009	0.0322	0.0199	<0.0003	592	<0.002	<0.0003	183	<0.00008	7.55	<0.002	<0.001	217

Table 3
Groundwater Metals Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Dissolved Metals	Collection Date	Arsenic	Barium	Cadmium	Calcium	Chromium	Lead	Magnesium	Mercury	Potassium	Selenium	Silver	Sodium
NMWQCC Standard (mg/L)		**0.1**	**1**	**0.01**	--	**0.05**	**0.05**	--	**0.002**	--	**0.05**	**0.05**	--
P-05	3/27/2007	0.00579	0.0164	<0.0003	558	<0.002	<0.0003	52.0	<0.00008	3.52	<0.002	<0.001	73.7
	6/18/2007	0.00225	0.0134	<0.0003	603	<0.002	<0.0003	60.4	<0.00008	3.02	<0.002	<0.001	84.9
	9/17/2007	0.00241	0.0148	<0.0003	594	<0.002	<0.0003	51.0	<0.00008	2.83	<0.002	<0.001	71.2
	12/10/2007	<0.002	0.0161	<0.0003	623	<0.002	<0.0003	52.1	<0.00008	2.95	<0.002	<0.001	87.4
	3/10/2008	<0.002	0.0156	<0.0003	595	<0.002	<0.0003	50.7	<0.00008	3.2	<0.002	<0.001	81.3
	9/16/2008	<0.002	0.0161	<0.0003	573	<0.002	<0.0003	44.3	<0.00008	3.53	<0.002	<0.001	58.0
	3/10/2009	<0.002	0.0167	<0.0003	594	<0.002	<0.0003	40.9	<0.00008	3.58	<0.002	<0.001	55.3

Notes
Metals analyzed via EPA SW846 Method 6020 by DHL Analytical Inc., Round Rock, Texas
Mercury analyzed via EPA SW846 Method 7470A by DHL Anaytical Inc., Round Rock, Texas
All values reported in Milligrams per liter (mg/L, parts per million).
< values - Indicate the value is less than Method Detection Limit MDL.

Table 3a
Groundwater Metals Quality Control Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Dissolved Metals	Collection Date	Arsenic	Barium	Cadmium	Calcium	Chromium	Lead	Magnesium	Mercury	Potassium	Selenium	Silver	Sodium
NMWQCC Standard (mg/L)		**0.1**	**1**	**0.01**	--	**0.05**	**0.05**	--	**0.002**	--	**0.05**	**0.05**	--
Duplicate-01 (P-02)	3/10/2008	<0.002	0.0154	<0.0003	556	<0.002	<0.0003	194	<0.00008	3.63	0.00417	<0.001	49.8
Duplicate-01 (MW-13)	9/16/2008	0.00809	0.0227	<0.0003	560	<0.002	<0.0003	37.2	<0.00008	5.67	<0.002	<0.001	78.4
Duplicate-01 (MW-13)	3/10/2009	0.00752	0.0260	<0.0003	537	<0.002	<0.0003	27.2	<0.00008	4.38	<0.002	<0.001	50.0
Duplicate-01 (MW-16)	7/15/2009	0.00594	0.0176	<0.0003	542	0.005480	<0.0003	1,260	<0.00008	36.2	0.00884	<0.001	1,950
Duplicate-02 (MW-02-16)	3/11/2008	0.00260	0.0125	<0.0003	565	<0.002	<0.0003	135	<0.00008	6.21	<0.002	<0.001	377
Duplicate-02 (MW-02-07)	9/17/2008	0.00578	0.0281	<0.0003	594	0.00416	<0.0003	72.2	<0.00008	11.3	<0.002	<0.001	141
Duplicate-02 (MW-12)	3/11/2009	<0.002	0.0148	<0.0003	539	<0.002	<0.0003	87.4	<0.00008	5.42	<0.002	<0.001	103
Equipment Rinse	3/11/2008	<0.002	<0.003	<0.0003	0.396	<0.002	<0.0003	<0.1	<0.00008	<0.1	<0.002	<0.001	0.113
	3/10/2009	<0.002	<0.003	<0.0003	<0.1	<0.002	<0.0003	<0.1	<0.00008	<0.1	<0.002	<0.001	<0.1
	3/11/2009	<0.002	<0.003	<0.0003	<0.1	<0.002	<0.0003	<0.1	<0.00008	<0.1	<0.002	<0.001	<0.1

Table 3a
Groundwater Metals Quality Control Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Dissolved Metals	Collection Date	*Arsenic*	*Barium*	*Cadmium*	*Calcium*	*Chromium*	Lead	Magnesium	Mercury	Potassium	Selenium	Silver	Sodium
NMWQCC Standard (mg/L)		**0.1**	**1**	**0.01**	--	**0.05**	**0.05**	--	**0.002**	--	**0.05**	**0.05**	--
Field Blank	3/10/2008	<0.002	<0.003	<0.0003	0.487	<0.002	<0.0003	0.223	<0.00008	<0.1	0.00245	<0.001	<0.1
	9/17/2008	<0.002	<0.003	<0.0003	<0.1	<0.002	<0.0003	<0.1	<0.00008	<0.1	<0.002	<0.001	<0.1
	3/10/2009	<0.002	<0.003	<0.0003	<0.1	<0.002	<0.0003	<0.1	<0.00008	<0.1	<0.002	<0.001	<0.1

Notes

Metals analyzed via EPA SW846 Method 6020 by DHL Analytical Inc., Round Rock, Texas

Mercury analyzed via EPA SW846 Method 7470A by DHL Anaytical Inc., Round Rock, Texas

All values reported in Milligrams per liter (mg/L, parts per million).

< values - Indicate the value is less than Method Detection Limit MDL.

Table 4
Groundwater Inorganics Other Than Metal Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Wet Chemistry	Collection Date	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Hydroxide	Alkalinity, Total	Chloride	Nitrate	Sulfate	Total Dissolved Solids
NMWQCC Standard (mg/L)		--	--	--	--	*250*	*10*	*600*	*1000*
MW-02	3/27/2007	163	<10	<10	163	151	7.19	**1,650**	**3,030**
	6/18/2007	298	<10	<10	298	139	3.42	**1,750**	**3,170**
	9/17/2007	218	<10	<10	218	61.2	3.31	**1,350**	**2,500**
	12/10/2007	272	<10	<10	272	131	0.408	**1,890**	**3,080**
	3/11/2008	186	<10	<10	186	72.5	2.85	**1,720**	**2,650**
	9/16/2008	490	<10	<10	490	95.0	<0.1	**1,560**	**3,020**
	3/10/2009	853	<10	<10	853	148	<0.1	**1,470**	**3,340**
MW-02-02	3/27/2007	5,350	736	<10	6,090	**9,350**	<10	**392,000**	**554,000**
	6/19/2007	9,390	<10	<10	9,390	**16,300**	<10	**221,000**	**388,000**
	9/18/2007	1,710	3,580	<10	5,280	**11,500**	<10	**299,000**	**531,000**
	12/11/2007	2,940	3,940	<10	6,880	**13,300**	<10	**224,000**	**445,000**
	3/11/2008	5,310	1,590	<10	6,900	**11,600**	<10	**340,000**	**500,000**
	9/17/2008	6,890	<10	<10	6,890	**11,400**	**10.7**	**352,000**	**511,000**
	3/11/2009	4,340	2,820	<10	7170	**9,460**	**12.8**	**294,000**	**510,000**
MW-02-03	3/29/2007	137	<10	<10	137	51.7	5.56	**1,960**	**2,990**
	6/20/2007	158	<10	<10	158	60.1	4.39	**1,840**	**3,100**
	9/18/2007	154	<10	<10	154	57.4	5.38	**1,870**	**3,040**
	12/11/2007	120	<10	<10	120	50.3	5.97	**1,840**	**2,960**
	3/11/2008	145	<10	<10	145	58.7	4.65	**1,930**	**3,030**
	9/17/2008	305	<10	<10	305	52.2	5.73	**1,970**	**3,030**
	3/11/2009	151	<10	<10	151	52.2	4.86	**1,820**	**3,120**
MW-02-04	3/28/2007	279	<10	<10	279	82.3	0.129	**1,750**	**3,150**
	6/18/2007	294	<10	<10	294	96.0	<0.1	**1,840**	**3,130**
	9/18/2007	288	<10	<10	288	103	<0.1	**1,800**	**3,250**
	12/10/2007	292	<10	<10	292	105	<0.1	**2,000**	**3,270**
	3/11/2008	283	<10	<10	283	104	<0.1	**1,910**	**3,260**
	9/16/2008	360	<10	<10	360	99.2	<0.1	**1,550**	**3,050**
	3/10/2009	338	<10	<10	338	96.4	<0.1	**1,750**	**3,150**

Table 4
Groundwater Inorganics Other Than Metal Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Wet Chemistry	Collection Date	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Hydroxide	Alkalinity, Total	Chloride	Nitrate	Sulfate	Total Dissolved Solids
NMWQCC Standard (mg/L)		--	--	--	--	250	10	600	1000
MW-02-05	3/27/2007	4,720	2,320	<10	7,040	**4,620**	<10	**394,000**	**569,000**
	6/19/2007	8,900	3,720	<10	126,000	**7,880**	<10	**244,000**	**387,000**
	9/18/2007	1,320	4,510	<10	5,830	**4,910**	<10	**317,000**	**553,000**
	12/11/2007	2,350	5,220	<10	7,570	**4,840**	<10	**216,000**	**435,000**
	3/11/2008	4,690	2,970	<10	7,660	**6,260**	<10	**352,000**	**506,000**
	9/16/2008	7,750	<10	<10	7,750	**5,490**	<10	**366,000**	**517,000**
	3/11/2009	4270	4650	<10	8,920	**5,440**	**14.7**	**297,000**	**498,000**
MW-02-06	3/28/2007	687	<10	<10	687	30.3	0.177	**1,730**	**3,560**
	6/20/2007	480	<10	<10	480	23.3	0.289	**1,690**	**3,230**
	9/18/2007	547	<10	<10	547	25.4	0.111	**1,790**	**3,270**
	12/11/2007	598	<10	<10	598	26.8	<0.1	**1,820**	**3,300**
	3/11/2008	563	<10	<10	563	25.8	<0.1	**2,060**	**3,410**
	9/16/2008	556	<10	<10	556	28.3	2.90	**1,800**	**3,320**
	3/10/2009	700	<10	<10	700	30.2	0.238	**1,540**	**3,370**
MW-02-07	3/28/2007	631	<10	<10	631	109	<0.1	**1,190**	**2,650**
	6/19/2007	664	<10	<10	664	110	<0.1	**1,280**	**2,740**
	9/18/2007	643	<10	<10	643	126	<0.1	**1,330**	**2,770**
	12/10/2007	670	<10	<10	670	112	<0.1	**1,320**	**2,810**
	3/11/2008	640	<10	<10	640	130	<0.1	**1,370**	**2,970**
	9/17/2008	672	<10	<10	672	103	<0.1	**1,420**	**3,010**
	3/10/2009	656	<10	<10	656	163	<0.1	**1,340**	**3,170**
MW-02-15	3/29/2007	336	<10	<10	336	168	<0.1	**1,800**	**3,090**
	6/20/2007	346	<10	<10	346	167	<0.1	**1,660**	**3,240**
	9/18/2007	366	<10	<10	366	169	<0.1	**1,670**	**3,180**
	12/11/2007	366	<10	<10	366	185	<0.1	**1,740**	**3,140**
	3/11/2008	347	<10	<10	347	205	<0.1	**1,700**	**3,200**
	9/17/2008	359	<10	<10	359	244	<0.1	**1,730**	**3,330**
	3/10/2009	363	<10	<10	363	**280**	<0.1	**1,520**	**3,430**

Table 4
Groundwater Inorganics Other Than Metal Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Wet Chemistry	Collection Date	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Hydroxide	Alkalinity, Total	Chloride	Nitrate	Sulfate	Total Dissolved Solids
NMWQCC Standard (mg/L)		--	--	--	--	250	10	600	1000
MW-02-16	3/29/2007	818	<10	<10	818	181	<0.1	**1,940**	**3,800**
	6/19/2007	756	<10	<10	756	206	<0.1	**1,810**	**3,900**
	9/18/2007	802	<10	<10	802	175	<0.1	**1,860**	**3,870**
	12/11/2007	809	<10	<10	809	169	<0.1	**1,850**	**3,790**
	3/11/2008	780	<10	<10	780	193	<0.1	**1,830**	**3,860**
	9/17/2008	404	<10	<10	404	181	0.140	**1,850**	**3,840**
	3/11/2009	814	<10	<10	814	168	<0.1	**1,730**	**3,840**
MW-02-18	3/28/2007	747	<10	<10	747	148	<0.1	**2,050**	**4,190**
	6/19/2007	641	<10	<10	641	121	<0.1	**1,970**	**3,820**
	9/18/2007	675	<10	<10	675	121	<0.1	**1,980**	**4,080**
	12/11/2007	830	<10	<10	830	109	0.106	**2,010**	**3,930**
	3/11/2008	785	<10	<10	785	127	0.34	**2,030**	**3,900**
	9/16/2008	839	<10	<10	839	114	3.2	**1,970**	**4,100**
	3/10/2009	920	<10	<10	920	119	0.151	**1,880**	**4,010**
MW-03-01	3/28/2007	463	<10	<10	463	170	<0.1	**1,420**	**3,000**
	6/19/2007	455	<10	<10	455	192	<0.1	**1,510**	**3,090**
	9/18/2007	410	<10	<10	410	192	<0.1	**1,440**	**2,870**
	12/11/2007	361	<10	<10	361	200	<0.1	**1,460**	**3,110**
	3/11/2008	427	<10	<10	427	240	<0.1	**1,570**	**3,240**
MW-03-02	3/29/2007	637	<10	<10	637	204	<0.1	**1,840**	**3,560**
	6/19/2007	685	<10	<10	685	174	<0.1	**1,600**	**3,420**
	12/11/2007	656	<10	<10	656	178	<0.1	**1,750**	**3,590**
MW-03-03	3/28/2007	665	<10	<10	665	201	<0.1	**964**	**2,420**
	6/17/2007	660	<10	<10	660	231	<0.1	**954**	**2,520**
	9/18/2007	635	<10	<10	635	228	<0.1	**963**	**2,480**
	3/11/2009	684	<10	<10	684	147	<0.1	**899**	**2,310**

Table 4
Groundwater Inorganics Other Than Metal Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Wet Chemistry	Collection Date	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Hydroxide	Alkalinity, Total	Chloride	Nitrate	Sulfate	Total Dissolved Solids
NMWQCC Standard (mg/L)		--	--	--	--	250	10	600	1000
MW-05	3/29/2007	540	<10	<10	540	159	<0.1	**1,910**	**3,440**
	6/19/2007	514	<10	<10	514	146	<0.1	**1,740**	**3,540**
	9/18/2007	530	<10	<10	530	156	<0.1	**1,810**	**3,450**
	12/11/2007	535	<10	<10	535	160	<0.1	**1,840**	**3,430**
	3/11/2008	524	<10	<10	524	197	<0.1	**1,840**	**3,400**
	9/17/2008	1,080	<10	<10	1,080	172	<0.1	**1,800**	**3,440**
	3/10/2009	555	<10	<10	555	161	<0.1	**1,650**	**3,460**
MW-07	3/28/2007	435	<10	<10	435	31.1	<0.1	**1,950**	**3,280**
	6/19/2007	559	<10	<10	559	31.4	<0.1	**1,580**	**2,880**
	9/18/2007	651	<10	<10	651	23.7	<0.1	**1,490**	**2,890**
	12/10/2007	617	<10	<10	617	30.8	<0.1	**1,660**	**2,980**
	3/11/2008	531	<10	<10	531	46.2	<0.2	**1,640**	**3,120**
MW-08	3/28/2007	485	<10	<10	485	**320**	<0.1	**1,650**	**3,500**
	6/19/2007	464	<10	<10	464	**344**	<0.1	**1,640**	**3,400**
	9/18/2007	468	<10	<10	468	**317**	<0.1	**1,550**	**3,420**
	12/11/2007	472	<10	<10	472	**302**	<0.1	**1,690**	**3,400**
	3/11/2008	458	<10	<10	458	**318**	<0.1	**1,730**	**3,470**
	9/17/2008	444	<10	<10	444	**333**	<0.1	**1,700**	**3,480**
	3/11/2009	468	<10	<10	468	**290**	0.118	**1,500**	**3,460**
MW-12	3/11/2009	358	<10	<10	358	105	<0.1	**1,540**	**3,100**
MW-13	9/16/2008	222	<10	<10	222	76.3	<0.1	**1,650**	**2,840**
	3/10/2009	170	<10	<10	170	52.1	<0.1	**1,560**	**2,560**
MW-15	9/16/2008	503	<10	<10	503	**1,430**	5.30	**23,500**	**37,200**
	3/10/2009	1070	<10	<10	1070	**3,170**	7.33	**47,900**	**73,200**
MW-16	7/15/2009	232	<10	<10	232	**1,500**	4.95	**7,560**	**13,900**

Table 4
Groundwater Inorganics Other Than Metal Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Wet Chemistry	Collection Date	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Hydroxide	Alkalinity, Total	Chloride	Nitrate	Sulfate	Total Dissolved Solids
NMWQCC Standard (mg/L)		--	--	--	--	**250**	**10**	**600**	**1000**
MW-17	7/15/2009	197	<10	<10	197	96.6	<0.10	**1,860**	**3,190**
MW-18	7/15/2009	203	<10	<10	203	46.9	<0.10	**1,400**	**2,570**
MW-20	7/15/2009	481	<10	<10	481	135	<0.10	**1,910**	**3,620**
MW-22	7/15/2009	632	<10	<10	632	77.1	0.113	**1,900**	**3,920**
MW-23	7/15/2009	493	<10	<10	493	**265**	<0.10	**1,710**	**3,730**
EB-01	3/27/2007	101	<10	<10	101	30	7.37	**1,790**	**2,890**
	6/18/2007	118	<10	<10	118	130	7.05	**2,000**	**3,250**
	9/17/2007	112	<10	<10	112	122	7.64	**1,870**	**3,250**
	12/10/2007	103	<10	<10	103	32	6.72	**1,990**	**2,910**
	3/10/2008	103	<10	<10	103	32.4	7.72	**1,870**	**2,990**
	9/16/2008	102	<10	<10	102	29.9	7.11	**1,750**	**3,010**
	3/10/2009	103	<10	<10	103	33.2	7.75	**1,880**	**2,940**
EB-02	3/27/2007	318	<10	<10	318	106	3.91	**2,260**	**3,730**
	6/18/2007	339	<10	<10	339	111	2.93	**2,090**	**3,610**
	9/17/2007	307	<10	<10	307	110	4.05	**2,360**	**3,740**
	12/10/2007	330	<10	<10	330	111	3.11	**2,190**	**3,630**
	3/10/2008	319	<10	<10	319	118	3.79	**2,210**	**3,820**
	9/16/2008	365	<10	<10	365	113	2.41	**2,150**	**3,640**
	3/10/2009	350	<10	<10	350	112	2.49	**2,220**	**3,720**
EB-03	3/27/2007	293	<10	<10	293	65.1	<0.1	**1,430**	**2,610**

Table 4
Groundwater Inorganics Other Than Metal Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Wet Chemistry	Collection Date	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Hydroxide	Alkalinity, Total	Chloride	Nitrate	Sulfate	Total Dissolved Solids
NMWQCC Standard (mg/L)		--	--	--	--	250	10	600	1000
EB-04	3/27/2007	254	<10	<10	254	**645**	2.51	**1,710**	**3,770**
	6/18/2007	250	<10	<10	250	**662**	2.90	**1,700**	**3,800**
	9/17/2007	244	<10	<10	244	**664**	3.23	**1,660**	**3,880**
	12/10/2007	252	<10	<10	252	**685**	2.13	**1,900**	**3,790**
	3/10/2008	247	<10	<10	247	**637**	3.29	**1,720**	**3,830**
	9/16/2008	245	<10	<10	245	**598**	2.39	**1,800**	**3,910**
	3/10/2009	247	<10	<10	247	**602**	2.35	**1,790**	**3,730**
EB-05	3/26/2007	167	<10	<10	167	41	<0.1	**1,400**	**2,420**
	6/18/2007	183	<10	<10	183	52.5	<0.1	**1,450**	**2,430**
	9/17/2007	228	<10	<10	228	79.0	<0.1	**1,560**	**2,550**
	12/10/2007	173	<10	<10	173	43.7	<0.1	**1,740**	**2,480**
	3/10/2008	162	<10	<10	162	45.4	<0.1	**1,420**	**2,470**
	9/16/2008	172	<10	<10	172	47.0	<0.1	**1,400**	**2,460**
	3/10/2009	156	<10	<10	156	43.5	0.568	**1,440**	**2,400**
EB-06	3/26/2007	108	<10	<10	108	160	4.61	**1,740**	**3,020**
	6/18/2007	107	<10	<10	107	167	4.74	**1,790**	**2,990**
	9/17/2007	96.8	<10	<10	96.8	162	5.25	**1,730**	**3,050**
	12/10/2007	79..6	<10	<10	79.6	159	3.99	**1,780**	**2,960**
	3/10/2008	94.8	<10	<10	94.8	177	5.1	**1,750**	**3,040**
	9/16/2008	95.4	<10	<10	95.4	161	4.68	**1,830**	**3,210**
	3/10/2009	101	<10	<10	101	165	4.88	**1,810**	**3,030**
EB-07	3/27/2007	415	<10	<10	415	174	<0.1	**1,610**	**3,230**
	6/18/2007	414	<10	<10	414	187	<0.1	**1,680**	**3,180**
	9/17/2007	400	<10	<10	400	182	<0.1	**1,800**	**3,200**
	12/10/2007	422	<10	<10	422	171	<0.1	**1,830**	**3,180**
	3/10/2008	428	<10	<10	428	193	<0.1	**1,670**	**3,300**
	9/16/2008	438	<10	<10	438	158	<0.1	**1,620**	**3,280**
	3/10/2009	441	<10	<10	441	171	<0.1	**1,910**	**3,190**

Table 4
Groundwater Inorganics Other Than Metal Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Wet Chemistry	Collection Date	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Hydroxide	Alkalinity, Total	Chloride	Nitrate	Sulfate	Total Dissolved Solids
NMWQCC Standard (mg/L)		--	--	--	--	250	10	600	1000
EB-08	3/27/2007	947	<10	<10	947	**504**	<0.1	**1,720**	**4,200**
	6/18/2007	966	<10	<10	966	**487**	<0.1	**1,610**	**4,130**
	9/17/2007	764	<10	<10	764	**418**	<0.1	**1,840**	**3,940**
	12/10/2007	630	<10	<10	630	238	<0.1	**1,770**	**3,650**
	3/10/2008	717	<10	<10	717	**381**	0.599	**1,750**	**3,900**
	9/16/2008	898	<10	<10	898	**374**	<0.1	**1,620**	**4,020**
	3/10/2009	902	<10	<10	902	**358**	<0.1	**1,640**	**3,930**
P-01	3/26/2007	215	<10	<10	215	40.5	0.153	**1,330**	**2,410**
	6/18/2007	221	<10	<10	221	51.3	0.304	**1,430**	**2,440**
	9/17/2007	272	<10	<10	272	86.5	0.234	**1,540**	**2,600**
	12/10/2007	233	<10	<10	233	50.7	0.215	**1,410**	**2,410**
	3/10/2008	238	<10	<10	238	47.6	0.954	**1,350**	**2,480**
	9/16/2008	266	<10	<10	266	51.0	0.146	**1,410**	**2,600**
	3/10/2009	234	<10	<10	234	71.9	0.232	**1,430**	**2,630**
P-02	3/27/2007	333	<10	<10	333	63.1	<0.1	**2,000**	**3,520**
	6/19/2007	441	<10	<10	441	55.8	<0.1	**1,770**	**3,380**
	9/17/2007	398	<10	<10	398	55.8	<0.1	**1,840**	**3,370**
	12/10/2007	391	<10	<10	391	52.0	<0.1	**1,930**	**3,370**
	3/10/2008	358	<10	<10	358	66.5	<0.1	**1,990**	**3,530**
	9/16/2008	362	<10	<10	362	58.2	<0.1	**1,980**	**3,520**
	3/10/2009	351	<10	<10	351	61.6	<0.1	**2,020**	**3,500**
P-03	3/27/2007	475	<10	<10	475	324	<0.1	**1,990**	**4,020**
	6/18/2007	479	<10	<10	479	445	<0.1	**2,030**	**4,120**
	9/17/2007	460	<10	<10	460	514	<0.1	**2,180**	**4,150**
	12/10/2007	462	<10	<10	462	489	<0.1	**2,120**	**4,090**
	3/10/2008	303	<10	<10	303	**529**	3.65	**1,410**	**3,360**
	9/16/2008	467	<10	<10	467	**659**	<0.1	**2,030**	**4,840**
	3/10/2009	469	<10	<10	469	**702**	<0.1	**2,090**	**4,540**

Table 4
Groundwater Inorganics Other Than Metal Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Wet Chemistry	Collection Date	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Hydroxide	Alkalinity, Total	Chloride	Nitrate	Sulfate	Total Dissolved Solids
NMWQCC Standard (mg/L)		--	--	--	--	250	10	600	1000
P-04	3/27/2007	553	<10	<10	553	**618**	<0.1	**1,860**	**4,450**
	6/18/2007	493	<10	<10	493	**570**	<0.1	**1,900**	**4,150**
	9/17/2007	408	<10	<10	408	**516**	<0.1	**1,810**	**3,980**
	12/10/2007	435	<10	<10	435	**514**	<0.1	**2,060**	**3,960**
	3/10/2008	414	<10	<10	414	**452**	0.215	**1,840**	**3,880**
	9/16/2008	521	<10	<10	521	**508**	0.144	**1,920**	**4,530**
	3/10/2009	461	<10	<10	461	**575**	0.538	**2,000**	**4,110**
P-05	3/27/2007	290	<10	<10	290	87.3	<0.1	**1,520**	**2,840**
	6/18/2007	270	<10	<10	270	103	<0.1	**1,600**	**2,800**
	9/17/2007	298	<10	<10	298	97.1	<0.1	**1,520**	**2,800**
	12/10/2007	304	<10	<10	304	104	<0.1	**1,700**	**2,860**
	3/10/2008	287	<10	<10	287	103	<0.1	**1,580**	**2,870**
	9/16/2008	294	<10	<10	294	73.9	<0.1	**1,550**	**2,800**
	3/10/2009	272	<10	<10	272	70.0	<0.1	**1,510**	**2,740**

Notes

Alkalinity analyzed via EPA Method 310.1 by DHL Anaytical Inc., Round Rock, Texas
Anions analyzed via EPA Method 300 by DHL Analytical Inc., Round Rock, Texas
TDS analyzed via EPA Method 160.1 by DHL Anaytical Inc., Round Rock, Texas
All values reported in Milligrams per liter (mg/L, parts per million).
< values - Indicate the value is less than Method Detection Limit MDL.

Table 4a
Groundwater Inorganics Other Than Metal Quality Control Summary
Frontier Field Services - Empire Abo Gas Plant (GW-022)
257 Empire Road
Artesia, New Mexico

Wet Chemistry	Collection Date	Alkalinity, Bicarbonate	Alkalinity, Carbonate	Alkalinity, Hydroxide	Alkalinity, Total	Chloride	Nitrate	Sulfate	Total Dissolved Solids
NMWQCC Standard (mg/L)		--	--	--	--	**250**	**10**	**600**	**1000**
Duplicate-01 (P-02)	3/10/2008	357	<10	<10	357	67.4	<0.1	**2,020**	**3,520**
Duplicate-01 (MW-13)	9/16/2008	215	<10	<10	215	77.4	<0.1	**1,650**	**2,740**
Duplicate-01 (MW-13)	3/10/2009	170	<10	<10	170	51.9	0.136	**1,540**	**2,560**
Duplicate-01 (MW-16)	7/15/2009	224	<10	<10	224	**1,480**	4.95	**7,480**	**14,400**
Duplicate-02 (MW-02-16)	3/11/2008	786	<10	<10	786	195	<0.1	**1,920**	**3,870**
Duplicate-02 (MW-02-07)	9/17/2008	670	<10	<10	670	108	<0.1	**1,460**	**3,030**
Duplicate-02 (MW-12)	3/11/2009	371	<10	<10	371	96.4	<0.1	**1,640**	**3,140**
Equipment Rinse	3/11/2008	<10	<10	<10	<10	<0.3	<0.1	<1	<10
	3/10/2009	<10	<10	<10	<10	0.349	<0.1	<1	48.0
	3/11/2009	<10	<10	<10	<10	<0.3	**<0.1**	<1	20.0
Field Blank	3/10/2008	<10	<10	<10	<10	<0.3	<0.1	<1	<10
	9/17/2008	<10	<10	<10	<10	<0.3	<0.1	<1	26.0
	3/10/2009	<10	<10	<10	<10	0.336	<0.1	<1	21.0

Notes
Alkalinity analyzed via EPA Method 310.1 by DHL Anaytical Inc., Round Rock, Texas
Anions analyzed via EPA Method 300 by DHL Analytical Inc., Round Rock, Texas
TDS analyzed via EPA Method 160.1 by DHL Anaytical Inc., Round Rock, Texas
All values reported in Milligrams per liter (mg/L, parts per million).
< values - Indicate the value is less than Method Detection Limit MDL.

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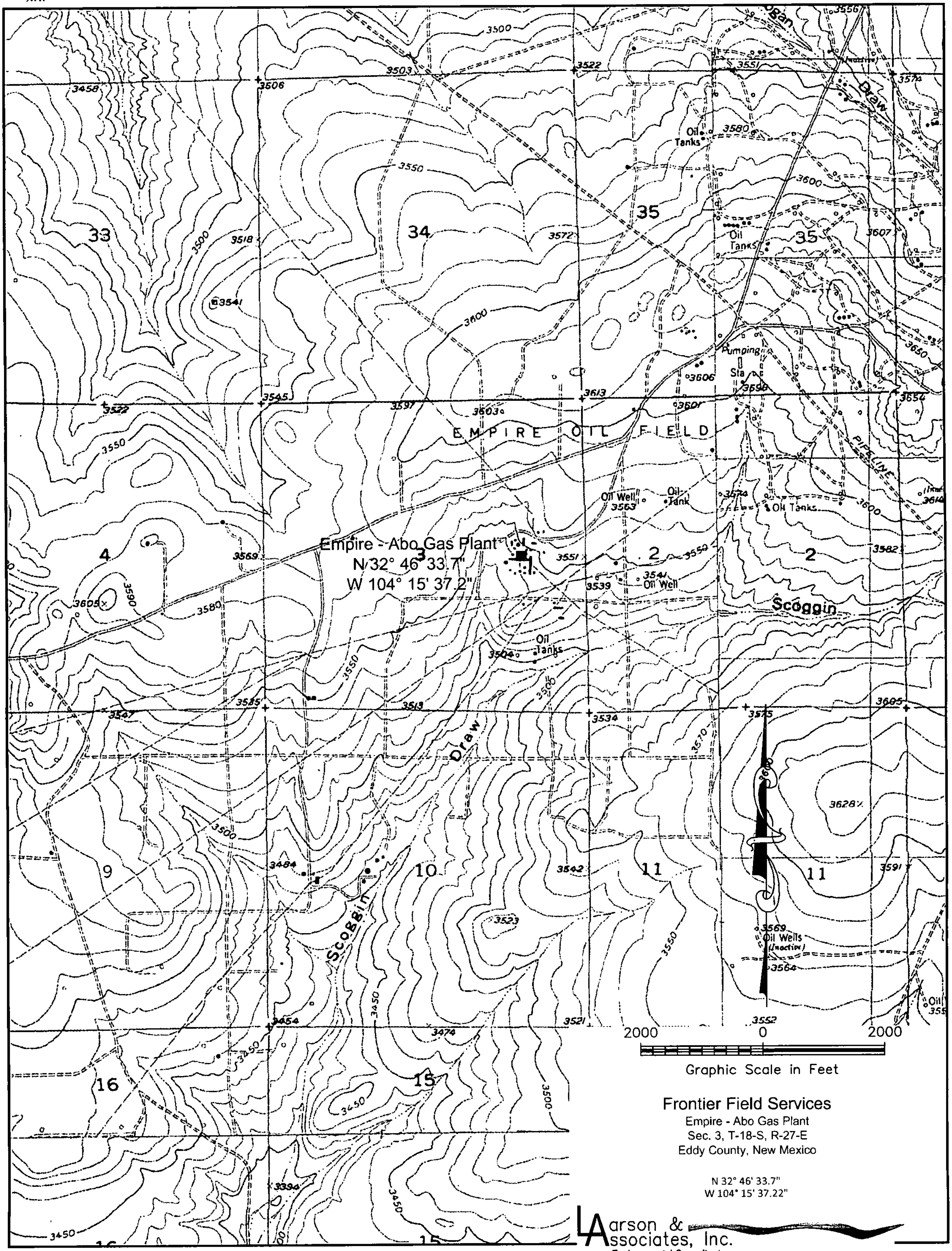

Figure 1 - Topographic Map

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Figure 2 - Aerial Map

LEGEND

- MW-01 - Plugged And Abandoned Monitoring Well Location
- MW-03 - Monitoring Well Location
- P-01 - Piezometer (Fluid Level) Location
- EB-03 - Monitoring Well Location
- * - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** - Hydrocarbon Emulsion Present In Well

- Fence
- Draw
- Roads
- Property Line

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

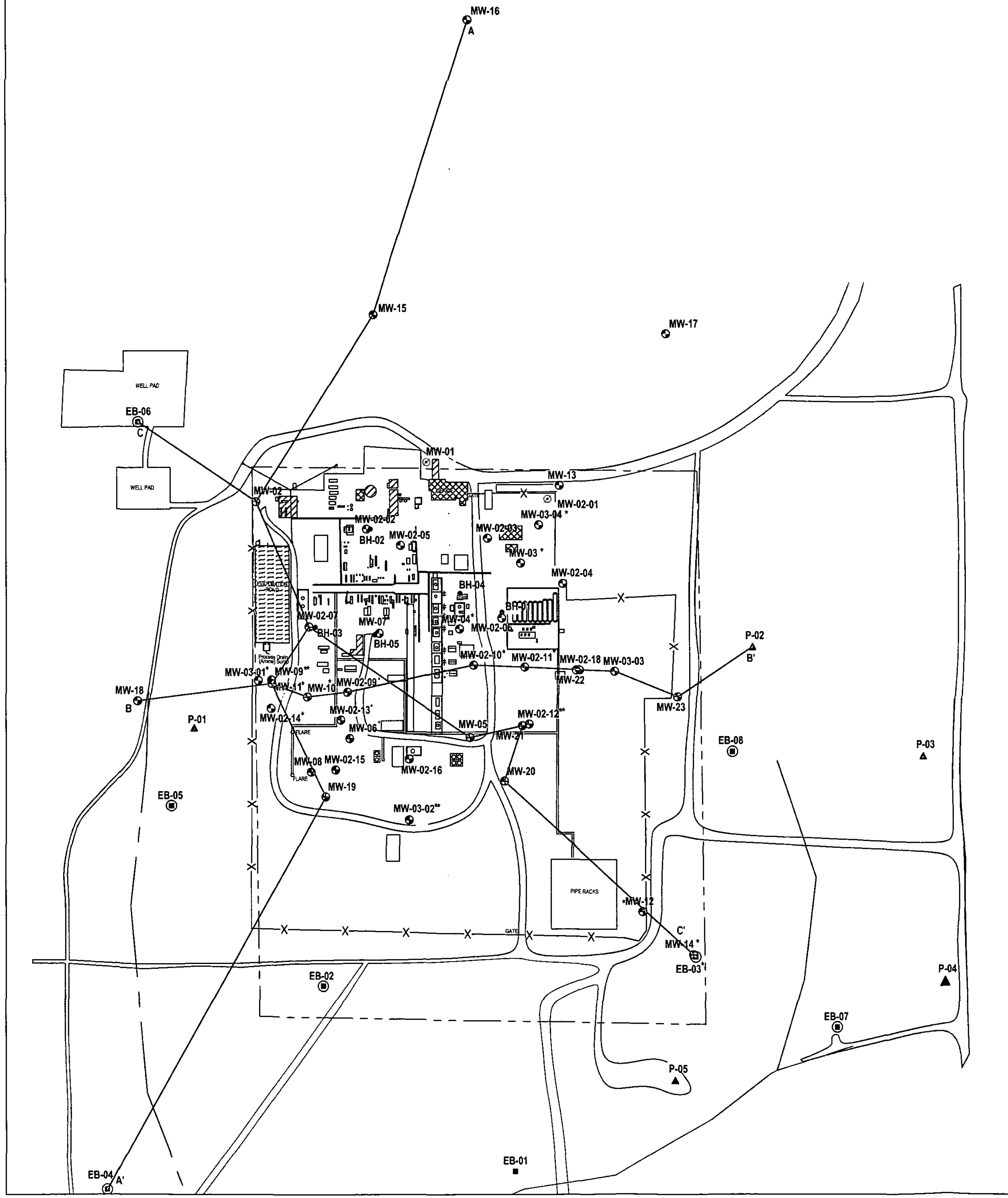
300 0 300

Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants



LEGEND

- MW-01 - Plugged And Abandoned Monitoring Well Location
- MW-02 - Monitoring Well Location
- P-01 - Piezometer (Fluid Level) Location
- EB-03 - Monitoring Well Location
- * - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** - Hydrocarbon Emulsion Present In Well
- —X— - Fence
- —— - Draw
- ═══ - Roads
- — — - Property Line
- A——A' - Line of Geological Cross Section

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3546.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

300 0 300

Graphic Scale in Feet

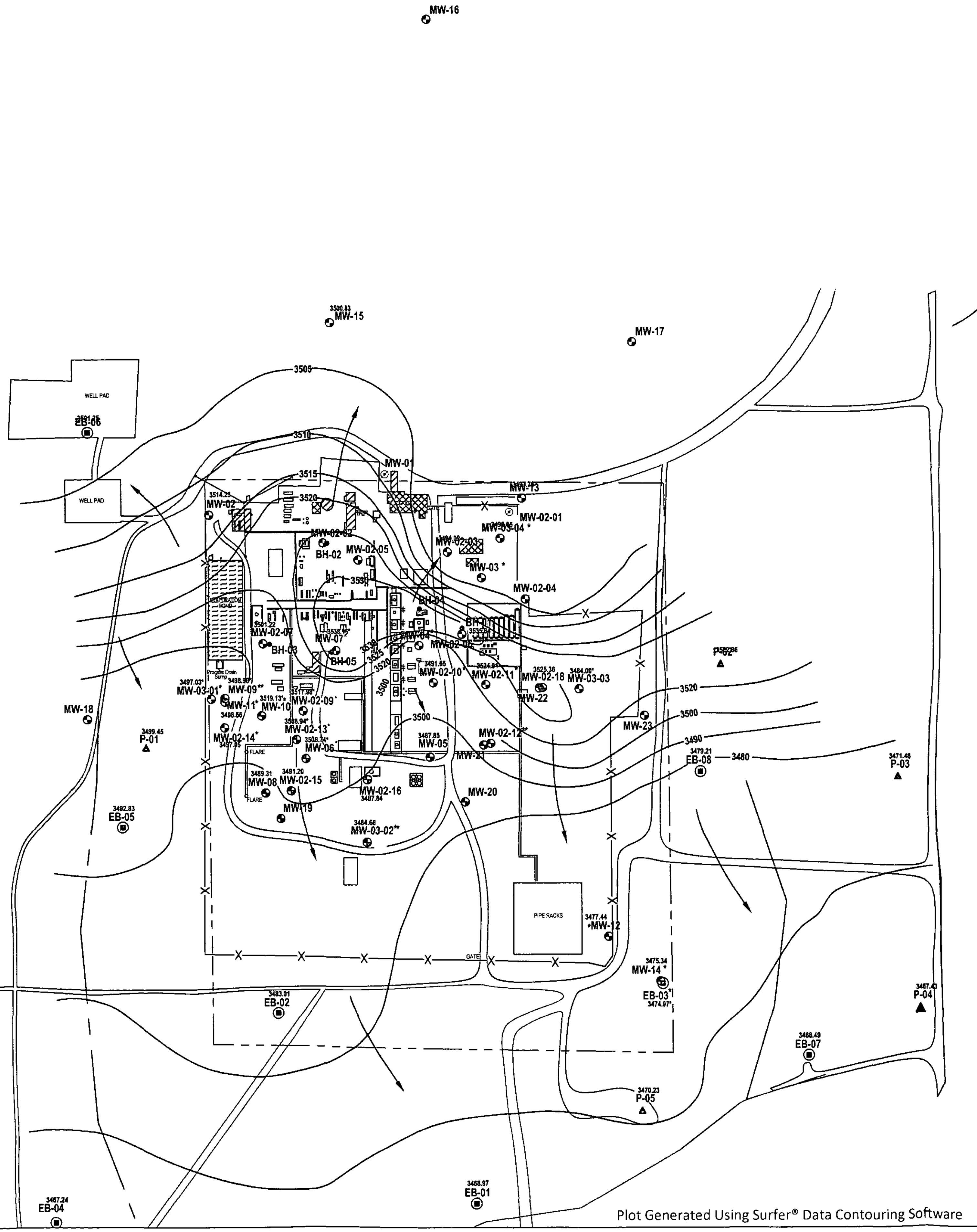
FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 3 - Facility Drawing

Figure 4 - Location Storage, Disposal, and Process Areas



LEGEND

- MW-01 - Plugged And Abandoned Monitoring Well Location
- MW-02 - Monitoring Well Location and Groundwater Potentiometric Surface Elevation, Feet AMSL, September 15, 2008
- P-01 - Piezometer (Fluid Level) Location and Groundwater Potentiometric Surface Elevation, Feet AMSL, September 15, 2008
- EB-04 - Monitoring Well Location and Groundwater Potentiometric Surface Elevation, Feet AMSL, September 15, 2008
- * - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** - Hydrocarbon Emulsion Present In Well
- 3490 - Contour of Groundwater Potentiometric Surface Elevation, Feet AMSL, September 15, 2008
- Fence
- Draw
- Roads
- Property Line
- Groundwater Flow

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

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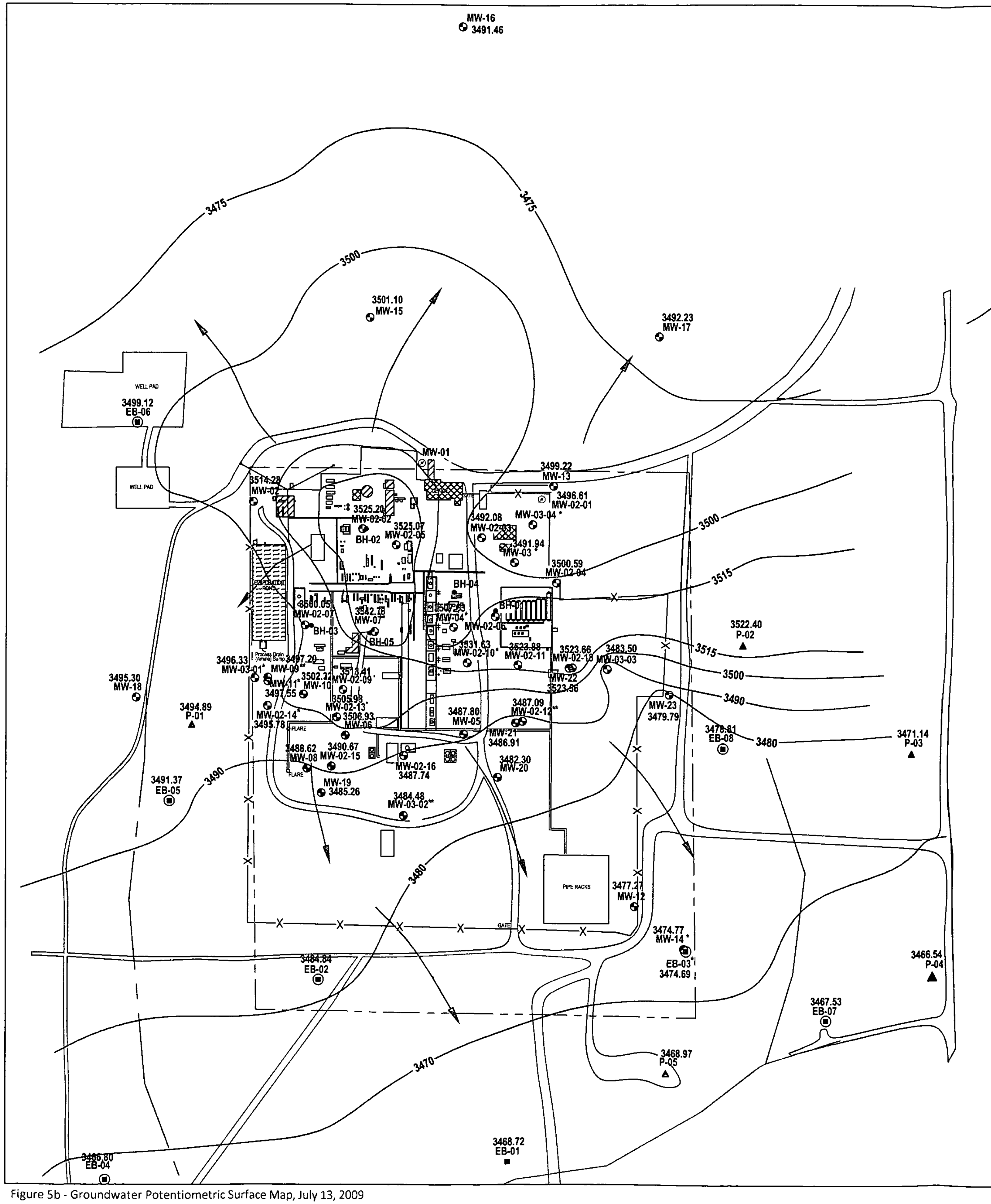
Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 5a - Groundwater Gradient Map September 15, 2008



LEGEND

- Plugged And Abandoned Monitoring Well Location (MW-01)
- Monitoring Well Location and Groundwater Potentiometric Surface Elevation, Feet AMSL, July 13, 2009 (3491.94 MW-03)
- Piezometer (Fluid Level) Locationand Groundwater Potentiometric Surface Elevation, Feet AMSL, July 13, 2009 (3494.89 P-01)
- Monitoring Well Location and Groundwater Potentiometric Surface Elevation, Feet AMSL, July 13, 2009 (3474.69 EB-03)
- * - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** - Hydrocarbon Emulsion Present In Well
- 3500 - Contour of Groundwater Potentiometric Surface Elevation, Feet AMSL, July 13, 2009
- Fence
- Draw
- Roads
- Property Line
- Groundwater Flow

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

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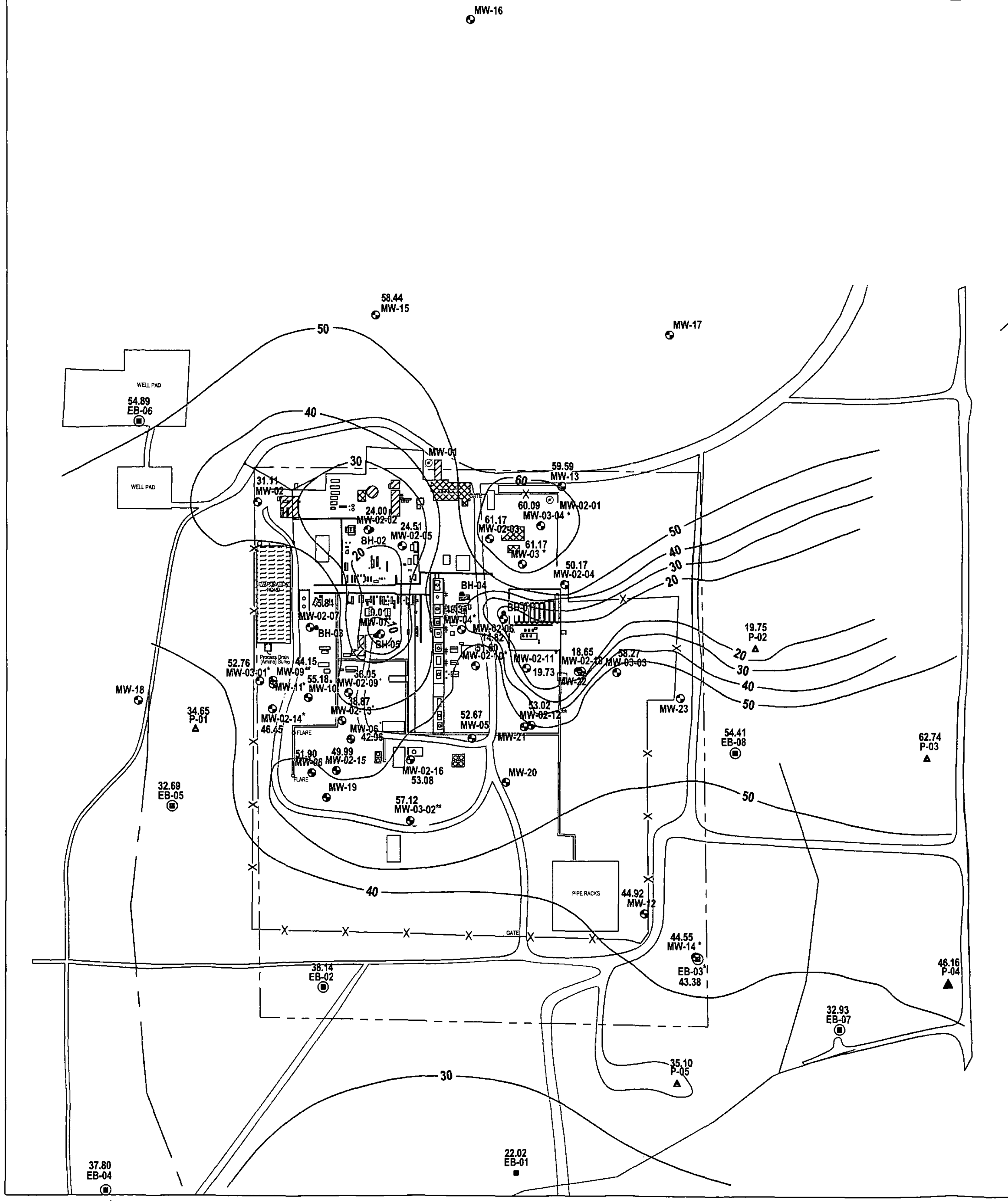
Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 5b - Groundwater Potentiometric Surface Map, July 13, 2009



LEGEND

- Plugged And Abandoned Monitoring Well Location
- Monitoring Well Location and Depth to Groundwater, Feet BGS, March 9, 2009
- Piezometer (Fluid Level) Location and Depth to Groundwater, Feet BGS, March 9, 2009
- Monitoring Well Location and Depth to Groundwater, Feet BGS, March 9, 2009
- * Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** Hydrocarbon Emulsion Present In Well
- Contour of Depth to Groundwater, Feet BGS, March 9, 2009
- Fence
- Draw
- Roads
- Property Line

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

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Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 5c - Depth to Groundwater Map, March 9, 2009

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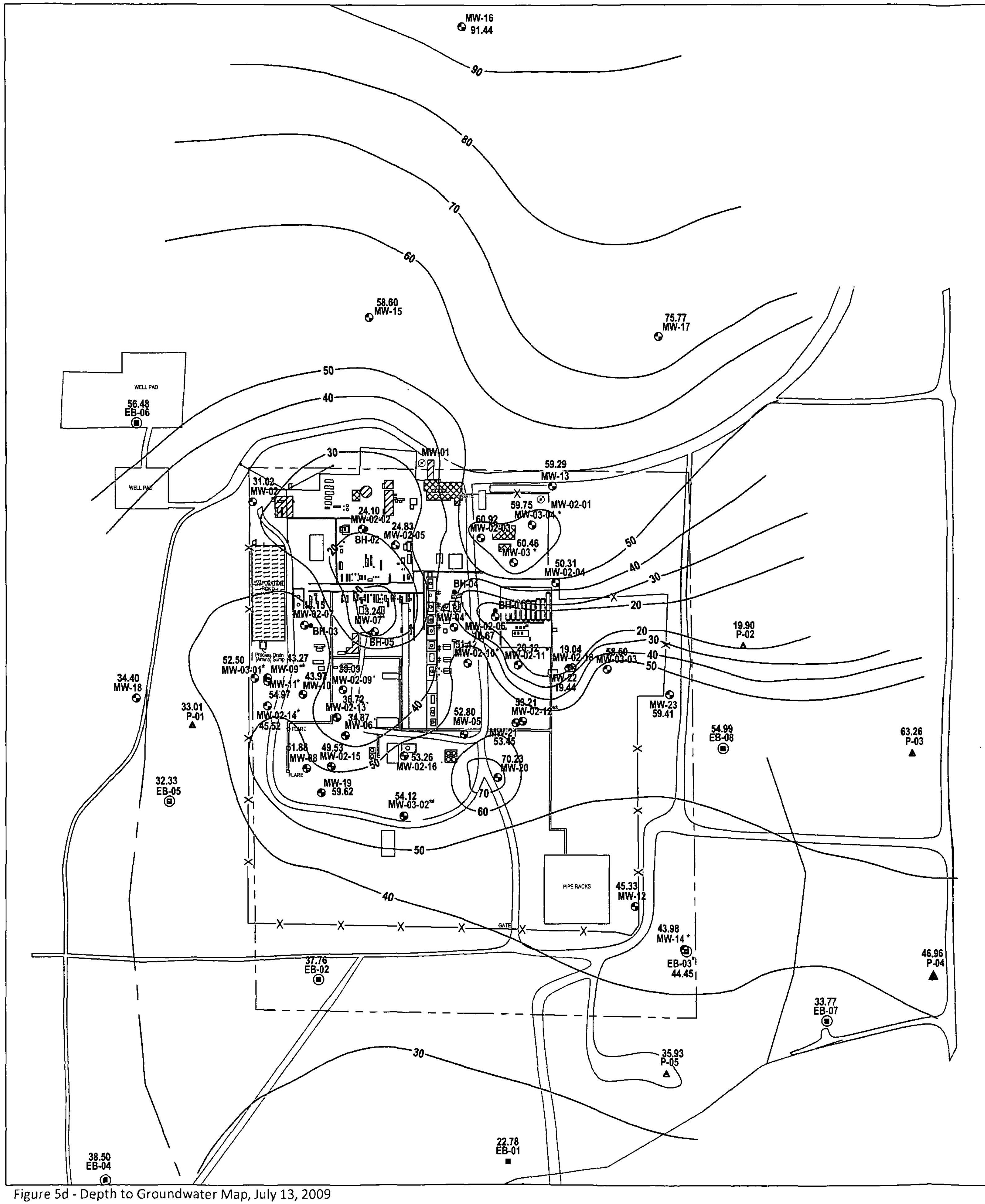


LEGEND

- Plugged And Abandoned Monitoring Well Location (MW-01)
- Monitoring Well Location and Depth to Groundwater, Feet BGS, July 13, 2009 (60.46 MW-03)
- Piezometer (Fluid Level) Location and Depth to Groundwater, Feet BGS, July 13, 2009 (33.01 P-01)
- Monitoring Well Location and Depth to Groundwater, Feet BGS, July 13, 2009 (44.45 EB-03)

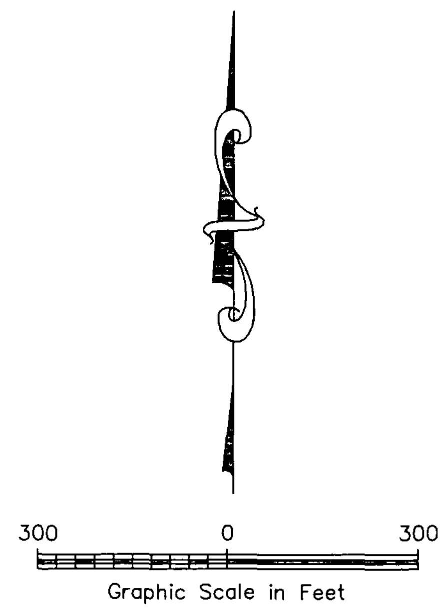
* - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity

** - Hydrocarbon Emulsion Present In Well

50 - Contour of Depth to Groundwater, Feet BGS, July 13, 2009

- Fence
- Draw
- Roads
- Property Line

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'



300 0 300

Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 5d - Depth to Groundwater Map, July 13, 2009

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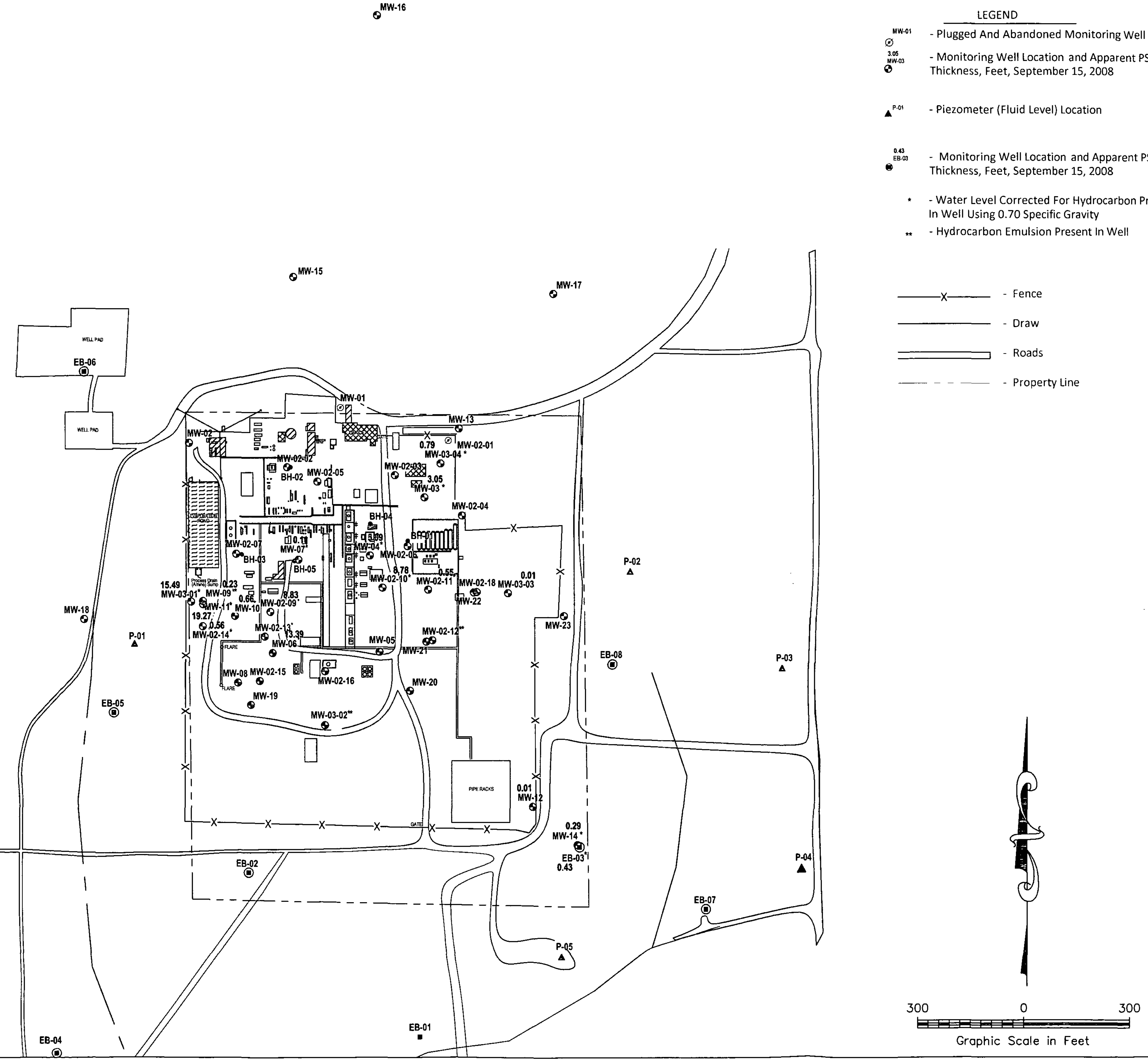


LEGEND

- MW-01 - Plugged And Abandoned Monitoring Well Location
- 3.05 MW-03 - Monitoring Well Location and Apparent PSH Thickness, Feet, September 15, 2008
- P-01 - Piezometer (Fluid Level) Location
- 0.43 EB-03 - Monitoring Well Location and Apparent PSH Thickness, Feet, September 15, 2008
- * - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** - Hydrocarbon Emulsion Present In Well
- Fence
- Draw
- Roads
- Property Line

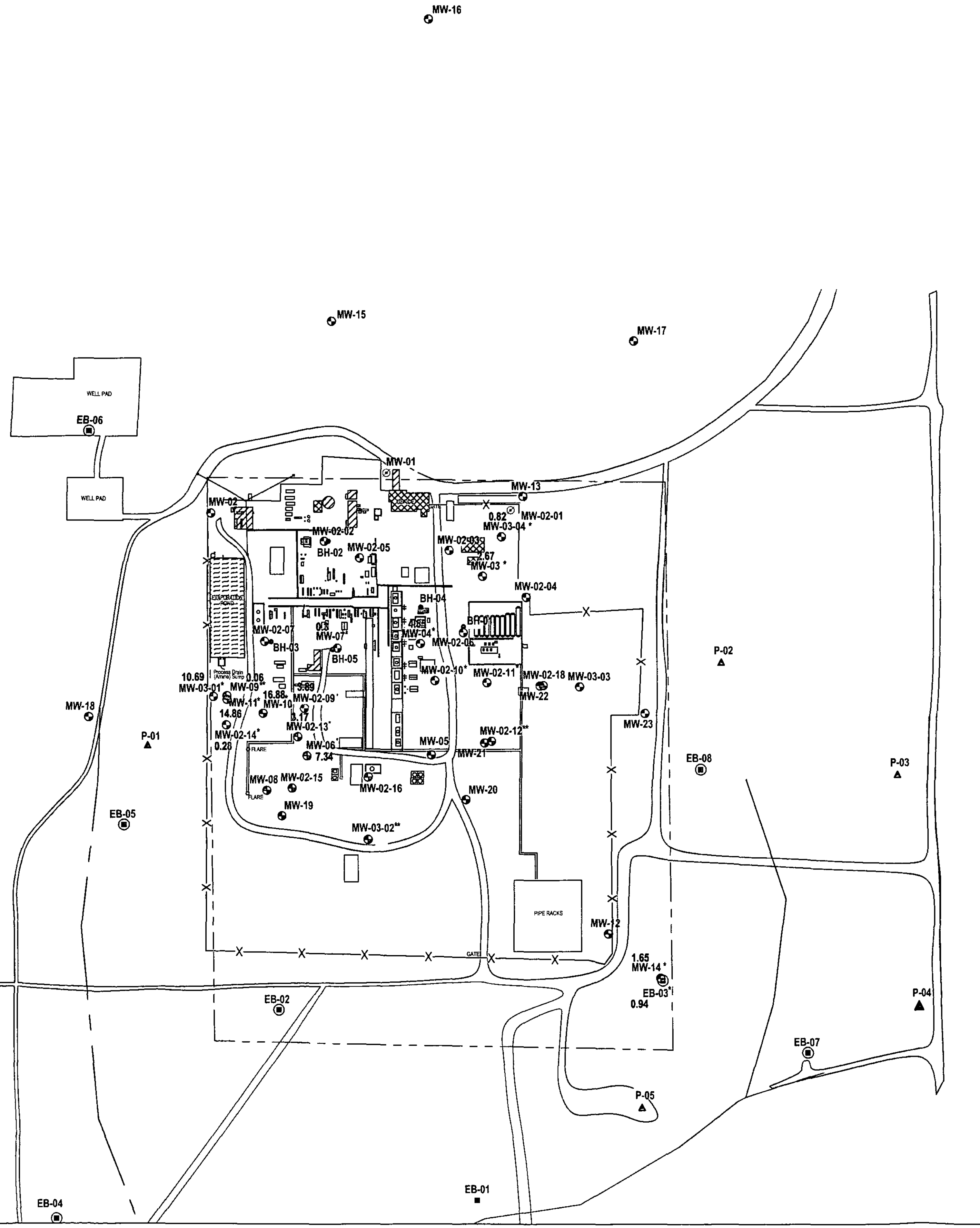
DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 6a - Apparent PSH Thickness Map September 15, 2008



LEGEND

- MW-01 - Plugged And Abandoned Monitoring Well Location
- 2.67 MW-03 - Monitoring Well Location and Apparent PSH Thickness, Feet, March 9, 2009
- P-01 - Piezometer (Fluid Level) Location
- 0.94 EB-03 - Monitoring Well Location and Apparent PSH Thickness, Feet, March 9, 2009
- * - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** - Hydrocarbon Emulsion Present In Well
- Fence
- Draw
- Roads
- Property Line

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

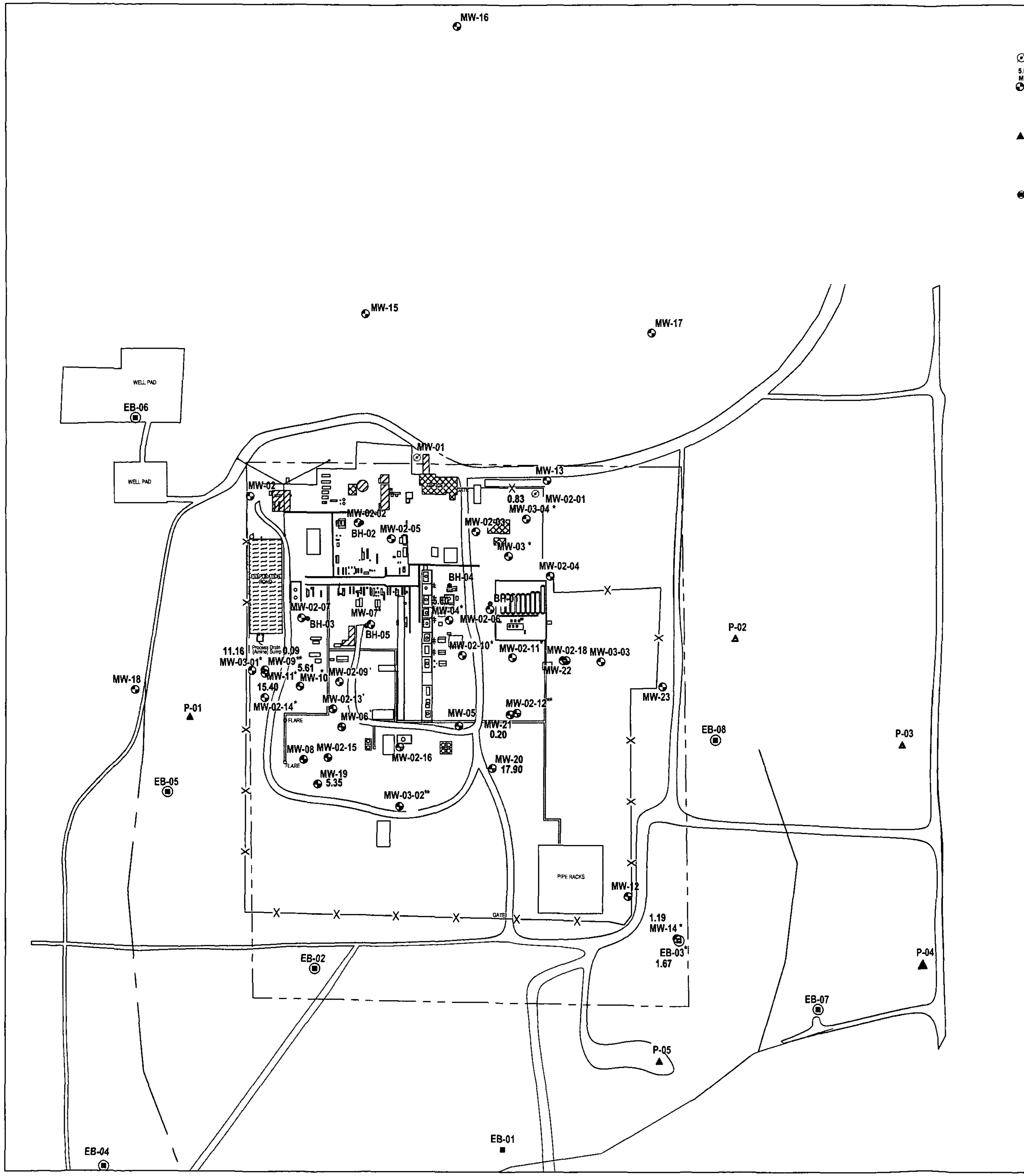
300 0 300
Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 6b - Apparent PSH Thickness Map, March 9, 2009



LEGEND

- Plugged And Abandoned Monitoring Well Location (MW-01)
- Monitoring Well Location and Apparent PSH Thickness, Feet, July 13, 2009 (5.80 MW-03)
- Piezometer (Fluid Level) Location (P-01)
- Monitoring Well Location and Apparent PSH Thickness, Feet, July 13, 2009 (1.67 EB-03)
- * - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** - Hydrocarbon Emulsion Present In Well
- Fence
- Draw
- Roads
- Property Line

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

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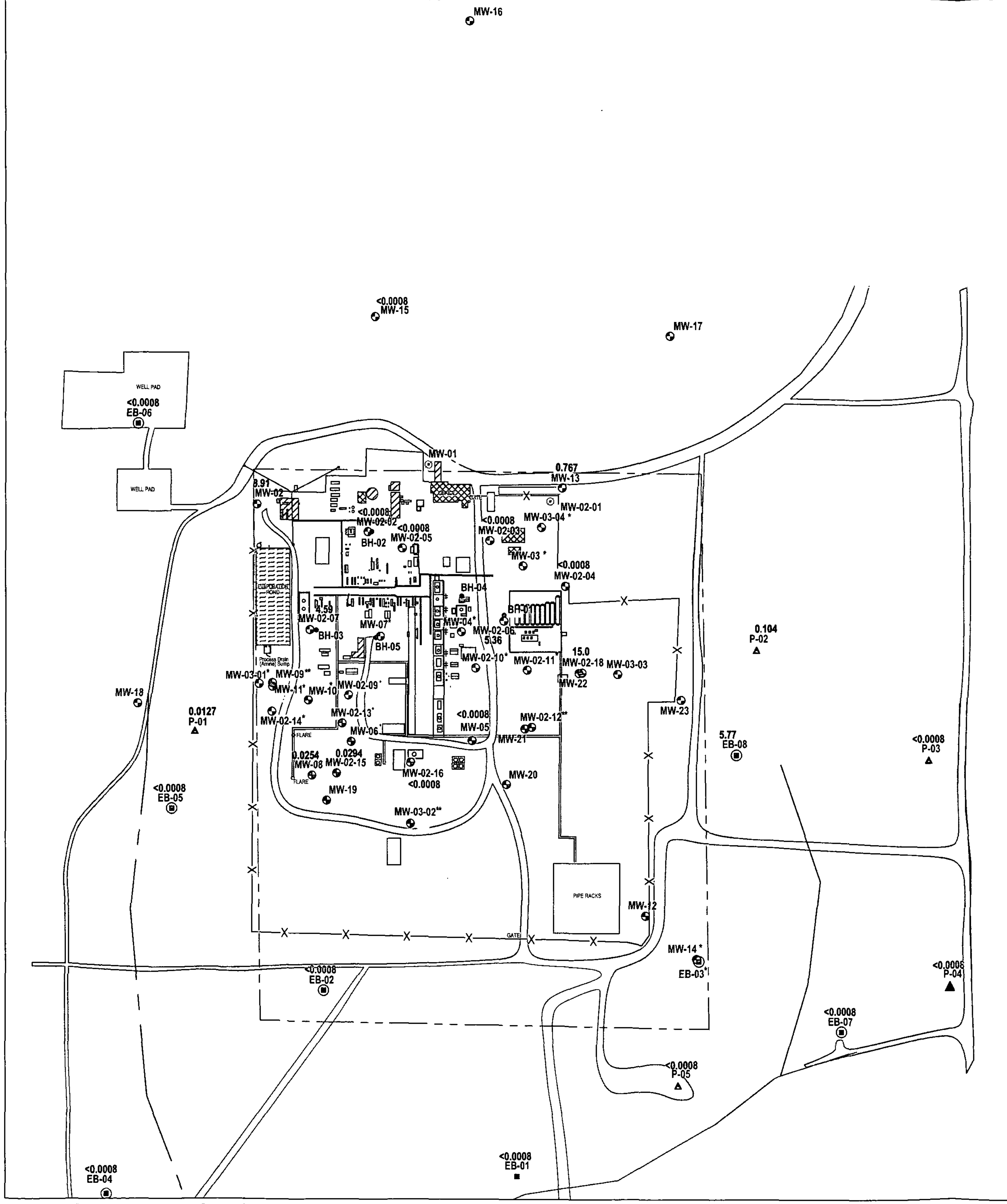
Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 6c - Apparent PSH Thickness Map, July 13, 2009



LEGEND

- MW-01 - Plugged And Abandoned Monitoring Well Location
- 8.91 MW-03 - Monitoring Well Location and Benzene Concentration in Groundwater, mg/L, September 2008
- P-01 - Piezometer (Fluid Level) Location
- <0.0008 EB-03 - Monitoring Well Location and Benzene Concentration in Groundwater, mg/L, September 2008
- * - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** - Hydrocarbon Emulsion Present In Well
- < - Below Method Detection Line

- Fence
- Draw
- Roads
- Property Line

WQCC Human Health Standard: 0.01 mg/L

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

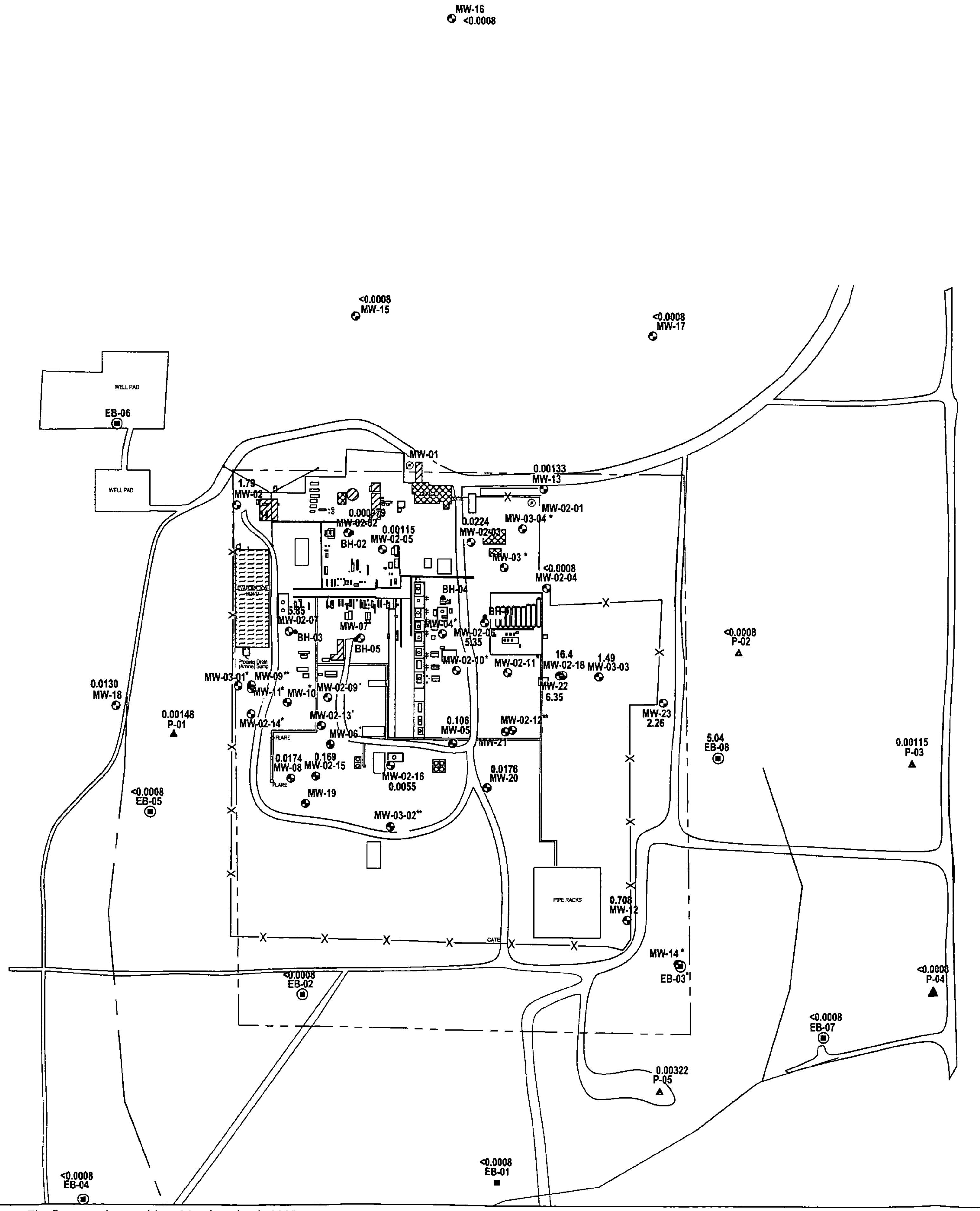
300 0 300
Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 7a - Benzene Isocon Map, September 2008



LEGEND

- Plugged And Abandoned Monitoring Well Location (MW-01)
- Monitoring Well Location and Benzene Concentration in Groundwater, mg/L, March 9, 2009 / July 15, 2009 (1.79 MW-03)
- Piezometer (Fluid Level) Location and Benzene Concentration in Groundwater, mg/L, March 9, 2009 / July 15, 2009 (0.00148 P-01)
- Monitoring Well Location and Benzene Concentration in Groundwater, mg/L, March 9, 2009 / July 15, 2009 (<0.0008 EB-03)

* - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity

** - Hydrocarbon Emulsion Present In Well

< - Less Than Method Detection Limit

—X— - Fence

- Draw
- Roads
- Property Line

WQCC Human Health Standard: 0.01 mg/L

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

300 0 300

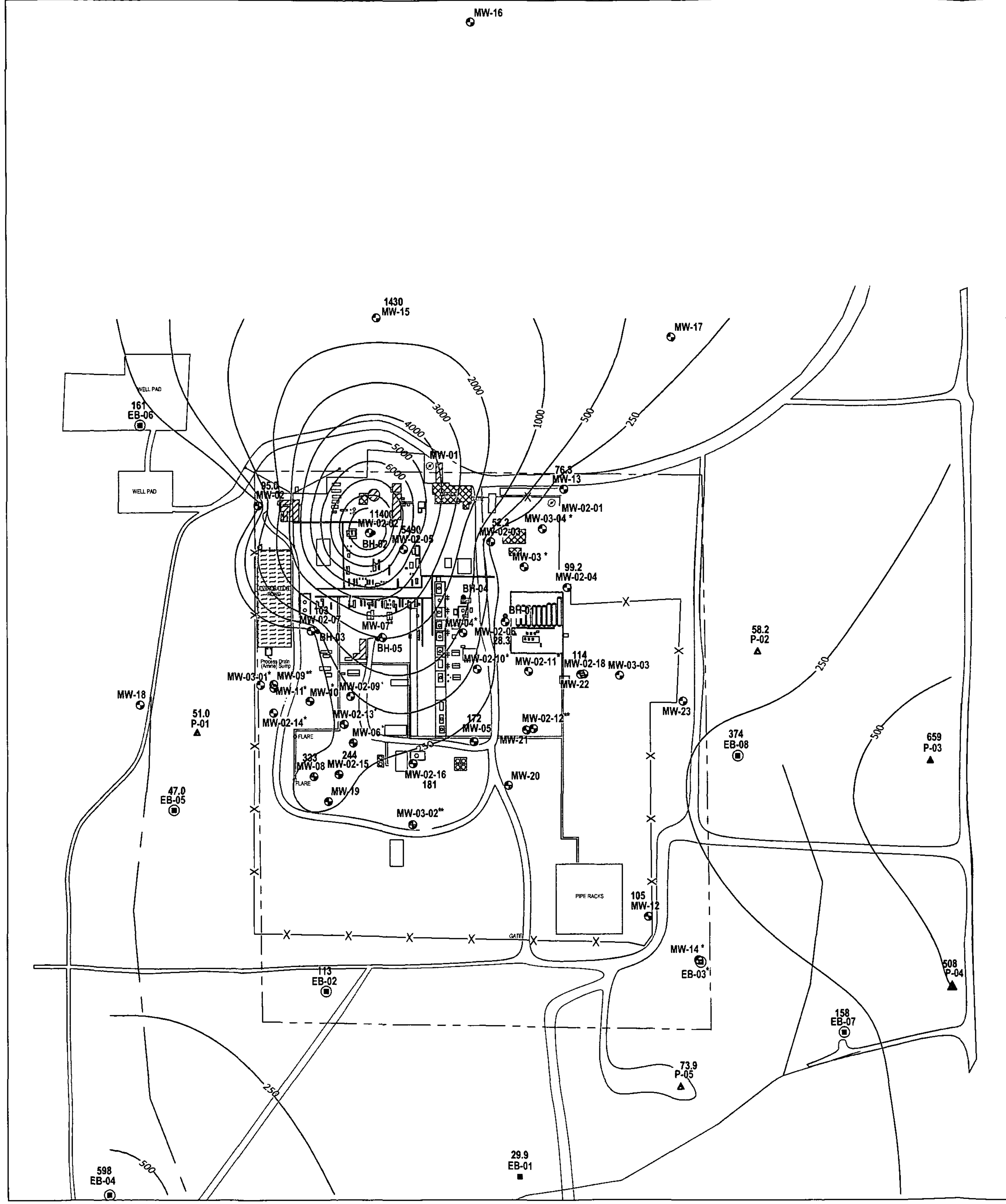
Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 7b - Benzene Isocon Map, March and July 2009



LEGEND

MW-01 - Plugged And Abandoned Monitoring Well Location

95.0 MW-03 - *Monitoring Well Location Chloride Concentration in* Groundwater, mg/L, September 16, 2008

51.0 P-01 - Piezometer (Fluid Level) Location and Chloride Concentration in Groundwater, mg/L, September 16, 2008

47.0 EB-03 - Monitoring Well Location Chloride Concentration in Groundwater, mg/L, September 16, 2008

* - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity

** - Hydrocarbon Emulsion Present In Well

250 - Contour of Chloride Concentration in Groundwater, mg/L, September 16, 2008

- Fence

- Draw

- Roads

- Property Line

WQCC Domestic Water Quality Standard: 250 mg/L

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

300 0 300
Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 8a - Chloride Isocon Map September 2008

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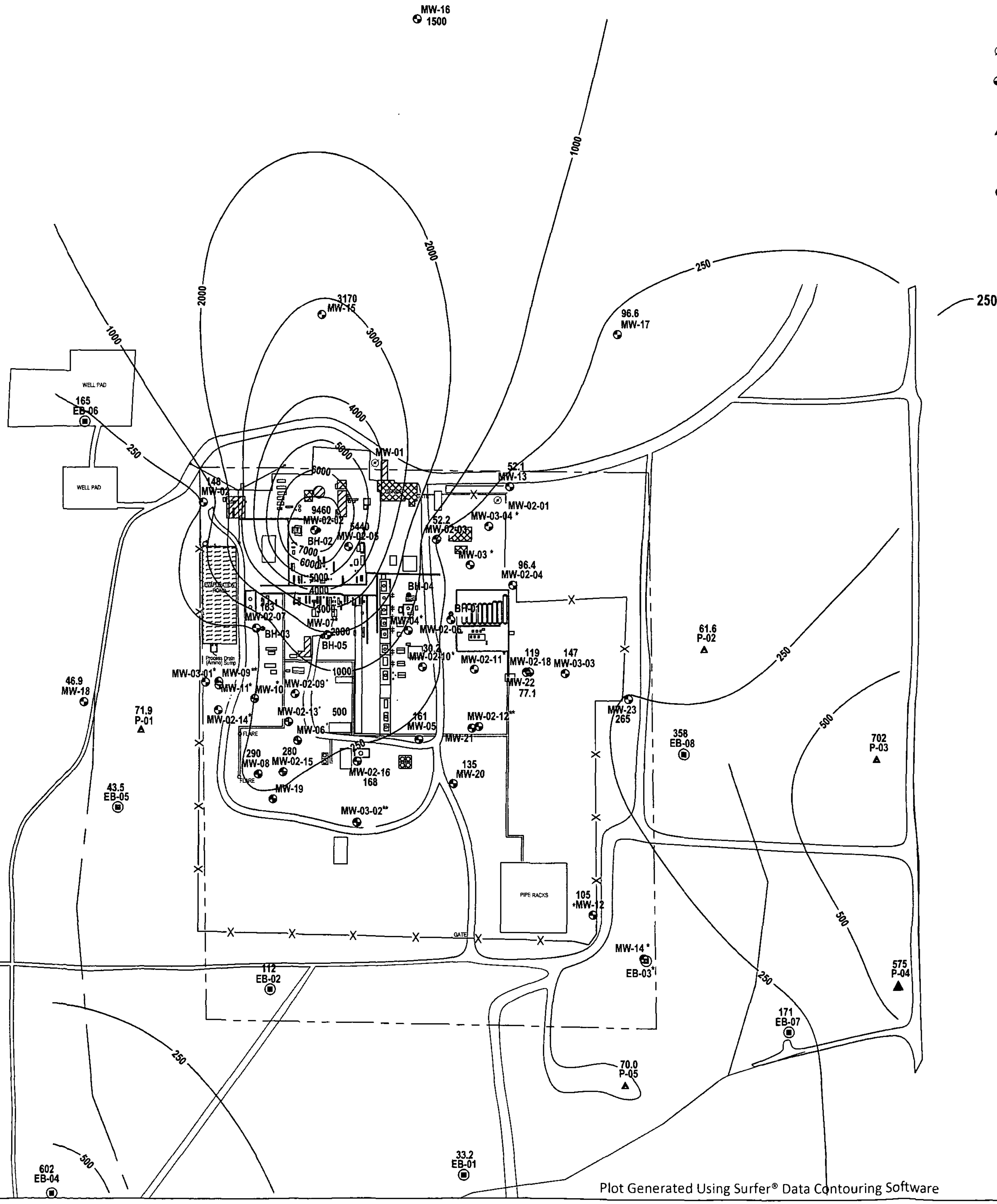

Figure 8b - Chloride Isocon Map March and July 2009

Plot Generated Using Surfer® Data Contouring Software

LEGEND

MW-01 - Plugged And Abandoned Monitoring Well Location

148 MW-02 - Monitoring Well Location and Chloride Concentration in Groundwater, mg/L, March and July 2009

71.9 P-01 - Piezometer (Fluid Level) Location and Chloride Concentration in Groundwater, mg/L, March and July 2009

602 EB-03 - Monitoring Well Location and Chloride Concentration in Groundwater, mg/L, March and July 2009

* - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity

** - Hydrocarbon Emulsion Present In Well

250 - Contour of Chloride Concentration in Groundwater, mg/L, March and July 2009

- Fence
- Draw
- Roads
- Property Line

WQCC Domestic Water Quality Standard: 250 mg/L

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

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Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

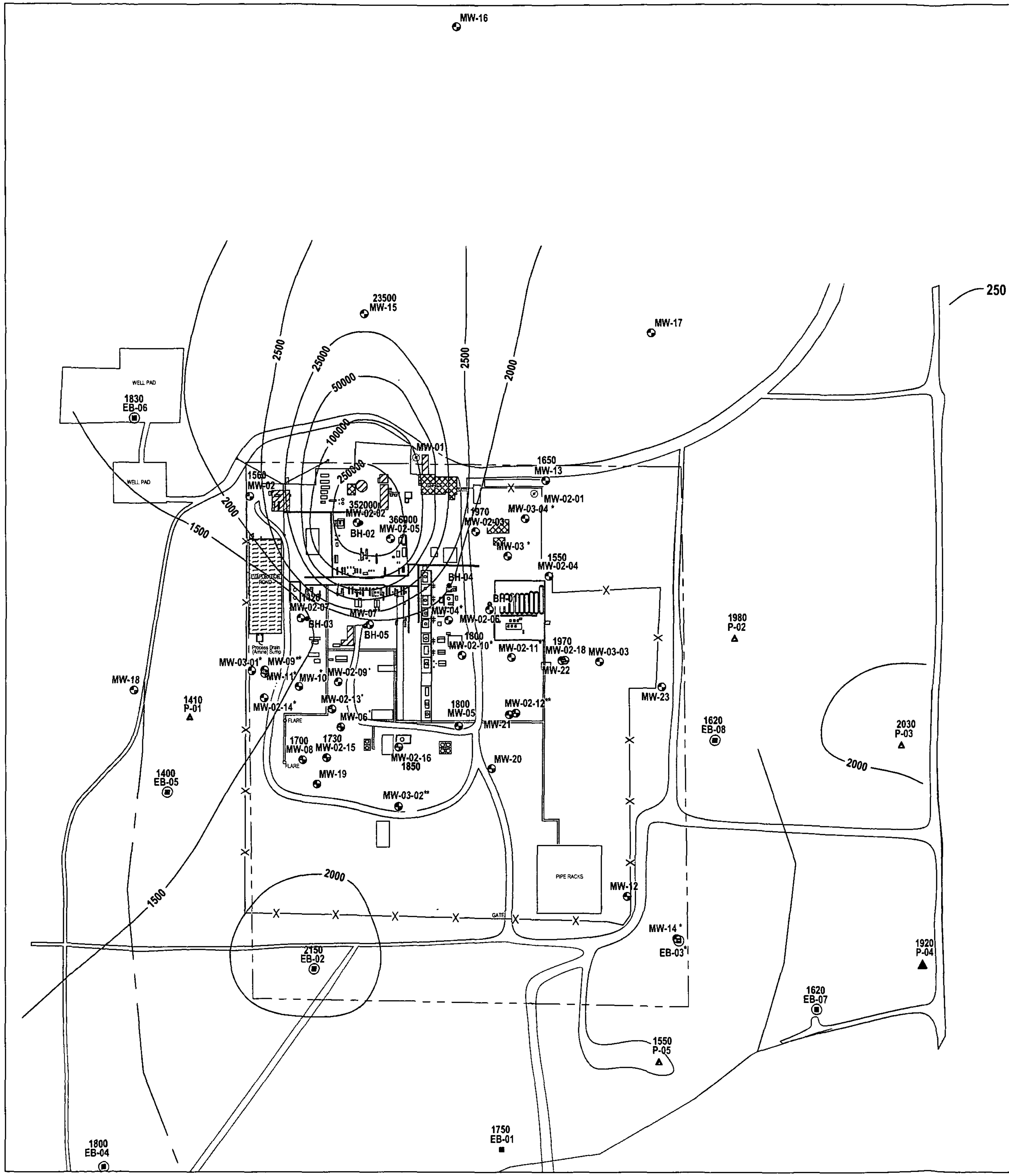

Figure 9a - Sulfate Isocon Map September 2008

LEGEND

- MW-01 - Plugged And Abandoned Monitoring Well Location
- 148 MW-03 - Monitoring Well Location and Sulfate Concentration in Groundwater, mg/L, September 15, 2008
- 71.9 P-01 - Piezometer (Fluid Level) Location and Sulfate Concentration in Groundwater, mg/L, September 15, 2008
- 602 EB-03 - Monitoring Well Location and Sulfate Concentration in Groundwater, mg/L, September 15, 2008
- * - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** - Hydrocarbon Emulsion Present In Well
- 250 - Contour of Sulfate Concentration in Groundwater Monitoring Well Location, mg/L, September 15, 2008
- ——X—— - Fence
- - Draw
- - Roads
- - Property Line

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

300 0 300

Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

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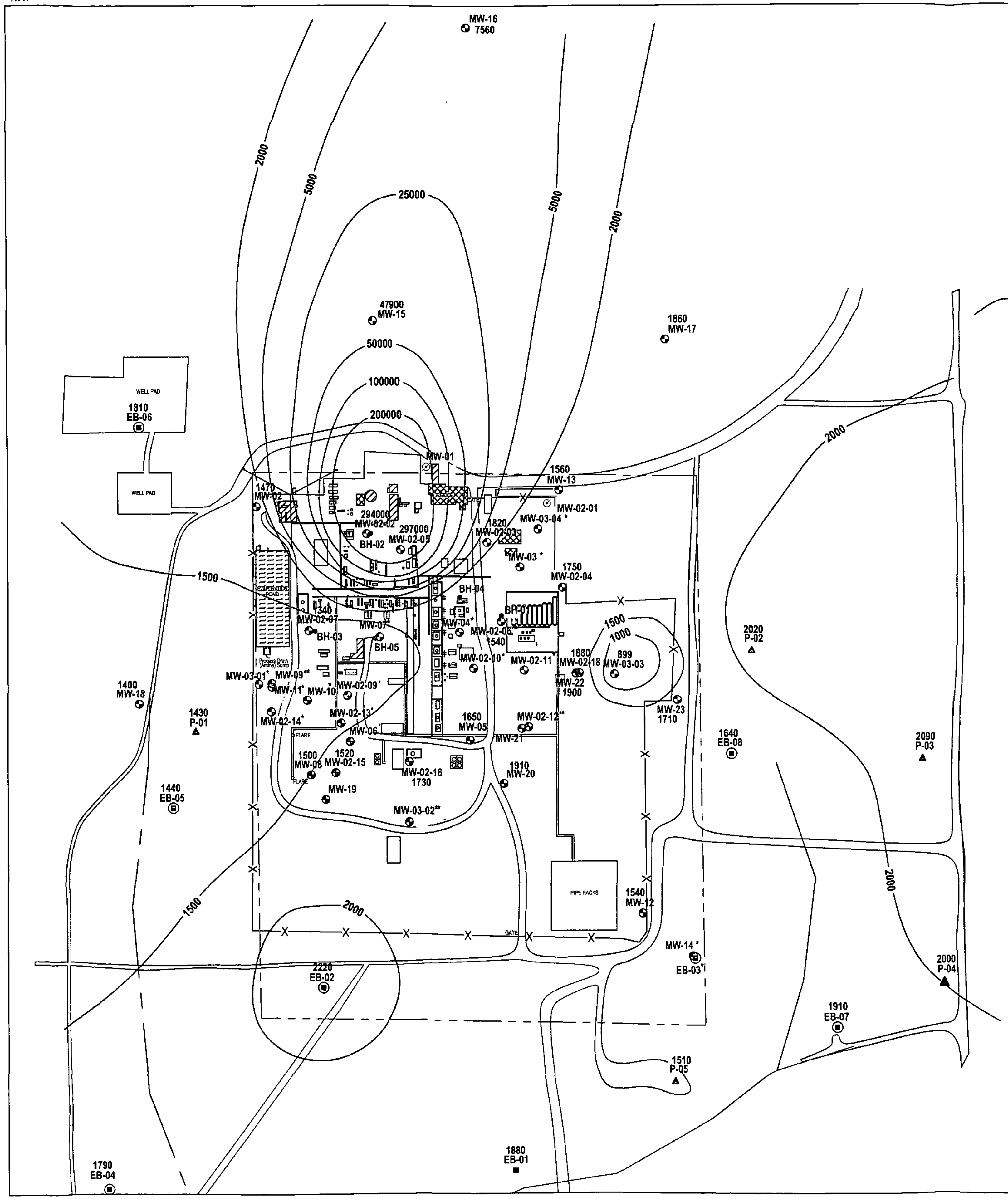

LEGEND

- Plugged And Abandoned Monitoring Well Location (MW-01)
- Monitoring Well Location and Sulfate Concentration in Groundwater, mg/L, March 9, 2009 and July 14, 2009 (148 MW-03, 71.9)
- Piezometer (Fluid Level) Location and Sulfate Concentration in Groundwater, mg/L, March 9, 2009 and July 15, 2009 (P-01, 602)
- Monitoring Well Location and Sulfate Concentration in Groundwater, mg/L, March 9, 2009 and July 14, 2009 (EB-03)
- * - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** - Hydrocarbon Emulsion Present In Well
- 250 - Contour of Sulfate Concentration in Groundwater Monitoring Well Location, mg/L, March 9, 2009 and July 14, 2009
- ——X—— - Fence
- - Draw
- - Roads
- — — - Property Line

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

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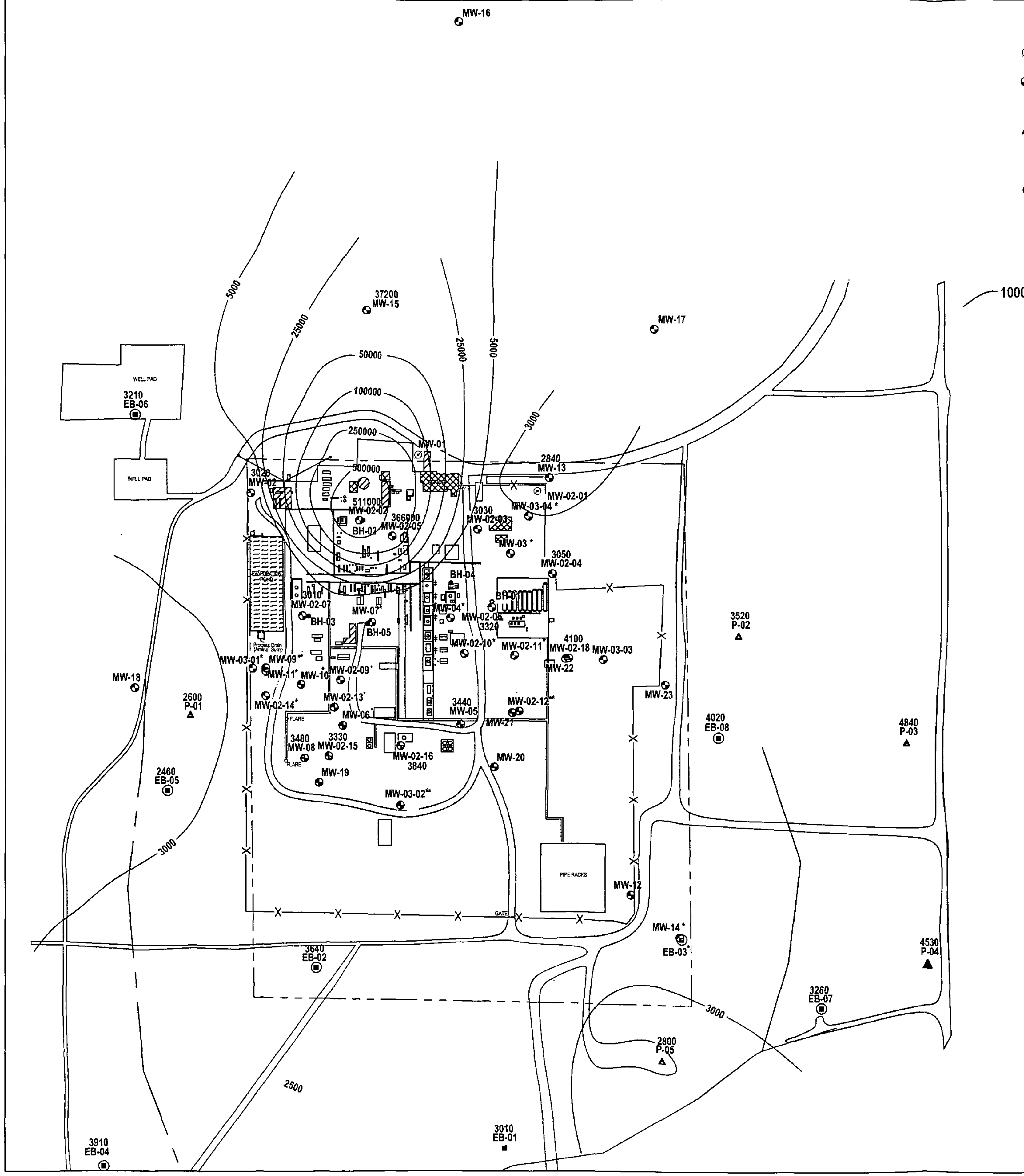
Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 9b - Sulfate Isocon Map, March and July 2009



LEGEND

MW-01 - Plugged And Abandoned Monitoring Well Location

3050 MW-03 - Monitoring Well Location and TDS Concentration in Groundwater, mg/L, September 16, 2008

2600 P-01 - Piezometer (Fluid Level) Location and TDS Concentration in Groundwater, mg/L, September 16, 2009

2460 EB-03 - Monitoring Well Location and TDS Concentration in Groundwater, mg/L, September 16, 2008

* - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity

** - Hydrocarbon Emulsion Present In Well

1000 - Contour of TDS Concentration in Groundwater Monitoring Well Location, mg/L, September 16, 2008

—X— - Fence

- Draw

- Roads

- Property Line

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

300 0 300

Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

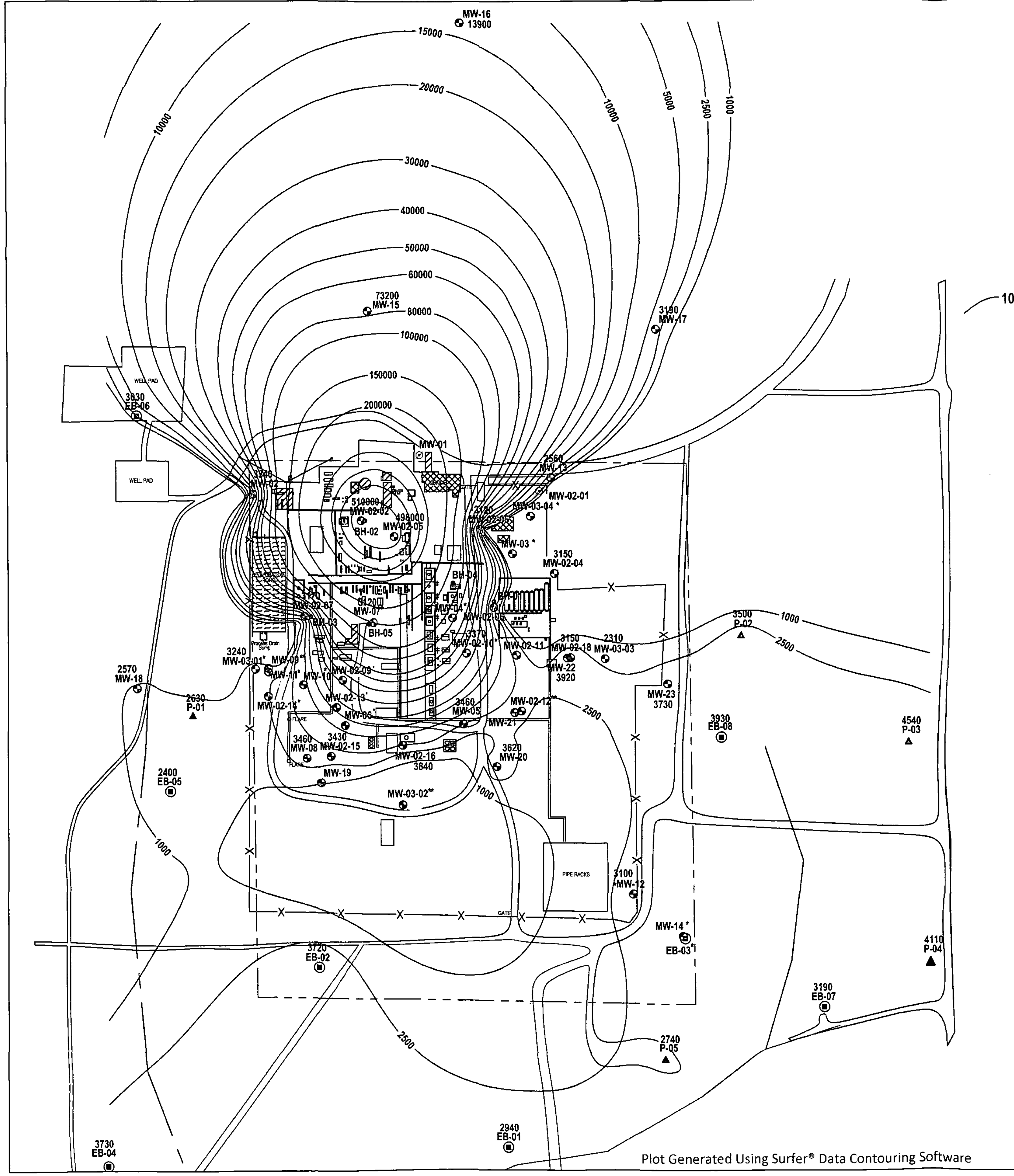
EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 10a - Total Dissolved Solids Isocon Map September 2008

Y:\PROJECTS\FRONTIER\6-0141\Empire Abo 2009.dwg, 9/3/2009 3:40:28 PM

JWW



LEGEND

- Plugged And Abandoned Monitoring Well Location (MW-01)
- Monitoring Well Location and TDS Concentration in Groundwater, mg/L, March 9, 2009 / July 14, 2009 (148 MW-02 71.9)
- Piezometer (Fluid Level) Location and TDS Concentration in Groundwater, mg/L, March 9, 2009 / July 14, 2009 (P-01 602)
- Monitoring Well Location and TDS Concentration in Groundwater, mg/L, March 9, 2009 / July 14, 2009 (EB-03)
- * - Water Level Corrected For Hydrocarbon Product In Well Using 0.70 Specific Gravity
- ** - Hydrocarbon Emulsion Present In Well
- 1000 - Contour of TDS Concentration in Groundwater Monitoring Well Location, mg/L, March 9, 2009 / July 14, 2009
- Fence
- Draw
- Roads
- Property Line

DESCRIPTION	NORTHING (Y)	EASTING (X)	LATITUDE	LONGITUDE	ELEVATION TOP OF CASING	ELEVATION CONCRETE PAD	ELEVATION NATURAL GROUND
MW-02	646,317.1	522,066.1	32°46'36.47" N	104°15'41.54" W	3548.19'	3545.52'	3545.3'
MW-02-02	646,237.4	522,394.6	32°46'35.68" N	104°15'37.69" W	3552.26'	3549.56'	3549.3'
MW-02-03	646,211.5	522,753.7	32°46'35.42" N	104°15'33.49" W	3556.03'	3553.33'	3553.0'
MW-02-04	646,079.3	522,976.0	32°46'34.11" N	104°15'30.89" W	3553.79'	3551.26'	3550.9'
MW-02-05	646,190.4	522,497.2	32°46'35.21" N	104°15'36.49" W	3552.69'	3550.14'	3549.9'
MW-02-06	645,978.8	522,794.7	32°46'33.12" N	104°15'33.01" W	3550.82'	3548.53'	3548.3'
MW-02-07	645,954.0	522,221.8	32°46'32.87" N	104°15'39.72" W	3547.00'	3544.29'	3544.2'
MW-02-09	645,764.0	522,336.9	32°46'30.99" N	104°15'38.37" W	3546.52'	3543.72'	3543.5'
MW-02-10	645,842.8	522,711.8	32°46'31.77" N	104°15'33.98" W	3548.40'	3545.80'	3545.4'
MW-02-11	645,837.0	522,862.1	32°46'31.71" N	104°15'32.22" W	3546.79'	3544.12'	3544.0'
MW-02-12	645,670.8	522,876.3	32°46'30.07" N	104°15'32.06" W	3543.32'	3540.56'	3540.3'
MW-02-13	645,682.6	522,318.6	32°46'30.19" N	104°15'38.59" W	3545.59'	3542.99'	3542.7'
MW-02-14	645,716.2	522,110.4	32°46'30.52" N	104°15'41.03" W	3544.53'	3541.63'	3541.3'
MW-02-15	645,538.6	522,302.8	32°46'28.76" N	104°15'38.78" W	3543.29'	3540.59'	3540.2'
MW-02-16	645,567.8	522,524.6	32°46'29.05" N	104°15'36.18" W	3544.24'	3541.36'	3541.0'
MW-02-18	645,828.9	523,023.2	32°46'31.63" N	104°15'30.33" W	3545.70'	3542.85'	3542.7'
MW-03	646,138.4	522,851.3	32°46'34.70" N	104°15'32.35" W	3555.30'	3552.66'	3552.4'
MW-03-01	645,797.3	522,071.7	32°46'31.32" N	104°15'41.48" W	3542.56'	3540.89'	3539.9'
MW-03-02	645,392.6	522,521.5	32°46'27.32" N	104°15'36.21" W	3541.08'	3538.68'	3538.6'
MW-03-03	645,825.2	523,127.9	32°46'31.59" N	104°15'29.11" W	3544.72'	3542.38'	3542.3'
MW-03-04	646,249.7	522,905.0	32°46'35.80" N	104°15'31.72" W	3558.45'	3556.02'	3555.7'
MW-04	645,948.1	522,670.7	32°46'32.81" N	104°15'34.46" W	3550.99'	3548.13'	3547.8'
MW-05	645,633.0	522,701.7	32°46'29.69" N	104°15'34.10" W	3543.77'	3540.79'	3540.6'
MW-06	645,629.2	522,344.7	32°46'29.66" N	104°15'38.28" W	3544.50'	3541.93'	3541.8'
MW-07	645,934.3	522,433.1	32°46'32.68" N	104°15'37.25" W	3546.49'	3546.26'	3546.0'
MW-08	645,532.1	522,229.0	32°46'28.70" N	104°15'39.64" W	3543.73'	3540.99'	3540.5'
MW-09	645,799.3	522,110.7	32°46'31.34" N	104°15'41.02" W	3542.82'	3540.21'	3540.4'
MW-10	645,750.3	522,217.3	32°46'30.86" N	104°15'39.78" W	3544.44'	3541.93'	3541.8'
MW-11	645,789.1	522,110.0	32°46'31.24" N	104°15'41.03" W	3542.73'	3540.40'	3540.2'
MW-12	645,127.5	523,211.3	32°46'24.69" N	104°15'28.14" W	3525.25'	3522.92'	3522.6'
MW-13	646,364.9	522,965.9	32°46'36.94" N	104°15'31.00" W	3561.40'	3558.71'	3558.5'
MW-14	645,005.2	523,358.2	32°46'23.48" N	104°15'26.42" W	3520.32'	3517.94'	3517.7'
MW-15	646,860.1	522,416.5	32°46'41.84" N	104°15'37.43" W	3562.45'	3559.91'	3559.7'
MW-16	647,718.3	522,695.8	32°46'50.33" N	104°15'34.15" W	3585.46'	3582.87'	3582.6'
MW-17	646,804.7	523,280.9	32°46'41.29" N	104°15'27.31" W	3570.84'	3568.18'	3568.0'
MW-18	645,739.4	521,718.8	32°46'30.75" N	104°15'45.61" W	3523.63'	3529.98'	3529.7'
MW-19	645,460.3	522,272.4	32°46'27.99" N	104°15'39.13" W	3543.34'		3540.6'
MW-20	645,506.5	522,802.6	32°46'28.44" N	104°15'32.92" W	2541.47'	3538.89'	3538.7'
MW-21	645,668.8	522,866.0	32°46'30.05" N	104°15'32.18" W	3543.15'	3540.52'	3540.2'
MW-22	645,828.3	523,014.0	32°46'31.63" N	104°15'30.44" W	3545.87'	3543.16'	3542.9'
MW-23	645,750.5	523,314.0	32°46'30.85" N	104°15'26.93" W	3542.21'	3539.36'	3539.2'
P-01	645,660.5	521,884.9	32°46'29.97" N	104°15'43.67" W	3530.21'	3528.08'	3527.9'
P-02	645,895.5	523,533.0	32°46'32.29" N	104°15'24.36" W	3544.73'	3542.47'	3542.3'
P-03	645,577.5	524,036.9	32°46'29.14" N	104°15'18.46" W	3536.83'	3534.67'	3534.4'
P-04	644,922.9	524,101.6	32°46'22.66" N	104°15'17.71" W	3515.77'	3513.78'	3513.5'
P-05	644,637.8	523,307.2	32°46'19.84" N	104°15'27.02" W	3507.48'	3505.25'	3504.9'
EB-01	644,375.6	522,834.9	32°46'17.25" N	104°15'32.55" W	3492.15'	3491.53'	3491.5'
EB-02	644,910.9	522,265.5	32°46'22.55" N	104°15'39.22" W	3525.34'	3522.65'	3522.6'
EB-03	644,995.4	523,366.4	32°46'23.38" N	104°15'26.32" W	3521.05'	3517.83'	3517.8'
EB-04	644,322.3	521,630.7	32°46'16.73" N	104°15'46.66" W	3508.38'	3505.64'	3505.3'
EB-05	645,435.1	521,818.6	32°46'27.74" N	104°15'44.45" W	3526.61'	3523.81'	3523.7'
EB-06	646,550.9	521,720.8	32°46'38.78" N	104°15'45.58" W	3556.63'	3555.92'	3555.6'
EB-07	644,792.5	523,783.0	32°46'21.37" N	104°15'21.44" W	3503.97'	3501.60'	3501.3'
EB-08	645,591.3	523,474.8	32°46'29.28" N	104°15'25.05" W	3537.07'	3533.88'	3533.8'
BH-1	645,997.0	522,795.1	32°46'33.30" N	104°15'33.01" W			3548.8'
BH-2	646,238.3	522,402.5	32°46'35.69" N	104°15'37.60" W			3549.4'
BH-3	645,953.4	522,231.2	32°46'32.87" N	104°15'39.61" W			3544.3'
BH-4	646,051.7	522,672.3	32°46'33.84" N	104°15'34.44" W			3549.9'
BH-5	645,932.6	522,426.0	32°46'32.66" N	104°15'37.33" W			3546.0'
A-1	645,054.0	522,868.6	32°46'23.96" N	104°15'32.15" W			3523.9'
E-1	646,923.6	522,960.6	32°46'42.46" N	104°15'31.06" W			3570.1'
NWc Plant	646,418.1	522,055.3	32°46'37.47" N	104°15'41.67" W			3547.6'
NEc Plant	646,404.9	523,372.0	32°46'37.33" N	104°15'26.25" W			3557.7'
SEc Plant	644,798.8	523,396.3	32°46'21.44" N	104°15'25.97" W			3507.9'
SWc Plant	644,822.3	522,077.2	32°46'21.68" N	104°15'41.42" W			3517.5'

300 0 300

Graphic Scale in Feet

Plot Generated Using Surfer® Data Contouring Software

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

Larson & Associates, Inc.
Environmental Consultants

Figure 10b - Total Dissolved Solids Isocon Map March / July 2009

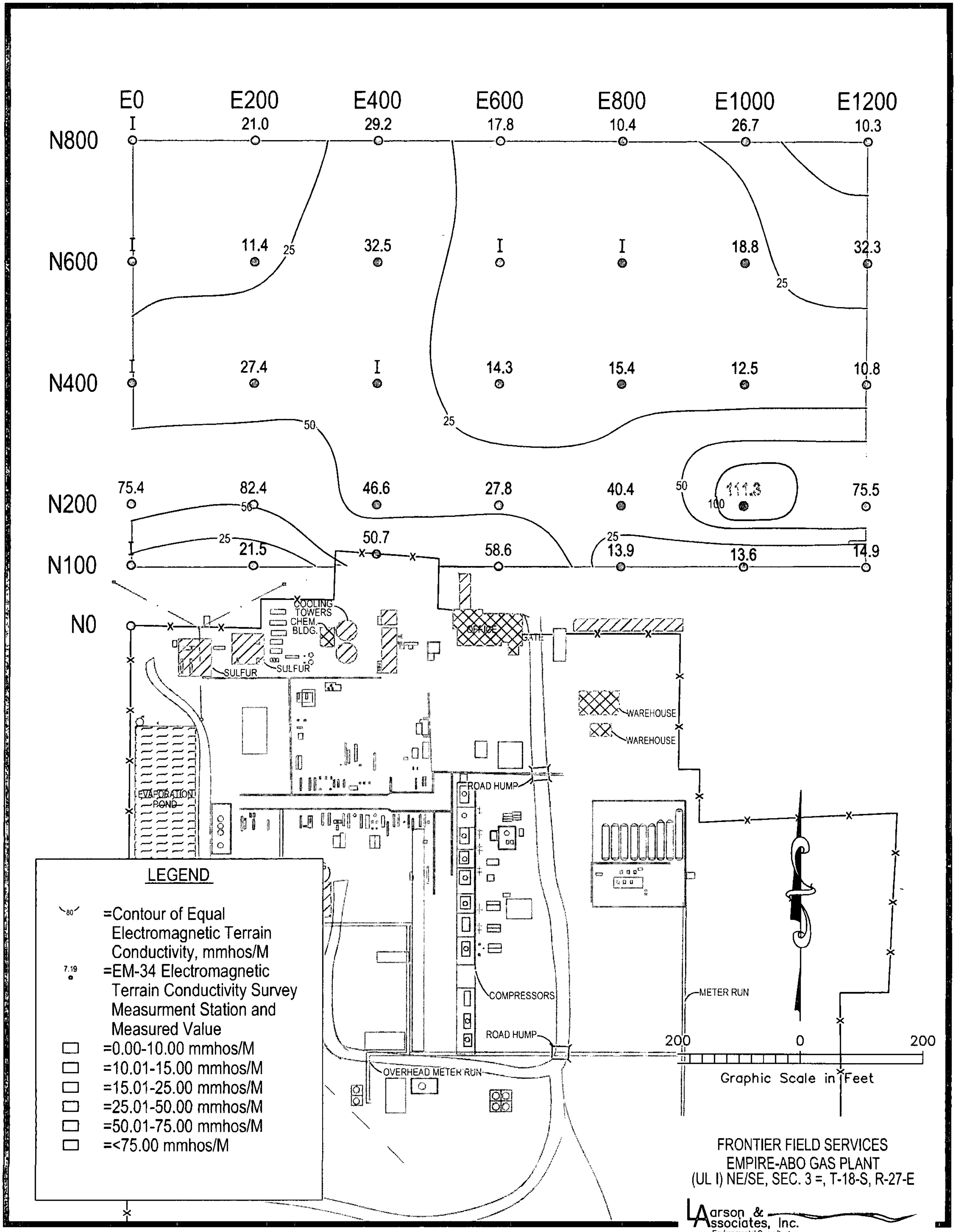


FIGURE 11-EM-34, 10-METER VD SURVEY (0 TO 98.4 FEET)

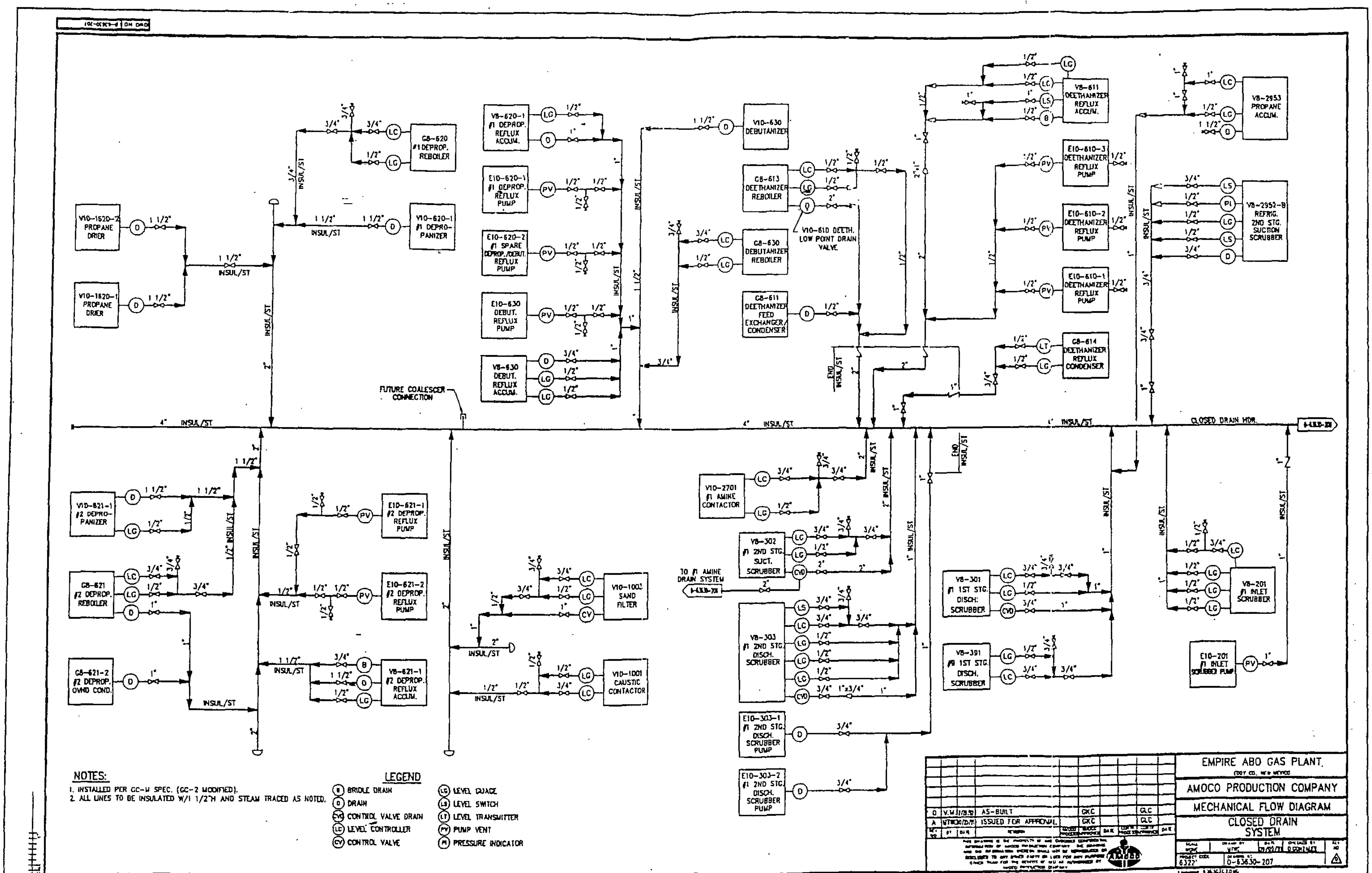
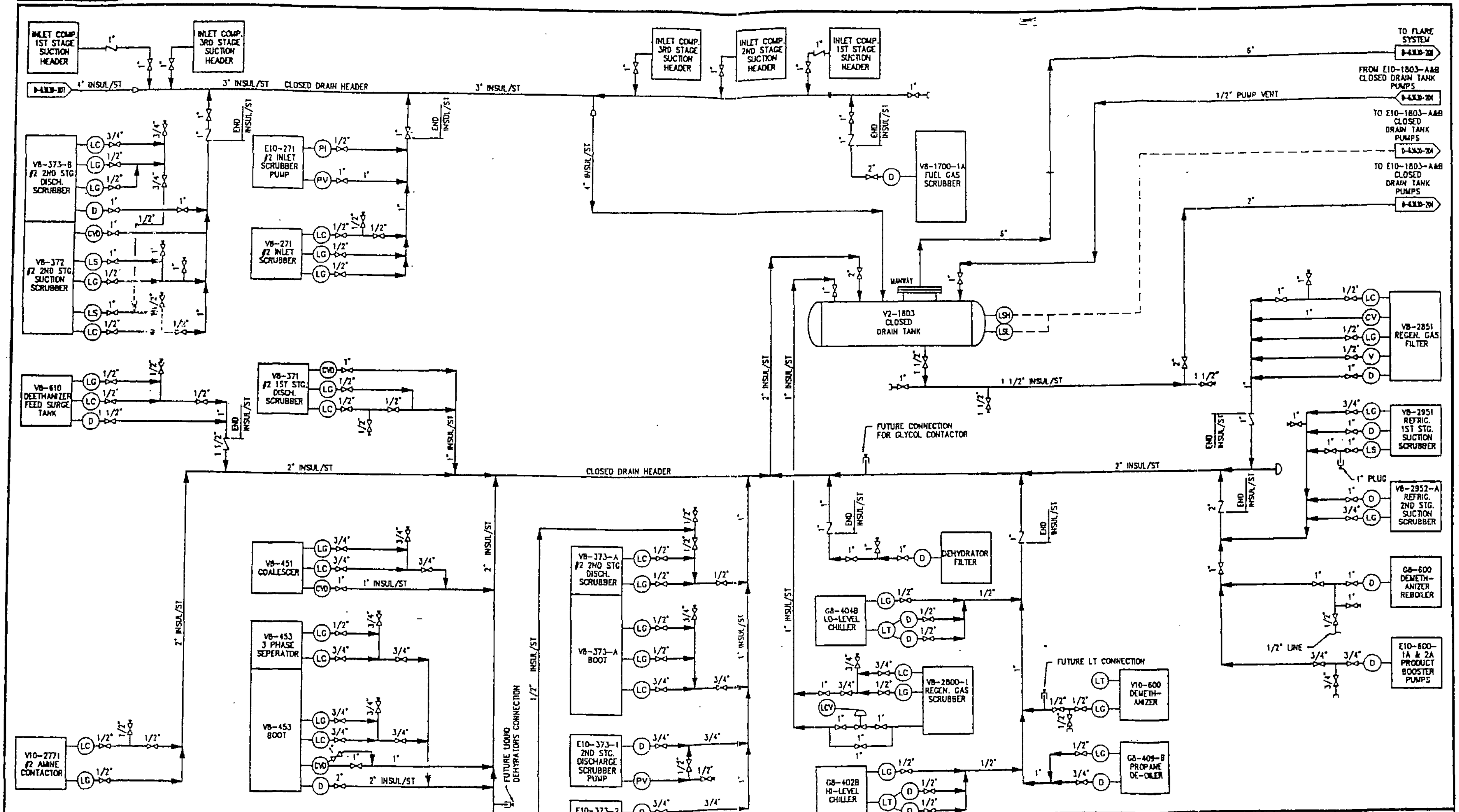

EMPIRE ABO GAS PLANT.
AMOCO PRODUCTION COMPANY
MECHANICAL FLOW DIAGRAM
CLOSED DRAIN SYSTEM
0 V.M. AS-BUILT GKC GLC
A ISSUED FOR APPROVAL GKC GLC
6322' D-63630-207
NOTES:
1. INSTALLED PER GC-M SPEC. (GC-2 MODIFIED).
2. ALL LINES TO BE INSULATED W/1 1/2"H AND STEAM TRACED AS NOTED.
LEGEND
(B) BRIDLE DRAIN
(D) DRAIN
(CVD) CONTROL VALVE DRAIN
(LC) LEVEL CONTROLLER
(CV) CONTROL VALVE
(LG) LEVEL GUAGE
(LS) LEVEL SWITCH
(LT) LEVEL TRANSMITTER
(PV) PUMP VENT
(PI) PRESSURE INDICATOR
CLOSED DRAIN HDR.
4" INSUL/ST
FUTURE COALESCER CONNECTION
V10-1620-2 PROPANE DRIER
V10-1620-1 PROPANE DRIER
C8-620 #1 DEPROP. REBOILER
V10-620-1 #1 DEPRO-PANIZER
V8-620-1 #1 DEPROP. REFLUX ACCUM.
E10-620-1 #1 DEPROP. REFLUX PUMP
E10-620-2 #1 SPARE DEPROP./DEBUT. REFLUX PUMP
E10-630 DEBUT. REFLUX PUMP
V8-630 DEBUT. REFLUX ACCUM.
V10-630 DEBUTANIZER
C8-613 DEETHANIZER REBOILER
C8-630 DEBUTANIZER REBOILER
C8-611 DEETHANIZER FEED EXCHANGER/CONDENSER
V10-610 DEETH. LOW POINT DRAIN VALVE
V8-611 DEETHANIZER REFLUX ACCUM.
E10-610-3 DEETHANIZER REFLUX PUMP
E10-610-2 DEETHANIZER REFLUX PUMP
E10-610-1 DEETHANIZER REFLUX PUMP
C8-614 DEETHANIZER REFLUX CONDENSER
V8-2953 PROPANE ACCUM.
V8-2952-B REFRIG. 2ND STG. SUCTION SCRUBBER
V10-821-1 #2 DEPRO-PANIZER
C8-821 #2 DEPROP. REBOILER
C8-621-2 #2 DEPROP. OVHD COND.
E10-621-1 #2 DEPROP. REFLUX PUMP
E10-621-2 #2 DEPROP. REFLUX PUMP
V8-621-1 #2 DEPROP. REFLUX ACCUM.
V10-1002 SAND FILTER
V10-1001 CAUSTIC CONTACTOR
V10-2701 #1 AMINE CONTACTOR
TO #1 AMINE DRAIN SYSTEM
V8-302 #1 2ND STG. SUCT. SCRUBBER
V8-303 #1 2ND STG. DISCH. SCRUBBER
E10-303-1 #1 2ND STG. DISCH. SCRUBBER PUMP
E10-303-2 #1 2ND STG. DISCH. SCRUBBER PUMP
V8-301 #1 1ST STG. DISCH. SCRUBBER
V8-391 #1 1ST STG. DISCH. SCRUBBER
V8-201 #1 INLET SCRUBBER
E10-201 #1 INLET SCRUBBER PUMP
END INSUL/ST

Fig. 94-3



NOTES:

1. INSTALLED PER GC-M SPEC. (GC-2 MODIFIED).
2. ALL LINES TO BE INSULATED W/1 1/2"H AND STEAM TRACED AS NOTED.

LEGEND

- (D) DRAIN
- (V) VENT
- (CVD) CONTROL VALVE DRAIN
- (LC) LEVEL CONTROLLER
- (CV) CONTROL VALVE
- (LCV) LEVEL CONTROL VALVE
- (LSL) LEVEL SWITCH LOW
- (LG) LEVEL GAUGE
- (LS) LEVEL SWITCH
- (LT) LEVEL TRANSMITTER
- (PV) PUMP VENT
- (PI) PRESSURE INDICATOR
- (LSH) LEVEL SWITCH HIGH
- HOSE CONNECTION

0	VW		AS-BUILT	GKC	GLC
A			ISSUED FOR APPROVAL	GKC	GLC

EMPIRE ABO GAS PLANT

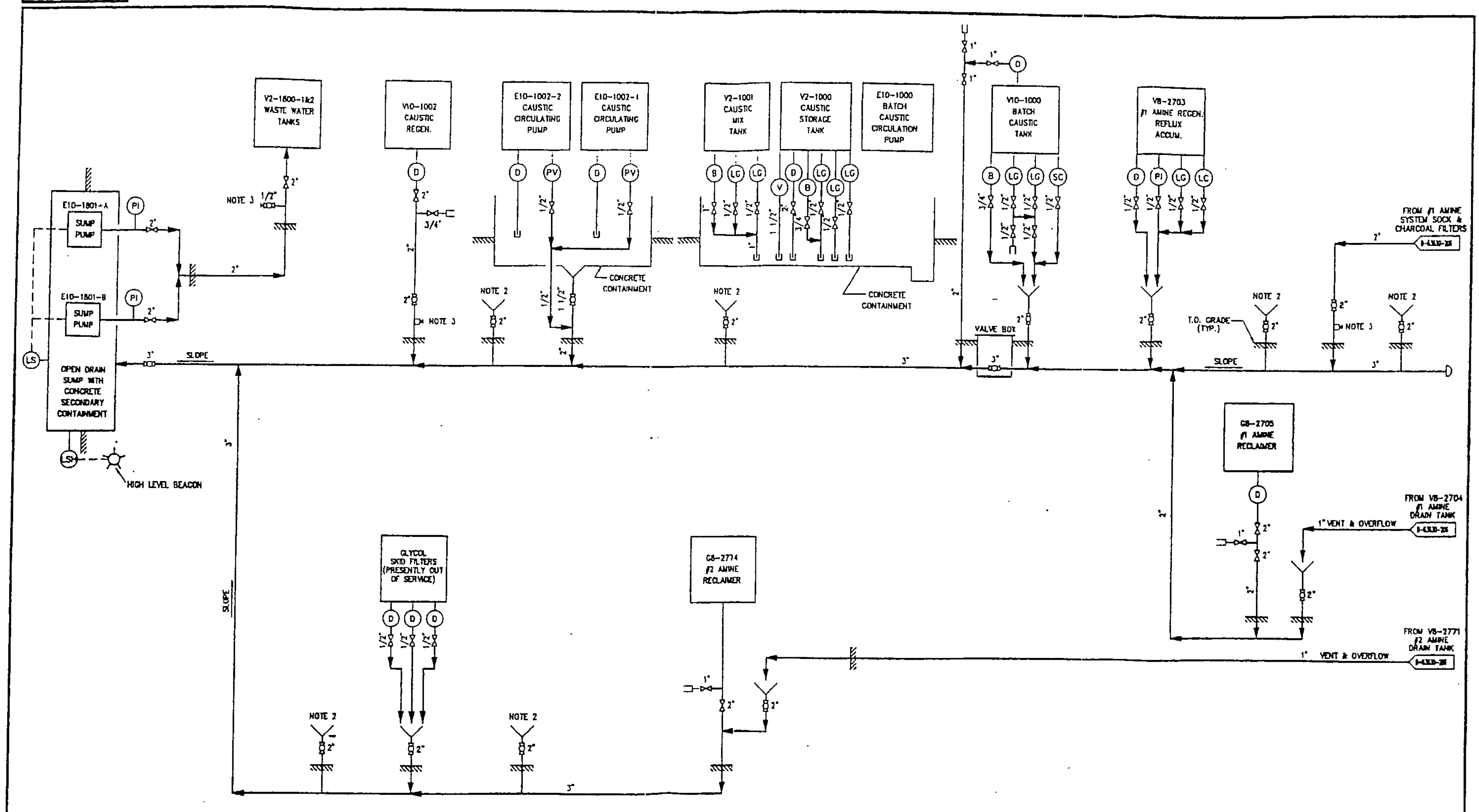
EDDY CO. NEW MEXICO

AMOCO PRODUCTION COMPANY

MECHANICAL FLOW DIAGRAM

CLOSED DRAIN SYSTEM

D-63530-208



NOTES

1. MAIN SYSTEM BLOCK VALVES ARE BALL VALVES (REGULAR PORT IN VERTICAL, FULL PORT IN HORIZONTAL).
2. AUXILIARY DRAIN POINTS CONNECTION.
3. TEST CONNECTION.
4. INSTALLED PER GC-M SPEC (GC-2 MODIFIED)
5. INSTALL DRAIN HUB COVERS ON ALL HUBS.

LEGEND

- (B) BRIDLE DRAIN
- (LG) LEVEL GAUGE
- (LC) LEVEL CONTROLLER
- (D) DRAIN
- (PI) PRESSURE INDICATOR
- (V) VENT
- (PV) PUMP VENT
- (LSH) LEVEL SWITCH HIGH
- (SC) SAMPLE CONNECTION
- (LS) LEVEL SWITCH
- HOSE CONNECTION

0	DL	2/8/12	AS-BUILT	CKC	GLC
A	BL	6/5/91	ISSUED FOR APPROVAL	CKC	GLC

EMPIRE ABO GAS PLANT
EDDY CO. NEW MEXICO
AMOCO PRODUCTION COMPANY
MECHANICAL FLOW DIAGRAM
OPEN DRAIN SYSTEM

D-63630-703

Fig. 94-4

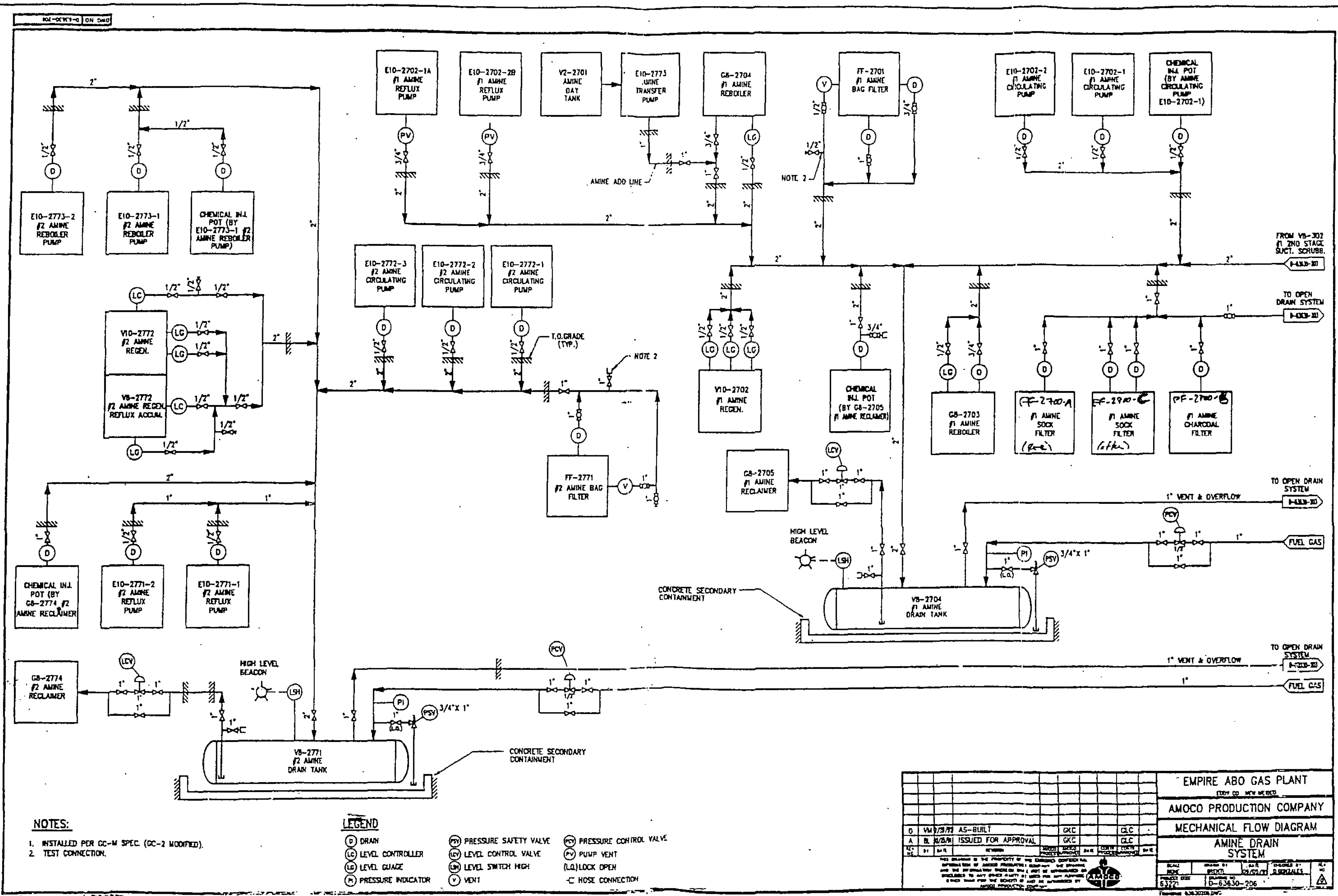
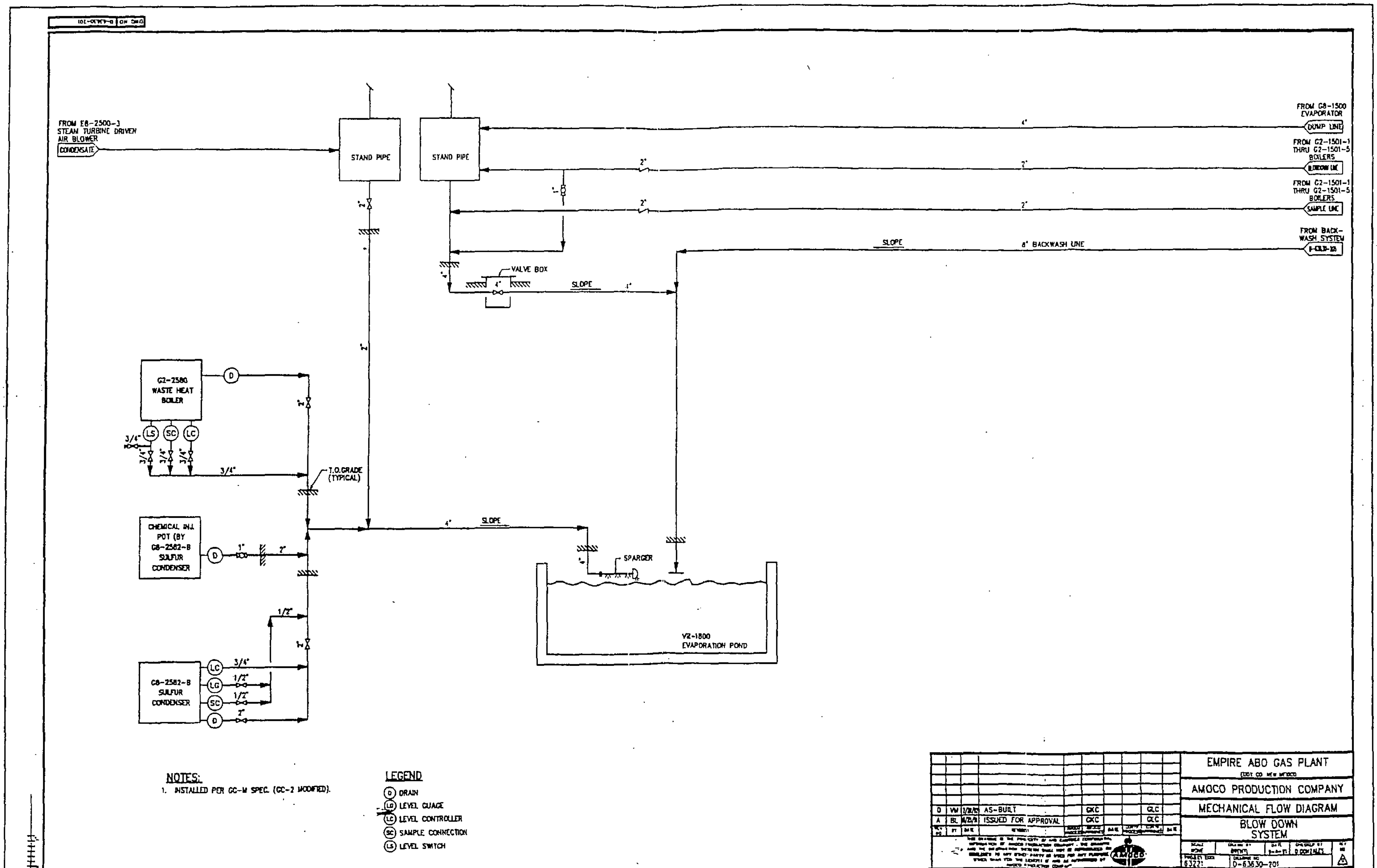
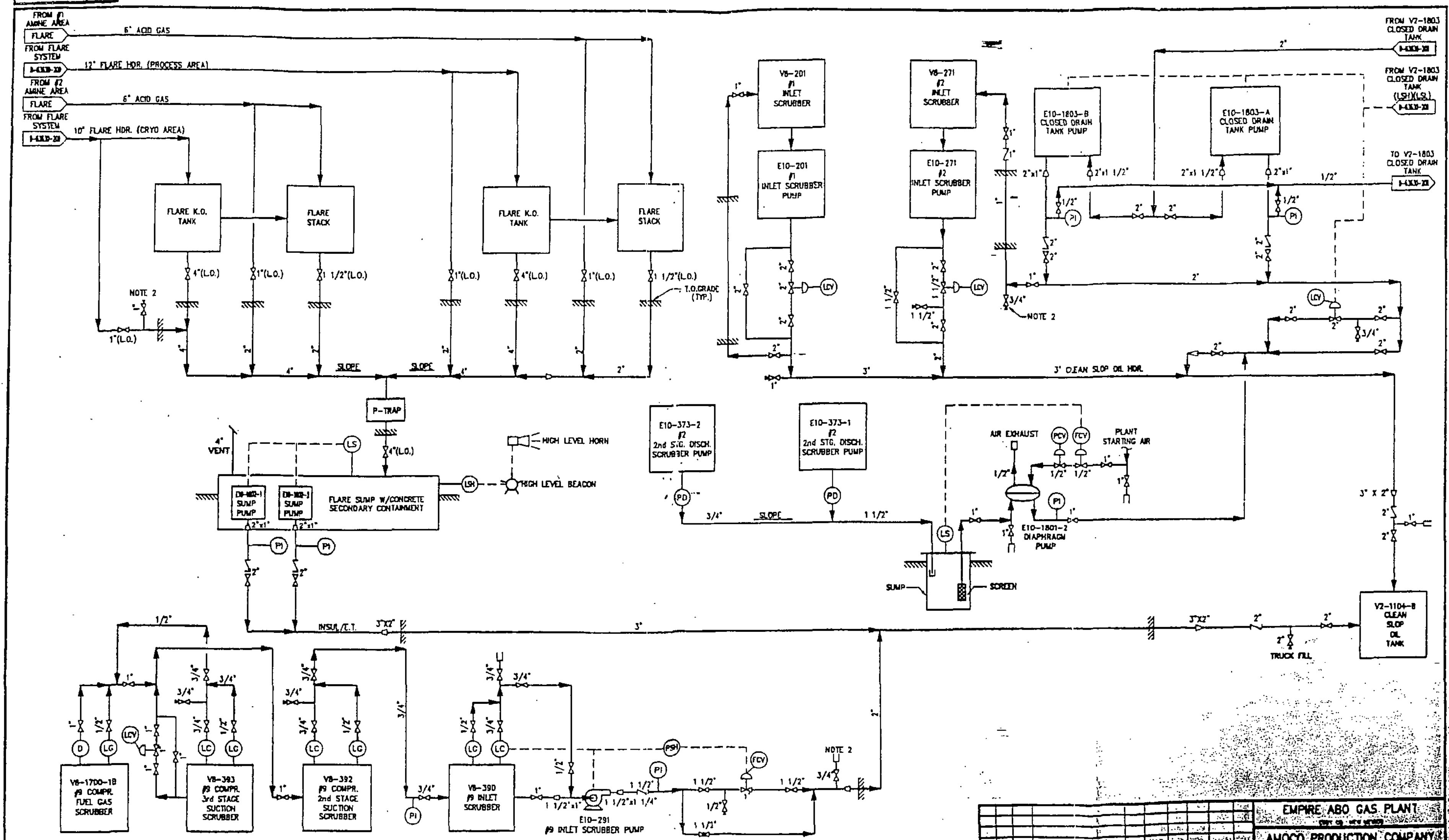

EMPIRE ABO GAS PLANT
AMOCO PRODUCTION COMPANY
MECHANICAL FLOW DIAGRAM
AMINE DRAIN SYSTEM
D-63630-206
0 AS-BUILT
A ISSUED FOR APPROVAL
E10-2773-2 #2 AMINE REBOILER PUMP
E10-2773-1 #2 AMINE REBOILER PUMP
CHEMICAL INJ. POT (BY E10-2773-1 #2 AMINE REBOILER PUMP)
E10-2702-1A #1 AMINE REFLUX PUMP
E10-2702-2B #1 AMINE REFLUX PUMP
V2-2701 AMINE DAY TANK
E10-2773 AMINE TRANSFER PUMP
G8-2704 #1 AMINE REBOILER
FF-2701 #1 AMINE BAG FILTER
E10-2702-2 #1 AMINE CIRCULATING PUMP
E10-2702-1 #1 AMINE CIRCULATING PUMP
CHEMICAL INJ. POT (BY AMINE CIRCULATING PUMP E10-2702-1)
AMINE ADD LINE
NOTE 2
FROM V8-302 #1 2ND STAGE SUCT. SCRUBB.
TO OPEN DRAIN SYSTEM
E10-2772-3 #2 AMINE CIRCULATING PUMP
E10-2772-2 #2 AMINE CIRCULATING PUMP
E10-2772-1 #2 AMINE CIRCULATING PUMP
T.O.GRADE (TYP.)
V10-2772 #2 AMINE REGEN.
V8-2772 #2 AMINE REGEN. REFLUX ACCUM.
V10-2702 #1 AMINE REGEN.
CHEMICAL INJ. POT (BY G8-2705 #1 AMINE RECLAIMER)
G8-2703 #1 AMINE REBOILER
#1 AMINE SOCK FILTER
#1 AMINE SOCK FILTER
#1 AMINE CHARCOAL FILTER
FF-2771 #2 AMINE BAG FILTER
G8-2705 #1 AMINE RECLAIMER
1" VENT & OVERFLOW
FUEL GAS
HIGH LEVEL BEACON
CONCRETE SECONDARY CONTAINMENT
V8-2704 #1 AMINE DRAIN TANK
CHEMICAL INJ. POT (BY G8-2774 #2 AMINE RECLAIMER
E10-2771-2 #2 AMINE REFLUX PUMP
E10-2771-1 #2 AMINE REFLUX PUMP
G8-2774 #2 AMINE RECLAIMER
V8-2771 #2 AMINE DRAIN TANK
NOTES:
1. INSTALLED PER GC-M SPEC. (GC-2 MODIFIED).
2. TEST CONNECTION.
LEGEND
D DRAIN
LC LEVEL CONTROLLER
LG LEVEL GUAGE
PI PRESSURE INDICATOR
PSV PRESSURE SAFETY VALVE
LCV LEVEL CONTROL VALVE
LSH LEVEL SWITCH HIGH
V VENT
PCV PRESSURE CONTROL VALVE
PV PUMP VENT
(LO) LOCK OPEN
HOSE CONNECTION

Fig. 94-5


DWG NO D-63630-201
FROM E8-2500-3
STEAM TURBINE DRIVEN
AIR BLOWER
CONDENSATE
STAND PIPE
STAND PIPE
FROM G8-1500
EVAPORATOR
DUMP LINE
FROM G2-1501-1
THRU G2-1501-5
BOILERS
FROM G2-1501-1
THRU G2-1501-5
BOILERS
SAMPLE LINE
FROM BACK-
WASH SYSTEM
SLOPE
8" BACKWASH LINE
VALVE BOX
SLOPE
G2-2580
WASTE HEAT
BOILER
T.O.GRADE
(TYPICAL)
CHEMICAL INJ.
POT (BY
G8-2582-B
SULFUR
CONDENSER
SLOPE
SPARGER
V2-1800
EVAPORATION POND
G8-2582-B
SULFUR
CONDENSER
NOTES:
1. INSTALLED PER GC-M SPEC. (GC-2 MODIFIED).
LEGEND
D DRAIN
LG LEVEL GUAGE
LC LEVEL CONTROLLER
SC SAMPLE CONNECTION
LS LEVEL SWITCH
D VW AS-BUILT GKC GLC
A BL ISSUED FOR APPROVAL GKC GLC
EMPIRE ABO GAS PLANT
AMOCO PRODUCTION COMPANY
MECHANICAL FLOW DIAGRAM
BLOW DOWN
SYSTEM
63221
D-63630-201
Fig. 94-6



NOTES:

1. ALL ABOVE GROUND SLOP OIL LINES TO BE INSULATED W/1 1/2"H AND STEAM TRACED.
2. TEST CONNECTION.
3. INSTALLED PER GC-M SPEC. (GC-2 MODIFIED).

LEGEND

- (D) DRAIN
- (PCV) PRESSURE CONTROL VALVE
- (LC) LEVEL CONTROLLER
- (PSH) PRESSURE SWITCH HIGH
- (LSH) LEVEL SWITCH HIGH
- (PD) PACKING DRAIN
- (LG) LEVEL GUAGE
- (LS) LEVEL SWITCH
- (PI) PRESSURE INDICATOR
- (LCV) LEVEL CONTROL VALVE
- (FCV) FLOW CONTROL VALVE
- (L.O.) LOCK OPEN
- HOSE CONNECTION

0	AS-BUILT			GLC
A	ISSUED FOR APPROVAL			GLC

EMPIRE ABO GAS PLANT

AMOCO PRODUCTION COMPANY

MECHANICAL FLOW DIAGRAM

CLEAN SLOP OIL SYSTEM

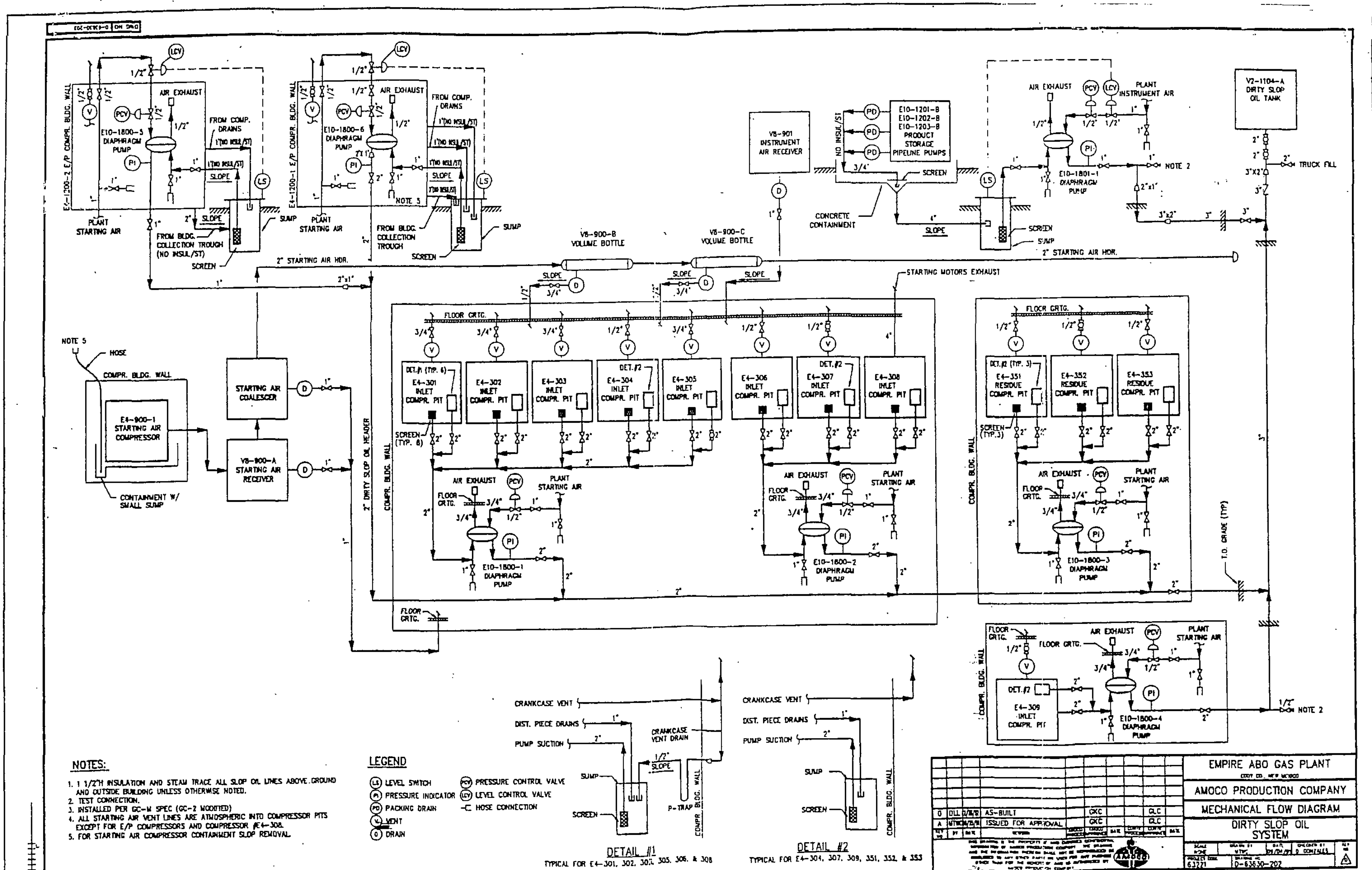
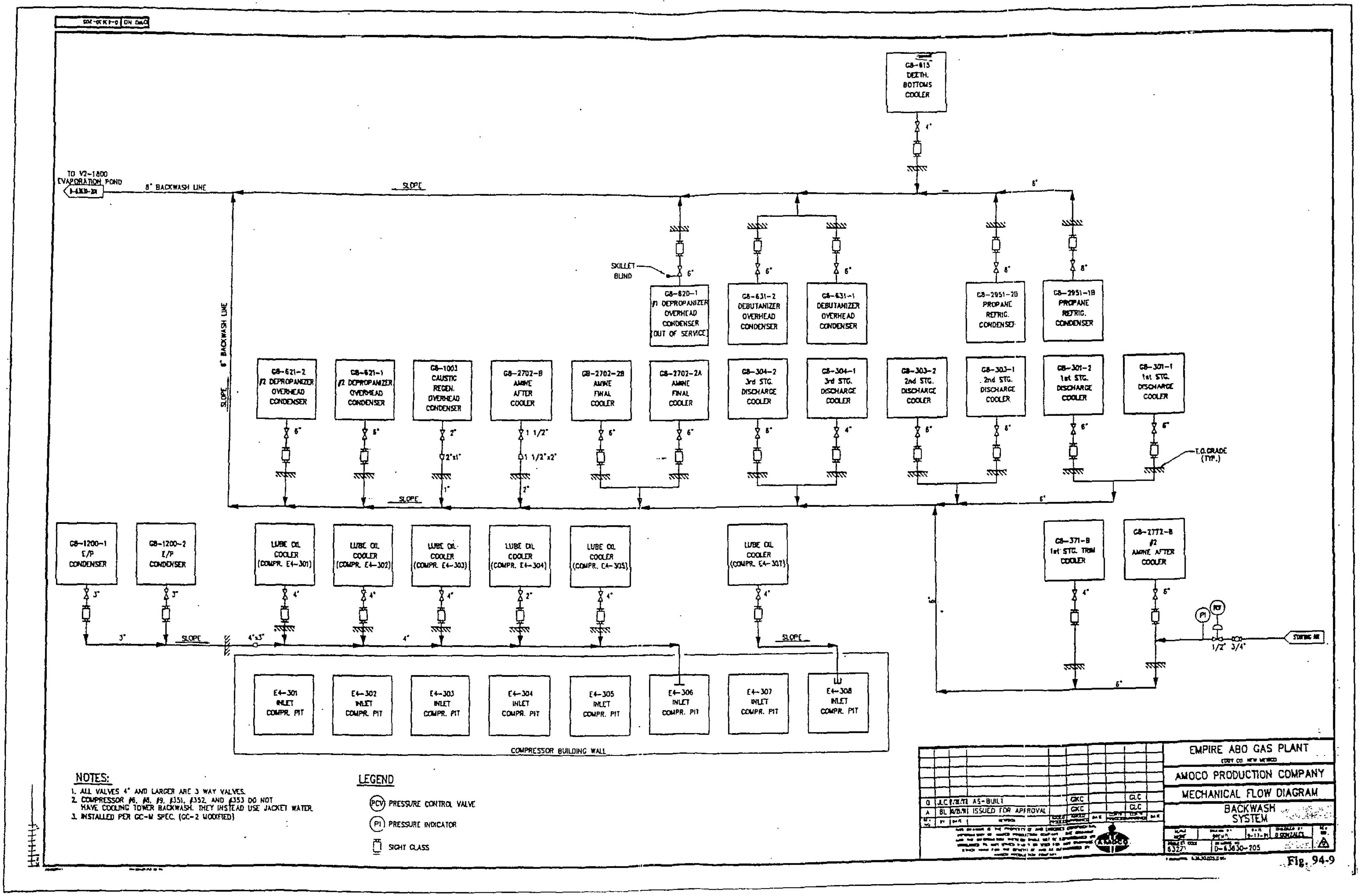
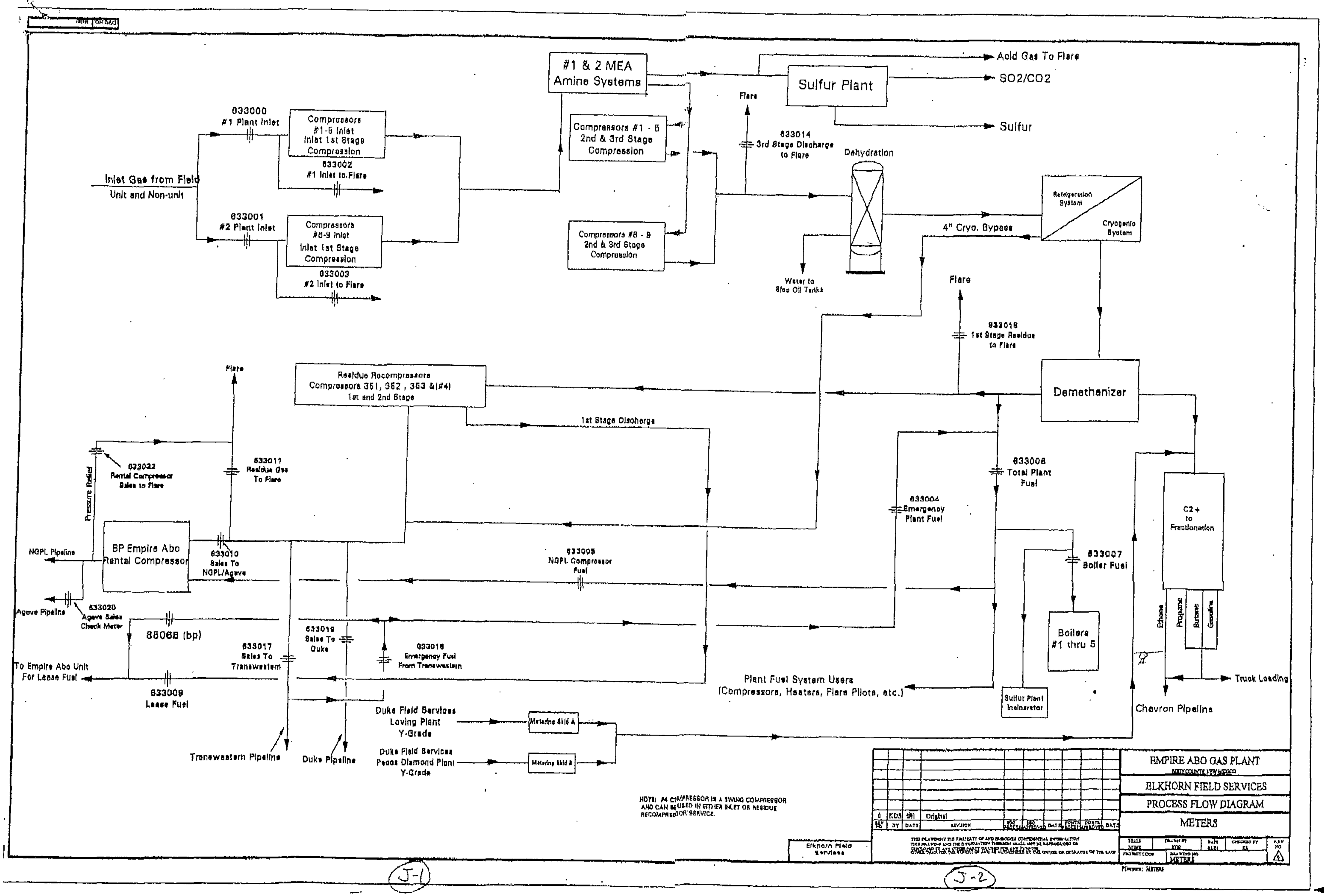

EMPIRE ABO GAS PLANT
AMOCO PRODUCTION COMPANY
MECHANICAL FLOW DIAGRAM
DIRTY SLOP OIL SYSTEM
D-63630-202
0 DLL AS-BUILT GKC GLC
A ISSUED FOR APPROVAL GKC GLC
NOTES:
1. 1 1/2"H INSULATION AND STEAM TRACE ALL SLOP OIL LINES ABOVE GROUND AND OUTSIDE BUILDING UNLESS OTHERWISE NOTED.
2. TEST CONNECTION.
3. INSTALLED PER GC-M SPEC (GC-2 MODIFIED)
4. ALL STARTING AIR VENT LINES ARE ATMOSPHERIC INTO COMPRESSOR PITS EXCEPT FOR E/P COMPRESSORS AND COMPRESSOR #E4-308.
5. FOR STARTING AIR COMPRESSOR CONTAINMENT SLOP REMOVAL.
LEGEND
LS LEVEL SWITCH
PI PRESSURE INDICATOR
PD PACKING DRAIN
V VENT
D DRAIN
PCV PRESSURE CONTROL VALVE
LCV LEVEL CONTROL VALVE
HOSE CONNECTION
DETAIL #1
TYPICAL FOR E4-301, 302, 303, 305, 306, & 308
DETAIL #2
TYPICAL FOR E4-304, 307, 309, 351, 352, & 353
CRANKCASE VENT
DIST. PIECE DRAINS
PUMP SUCTION
CRANKCASE VENT DRAIN
SUMP
SCREEN
P-TRAP
COMPR. BLDG. WALL
E4-1200-2 E/P COMPR. BLDG. WALL
E4-1200-1 E/P COMPR. BLDG. WALL
E10-1800-5 DIAPHRAGM PUMP
E10-1800-6 DIAPHRAGM PUMP
AIR EXHAUST
FROM COMP. DRAINS
FROM BLDG. COLLECTION TROUGH (NO INSUL/ST)
FROM BLDG. COLLECTION TROUGH
PLANT STARTING AIR
2" STARTING AIR HDR.
V8-900-B VOLUME BOTTLE
V8-900-C VOLUME BOTTLE
V8-901 INSTRUMENT AIR RECEIVER
E10-1201-B E10-1202-B E10-1203-B PRODUCT STORAGE PIPELINE PUMPS
NO INSUL/ST
CONCRETE CONTAINMENT
PLANT INSTRUMENT AIR
E10-1801-1 DIAPHRAGM PUMP
NOTE 2
V2-1104-A DIRTY SLOP OIL TANK
TRUCK FILL
STARTING MOTORS EXHAUST
NOTE 5
HOSE
E4-900-1 STARTING AIR COMPRESSOR
CONTAINMENT W/ SMALL SUMP
STARTING AIR COALESCER
V8-900-A STARTING AIR RECEIVER
2" DIRTY SLOP OIL HEADER
FLOOR GRTG.
E4-301 INLET COMPR. PIT
E4-302 INLET COMPR. PIT
E4-303 INLET COMPR. PIT
E4-304 INLET COMPR. PIT
E4-305 INLET COMPR. PIT
E4-306 INLET COMPR. PIT
E4-307 INLET COMPR. PIT
E4-308 INLET COMPR. PIT
E4-351 RESIDUE COMPR. PIT
E4-352 RESIDUE COMPR. PIT
E4-353 RESIDUE COMPR. PIT
E4-309 INLET COMPR. PIT
E10-1800-1 DIAPHRAGM PUMP
E10-1800-2 DIAPHRAGM PUMP
E10-1800-3 DIAPHRAGM PUMP
E10-1800-4 DIAPHRAGM PUMP
T.O. GRADE (TYP)

Fig. 94-8



TO V2-1800 EVAPORATION POND
8" BACKWASH LINE
SLOPE
G8-615 DEETH. BOTTOMS COOLER
G8-820-1 #1 DEPROPANIZER OVERHEAD CONDENSER (OUT OF SERVICE)
SKILLET BLIND
G8-631-2 DEBUTANIZER OVERHEAD CONDENSER
G8-631-1 DEBUTANIZER OVERHEAD CONDENSER
G8-2951-2B PROPANE REFRIG. CONDENSER
G8-2951-1B PROPANE REFRIG. CONDENSER
G8-621-2 #2 DEPROPANIZER OVERHEAD CONDENSER
G8-621-1 #2 DEPROPANIZER OVERHEAD CONDENSER
G8-1003 CAUSTIC REGEN. OVERHEAD CONDENSER
G8-2702-B AMINE AFTER COOLER
G8-2702-2B AMINE FINAL COOLER
G8-2702-2A AMINE FINAL COOLER
G8-304-2 3rd STG. DISCHARGE COOLER
G8-304-1 3rd STG. DISCHARGE COOLER
G8-303-2 2nd STG. DISCHARGE COOLER
G8-303-1 2nd STG. DISCHARGE COOLER
G8-301-2 1st STG. DISCHARGE COOLER
G8-301-1 1st STG. DISCHARGE COOLER
T.O.GRADE (TYP.)
G8-1200-1 E/P CONDENSER
G8-1200-2 E/P CONDENSER
LUBE OIL COOLER (COMPR. E4-301)
LUBE OIL COOLER (COMPR. E4-302)
LUBE OIL COOLER (COMPR. E4-303)
LUBE OIL COOLER (COMPR. E4-304)
LUBE OIL COOLER (COMPR. E4-305)
LUBE OIL COOLER (COMPR. E4-307)
G8-371-B 1st STG. TRIM COOLER
G8-2772-B #2 AMINE AFTER COOLER
STARTING AIR
1/2" 3/4"
E4-301 INLET COMPR. PIT
E4-302 INLET COMPR. PIT
E4-303 INLET COMPR. PIT
E4-304 INLET COMPR. PIT
E4-305 INLET COMPR. PIT
E4-306 INLET COMPR. PIT
E4-307 INLET COMPR. PIT
E4-308 INLET COMPR. PIT
COMPRESSOR BUILDING WALL
NOTES:
1. ALL VALVES 4" AND LARGER ARE 3 WAY VALVES.
2. COMPRESSOR #6, #8, #9, #351, #352, AND #353 DO NOT HAVE COOLING TOWER BACKWASH. THEY INSTEAD USE JACKET WATER.
3. INSTALLED PER GC-M SPEC. (GC-2 MODIFIED)
LEGEND
PCV PRESSURE CONTROL VALVE
PI PRESSURE INDICATOR
SIGHT GLASS
0 J.C. AS-BUILT GKC GLC
A BL ISSUED FOR APPROVAL GKC GLC
EMPIRE ABO GAS PLANT
AMOCO PRODUCTION COMPANY
MECHANICAL FLOW DIAGRAM
BACKWASH SYSTEM
D-63630-205

Fig. 94-9



Inlet Gas from Field
Unit and Non-unit
633000
#1 Plant Inlet
633001
#2 Plant Inlet
Compressors #1-5 Inlet Inlet 1st Stage Compression
633002
#1 Inlet to Flare
Compressors #8-9 Inlet Inlet 1st Stage Compression
633003
#2 Inlet to Flare
#1 & 2 MEA Amine Systems
Compressors #1 - 5 2nd & 3rd Stage Compression
Compressors #8 - 9 2nd & 3rd Stage Compression
Flare
633014
3rd Stage Discharge to Flare
Sulfur Plant
Acid Gas To Flare
SO2/CO2
Sulfur
Dehydration
Water to Slop Oil Tanks
Refrigeration System
Cryogenic System
4" Cryo. Bypass
Flare
633018
1st Stage Residue to Flare
Demethanizer
Residue Recompressors
Compressors 351, 352 , 353 &(#4)
1st and 2nd Stage
1st Stage Discharge
Flare
633011
Residue Gas To Flare
633022
Rental Compressor Sales to Flare
Pressure Relief
BP Empire Abo Rental Compressor
NGPL Pipeline
633010
Sales To NGPL/Agave
Agave Pipeline
633020
Agave Sales Check Meter
85068 (bp)
To Empire Abo Unit For Lease Fuel
633009
Lease Fuel
633017
Sales To Transwestern
633019
Sales To Duke
633016
Emergency Fuel From Transwestern
633005
NGPL Compressor Fuel
633004
Emergency Plant Fuel
633008
Total Plant Fuel
633007
Boiler Fuel
Boilers #1 thru 5
Sulfur Plant Incinerator
Plant Fuel System Users
(Compressors, Heaters, Flare Pilots, etc.)
C2+ to Fractionation
Ethane
Propane
Butane
Gasoline
Truck Loading
Chevron Pipeline
Duke Field Services Loving Plant Y-Grade
Duke Field Services Pecos Diamond Plant Y-Grade
Metering Skid A
Metering Skid B
Transwestern Pipeline
Duke Pipeline
NOTE: #4 COMPRESSOR IS A SWING COMPRESSOR AND CAN BE USED IN EITHER INLET OR RESIDUE RECOMPRESSOR SERVICE.
0 KDS Original
REV BY DATE REVISION
Elkhorn Field Services
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN FIELD SERVICES
PROCESS FLOW DIAGRAM
METERS
J-1
J-2

Michelle Green

From: Mark Larson
Sent: Thursday, May 08, 2008 5:44 PM
To: dharris@frontierfieldservices.com
Cc: michelle@laenvironmental.com
Subject: FW: Discharge Permit GW-022 Groundwater Sampling Schedule Modification Approval
Attachments: image001.jpg

Dave,
Here's the OCD's approval for modifying the groundwater sampling schedule from quarterly to semi annually.

Mark J. Larson
Sr. Project Manager / President
507 N. Marienfeld St., Ste. 202
Midland, Texas 79701
(432) 687-0901 (office)
(432) 687-0456 (fax)
(432) 556-8656 (cell)
mark@laenvironmental.com

From: Price, Wayne, EMNRD [mailto:wayne.price@state.nm.us]
Sent: Thursday, May 08, 2008 5:28 PM
To: Mark Larson
Cc: VonGonten, Glenn, EMNRD
Subject: RE: Discharge Permit GW-022 Groundwater Sampling Schedule Modification Approval

Approved! Please make sure this approval is part of the submittal record.

Please be advised that OCD approval of this plan does not relieve the owner/operator 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, OCD approval does not relieve the owner/operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

From: Mark Larson [mailto:Mark@laenvironmental.com]
Sent: Thursday, May 08, 2008 1:48 PM
To: Price, Wayne, EMNRD
Cc: John Fergerson
Subject: Re: Discharge Permit GW-022 Groundwater Sampling Schedule Modification Approval

Dear Wayne,

This message is submitted to the New Mexico Oil Conservation Division (OCD) on behalf of Frontier Field Services, L.P. (Frontier) by Larson & Associates, inc., its consultant, to confirm verbal approval from the OCD for Frontier to modify the groundwater monitoring schedule for its Empire Abo Gas Plant (GW-022). Groundwater samples are currently obtained on a quarterly (4 times per year) schedule and a verbal request was approved by the OCD during a conversation today to allow Frontier to collect groundwater samples on a semi-annual (twice yearly) schedule beginning immediately. Thank you for your consideration of this request. Please do not hesitate to contact me if you have questions.

Mark J. Larson
Sr. Project Manager / President
507 N. Marienfeld St., Ste. 202
Midland, Texas 79701
(432) 687-0901 (office)
(432) 687-0456 (fax)
(432) 556-8656 (cell)
mark@laenvironmental.com

Larson & Associates, Inc.
Environmental Consultants

5 YR. UNDERGROUND DRAIN TESTING

Task No.		**Request Date**	4/21/2005
Tenant		**Request Time**	14:35:30
Assigned By	STEVENSON	**Originator**	STEVENSON
Assigned To	STEVENSON	**Telephone No.**	505-677-5119
Scheduled Start Date		**Extension**	5119
Scheduled Finish Date		**WO Type**	ENV
Perform by Warranty	No	**Completion Date**	5/9/05
Priority	3.00	**Completion Time**	
Expense Class			

Craft	Crew Size	Estimated Labor Hours

Equipment No.	Equipment Description	Location	Sub-location 1	Sub-location 2	Sub-location 3
1800	SYSTEM, SEWERAGE	EAGP	-	-	-

Item No.	Equipment No.	Description	Qty Required	Date Used	Qty Used

List extra parts and comments here

All Lines were Hydrotested. No Leaks were detected.

Employee Code	Equipment No.	Work Date	First Name	Last Name	Regular Hours	Overtime Hours

Safety Notes

Ray Spencer - TRS Resources

Equipment No. 1800

Task Instructions

TRS Resources LLC

Global Industrial Solutions

SUMMARY REPORT

HYDROSTATIC PRESSURE TESTING OF UNDERGROUND DRAIN PIPING

Frontier
Field Services

EMPIRE ABO GAS PLANT

120 Chuckwagon Rd Carlsbad, New Mexico 88220 (505)887-7111 fax (505)628-8276

TRS Resources LLC
Global Industrial Solutions

SUMMARY REPORT
HYDROSTATIC PRESSURE TESTING OF UNDERGROUND DRAIN PIPING
FRONTIER FIELD SERVICES
EMPIRE ABO GAS PLANT

INTRODUCTION

On 04/27/05, TRS Resources LLC began conducting hydrostatic pressure testing of the noted underground drain piping systems at the Empire ABO Gas Plant.

INSPECTION METHODOLOGY

Each piping circuit was isolated, filled with clean water ensuring that the air was removed and then connected to a water filled riser with a fill height of 83 ½ ". To ensure that a minimum of three (3) pounds per square inch was achieved a pressure gage was installed at the bottom of the riser to verify the minimum pressure). The system was considered acceptable when there was no change in the height of the water in the riser for a period of thirty (30) minutes.

INSPECTION

Drain line from	Drain line to	Line size/Length/Type	Test Date/Time	Results
Product storage containment sump	Dirty Slop Oil Tank	2&3"/35ft/CS	5/10/05 1235-1305	Acceptable
Compressor Building Sumps	Dirty Slop Oil Tank	3"/690ft/CS	5/10/05 1400-1430	Acceptable
Open Drain Sump Tank	Wastewater Process Tanks North & South	2"/216ft/CS	4/28/05 1110-1140	Acceptable
Sulfur Condensers	Evaporation Pond	2"/171ft/CS	4/27/05 1530-1600	Acceptable
Flare System	Flare Sump Tank	4"/335ft/CS	5/10/05 0800-0830	Acceptable
Glycol, Amine & Caustic Drain System	Open Drain Sump Tank	2"/283ft/CS 3"/284ft/CS 4"/18ft/CS	5/6/05 1530-1600	Acceptable
Flare Sump Tank	Clean Slop Oil Tank	3"/871ft/CS 1½ "/80ft/CS	5/10/05 1000-1030	Acceptable
Scrubber Coolers, Demethanizer System, Propane System, Debutanizer System, Amine System and Boiler Drains	Evaporation Pond	3"/16ft/CS 4"/332ft/CS 6"/1120ft/CS 8"/660ft/CS	4/27/05 1300-1330	Acceptable
EP Coolers, Lube Oil and Air Compressor Systems	Compressor Bldg Cellar	1"/40ft CS 3"/20ft/CS 4"/180ft/CS	5/10/05 1545-1615	Acceptable
Product Containment Sump	Dirty Slop Oil Tank	2"/27ft/CS	5/9/05 1115-1145	Acceptable
Compressor Skid	Fiberglass Tank	2"/93ft/CS	5/9/05 1400-1430	Acceptable
All line lengths are approximate per AGRA Measurements				

120 Chuckwagon Rd Carlsbad, New Mexico 88220 (505)887-7111 fax (505)628-8276

TRS Resources LLC

Global Industrial Solutions

External Inspection:

All above ground piping was visually inspected for leaks after the test pressure had stabilized.

Note:

The Oil Conservation District was contacted and numerous messages were left notifying them about the line testing dates, No one from the OCD office returned any phone calls to the Frontier Field Services Representative Kyle Stevenson, or came to the plant to witness the line testing.

The above statements are indicative regarding the conditions observed at the time of the visits and the results of the documentation review conducted.
TRS Resources LLC does not warrant or specifically guarantee the continued serviceability of any item, and this report should not be construed or promulgated to indicate any implied guarantee of future integrity or serviceability.

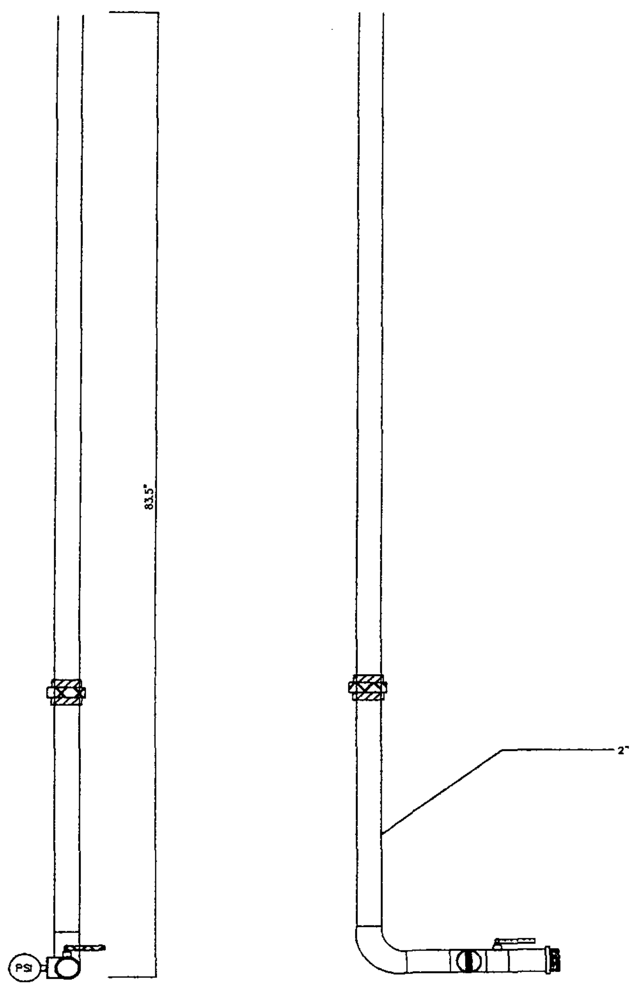
Respectfully Submitted: ____________________

Ray Spencer
TRS Resources LLC
API-570 #7196

Date: 5/10/05

Enclosures: Mechanical Flow Diagrams

XC: File



TRS Resources LLC
Global Industrial Solutions

REV NO	BY	DATE	REVISION
0	TRS	04/05	

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TRS RESOURCES LLC
CARLSBAD, NM

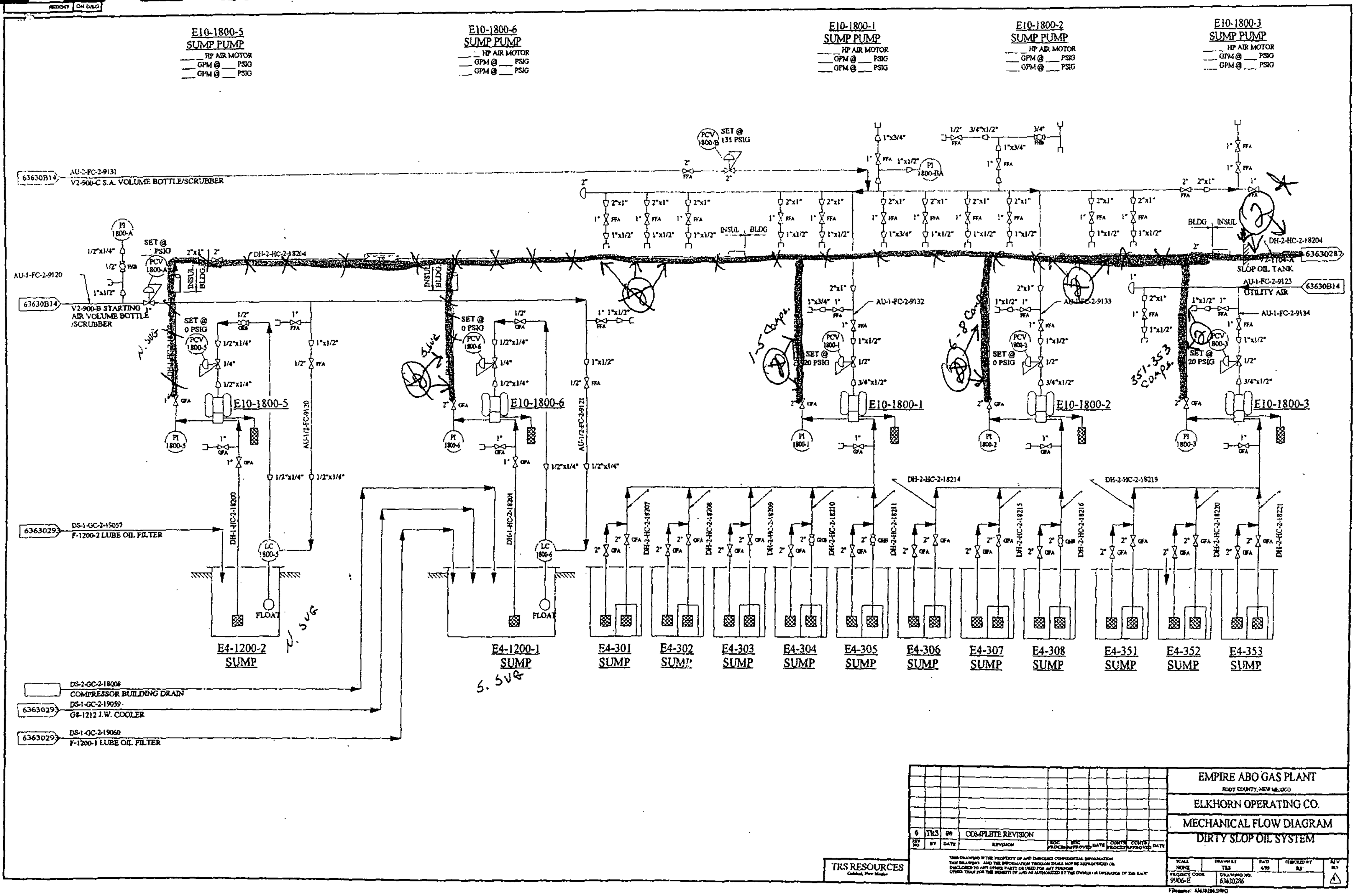
Frontier Field Services

Drain Piping Test Riser

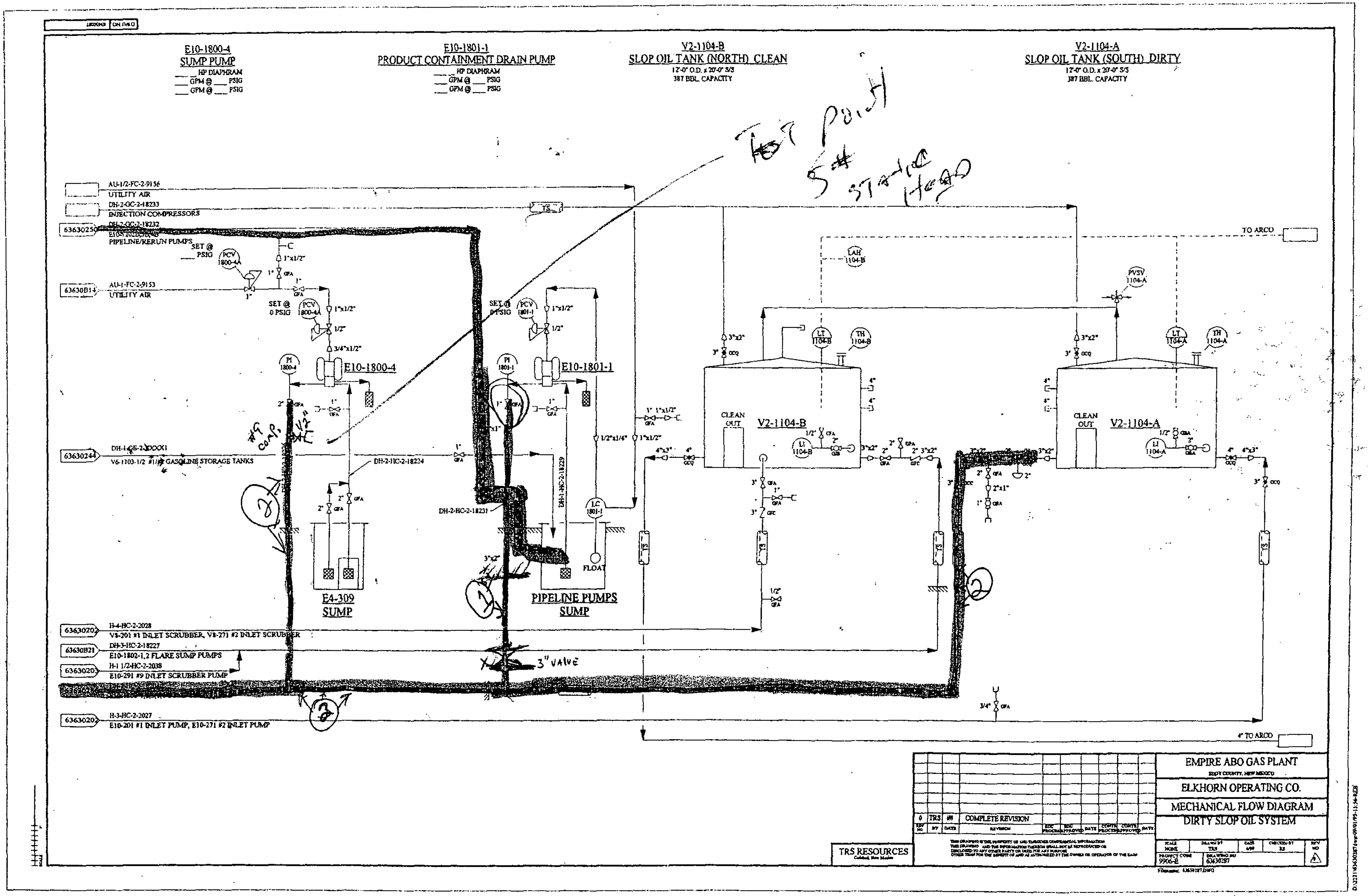
Drain Piping Test Riser

SCALE	DRAWN BY	DATE	CHECKED BY	REV NO
NONE	TRS	04/05	B.S.	0
PROJECT CODE	DRAWING NO. FFB1			

Filename: FFB1

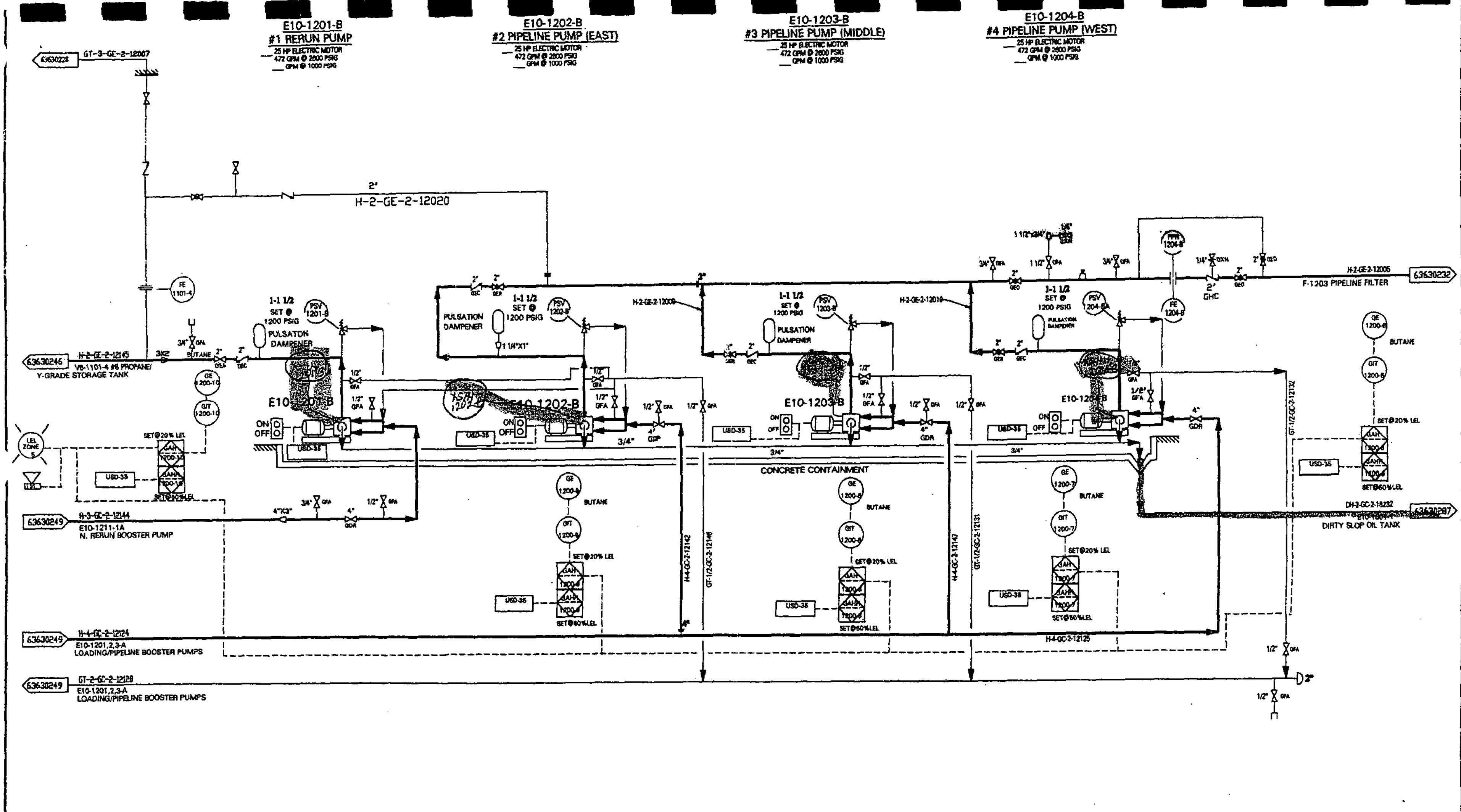


E10-1800-5 SUMP PUMP
E10-1800-6 SUMP PUMP
E10-1800-1 SUMP PUMP
E10-1800-2 SUMP PUMP
E10-1800-3 SUMP PUMP
HP AIR MOTOR
GPM @ ___ PSIG
63630B14
AU-2-FC-2-9131
V2-900-C S.A. VOLUME BOTTLE/SCRUBBER
AU-1-FC-2-9120
V2-900-B STARTING AIR VOLUME BOTTLE /SCRUBBER
DH-2-HC-2-18204
63630287
V2-1104-A SLOP OIL TANK
AU-1-FC-2-9123 UTILITY AIR
AU-1-FC-2-9132
AU-1-FC-2-9133
AU-1-FC-2-9134
AU-1/2-FC-2-9120
AU-1/2-FC-2-9121
DH-2-HC-2-18214
DH-2-HC-2-18219
E4-1200-2 SUMP
E4-1200-1 SUMP
E4-301 SUMP
E4-302 SUMP
E4-303 SUMP
E4-304 SUMP
E4-305 SUMP
E4-306 SUMP
E4-307 SUMP
E4-308 SUMP
E4-351 SUMP
E4-352 SUMP
E4-353 SUMP
63630293
DS-1-GC-2-19057
F-1200-2 LUBE OIL FILTER
DS-2-GC-2-18008
COMPRESSOR BUILDING DRAIN
DS-1-GC-2-19059
G8-1212 J.W. COOLER
DS-1-GC-2-19060
F-1200-1 LUBE OIL FILTER
6 TRS COMPLETE REVISION
TRS RESOURCES
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
DIRTY SLOP OIL SYSTEM
9906-E
63630286



E10-1800-4
SUMP PUMP
HP DIAPHRAM
GPM @ PSIG
GPM @ PSIG
E10-1801-1
PRODUCT CONTAINMENT DRAIN PUMP
HP DIAPHRAM
GPM @ PSIG
GPM @ PSIG
V2-1104-B
SLOP OIL TANK (NORTH) CLEAN
12'-0" O.D. x 20'-0" S/S
387 BBL. CAPACITY
V2-1104-A
SLOP OIL TANK (SOUTH) DIRTY
12'-0" O.D. x 20'-0" S/S
387 BBL. CAPACITY
Test Point
5# Static Head
AU-1/2-FC-2-9156
UTILITY AIR
DH-2-GC-2-18233
INJECTION COMPRESSORS
63630250
DH-2-GC-2-18232
PIPELINE/KERUN PUMPS
63630B14
AU-1-FC-2-9153
UTILITY AIR
63630244
DH-1-GS-2-XXXX1
V6-1103-1/2 #1/#2 GASOLINE STORAGE TANKS
#9 Comp. 1/2"
E10-1800-4
E10-1801-1
E4-309
SUMP
PIPELINE PUMPS
SUMP
FLOAT
DH-2-HC-2-18224
DH-1-HC-2-18229
DH-2-HC-2-18231
3" VALVE
63630202
H-4-HC-2-2028
V8-201 #1 INLET SCRUBBER, V8-271 #2 INLET SCRUBBER
63630B21
DH-3-HC-2-18227
E10-1802-1,2 FLARE SUMP PUMPS
63630202
H-1 1/2-HC-2-2038
E10-291 #9 INLET SCRUBBER PUMP
63630202
H-3-HC-2-2027
E10-201 #1 INLET PUMP, E10-271 #2 INLET PUMP
CLEAN OUT
V2-1104-B
CLEAN OUT
V2-1104-A
TO ARCO
4" TO ARCO
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
DIRTY SLOP OIL SYSTEM
0 TRS COMPLETE REVISION
TRS RESOURCES
9906-E
63630287

#1



3			PER MARK-UP							
1	TRS	12/99	PER MARK UP							
0	TRS	3/99	COMPLETE REVISION							
REV NO	BY	DATE	REVISION	EOC PROCESS	EOC APPROVED	DATE	CONTR PROCESS	CONTR APPROVED	DATE	

TRSRESOURCES

EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO

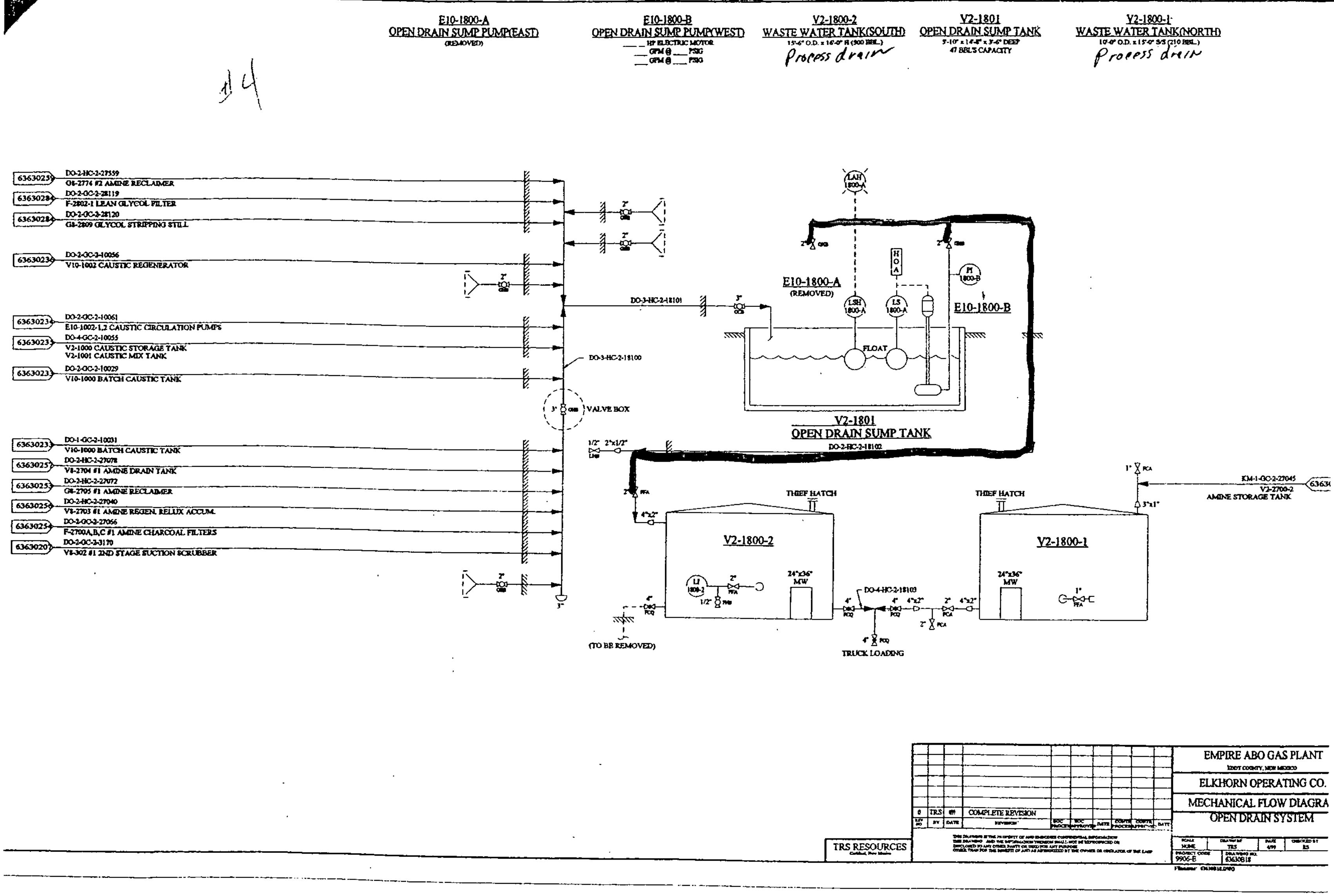
ELKHORN OPERATING CO.

MECHANICAL FLOW DIAGRAM

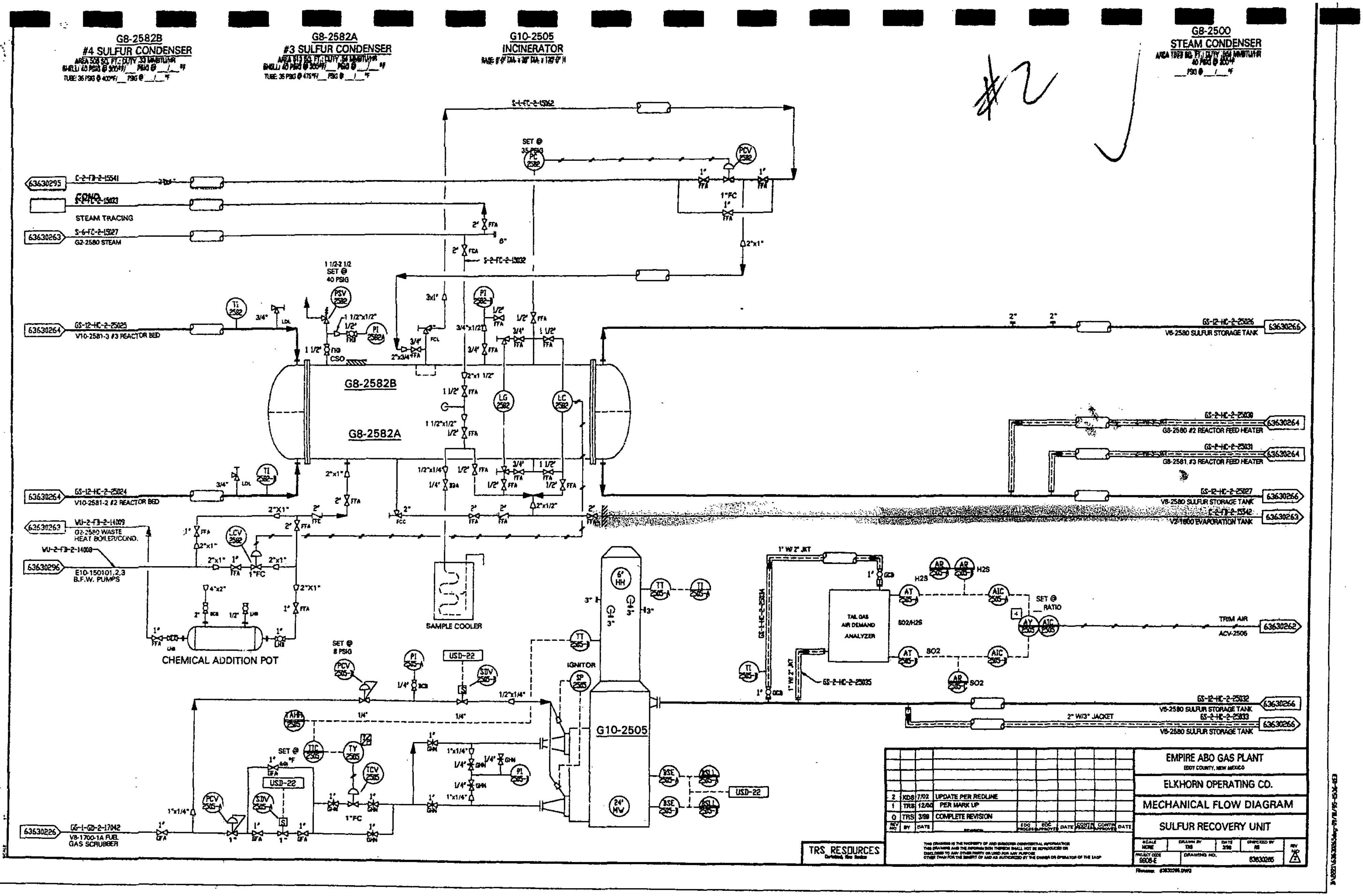
TANK FARM
PUMP STATION

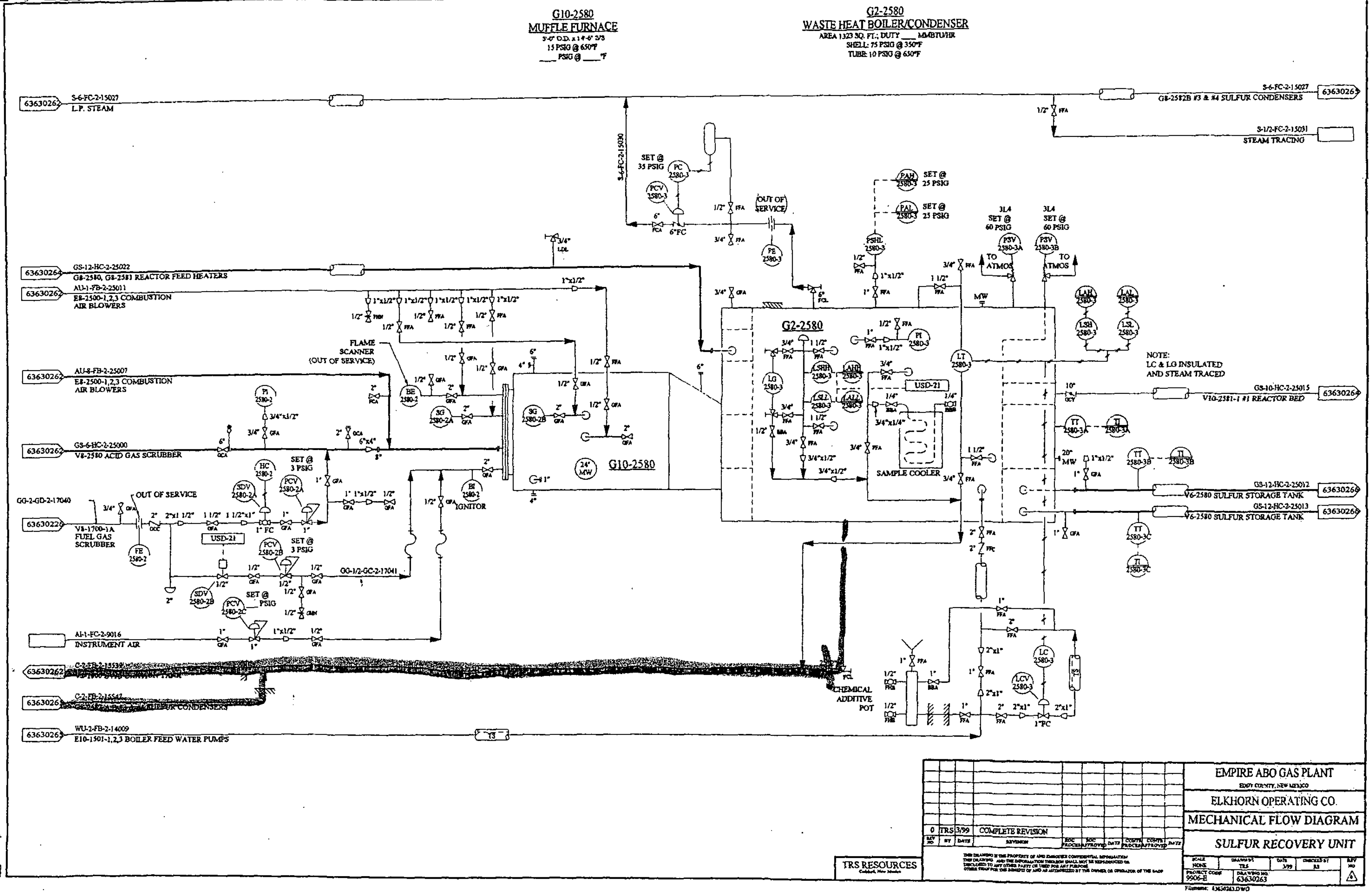
SCALE	DRAWN BY	DATE	CHECKED BY	REV NO
NONE	TRS	3/99	RS	3
PROJECT CODE	DRAWING NO.			
9806-E	63630250			

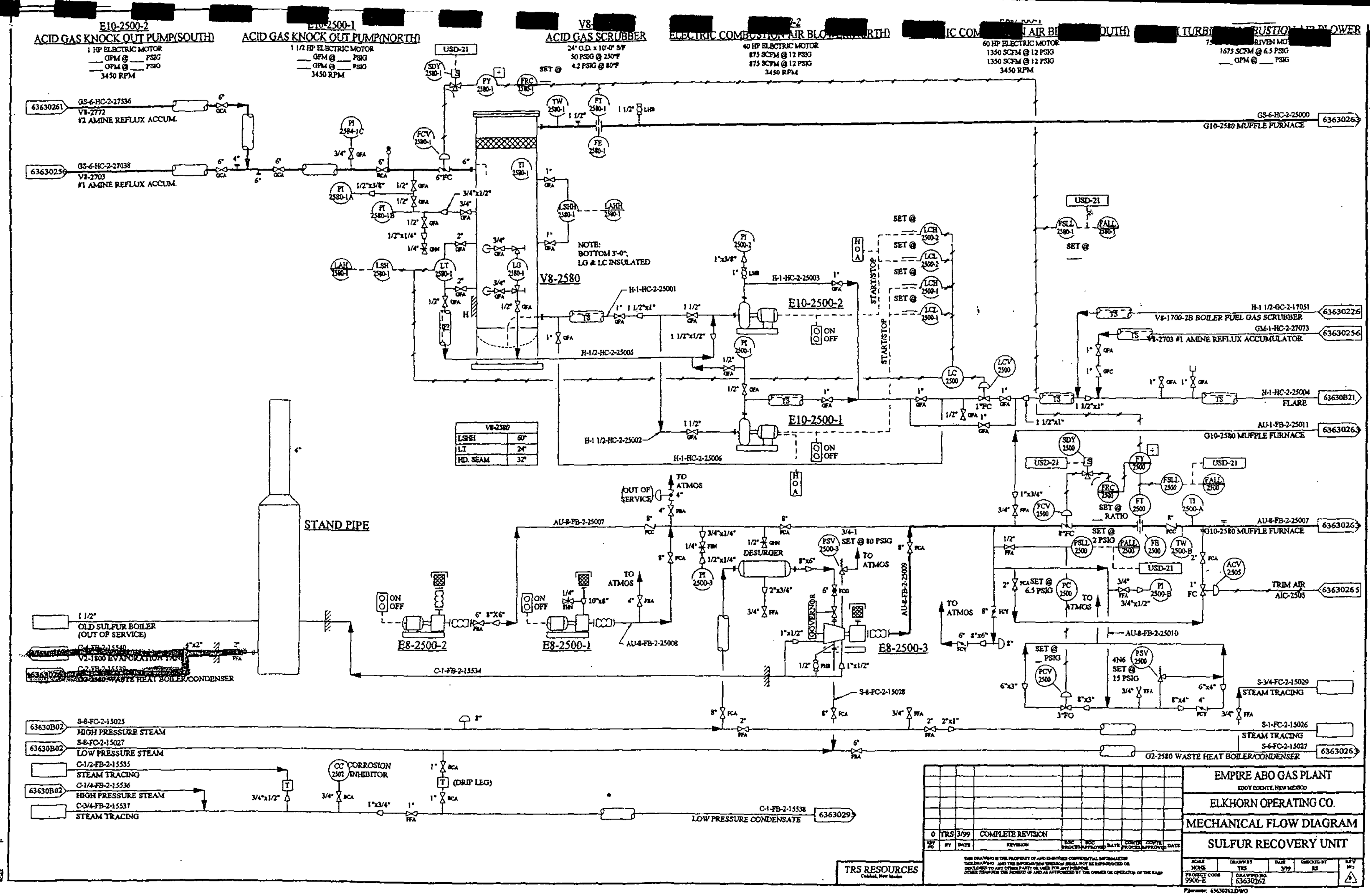
Filename: 63630250.DWG



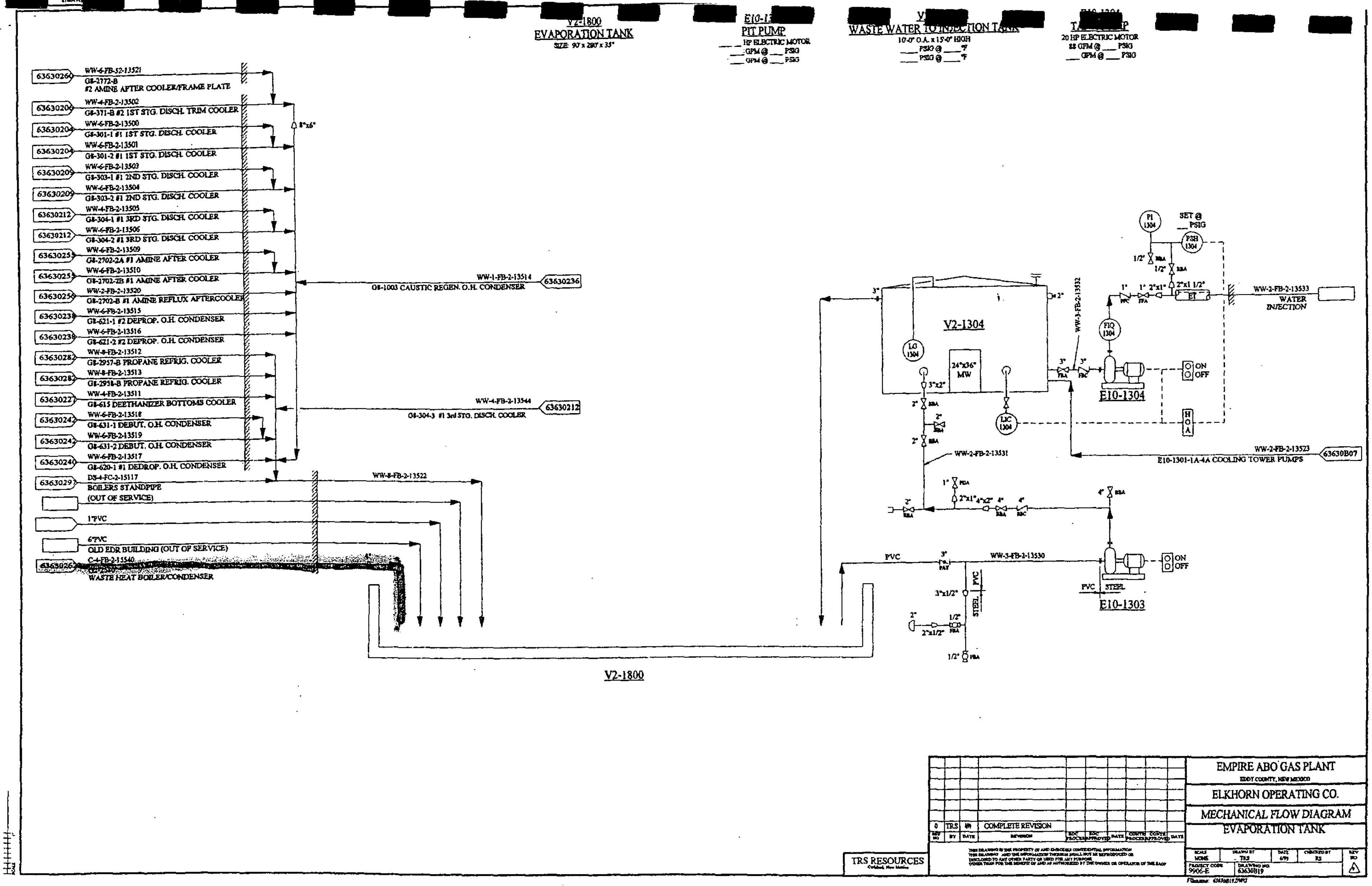
E10-1800-A
OPEN DRAIN SUMP PUMP(EAST)
(REMOVED)
E10-1800-B
OPEN DRAIN SUMP PUMP(WEST)
HP ELECTRIC MOTOR
GPM @ PSIG
GPM @ PSIG
V2-1800-2
WASTE WATER TANK(SOUTH)
Process drain
V2-1801
OPEN DRAIN SUMP TANK
47 BBL'S CAPACITY
V2-1800-1
WASTE WATER TANK(NORTH)
Process drain
14
DO-2-HC-2-27559
G8-2774 #2 AMINE RECLAIMER
DO-2-GC-2-28119
F-2802-1 LEAN GLYCOL FILTER
DO-2-GC-2-28120
G8-2809 GLYCOL STRIPPING STILL
DO-2-GC-2-10056
V10-1002 CAUSTIC REGENERATOR
DO-2-GC-2-10061
E10-1002-1,2 CAUSTIC CIRCULATION PUMPS
DO-4-GC-2-10055
V2-1000 CAUSTIC STORAGE TANK
V2-1001 CAUSTIC MIX TANK
DO-2-GC-2-10029
V10-1000 BATCH CAUSTIC TANK
DO-1-GC-2-10031
V10-1000 BATCH CAUSTIC TANK
DO-2-HC-2-27078
V8-2704 #1 AMINE DRAIN TANK
DO-3-HC-2-27072
G8-2705 #1 AMINE RECLAIMER
DO-2-HC-2-27040
V8-2703 #1 AMINE REGEN. RELUX ACCUM.
DO-3-GC-2-27056
F-2700A,B,C #1 AMINE CHARCOAL FILTERS
DO-2-GC-2-3170
V8-302 #1 2ND STAGE SUCTION SCRUBBER
DO-3-HC-2-18101
DO-3-HC-2-18100
VALVE BOX
LAH 1800-A
E10-1800-A
(REMOVED)
LSH 1800-A
LS 1800-A
H O A
PI 1800-B
E10-1800-B
FLOAT
V2-1801
OPEN DRAIN SUMP TANK
DO-2-HC-2-18102
THIEF HATCH
V2-1800-2
24"x36" MW
THIEF HATCH
V2-1800-1
24"x36" MW
KM-1-GC-2-27045
V3-2700-2
AMINE STORAGE TANK
DO-4-HC-2-18103
TRUCK LOADING
(TO BE REMOVED)
TRS RESOURCES
COMPLETE REVISION
EMPIRE ABO GAS PLANT
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRA
OPEN DRAIN SYSTEM
9906-E
63630818


G8-2582B
#4 SULFUR CONDENSER
G8-2582A
#3 SULFUR CONDENSER
G10-2505
INCINERATOR
G8-2500
STEAM CONDENSER
#2
63630295
STEAM TRACING
63630263
G2-2580 STEAM
63630264
V10-2581-3 #3 REACTOR BED
V10-2581-2 #2 REACTOR BED
62630263
G2-2580 WASTE HEAT BOILER/COND.
63630296
E10-150101,2,3 B.F.W. PUMPS
CHEMICAL ADDITION POT
SAMPLE COOLER
63630226
V8-1700-1A FUEL GAS SCRUBBER
63630266
V6-2580 SULFUR STORAGE TANK
G8-2580 #2 REACTOR FEED HEATER
G8-2581 #3 REACTOR FEED HEATER
V2-1600 EVAPORATION TANK
TAIL GAS AIR DEMAND ANALYZER
TRIM AIR
63630262
ACV-2505
IGNITOR
USD-22
2" W/3" JACKET
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
SULFUR RECOVERY UNIT
2 KDB 7/02 UPDATE PER REDLINE
1 TRS 12/00 PER MARK UP
0 TRS 3/98 COMPLETE REVISION
TRS RESOURCES
63630265

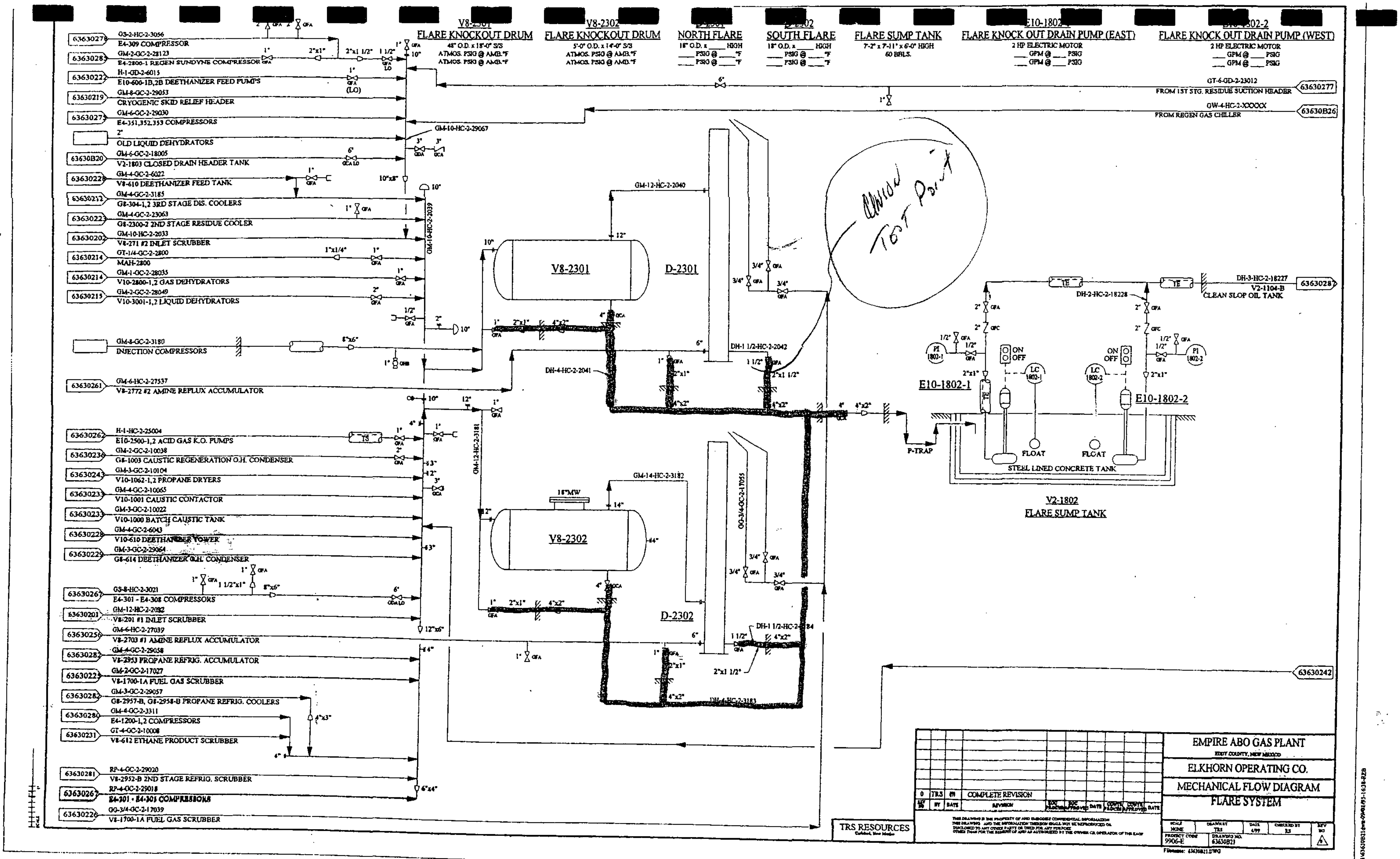

G10-2580
MUFFLE FURNACE
15 PSIG @ 650°F
G2-2580
WASTE HEAT BOILER/CONDENSER
SHELL: 75 PSIG @ 350°F
TUBE: 10 PSIG @ 650°F
S-6-FC-2-15027
L.P. STEAM
GB-2582B #3 & #4 SULFUR CONDENSERS
S-1/2-FC-2-15031
STEAM TRACING
GS-12-HC-2-25022
GB-2580, GB-2581 REACTOR FEED HEATERS
AU-1-FB-2-25011
EB-2500-1,2,3 COMBUSTION AIR BLOWERS
AU-8-FB-2-25007
EB-2500-1,2,3 COMBUSTION AIR BLOWERS
GS-6-HC-2-25000
VB-2580 ACID GAS SCRUBBER
GG-2-GD-2-17040
VB-1700-1A FUEL GAS SCRUBBER
OUT OF SERVICE
FLAME SCANNER (OUT OF SERVICE)
IGNITOR
GG-1/2-GC-2-17041
AI-1-FC-2-9016
INSTRUMENT AIR
WU-2-FB-2-14009
E10-1501-1,2,3 BOILER FEED WATER PUMPS
SAMPLE COOLER
USD-21
NOTE:
LC & LG INSULATED AND STEAM TRACED
GS-10-HC-2-25015
V10-2581-1 #1 REACTOR BED
GS-12-HC-2-25012
V6-2580 SULFUR STORAGE TANK
GS-12-HC-2-25013
V6-2580 SULFUR STORAGE TANK
CHEMICAL ADDITIVE POT
TO ATMOS
SET @ 60 PSIG
SET @ 25 PSIG
SET @ 35 PSIG
SET @ 3 PSIG
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
SULFUR RECOVERY UNIT
0 TRS 3/99 COMPLETE REVISION
TRS RESOURCES
9906-E
63630263

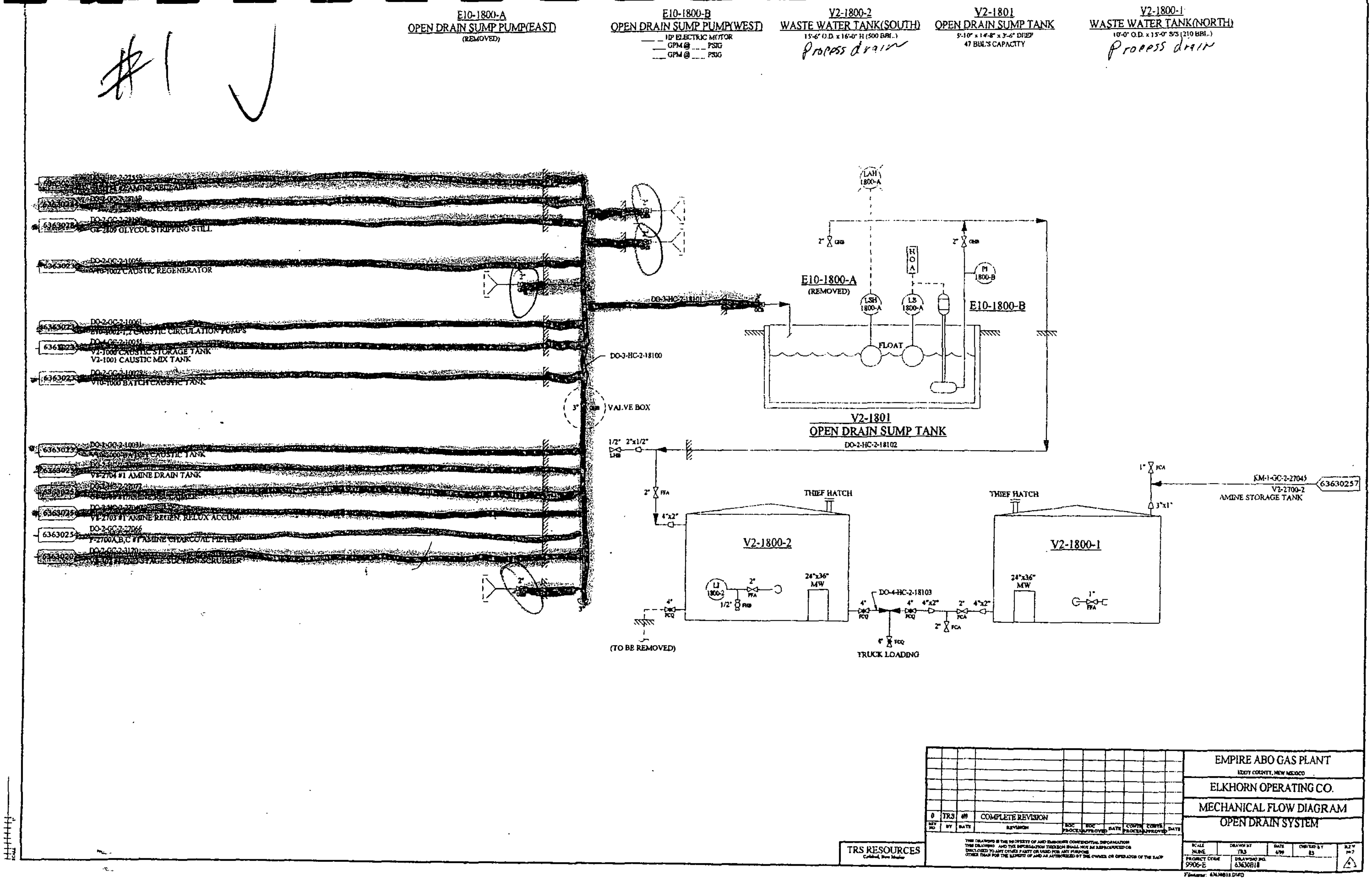


[redacted]
E10-2500-2
ACID GAS KNOCK OUT PUMP(SOUTH)
1 HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
3450 RPM
E10-2500-1
ACID GAS KNOCK OUT PUMP(NORTH)
1 1/2 HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
3450 RPM
V8-[redacted]
ACID GAS SCRUBBER
24" O.D. x 10'-0" S/F
50 PSIG @ 250°F
4.2 PSIG @ 80°F
[redacted]
ELECTRIC COMB[redacted] AIR BL[redacted]ORTH)
40 HP ELECTRIC MOTOR
875 SCFM @ 12 PSIG
875 SCFM @ 12 PSIG
3450 RPM
[redacted]IC COM[redacted] AIR B[redacted]OUTH)
60 HP ELECTRIC MOTOR
1350 SCFM @ 12 PSIG
1350 SCFM @ 12 PSIG
3450 RPM
[redacted] TURB[redacted]BUSTION AIR BLOWER
1675 SCFM @ 6.5 PSIG
___ GPM @ ___ PSIG
63630261
GS-6-HC-2-27536
V8-2772
#2 AMINE REFLUX ACCUM.
63630256
GS-6-HC-2-27038
V8-2703
#1 AMINE REFLUX ACCUM.
USD-21
SET @
GS-6-HC-2-25000
G10-2580 MUFFLE FURNACE
63630263
NOTE:
BOTTOM 3'-0";
LG & LC INSULATED
V8-2580
H-1-HC-2-25001
H-1-HC-2-25003
H-1/2-HC-2-25005
H-1 1/2-HC-2-25002
H-1-HC-2-25006
E10-2500-2
E10-2500-1
ON
OFF
START/STOP
H-1 1/2-GC-2-17051
V8-1700-2B BOILER FUEL GAS SCRUBBER
63630226
GM-1-HC-2-27073
V8-2703 #1 AMINE REFLUX ACCUMULATOR
63630256
H-1-HC-2-25004
FLARE
63630B21
AU-1-FB-2-25011
G10-2580 MUFFLE FURNACE
63630263
V8-2580	
LSHH	60"
LT	24"
HD. SEAM	32"
STAND PIPE
OUT OF SERVICE
TO ATMOS
AU-8-FB-2-25007
DESURGER
SET @ 80 PSIG
GOVERNOR
E8-2500-2
E8-2500-1
E8-2500-3
AU-8-FB-2-25008
AU-8-FB-2-25009
SET @ RATIO
SET @ 2 PSIG
SET @ 6.5 PSIG
AU-8-FB-2-25007
G10-2580 MUFFLE FURNACE
63630263
TRIM AIR
AIC-2505
63630265
AU-8-FB-2-25010
SET @ PSIG
SET @ 15 PSIG
OLD SULFUR BOILER
(OUT OF SERVICE)
C-1-FB-2-15534
S-8-FC-2-15028
S-3/4-FC-2-15029
STEAM TRACING
63630B02
S-8-FC-2-15025
HIGH PRESSURE STEAM
63630B02
S-8-FC-2-15027
LOW PRESSURE STEAM
C-1/2-FB-2-15535
STEAM TRACING
63630B02
C-1/4-FB-2-15536
HIGH PRESSURE STEAM
C-3/4-FB-2-15537
STEAM TRACING
CORROSION INHIBITOR
(DRIP LEG)
C-1-FB-2-15538
LOW PRESSURE CONDENSATE
63630293
S-1-FC-2-15026
STEAM TRACING
S-6-FC-2-15027
G2-2580 WASTE HEAT BOILER/CONDENSER
63630263
0 | TRS | 3/99 | COMPLETE REVISION
TRS RESOURCES
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
SULFUR RECOVERY UNIT
SCALE NONE
DRAWN BY TRS
DATE 3/99
CHECKED BY RS
PROJECT CODE 9906-E
DRAWING NO. 63630262
Filename: 63630262.DWG



V2-1800
EVAPORATION TANK
SIZE: 90' x 280' x 35"
PIT PUMP
___ HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
10'-0" O.A. x 15'-0" HIGH
___ PSIG @ ___ °F
___ PSIG @ ___ °F
20 HP ELECTRIC MOTOR
88 GPM @ ___ PSIG
___ GPM @ ___ PSIG
63630206 WW-6-FB-52-13521 G8-2772-B #2 AMINE AFTER COOLER/FRAME PLATE
63630206 WW-4-FB-2-13502 G8-371-B #2 1ST STG. DISCH. TRIM COOLER
63630206 WW-6-FB-2-13500 G8-301-1 #1 1ST STG. DISCH. COOLER
63630206 WW-6-FB-2-13501 G8-301-2 #1 1ST STG. DISCH. COOLER
63630209 WW-6-FB-2-13503 G8-303-1 #1 2ND STG. DISCH. COOLER
63630209 WW-6-FB-2-13504 G8-303-2 #1 2ND STG. DISCH. COOLER
63630212 WW-4-FB-2-13505 G8-304-1 #1 3RD STG. DISCH. COOLER
63630212 WW-6-FB-2-13506 G8-304-2 #1 3RD STG. DISCH. COOLER
63630253 WW-6-FB-2-13509 G8-2702-2A #1 AMINE AFTER COOLER
63630253 WW-6-FB-2-13510 G8-2702-2B #1 AMINE AFTER COOLER
63630256 WW-2-FB-2-13520 G8-2702-B #1 AMINE REFLUX AFTERCOOLER
63630238 WW-6-FB-2-13515 G8-621-1 #2 DEPROP. O.H. CONDENSER
63630238 WW-6-FB-2-13516 G8-621-2 #2 DEPROP. O.H. CONDENSER
63630282 WW-8-FB-2-13512 G8-2957-B PROPANE REFRIG. COOLER
63630282 WW-8-FB-2-13513 G8-2958-B PROPANE REFRIG. COOLER
63630227 WW-4-FB-2-13511 G8-615 DEETHANIZER BOTTOMS COOLER
63630242 WW-6-FB-2-13518 G8-631-1 DEBUT. O.H. CONDENSER
63630242 WW-6-FB-2-13519 G8-631-2 DEBUT. O.H. CONDENSER
63630240 WW-6-FB-2-13517 G8-620-1 #1 DEDROP. O.H. CONDENSER
63630297 DS-4-FC-2-15117 BOILERS STANDPIPE
(OUT OF SERVICE)
1"PVC
6"PVC
OLD EDR BUILDING (OUT OF SERVICE)
63630262 C-4-FB-2-15540 WASTE HEAT BOILER/CONDENSER
8"x6"
WW-1-FB-2-13514
G8-1003 CAUSTIC REGEN. O.H. CONDENSER
63630236
WW-4-FB-2-13544
G8-304-3 #1 3rd STG. DISCH. COOLER
63630212
WW-8-FB-2-13522
V2-1800
V2-1304
24"x36" MW
LG 1304
LIC 1304
FIQ 1304
PI 1304
PSH 1304
SET @ ___ PSIG
WW-3-FB-2-13532
WW-2-FB-2-13533
WATER INJECTION
ON
OFF
H O A
E10-1304
WW-2-FB-2-13523
E10-1301-1A-4A COOLING TOWER PUMPS
63630B07
WW-2-FB-2-13531
WW-3-FB-2-13530
PVC
STEEL
E10-1303
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
EVAPORATION TANK
0 TRS COMPLETE REVISION
TRS RESOURCES
SCALE NONE
DRAWN BY TRS
CHECKED BY RS
PROJECT CODE 9906-E
DRAWING NO. 63630B19


[redacted]
FLARE KNOCKOUT DRUM
48" O.D. x 18'-0" S/S
ATMOS. PSIG @ AMB.°F
ATMOS. PSIG @ AMB.°F
V8-2302
FLARE KNOCKOUT DRUM
5'-0" O.D. x 14'-0" S/S
ATMOS. PSIG @ AMB.°F
ATMOS. PSIG @ AMB.°F
NORTH FLARE
18" O.D. x ___ HIGH
___ PSIG @ ___ °F
___ PSIG @ ___ °F
SOUTH FLARE
18" O.D. x ___ HIGH
___ PSIG @ ___ °F
___ PSIG @ ___ °F
FLARE SUMP TANK
7'-2" x 7'-11" x 6'-0" HIGH
60 BBLS.
FLARE KNOCK OUT DRAIN PUMP (EAST)
2 HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
FLARE KNOCK OUT DRAIN PUMP (WEST)
2 HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
63630278 GS-2-HC-2-3056 E4-309 COMPRESSOR
63630028 GM-2-GC-2-28123 E4-2800-1 REGEN SUNDYNE COMPRESSOR
63630022 H-1-GD-2-6015 E10-600-1B,2B DEETHANIZER FEED PUMPS
63630219 GM-8-GC-2-29053 CRYOGENIC SKID RELIEF HEADER
63630273 GM-6-GC-2-29030 E4-351,352,353 COMPRESSORS
2" OLD LIQUID DEHYDRATORS
63630B20 GM-6-GC-2-18005 V2-1803 CLOSED DRAIN HEADER TANK
63630228 GM-4-GC-2-6022 V8-610 DEETHANIZER FEED TANK
63630212 GM-4-GC-2-3185 G8-304-1,2 3RD STAGE DIS. COOLERS
63630222 GM-4-GC-2-23063 G8-2300-2 2ND STAGE RESIDUE COOLER
63630202 GM-10-HC-2-2033 V8-271 #2 INLET SCRUBBER
63630214 GT-1/4-GC-2-2800 MAH-2800
63630214 GM-1-GC-2-28035 V10-2800-1,2 GAS DEHYDRATORS
63630215 GM-2-GC-2-28049 V10-3001-1,2 LIQUID DEHYDRATORS
GM-8-GC-2-3180 INJECTION COMPRESSORS
63630261 GM-6-HC-2-27537 V8-2772 #2 AMINE REFLUX ACCUMULATOR
63630262 H-1-HC-2-25004 E10-2500-1,2 ACID GAS K.O. PUMPS
63630236 GM-2-GC-2-10038 G8-1003 CAUSTIC REGENERATION O.H. CONDENSER
63630243 GM-3-GC-2-10104 V10-1062-1,2 PROPANE DRYERS
63630233 GM-4-GC-2-10065 V10-1001 CAUSTIC CONTACTOR
63630233 GM-3-GC-2-10022 V10-1000 BATCH CAUSTIC TANK
63630228 GM-4-GC-2-6043 V10-610 DEETHANIZER TOWER
63630229 GM-3-GC-2-29064 G8-614 DEETHANIZER O.H. CONDENSER
63630267 GS-8-HC-2-3021 E4-301 - E4-308 COMPRESSORS
63630201 GM-12-HC-2-2082 V8-201 #1 INLET SCRUBBER
63630256 GM-6-HC-2-27039 V8-2703 #1 AMINE REFLUX ACCUMULATOR
63630282 GM-4-GC-2-29058 V8-2953 PROPANE REFRIG. ACCUMULATOR
63630223 GM-2-GC-2-17027 V8-1700-1A FUEL GAS SCRUBBER
63630282 GM-3-GC-2-29057 G8-2957-B, G8-2958-B PROPANE REFRIG. COOLERS
63630280 GM-4-GC-2-3311 E4-1200-1,2 COMPRESSORS
63630231 GT-4-GC-2-10008 V8-612 ETHANE PRODUCT SCRUBBER
63630281 RP-4-GC-2-29020 V8-2952-B 2ND STAGE REFRIG. SCRUBBER
63630267 RP-4-GC-2-29018 E4-201 - E4-205 COMPRESSORS
63630226 GG-3/4-GC-2-17039 V8-1700-1A FUEL GAS SCRUBBER
63630277 GT-6-GD-2-23012 FROM 1ST STG. RESIDUE SUCTION HEADER
63630B26 GW-4-HC-2-XXXXX FROM REGEN GAS CHILLER
GM-10-HC-2-29067
GM-10-HC-2-2039
GM-12-HC-2-2040
GM-12-HC-2-3181
GM-14-HC-2-3182
GG-3/4-GC-2-17055
DH-1 1/2-HC-2-2042
DH-4-HC-2-2041
DH-4-HC-2-3183
V8-2301
D-2301
V8-2302
D-2302
18"MW
63630287 DH-3-HC-2-18227 V2-1104-B CLEAN SLOP OIL TANK
DH-2-HC-2-18228
E10-1802-1
E10-1802-2
PI 1802-1
PI 1802-2
LC 1802-1
LC 1802-2
ON OFF
FLOAT
STEEL LINED CONCRETE TANK
P-TRAP
V2-1802
FLARE SUMP TANK
63630242
COMPLETE REVISION
TRS RESOURCES
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
FLARE SYSTEM
9906-E
63630B21
#5


#1
E10-1800-A
OPEN DRAIN SUMP PUMP(EAST)
(REMOVED)
E10-1800-B
OPEN DRAIN SUMP PUMP(WEST)
10' ELECTRIC MOTOR
GPM @ PSIG
GPM @ PSIG
V2-1800-2
WASTE WATER TANK(SOUTH)
15'-6" O.D. x 16'-0" H (500 BBL.)
Process drain
V2-1801
OPEN DRAIN SUMP TANK
5'-10" x 14'-8" x 3'-6" DEEP
47 BBL'S CAPACITY
V2-1800-1
WASTE WATER TANK(NORTH)
10'-0" O.D. x 15'-0" S/S (210 BBL.)
Process drain
GE-2809 GLYCOL STRIPPING STILL
V10-1002 CAUSTIC REGENERATOR
V2-1000 CAUSTIC STORAGE TANK
V2-1001 CAUSTIC MIX TANK
V10-1000 BATCH CAUSTIC TANK
V2-2704 #1 AMINE DRAIN TANK
V2-2703 #1 AMINE REGEN. RELUX ACCUM.
F-2700A,B,C #1 AMINE CHARCOAL FILTERS
DO-3-HC-2-18100
VALVE BOX
DO-3-HC-2-18101
E10-1800-A
(REMOVED)
E10-1800-B
FLOAT
V2-1801
OPEN DRAIN SUMP TANK
DO-2-HC-2-18102
THIEF HATCH
V2-1800-2
24"x36" MW
V2-1800-1
24"x36" MW
DO-4-HC-2-18103
TRUCK LOADING
(TO BE REMOVED)
KM-1-GC-2-27045
V2-2700-2
AMINE STORAGE TANK
63630257
0 TRS 4/99 COMPLETE REVISION
TRS RESOURCES
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
OPEN DRAIN SYSTEM
9906-E
63630818

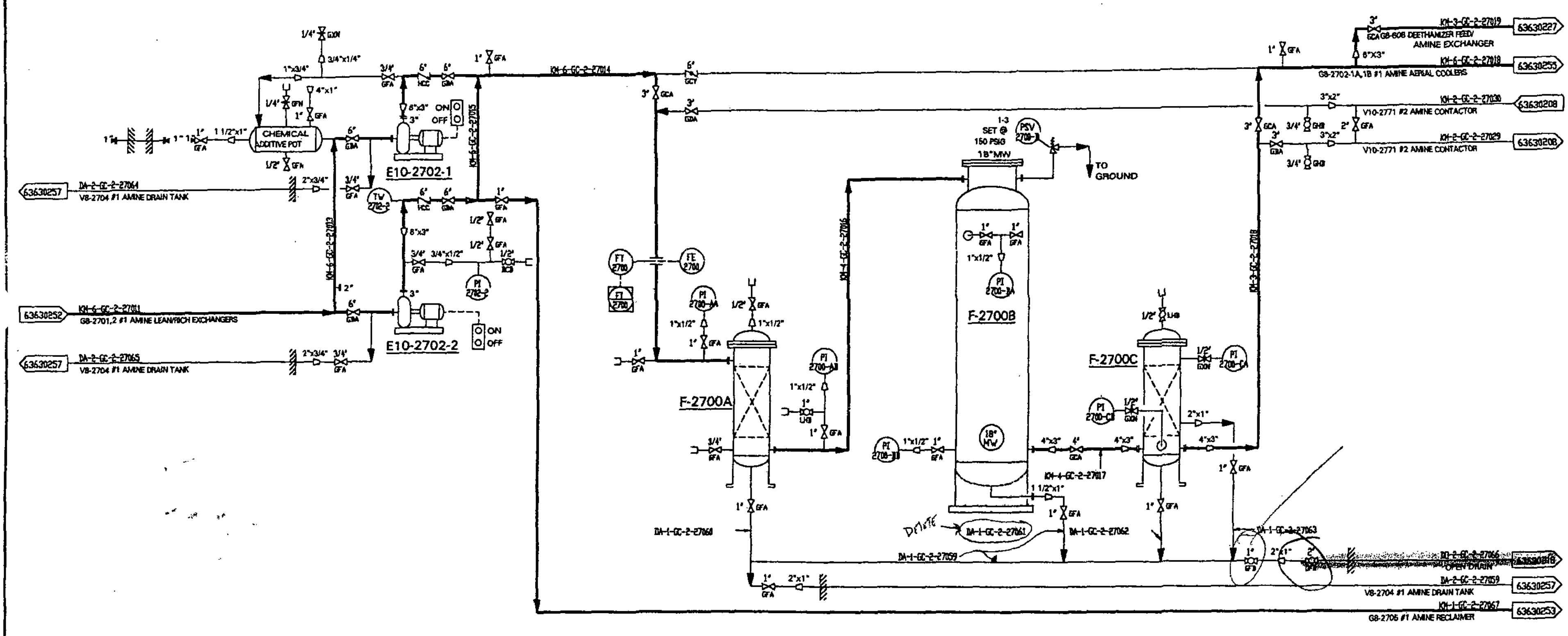
E1[redacted]
#1 AMINE CIRCULATION PUMP (EAST)
300 GPM @ 202 FT. HP
__ GPM @ __ PSIG

E10-27[redacted]
#1 AMINE CIRCULATION PUMP (WEST)
300 GPM @ 202 FT. HP
__ GPM @ 110 PSIG

[redacted]2700A
PRE-CHARCOAL FILTER
330 PSIG @ 125°F
125 PSIG @ __°F

F-[redacted]
CHARCOAL FILTER
330 PSIG @ 125°F
100 PSIG @ __°F

F-2[redacted]
AFTER-CHARCOAL FILTER
150 PSIG @ 100°F
100 PSIG @ __°F



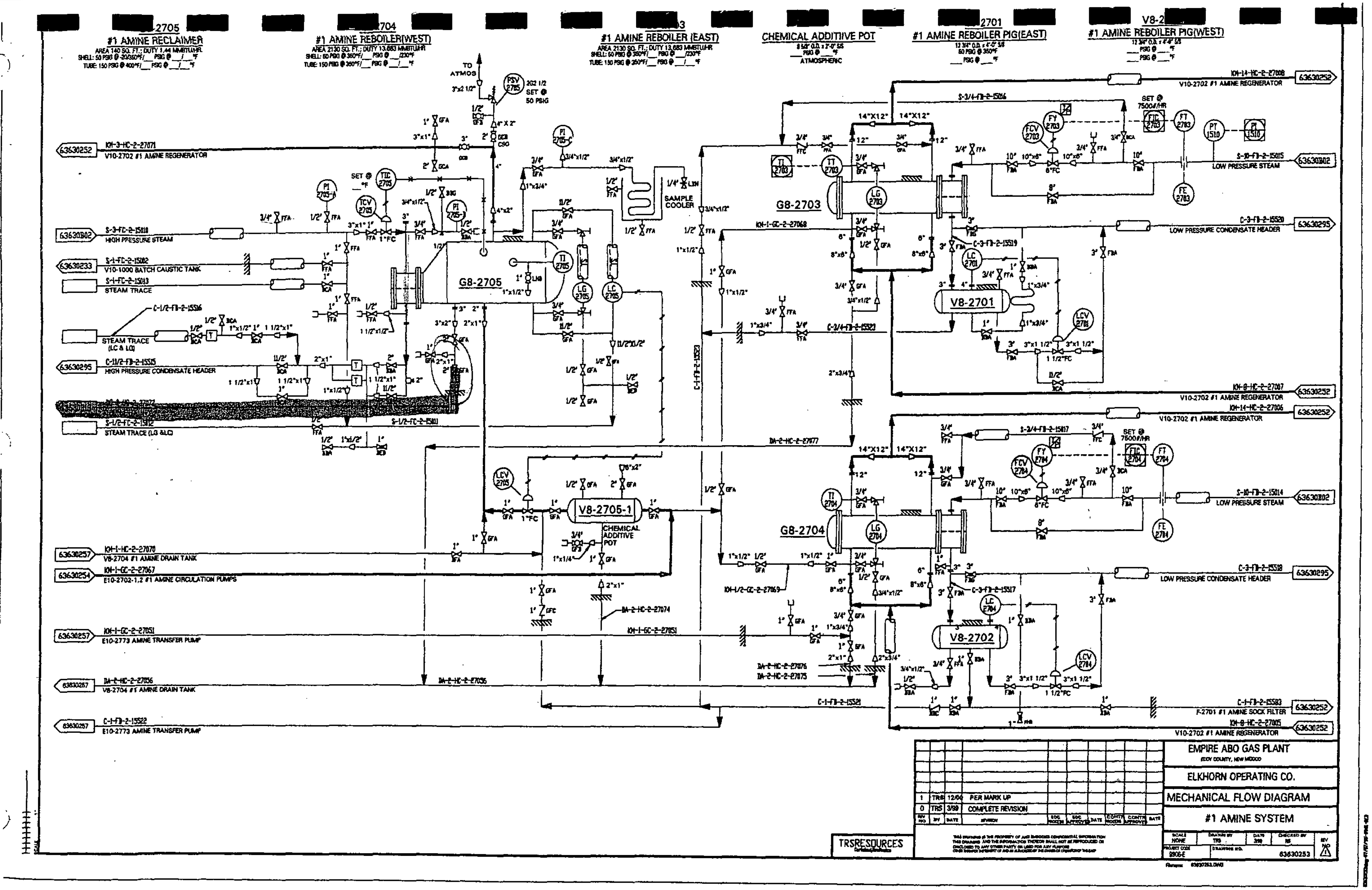
F-2700B	
HDLSEAM	48"

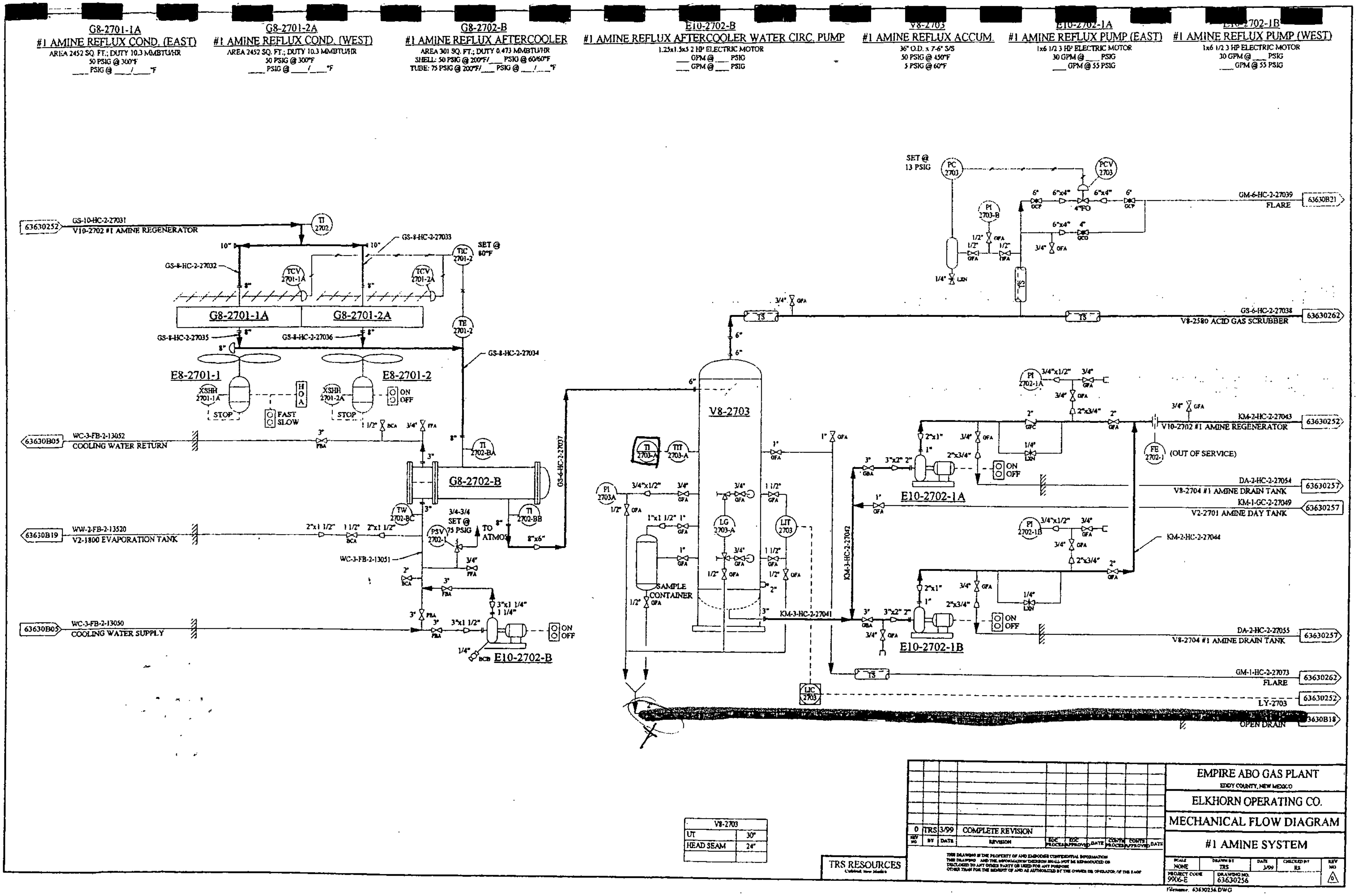
REV NO	BY	DATE	REVISION
1	TRS	12/00	PER MARK UP
0	TRS	3/99	COMPLETE REVISION

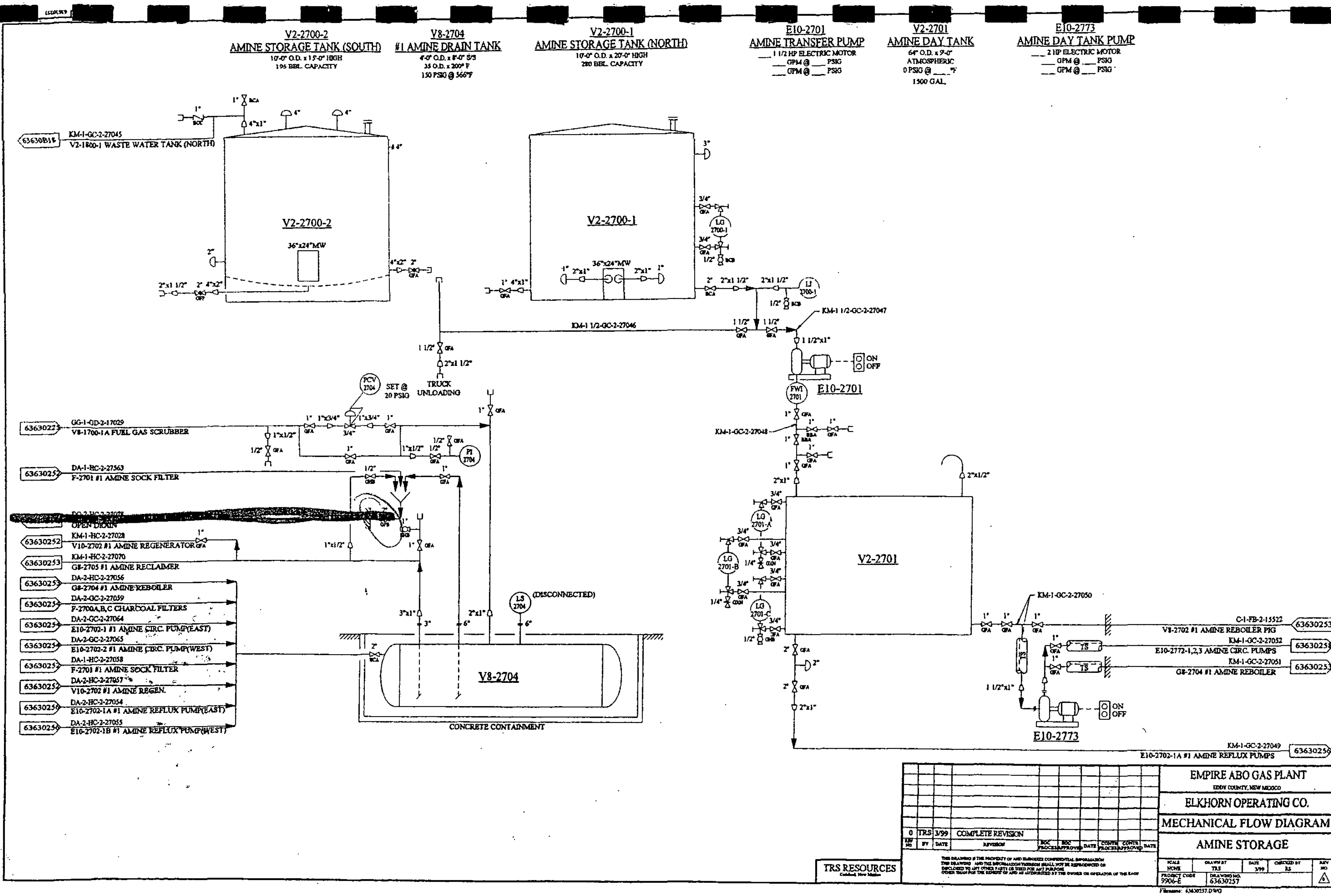
TRS RESOURCES

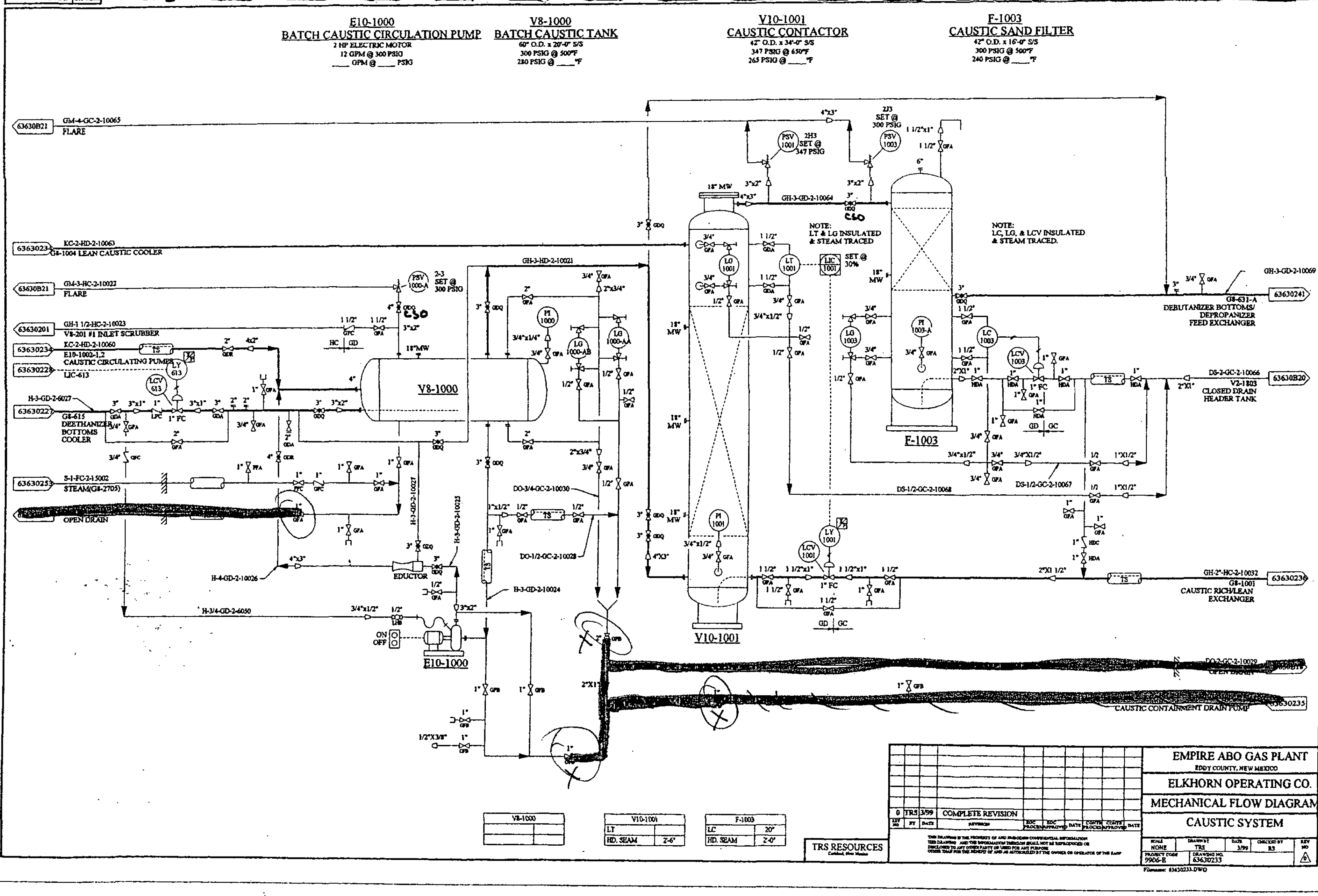
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
#1 AMINE SYSTEM

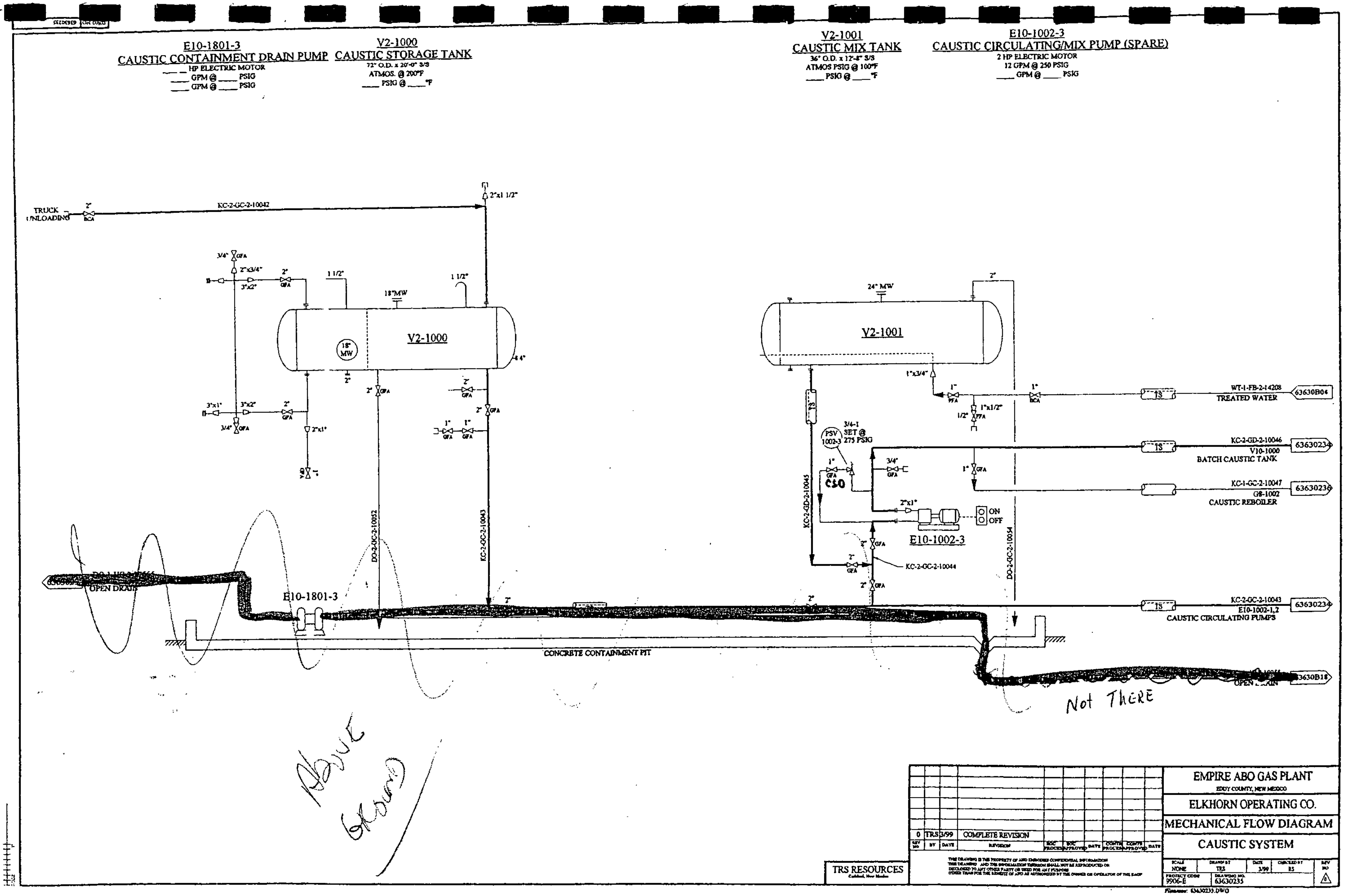
SCALE: NONE | DRAWN BY: TRS | DATE: 3/99 | CHECKED BY: RS
PROJECT CODE: S606-E | DRAWING NO. 63630254

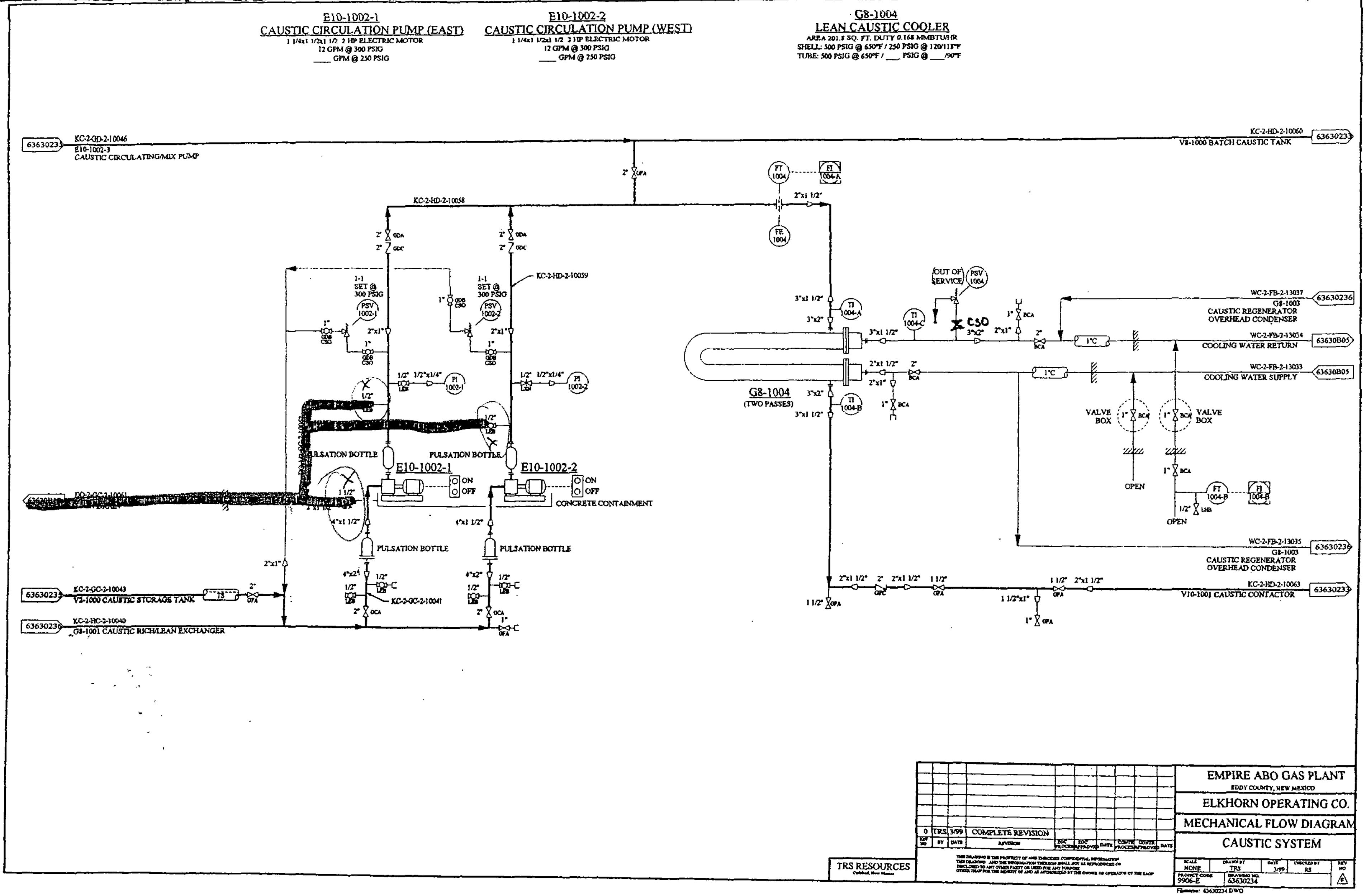

#1 AMINE RECLAIMER
#1 AMINE REBOILER(WEST)
#1 AMINE REBOILER (EAST)
CHEMICAL ADDITIVE POT
ATMOSPHERIC
#1 AMINE REBOILER PIG(EAST)
#1 AMINE REBOILER PIG(WEST)
TO ATMOS
G8-2705
G8-2703
G8-2704
V8-2701
V8-2702
V8-2705-1
CHEMICAL ADDITIVE POT
SAMPLE COOLER
V10-2702 #1 AMINE REGENERATOR
HIGH PRESSURE STEAM
V10-1000 BATCH CAUSTIC TANK
STEAM TRACE
STEAM TRACE (LC & LG)
HIGH PRESSURE CONDENSATE HEADER
STEAM TRACE (LG &LC)
V8-2704 #1 AMINE DRAIN TANK
E10-2702-1,2 #1 AMINE CIRCULATION PUMPS
E10-2773 AMINE TRANSFER PUMP
LOW PRESSURE STEAM
LOW PRESSURE CONDENSATE HEADER
F-2701 #1 AMINE SOCK FILTER
63630252
63630802
63630233
63630295
63630257
63630254
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
#1 AMINE SYSTEM
1 TRS 12/00 PER MARK UP
0 TRS 3/99 COMPLETE REVISION
TRSRESOURCES
63630253

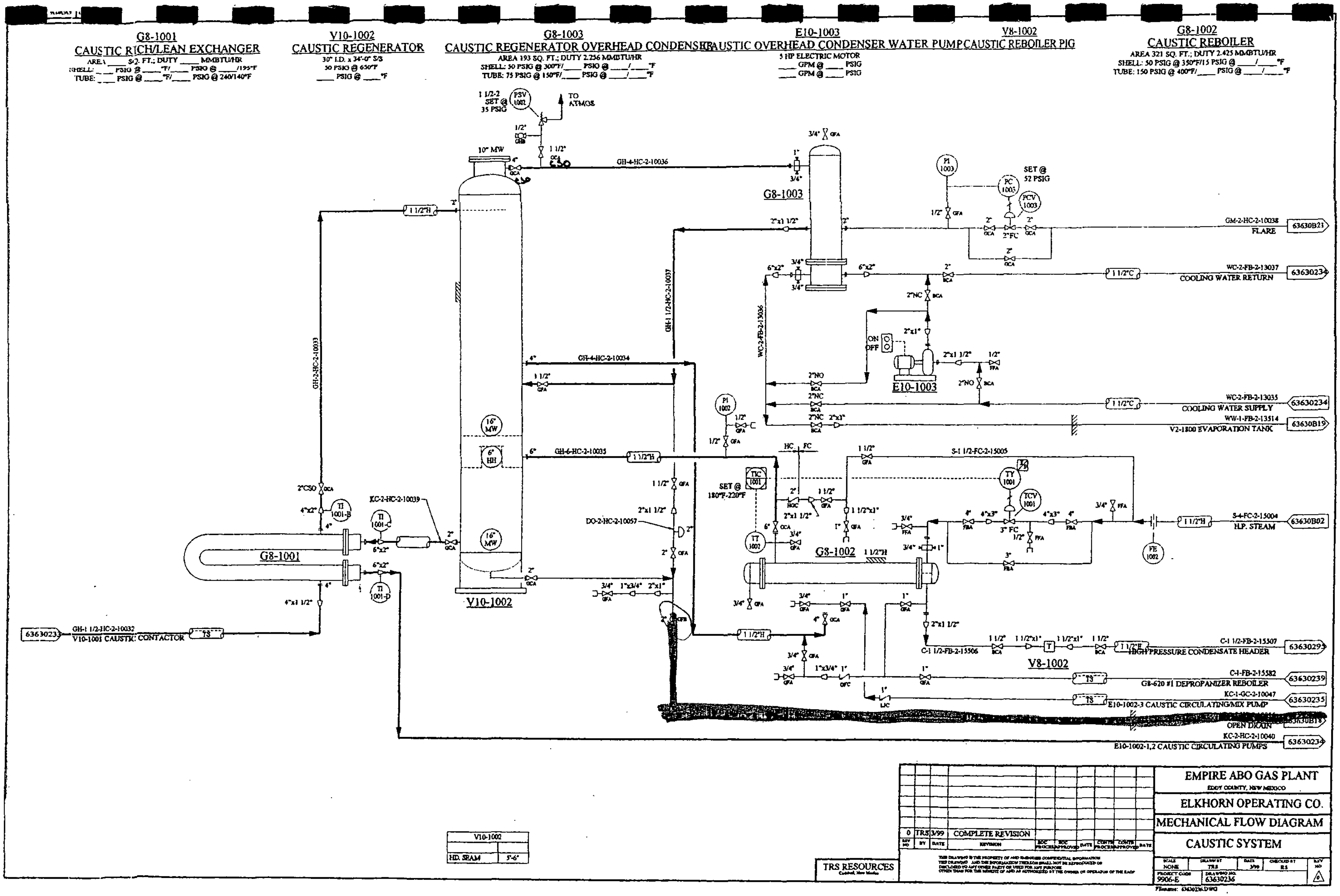

G8-2701-1A
#1 AMINE REFLUX COND. (EAST)
AREA 2452 SQ. FT.; DUTY 10.3 MMBTU/HR
50 PSIG @ 300°F
___ PSIG @ ___/___°F
G8-2701-2A
#1 AMINE REFLUX COND. (WEST)
AREA 2452 SQ. FT.; DUTY 10.3 MMBTU/HR
50 PSIG @ 300°F
___ PSIG @ ___/___°F
G8-2702-B
#1 AMINE REFLUX AFTERCOOLER
AREA 301 SQ. FT.; DUTY 0.473 MMBTU/HR
SHELL: 50 PSIG @ 200°F/___ PSIG @ 60/60°F
TUBE: 75 PSIG @ 200°F/___ PSIG @ ___/___°F
E10-2702-B
#1 AMINE REFLUX AFTERCOOLER WATER CIRC. PUMP
1.25x1.5x5 2 HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
V8-2703
#1 AMINE REFLUX ACCUM.
36" O.D. x 7'-6" S/S
50 PSIG @ 450°F
5 PSIG @ 60°F
E10-2702-1A
#1 AMINE REFLUX PUMP (EAST)
1x6 1/2 3 HP ELECTRIC MOTOR
30 GPM @ ___ PSIG
___ GPM @ 55 PSIG
E10-2702-1B
#1 AMINE REFLUX PUMP (WEST)
1x6 1/2 3 HP ELECTRIC MOTOR
30 GPM @ ___ PSIG
___ GPM @ 55 PSIG
63630252
GS-10-HC-2-27031
V10-2702 #1 AMINE REGENERATOR
63630B05
WC-3-FB-2-13052
COOLING WATER RETURN
63630B19
WW-2-FB-2-13520
V2-1800 EVAPORATION TANK
63630B05
WC-3-FB-2-13050
COOLING WATER SUPPLY
G8-2701-1A
G8-2701-2A
E8-2701-1
E8-2701-2
G8-2702-B
E10-2702-B
V8-2703
E10-2702-1A
E10-2702-1B
SAMPLE CONTAINER
SET @ 13 PSIG
SET @ 80°F
SET @ 75 PSIG
TO ATMOS
GM-6-HC-2-27039
FLARE
63630B21
GS-6-HC-2-27038
V8-2580 ACID GAS SCRUBBER
63630262
KM-2-HC-2-27043
V10-2702 #1 AMINE REGENERATOR
63630252
(OUT OF SERVICE)
DA-2-HC-2-27054
V8-2704 #1 AMINE DRAIN TANK
63630257
KM-1-GC-2-27049
V2-2701 AMINE DAY TANK
63630257
KM-2-HC-2-27044
DA-2-HC-2-27055
V8-2704 #1 AMINE DRAIN TANK
63630257
GM-1-HC-2-27073
FLARE
63630262
LY-2703
63630252
OPEN DRAIN
63630B18
V8-2703
UT 30"
HEAD SEAM 24"
0 TRS 3/99 COMPLETE REVISION
TRS RESOURCES
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
#1 AMINE SYSTEM
SCALE NONE
DRAWN BY TRS
DATE 3/99
CHECKED BY RS
PROJECT CODE 9906-E
DRAWING NO. 63630256
Filename: 63630256.DWG

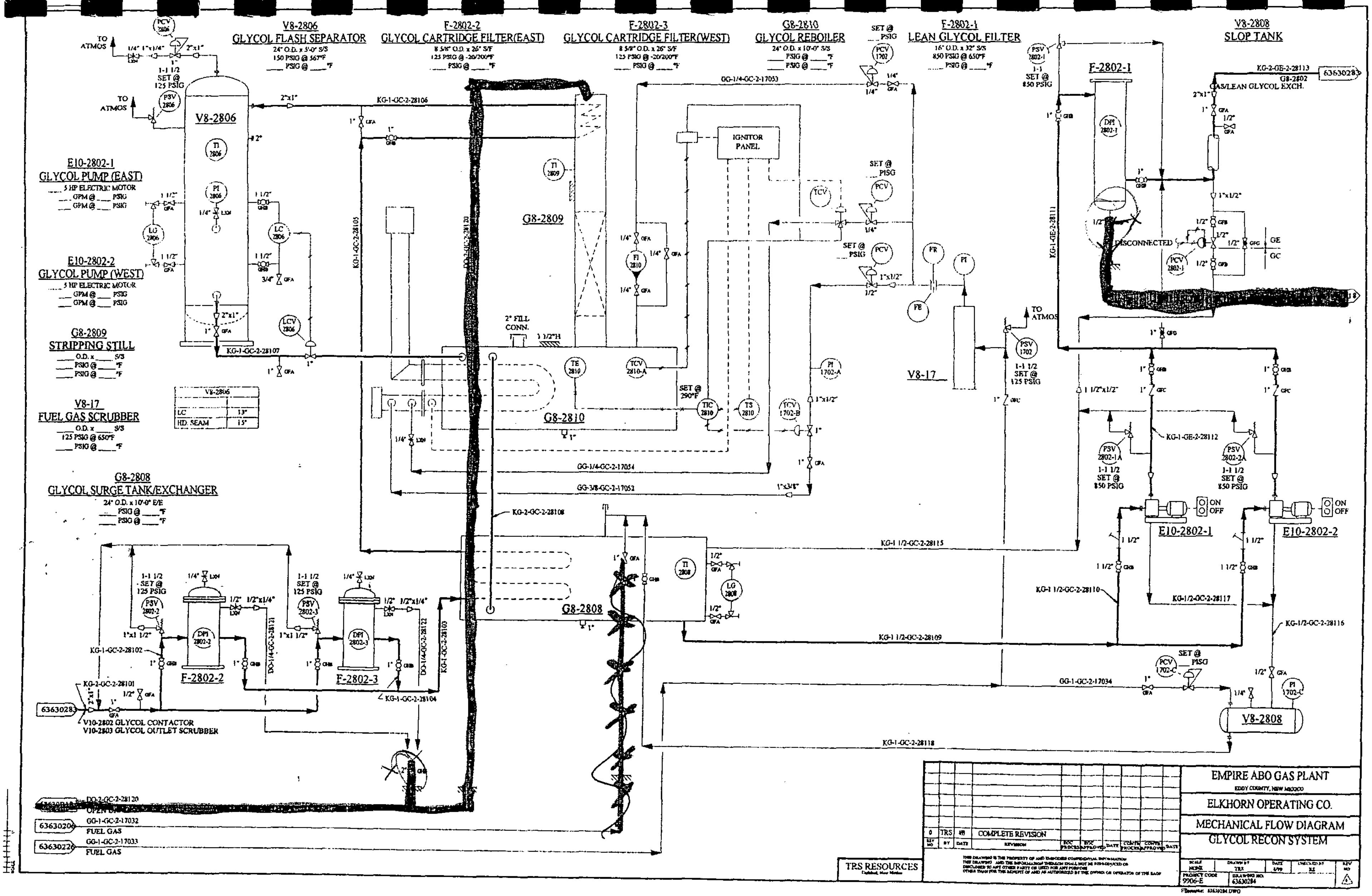

V2-2700-2
AMINE STORAGE TANK (SOUTH)
10'-0" O.D. x 15'-0" HIGH
195 BBL. CAPACITY
V8-2704
#1 AMINE DRAIN TANK
4'-0" O.D. x 8'-0" S/S
35 O.D. x 200° F
150 PSIG @ 566°F
V2-2700-1
AMINE STORAGE TANK (NORTH)
10'-0" O.D. x 20'-0" HIGH
280 BBL. CAPACITY
E10-2701
AMINE TRANSFER PUMP
1 1/2 HP ELECTRIC MOTOR
V2-2701
AMINE DAY TANK
64" O.D. x 9'-0"
ATMOSPHERIC
1500 GAL.
E10-2773
AMINE DAY TANK PUMP
2 HP ELECTRIC MOTOR
63630B18
KM-1-GC-2-27045
V2-1800-1 WASTE WATER TANK (NORTH)
V2-2700-2
36"x24"MW
V2-2700-1
36"x24"MW
KM-1 1/2-GC-2-27046
KM-1 1/2-GC-2-27047
TRUCK UNLOADING
PCV 2704
SET @ 20 PSIG
E10-2701
FWI 2701
KM-1-GC-2-27048
63630223
GG-1-GD-2-17029
V8-1700-1A FUEL GAS SCRUBBER
PI 2704
63630252
DA-1-HC-2-27563
F-2701 #1 AMINE SOCK FILTER
OPEN DRAIN
63630252
KM-1-HC-2-27028
V10-2702 #1 AMINE REGENERATOR
63630253
KM-1-HC-2-27070
G8-2705 #1 AMINE RECLAIMER
63630253
DA-2-HC-2-27056
G8-2704 #1 AMINE REBOILER
63630254
DA-2-GC-2-27059
F-2700A,B,C CHARCOAL FILTERS
63630254
DA-2-GC-2-27064
E10-2702-1 #1 AMINE CIRC. PUMP(EAST)
63630254
DA-2-GC-2-27065
E10-2702-2 #1 AMINE CIRC. PUMP(WEST)
63630252
DA-1-HC-2-27058
F-2701 #1 AMINE SOCK FILTER
63630252
DA-2-HC-2-27057
V10-2702 #1 AMINE REGEN.
63630256
DA-2-HC-2-27054
E10-2702-1A #1 AMINE REFLUX PUMP(EAST)
63630256
DA-2-HC-2-27055
E10-2702-1B #1 AMINE REFLUX PUMP(WEST)
LS 2704
(DISCONNECTED)
V8-2704
CONCRETE CONTAINMENT
V2-2701
KM-1-GC-2-27050
63630253
C-1-FB-2-15522
V8-2702 #1 AMINE REBOILER PIG
63630254
KM-1-GC-2-27052
E10-2772-1,2,3 AMINE CIRC. PUMPS
63630253
KM-1-GC-2-27051
G8-2704 #1 AMINE REBOILER
E10-2773
63630256
KM-1-GC-2-27049
E10-2702-1A #1 AMINE REFLUX PUMPS
ON
OFF
0 TRS 3/99 COMPLETE REVISION
TRS RESOURCES
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
AMINE STORAGE
SCALE NONE
DRAWN BY TRS
DATE 3/99
PROJECT CODE 9906-E
DRAWING NO. 63630257
Filename: 63630257.DWG

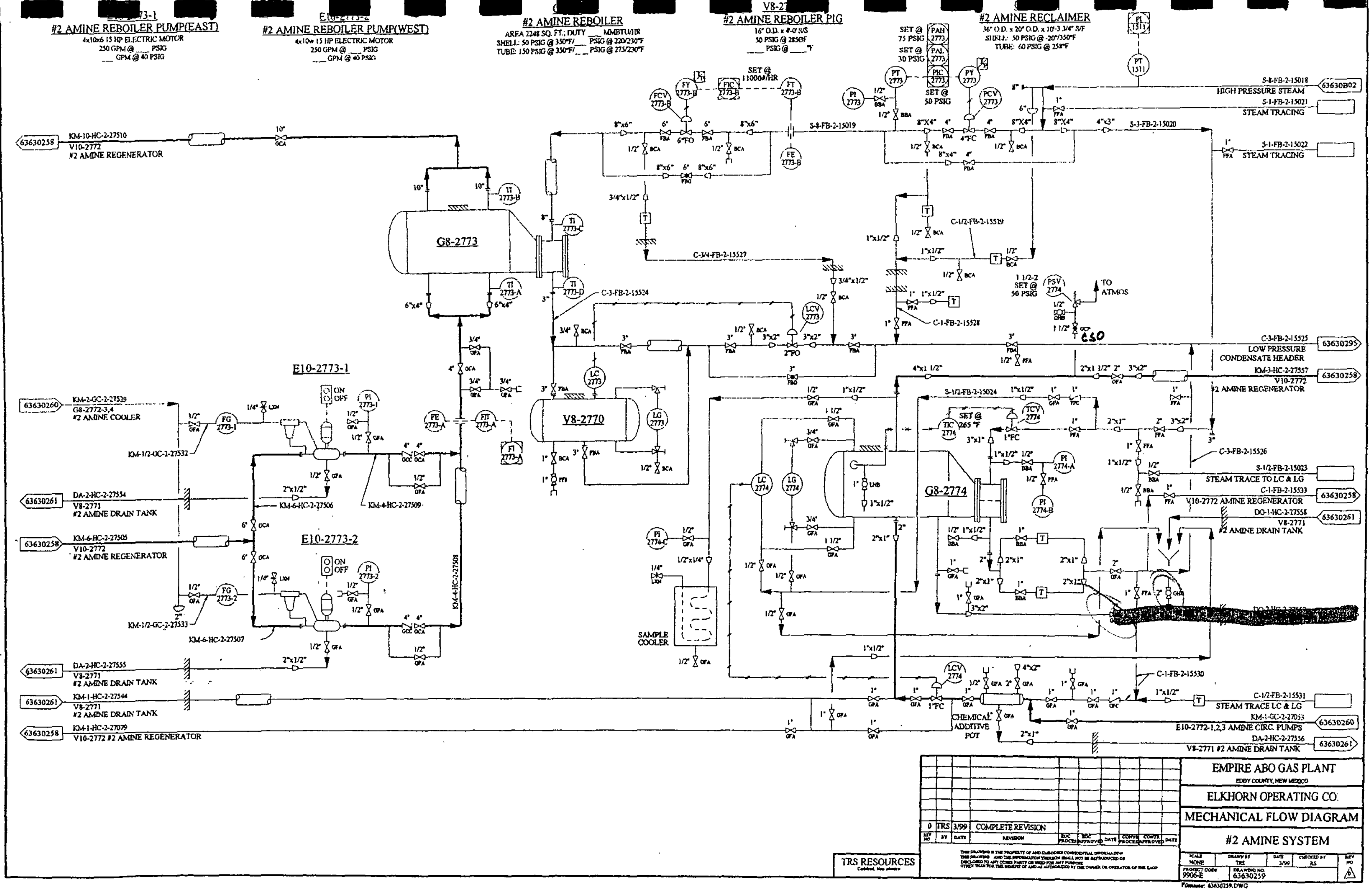

E10-1000
BATCH CAUSTIC CIRCULATION PUMP
2 HP ELECTRIC MOTOR
12 GPM @ 300 PSIG
____ GPM @ ____ PSIG
V8-1000
BATCH CAUSTIC TANK
60" O.D. x 20'-0" S/S
300 PSIG @ 500°F
280 PSIG @ ____°F
V10-1001
CAUSTIC CONTACTOR
42" O.D. x 34'-0" S/S
347 PSIG @ 650°F
265 PSIG @ ____°F
F-1003
CAUSTIC SAND FILTER
42" O.D. x 16'-0" S/S
300 PSIG @ 500°F
240 PSIG @ ____°F
63630B21
GM-4-GC-2-10065
FLARE
63630231
KC-2-HD-2-10063
G8-1004 LEAN CAUSTIC COOLER
63630B21
GM-3-HC-2-10022
FLARE
63630201
GH-1 1/2-HC-2-10023
V8-201 #1 INLET SCRUBBER
63630231
KC-2-HD-2-10060
E10-1002-1,2
CAUSTIC CIRCULATING PUMPS
63630228
LIC-613
63630227
H-3-GD-2-6027
G8-615
DEETHANIZER BOTTOMS COOLER
63630253
S-1-FC-2-15002
STEAM(G8-2705)
OPEN DRAIN
EDUCTOR
H-4-GD-2-10026
H-3/4-GD-2-6050
H-3-GD-2-10027
H-3-GD-2-10025
H-3-GD-2-10024
GH-3-HD-2-10021
DO-3/4-GC-2-10030
DO-1/2-GC-2-10028
V8-1000
E10-1000
ON
OFF
PSV 1000-A
2-3
SET @
300 PSIG
CSO
GH-3-GD-2-10064
PSV 1001
2H3
SET @
347 PSIG
PSV 1003
2J3
SET @
300 PSIG
NOTE:
LT & LG INSULATED
& STEAM TRACED
LIC 1001
SET @
30%
NOTE:
LC, LG, & LCV INSULATED
& STEAM TRACED.
V10-1001
F-1003
GH-3-GD-2-10069
G8-631-A
DEBUTANIZER BOTTOMS/
DEPROPANIZER
FEED EXCHANGER
63630241
DS-2-GC-2-10066
V2-1803
CLOSED DRAIN
HEADER TANK
63630B20
DS-1/2-GC-2-10068
DS-1/2-GC-2-10067
GH-2"-HC-2-10032
G8-1001
CAUSTIC RICH/LEAN
EXCHANGER
63630236
DO-2-GC-2-10029
OPEN DRAIN
CAUSTIC CONTAINMENT DRAIN PUMP
63630235
V8-1000
V10-1001
LT
HD. SEAM
2'-6"
F-1003
LC
20"
HD. SEAM
2'-0"
TRS RESOURCES
0 TRS 3/99 COMPLETE REVISION
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
CAUSTIC SYSTEM
SCALE NONE
DRAWN BY TRS
DATE 3/99
CHECKED BY RS
PROJECT CODE 9906-E
DRAWING NO. 63630233
Filename: 63630233.DWG

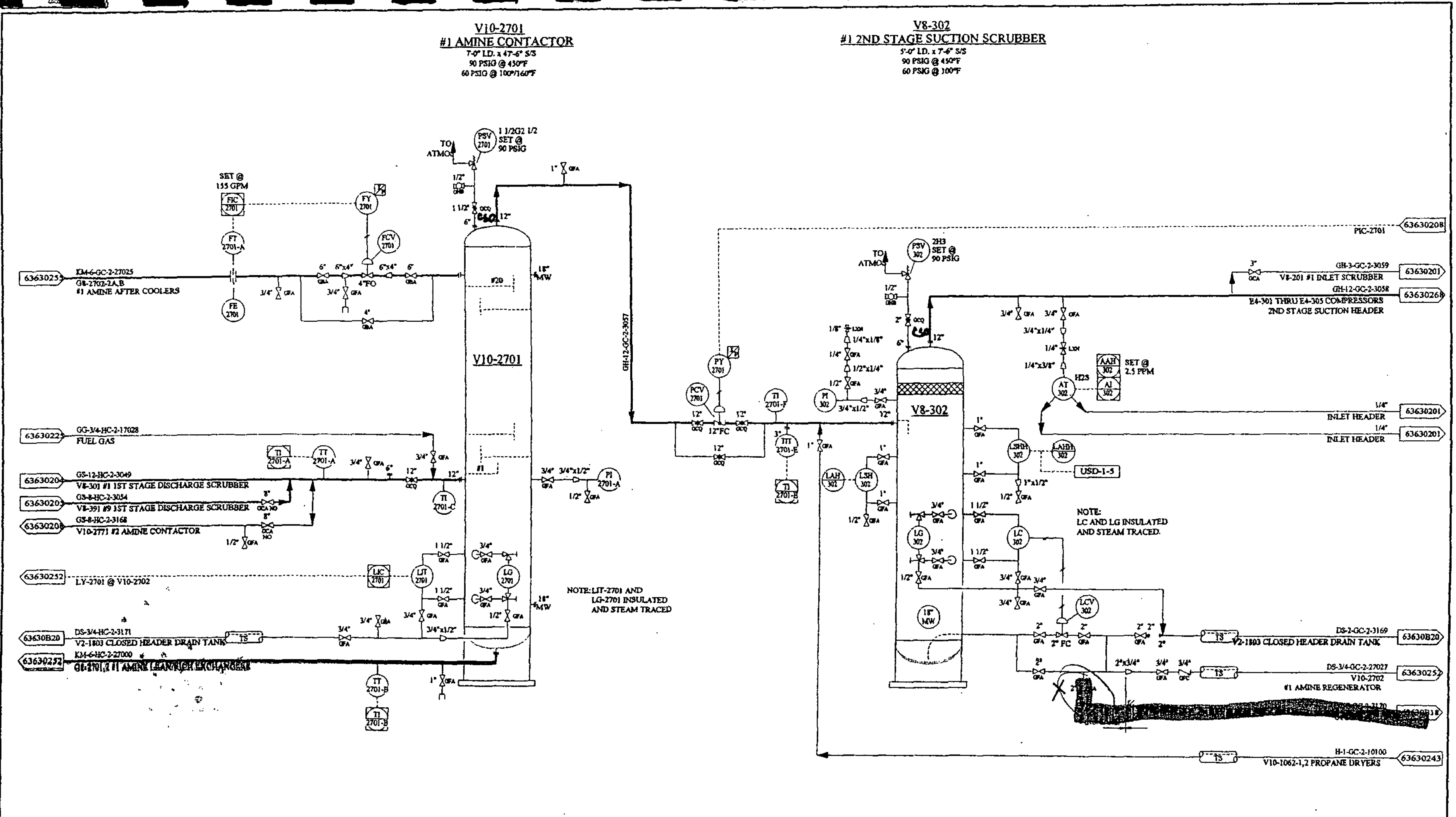

E10-1801-3
CAUSTIC CONTAINMENT DRAIN PUMP
___ HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
V2-1000
CAUSTIC STORAGE TANK
72" O.D. x 20'-0" S/S
ATMOS. @ 200°F
___ PSIG @ ___°F
V2-1001
CAUSTIC MIX TANK
36" O.D. x 12'-8" S/S
ATMOS PSIG @ 100°F
___ PSIG @ ___°F
E10-1002-3
CAUSTIC CIRCULATING/MIX PUMP (SPARE)
2 HP ELECTRIC MOTOR
12 GPM @ 250 PSIG
___ GPM @ ___ PSIG
TRUCK UNLOADING
KC-2-GC-2-10042
V2-1000
V2-1001
E10-1801-3
E10-1002-3
PSV 1002-3
3/4-1 SET @ 275 PSIG
CSO
DO-2-GC-2-10052
KC-2-GC-2-10043
KC-2-GD-2-10045
KC-2-GC-2-10044
DO-2-GC-2-10054
WT-1-FB-2-14208
TREATED WATER
63630B04
KC-2-GD-2-10046
V10-1000
BATCH CAUSTIC TANK
63630234
KC-1-GC-2-10047
G8-1002
CAUSTIC REBOILER
63630236
KC-2-GC-2-10043
E10-1002-1,2
CAUSTIC CIRCULATING PUMPS
63630234
OPEN DRAIN
63630B18
CONCRETE CONTAINMENT PIT
ON
OFF
Not There
Above Ground
0 TRS 3/99 COMPLETE REVISION
TRS RESOURCES
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
CAUSTIC SYSTEM
SCALE NONE
DRAWN BY TRS
DATE 3/99
PROJECT CODE 9906-E
DRAWING NO. 63630235
Filename: 63630235.DWG


E10-1002-1
CAUSTIC CIRCULATION PUMP (EAST)
1 1/4x1 1/2x1 1/2 2 HP ELECTRIC MOTOR
12 GPM @ 300 PSIG
___ GPM @ 250 PSIG
E10-1002-2
CAUSTIC CIRCULATION PUMP (WEST)
1 1/4x1 1/2x1 1/2 2 HP ELECTRIC MOTOR
12 GPM @ 300 PSIG
___ GPM @ 250 PSIG
G8-1004
LEAN CAUSTIC COOLER
AREA 201.8 SQ. FT. DUTY 0.168 MMBTU/HR
SHELL: 500 PSIG @ 650°F / 250 PSIG @ 120/115°F
TUBE: 500 PSIG @ 650°F / ___ PSIG @ ___/90°F
6363023
KC-2-GD-2-10046
E10-1002-3
CAUSTIC CIRCULATING/MIX PUMP
KC-2-HD-2-10060
V8-1000 BATCH CAUSTIC TANK
KC-2-HD-2-10058
KC-2-HD-2-10059
PSV 1002-1
PSV 1002-2
SET @ 300 PSIG
PI 1002-1
PI 1002-2
PULSATION BOTTLE
E10-1002-1
E10-1002-2
ON
OFF
CONCRETE CONTAINMENT
KC-2-GC-2-10043
V2-1000 CAUSTIC STORAGE TANK
KC-2-HC-2-10040
G8-1001 CAUSTIC RICH/LEAN EXCHANGER
KC-2-GC-2-10041
FT 1004
FI 1004-A
FE 1004
TI 1004-A
TI 1004-B
TI 1004-C
G8-1004
(TWO PASSES)
OUT OF SERVICE
PSV 1004
CSO
WC-2-FB-2-13037
G8-1003
CAUSTIC REGENERATOR
OVERHEAD CONDENSER
6363023б
WC-2-FB-2-13034
COOLING WATER RETURN
63630B05
WC-2-FB-2-13033
COOLING WATER SUPPLY
VALVE BOX
OPEN
FT 1004-B
FI 1004-B
WC-2-FB-2-13035
KC-2-HD-2-10063
V10-1001 CAUSTIC CONTACTOR
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
CAUSTIC SYSTEM
0 TRS 3/99 COMPLETE REVISION
TRS RESOURCES
SCALE NONE
DRAWN BY TRS
DATE 3/99
CHECKED BY RS
PROJECT CODE 9906-E
DRAWING NO. 63630234
Filename: 63630234.DWG


G8-1001
CAUSTIC RICH/LEAN EXCHANGER
V10-1002
CAUSTIC REGENERATOR
30" I.D. x 34'-0" S/S
G8-1003
CAUSTIC REGENERATOR OVERHEAD CONDENSER
AREA 193 SQ. FT.; DUTY 2.256 MMBTU/HR
E10-1003
CAUSTIC OVERHEAD CONDENSER WATER PUMP
5 HP ELECTRIC MOTOR
V8-1002
CAUSTIC REBOILER PIG
G8-1002
CAUSTIC REBOILER
AREA 321 SQ. FT.; DUTY 2.425 MMBTU/HR
TO ATMOS.
FLARE
COOLING WATER RETURN
COOLING WATER SUPPLY
V2-1800 EVAPORATION TANK
H.P. STEAM
HIGH PRESSURE CONDENSATE HEADER
G8-620 #1 DEPROPANIZER REBOILER
E10-1002-3 CAUSTIC CIRCULATING/MIX PUMP
OPEN DRAIN
E10-1002-1,2 CAUSTIC CIRCULATING PUMPS
V10-1001 CAUSTIC CONTACTOR
63630B21
63630234
63630B19
63630B02
63630293
63630239
63630235
63630233
V10-1002
HD. SEAM
5'-6"
0
TRS
3/99
COMPLETE REVISION
TRS RESOURCES
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
CAUSTIC SYSTEM
9906-E
63630236


V8-2806
GLYCOL FLASH SEPARATOR
F-2802-2
GLYCOL CARTRIDGE FILTER(EAST)
F-2802-3
GLYCOL CARTRIDGE FILTER(WEST)
G8-2810
GLYCOL REBOILER
F-2802-1
LEAN GLYCOL FILTER
V8-2808
SLOP TANK
E10-2802-1
GLYCOL PUMP (EAST)
E10-2802-2
GLYCOL PUMP (WEST)
G8-2809
STRIPPING STILL
V8-17
FUEL GAS SCRUBBER
G8-2808
GLYCOL SURGE TANK/EXCHANGER
IGNITOR PANEL
DISCONNECTED
V10-2802 GLYCOL CONTACTOR
V10-2803 GLYCOL OUTLET SCRUBBER
FUEL GAS
FUEL GAS
TRS RESOURCES
COMPLETE REVISION
EMPIRE ABO GAS PLANT
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
GLYCOL RECON SYSTEM


[redacted]
#2 AMINE REBOILER PUMP(EAST)
4x10x6 15 HP ELECTRIC MOTOR
250 GPM @ ___ PSIG
___ GPM @ 40 PSIG
[redacted]
#2 AMINE REBOILER PUMP(WEST)
4x10x6 15 HP ELECTRIC MOTOR
250 GPM @ ___ PSIG
___ GPM @ 40 PSIG
[redacted]
#2 AMINE REBOILER
AREA 2248 SQ. FT.; DUTY ___ MMBTU/HR
SHELL: 50 PSIG @ 350°F/___ PSIG @ 220/230°F
TUBE: 150 PSIG @ 350°F/___ PSIG @ 275/230°F
[redacted]
#2 AMINE REBOILER PIG
16" O.D. x 4'-0" S/S
50 PSIG @ 285°F
___ PSIG @ ___ °F
[redacted]
#2 AMINE RECLAIMER
36" O.D. x 20" O.D. x 10'-3 3/4" S/F
SHELL: 50 PSIG @ -20°/350°F
TUBE: 60 PSIG @ 258°F
G8-2773
V8-2770
G8-2774
E10-2773-1
E10-2773-2
SAMPLE COOLER
CHEMICAL ADDITIVE POT
63630258
KM-10-HC-2-27510
V10-2772
#2 AMINE REGENERATOR
63630260
KM-2-GC-2-27529
G8-2772-3,4
#2 AMINE COOLER
63630261
DA-2-HC-2-27554
V8-2771
#2 AMINE DRAIN TANK
63630258
KM-6-HC-2-27505
V10-2772
#2 AMINE REGENERATOR
63630261
DA-2-HC-2-27555
V8-2771
#2 AMINE DRAIN TANK
63630261
KM-1-HC-2-27544
V8-2771
#2 AMINE DRAIN TANK
63630258
KM-1-HC-2-27079
V10-2772 #2 AMINE REGENERATOR
S-8-FB-2-15018
HIGH PRESSURE STEAM
63630B02
S-1-FB-2-15021
STEAM TRACING
S-1-FB-2-15022
STEAM TRACING
C-3-FB-2-15525
LOW PRESSURE
CONDENSATE HEADER
63630295
KM-3-HC-2-27557
V10-2772
#2 AMINE REGENERATOR
63630258
S-1/2-FB-2-15023
STEAM TRACE TO LC & LG
C-1-FB-2-15533
V10-2772 AMINE REGENERATOR
63630258
DO-1-HC-2-27558
V8-2771
#2 AMINE DRAIN TANK
63630261
C-1/2-FB-2-15531
STEAM TRACE LC & LG
KM-1-GC-2-27053
E10-2772-1,2,3 AMINE CIRC. PUMPS
63630260
DA-2-HC-2-27556
V8-2771 #2 AMINE DRAIN TANK
63630261
TO ATMOS
CSO
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
#2 AMINE SYSTEM
0 TRS 3/99 COMPLETE REVISION
TRS RESOURCES
SCALE NONE
DRAWN BY TRS
DATE 3/99
CHECKED BY RS
PROJECT CODE 9906-E
DRAWING NO. 63630259
Filename: 63630259.DWG



V10-2701	
LC	24"
HD. SEAM	54"

V8-302	
LSH	38"
LC	20"
HD. SEAM	36"

TRS RESOURCES

REV NO	BY	DATE	REVISION
0	TRS	3/99	COMPLETE REVISION

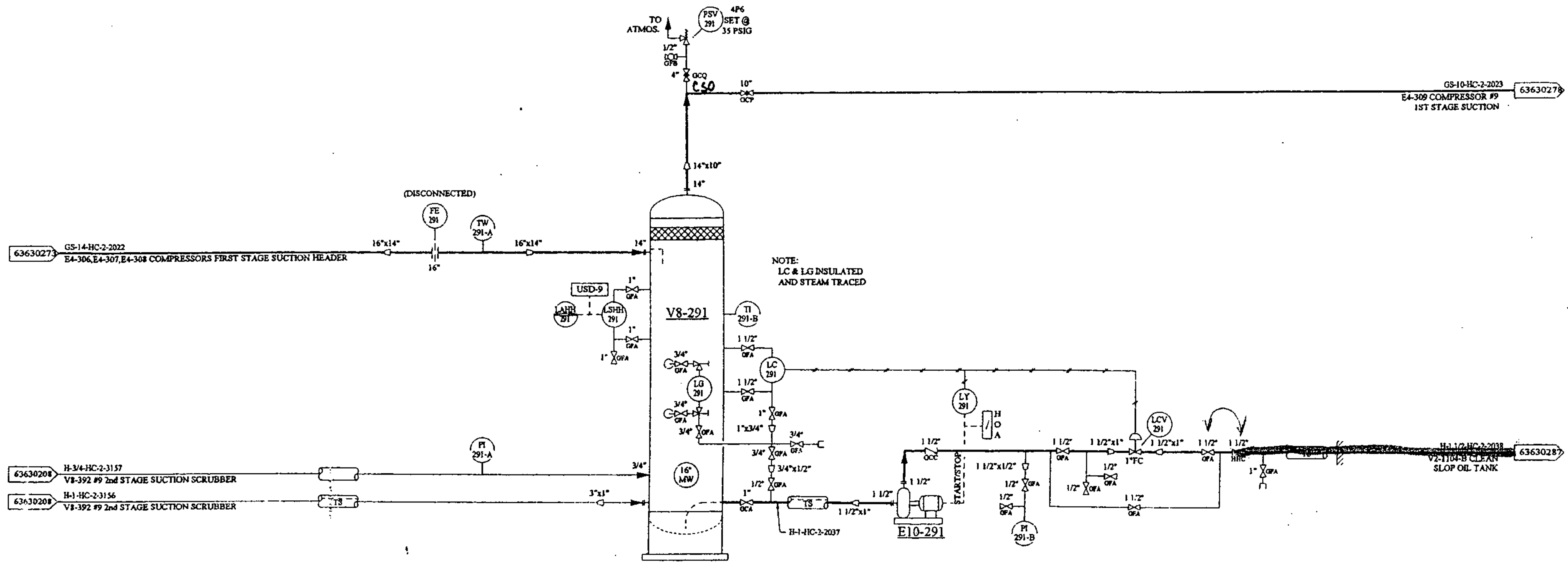
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
#1 AMINE CONTACTOR
2ND STAGE SCRUBBER

SCALE	DRAWN BY	DATE	CHECKED BY	REV NO
NONE	TRS	3/99	RB	0
PROJECT CODE 9906-E	DRAWING NO. 63630207			

Filename: 63630207.DWG

V8-291
#9 1ST STAGE SUCTION SCRUBBER
4'-0" O.D. x 8'-0" S/S
50 PSIG @ 150°F
14 PSIG @ 80°F

E10-291
#9 INLET SCRUBBER PUMP
1 1/2 x 1 1/2-5 2 HP ELECTRIC MOTOR
____ GPM @ ____ PSIG
____ GPM 50 PSIG



V8-291	
LSHH	50"
LC	28"
HD. SEAM	30"

TRS RESOURCES
Carlsbad, New Mexico

REV NO	BY	DATE	REVISION
0	TRS	2/99	COMPLETE REVISION

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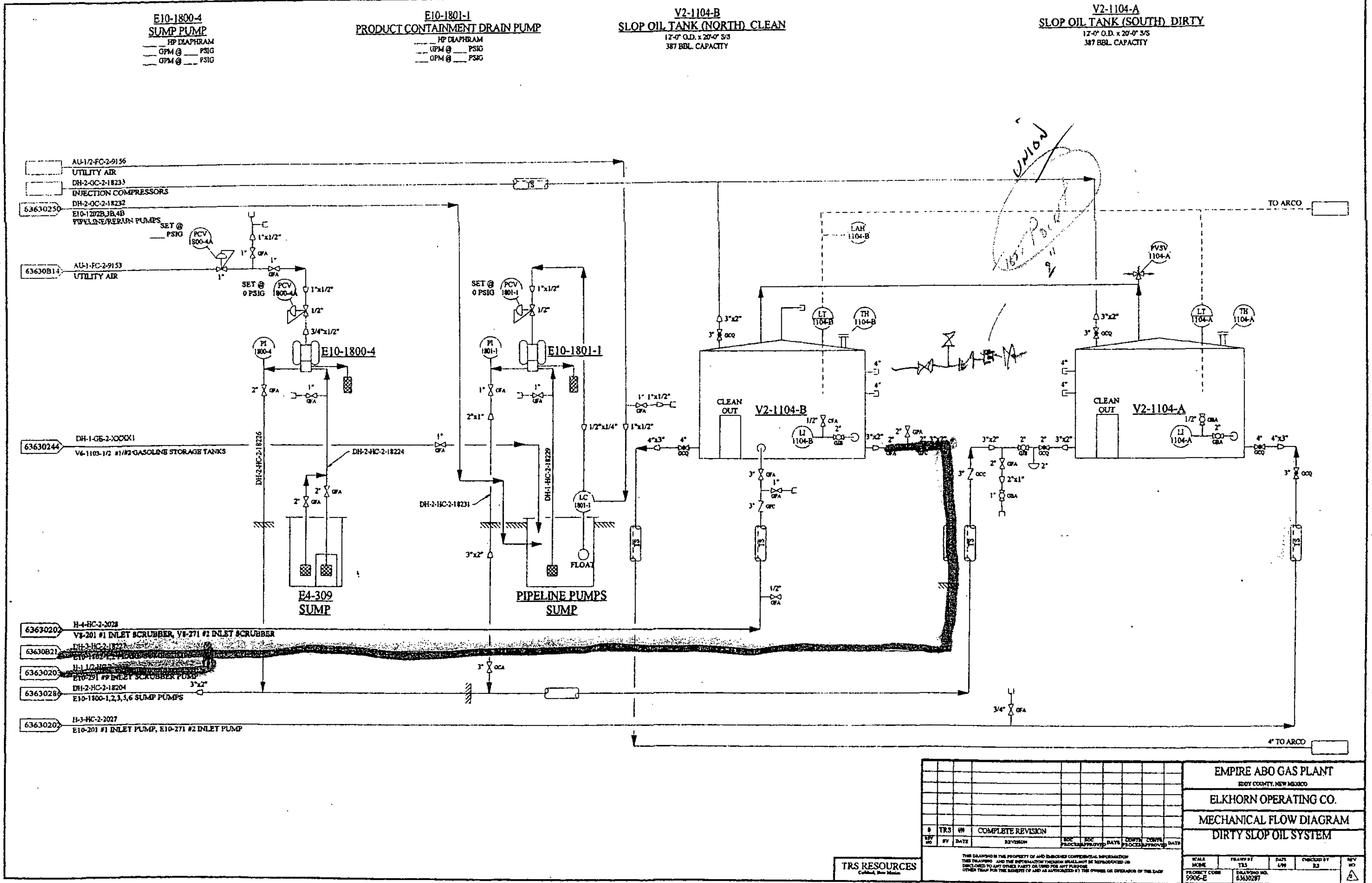
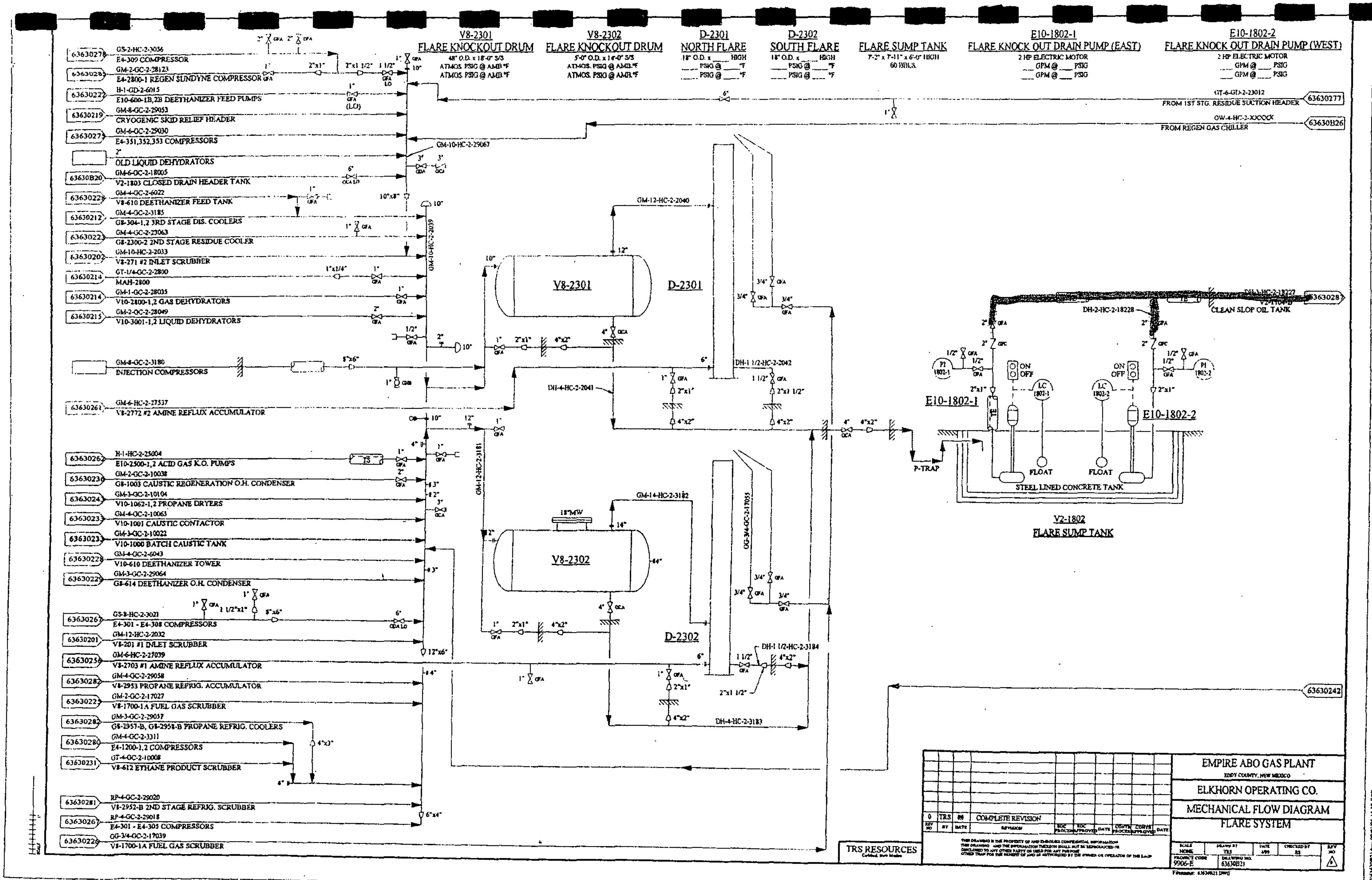
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
INLET GAS SYSTEM

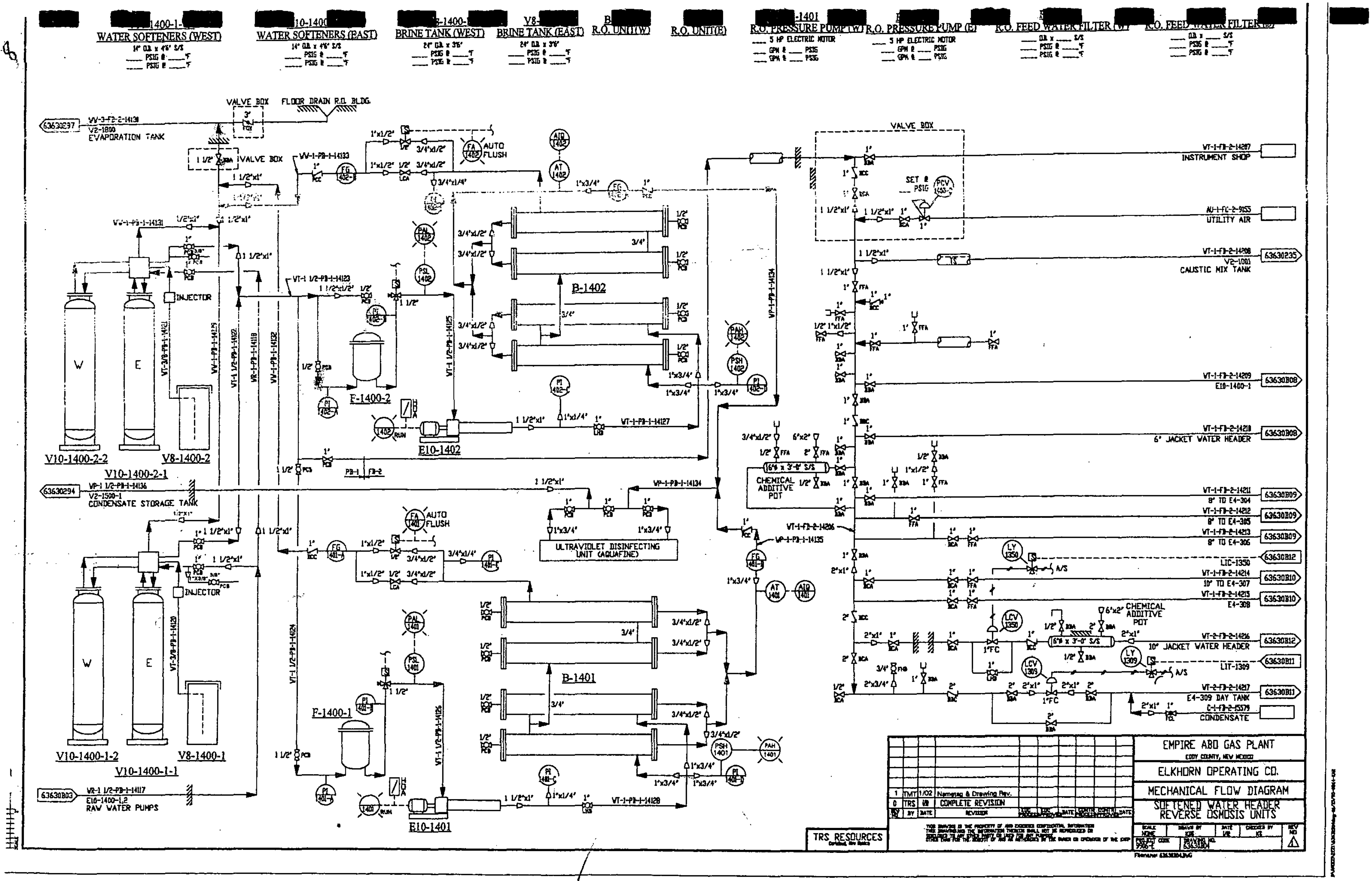
SCALE	DRAWN BY	DATE	CHECKED BY	REV NO
NONE	TRS	2/99	RS	6

PROJECT CODE: 9906-E
DRAWING NO: 63630203
Filename: 63630203.DWG

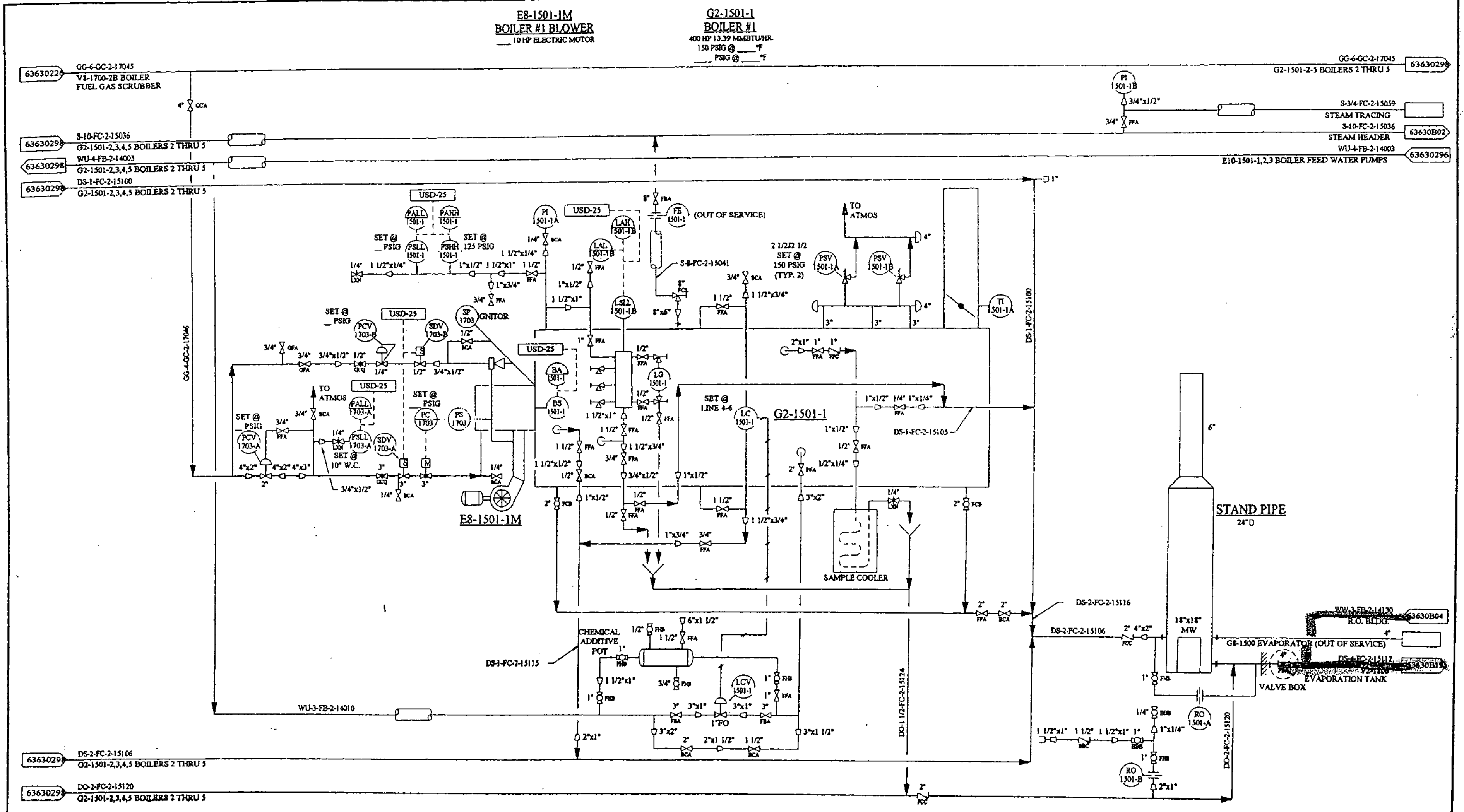

E10-1800-4
SUMP PUMP
HP DIAPHRAM
GPM @ PSIG
GPM @ PSIG
E10-1801-1
PRODUCT CONTAINMENT DRAIN PUMP
HP DIAPHRAM
GPM @ PSIG
GPM @ PSIG
V2-1104-B
SLOP OIL TANK (NORTH) CLEAN
12'-0" O.D. x 20'-0" S/S
387 BBL. CAPACITY
V2-1104-A
SLOP OIL TANK (SOUTH) DIRTY
12'-0" O.D. x 20'-0" S/S
387 BBL. CAPACITY
AU-1/2-FC-2-9156
UTILITY AIR
DH-2-GC-2-18233
INJECTION COMPRESSORS
63630250
DH-2-OC-2-18232
E10-1202B,3B,4B
PIPELINE/RERUN PUMPS
63630B14
AU-1-FC-2-9153
UTILITY AIR
63630244
DH-1-GE-2-XXXX1
V6-1103-1/2 #1/#2 GASOLINE STORAGE TANKS
63630202
H-4-HC-2-2028
V8-201 #1 INLET SCRUBBER, V8-271 #2 INLET SCRUBBER
63630B21
63630202
E10-291 #9 INLET SCRUBBER PUMP
63630286
DH-2-HC-2-18204
E10-1800-1,2,3,5,6 SUMP PUMPS
63630202
H-3-HC-2-2027
E10-201 #1 INLET PUMP, E10-271 #2 INLET PUMP
E4-309
SUMP
PIPELINE PUMPS
SUMP
FLOAT
CLEAN OUT
V2-1104-B
V2-1104-A
TO ARCO
4" TO ARCO
UNION
150 PSI
TRS RESOURCES
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
DIRTY SLOP OIL SYSTEM
COMPLETE REVISION
9906-E
63630287

#6


V8-2301
FLARE KNOCKOUT DRUM
48" O.D. x 18'-0" S/S
ATMOS. PSIG @ AMB.°F
ATMOS. PSIG @ AMB.°F
V8-2302
FLARE KNOCKOUT DRUM
5'-0" O.D. x 14'-0" S/S
ATMOS. PSIG @ AMB.°F
ATMOS. PSIG @ AMB.°F
D-2301
NORTH FLARE
18" O.D. x ___ HIGH
___ PSIG @ ___ °F
___ PSIG @ ___ °F
D-2302
SOUTH FLARE
18" O.D. x ___ HIGH
___ PSIG @ ___ °F
___ PSIG @ ___ °F
FLARE SUMP TANK
7'-2" x 7'-11" x 6'-0" HIGH
60 BBLS.
E10-1802-1
FLARE KNOCK OUT DRAIN PUMP (EAST)
2 HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
E10-1802-2
FLARE KNOCK OUT DRAIN PUMP (WEST)
2 HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
63630278 GS-2-HC-2-3056 E4-309 COMPRESSOR
63630285 GM-2-GC-2-28123 E4-2800-1 REGEN SUNDYNE COMPRESSOR
63630222 H-1-GD-2-6015 E10-600-1B,2B DEETHANIZER FEED PUMPS
63630219 GM-8-GC-2-29053 CRYOGENIC SKID RELIEF HEADER
63630273 GM-6-GC-2-29030 E4-351,352,353 COMPRESSORS
OLD LIQUID DEHYDRATORS
63630B20 GM-6-GC-2-18005 V2-1803 CLOSED DRAIN HEADER TANK
63630229 GM-4-GC-2-6022 V8-610 DEETHANIZER FEED TANK
63630212 GM-4-GC-2-3185 G8-304-1,2 3RD STAGE DIS. COOLERS
63630223 GM-4-GC-2-23063 G8-2300-2 2ND STAGE RESIDUE COOLER
63630202 GM-10-HC-2-2033 V8-271 #2 INLET SCRUBBER
63630214 GT-1/4-GC-2-2800 MAH-2800
63630214 GM-1-GC-2-28035 V10-2800-1,2 GAS DEHYDRATORS
63630215 GM-2-GC-2-28049 V10-3001-1,2 LIQUID DEHYDRATORS
GM-8-GC-2-3180 INJECTION COMPRESSORS
63630261 GM-6-HC-2-27537 V8-2772 #2 AMINE REFLUX ACCUMULATOR
63630262 H-1-HC-2-25004 E10-2500-1,2 ACID GAS K.O. PUMPS
63630236 GM-2-GC-2-10038 G8-1003 CAUSTIC REGENERATION O.H. CONDENSER
63630243 GM-3-GC-2-10104 V10-1062-1,2 PROPANE DRYERS
63630233 GM-4-GC-2-10065 V10-1001 CAUSTIC CONTACTOR
63630233 GM-3-GC-2-10022 V10-1000 BATCH CAUSTIC TANK
63630228 GM-4-GC-2-6043 V10-610 DEETHANIZER TOWER
63630229 GM-3-GC-2-29064 G8-614 DEETHANIZER O.H. CONDENSER
63630267 GS-8-HC-2-3021 E4-301 - E4-308 COMPRESSORS
63630201 GM-12-HC-2-2032 V8-201 #1 INLET SCRUBBER
63630258 GM-6-HC-2-27039 V8-2703 #1 AMINE REFLUX ACCUMULATOR
63630282 GM-4-GC-2-29058 V8-2953 PROPANE REFRIG. ACCUMULATOR
63630223 GM-2-GC-2-17027 V8-1700-1A FUEL GAS SCRUBBER
63630283 GM-3-GC-2-29057 G8-2957-B, G8-2958-B PROPANE REFRIG. COOLERS
63630280 GM-4-GC-2-3311 E4-1200-1,2 COMPRESSORS
63630231 GT-4-GC-2-10008 V8-612 ETHANE PRODUCT SCRUBBER
63630281 RP-4-GC-2-29020 V8-2952-B 2ND STAGE REFRIG. SCRUBBER
63630267 RP-4-GC-2-29018 E4-301 - E4-305 COMPRESSORS
63630226 GG-3/4-GC-2-17039 V8-1700-1A FUEL GAS SCRUBBER
GT-6-GD-2-23012 FROM 1ST STG. RESIDUE SUCTION HEADER 63630277
GW-4-HC-2-XXXXX FROM REGEN GAS CHILLER 63630B26
GM-10-HC-2-29067
GM-10-HC-2-2039
GM-12-HC-2-2040
GM-12-HC-2-3181
GM-14-HC-2-3182
GG-3/4-GC-2-17055
DH-4-HC-2-2041
DH-1 1/2-HC-2-2042
DH-1 1/2-HC-2-3184
DH-4-HC-2-3183
DH-2-HC-2-18228
DH-1-HC-2-18227
CLEAN SLOP OIL TANK 63630285
V8-2301
V8-2302
D-2301
D-2302
18"MW
E10-1802-1
E10-1802-2
ON OFF
LC 1802-1
LC 1802-2
PI 1802-1
PI 1802-2
FLOAT
STEEL LINED CONCRETE TANK
P-TRAP
V2-1802
FLARE SUMP TANK
63630242
TRS RESOURCES
Carlsbad, New Mexico
0 TRS COMPLETE REVISION
REV NO BY DATE REVISION
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
FLARE SYSTEM
SCALE NONE
DRAWN BY TRS
PROJECT CODE 9906-E
DRAWING NO. 63630B21


[redacted] 1400-1-[redacted] WATER SOFTENERS (WEST)
[redacted] 10-1400[redacted] WATER SOFTENERS (EAST)
[redacted] 8-1400-[redacted] BRINE TANK (WEST)
V8-[redacted] BRINE TANK (EAST)
B[redacted] R.O. UNIT (W)
[redacted] R.O. UNIT (E)
[redacted] -1401 R.O. PRESSURE PUMP (W)
R.O. PRESSURE PUMP (E)
R.O. FEED WATER FILTER (W)
R.O. FEED WATER FILTER (E)
VALVE BOX
FLOOR DRAIN R.O. BLDG.
63630297
V2-1800 EVAPORATION TANK
63630294
V2-1500-1 CONDENSATE STORAGE TANK
63630803
E10-1400-1,2 RAW WATER PUMPS
V10-1400-2-2
V10-1400-2-1
V8-1400-2
V10-1400-1-2
V10-1400-1-1
V8-1400-1
INJECTOR
F-1400-2
F-1400-1
E10-1402
E10-1401
B-1402
B-1401
AUTO FLUSH
ULTRAVIOLET DISINFECTING UNIT (AQUAFINE)
CHEMICAL ADDITIVE POT
INSTRUMENT SHOP
UTILITY AIR
63630235
V2-1001 CAUSTIC MIX TANK
63630808
E10-1400-1
63630908
6" JACKET WATER HEADER
63630809
8" TO E4-304
8" TO E4-305
8" TO E4-306
63630812
LIC-1350
63630810
10" TO E4-307
E4-308
10" JACKET WATER HEADER
63630811
LIT-1309
E4-309 DAY TANK
CONDENSATE
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
SOFTENED WATER HEADER
REVERSE OSMOSIS UNITS
1 TMT 1/02 Nametag & Drawing Rev.
0 TRS COMPLETE REVISION
REV. BY DATE REVISION
TRS RESOURCES
63630804

#3



0	TRS	4/99	COMPLETE REVISION							
REV NO	BY	DATE	REVISION	EOC PROCEED	EOC APPROVED	DATE	CONTR PROCEED	CONTR APPROVED	DATE	

TRS RESOURCES

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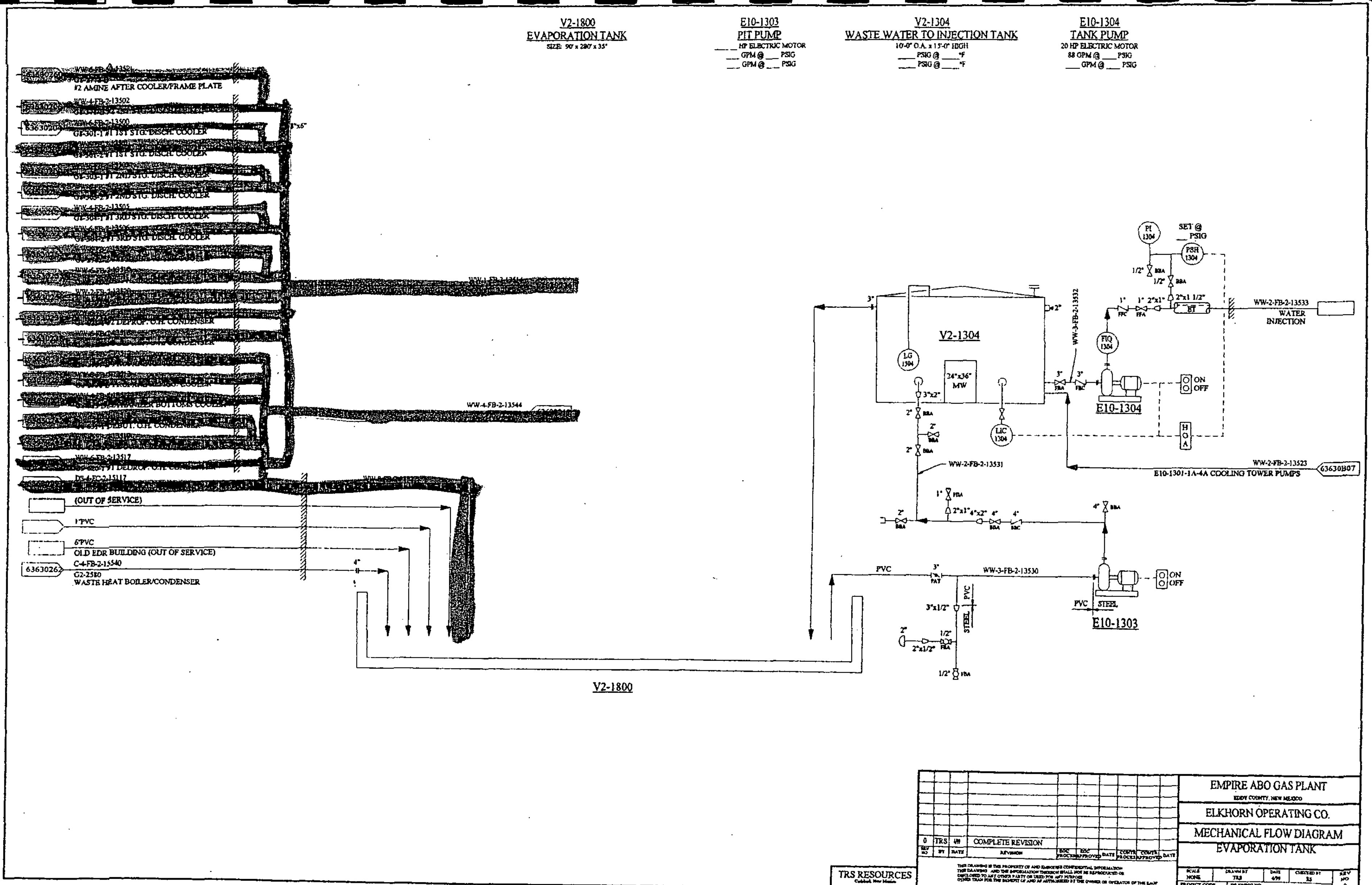
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO

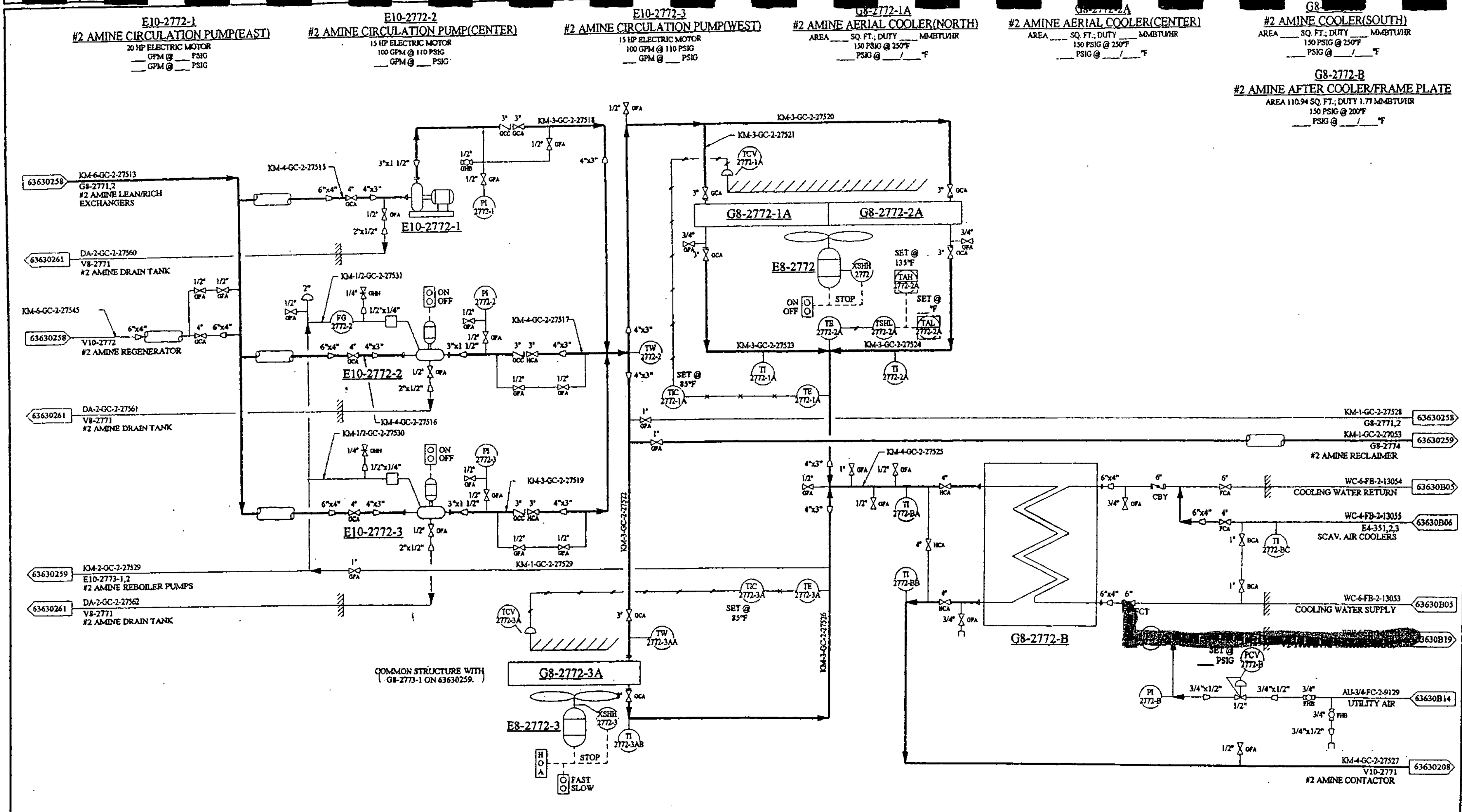
ELKHORN OPERATING CO.

MECHANICAL FLOW DIAGRAM
BOILER #1

SCALE	DRAWN BY	DATE	CHECKED BY	REV NO
NONE	TRS	4/99		
PROJECT CODE 9906-E	DRAWING NO. 63630297			

Filename: 63630297.DWG


V2-1800
EVAPORATION TANK
SIZE: 90' x 280' x 35'
E10-1303
PIT PUMP
___ HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
V2-1304
WASTE WATER TO INJECTION TANK
10'-0" O.A. x 15'-0" HIGH
___ PSIG @ ___ °F
___ PSIG @ ___ °F
E10-1304
TANK PUMP
20 HP ELECTRIC MOTOR
88 GPM @ ___ PSIG
___ GPM @ ___ PSIG
#2 AMINE AFTER COOLER/FRAME PLATE
WW-4-FB-2-13502
WW-6-FB-2-13500
GF-301-1 #1 1ST STG. DISCH. COOLER
WW-4-FB-2-13505
WW-4-FB-2-13544
WW-6-FB-2-13517
(OUT OF SERVICE)
1"PVC
6"PVC
OLD EDR BUILDING (OUT OF SERVICE)
C-4-FB-2-15540
6363026
G2-2580
WASTE HEAT BOILER/CONDENSER
V2-1800
V2-1304
24"x36" MW
LG 1304
LIC 1304
3"x2"
WW-2-FB-2-13531
WW-3-FB-2-13532
FIQ 1304
PI 1304
SET @ ___ PSIG
PSH 1304
2"x1 1/2"
WW-2-FB-2-13533
WATER INJECTION
E10-1304
ON
OFF
H
O
A
WW-2-FB-2-13523
E10-1301-1A-4A COOLING TOWER PUMPS
63630B07
PVC
WW-3-FB-2-13530
3"x1/2"
STEEL
2"x1/2"
E10-1303
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
EVAPORATION TANK
0
TRS
COMPLETE REVISION
REV NO
BY
DATE
REVISION
TRS RESOURCES
SCALE NONE
DRAWN BY TRS
DATE 4/99
PROJECT CODE 9506-E
DRAWING NO. 63630B19
Filename: 63630B19.DWG



0	TRS	3/99	COMPLETE REVISION					
REV NO	BY	DATE	REVISION	EDC PROCESS	EDC APPROVED	DATE	CONSTR PROCESS	CONSTR APPROVED	DATE

TRS RESOURCES

EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO

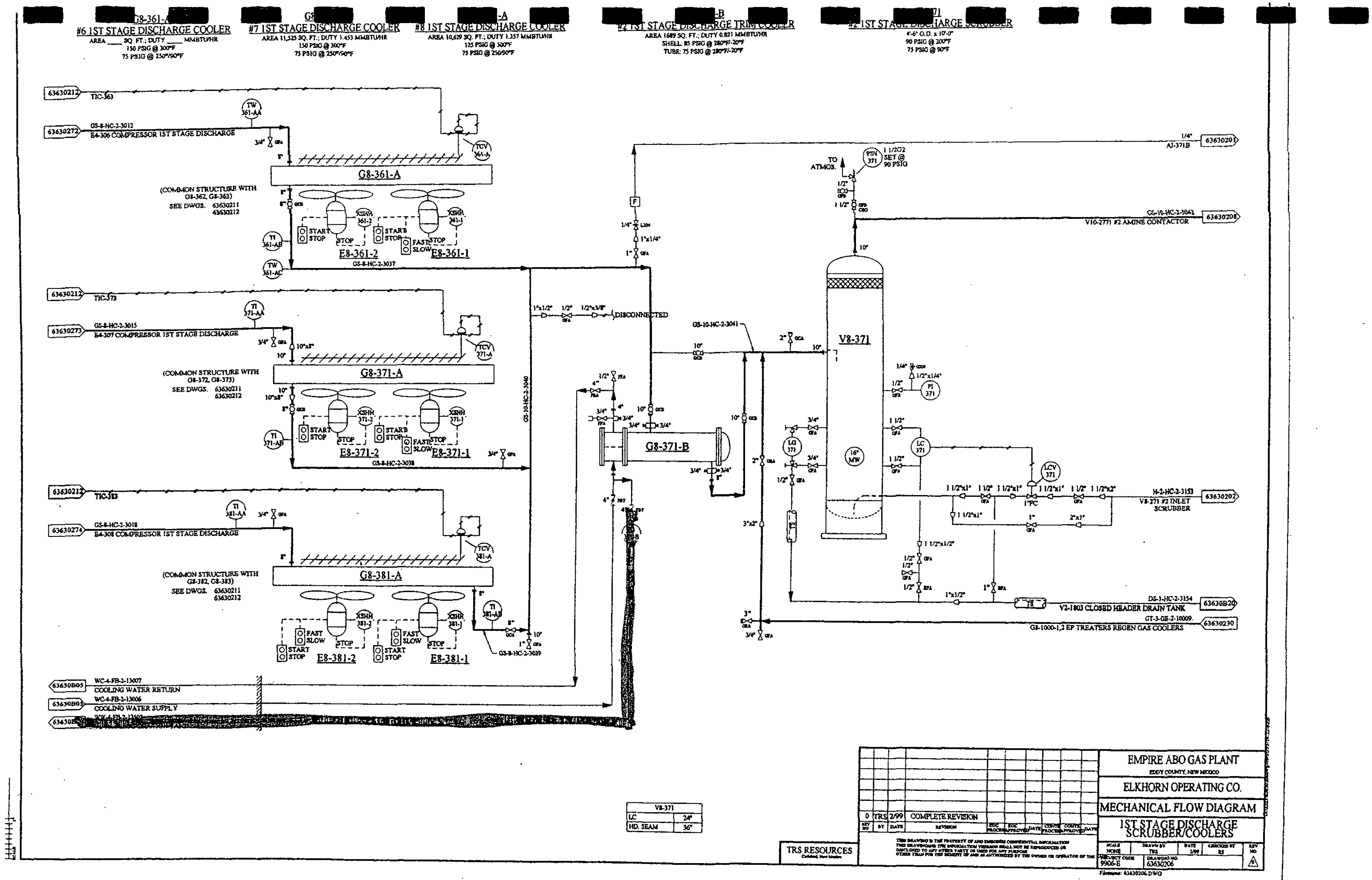
ELKHORN OPERATING CO.

MECHANICAL FLOW DIAGRAM

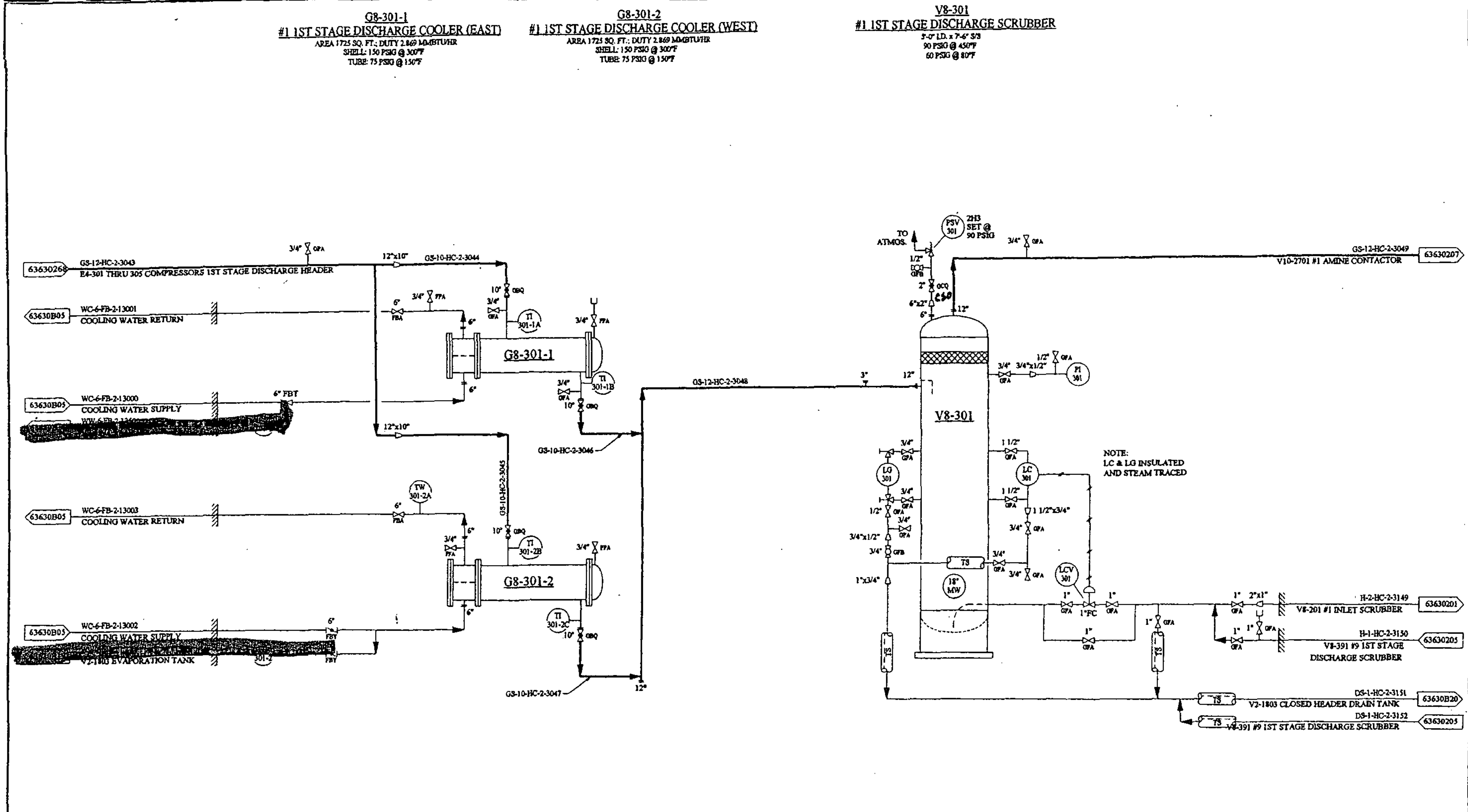
#2 AMINE SYSTEM

SCALE	DRAWN BY	DATE	CHECKED BY	REV NO
NONE	TRS	3/99	RS	0
PROJECT CODE 5906-E	DRAWING NO. 63630260			

Filename: 63630260.DWG



#6 1ST STAGE DISCHARGE COOLER
#7 1ST STAGE DISCHARGE COOLER
#8 1ST STAGE DISCHARGE COOLER
G8-361-A
G8-371-A
G8-381-A
G8-371-B
V8-371
E8-361-1
E8-361-2
E8-371-1
E8-371-2
E8-381-1
E8-381-2
E4-306 COMPRESSOR 1ST STAGE DISCHARGE
E4-307 COMPRESSOR 1ST STAGE DISCHARGE
E4-308 COMPRESSOR 1ST STAGE DISCHARGE
V10-2771 #2 AMINE CONTACTOR
V8-271 #2 INLET SCRUBBER
V2-1803 CLOSED HEADER DRAIN TANK
COOLING WATER RETURN
COOLING WATER SUPPLY
DISCONNECTED
TO ATMOS.
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
1ST STAGE DISCHARGE SCRUBBER/COOLERS
0 TRS 2/99 COMPLETE REVISION
TRS RESOURCES
9906-E
63630206



V8-301	
LC	21"
HD. SEAM	36"

TRS RESOURCES

REV NO	BY	DATE	REVISION
0	TRS	2/99	COMPLETE REVISION

EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO

ELKHORN OPERATING CO.

MECHANICAL FLOW DIAGRAM
1ST STAGE DISCHARGE SCRUBBER/COOLERS

SCALE	DRAWN BY	DATE	CHECKED BY
NONE	TRS	2/99	RJ
PROJECT CODE	DRAWING NO.		
9906-E	63630204		

Filename: 63630204.DWG

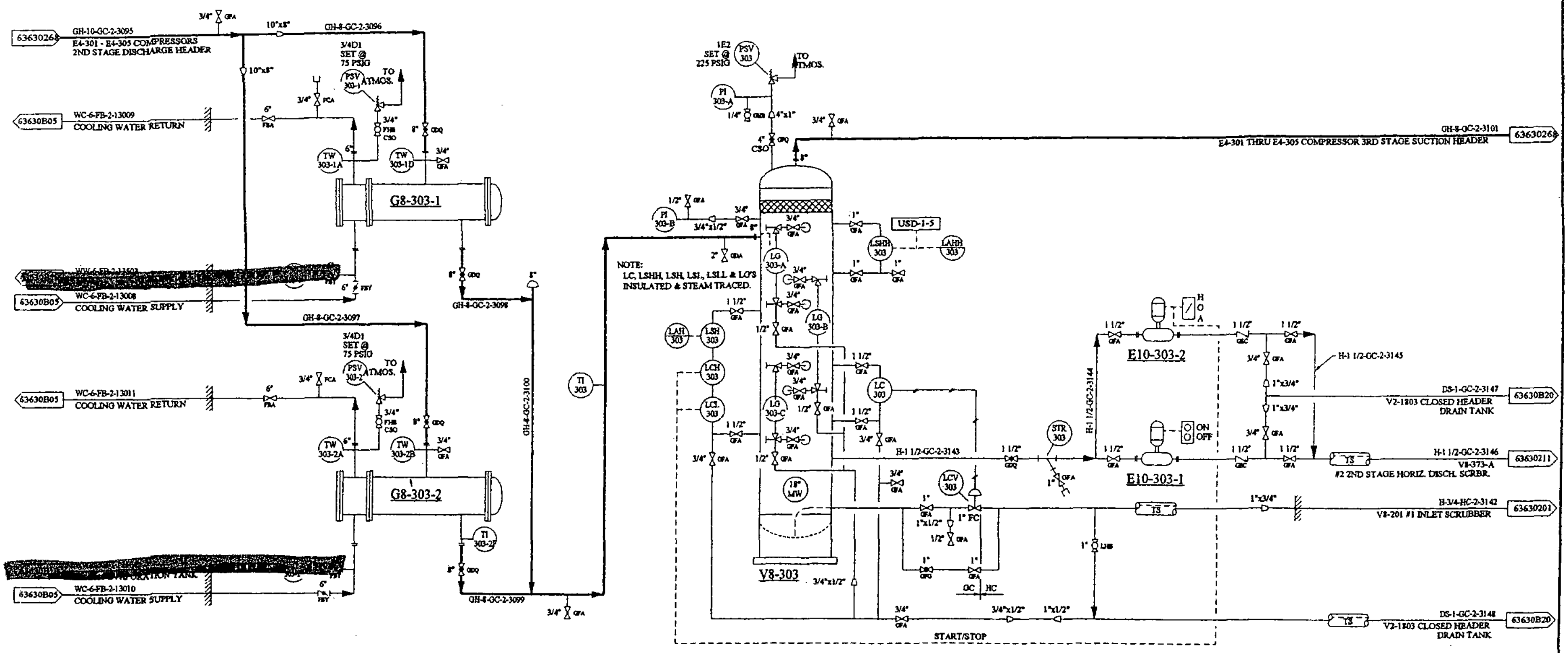
G8-303-1
#1 2ND STAGE DISCHARGE COOLER (EAST)
AREA 1048 SQ. FT.; DUTY 2.146 MMBTU/HR
SHELL: 250 PSIG @ 300°F/200 PSIG @ 250°/75°F
TUBE: 45 PSIG @ 150°F/33 PSIG @ 70°/90°F

G8-303-2
#1 2ND STAGE DISCHARGE COOLER (WEST)
AREA 1048 SQ. FT.; DUTY 2.146 MMBTU/HR
SHELL: 250 PSIG @ 300°F/200 PSIG @ 250°/75°F
TUBE: 45 PSIG @ 150°F/33 PSIG @ 70°/90°F

V8-303
#1 2ND STAGE DISCHARGE SCRUBBER
42" I.D. x 10'-0" S/S
225 PSIG @ 450°F
210 PSIG @ 78°F

E10-303-1
#1 2ND STAGE DISCHARGE PUMP (NORTH)
2"x1 1/2"-6" 3 HP ELECTRIC MOTOR
7 GPM @ ___ PSIG
___ GPM @ ___ PSIG

E10-303-2
#1 2ND STAGE DISCHARGE PUMP (SOUTH)
2"x1 1/2"-6" 3 HP ELECTRIC MOTOR
7 GPM @ ___ PSIG
___ GPM @ ___ PSIG



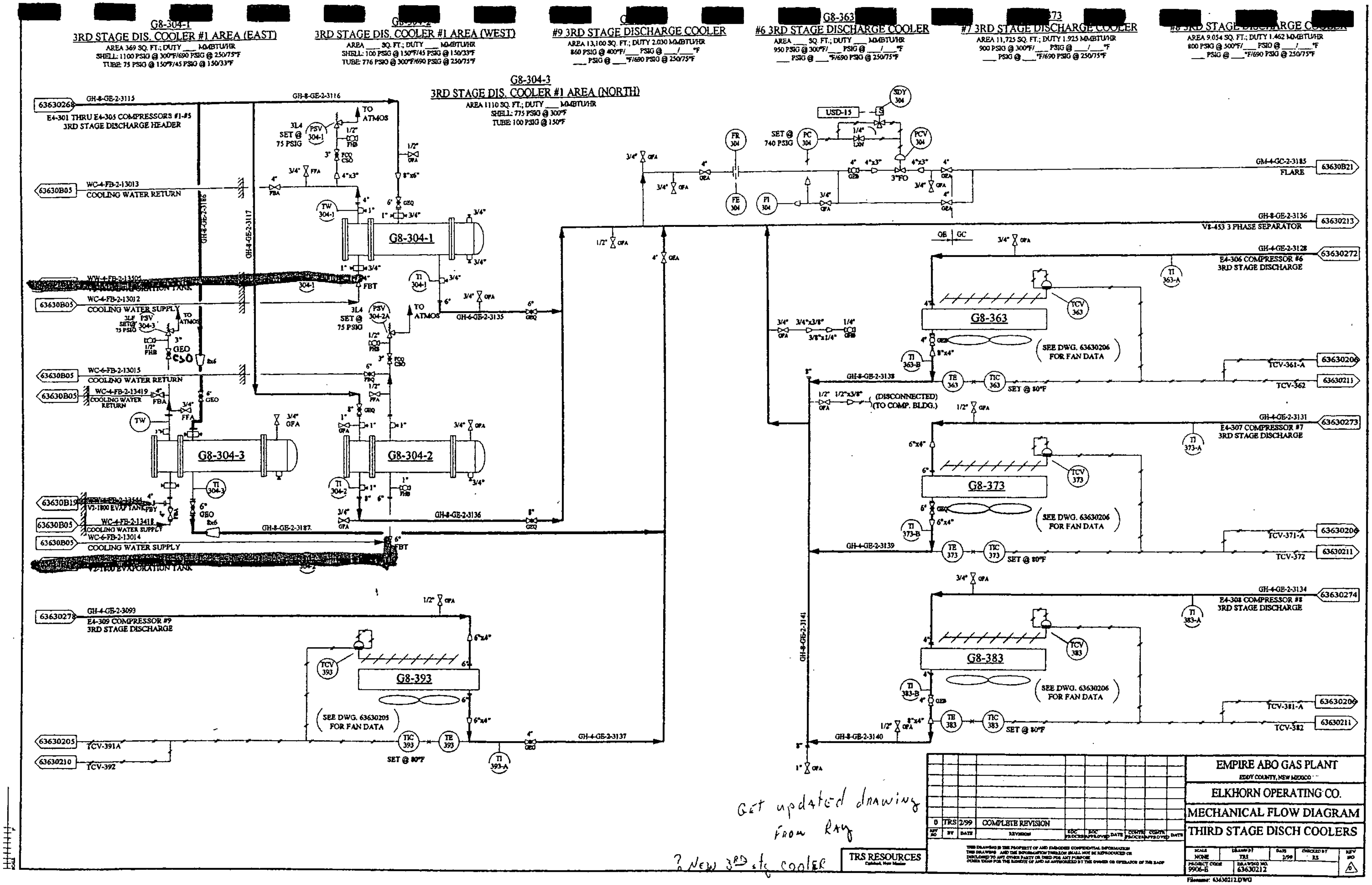
V8-303	
LSHH	68"
LSH	47"
LC	15"
LCH	44"
LCL	28"
HD. SEAM	3'-0"

NO.	BY	DATE	REVISION
0	TRS	2/99	COMPLETE REVISION

TRS RESOURCES

EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
2ND STAGE DISCHARGE COOLERS/SCRUBBER

SCALE: NONE | DRAWN BY: TRS | DATE: 2/99 | CHECKED BY: RB
PROJECT CODE: 9906-B | DRAWING NO. 63630209
Filename: 63630209.DWG



Get updated drawing
from Ray

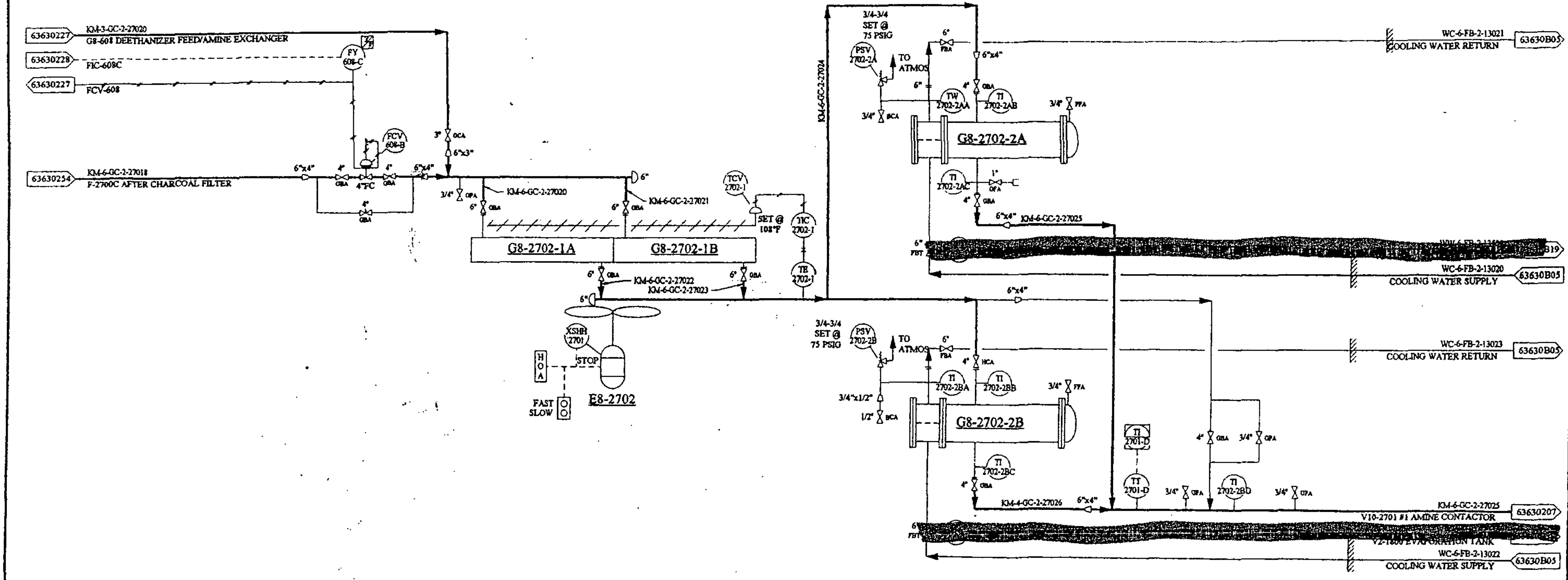
? New 3RD stg cooler

G8-2702-1A
AMINE COOLER
AREA 1962 SQ. FT.; DUTY 5.721 MMBTU/HR
100 PSIG @ 250°F
___ PSIG @ ___/___°F

G8-2702-1B
AMINE COOLER
AREA 1962 SQ. FT.; DUTY 5.721 MMBTU/HR
100 PSIG @ 250°F
___ PSIG @ ___/___°F

G8-2702-2A
#1 AMINE AFTER COOLER (EAST)
AREA 831 SQ. FT.; DUTY 2.078 MMBTU/HR
SHELL: 150 PSIG @ 200°F/___ PSIG @ 125/88°F
TUBE: 75 PSIG @ 150°F/___ PSIG @ ___/___°F

G8-2702-2B
#1 AMINE AFTER COOLER (WEST)
AREA 831 SQ. FT.; DUTY 4.643 MMBTU/HR
SHELL: 150 PSIG @ 200°F/___ PSIG @ 125/88°F
TUBE: 75 PSIG @ 150°F/___ PSIG @ ___/___°F



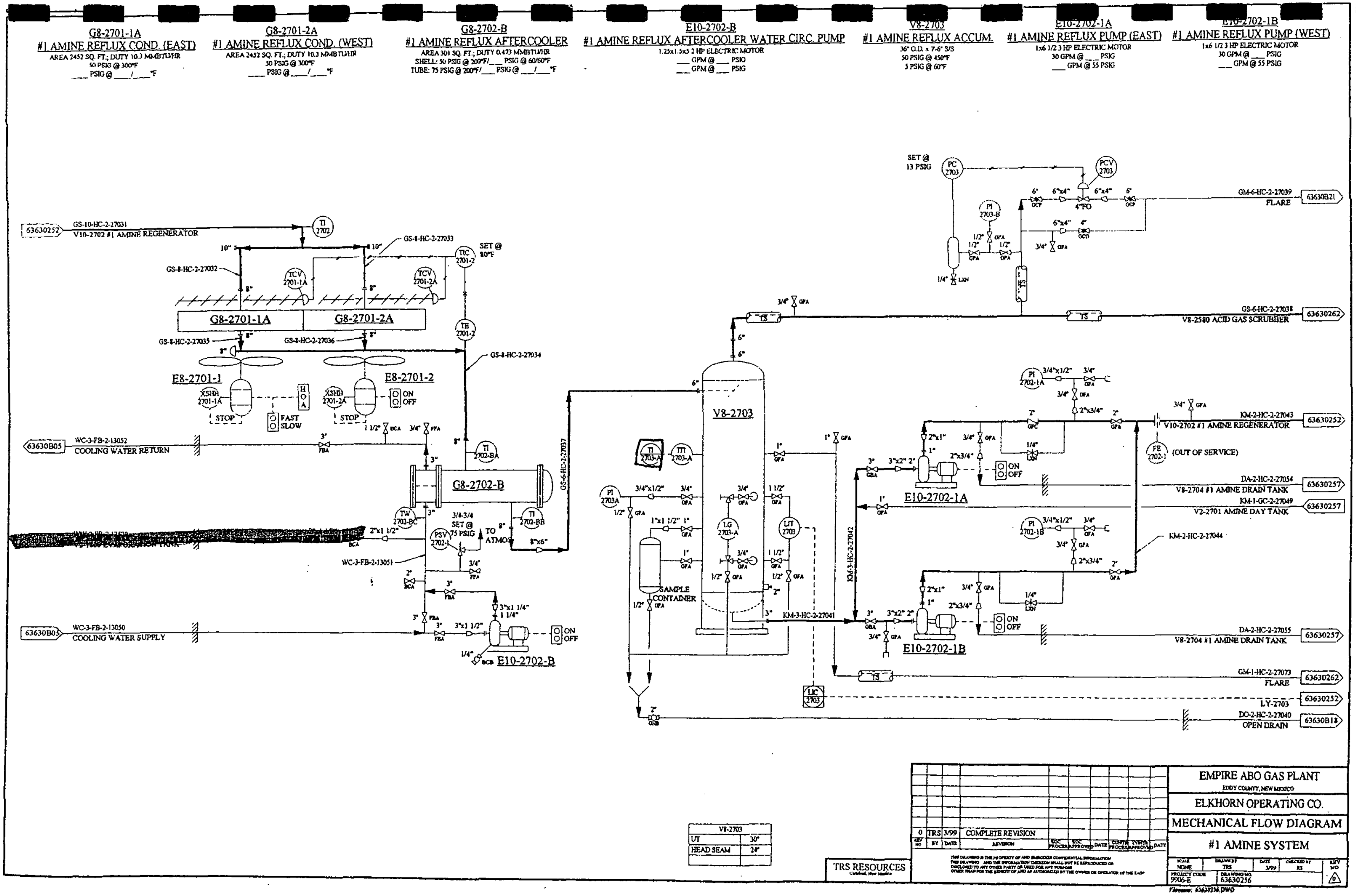
REV NO	BY	DATE	REVISION	EOC PROCESS	EOC APPROVED	DATE	CONTR PROCESS	CONTR APPROVED	DATE
0	TRS	3/99	COMPLETE REVISION						

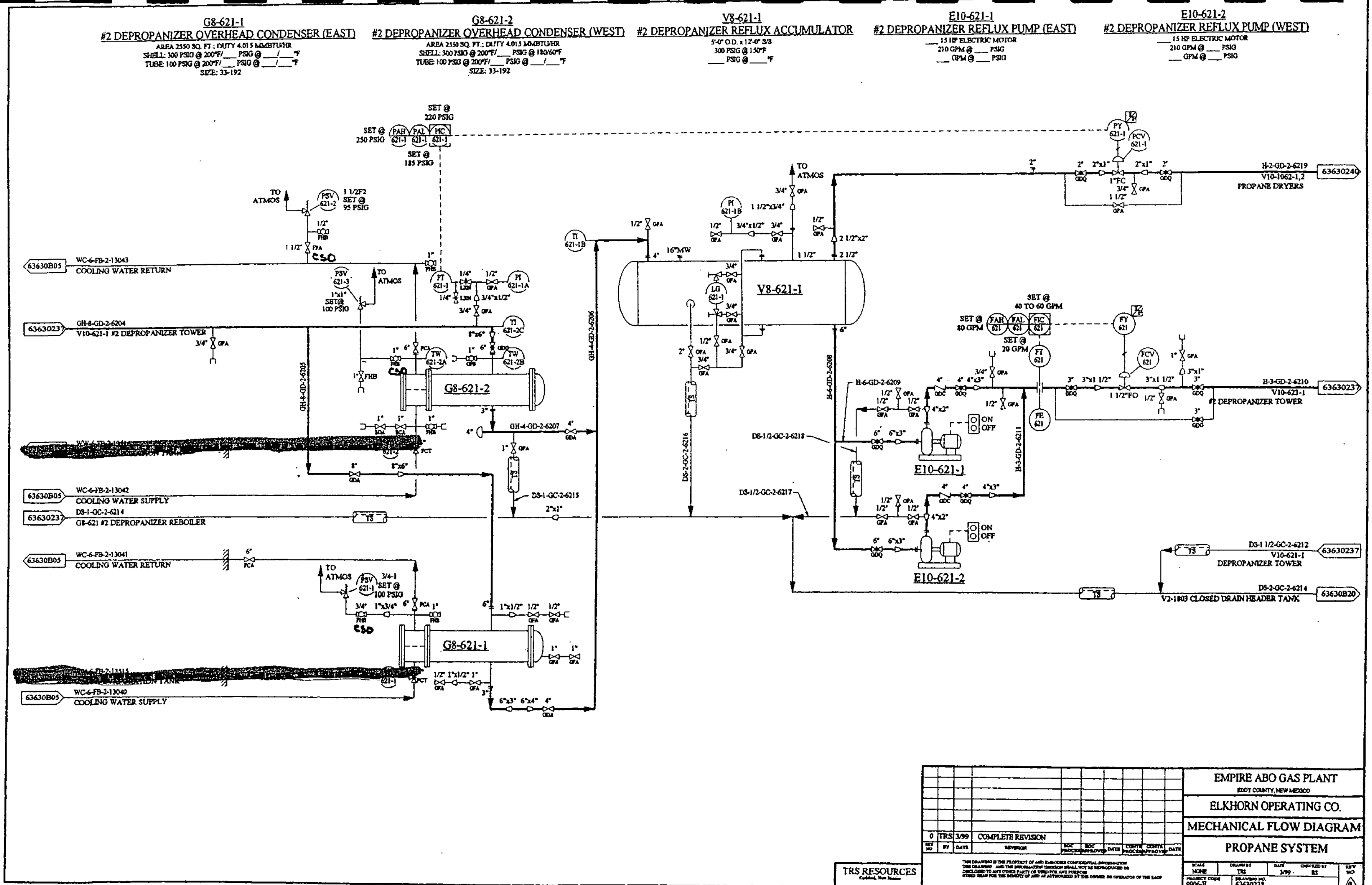
TRS RESOURCES

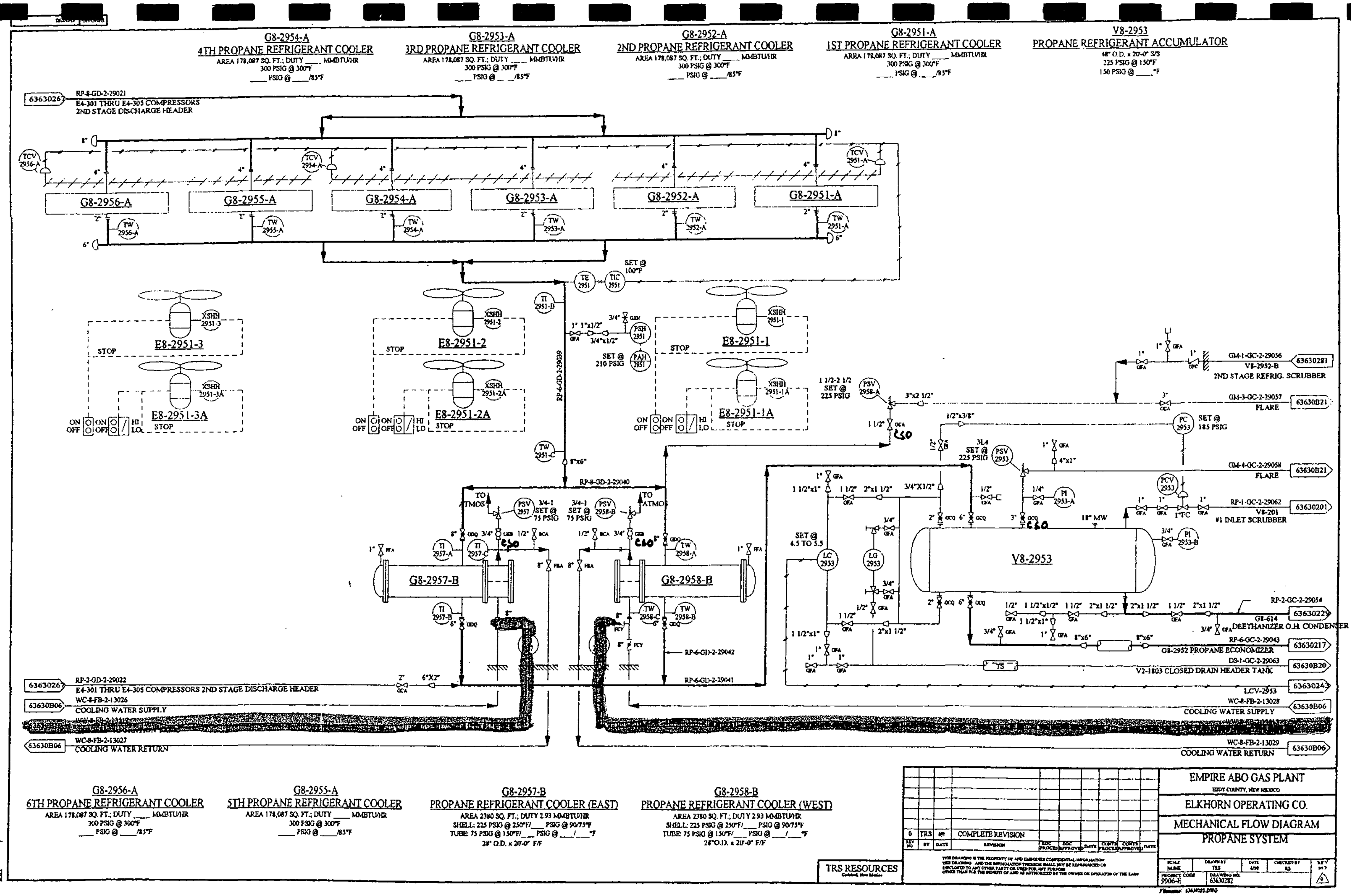
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
#1 AMINE SYSTEM

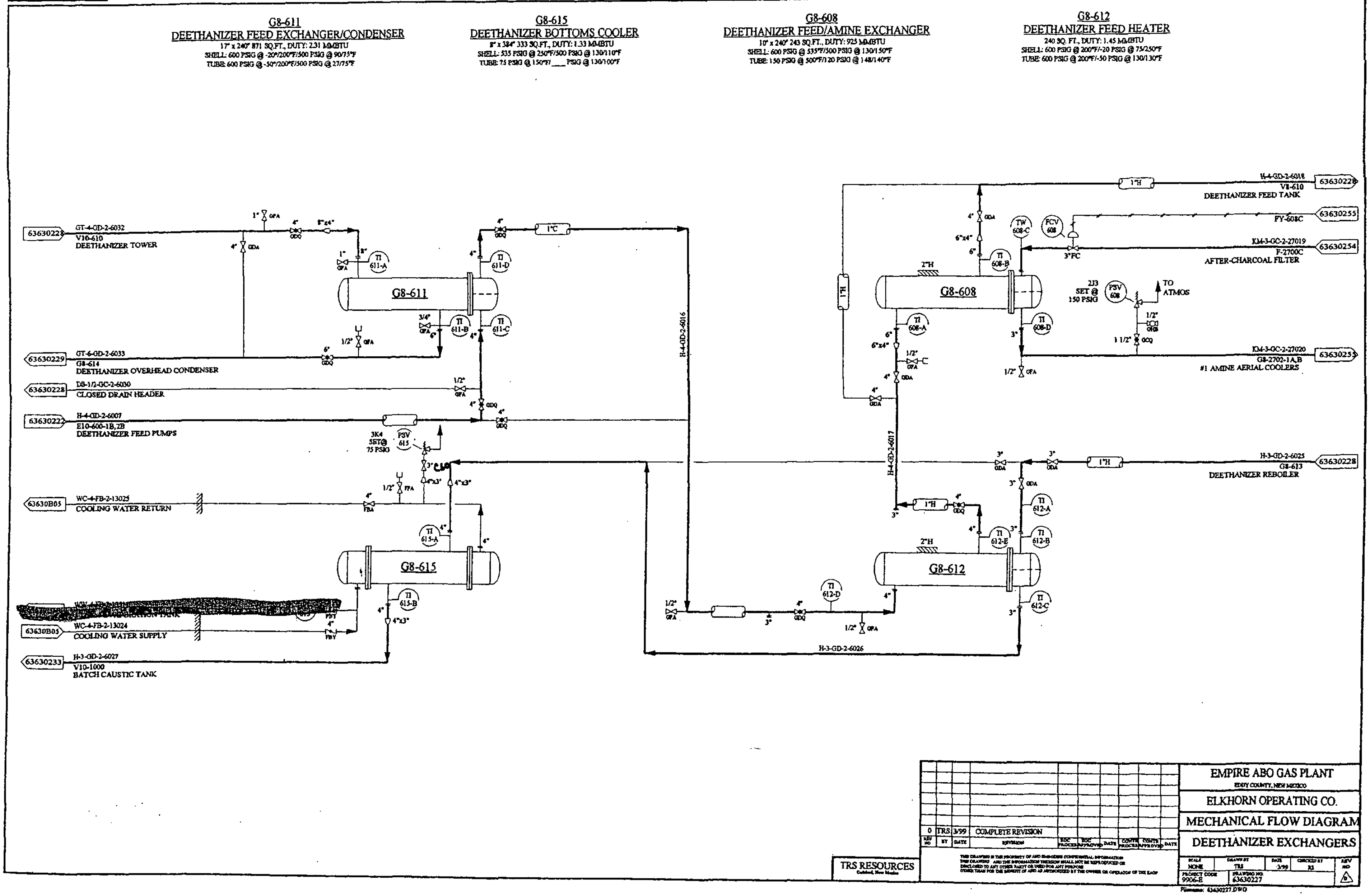
SCALE	DRAWN BY	DATE	CHECKED BY	REV NO
NONE	TRS	3/99	RS	
PROJECT CODE 9906-E	DRAWING NO. 63630255			

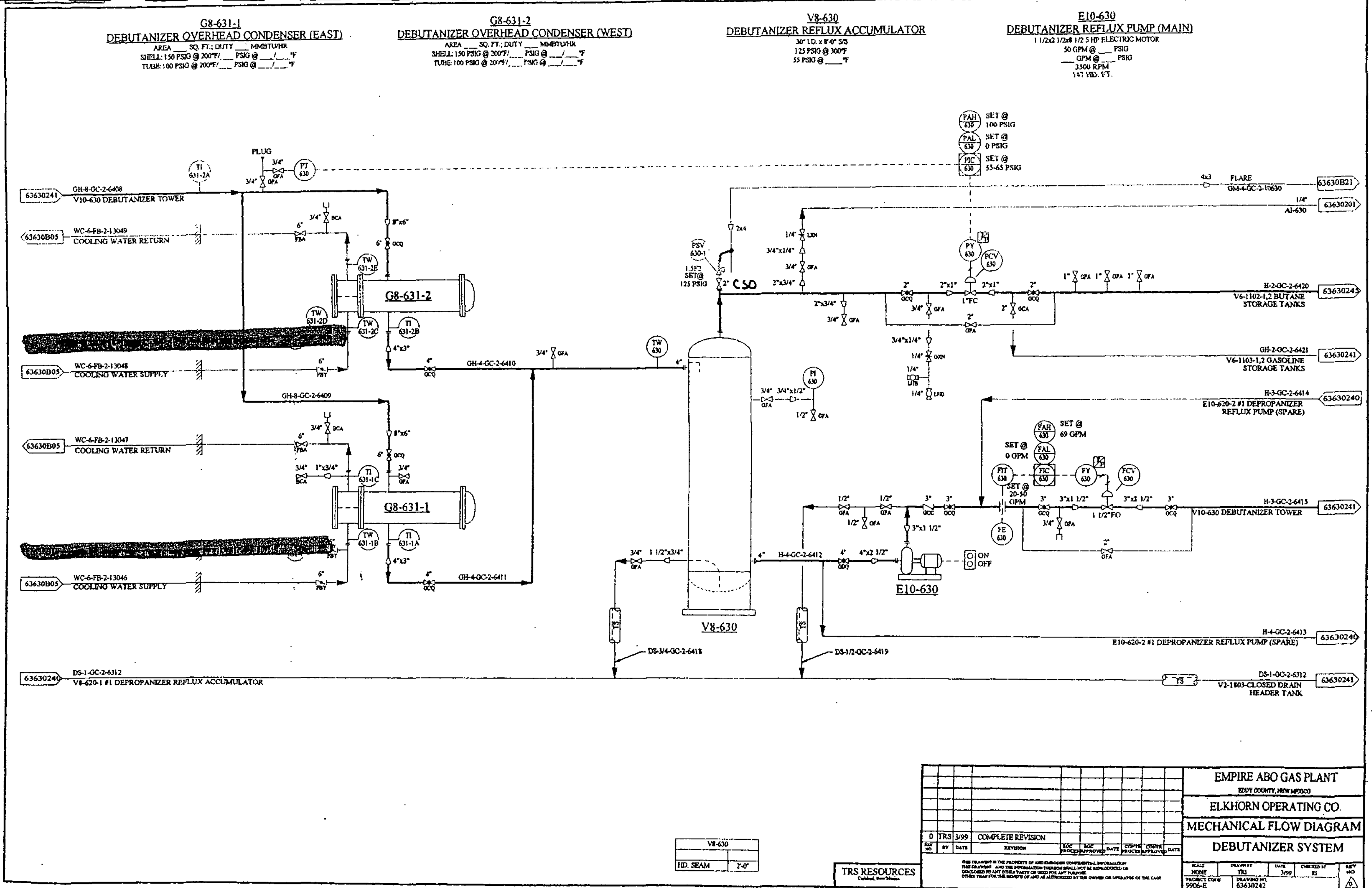
Filename: 63630255.DWG

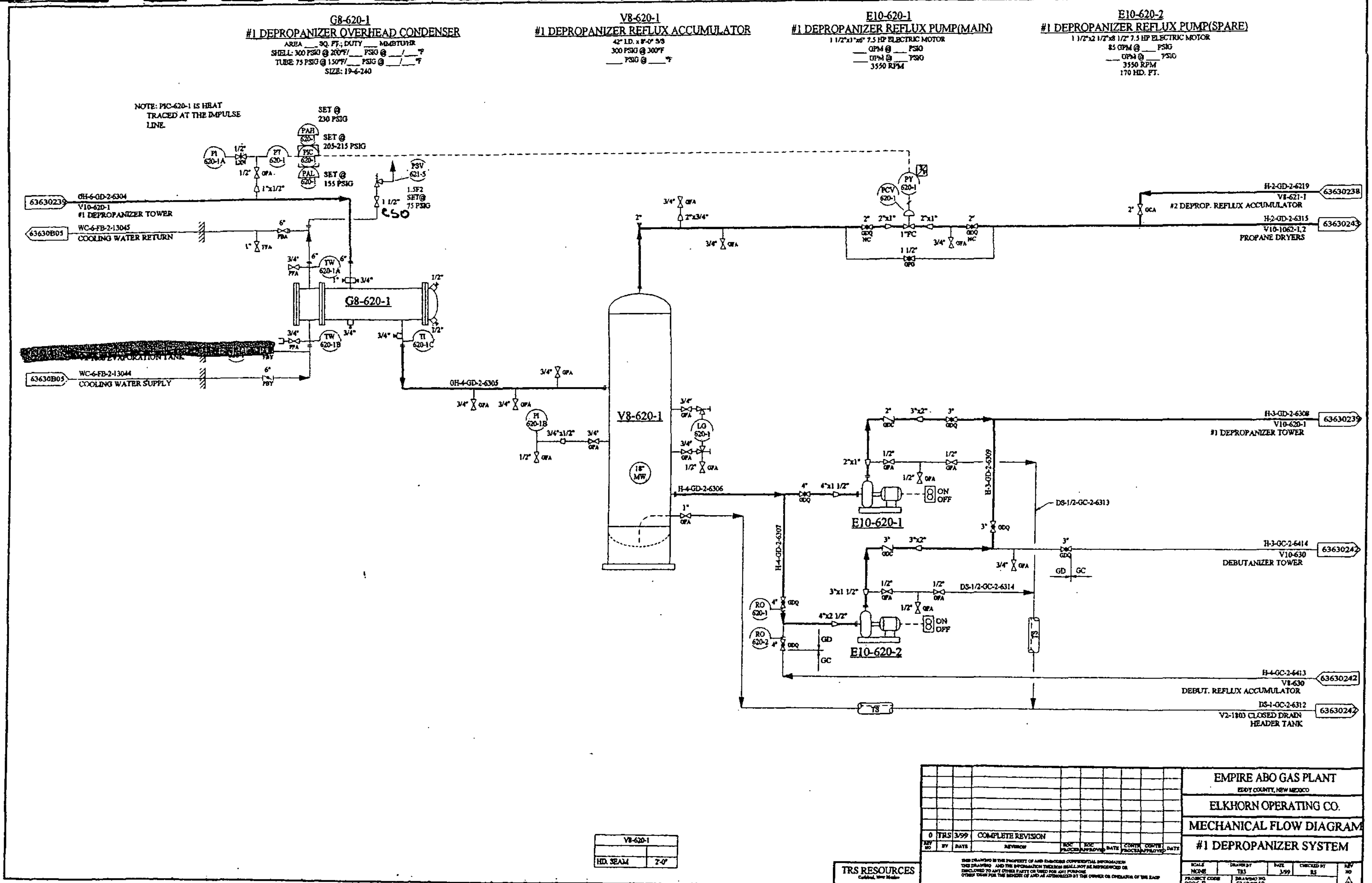

G8-2701-1A
#1 AMINE REFLUX COND. (EAST)
AREA 2452 SQ. FT.; DUTY 10.3 MMBTU/HR
50 PSIG @ 300°F
___ PSIG @ ___/___°F
G8-2701-2A
#1 AMINE REFLUX COND. (WEST)
AREA 2452 SQ. FT.; DUTY 10.3 MMBTU/HR
50 PSIG @ 300°F
___ PSIG @ ___/___°F
G8-2702-B
#1 AMINE REFLUX AFTERCOOLER
AREA 301 SQ. FT.; DUTY 0.473 MMBTU/HR
SHELL: 50 PSIG @ 200°F/___ PSIG @ 60/60°F
TUBE: 75 PSIG @ 200°F/___ PSIG @ ___/___°F
E10-2702-B
#1 AMINE REFLUX AFTERCOOLER WATER CIRC. PUMP
1.25x1.5x5 2 HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
V8-2703
#1 AMINE REFLUX ACCUM.
36" O.D. x 7'-6" S/S
50 PSIG @ 450°F
5 PSIG @ 60°F
E10-2702-1A
#1 AMINE REFLUX PUMP (EAST)
1x6 1/2 3 HP ELECTRIC MOTOR
30 GPM @ ___ PSIG
___ GPM @ 55 PSIG
E10-2702-1B
#1 AMINE REFLUX PUMP (WEST)
1x6 1/2 3 HP ELECTRIC MOTOR
30 GPM @ ___ PSIG
___ GPM @ 55 PSIG
63630252
GS-10-HC-2-27031
V10-2702 #1 AMINE REGENERATOR
G8-2701-1A
G8-2701-2A
E8-2701-1
E8-2701-2
63630B05
WC-3-FB-2-13052
COOLING WATER RETURN
G8-2702-B
63630B05
WC-3-FB-2-13050
COOLING WATER SUPPLY
E10-2702-B
V8-2703
SAMPLE CONTAINER
E10-2702-1A
E10-2702-1B
SET @ 13 PSIG
GM-6-HC-2-27039
FLARE
63630B21
GS-6-HC-2-27038
V8-2580 ACID GAS SCRUBBER
63630262
KM-2-HC-2-27043
V10-2702 #1 AMINE REGENERATOR
63630252
(OUT OF SERVICE)
DA-2-HC-2-27054
V8-2704 #1 AMINE DRAIN TANK
63630257
KM-1-GC-2-27049
V2-2701 AMINE DAY TANK
63630257
DA-2-HC-2-27055
V8-2704 #1 AMINE DRAIN TANK
63630257
GM-1-HC-2-27073
FLARE
63630262
LY-2703
63630252
DO-2-HC-2-27040
OPEN DRAIN
63630B18
V8-2703
UT 30"
HEAD SEAM 24"
TRS RESOURCES
0 TRS 3/99 COMPLETE REVISION
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
#1 AMINE SYSTEM
SCALE NONE
DRAWN BY TRS
DATE 3/99
PROJECT CODE 5906-E
DRAWING NO. 63630256
Filename: 63630256.DWG

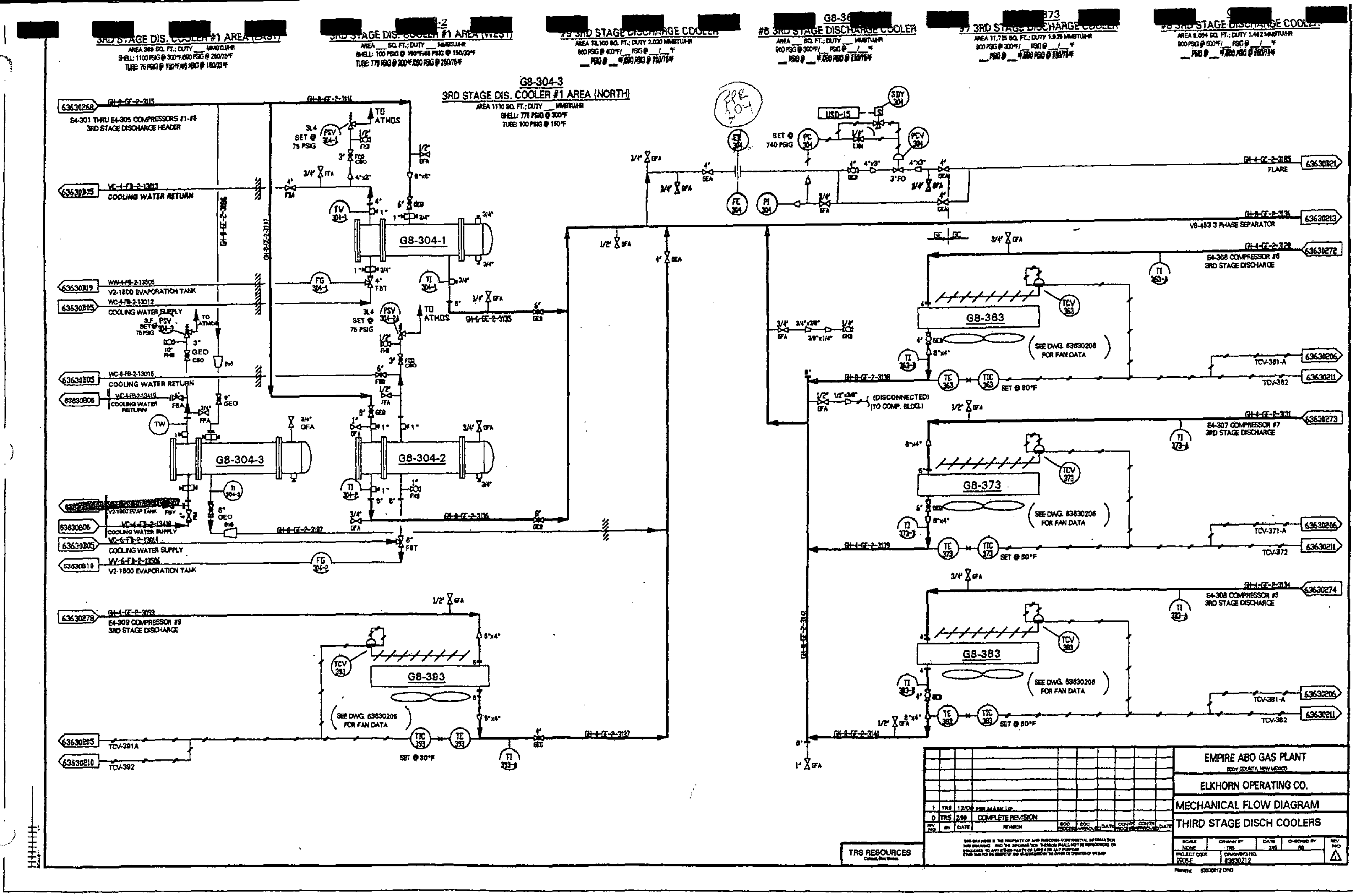

G8-621-1
#2 DEPROPANIZER OVERHEAD CONDENSER (EAST)
AREA 2550 SQ. FT.; DUTY 4.015 MMBTU/HR
SHELL: 300 PSIG @ 200°F/___ PSIG @ ___/___°F
TUBE: 100 PSIG @ 200°F/___ PSIG @ ___/___°F
SIZE: 33-192
G8-621-2
#2 DEPROPANIZER OVERHEAD CONDENSER (WEST)
AREA 2550 SQ. FT.; DUTY 4.015 MMBTU/HR
SHELL: 300 PSIG @ 200°F/___ PSIG @ 180/60°F
TUBE: 100 PSIG @ 200°F/___ PSIG @ ___/___°F
SIZE: 33-192
V8-621-1
#2 DEPROPANIZER REFLUX ACCUMULATOR
5'-0" O.D. x 17'-0" S/S
300 PSIG @ 150°F
___ PSIG @ ___°F
E10-621-1
#2 DEPROPANIZER REFLUX PUMP (EAST)
___ 15 HP ELECTRIC MOTOR
210 GPM @ ___ PSIG
___ GPM @ ___ PSIG
E10-621-2
#2 DEPROPANIZER REFLUX PUMP (WEST)
___ 15 HP ELECTRIC MOTOR
210 GPM @ ___ PSIG
___ GPM @ ___ PSIG
SET @ 220 PSIG
SET @ 250 PSIG
PAH 621-1
PAL 621-1
PIC 621-1
SET @ 185 PSIG
TO ATMOS
PSV 621-2
1 1/2F2 SET @ 95 PSIG
CSO
63630B05
WC-6-FB-2-13043
COOLING WATER RETURN
PSV 621-3
1"x1" SET @ 100 PSIG
FT 621-1
PI 621-1A
TI 621-2C
63630237
GH-8-GD-2-6204
V10-621-1 #2 DEPROPANIZER TOWER
TW 621-2A
TW 621-2B
G8-621-2
GH-8-GD-2-6205
GH-4-GD-2-6207
GH-4-GD-2-6206
TI 621-1B
63630B05
WC-6-FB-2-13042
COOLING WATER SUPPLY
63630237
DS-1-GC-2-6214
G8-621 #2 DEPROPANIZER REBOILER
DS-1-GC-2-6215
63630B05
WC-6-FB-2-13041
COOLING WATER RETURN
PSV 621-1
3/4-1 SET @ 100 PSIG
G8-621-1
63630B05
WC-6-FB-2-13040
COOLING WATER SUPPLY
16"MW
PI 621-1B
LG 621-1
V8-621-1
DS-2-GC-2-6216
H-6-GD-2-6208
H-6-GD-2-6209
DS-1/2-GC-2-6218
DS-1/2-GC-2-6217
E10-621-1
E10-621-2
H-3-GD-2-6211
ON OFF
SET @ 40 TO 60 GPM
SET @ 80 GPM
PAH 621
PAL 621
FIC 621
SET @ 20 GPM
FT 621
FE 621
FY 621
FCV 621
1 1/2"FO
H-3-GD-2-6210
V10-621-1
#2 DEPROPANIZER TOWER
63630237
FY 621-1
PCV 621-1
1"FC
H-2-GD-2-6219
V10-1062-1,2
PROPANE DRYERS
63630240
DS-1 1/2-GC-2-6212
V10-621-1
DEPROPANIZER TOWER
63630237
DS-2-GC-2-6214
V2-1803 CLOSED DRAIN HEADER TANK
63630B20
0 | TRS | 3/99 | COMPLETE REVISION
REV NO | BY | DATE | REVISION | DOC PROCESS | DOC APPROVED | DATE | CONTR PROCESS | CONTR APPROVED | DATE
TRS RESOURCES
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
PROPANE SYSTEM
SCALE NONE
DRAWN BY TRS
DATE 3/99
CHECKED BY RS
PROJECT CODE 9906-E
DRAWING NO. 63630238
REV NO 0


G8-2954-A
4TH PROPANE REFRIGERANT COOLER
AREA 178,087 SQ. FT.; DUTY ___ MMBTU/HR
300 PSIG @ 300°F
___ PSIG @ ___/85°F
G8-2953-A
3RD PROPANE REFRIGERANT COOLER
AREA 178,087 SQ. FT.; DUTY ___ MMBTU/HR
300 PSIG @ 300°F
___ PSIG @ ___/85°F
G8-2952-A
2ND PROPANE REFRIGERANT COOLER
AREA 178,087 SQ. FT.; DUTY ___ MMBTU/HR
300 PSIG @ 300°F
___ PSIG @ ___/85°F
G8-2951-A
1ST PROPANE REFRIGERANT COOLER
AREA 178,087 SQ. FT.; DUTY ___ MMBTU/HR
300 PSIG @ 300°F
___ PSIG @ ___/85°F
V8-2953
PROPANE REFRIGERANT ACCUMULATOR
48" O.D. x 20'-0" S/S
225 PSIG @ 150°F
150 PSIG @ ___°F
63630267
RP-8-GD-2-29021
E4-301 THRU E4-305 COMPRESSORS
2ND STAGE DISCHARGE HEADER
G8-2956-A
G8-2955-A
G8-2954-A
G8-2953-A
G8-2952-A
G8-2951-A
TCV 2956-A
TCV 2954-A
TCV 2951-A
TW 2956-A
TW 2955-A
TW 2954-A
TW 2953-A
TW 2952-A
TW 2951-A
TE 2951
TIC 2951
SET @ 100°F
TI 2951-B
E8-2951-3
E8-2951-3A
E8-2951-2
E8-2951-2A
E8-2951-1
E8-2951-1A
STOP
ON OFF
HI LO
PSH 2951
PAH 2951
SET @ 210 PSIG
RP-6-GD-2-29039
TW 2951-C
RP-8-GD-2-29040
TO ATMOS
PSV 2957
3/4-1 SET @ 75 PSIG
PSV 2958-B
PSV 2958-A
1 1/2-2 1/2 SET @ 225 PSIG
CSO
G8-2957-B
G8-2958-B
TI 2957-A
TI 2957-C
TI 2957-B
TW 2958-A
TW 2958-C
TW 2958-B
RP-6-GD-2-29042
RP-6-GD-2-29041
63630267
RP-2-GD-2-29022
E4-301 THRU E4-305 COMPRESSORS 2ND STAGE DISCHARGE HEADER
63630B06
WC-8-FB-2-13026
COOLING WATER SUPPLY
63630B06
WC-8-FB-2-13027
COOLING WATER RETURN
V8-2953
18" MW
PSV 2953
3L4 SET @ 225 PSIG
PC 2953
SET @ 185 PSIG
PCV 2953
PI 2953-A
PI 2953-B
LC 2953
SET @ 4.5 TO 5.5
LG 2953
GM-1-GC-2-29056
V8-2952-B
2ND STAGE REFRIG. SCRUBBER
63630281
GM-3-GC-2-29057
FLARE
63630B21
GM-4-GC-2-29058
FLARE
63630B21
RP-1-GC-2-29062
V8-201
#1 INLET SCRUBBER
63630201
RP-2-GC-2-29054
G8-614
DEETHANIZER O.H. CONDENSER
63630229
RP-6-GC-2-29043
G8-2952 PROPANE ECONOMIZER
63630217
DS-1-GC-2-29063
V2-1803 CLOSED DRAIN HEADER TANK
63630B20
LCV-2953
63630243
WC-8-FB-2-13028
COOLING WATER SUPPLY
63630B06
WC-8-FB-2-13029
COOLING WATER RETURN
63630B06
G8-2956-A
6TH PROPANE REFRIGERANT COOLER
AREA 178,087 SQ. FT.; DUTY ___ MMBTU/HR
300 PSIG @ 300°F
___ PSIG @ ___/85°F
G8-2955-A
5TH PROPANE REFRIGERANT COOLER
AREA 178,087 SQ. FT.; DUTY ___ MMBTU/HR
300 PSIG @ 300°F
___ PSIG @ ___/85°F
G8-2957-B
PROPANE REFRIGERANT COOLER (EAST)
AREA 2380 SQ. FT.; DUTY 2.93 MMBTU/HR
SHELL: 225 PSIG @ 250°F/___ PSIG @ 90/75°F
TUBE: 75 PSIG @ 150°F/___ PSIG @ ___/___°F
28" O.D. x 20'-0" F/F
G8-2958-B
PROPANE REFRIGERANT COOLER (WEST)
AREA 2380 SQ. FT.; DUTY 2.93 MMBTU/HR
SHELL: 225 PSIG @ 250°F/___ PSIG @ 90/75°F
TUBE: 75 PSIG @ 150°F/___ PSIG @ ___/___°F
28" O.D. x 20'-0" F/F
0 TRS COMPLETE REVISION
TRS RESOURCES
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
PROPANE SYSTEM
SCALE NONE
DRAWN BY TRS
PROJECT CODE 9906-E
DRAWING NO. 63630282

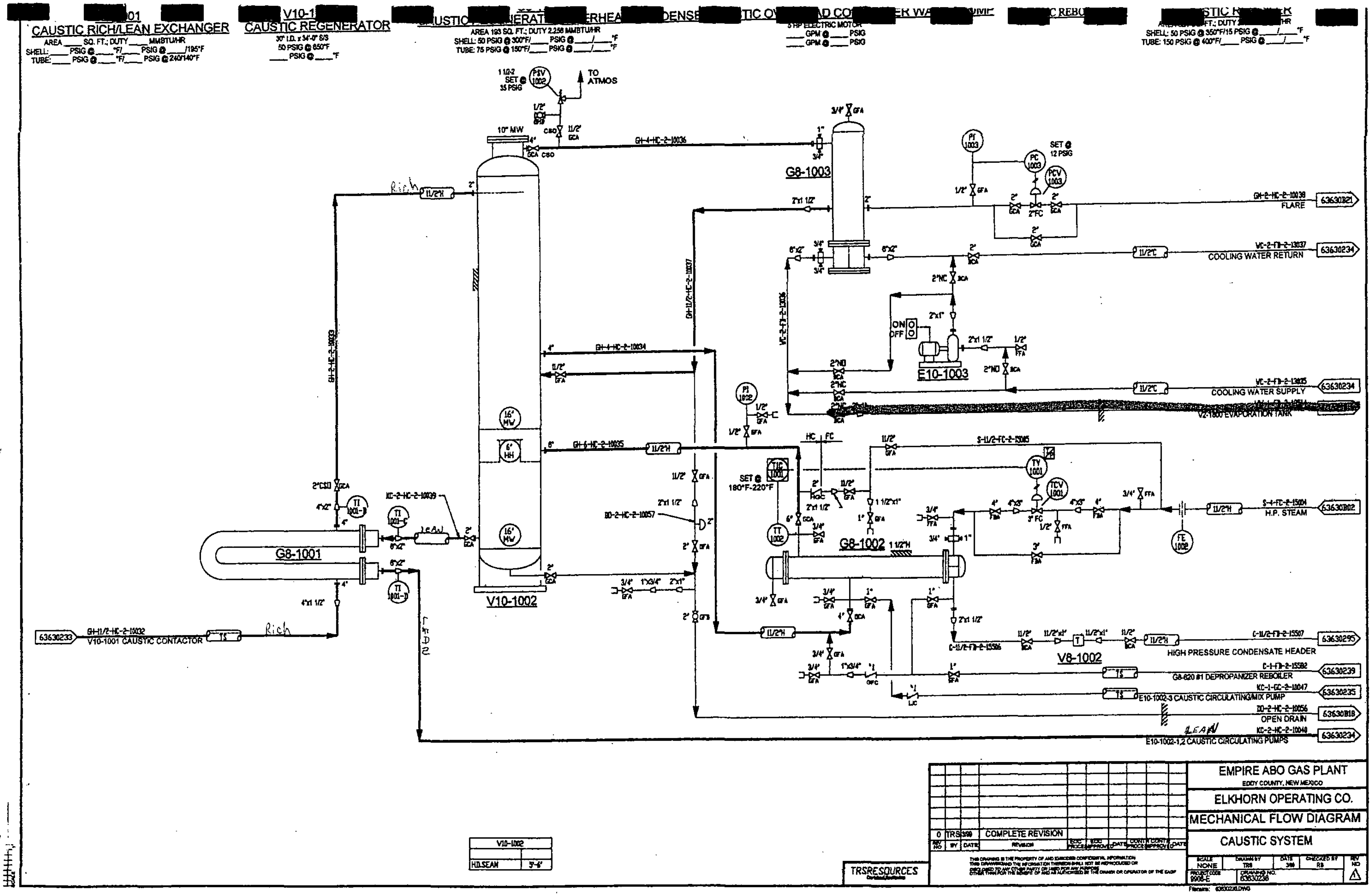

G8-611
DEETHANIZER FEED EXCHANGER/CONDENSER
17" x 240" 871 SQ.FT., DUTY: 2.31 MMBTU
SHELL: 600 PSIG @ -20°/200°F/500 PSIG @ 90/75°F
TUBE: 600 PSIG @ -50°/200°F/500 PSIG @ 27/75°F
G8-615
DEETHANIZER BOTTOMS COOLER
8" x 384" 333 SQ.FT., DUTY: 1.33 MMBTU
SHELL: 535 PSIG @ 250°F/500 PSIG @ 130/110°F
TUBE: 75 PSIG @ 150°F/___ PSIG @ 130/100°F
G8-608
DEETHANIZER FEED/AMINE EXCHANGER
10" x 240" 243 SQ.FT., DUTY: 925 MMBTU
SHELL: 600 PSIG @ 535°F/500 PSIG @ 130/150°F
TUBE: 150 PSIG @ 500°F/120 PSIG @ 148/140°F
G8-612
DEETHANIZER FEED HEATER
240 SQ. FT., DUTY: 1.45 MMBTU
SHELL: 600 PSIG @ 200°F/-20 PSIG @ 75/250°F
TUBE: 600 PSIG @ 200°F/-50 PSIG @ 130/130°F
63630228 GT-4-GD-2-6032 V10-610 DEETHANIZER TOWER
63630229 GT-6-GD-2-6033 G8-614 DEETHANIZER OVERHEAD CONDENSER
63630228 DS-1/2-GC-2-6030 CLOSED DRAIN HEADER
63630227 H-4-GD-2-6007 E10-600-1B,2B DEETHANIZER FEED PUMPS
63630B05 WC-4-FB-2-13025 COOLING WATER RETURN
[redacted]
63630B05 WC-4-FB-2-13024 COOLING WATER SUPPLY
63630233 H-3-GD-2-6027 V10-1000 BATCH CAUSTIC TANK
H-4-GD-2-6018 V8-610 DEETHANIZER FEED TANK 63630228
FY-608C 63630255
KM-3-GC-2-27019 F-2700C AFTER-CHARCOAL FILTER 63630254
KM-3-GC-2-27020 G8-2702-1A,B #1 AMINE AERIAL COOLERS 63630235
H-3-GD-2-6025 G8-613 DEETHANIZER REBOILER 63630228
G8-611
G8-615
G8-608
G8-612
H-4-GD-2-6016
H-4-GD-2-6017
H-3-GD-2-6026
TI 611-A
TI 611-B
TI 611-C
TI 611-D
TI 615-A
TI 615-B
TI 608-A
TI 608-B
TI 608-D
TW 608-C
FCV 608
3"FC
PSV 608
2J3 SET @ 150 PSIG
TO ATMOS
PSV 615
3K4 SET@ 75 PSIG
TI 612-A
TI 612-B
TI 612-C
TI 612-D
TI 612-E
1"H
1"C
2"H
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
DEETHANIZER EXCHANGERS
0 TRS 3/99 COMPLETE REVISION
REV NO | BY | DATE | REVISION | EOC PROCESS | EOC APPROVED | DATE | CONTR. PROCESS | CONTR. APPROVED | DATE
SCALE NONE
DRAWN BY TRS
DATE 3/99
CHECKED BY RS
REV NO 0
PROJECT CODE 9906-E
DRAWING NO. 63630227
Filename: 63630227.DWG
TRS RESOURCES


G8-631-1
DEBUTANIZER OVERHEAD CONDENSER (EAST)
AREA ___ SQ. FT.; DUTY ___ MMBTU/HR
SHELL: 150 PSIG @ 200°F/___ PSIG @ ___/___°F
TUBE: 100 PSIG @ 200°F/___ PSIG @ ___/___°F
G8-631-2
DEBUTANIZER OVERHEAD CONDENSER (WEST)
AREA ___ SQ. FT.; DUTY ___ MMBTU/HR
SHELL: 150 PSIG @ 200°F/___ PSIG @ ___/___°F
TUBE: 100 PSIG @ 200°F/___ PSIG @ ___/___°F
V8-630
DEBUTANIZER REFLUX ACCUMULATOR
30" I.D. x 8'-0" S/S
125 PSIG @ 300°F
55 PSIG @ ___°F
E10-630
DEBUTANIZER REFLUX PUMP (MAIN)
1 1/2x2 1/2x8 1/2 5 HP ELECTRIC MOTOR
50 GPM @ ___ PSIG
___ GPM @ ___ PSIG
3500 RPM
147 YD. FT.
PAH 630 SET @ 100 PSIG
PAL 630 SET @ 0 PSIG
PIC 630 SET @ 55-65 PSIG
63630241 GH-8-GC-2-6408 V10-630 DEBUTANIZER TOWER
63630B05 WC-6-FB-2-13049 COOLING WATER RETURN
63630B05 WC-6-FB-2-13048 COOLING WATER SUPPLY
63630B05 WC-6-FB-2-13047 COOLING WATER RETURN
63630B05 WC-6-FB-2-13046 COOLING WATER SUPPLY
63630240 DS-1-GC-2-6312 V8-620-1 #1 DEPROPANIZER REFLUX ACCUMULATOR
G8-631-2
G8-631-1
GH-4-GC-2-6410
GH-8-GC-2-6409
GH-4-GC-2-6411
PLUG
PSV 630-1 1.5F2 SET @ 125 PSIG
CSO
V8-630
E10-630
SET @ 69 GPM
SET @ 0 GPM
SET @ 20-50 GPM
ON
OFF
H-4-GC-2-6412
DS-3/4-GC-2-6418
DS-1/2-GC-2-6419
FLARE GM-4-GC-2-10630 63630B21
1/4" AI-630 63630201
H-2-GC-2-6420 V6-1102-1,2 BUTANE STORAGE TANKS 63630243
GH-2-GC-2-6421 V6-1103-1,2 GASOLINE STORAGE TANKS 63630241
H-3-GC-2-6414 E10-620-2 #1 DEPROPANIZER REFLUX PUMP (SPARE) 63630240
H-3-GC-2-6415 V10-630 DEBUTANIZER TOWER 63630241
H-4-GC-2-6413 E10-620-2 #1 DEPROPANIZER REFLUX PUMP (SPARE) 63630240
DS-1-GC-2-6312 V2-1803-CLOSED DRAIN HEADER TANK 63630241
V8-630 HD. SEAM 2'-0"
TRS RESOURCES
0 TRS 3/99 COMPLETE REVISION
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
DEBUTANIZER SYSTEM
SCALE NONE
DRAWN BY TRS
DATE 3/99
PROJECT CODE 9906-E
DRAWING NO. 63630242
Filename: 63630242.DWG

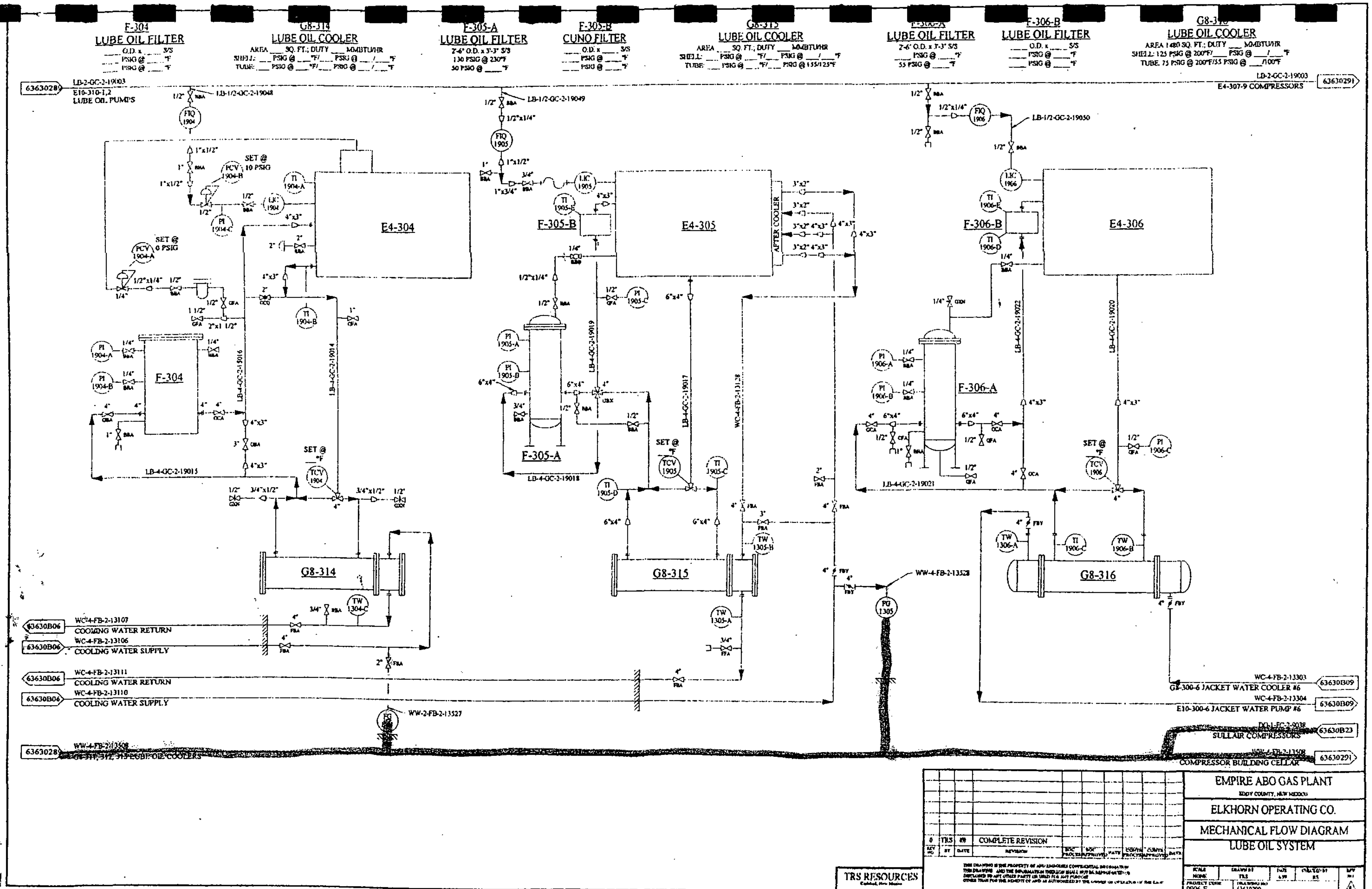

G8-620-1
#1 DEPROPANIZER OVERHEAD CONDENSER
AREA ___ SQ. FT.; DUTY ___ MMBTU/HR
SHELL: 300 PSIG @ 200°F/___ PSIG @ ___/___°F
TUBE: 75 PSIG @ 150°F/___ PSIG @ ___/___°F
SIZE: 19-6-240
V8-620-1
#1 DEPROPANIZER REFLUX ACCUMULATOR
42" I.D. x 8'-0" S/S
300 PSIG @ 300°F
___ PSIG @ ___°F
E10-620-1
#1 DEPROPANIZER REFLUX PUMP(MAIN)
1 1/2"x1"x6" 7.5 HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
3550 RPM
E10-620-2
#1 DEPROPANIZER REFLUX PUMP(SPARE)
1 1/2"x2 1/2"x8 1/2" 7.5 HP ELECTRIC MOTOR
85 GPM @ ___ PSIG
___ GPM @ ___ PSIG
3550 RPM
170 HD. FT.
NOTE: PIC-620-1 IS HEAT TRACED AT THE IMPULSE LINE.
SET @ 230 PSIG
SET @ 205-215 PSIG
SET @ 155 PSIG
PAH 620-1
PIC 620-1
PAL 620-1
PI 620-1A
PT 620-1
PSV 621-5
1.5F2 SET@ 75 PSIG
CSO
63630239
0H-6-GD-2-6304
V10-620-1
#1 DEPROPANIZER TOWER
63630B05
WC-6-FB-2-13045
COOLING WATER RETURN
TW 620-1A
TW 620-1B
TI 620-1C
G8-620-1
[redacted]
63630B05
WC-6-FB-2-13044
COOLING WATER SUPPLY
0H-4-GD-2-6305
PI 620-1B
V8-620-1
18" MW
LG 620-1
H-4-GD-2-6306
H-4-GD-2-6307
RO 620-1
RO 620-2
E10-620-1
E10-620-2
ON OFF
H-3-GD-2-6309
DS-1/2-GC-2-6313
DS-1/2-GC-2-6314
PCV 620-1
PY 620-1
1"FC
H-2-GD-2-6219
V8-621-1
#2 DEPROP. REFLUX ACCUMULATOR
63630238
H-2-GD-2-6315
V10-1062-1,2
PROPANE DRYERS
63630243
H-3-GD-2-6308
V10-620-1
#1 DEPROPANIZER TOWER
63630239
H-3-GC-2-6414
V10-630
DEBUTANIZER TOWER
63630242
GD GC
YS
H-4-GC-2-6413
V8-630
DEBUT. REFLUX ACCUMULATOR
63630242
DS-1-GC-2-6312
V2-1803 CLOSED DRAIN HEADER TANK
63630242
V8-620-1
HD. SEAM 2'-0"
TRS RESOURCES
0 TRS 3/99 COMPLETE REVISION
REV NO BY DATE REVISION
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
#1 DEPROPANIZER SYSTEM
SCALE NONE
DRAWN BY TRS
DATE 3/99
CHECKED BY RS
PROJECT CODE 9906-B
DRAWING NO. 63630240
Filename: 63630240.DWG



[redacted] 3RD STAGE DIS. COOLER #1 AREA [redacted]
[redacted] 3RD STAGE DIS. COOLER #1 AREA (WEST)
[redacted] #9 3RD STAGE DISCHARGE COOLER
G8-36 [redacted] #8 3RD STAGE DISCHARGE COOLER
[redacted] 373 [redacted] #7 3RD STAGE DISCHARGE COOLER
[redacted] 3RD STAGE DISCHARGE COOLER
G8-304-3
3RD STAGE DIS. COOLER #1 AREA (NORTH)
G8-304-1
G8-304-2
G8-304-3
G8-363
G8-373
G8-383
G8-393
E4-301 THRU E4-305 COMPRESSORS #1-#5
3RD STAGE DISCHARGE HEADER
COOLING WATER RETURN
V2-1800 EVAPORATION TANK
COOLING WATER SUPPLY
E4-309 COMPRESSOR #9
3RD STAGE DISCHARGE
E4-306 COMPRESSOR #6
3RD STAGE DISCHARGE
E4-307 COMPRESSOR #7
3RD STAGE DISCHARGE
E4-308 COMPRESSOR #8
3RD STAGE DISCHARGE
FLARE
V8-453 3 PHASE SEPARATOR
SEE DWG. 63830205 FOR FAN DATA
SET @ 80°F
SET @ 740 PSIG
SET @ 75 PSIG
TO ATMOS
(DISCONNECTED) (TO COMP. BLDG.)
USD-15
TCV-391A
TCV-392
TCV-361-A
TCV-362
TCV-371-A
TCV-372
TCV-381-A
TCV-382
63630268
63630213
63630272
63630273
63630274
63630278
TRS RESOURCES
1 TRS 12/00 PRE MARK UP
0 TRS 2/98 COMPLETE REVISION
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
THIRD STAGE DISCH COOLERS
SCALE NONE
63630212



[redacted]01
CAUSTIC RICH/LEAN EXCHANGER
AREA ___ SQ. FT.; DUTY ___ MMBTU/HR
SHELL: ___ PSIG @ ___°F/___ PSIG @ ___/195°F
TUBE: ___ PSIG @ ___°F/___ PSIG @ 240/140°F
[redacted] V10-1[redacted]
CAUSTIC REGENERATOR
30" I.D. x 34'-0" S/S
50 PSIG @ 650°F
___ PSIG @ ___°F
[redacted] USTIC [redacted] ERAT [redacted] ERHEA [redacted] DENSE [redacted] TIC O [redacted] AD CO [redacted] ER WA [redacted] UMP [redacted] C REBO [redacted] STIC R [redacted] ER [redacted]
AREA 193 SQ. FT.; DUTY 2.256 MMBTU/HR
SHELL: 50 PSIG @ 300°F/___ PSIG @ ___/___°F
TUBE: 75 PSIG @ 150°F/___ PSIG @ ___/___°F
5 HP ELECTRIC MOTOR
___ GPM @ ___ PSIG
___ GPM @ ___ PSIG
FT.; DUTY [redacted] HR
SHELL: 50 PSIG @ 350°F/15 PSIG @ ___/___°F
TUBE: 150 PSIG @ 400°F/___ PSIG @ ___/___°F
TO ATMOS
SET @ 35 PSIG
PSV 1002
10" MW
GH-4-HC-2-10036
G8-1003
PI 1003
PC 1003
PCV 1003
SET @ 12 PSIG
GH-2-HC-2-10038
FLARE
63630321
WC-2-FW-2-13037
COOLING WATER RETURN
63630234
E10-1003
ON OFF
WC-2-FW-2-13035
COOLING WATER SUPPLY
63630234
V2-1800 EVAPORATION TANK
GH-1 1/2-HC-2-10037
WC-2-FW-2-13036
GH-4-HC-2-10034
GH-6-HC-2-10035
GH-2-HC-2-10033
Rich
Lean
Rich
LEAN
V10-1002
16" MW
6" HH
KC-2-HC-2-10039
BD-2-HC-2-10057
TI 1001-B
TI 1001-C
TI 1001-D
G8-1001
GH-1 1/2-HC-2-10032
V10-1001 CAUSTIC CONTACTOR
63630233
PI 1002
SET @ 180°F-220°F
TIC 1001
TT 1002
HC FC
S-1 1/2-FC-2-15085
TY 1001
TCV 1001
G8-1002
S-4-FC-2-15084
H.P. STEAM
63630802
FE 1002
C-1 1/2-FW-2-15507
HIGH PRESSURE CONDENSATE HEADER
63630295
C-1 1/2-FW-2-15586
V8-1002
C-1-FW-2-15582
G8-620 #1 DEPROPANIZER REBOILER
63630239
KC-1-GC-2-10047
E10-1002-3 CAUSTIC CIRCULATING/MIX PUMP
63630235
BD-2-HC-2-10056
OPEN DRAIN
63630818
KC-2-HC-2-10040
E10-1002-1,2 CAUSTIC CIRCULATING PUMPS
63630234
V10-1002
HD.SEAM 5'-6"
TRSRESOURCES
0 TRS 3/99 COMPLETE REVISION
REV NO | BY | DATE | REVISION | ENG. PROCESS | DATE | ENG. APPROVED | DATE | CONST. PROCESS | CONST. APPROVED | DATE
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
CAUSTIC SYSTEM
SCALE NONE
DRAWN BY TRS
DATE 3/99
CHECKED BY RB
PROJECT CODE 9908-E
DRAWING NO. 63630236
REV NO
Filename: 63630236.DWG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G8-314
LUBE OIL COOLER
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LUBE OIL FILTER
F-305-B
CUNO FILTER
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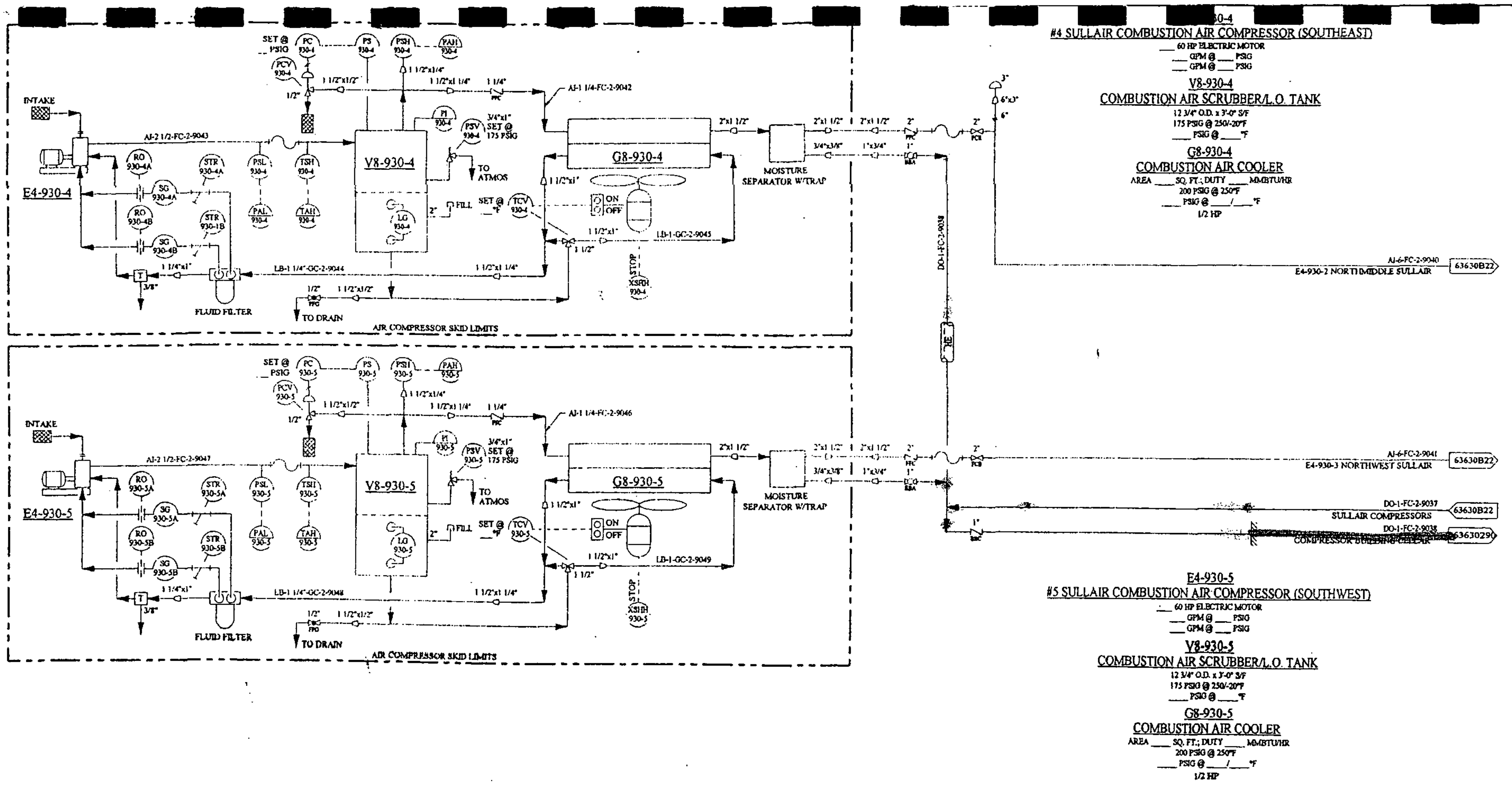
LUBE OIL COOLER
F-306-A
LUBE OIL FILTER
F-306-B
LUBE OIL FILTER
G8-316
LUBE OIL COOLER
E10-310-1,2
LUBE OIL PUMPS
E4-307-9 COMPRESSORS
E4-304
E4-305
E4-306
AFTER COOLER
G8-314
G8-315
G8-316
F-304
F-305-A
F-306-A
COOLING WATER RETURN
COOLING WATER SUPPLY
COOLING WATER RETURN
COOLING WATER SUPPLY
JACKET WATER COOLER #6
E10-300-6 JACKET WATER PUMP #6
SULLAIR COMPRESSORS
COMPRESSOR BUILDING CELLAR
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
LUBE OIL SYSTEM
COMPLETE REVISION
TRS RESOURCES
9906-E
63630290

#9



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REV NO	BY	DATE	REVISION	EOC PROCESS	EOC APPROVAL	DATE	CONTR PROCESS	CONTR APPROVAL	DATE

TRS RESOURCES

EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO

ELKHORN OPERATING CO.

MECHANICAL FLOW DIAGRAM
INSTRUMENT AIR

SCALE	DRAWN BY	DATE	CHECKED BY	REV
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PROJECT CODE	DRAWING NO.			
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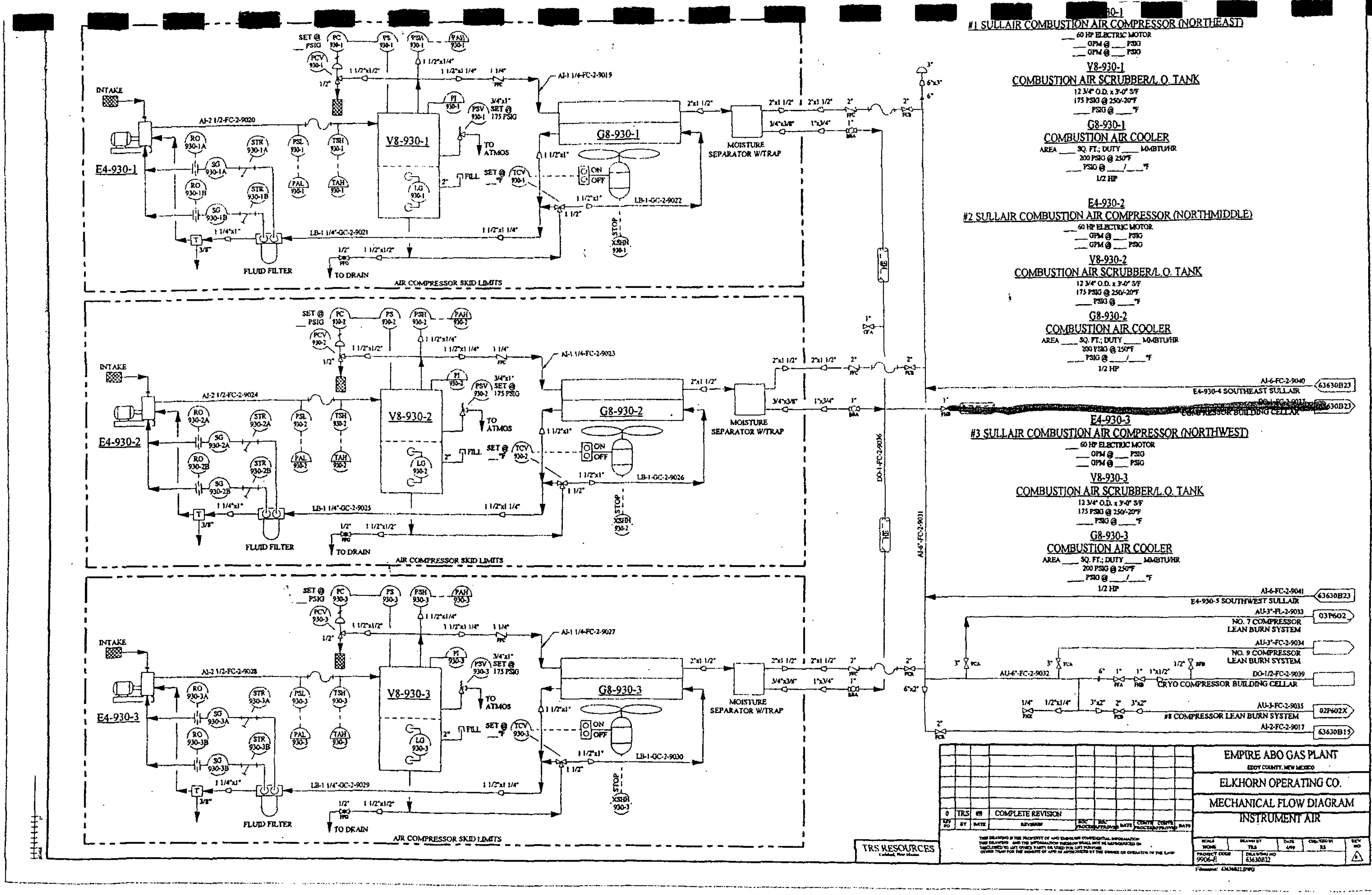

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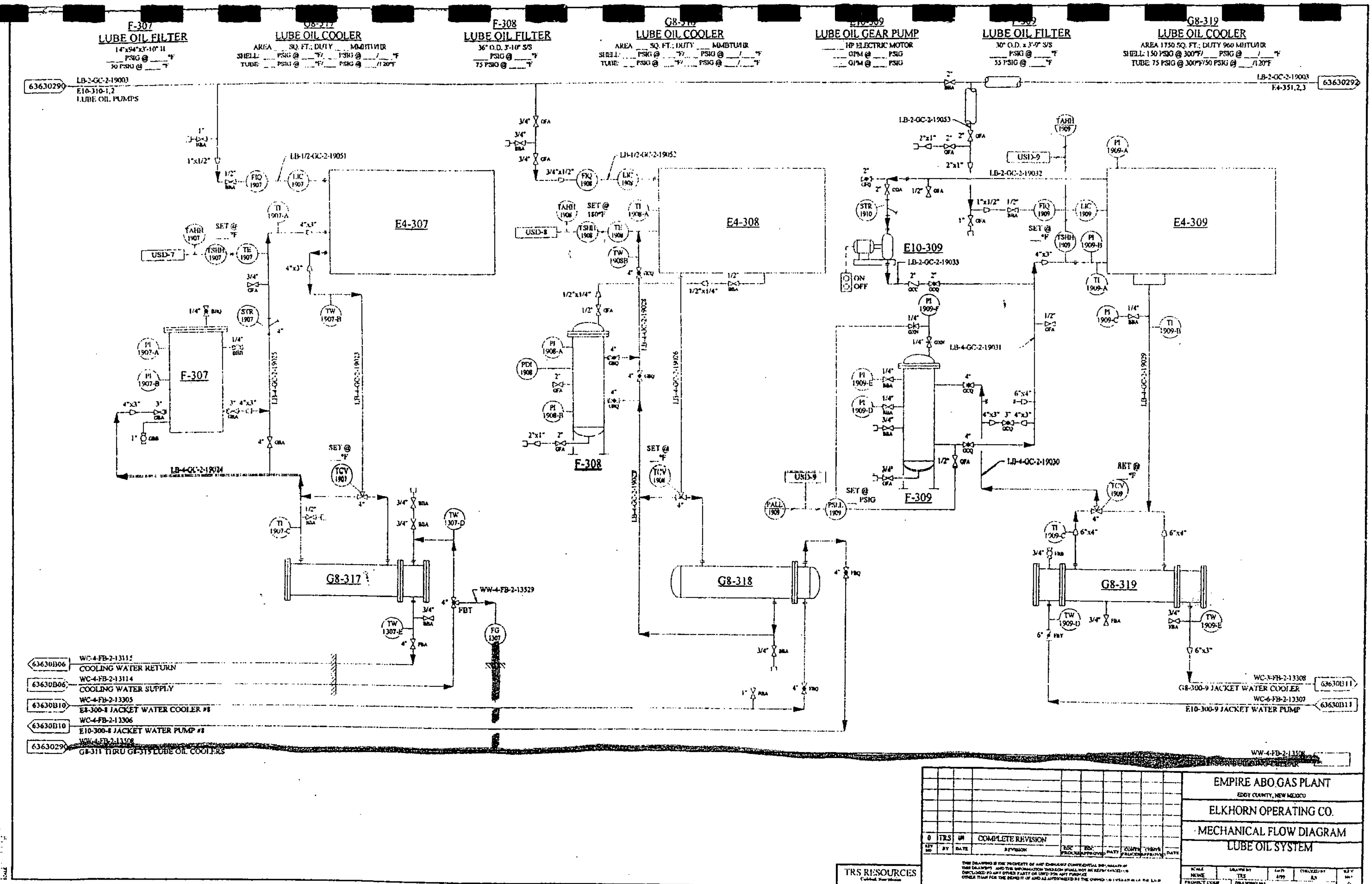
60 HP ELECTRIC MOTOR
V8-930-1
COMBUSTION AIR SCRUBBER/L.O. TANK
12 3/4" O.D. x 3'-0" S/F
175 PSIG @ 250/-20°F
G8-930-1
COMBUSTION AIR COOLER
200 PSIG @ 250°F
1/2 HP
E4-930-2
#2 SULLAIR COMBUSTION AIR COMPRESSOR (NORTHMIDDLE)
60 HP ELECTRIC MOTOR
V8-930-2
COMBUSTION AIR SCRUBBER/L.O. TANK
G8-930-2
COMBUSTION AIR COOLER
E4-930-3
#3 SULLAIR COMBUSTION AIR COMPRESSOR (NORTHWEST)
60 HP ELECTRIC MOTOR
V8-930-3
COMBUSTION AIR SCRUBBER/L.O. TANK
G8-930-3
COMBUSTION AIR COOLER
E4-930-1
E4-930-2
E4-930-3
INTAKE
FLUID FILTER
TO DRAIN
TO ATMOS
MOISTURE SEPARATOR W/TRAP
AIR COMPRESSOR SKID LIMITS
AI-6"-FC-2-9040
E4-930-4 SOUTHEAST SULLAIR
63630B23
COMPRESSOR BUILDING CELLAR
AI-6"-FC-2-9041
E4-930-5 SOUTHWEST SULLAIR
AU-3"-FL-2-9033
NO. 7 COMPRESSOR LEAN BURN SYSTEM
03P602
AU-3"-FC-2-9034
NO. 9 COMPRESSOR LEAN BURN SYSTEM
DO-1/2-FC-2-9039
CRYO COMPRESSOR BUILDING CELLAR
AU-3-FC-2-9035
#8 COMPRESSOR LEAN BURN SYSTEM
02P602X
AI-2-FC-2-9017
63630B15
AI-6"-FC-2-9031
DO-1-FC-2-9036
AU-6"-FC-2-9032
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
INSTRUMENT AIR
COMPLETE REVISION
TRS RESOURCES
63630B12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G8-317
LUBE OIL COOLER
F-308
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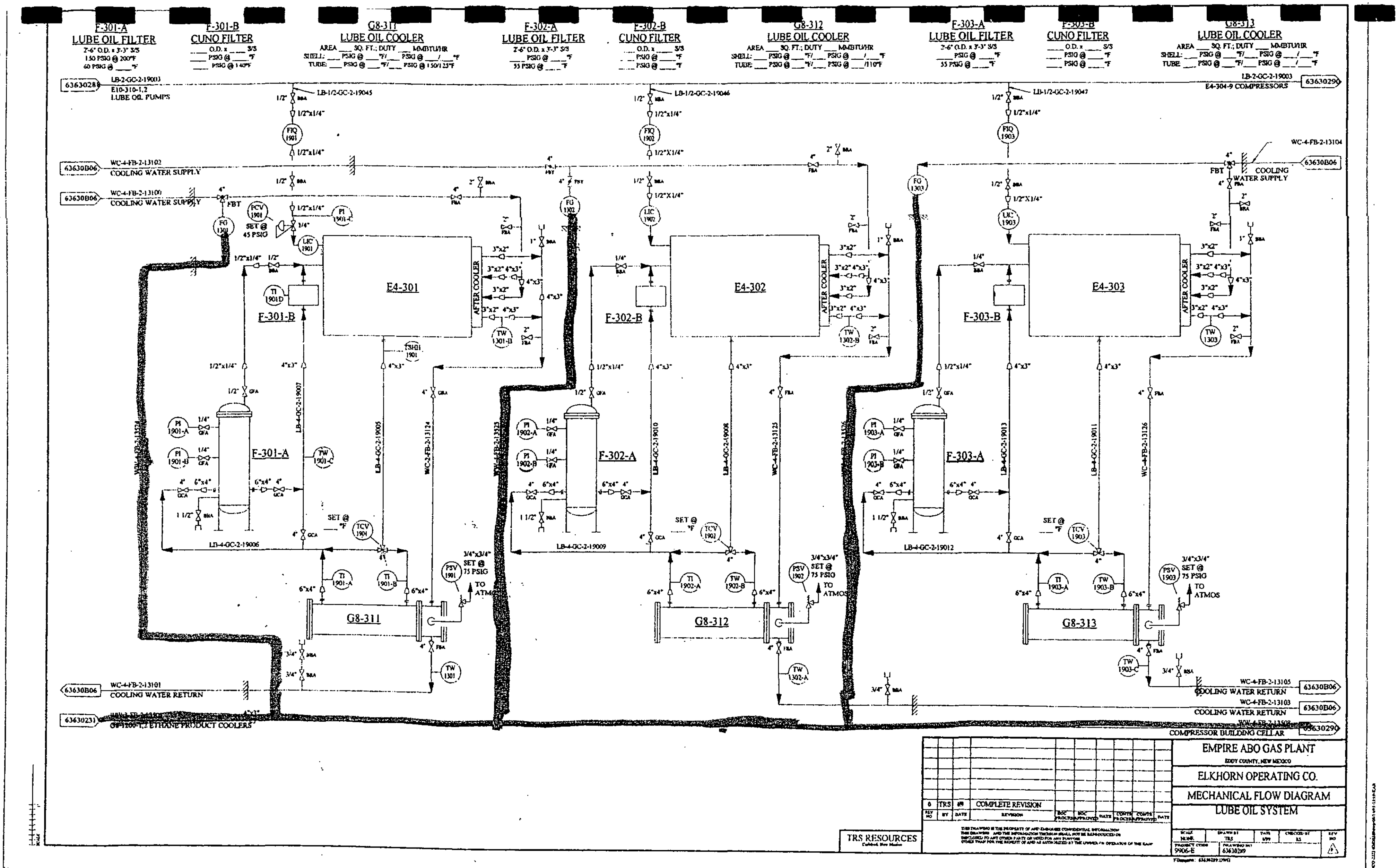
G8-318
LUBE OIL COOLER
LUBE OIL GEAR PUMP
HP ELECTRIC MOTOR
LUBE OIL FILTER
G8-319
LUBE OIL COOLER
AREA 1750 SQ. FT.; DUTY 960 MBTU/HR
E4-307
E4-308
E4-309
E10-309
F-307
F-308
F-309
G8-317
G8-318
G8-319
USD-7
USD-8
USD-9
ON
OFF
COOLING WATER RETURN
COOLING WATER SUPPLY
G8-300-9 JACKET WATER COOLER
E10-300-9 JACKET WATER PUMP
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
LUBE OIL SYSTEM
COMPLETE REVISION
TRS RESOURCES
63630291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F-301-B
CUNO FILTER
G8-311
LUBE OIL COOLER
F-302-A
LUBE OIL FILTER
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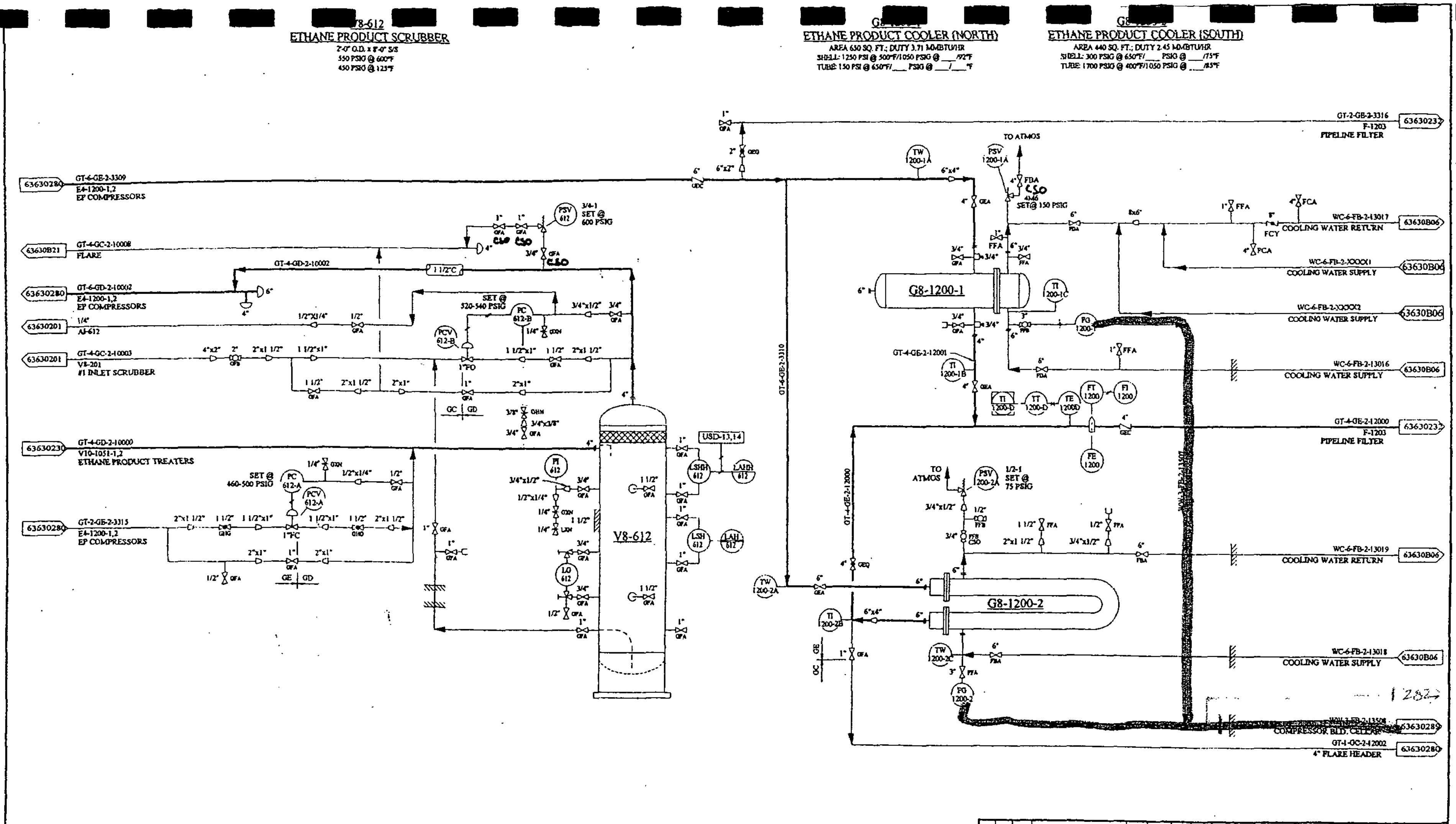
CUNO FILTER
G8-312
LUBE OIL COOLER
F-303-A
LUBE OIL FILTER
F-303-B
CUNO FILTER
G8-313
LUBE OIL COOLER
E10-310-1,2
LUBE OIL PUMPS
E4-304-9 COMPRESSORS
COOLING WATER SUPPLY
COOLING WATER RETURN
G8-1200-1,2 ETHANE PRODUCT COOLERS
COMPRESSOR BUILDING CELLAR
E4-301
E4-302
E4-303
AFTER COOLER
G8-311
G8-312
G8-313
TO ATMOS
EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO
ELKHORN OPERATING CO.
MECHANICAL FLOW DIAGRAM
LUBE OIL SYSTEM
COMPLETE REVISION
TRS RESOURCES
9906-E
63630289



V8-612	
LSHH	4'-0"
LSH	1'-9"
I.D. SEAM	3'-0"

REV NO	BY	DATE	REVISION
0	TRS	3/99	COMPLETE REVISION

TRS RESOURCES

EMPIRE ABO GAS PLANT
EDDY COUNTY, NEW MEXICO

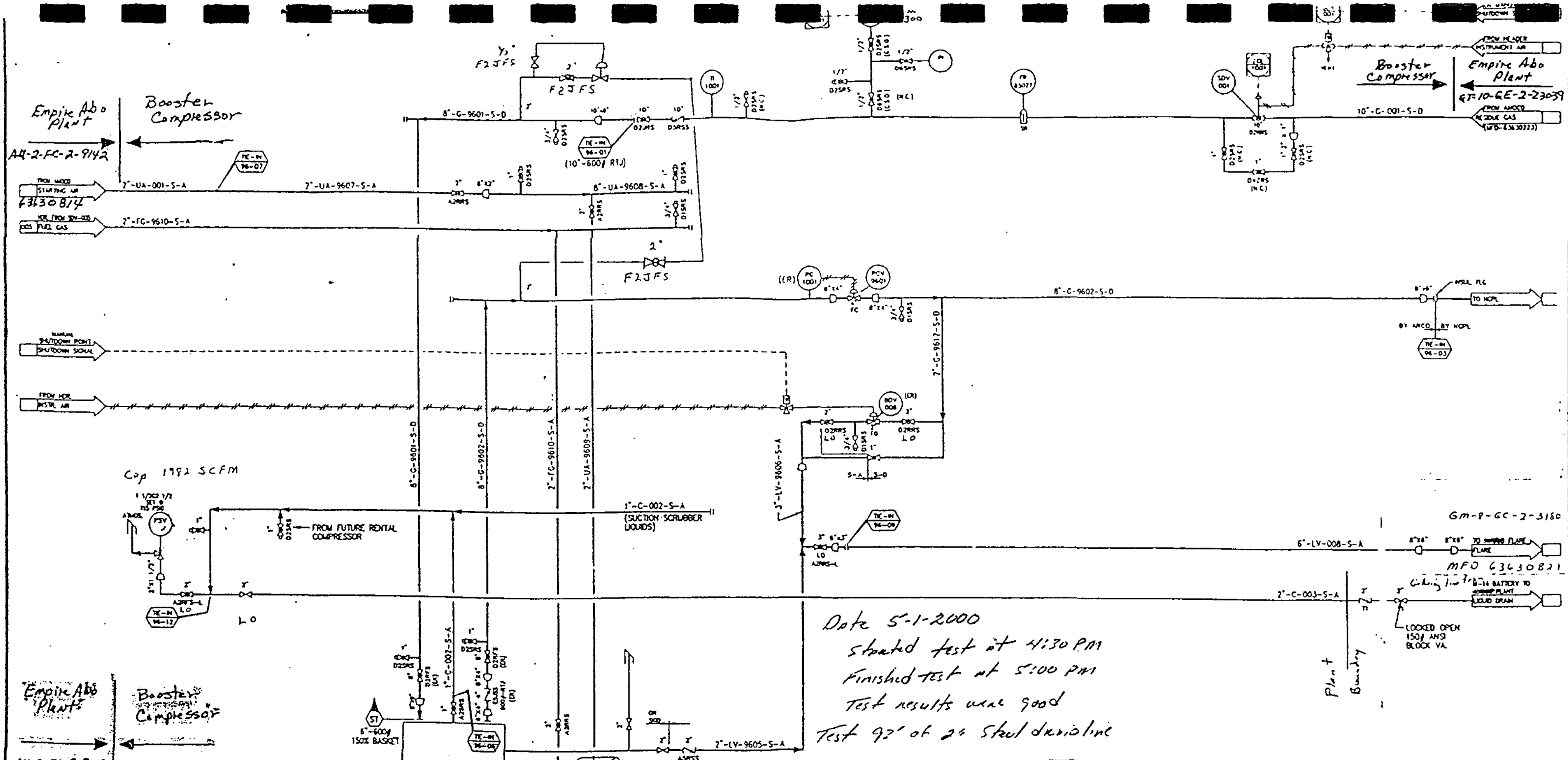
ELKHORN OPERATING CO.

MECHANICAL FLOW DIAGRAM

ETHANE PRODUCT

SCALE: NONE | DRAWN BY: TRS | DATE: 3/99 | CHECKED BY: BS
PROJECT CODE: 9906-E | DRAWING NO.: 63630231

Filename: 63630231.DWG



Date 5-1-2000
Started test at 4:30 PM
Finished test at 5:00 PM
Test results were good
Test 92' of 2" Steel drainline

No Drainline number

NOTE

1. TYPICAL OF BLOCKED AND BLINDED, (SUCTION, STARTING AIR, AND DISCHARGE LINES), TO FOUR OUT OF SERVICE COMPRESSORS.
2. (ER) = EXISTING RELOCATED.
3. INSTALL INSULATING KITS IN ALL LINES TO AND FROM COMPRESSOR EXCEPT DRAIN LINE.

ISSUED FOR

JUL 1 1 1996

CONSTRUCTION

HPF CONSULTANTS, INC.
ENGINEERING, DESIGN & INSPECTION
MIDLAND, TEXAS

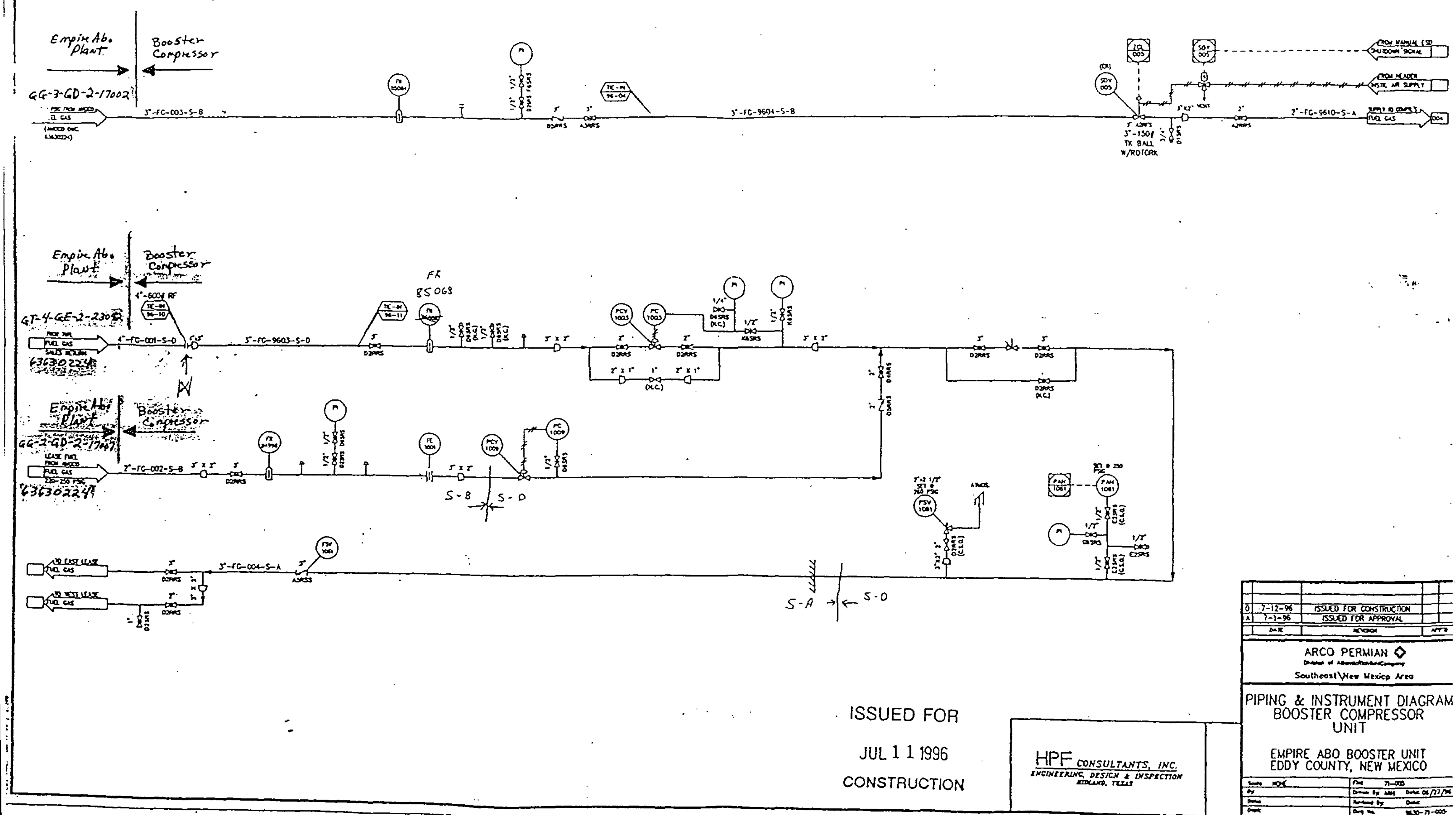
0	7-12-96	ISSUED FOR CONSTRUCTION		
A	7-1-96	ISSUED FOR APPROVAL		
	DATE	REVISION		APP'D

ARCO PERMIAN
Division of AtlanticRichfieldCompany
Southeast\New Mexico Area

PIPING & INSTRUMENT DIAGRAM
BOOSTER COMPRESSOR
UNIT

EMPIRE ABO BOOSTER UNIT
EDDY COUNTY, NEW MEXICO

Scale NONE	File 71-004		
By	Drawn By MN	Date 06/27/96	
Date	Revised By	Date	
Dept.	Dwg No. 9630-71-004		


Empire Abo Plant
Booster Compressor
GG-3-GD-2-17002
3"-FC-003-S-B
3"-FC-9604-S-B
2"-FC-9610-S-A
3"-150# TK BALL W/ROTORK
Empire Abo Plant
Booster Compressor
GT-4-GE-2-2308
4"-FC-001-S-D
3"-FC-9603-S-D
FR 85063
63630224
Empire Abo Plant
Booster Compressor
GG-2-GD-2-17007
2"-FC-002-S-B
63630224
3"-FC-004-S-A
S-B
S-D
S-A
S-D
ISSUED FOR
JUL 1 1 1996
CONSTRUCTION
HPF CONSULTANTS, INC.
ENGINEERING, DESIGN & INSPECTION
MIDLAND, TEXAS
0 7-12-96 ISSUED FOR CONSTRUCTION
A 7-1-96 ISSUED FOR APPROVAL
ARCO PERMIAN
Southeast\New Mexico Area
PIPING & INSTRUMENT DIAGRAM
BOOSTER COMPRESSOR
UNIT
EMPIRE ABO BOOSTER UNIT
EDDY COUNTY, NEW MEXICO

TRS Resources LLC

Global Industrial Solutions

Thank You for Your Business

120 Chuckwagon Rd Carlsbad, New Mexico 88220 (505)887-7111 fax (505)628-8276

SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

EMPIRE ABO GAS PLANT

Eddy County, New Mexico
257 Empire Road, Artesia, NM 88211 -0070

Operated by:
Frontier Field Services, LLC

Owned by:
Frontier Field Services, LLC
4200 Skelly Drive, Suite 700
Tulsa, Oklahoma 74135

Updated by:

Flatrock Engineering and Environmental, Ltd
2000 S.E. 15th Street, Bldg 150-D
Edmond, OK 73013

TABLE OF CONTENTS

Page

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APPENDICES

LOG OF PLAN REVIEW AND AMENDMENTS

NON TECHNICAL AMENDMENTS

- Non-technical amendments are not certified by a Professional Engineer.
- Examples of changes include, but are not limited to, phone numbers, name changes, or any non-technical text change(s).

TECHNICAL AMENDMENTS

- Technical amendments are certified by a Professional Engineer (§112.5(c)).
- Examples of changes include, but are not limited to, commissioning or decommissioning containers; replacement, reconstruction, or movement of containers; reconstruction, replacements, or installation of piping systems; construction or demolition that might alter secondary containment structures; changes of product or service; or addition/deletion of standard operation or maintenance procedures related to discharge prevention measures. It is the responsibility of the facility to determine, and confirm with the regulatory authority as necessary, what constitutes a technical amendment. The preamble of the rule states that an amendment is required only "when there is a change that materially affects the facility's potential to discharge oil" (67 **FR** 47091).
- An amendment made under this section will be prepared within six (6) months of the change and implemented as soon as possible but not later than six (6) months following preparation of the amendment.
- Technical Amendments affecting various pages within the plan can be P.E. certified on those pages, certifying those amendments only, and will be documented on the log form below.

MANAGEMENT REVIEW

- Management will review this SPCC Plan at least each five (5) years and document the review on the form below (§112.5(b)).

Review/ Amend Date	Signature* (Specify)	Amend Plan (will/will not)	Description of Review Amendment	Affected Page(s)	P.E. Certification (Y/N)

* Typically signed by Manager, Professional Engineer or plan reviewer.

ONSHORE FACILITY - REGULATORY CROSS-REFERENCE		
Citation	**Description**	**Section**
§112.3(d)(1)	Professional Engineer Certification	1.2
§112.5(b)	Management of Five Year Review	Foreword
§112.7	General requirements for SPCC Plans for all facilities and all oil types	-----
§112.7(a)	General requirements: discussion of facility's conformance with rule requirements; deviations from Plan requirements; facility characteristics that must be described in the Plan; spill reporting information in the Plan; emergency procedures	1, 2, App. A-D
§112.7(b)	Fault analysis	2A.1
§112.7(c)	Secondary containment	2A.1, 2A.3.1
§112.7(d)	Contingency planning	App. D
§112.7(e)	Inspections, tests, and records	2A.5.3, 2A.7, App. B
§112.7(f)	Employee training and discharge prevention procedures	1.6, App. A, App. B
§112.7(g)	Security (excluding oil production facilities)	2A.4.2, 2A.6
§112.7(h)	Loading/unloading (excluding offshore facilities)	2A.5
§112.7(i)	Brittle fracture evaluation requirements	2A.7
§112.7(j)	Conformance with State requirements	1.11
§112.8	Requirements for onshore facilities (excluding production facilities)	-----
§112.8(a)	General and specific requirements	2A.1 - 2A.4, 2A.7
§112.8(b)	Facility drainage	2A.3
§112.8(c)	Bulk storage containers	2A.1, 2A.2, 2A.7
§112.8(d)	Facility transfer operations, pumping, and facility process	2A.4, 2.A.7
§112.9	Requirements for onshore production facilities	N/A
§112.9(a)	General and specific requirements	N/A
§112.9(b)	Oil production facility drainage	N/A
§112.9(c)	Oil production facility bulk storage containers	N/A
§112.9(d)	Facility transfer operations, oil production facility	N/A
§112.10)	Requirements for onshore oil drilling and workover facilities	N/A
§112.10(a)	General and specific requirements	N/A
§112.10(b)	Mobile facilities	N/A
§112.10(c)	Secondary containment - catchment basins or diversion structures	N/A
§112.10(d)	Blowout prevention (BOP)	N/A
§112.11	Requirements for offshore oil drilling, production, or workover facilities	N/A
§112.11(a)	General and specific procedures	N/A
§112.11(b)	Facility drainage	N/A
§112.11(c)	Sump systems	N/A
§112.11(d)	Discharge prevention systems for separators and treaters	N/A
§112.11(e)	Atmospheric storage or surge containers; alarms	N/A
§112.11(f)	Pressure containers; alarm systems	N/A
§112.11(g)	Corrosion protection	N/A
§112.11(h)	Pollution prevention system procedures	N/A
§112.11(i)	Pollution prevention systems; testing and inspection	N/A
§112.1(j)	Surface and subsurface well shut-in valves and devices	N/A
§112.11(k)	Blowout prevention	N/A
§112.11(l)	Manifolds	N/A
§112.11(m)	Flowlines, pressure sensing devices	N/A
§112.11(n)	Piping; corrosion protection	N/A
§112.11(o)	Sub-marine piping; environmental stresses	N/A
§112.11(p)	Inspections of sub-marine piping	N/A

SECTION ONE

General Information

1.0 General Information

1.1 Management Approval and Review

Management Approval

- Operator responsible for Facility: Frontier Field Services, LLC

Facility Name and Location: Empire Abo Gasoline Plant
257 Empire Road, Artesia NM 88211

- Owner of the Facility: Frontier Field Services, LLC

Address: 4200 Skelly Drive, Suite 700., Tulsa, OK 74135

- This SPCC Plan will be implemented as herein described.

Signature:	____________________	Designated person accountable for oil spill prevention at the facility:	
Name:	Chad Cagle	Name:	David Harris
Date:	____________________	Title:	Plant Manager
Title:	Director of Operations		

- This SPCC Plan will be implemented as herein described.

Signature:	____________________	Designated person accountable for oil spill prevention at the facility:	
Name:	____________________	Name:	____________________
Date:	____________________	Title:	____________________
Title:	____________________		

1.2 Professional Engineer Certification

Professional Engineer Certification

By means of this Professional Engineer Certification, I hereby attest to the following:

- I am familiar with the requirements of 40 CFR Part 112 and have verified that this Plan has been prepared in accordance with the requirements of this Part.
- I or my agent have visited and examined the facility(s).
- I have verified that this Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards.
- I have verified that the required inspection and testing procedures have been established as described in Section 2.
- I have verified that the Plan is adequate for the facility.

Mark Martelli
Printed Name of Registered Professional Engineer

(Seal)

____
Signature of Registered Professional Engineer

Date: ________________

Registration No.: _77679 **State: _Texas_**

1.3 Substantial Harm Certification (excerpt from 40 CFR Part 112 - Attachment CII)

CERTIFICATION OF THE APPLICABILITY OF THE SUBSTANTIAL HARM CRITERIA

FACILITY NAME: Empire Abo Gasoline Plant
FACILITY ADDRESS: 257 Empire Road
Artesia NM 88211

1. Does the facility transfer oil over water to or from vessels ***and*** does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?

   ☐ YES ☒ NO

2. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground oil storage tank area?

   ☐ YES ☒ NO

3. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula[1]) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments? For further description of fish and wildlife and sensitive environments, see Appendices I, II, and III to DOC/NOAA's "Guidance for Facility and Vessel Response Plans: Fish and Wildlife and Sensitive Environments" (59 FR 14713, March 29, 1994) and the applicable Area Contingency Plan.

   ☐ YES ☒ NO

4. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula [1]) such that a discharge from the facility would shut down a public drinking water intake[2]?

   ☐ YES ☒ NO

5. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?

   ☐ YES ☒ NO

CERTIFICATION
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

______________________	Director of Operations
Signature	Title
Chad Cagle	
Name (please type or print)	Date

1 If a comparable formula is used, documentation of the reliability and analytical soundness of the comparable formula must be attached to this form.

2 For the purposes of 40 CFR part 112, public drinking water intakes are analogous to public water systems as described at 40 CFR 143.2(c).

1.4 Contact List and Phone Numbers

The contact list and phone number reference for the facility is provided in Appendix A. Also, please refer to the "Emergency Action Plan" kept at the plant, for any updated telephone numbers.

1.5 Notification Data Sheet

A Notification Data Sheet is provided in Appendix A.

1.6 Personnel, Training, and Discharge Prevention Procedures

Training

- The Facility provides the following minimum training to oil-handling personnel prior to assignment of job responsibilities:

  - *Operation and maintenance of equipment to prevent oil discharges;*
  - Oil Spill Contingency Plan;
  - Applicable oil spill prevention (State & Federal) laws, rules, and regulations;
  - General facility operations; and,
  - The contents of the facility SPCC Plan and applicable pollution control laws, rules, and regulations.

Briefings

The facility conducts prevention briefings for oil-handling personnel at least once a year to assure adequate understanding of the SPCC Plan for the facility. These briefings include discussion of potential discharges or component failures and precautionary measures. Also included are any known discharges, failures, malfunctioning components and any new precautionary measures.

Documentation

Documentation of these Personnel, Training, and Discharge Prevention Briefing programs is maintained for a minimum period of three (3) years. The training company issues wallet cards to each employee undergoing the training so that each employee can document that he/she has been trained/ briefed on an annual basis. Additionally, the plant clerk in the main office keeps annual training/ briefing logs.

1.7 Facility Layout and Diagram

1.7.1 Facility Layout

Diagrams of the facility are located in Appendix C. More detailed drawings can be found in the plant office. The first set of diagrams shows the general layout and placement of tanks and other equipment. The second diagram shows the locations of fences, dikes and other items relevant to this plant.

The physical layout of the facility is described as follows:

The facility is laid out in a north-south and east- west grid pattern. At the northern top side of the plant is the main office and control room. Important areas for the storage of hydrocarbons and potential sources of spills would include:

1. The LPG and NGL storage facility located south easterly of the office. This area contains nine different horizontal "bullet" tanks ranging in size from 1000 Bbl to 1285 Bbl. Only refrigeration grade propane is stored in this area at this time.

2. Lubricating oils and solvents are stored in an area between the office and the LPG and NGL storage facility. The storage area has two 322 Bbl lubricating oil tanks, one 1000 gallon vehicle gasoline storage tank and one 500 gallon vehicle gasoline storage tank.

3. Used lubricating oils and process water are stored in the slop oil storage area located near the south border of the facility. Three 400 Bbl tanks and one 400 Bbl gunbarrel are used to store a mixture of water, produced oils and used lubricating oil.

4. Materials from the process drain system are stored in two tanks located in the process drain storage area. The process drain storage area is located in a southwesterly direction from the main office just east of the evaporation pond. The diked area contains four tanks. The 500 BBl. tank is used by for holding materials from the process drain system. A second 210 BBl. tank may be used if required. The tanks receive wastewater, hydrocarbons and amine from the process drain system.

5. The loading and unloading racks are located just to the northeast of the LPG and NGL storage facility. Several truck racks are located in this area to load gasoline, butane, propane or a mixture of petroleum liquids. LPG and NGL are no longer loaded into trucks. Only refrigeration grade propane is unloaded.

- Further details are provided in Section 2 - Container and Potential Spills Table and also in Appendix "E" which shows the storage tanks and containment areas.

1.7.2 Facility and Containment diagrams are attached (Appendix C and E) with the following detail and location information (as applicable):

- Process equipment, operating equipment, electrical equipment.
- Loading/Unloading racks.
- Fixed aboveground storage tanks.
- Transfer Stations and connecting lines.
- Drum and portable container storage areas.
- The contents of all containers.

1.8 Prevention, Response and Cleanup

Prevention

- The facility discharge prevention measures, including procedures for routine handling of products (loading, unloading, facility transfers, etc.), are described as follows:

The facility has developed operating procedures to assure the safe operation of the plant and also to prevent spills. Procedures include truck loading and unloading, bleeding of vessels, pumping of liquids and other items.

The facility has also been designed to collect any drainage from areas having lines containing gasoline or other liquid hydrocarbons. Storm water levees are located on the south and west sides of the plant. These levees are in place to act as containment for storm water and as tertiary containment for oil, other hydrocarbon liquids, or chemicals. Oil will be collected if accumulations occur in this area as described above for diked containment areas.

The removal of oil fluid from the diked containment areas will be through the use of vacuum trucks and/or portable pumps with disposal at approved facilities or the fluid may be placed in the production stream for reconditioning.

Vacuum trucks may be used, if necessary, during large storm events to remove rainwater from diked areas. The rainwater is disposed of in an approved manner. The water may be disposed of in an approved disposal well in accordance with the Discharge Plan. Clean rainwater may also be discharged immediately outside of the diked area if the water has no visible sheen and the discharge is logged on the Tank Drainage Form found on page B-4 of this plan.

Countermeasures

- The facility discharge discovery, response and cleanup capabilities are described as follows:

On the operator's routine rounds, the operator will look for signs of oil. Operators will look for signs of leaking equipment (tanks, flanges, piping etc.), oil sheens in water, and stained soil near known underground pipelines.

The Oil Spill Contingency Plan found in Appendix D is used if an oil spill is observed. If oil is observed, the Plant Manager will be notified. Liquid spilled product will be recovered by pumps and/or vacuum trucks and handled in approved methods (disposal or recycled). Any contaminated soil or clean-up debris will be collected and either remediated or disposed of in an approved manner.

The plant has personnel, hand tools and other equipment available for cleaning up any minor oil spill on a 24-hour basis. Outside contractors will be brought in to assist in the event that the spill is too large to be cleaned up by plant personnel.

- The resources available to the facility for discharge cleanup are provided in the "Emergency Action Plan" that may be found in the Safety office. This plan is kept up to date and can be used to address many other emergencies, besides oil cleanup activities.

1.8 Prevention, Response and Cleanup (Cont'd)

Disposal

The facility has established the following methods of disposal for recovered materials in accordance with applicable legal requirements:

If the substance spilled is a hazardous chemical, prior to taking any action, refer to the chemical's Material Safety Data Sheet (MSDS).

1. Removal:

Once the release is contained, an attempt shall be made to remove the spilled material in a manner, which minimizes damage to the environment. The Frontier Plant Manager for the facility should be contacted for site-specific guidelines. Possible removal methods may include:

A. Natural biodegradation/enhanced bioremediation

B. Soil removal

C. Application of sorbent materials

D. Evaporation and/or in situ burning (requires regulatory approvals)

E. Skimmers

F. Chemical treatment (e.g. Dispersants, which require regulatory approvals)

2. Disposal:

Contaminated soil, sorbent materials, and all other forms of oil or hazardous wastes resulting from spill and cleanup efforts will be disposed in accordance with applicable regulations. Consideration should be given to all onsite options before shipping offsite.

Those materials that cannot be disposed of onsite must go to an approved offsite waste disposal or recycling location. The Frontier Plant Manager maintains a list of approved waste disposal. If needed, contact the Frontier Plant Manager for assistance in selecting the appropriate disposal option.

3. Restoration:

Restoration will be performed as necessary to minimize ecological damages. The Frontier Plant Manager should be consulted for guidance specific to each spill location. All temporary containment devices such as dikes, trenches, etc., will be removed. The topography should resemble the appearance present prior to the spill. If any soil was removed, it shall be replaced with compatible material. If vegetation is destroyed, it may be necessary to replant and revitalize the landscape.

In any event, the Frontier Plant Manager should be consulted, for assistance in developing site-specific plans for spill cleanup and remediation.

1.9 Impracticability (as applicable)

The containment and/or diversionary structures or equipment to prevent a discharge ☒ **are** ☐ **are not** practicable.

If not, the following provides a description of the impracticability. ______________________________

Refer to the Container and Potential Spills Table in Section 2 for additional details.

- **If not** practicable, ☐ an oil spill contingency plan is attached (provided in Appendix D) or ☐ is addressed by the Facility Response Plan.
- A written commitment of manpower, equipment and materials required to expeditiously control and remove any quantity of oil discharged is provided in ☐ Appendix D or in the ☐ Facility Response Plan.
- If containment and/or diversionary structures are impracticable for bulk storage containers, then periodic integrity testing of the container(s) and integrity and leak testing of the valves and piping is required.
- *Reference supporting documentation maintained separately, as appropriate:* ______________________________

  [*Additional pages may be attached as necessary.*]

1.10 Deviations to Rule

☒ The facility has no deviations to the rule.

☐ The facility has identified various deviations from the rule and the equivalent environmental protection to support the deviations. The deviations, and the reasons for the deviations, are summarized ☐ below or ☐ in the appropriate sections of this plan.

1.11 Improvements

The facility may from time-to-time install additional measures or implement new procedures to improve spill prevention, control or countermeasures. The following area allows the SPCC plan user to list any additional improvements after the plan was enacted.

1.12 Conformance with other Requirements

Describe conformance with other applicable requirements and effective discharge prevention and containment procedures in-place at the facility. Include a description of compliance with more stringent State rules, regulations, and guidelines, if any:

The facility is in conformance with the New Mexico Oil Conservation Division (OCD) "Discharge Plan" requirements. Pertinent requirements quoted from the "Discharge Plan" include:

Attachment 10: Inspection, Maintenance and Reporting

Inspection and maintenance of the facility occurs on a daily basis (See SPCCP, Appendix E). Below ground and non-pressurized process and wastewater lines are tested every 5 years (See Drain Line Testing Report, Appendix D).

Groundwater Monitoring
All wastewater is stored in tanks with secondary containment or the lined evaporation pond. All wastewater is transported from the point of generation to the storage units via pipelines with documented mechanical integrity. Therefore, ground water monitoring is not necessary. Ground water monitoring is addressed separately in the Stage I/II Abatement Plan.

Precipitation Runoff Control
The plant has levees around its southern, and western sides to contain storm water runoff. These act as a tertiary containment for other spills at the plant. Any oil liquid that accumulates in this area is recovered with vacuum trucks and portable pumps. This is disposed at an approved offsite facility or added to the production stream.

SECTION 2A

Onshore Facility Information

2A.1 Container and Potential Spills Table

- The potential spills sources at the facility are summarized in the following table:

Oil Source	Associated Substance (Contents) *(Oil)*	Source Capacity *(Bbls)*	Potential Failure	Rate of Flow *(Bbls/hr)*	Direction of Flow	Containment System(s)*
Aboveground Fixed Containers						
NGL Storage Area	Ref grade propane only	4285	Leak	4285	South	Yes – Bermed area
Process Drain Storage Area	Water, Oil, Amine	500, 210	Leak	500	South	Yes – Bermed area
Amine Tank	Water, amine	280	Leak	280	South	Yes – Bermed area
Amine Tank	Water, Amine	195	Leak	195	South	Yes – Bermed area
Amine Day Tank	Amine	26	Leak	26	South	Yes – Bermed area
Methanol Tank	Methanol	24	Leak	24	South	Yes – Bermed area
Lube Oil Storage Area	2 lube oil storage tanks	322, 322	Leak	322	South	Yes – Bermed area
Lube Oil Storage Area	Gasoline storage tank	12	Leak	12	South	Yes – Bermed area
Lube Oil Storage Area	Gasoline storage tank	24	Leak	24	South	Yes – Bermed area
Solvent Storage Area	Solvent Storage Tank	12	Leak	12	South	Yes – Fiberglas containment
Lube Oil Storage Area – **Not used**	Propane Fuel Storage tank	24	Leak	24	South	Yes – Bermed area
Diesel Tank	Diesel Tank	12.5	Leak	12.5	South	Yes – Bermed area
1 Ethyl Mercaptan tank – **to be removed**	Ethyl Mercaptan	15	Leak	15	South	Yes – Bermed area
Slop Oil Storage	Water, Oil	387, 380, 380, 380	Leak	387	South	Yes – Bermed area
Completely or Partially Buried Tanks						
Mobile and Portable Containers						
Oil Drum	Lube Oil	1.3	Leak	1.3	South	Yes – Bermed Area

Oil Source	Associated Substance (Contents) *(Oil)*	Source Capacity *(Bbls)*	Potential Failure	Rate of Flow *(Bbls/hr)*	Direction of Flow	Containment System(s)*
Operational Equipment (Transformers, Manufacturing Equipment, Process Vessels, etc.)						
Truck or Rail Loading/Unloading Rack						
LPG Loading Rack – **Not used**	Propane, Butane	1000 Bbl	Rupture	100	Evaporates	No
NGL Loading Rack	Ref grade propane unloading only	1000 Bbl	Rupture	100	South	Yes – Bermed area (proposed)
Other Potential Spill Sources (Piping, Surface Impoundments, etc.)						
Gasoline Piping – **Not used**	Gasoline	100 Bbl	Rupture	100	South	Yes – Flows into southern bermed area

- The material and construction of bulk storage containers are compatible with the material stored and conditions of storage such as pressure and temperature.
- All bulk storage container installations are constructed so that a means of secondary containment is provided for the entire capacity of the largest single container and sufficient freeboard to contain precipitation.
- Diked areas are sufficiently impervious to contain discharged oil. (See Appendix E)
- Visible discharges, which result in a loss of product from containers, will be promptly corrected and any accumulations of oil in the diked area(s) will be promptly removed.

* See Sec. 2A.3.1 for further details.

2A.2 Bulk Storage Containers

2A.2.1 Completely and Partially Buried Tanks

- The facility has several buried tanks. Each of the tanks has secondary containment or a leak detection system installed. A list of the tanks is as follows:
  - Process Drain Tank (Metal tank inside of a concrete enclosure with inspection ports.)
  - Molten Sulfur Tank (Metal tank built to provide for leak detection through inspection ports.)
  - Amine Drain Tank (Metal tank inside of a concrete enclosure with inspection ports.)
  - Flare Sump (Metal tank inside of a concrete enclosure with inspection ports.)

- Protective coatings provide corrosion protection and the tanks are placed inside of concrete cellars that are kept dry.

2A.2.2 Mobile or Portable Oil Storage Containers

- Mobile or portable oil storage containers are located at the facility. Drums are used for lubricating oils and miscellaneous chemicals.
- Secondary containment is **provided** which is adequately sized to contain the largest container plus sufficient freeboard for precipitation. See Sec. 2A.3.1 for details. Secondary containment includes:
  - A concrete containment area is provided under the barrel storage area. See Appendix E for details.
  - Drum "coffins" being of either fiberglass or metal are used whenever chemicals are used in the plant.

2A.2.3 Internal Heating Coils

- The facility does utilize internal heating coils in the sulfur storage tank. Internal heating coil leakage is controlled by monitoring the vents off of the molten sulfur storage tank. The steam return line is in a closed system and does not discharge into an open water course.

2A.2.4 Fail Safe Precautions

The plant is manned 24 hours a day to assure that alarms are properly responded to.

- The following precautions are used to assure that tanks are not overfilled:
  - Slop Oil Tanks: Has a Level Safety High (LSH) sensor and alarm to alert the operators if a high level condition exists. A light is turned on at the tank by the sensor (local alarm).
  - South Process Drain Tank: Has a Level Safety High (LSH) sensor and alarm to alert the operators if a high level condition exists. A light is turned on at the tank by the sensor (local alarm).

2A.3 Facility Containment, Drainage and Water Treatment

2A.3.1 Secondary Containment Systems

Containment ID	Drainage Method	Type of Containment and Material of Construction
Lube Oil Storage Tanks	Vacuum Truck	Dike – Earthen
Gas – Motor Fuel Tank	Vacuum Truck	Tank – Fiberglass
MR Solvent	Vacuum Truck	Tank – Fiberglass
Slop Oil Tanks	Vacuum Truck	Dike – Earthen
Barrel Storage Area	Vacuum Truck	Dike – Concrete
Process Drain Tanks	Vacuum Truck	Dike – Earthen
Elevated Lube Oil (SAC)	Vacuum Truck	Tank – Steel
Diesel Storage Tank	Vacuum Truck	Tank – Fiberglass
Amolite Oil Tank	Vacuum Truck	Dike – Concrete
Gasoline Loading Rack-not used	Vacuum Truck	Dike – Earthen

2A.3.2 Facility Drainage to Surface Waters without Facility Treatment System

- Water is removed only by vacuum truck from the inside of secondary containment areas. The water is disposed of in an approved manner in accordance with the water discharge plan.
- Storm water flows in a southerly direction where it is contained by dikes. The water evaporates or percolates into the ground.

2A.3.3 Water Treatment System

- A water treatment system for discharges is not applicable at this facility. Water discharges are made in accordance with the water discharge plan obtained from the State of New Mexico.

2A.3.4 Effluent Treatment Facilities

The facility does not treat water prior to discharge off site.

2A.3.5 Facility Undiked Drainage to Surface Waters

- The facility may have the potential to discharge into undiked areas.

  The facility un-diked areas flow to diked catchment basins located at the western and southern sides of the plant.

2A.4 Facility Transfer Operations, Pumping and Facility Process

2A.4.1 Facility Piping

- The facility does have buried piping. Corrosion protection for all new and replaced buried piping is provided as follows
  - Wrapping and Coating
- When a pipe section is exposed, it is examined and corrective action taken as necessary.
- Cathodic protection is not used, as the plant is located in an arid region where historical records show that use of cathodic corrosion devices have not increased protection.
- Describe the facility piping systems (aboveground and buried): Most all of the piping is above ground at the plant. The pipe is generally installed on elevated or ground level pipe racks. Leaks are very evident to the operators and maintenance personnel. The drain system piping is buried. The drain system piping is leak tested every five years in accordance with the water discharge plan.

2A.4.2 Out of Service Piping

Out of service piping terminal connections are capped or blank-flanged and marked when the piping is not in service or in standby service for extended periods.

2A.4.3 Pipe Supports

Pipe supports are designed to minimize abrasion and corrosion and allow for expansion and contraction.

2A.4.4 Vehicle Warnings

Vehicles are warned orally, by signs, fencing and with bumper guards, to be sure that no vehicle will endanger aboveground piping or other oil transfer operations. The entire plant is fenced with only maintenance vehicles allowed inside of the fenced areas. Inside the plant, there are numerous guards placed to prevent maintenance vehicles from hitting the piping. The loading racks have guards in place to assure that vehicles do not endanger any of the loading connections.

2A.5. Facility Tank Truck Loading/Unloading Rack

- Tank truck unloading of refrigerant grade propane does occur at the facility.
- Tank car (rail) loading/unloading does not occur at the facility.

2A.5.1 Tank Truck Containment Systems for Loading/Unloading Rack

- Loading/unloading area drainage has modifications to allow spills to flow into a catchment basin designed to handle discharges. Unloading of refrigerant grade propane only occurs at the loading/unloading rack.

  The containment system holds the maximum capacity of any single compartment of a tank truck loaded or unloaded at the facility.

  The containment system consists of concrete walls to direct the flow of any spilled materials into a catchment pond.

- Refer to the Container and Potential Spills Table in Section 2A.1 for additional details.

2A.5.2 Prevention of Premature Vehicular Departure

- The methods, procedures, and/or equipment used to prevent premature vehicular departure include:

  ☐ ***Interlocked warning lights,***
  ☒ ***Warning signs,***
  ☐ ***Vehicle brake interlock systems,***
  ☒ ***Physical barrier systems,***
  ☒ ***Wheel chocks,***
  ☐ ***Company personnel supervising loading operation – refrigeration grade propane only***

- Describe these and other premature vehicular departure prevention measures: Warning signs have been posted to alert the drivers about premature vehicular departure. Trucks are required to have wheel chocks in place to assure that the truck does not move during loading operations. A physical barrier (warning cone) is placed in front of the vehicle during loading operations. It is noted that a fixed non-moveable barrier is in place at the rear of the truck, as the truck must back into the loading area.

2A.5.3 Drain And Outlet Inspection

Drains and outlets on tank trucks are checked for leakage before unloading or departure and, if necessary, are tightened, adjusted or replaced by the drivers. Concrete pads are installed under the truck loading areas to assist the drivers in identifying any leaks or drips that may have occurred during loading operations.

2A.6 Security

Visitors and contractors must first sign in at the front office of the facility. Each individual must view the orientation program where plant safety systems and spills are discussed. Each individual must pass a written test to work in the plant.

The facility is fully fenced except for the truck loading area. A six-foot high chain link fence is installed around the northern perimeter, and next to the truck loading area on the west side of the plant. Barbwire fencing is used in the remote areas on the southern and western side of the plant.

The main entrance gate is locked and under the control admin/operations department located on the north side of the plant near the main office complex. The facility is attended twenty-four hours a day. Other gates are locked and may be opened by the operations staff.

Any valves, which permit direct outflow of a container's contents, have adequate security measures so that they remain closed when in non-operating or standby status. All valves are located within the plant boundaries.

Starter controls on all oil pumps in non-operating or standby status are locked in the off position in accordance with the energy isolation (lock out tag out) program. All pump switches and switchgear is located inside of the fenced plant boundaries and accessible only to authorized personnel.

Facility lighting is commensurate with the operation and the type and location of the facility to assist in the discovery of discharges and to prevent discharges occurring through acts of vandalism.

2A.7 Inspections, Tests and Records

Container Testing and Inspections

- Below is the facility aboveground bulk storage container integrity testing and inspection program including inspection frequency, records of inspections and any equivalent environmental protection:
  - Visual exterior inspections are made once a month and are documented
  - The plant follows API 653 for tank inspections. API 653 includes Calculations of Minimum Thickness for Existing Tank Shell, Maximum Period of Operation, Minimum Thickness for Tank Bottom Plate, Maximum Fill Height (Hydrostatic Testing), and Corrosion Rates and Inspection Intervals; Reinforcement of Openings, Nondestructive Testing and Welding Requirements, as well as Cathodic Protection.

- For pressurized vessels, the plant follows API 510. This includes Calculations of Heads, Reinforcement, Impact Testing, Cylindrical Components under Internal and External Pressure, and Pressure Testing Requirements; Nondestructive Testing and Welding Requirements; as well as Repairs and Alterations.
- The Plant Manager makes an annual review of the plant, which is documented.
- Daily checks (undocumented) are made by plant personnel.

- In the event that a field-constructed aboveground container undergoes a repair, alteration, reconstruction, or a change in service, the container will be evaluated for the risk of discharge or failure due to brittle fracture or other catastrophe.

- The facility leak testing program for completely buried tanks includes weekly inspections of the concrete cellars around the steel tanks, or visual inspections through inspection ports to determine if a leak has been initiated.

- Liquid level sensing devices are checked on an annual basis

Buried Piping Integrity and Leak Testing

- Buried piping is present.

- Integrity and leak testing of buried piping is performed at the time of ☒ installation, ☒ modification, ☒ construction, ☒relocation, or ☒ replacement.

Aboveground Piping Examination

- All aboveground valves and piping (including flange joints, valve glands and bodies, catch pans, pipe supports, locking of valves, and metal surfaces) are regularly examined.
- The facility also uses API 570 for the inspection of above ground piping. API 570 includes Calculations of Corrosion Rate and Remaining Life Determination, Maximum Allowable Working Pressure, Minimum Required Thickness, Evaluation of Locally Thinned Areas, and Pressure Testing Requirements; Nondestructive Testing and Welding Requirements, Repairs and Alterations as well as Recommended Inspection Practices.

Dike Integrity and Drainage Inspections

- Dikes are inspected for integrity weekly in accordance with preventive maintenance procedures (PM). All PM inspections are recorded. Undocumented inspections are made on a daily basis and particularly after major storms. A work order is generated if equipment or dikes are found to be in need of repair.

- The diked area is inspected on the basis of daily observations and weekly PM and particularly after major storms for any oil stains on soil, sheen on standing water or drip from equipment. A work order is generated if equipment needs to be repaired.

- Drainage of rainwater from secondary containment into a storm drain or an open watercourse is not allowed. (However, rainwater may be drained onto the ground as stated in Section 1.8.) All rainwater is usually removed from diked areas by a vacuum truck and disposed of in accordance with the discharge plan.

Other Applicable Inspections

- A test is conducted every five years in accordance with the discharge plan to test all buried drain piping.

Documentation:

- Inspection and test records are provided in Appendix B.

- Other documentation concerning inspections, and repairs may be found in the operator's logbook, in the environmental files (located in the main office) or in the automated work order system.

APPENDIX A

NOTIFICATION

- Contact List and Phone Numbers
- Notification Data Sheet
- Procedures for Reporting Spills and Upsets
- BLM "Report of Undesirable Event" (Form NM 3162-1)
- Oil Conservation Division Form "Release Notification and Corrective Action" Form (C-141)
- Frontier Field Services, Growth Fund Policy Spill Reporting Form
- Submittal of Information to Regional Administrator for Qualified Discharge(s)

Contact List and Phone Numbers

The following is a contact list and phone number reference for the Facility:

REFERENCE THE "EMERGENCY ACTION PLAN" FOR ADDITIONAL AND THE MOST UPDATED NUMBERS

Contact	Primary	Alternate
Designated Person Accountable For Oil Spill Prevention and/or Facility Response Coordinator		
Name/Title: David Harris/ Plant Manager	505-677-5117	505-703-0891
Name/Title: Glen Parrish/ Maintenance Supt.	505-677-5102	505-513-0408
National Response Center	800-424-8802	202-267-2675
Bureau of Land Management	505-887-6544	
State Agency for Oil Spill Response New Mexico Oil Conservation Division (24 hr)	505-748-1283	
Cleanup Contractors (as necessary):		
Vacuum Trucks – I&W Trucking, Loco Hills	505-677-2111	
Vacuum Trucks – Rowland Trucking, Hobbs	505-393-4994	
Contract Labor – Stevenson Roach, Artesia	505-746-3222	
Contract Labor – E.D. Walton	800-616-3633	
Earth Moving Equipment – Sweatt Construction, Artesia	505-748-1238	
Earth Moving Equipment – E.D. Walton	800-616-3633	
HazMat Response – ________		
HazMat Response – Safety & Env Solutions, Hobbs	505-397-0510	
Other Federal, State and local agencies (as necessary):		

Notification Data Sheet

The Facility will utilize the following form to relate information in the event of a discharge:

Date: ______________________ *Time:* ______________________

INCIDENT DESCRIPTION

Reporter's Full Name: ______________________ *Position:* ______________________
Day Phone Number: ______________________ *Evening Phone Number:* ______________________
Company: ______________________ *Organization Type:* ______________________
Facility Address: ______________________ *Owner's Address:* ______________________

Facility Latitude: ______________________ *Facility Longitude:* ______________________
Spill Location: ______________________
(if not at Facility) ______________________
Responsible Party's Name: ______________________ *Phone Number:* ______________________
Responsible Party's Address: ______________________
Source and/or cause of discharge: ______________________

Nearest City: ______________________
County: ______________________ *State:* __________ *Zip code:* ______________________
Section: __________ *Township:* __________ *Range:* __________ *County:* ______________________
Distance from City: ______________________ *Direction from City:* ______________________
Container Type: ______________________ *Container Storage Capacity:* ______________________
Facility Oil Storage Capacity: ______________________
Material:

Total Quantity Released	Water Impact (*YES or NO*)	Quantity into Water

RESPONSE ACTION(S)

Action(s) taken to Correct, Control, or Mitigate Incident: ______________________

Number of Injuries: ______________________ *Number of Deaths:* ______________________
Evacuation(s): ______________________ *Number Evacuated:* ______________________
Damage Estimate: ______________________
More information about impacted medium: ______________________

CALLER NOTIFICATIONS

National Response Center (NRC): 1-800-424-8802
Additional Notifications (Circle all applicable): *State* *Other*

ADDITIONAL INFORMATION

Any information about the incident not recorded elsewhere in this report: ______________________

NOTE: DO NOT DELAY NOTIFICATION PENDING COLLECTION OF ALL INFORMATION.

Procedures for Reporting Spills and Upsets

1. PROCEDURES FOR REPORTING SPILLS AND UPSETS
Empire Abo Gasoline Plant

This is to be used to know what type of spills or upsets are "reportable" and the reporting procedures to follow, as required by Frontier Field Services and the agencies of jurisdiction for the gas plant. These reporting procedures are consistent with and should be used in conjunction with any facility comprehensive spill contingency plans. Both the New Mexico Oil Conservation Division and the Bureau of Land Management combine the volume of produced water and oil to determine reportable volume.

For spills that do not create a sheen on water or allow oil into a dry draw, the following procedures should be followed.

2. REPORTABLE SPILLS

Releases to be reported by the Plant Manager or delegated person:

a. OIL AND PRODUCED WATER

Spill Conditions		Required Reports					
Location	Amount (bbl)	NMOCD		BLM		NRC[1]	BP*
		Phone[2]	Write[3]	Phone	Write	Phone	Phone
Federal	<5	No	No	No	No	No	Yes
Federal	>5,<10	No	Yes	No	No	No	Yes
Federal	>10,<25	No	Yes	No	Yes	No	Yes
Federal	>25, <100	Yes	Yes	No	Yes	No	Yes
Federal	>100	Yes	Yes	Yes	Yes	No	Yes
Fee, State	<5	No	No	No	No	No	Yes
Fee, State	>5,<25	No	Yes	No	No	No	Yes
Fee, State	>25	Yes	Yes	No	No	No	Yes
In Water - BLM[4]	Any	Yes	Yes	Yes	Yes	Yes	Yes
In Water - State[4]	Any	Yes	Yes	Yes	Yes	Yes	Yes

*All oil spills greater than 1 barrel must be reported to the Plant Manager.

Notes:
1 National Response Center (1-800-424-8802) for any spills in water
2 Phone - telephone call made within 24 hours of the spill
3 Write - written report as described below, within 10 days
4 See "Oil Spill Contingency Plan" located in Appendix D.

Report to
- Frontier Plant Manager
- Chad Cagle - Tulsa
- New Mexico Oil Conservation Division
- If on BLM land, the BLM District Office
- If spill enters water or water course - National Response Center (1-800-424-8802).

Reporting Method:
- As required, phone in report within 24 hours
  See note on telephone reporting

- For all spills, written report within 10 days
- Use Release Notification and Corrective Action Form (C-141) to report to OCD
- Use BLM form NM 3162-1 to report to the BLM
- Use Frontier Field Services, Growth Fund Policy Spill Reporting Form (see attached).

b. CHEMICAL SPILLS

Reportable Spill: Spills of caustics, acids, or chemicals endangering persons, wildlife, or property

Methanol	5000 lbs. or 16 bbls.	CERCLA

For other chemicals, contact the Frontier Plant Manager.

Reporting Method:

- First, report immediately any chemical spill to the Frontier Plant Manager before reporting further, unless people or wildlife are immediately endangered.
- Spills that could potentially harm the public or cause significant damage to the environment should be reported to the New Mexico Oil Conservation Division and the Bureau of Land Management (if applicable) district office.
- If communications with Frontier Plant Manager confirm the existence of a "reportable quantity" spill, additional reports must be made to the National Response Center, the SERC, LEPC, and OCD.

MSDS sheets and other available resources should be used in obtaining data on chemicals used in your facility.

c. GASEOUS RELEASE

Reportable Release:

- On BLM land, any event releasing 500 MCF or more of gas (use BLM form NM 3162-1)
- Any event that releases more than 500 MCF requires immediate notification of the NMOCD district office
- Any event that releases more than 5000 MCF requires written notification of the NMOCD district office
- Any event that places life or property in danger requires NMOCD verbal and written report

Reporting Method:

- First, report immediately any gaseous release to the Frontier Plant Manager, unless people or wildlife are immediately endangered.
- Releases that could potentially harm the public or cause significant damage to the environment should be reported to the New Mexico Oil Conservation Division and the Bureau of Land Management district office.

3. NOTES ON REPORTING

a. TELEPHONE REPORTS

- Reports should be made as soon as possible, at least within 24 hours. It is recommended to discuss spill with Randy McCollum, Manager of Compliance, before reporting to other entities.
- For telephone reports, use the Frontier Field Services, Growth Fund Policy Form as a guide to indicate what information needs to be given. A copy of this form is attached to the plan.
- Document in facility records, all attempts to telephone reports to agencies successfully or unsuccessfully.
- Document spills of less than reportable amounts in facility files.

b. WRITTEN REPORTS

- Use the Frontier Field Services, Growth Fund Policy Spill Report Forms for reporting all spills and releases.
- Use Release Notification and Corrective Action Form (C-141) to report to OCD.
- Use BLM form NM 3162-1 to report to the BLM

- Reports should be submitted within 10 days of spill.

c. **ADDRESSES AND PHONE NUMBERS**

- **Empire Abo Plant**

Production:	David Harris	(505) 677-5177 (W)	(505) 703-0891 (Cell)
Environmental:	Randy McCollum	(505) 676-3505 (W)	(505) 361-0128 (Cell)

- **For the State of New Mexico**

New Mexico Oil Conservation Division
District II
811 S. First Street
Artesia, NM 88210
(505) 748-1283

New Mexico Environment Department
Ground Water Quality Bureau
P.O. Box 1778
Santa Fe, NM 87502
(505) 827-2918

- **Bureau of Land Management**

BLM - Carlsbad Resource Area
P.O. Box 1778
Carlsbad, NM 87820
(505) 887-6544

BLM - New Mexico State Office
P.O. Box 1449
Santa Fe, NM 87504
(505) 438-7400

- **National Response Center:** 1-800-424-8802

- **For SARA and CERCLA reportable spills (chemical spills):**

a.) **SERC:**
Max Johnson, ERC Coordinator
Department of Public Safety
Title III Bureau
P.O. Box 1628
Santa Fe, NM 87504-1628
(505) 827-9224

b.) **Local Emergency Planning Committee**
Eddy County LEPC
Attn: Mr. Joel Arnwine
101 West Greene St.
Carlsbad, NM 88220
(505) 887-9511

c.) **Fire Department**
Artesia Fire Department
309 N. 7th
Artesia, NM 88210
(505) 746-2701

Loco Hills Volunteer Fire Department
P.O. Box 9
Loco Hills, NM 88255
(505) 677-3266

Form NM 3162-1
(July 1991)

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management
New Mexico State Office

REPORT OF UNDESIRABLE EVENT

DATE OF OCCURRENCE/DISCOVERY: ____________ TIME OF OCCURRENCE: ____________

DATE REPORTED TO BLM: ____________ TIME REPORTED: ____________

BLM OFFICE REPORTED TO: (RESOURCE AREA/DISTRICT/OTHER): ____________

LOCATION: (¼ ¼) ___ SECTION ___ T. ___ R. ___ MERIDIAN ____________

COUNTY: ________ STATE: ________ WELL NAME: ____________

OPERATOR: COMPANY NAME ____________ PHONE NO. ____________
CONTACT PERSON'S NAME ____________

SURFACE OWNER: ____________ MINERAL OWNER: ____________
(FEDERAL/INDIAN/FEE/STATE)

LEASE NO.: ____________ RIGHT-OF-WAY NO.: ____________

UNIT NAME / COMMUNITIZATION AGREEMENT No.: ____________

TYPE OF EVENT, CIRCLE APPROPRIATE ITEM(S):

BLOWOUT, FIRE, FATALITY, INJURY, PROPERTY DAMAGE, OIL SPILL, SALTWATER SPILL, OIL AND SALTWATER SPILL, TOXIC FLUID SPILL, HAZARDOUS MATERIAL SPILL, UNCONTROLLED FLOW OF WELLBORE FLUIDS, OTHER (SPECIFY):

____

CAUSE OF EVENT: ____________

____

HazMat Notified: (for spills) ____________

Law Enforcement Notified: (for thefts) ____________

CAUSE AND EXTENT OF PERSONAL INJURIES/CAUSE OF DEATH(S):

____

Safety Officer Notified: ____________

EFFECTS OF EVENT: ____________

____

ACTION TAKEN TO CONTROL EVENT: ____________

____

LENGTH OF TIME TO CONTROL BLOWOUT OR FIRE: ____________

VOLUMES DISCHARGED: OIL ____________ WATER ________ GAS __________

OTHER AGENCIES NOTIFIED: ______________________________

ACTION TAKEN OR TO BE TAKEN TO PREVENT RECURRENCE: ______________

FINAL INVESTIGATION:
TEAM NAME(S) ______________________________

FIELD INSPECTION DATE ______________________________

SUMMARY OF RESULTS OF INSPECTION ______________________________

RESOURCE LOSS WAS (CIRCLE ITEM): AVOIDABLE UNAVOIDABLE

DATE OF MEMO NOTIFYING MINERALS MANAGEMENT SERVICE THAT LOSS WAS AVOIDABLE:

DATE/TIME/PERSON NOTIFIED:
DISTRICT OFFICE ______________________________

STATE OFFICE ______________________________

WASHINGTON OFFICE ______________________________

SUMMARY OF RESULTS OF RECLAMATION/CORRECTIVE ACTION:

REMARKS: ______________________________

SIGNATURE OF AUTHORIZED OFFICER: ____________________

DATE: ____________ TITLE: ____________________

District I
1625 N. French Dr., Hobbs, NM 88240
District II
1301 W. Grand Avenue, Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

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

Form C-141
Revised October 10, 2003

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

Release Notification and Corrective Action

OPERATOR ☐ Initial Report ☐ Final Report

Name of Company	Contact
Address	Telephone No.
Facility Name	Facility Type

Surface Owner	Mineral Owner	Lease No.

LOCATION OF RELEASE

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

Latitude______________ **Longitude**______________

NATURE OF RELEASE

Type of Release	Volume of Release	Volume Recovered
Source of Release	Date and Hour of Occurrence	Date and Hour of Discovery
Was Immediate Notice Given? ☐ Yes ☐ No ☐ Not Required	If YES, To Whom?	
By Whom?	Date and Hour	
Was a Watercourse Reached? ☐ Yes ☐ No	If YES, Volume Impacting the Watercourse.	

If a Watercourse was Impacted, Describe Fully.*

Describe Cause of Problem and Remedial Action Taken.*

Describe Area Affected and Cleanup Action Taken.*

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

	OIL CONSERVATION DIVISION	
Signature:		
Printed Name:	Approved by District Supervisor:	
Title:	Approval Date:	Expiration Date:
E-mail Address:	Conditions of Approval:	Attached ☐
Date: Phone:		

* Attach Additional Sheets If Necessary

Southern Ute Growth Fund Spill/Release Report

Forward to the Growth Fund Safety & Environmental Compliance Management Group at Fax 970-247-1178

Report Date________ Time:_______am/pm or (military time)

Spill Date__________ Spill Time:________am/pm or (military time)

Company Name:____________________________ Phone Number:____________________________

Reported By:______________________ Title:____________________________

Facility Name:____

Location: 1/4_________ Section:__________Township:_________Range:__________

Type of Spill (*Circle One*): Produced Water, Oil, Gas, Other________________________

Estimate spilled:_________*barrels* Estimate recovered: ________ Hazardous: *Y / N*

Is the Spill Contained: *Y / N* If No, is it within the property "footprint": *Y / N*

Extent of spill (area)___________ft2 Surrounding Land Use___________________________

Damages/Injuries? ____________________ Evacuation Needed?: *Y / N*

Ground Water impacted: Y___ N___ Surface Water impacted: Y___ N___

IF LESS THAN A MILE, report distance IN FEET to the nearest.....

Surface water:________ Wetlands:_________ Water wells:________ Dry arroyo:________ Residence:_________

Cause Of Spill:____

____

____

Describe immediate response:____

____

____

____

Does this facility require an SPCC plan: *Yes / No* If yes, is there one in place: *Yes / No*

Is there a remediation plan in place for clean up: *Yes / No*

Follow-up Report Being Sent: *Yes / No* Due By the Following Date: _________, 20_____

Closure Report Being Sent: *Yes / No* Due By the Following Date: _________, 20_____

OTHER NOTIFICATIONS

Date	Agency	Contact Person	Type of notification	Comments:
			Written / Verbal / Both	
			Written / Verbal / Both	
			Written / Verbal / Both	
			Written / Verbal / Both	

For Office Use Only (if initial report was by voice):

Report Completed By:______________________Title:______________________

Note: This form is only used if the facility has spills (see below), which require submission of the plan to the EPA.

Sample - Submittal of Information to Regional Administrator for Qualified Discharge(s)

In the event of a qualified discharge or discharges, this page can be utilized to provide official notification to the Regional Administrator. If the Facility has had a discharge or discharges, which meet one of the following two criteria, then this report must be submitted to the Regional Administrator within 60 days. (Check as appropriate)

☐ This Facility has experienced a reportable spill as referenced in 40 CFR Part 112.1(b) of 1,000 gallons or more.

☐ This Facility has experienced two (2) reportable spills (as referenced in 40 CFR Part 112.1(b) of greater than 42 gallons each within a 12-month period.

Facility Name and Location: ____________________

____

____

Facility Contact Person (Name, address/phone number): ____________________

____

____

Facility maximum storage or handling capacity: ____________________

____

____

Facility normal daily throughput: ____________________

____

____

Describe the corrective action and countermeasures taken (include description of equipment repairs and replacements): ____________________

____

____

Describe the Facility (maps, flow diagrams and topographical maps attached as necessary): ____________________

____

____

Describe the cause of discharge (as referenced in 40 CFR Part 112.1(b)) including failure analysis of the system is: ____________________

____

Describe the preventative measures taken or contemplated to be taken to minimize the possibility of recurrence: ____________________

____

____

Other pertinent information: ____________________

____

- A copy of this report is also to be sent to the appropriate state agency in charge of oil pollution control activities.

APPENDIX B

LOGS

- SPCC Inspection Checklist
- Onshore Facility Bulk Storage Tank Drainage System

SPCC INSPECTION CHECKLIST

At least once **annually**, the **Plant Manager** in charge of the facility will visually inspect the facility for leaks and potential problems. This visual examination will review the condition of foundation and supports of tanks, possible corrosion of tanks, overflow equalizing lines, thief hatches (vacuum protection), back pressure vent valves, drain valves and lines, fill and shipping lines, oil transfer facilities, alarm systems, and overall condition of complete installation and secondary containment. Additionally, the Plant Manager will inspect and document the conditions of diked areas.

Production Facility: ____________________ Reviewer: ____________________
Review Date: ____________________

Berms around Storage Tanks:
___ Can they hold the capacity of storage tanks?
___ Are they in good shape (No low spots in berm)?
___ Do they have proper drainage?
___ Is there any contaminated soil inside or outside berms?
___ Is rainwater inspected prior to drainage?
___ Are drains properly closed and sealed after water drainage?
___ Are adequate records kept after water drainage?
___ Are accumulations of oil in traps, drips, sumps, etc. properly removed?
Comments: ____

Storage Tanks:
___ Are tanks leaking anywhere (pinholes, manways, etc.)?
___ Are tanks free of rust?
___ Are they visually examined on a routine basis?
___ Are they fail-safe engineered to prevent spills?
  ___ Adequate capacity ___ Over flow equalizing lines
  ___ Vacuum protection ___ High level shut down
Comments: ____

Truck Loading Racks:
___ Are truck drivers receiving their annual training on proper loading of trucks?
___ Are premature departure methods in place (chocks, signs, physical barriers [cones])?
___ Are trucks checked for leaking valves and fittings prior to departure?
___ Is the containment area in good condition and able to contain the full volume of one truck?
Comments: ____

Facility Inspection Procedures:
___ Are weekly PM checks on berms documented?
___ Are API 510 recommended practices for inspecting pressurized vessels being used?
___ Are API 570 recommended practices for above ground piping inspections being used?
___ Are API 653 recommended practices for inspecting tanks being used?
Comments: ______________________________
____
____

General Comments: ______________________________
____
____
____

ONSHORE FACILITY BULK STORAGE TANKS DRAINAGE SYSTEM

Record of drainage, bypassing, inspection and oil removal from secondary containment:

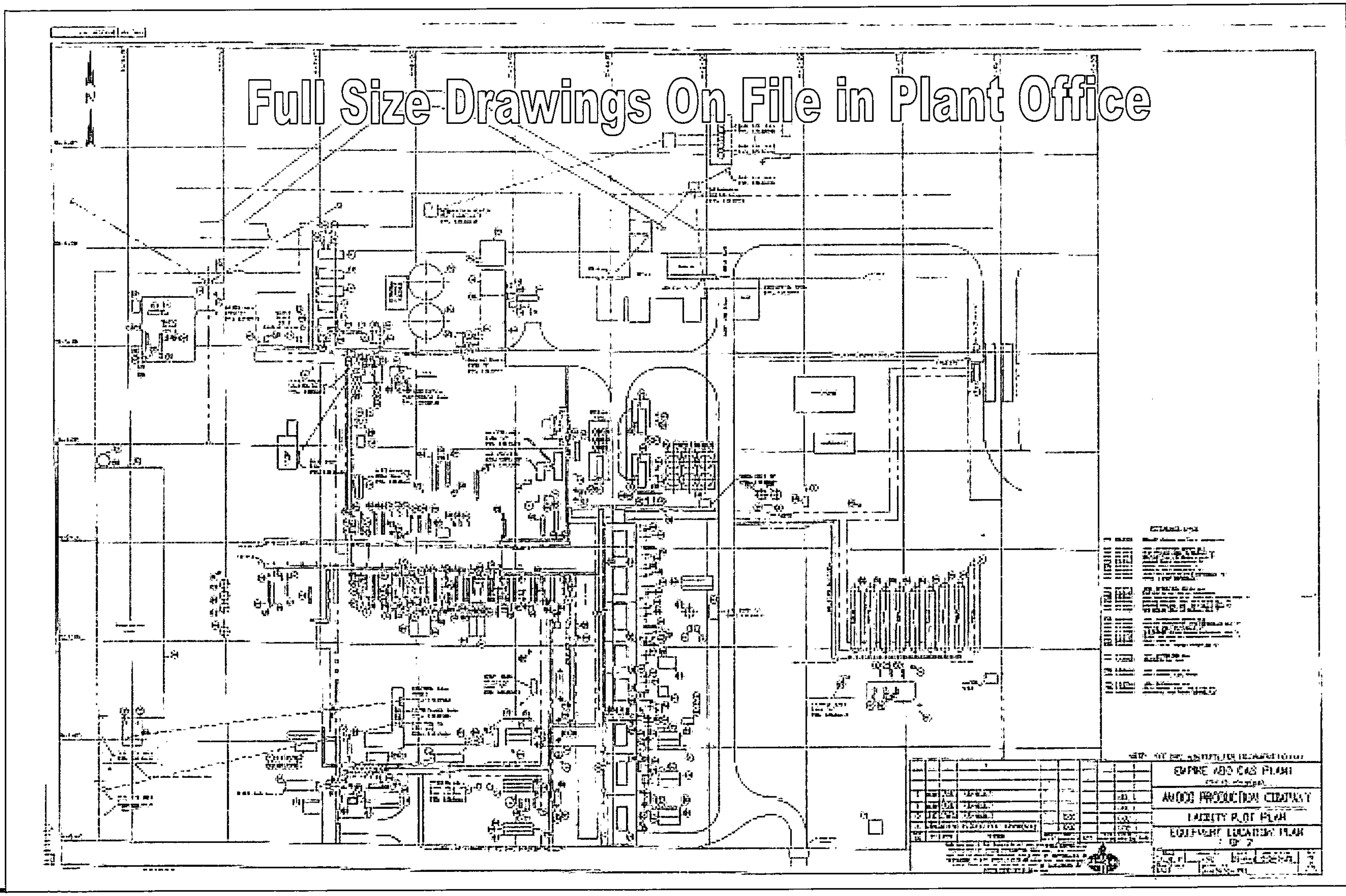
Date of Drainage	Date of Bypassing		Date of Inspection	Oil Removal	Supervisor's or Inspector's Signature
	Open	Closed			

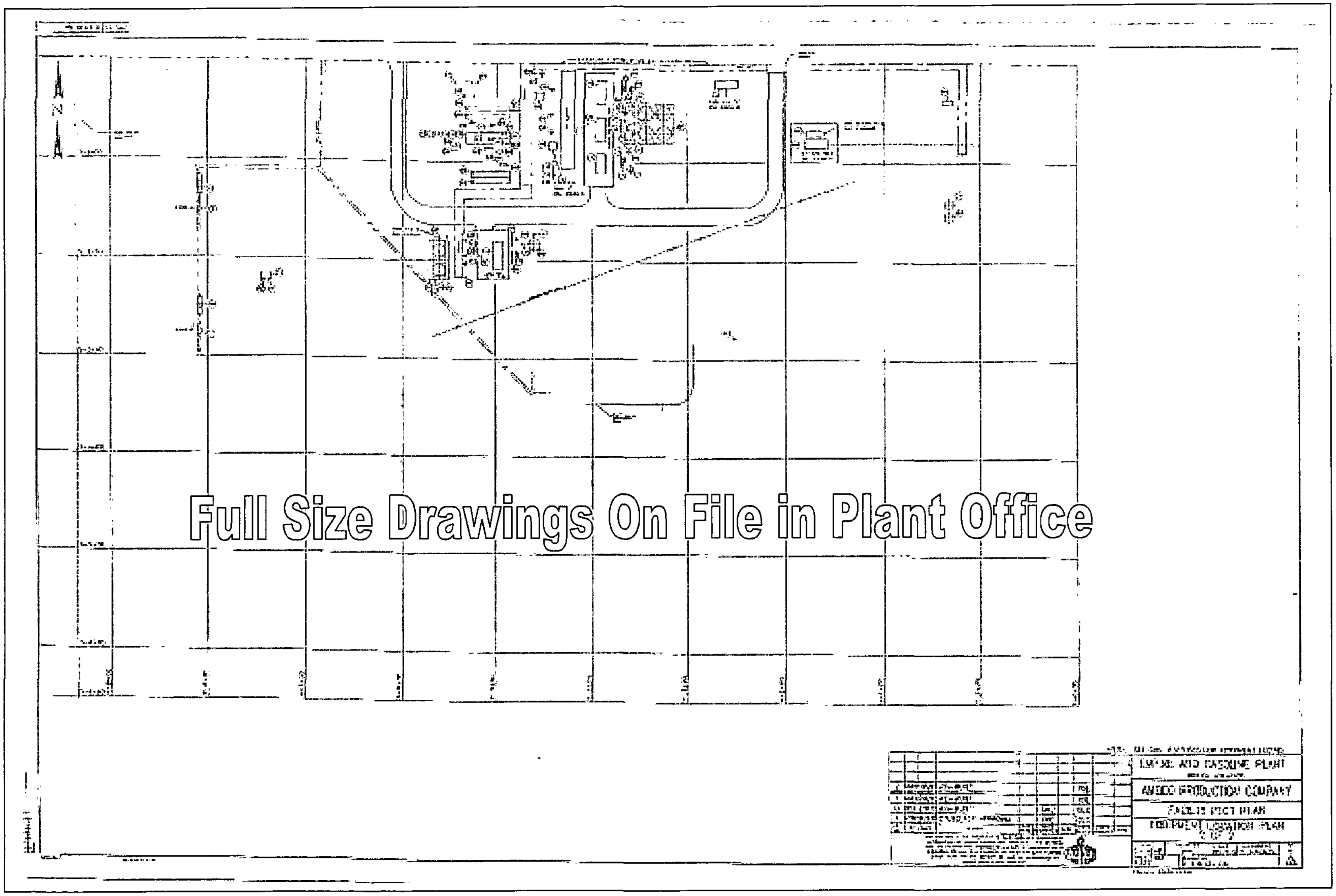
APPENDIX C

Facility Diagrams

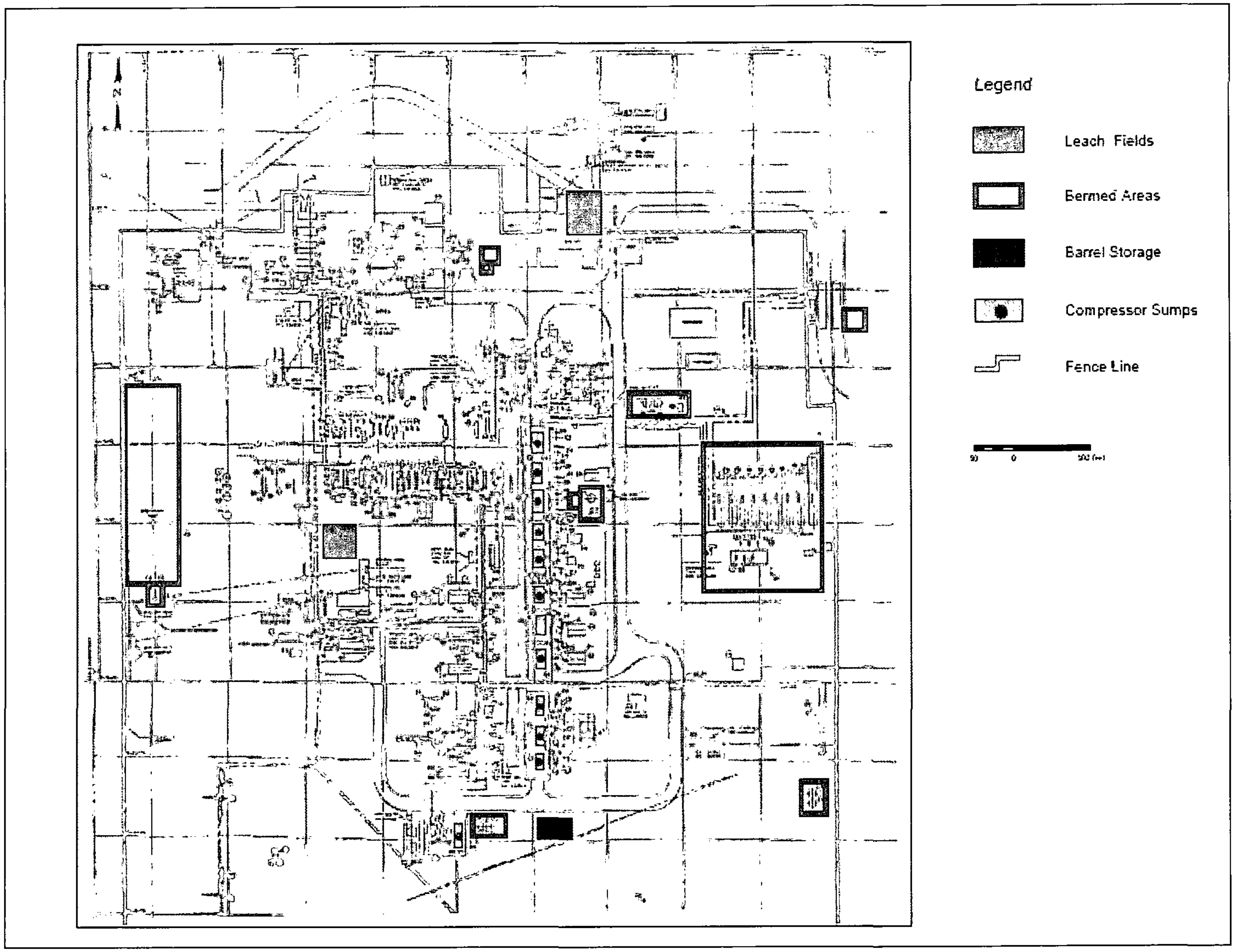
- Equipment Layout (Page 1 and Page 2)
- Tanks and containment structures
- Topographical Map (1975)
- Aerial Photograph (October 1997)

Site Map

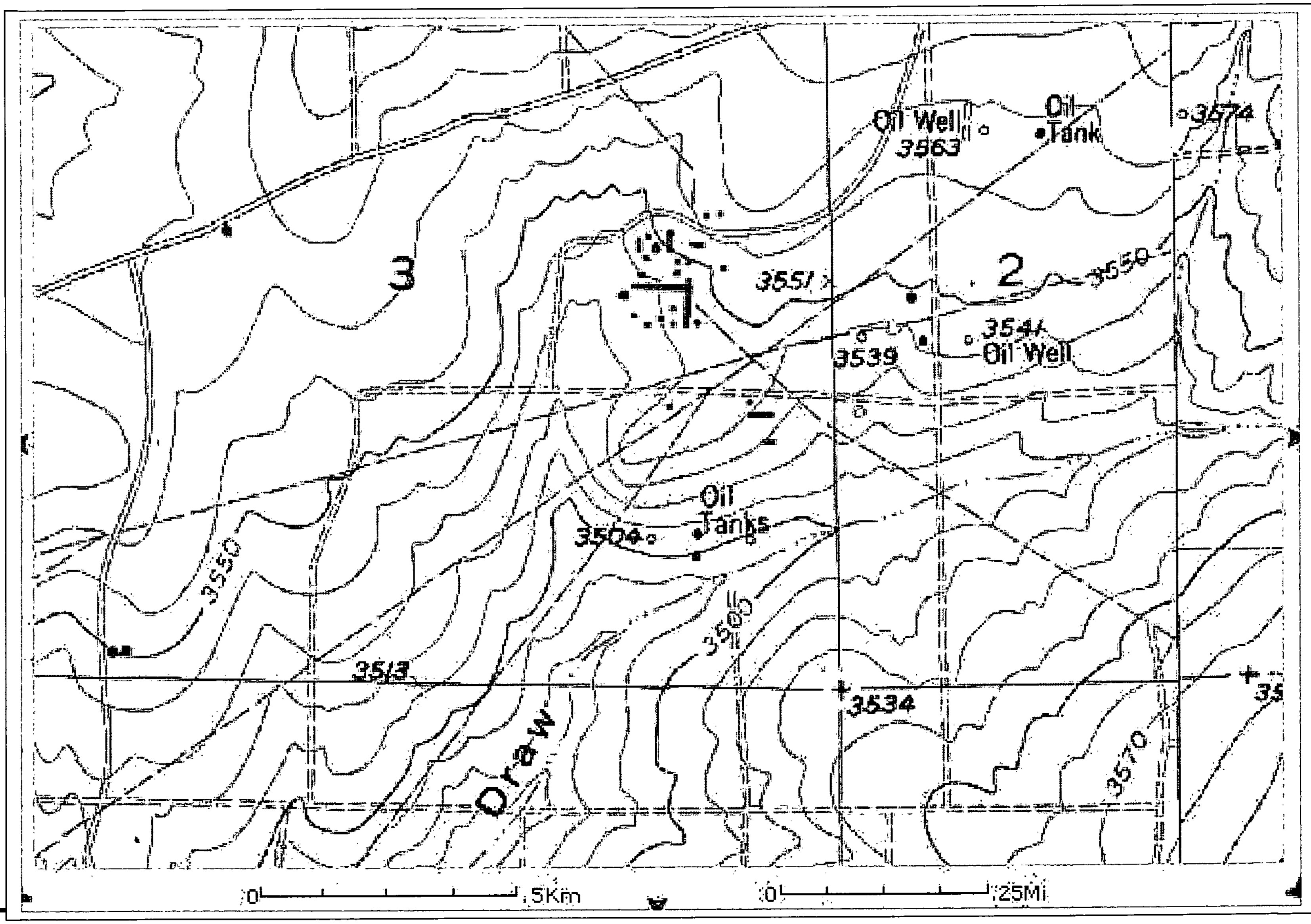

Full Size Drawings On File in Plant Office
N
EMPIRE ABO GAS PLANT
AMOCO PRODUCTION COMPANY
FACILITY PLOT PLAN
EQUIPMENT LOCATION PLAN


Full Size Drawings On File in Plant Office
AMOCO PRODUCTION COMPANY

Tanks and Containment Structures



Topographical Map (1975)



Aerial Photograph (October 1997)

APPENDIX D

Oil Spill Contingency Plan

A. INITIAL ACTION AT THE SITE OF A SPILL

The responsible Frontier Field Services, LLC employee at the scene of the operation who first learns about an oil spill or pollution shall take the following action:

1. Notify Appropriate Supervisor - Immediately contact supervisor, giving an assessment of the situation. The Supervisor on duty shall notify the Plant Manager or his designate. (David Harris: Home (505) 736-1846, Cell (505) 703-0891)

2. Alleviate danger - If any human life or property is in danger, take prompt action to alleviate such danger.

3. Contain spill - If the spill can be stopped or brought under control, take prompt action to do so. If possible, contain the spread of the spill using equipment available on-site.

4. Determine if spill reached "navigable water." "Navigable water" includes a variety of different sources, including lakes, creeks, and dry draws. A spill into navigable water is reportable if it is enough to create a sheen. Even if the draw is dry at the time of the spill, if oil gets into it, the spill is reportable to the National Response Center (NRC). If the spill did not get into "navigable water" respond according to the "Procedures for Reporting Spills and Upsets" found in Appendix A. If the spill did get into "navigable water", the Plant Manager or his designee will call the NRC and one of the following, beginning with the Plant Engineer:

1)	David Harris		(505) 677-5117
	Plant Engineer	Cell	(505) 703-0891
2)	Randy McCollum		(505) 676-3505
	Manager of Compliance	Cell	(505) 361-0128
3)	Chad Cagle		(918) 388-8442
	Director of Operations	Cell	(918) 808-4863

Your supervisor will contact the Plant Manager and one of Frontier personnel and apprise them of the situation.

B. ACTIVATION OF SPCC PLAN:

After being notified, the Plant Manager or other responsible official shall promptly accomplish three actions:

1. **Notify Management** - He shall apprise Frontier of the situation as appropriate.

2. **Notify Agencies** - If the spill reaches navigable water, verify that the National Response Center, the New Mexico Oil Conservation Division (OCD), the Bureau of Land Management (as necessary), and the Frontier Plant Manager have been notified. To notify Federal and State agencies, call the following numbers:

Federal Agencies:	National Response Center (USCG)	(800) 424-8802
	Bureau of Land Management	(505) 877-6544
State Agencies	NM Oil Conservation Commission	(505) 748-1283

When a spill is outside the responsibility of the SPCC plan (i.e. it still does not reach navigable water) it may still need to be reported to a federal or local agency depending on area, amount, and type of spill. The "Procedure for Reporting Spills and Upsets" found in Appendix A contains reporting procedures.

3. **Initiate Cleanup** - The Plant Manager is responsible for determining the degree and speed of containment and cleanup measures required as outlined in the Oil Spill Clean Up Plan in C below. Decisions as to how to clean up the spill are based on

- Substance spilled
- Size of spill
- Sensitivity of location to people and environment
- If spill entered water
- Type of watercourse entered
- Requirements of agency

Do not talk to media - During an oil or condensate spill situation, the following matters should not be discussed with anyone other than Frontier Field Services, LLC personnel unless prior clearances have been obtained:

a. Cause, liability, legal consequences of the spill
b. Estimates of damage to property or ecology
c. Length and scope of cleanup operations
d. Opinions concerning county, state, federal or other government agencies' response to the spill

C. OIL SPILL CLEAN UP PLAN

1. The Plant Manager shall:

a. Ensure the spill is contained or stabilized to the extent conditions allow.
b. Ensure that the spill has been reported to the proper agencies.
c. Initiate cleanup operations.
d. Supervise and direct the cleanup operation subject to the approval of BP Management.
e. Determine the needs of equipment and personnel involved in the cleanup operations.
f. Keep the Frontier Plant Manager informed of progress.

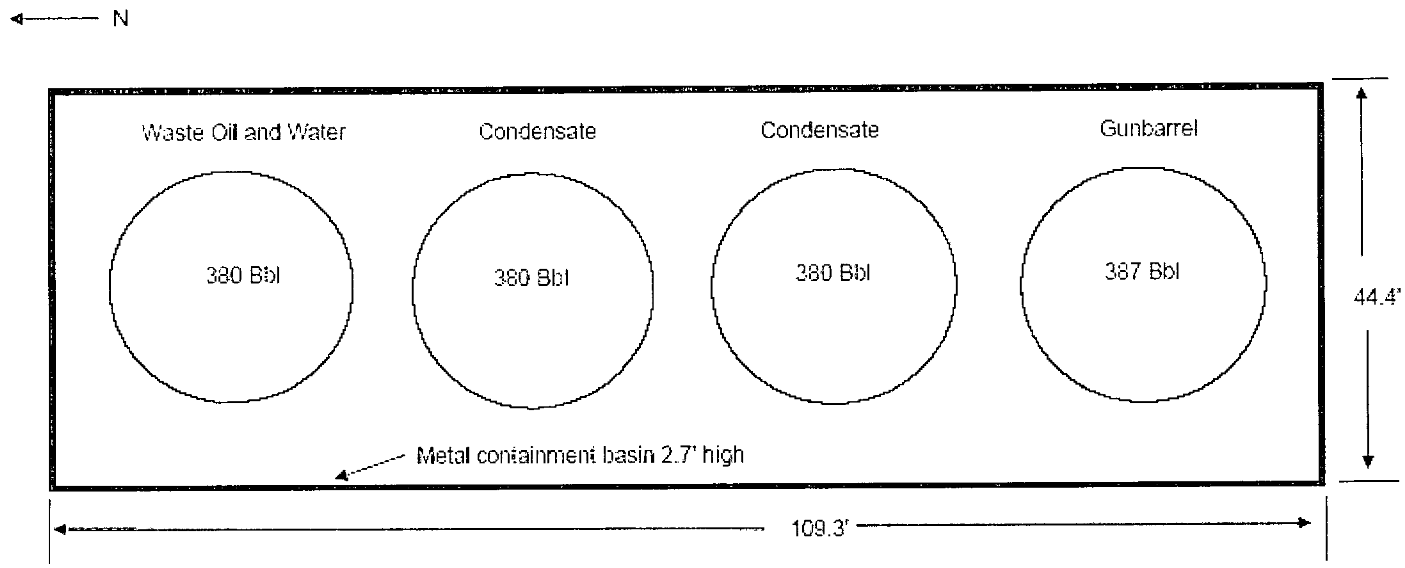
2. The facility's Plant Manager shall clean up the spill as follows:

a. Establish a plan of action for cleanup. This plan should be discussed with the Frontier Plant Manager and the responsible agency before implementing.
b. Procure bulldozers and/or backhoe to build additional containment such as dikes, dams, etc., to better contain the oil spill.
c. Procure vacuum trucks to reclaim the effluents spilled.
d. Restore the area of the spill, as nearly as possible, to the same condition as before the spill.
e. The Frontier Plant Manager will advise on appropriate action if the spill reaches waters of the United States.
f. Record any reportable SPCC spill and maintain records in local files.
g. If the spill enters the waters of the U.S. and is greater than 1000 gallons, or if two reportable spills occur within 12 consecutive months, a report must be submitted to the EPA within 60 days. This report will contain the entire SPCC plan along with details of the spill event(s).

APPENDIX E

CONTAINMENT DRAWINGS

EMPIRE ABO GAS PLANT
SLOP OIL TANKS

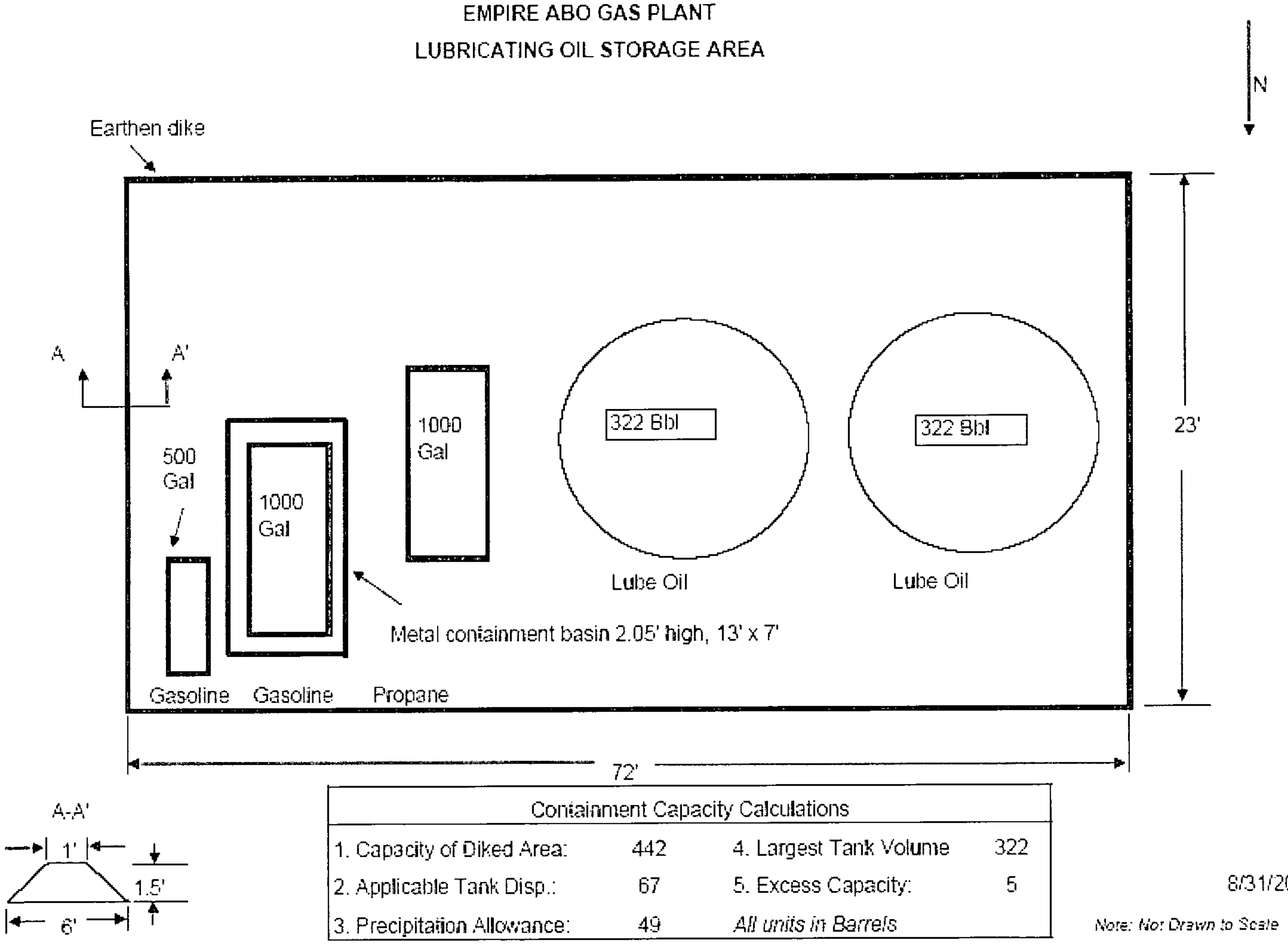


Containment Capacity Calculations			
1. Capacity of Diked Area:	1729	4. Largest Tank Volume:	387
2. Applicable Tank Disp.:	81	5. Excess Capacity:	1117
3. Precipitation Allowance*:	144	*All units in Barrels*	

**Precipitation allowance of 2"*

Note: Not Drawn to Scale 11/10/2006

EMPIRE ABO GAS PLANT
LUBRICATING OIL STORAGE AREA

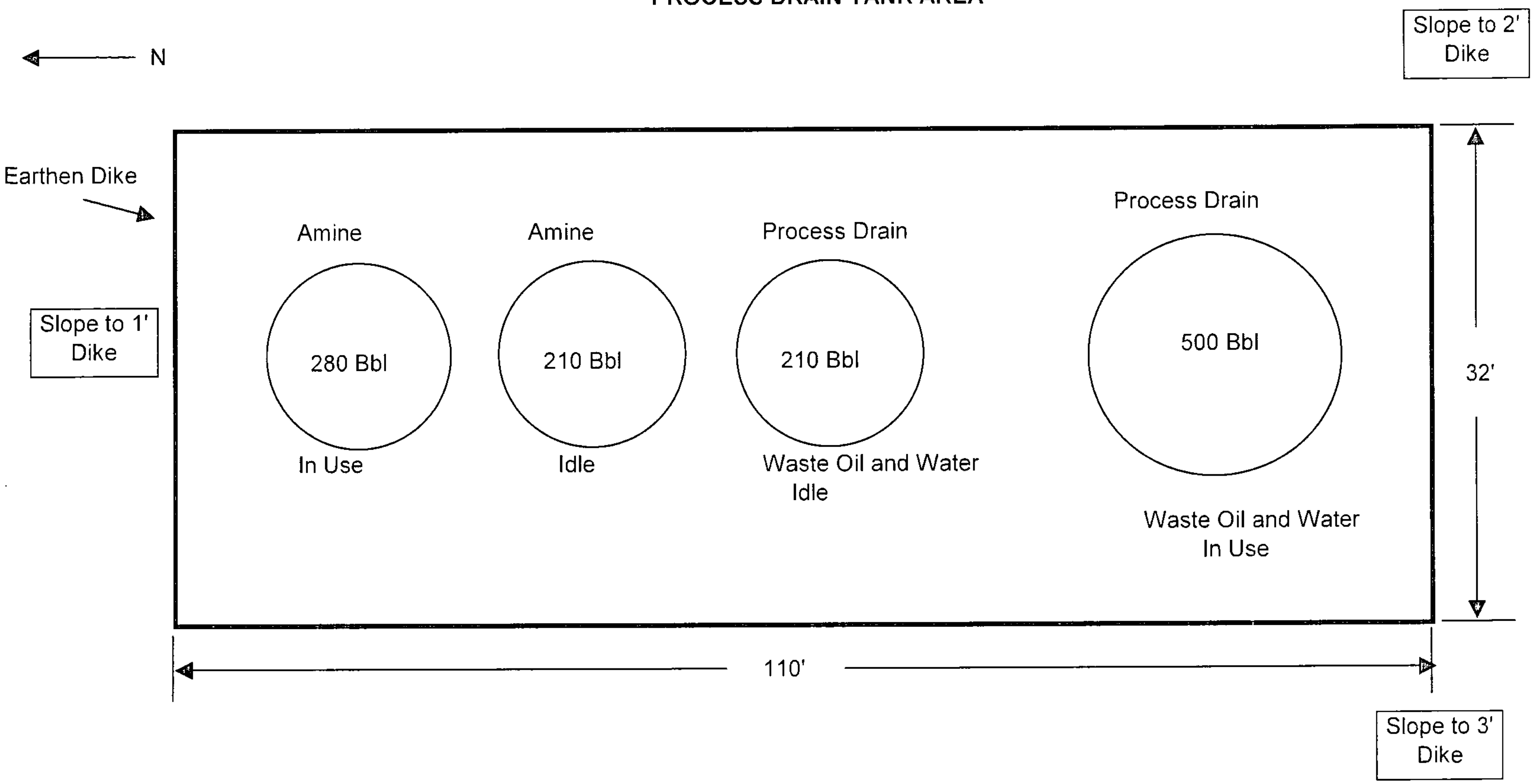


Containment Capacity Calculations			
1. Capacity of Diked Area:	442	4. Largest Tank Volume	322
2. Applicable Tank Disp.:	67	5. Excess Capacity:	5
3. Precipitation Allowance:	49	*All units in Barrels*	

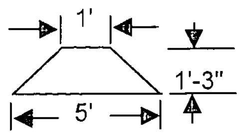
8/31/2004

Note: Not Drawn to Scale

EMPIRE ABO GAS PLANT
PROCESS DRAIN TANK AREA



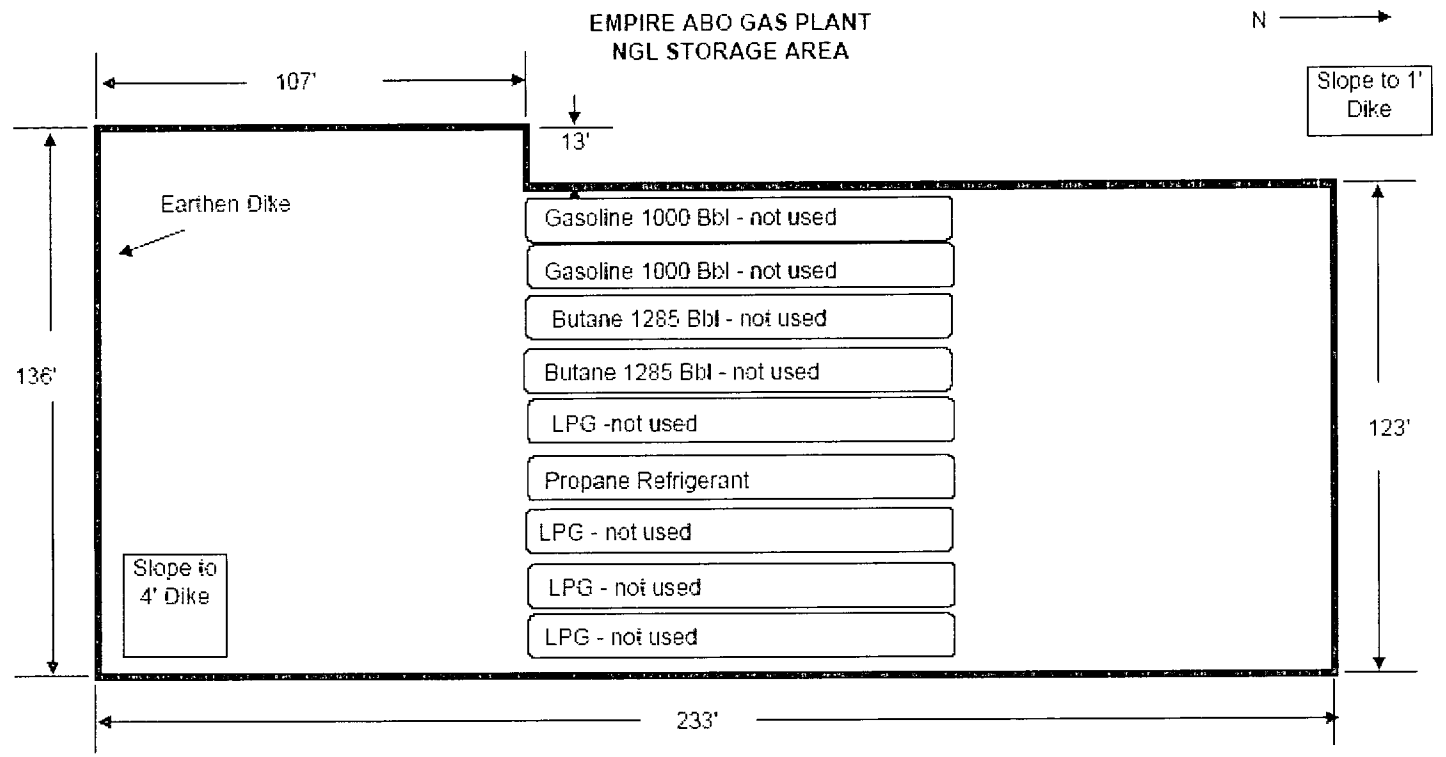
Minimum Dike Dimensions

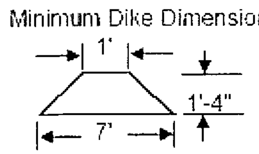


Containment Capacity Calculations			
1. Capacity of Diked Area:	784	4. Largest Tank Volume:	500
2. Applicable Tank Disp.:	120	5. Excess Capacity:	114
3. Precipitation Allowance*:	49	*All units in Barrels*	

**Precipitation allowance of 2"*

Note: Not Drawn to Scale 8/31/2004





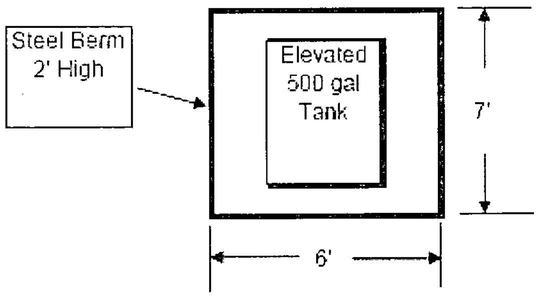
Containment Capacity Calculations			
1. Capacity of Diked Area:	7118	4. Largest Tank Volume:	1000
2. Applicable Tank Disp.:	Elevated	5. Excess Capacity:	5226
3. Precipitation Allowance*:	892	*All units in Barrels*	

**Precipitation allowance of 2"*

Note: Not Drawn to Scale 8/31/2004

EMPIRE ABO GAS PLANT
MISCELLANEOUS STORAGE SITES

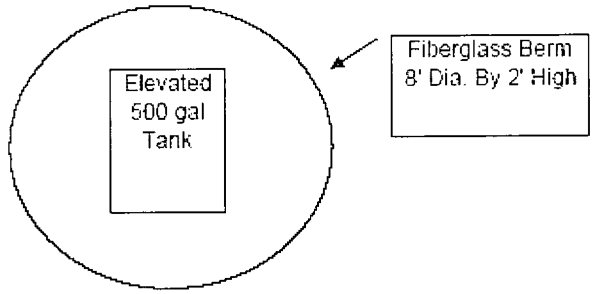
500 Gallon Lube Oil Tank at Rental Compressor - TO BE REMOVED



Containment Capacity Calculations			
1. Capacity of Diked Area:	15	4. Largest Tank Volume:	11.9
2. Applicable Tank Disp.:	0	5. Excess Capacity:	2
3. Precipitation Allowance*:	1	*All units in Barrels*	

**Precipitation allowance of 2"*

500 Gallon Diesel Storage Tank Near
Chemical Storage Area



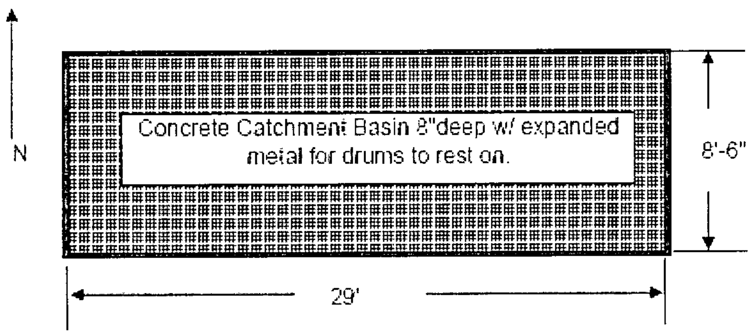
Containment Capacity Calculations			
1. Capacity of Diked Area:	18	4. Largest Tank Volume:	11.9
2. Applicable Tank Disp.:	0	5. Excess Capacity:	4
3. Precipitation Allowance*:	1	*All units in Barrels*	

**Precipitation allowance of 2"*

Note: Not Drawn to Scale 8/31/2004

EMPIRE ABO GAS PLANT
MISCELLANEOUS STORAGE SITES

Lube Oil Storage Area



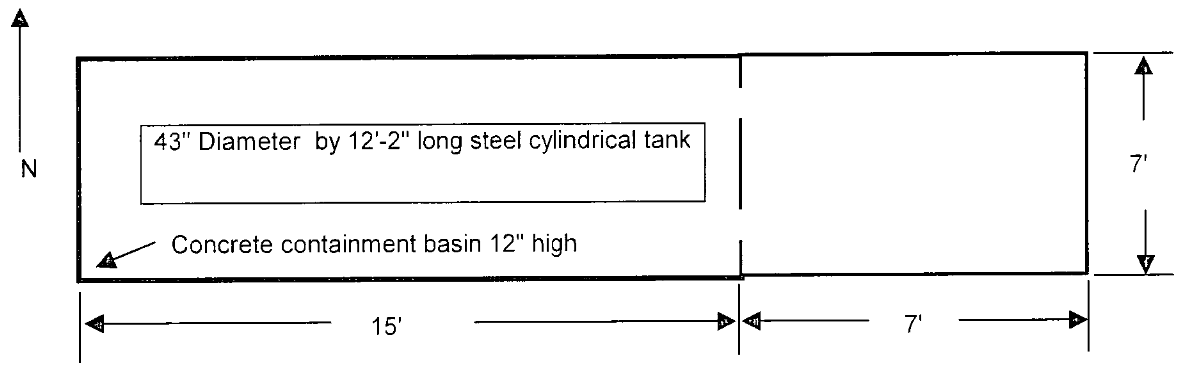
Containment Capacity Calculations			
1. Capacity of Diked Area:	33	4. Largest Tank Volume:	1.31
2. Applicable Tank Disp.:	0	5. Excess Capacity:	24
3. Precipitation Allowance*:	7	*All units in Barrels*	

**Precipitation allowance of 2"*

Note: Not Drawn to Scale 8/31/2004

EMPIRE ABO GAS PLANT
MISCELLANEOUS STORAGE SITES

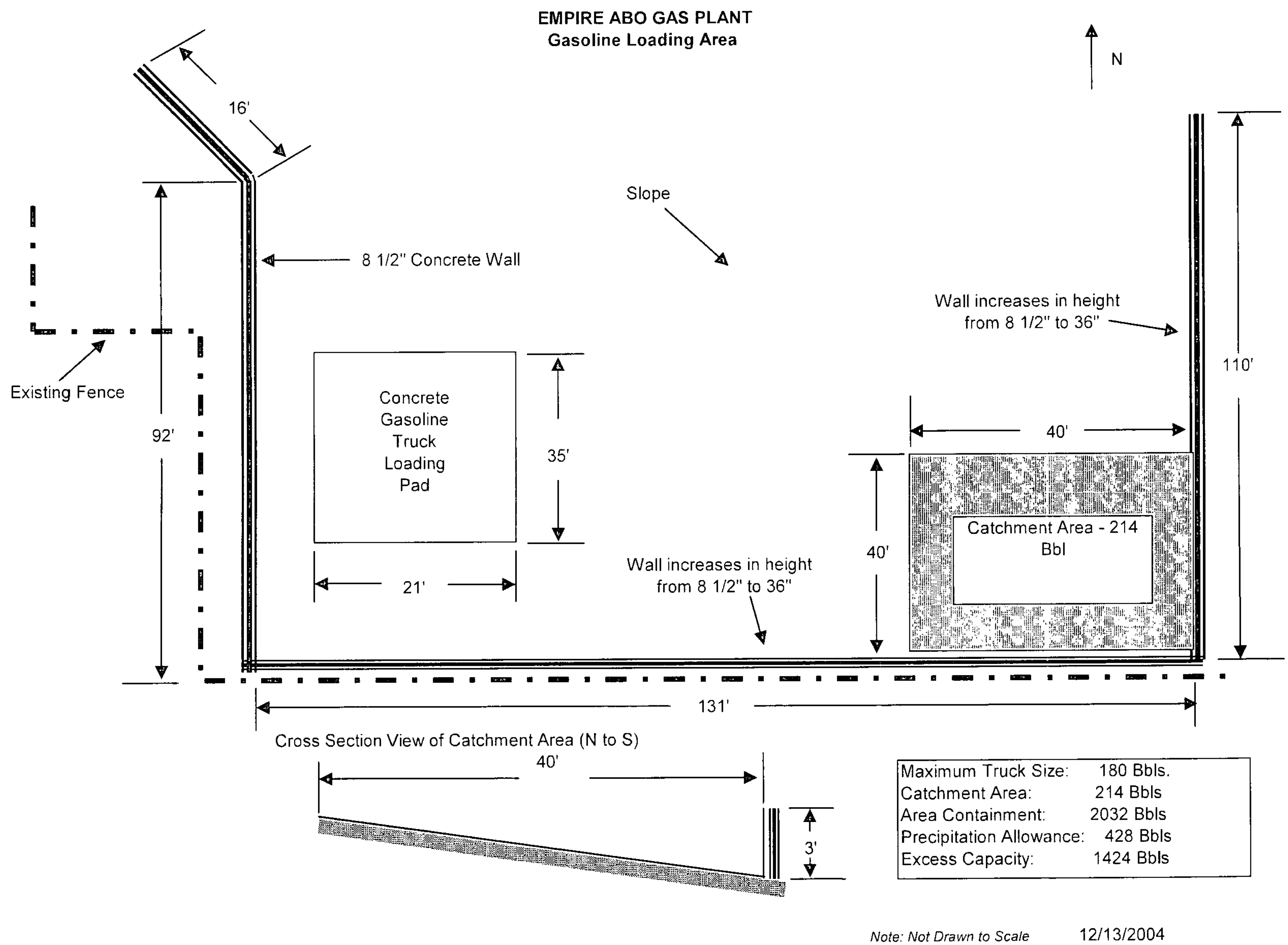
Refrigeration Oil Storage Tank



Containment Capacity Calculations			
1. Capacity of Diked Area:	27	4. Largest Tank Volume:	21.8
2. Applicable Tank Disp.:	0	5. Excess Capacity:	1
3. Precipitation Allowance*:	5	*All units in Barrels*	

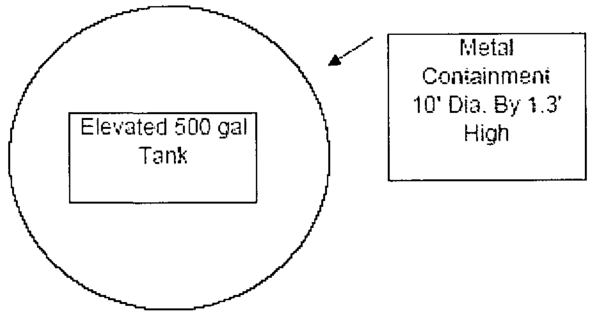
**Precipitation allowance of 2"*

Note: Not Drawn to Scale 12/13/2004


EMPIRE ABO GAS PLANT
Gasoline Loading Area
N
16'
Slope
8 1/2" Concrete Wall
Wall increases in height from 8 1/2" to 36"
Existing Fence
92'
Concrete Gasoline Truck Loading Pad
35'
21'
110'
40'
40'
Catchment Area - 214 Bbl
Wall increases in height from 8 1/2" to 36"
131'
Cross Section View of Catchment Area (N to S)
40'
3'
Maximum Truck Size: 180 Bbls.
Catchment Area: 214 Bbls
Area Containment: 2032 Bbls
Precipitation Allowance: 428 Bbls
Excess Capacity: 1424 Bbls
Note: Not Drawn to Scale
12/13/2004

EMPIRE ABO GAS PLANT
MISCELLANEOUS STORAGE SITES

500 Gallon MR Solvent Storage Tank Due East of Diesel Fuel Area



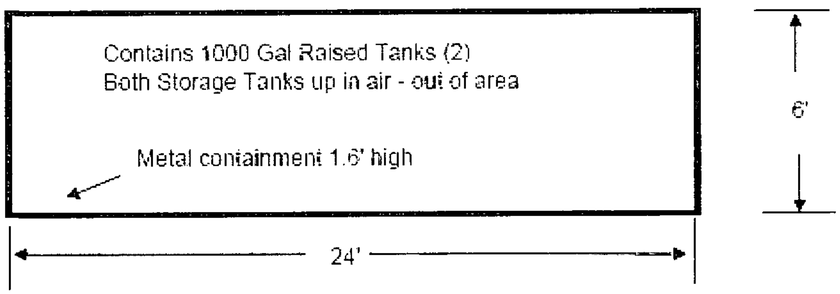
Containment Capacity Calculations			
1. Capacity of Diked Area:	18	4. Largest Tank Volume:	11.9
2. Applicable Tank Disp.:	0	5. Excess Capacity:	4
3. Precipitation Allowance*:	2	*All units in Barrels*	

**Precipitation allowance of 2"*

Note: Not Drawn to Scale 11/10/2006

EMPIRE ABO GAS PLANT
MISCELLANEOUS STORAGE SITES

Monitor Well Groundwater - by evaporation pond - Temporary



Containment Capacity Calculations			
1. Capacity of Diked Area:	41	4. Largest Tank Volume:	23.8
2. Applicable Tank Disp.:	0	5. Excess Capacity:	13
3. Precipitation Allowance*:	4	*All units in Barrels*	

**Precipitation allowance of 2"*

Note: Not Drawn to Scale 11/10/2006

ARTESIA 6 S, NEW MEXICO (290600)

Period of Record Monthly Climate Summary

Period of Record : 1/ 1/1914 to 3/31/2004

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	56.8	62.1	69.1	78.3	86.4	94.0	94.8	93.2	86.9	77.9	65.8	57.9	76.9
Average Min. Temperature (F)	23.4	27.7	34.0	42.6	52.3	61.2	65.1	63.5	55.9	44.0	31.8	23.9	43.8
Average Total Precipitation (in.)	0.40	0.41	0.45	0.57	1.25	1.47	1.59	1.75	1.78	1.20	0.47	0.47	11.83
Average Total SnowFall (in.)	1.7	1.2	0.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.7	6.2
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 64.4% Min. Temp.: 64.4% Precipitation: 98.5% Snowfall: 60% Snow Depth: 58.5%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Note: 2" of precipitation was used as a maximum storm event based on the above table. The 2" is in excess of the total monthly average for any given month over the past 90 years.

New Mexico Office of the State Engineer
Point of Diversion by Location
(with Owner Information)

Nbr	Sub basin	Use	Diversion (acre ft per annum)	Owner	County	POD Number	Grant	Source	q 64	q 16	q 4	Sec	Tws	Rng	X (NAD83 UTM in meters)	Y	Distance
6		DOM	3	PATON BROTHERS	ED	RA 02996			2	3	1	02	18S	27E	569808	3627025*	1117
7		PRO	0	PAN AMERICAN PETROLEUM CORP.	LE	RA 03917		Artesian	4	1	2	10	18S	27E	569019	3625660*	1154

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest)

Count: 2

MNAD83 Radius Search (in meters):

Easting (X): 568719 **Northing (Y):** 3626775 **Radius:** 2500

rted by: Distance

ation was derived from PLSS - see Help

New Mexico Office of the State Engineer
Water Right Summary

WR File Number: RA 02996
Primary Purpose: DOM 72-12-1 DOMESTIC ONE HOUSEHOLD
Primary Status: PMT PERMIT
Total Acres:
Total Diversion: 3
Owner: PATON BROTHERS

Documents on File

Doc	File/Act	Status 1	Status 2	Status 3	Transaction Desc.	From/To	Acres	Diversion	Consumptive
72121	1953-01-06	PMT	APR	ABS	RA 02996	T		3	

Point of Diversion

(NAD83 UTM in meters)

Pod Number	Source	Q 64	Q 16	Q 4	Sec	Tws	Rng	X	Y	Other Location Desc
RA 02996		2	3	1	02	18S	27E	569808	3627025*	

***An (*) after northing value indicates UTM location was derived from PLSS - see Help**

New Mexico Office of the State Engineer
Transaction Summary

72121 All Applications Under Statute 72-12-1

Transaction Number: 283630 **Transaction Desc:** RA 02996 **File Date:** 12/22/1952

Primary Status: PMT Permit
Secondary Status: APR Approved
Person Assigned: *******
Applicant: PATON BROTHERS

Events

Date	Type	Description	Comment	Processed By
12/22/1952	APP	Application Received		*******
01/06/1953	FIN	Final Action on application		*******
01/06/1953	WAP	General Approval Letter		*******
09/09/2003	RUB	Re-Update the WR Database		*******

Change To:

WR File Nbr	Acres	Diversion	Consumptive	Purpose of Use
RA 02996		3		DOM 72-12-1 DOMESTIC ONE HOUSEHOLD

****Point of Diversion**

RA 02996	569808	3627025*

***An (*) after northing value indicates UTM location was derived from PLSS - see Help**

Remarks

THIS WELL IS A PLUGGED AND ABANDONED OIL WELL. WE ANTICIPATE REOPENING THE WELL AND CLEANING IT OUT TO AN APPROXIMATE DEPTH OF 300'. UNABLE TO LOCATE WELL LOG.

Conditions

10 Total diversion from all wells under this permit number shall not exceed 3 acre-feet per annum.

B The well shall be drilled by a driller licensed in the State of New Mexico in accordance with Section 72-12-12 New Mexico Statutes Annotated. A licensed driller shall not be required for the construction of a driven well; provided, that the casing shall not exceed two and three-eighths (2 3/8) inches outside diameter (Section 72-12-12).

D The casing shall not exceed 7 inches outside diameter except under specific conditions in which reasons satisfactory to the State Engineer are shown.

Action of the State Engineer

Approval Code: A - Approved
Action Date: 01/06/1953
Log Due Date: 01/06/1954
State Engineer:

New Mexico Office of the State Engineer
Water Right Summary

WR File Number: RA 03917
Primary Purpose: PRO 72-12-1 PROSPECTING OR DEVELOPMENT OF NATURAL RESOURCE
Primary Status: PMT PERMIT
Total Acres:
Total Diversion: 0
Owner: PAN AMERICAN PETROLEUM CORP.

Documents on File

Doc	File/Act	Status 1	Status 2	Status 3	Transaction Desc.	From/To	Acres	Diversion	Consumptive
72121	1958-08-06	PMT	APR	ABS	RA 03917	T		3	

Point of Diversion

(NAD83 UTM in meters)

Pod Number	Source	Q 64	Q 16	Q 4	Sec	Tws	Rng	X	Y	Other Location Desc
RA 03917	Artesian	4	1	2	10	18S	27E	569019	3625660*	

***An (*) after northing value indicates UTM location was derived from PLSS - see Help**

New Mexico Office of the State Engineer
Point of Diversion Summary

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters)

POD Number	Q64	Q16	Q4	Sec	Tws	Rng	X	Y
RA 03917	4	1	2	10	18S	27E	569019	3625660*

Driller License: BURKE, EDWARD B.

Driller Name:

Source: Artesian

Drill Start Date: 07/31/1958 **Drill Finish Date:** 07/31/1958

Log File Date: 08/06/1958 **PCW Received Date:**

Pump Type: **Pipe Discharge Size:**

Casing Size: **Estimated Yield:**

Depth Well: 130 feet **Depth Water:** 50 feet

***UTM location was derived from PLSS - see Help**

New Mexico Office of the State Engineer
Transaction Summary

72121 All Applications Under Statute 72-12-1

Transaction Number: 255920 **Transaction Desc:** RA 03917 **File Date:** 08/06/1958

Primary Status: PMT Permit
Secondary Status: APR Approved
Person Assigned: *******
Applicant: PAN AMERICAN PETROLEUM CORP.

Events

Date	Type	Description	Comment	Processed By
08/06/1958	APP	Application Received		*******
08/06/1958	FIN	Final Action on application		*******
08/06/1958	WAP	General Approval Letter		*******

Change To:

WR File Nbr	Acres	Diversion	Consumptive	Purpose of Use
RA 03917		3		PRO 72-12-1 PROSPECTING OR DEVELOPMENT OF NATURAL RESOURCE
****Point of Diversion**				
RA 03917		569019	3625660*	

***An (*) after northing value indicates UTM location was derived from PLSS - see Help**

Remarks

Malco "D" lease, Eddy Co.

Conditions

1A Depth of the well shall not exceed the thickness of the valley fill.

4 Use shall be limited to household, non-commercial trees, lawn and garden not to exceed one acre and/or stock use.

Action of the State Engineer

Approval Code: A - Approved
Action Date: 08/06/1958
Log Due Date: 08/06/1959
State Engineer:

USDA United States Department of Agriculture

NRCS Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Eddy Area, New Mexico

Empire Abo Gas Plant

August 6, 2009

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:5,640 if printed on A size (8.5" x 11") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1,200

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities
- PLSS Township and Range
- PLSS Section

Federal Land
- Bureau of Land Management

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:5,640 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 13N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Eddy Area, New Mexico
Survey Area Data: Version 9, Feb 20, 2009

Date(s) aerial images were photographed: 10/19/1997

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Eddy Area, New Mexico (NM614)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GC	Gypsum land-Cottonwood complex, 0 to 3 percent slopes	75.5	56.9%
RG	Reeves-Gypsum land complex, 0 to 3 percent slopes	57.2	43.1%
Totals for Area of Interest		**132.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Eddy Area, New Mexico

GC—Gypsum land-Cottonwood complex, 0 to 3 percent slopes

Map Unit Setting

Elevation: 3,000 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 190 to 220 days

Map Unit Composition

Gypsum land: 60 percent
Cottonwood and similar soils: 30 percent

Description of Gypsum Land

Setting

Landform: Hills, plains, ridges
Landform position (two-dimensional): Shoulder, toeslope, backslope, footslope
Landform position (three-dimensional): Crest, nose slope, side slope, head slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gypsum

Interpretive groups

Land capability (nonirrigated): 8s

Description of Cottonwood

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Shoulder, toeslope, backslope, footslope
Landform position (three-dimensional): Head slope, crest, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gypsum

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 3 to 12 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water capacity: Very low (about 1.2 inches)

Interpretive groups

Land capability (nonirrigated): 6s
Ecological site: Gyp Upland (R042XC006NM)

Typical profile

0 to 8 inches: Loam
8 to 60 inches: Bedrock

RG—Reeves-Gypsum land complex, 0 to 3 percent slopes

Map Unit Setting

Elevation: 3,000 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 190 to 220 days

Map Unit Composition

Reeves and similar soils: 55 percent
Gypsum land: 30 percent

Description of Reeves

Setting

Landform: Hills, plains, ridges
Landform position (two-dimensional): Toeslope, backslope, footslope, shoulder
Landform position (three-dimensional): Side slope, head slope, crest, nose slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gypsum

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Gypsum, maximum content: 80 percent
Maximum salinity: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability (nonirrigated): 7s
Ecological site: Loamy (R042XC007NM)

Typical profile

0 to 8 inches: Loam
8 to 32 inches: Clay loam
32 to 60 inches: Gypsiferous material

Description of Gypsum Land

Setting

Landform: Hills, plains, ridges
Landform position (two-dimensional): Footslope, shoulder, toeslope, backslope
Landform position (three-dimensional): Crest, nose slope, side slope, head slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from gypsum

Interpretive groups

Land capability (nonirrigated): 8s

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

AOI Inventory

This folder contains a collection of tabular reports that present a variety of soil information. Included are various map unit description reports, special soil interpretation reports, and data summary reports.

Component Legend

This report presents general information about the map units and map unit components in the selected area. It shows map unit symbols and names and the components in each map unit. It also shows the percent of the components in the map units, the kind of component, and the slope range of each component.

Report—Component Legend

Component Legend– Eddy Area, New Mexico						
Map unit symbol and name	Pct. of map unit	Component name	Component kind	Pct. slope		
				Low	RV	High
GC—Gypsum land-Cottonwood complex, 0 to 3 percent slopes						
	60	Gypsum land	Miscellaneous area		38	
	30	Cottonwood	Series	0	2	3

Component Legend– Eddy Area, New Mexico						
Map unit symbol and name	Pct. of map unit	Component name	Component kind	Pct. slope		
				Low	RV	High
RG—Reeves-Gypsum land complex, 0 to 3 percent slopes						
	55	Reeves	Series	0	1	1
	30	Gypsum land	Miscellaneous area	0	2	3

Soil Chemical Properties

This folder contains a collection of tabular reports that present soil chemical properties. The reports (tables) include all selected map units and components for each map unit. Soil chemical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil chemical properties include pH, cation exchange capacity, calcium carbonate, gypsum, and electrical conductivity.

Chemical Soil Properties

This table shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable cations plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity and aeration, and a general degradation of soil structure.

Chemical Soil Properties– Eddy Area, New Mexico								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange *capacity***	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
GC—Gypsum land-Cottonwood complex, 0 to 3 percent slopes								
Gypsum land	—	—	—	—	—	—	—	—
Cottonwood	0-8	8.0-20	—	7.9-8.4	5-15	0-5	0.0-2.0	0-1
	8-60	—	—	—	—	—	—	—
RG—Reeves-Gypsum land complex, 0 to 3 percent slopes								
Reeves	0-8	10-20	—	7.9-9.0	10-15	0-1	2.0-8.0	0-4
	8-32	10-20	—	7.9-9.0	15-25	0-3	2.0-8.0	0-4
	32-60	—	—	—	—	20-80	—	—
Gypsum land	—	—	—	—	—	—	—	—

Soil Qualities and Features

This folder contains tabular reports that present various soil qualities and features. The reports (tables) include all selected map units and components for each map unit. Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Soil Features

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Soil Features– Eddy Area, New Mexico									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		In	*In*		*In*	*In*			
GC—Gypsum land-Cottonwood complex, 0 to 3 percent slopes									
Gypsum land		—	—		—	—	Low	High	High
Cottonwood	Paralithic bedrock	3-12	—	Moderately cemented	—	—	Low	High	Moderate
RG—Reeves-Gypsum land complex, 0 to 3 percent slopes									
Reeves		—	—		—	—	Low	High	High
Gypsum land		—	—		—	—	Low	High	High

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Soil Features– Eddy Area, New Mexico

Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to *top*	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		In	*In*		*In*	*In*			
GC—Gypsum land-Cottonwood complex, 0 to 3 percent slopes									
Gypsum land		—	—		—	—	Low	High	High
Cottonwood	Paralithic bedrock	3-12	—	Moderately cemented	—	—	Low	High	Moderate
RG—Reeves-Gypsum land complex, 0 to 3 percent slopes									
Reeves		—	—		—	—	Low	High	High
Gypsum land		—	—		—	—	Low	High	High

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Soil Features– Eddy Area, New Mexico									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		In	*In*		*In*	*In*			
GC—Gypsum land-Cottonwood complex, 0 to 3 percent slopes									
Gypsum land		—	—		—	—	Low	High	High
Cottonwood	Paralithic bedrock	3-12	—	Moderately cemented	—	—	Low	High	Moderate
RG—Reeves-Gypsum land complex, 0 to 3 percent slopes									
Reeves		—	—		—	—	Low	High	High
Gypsum land		—	—		—	—	Low	High	High

Soil Features

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Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		In	*In*		*In*	*In*			
GC—Gypsum land-Cottonwood complex, 0 to 3 percent slopes									
Gypsum land		—	—		—	—	Low	High	High
Cottonwood	Paralithic bedrock	3-12	—	Moderately cemented	—	—	Low	High	Moderate
RG—Reeves-Gypsum land complex, 0 to 3 percent slopes									
Reeves		—	—		—	—	Low	High	High
Gypsum land		—	—		—	—	Low	High	High

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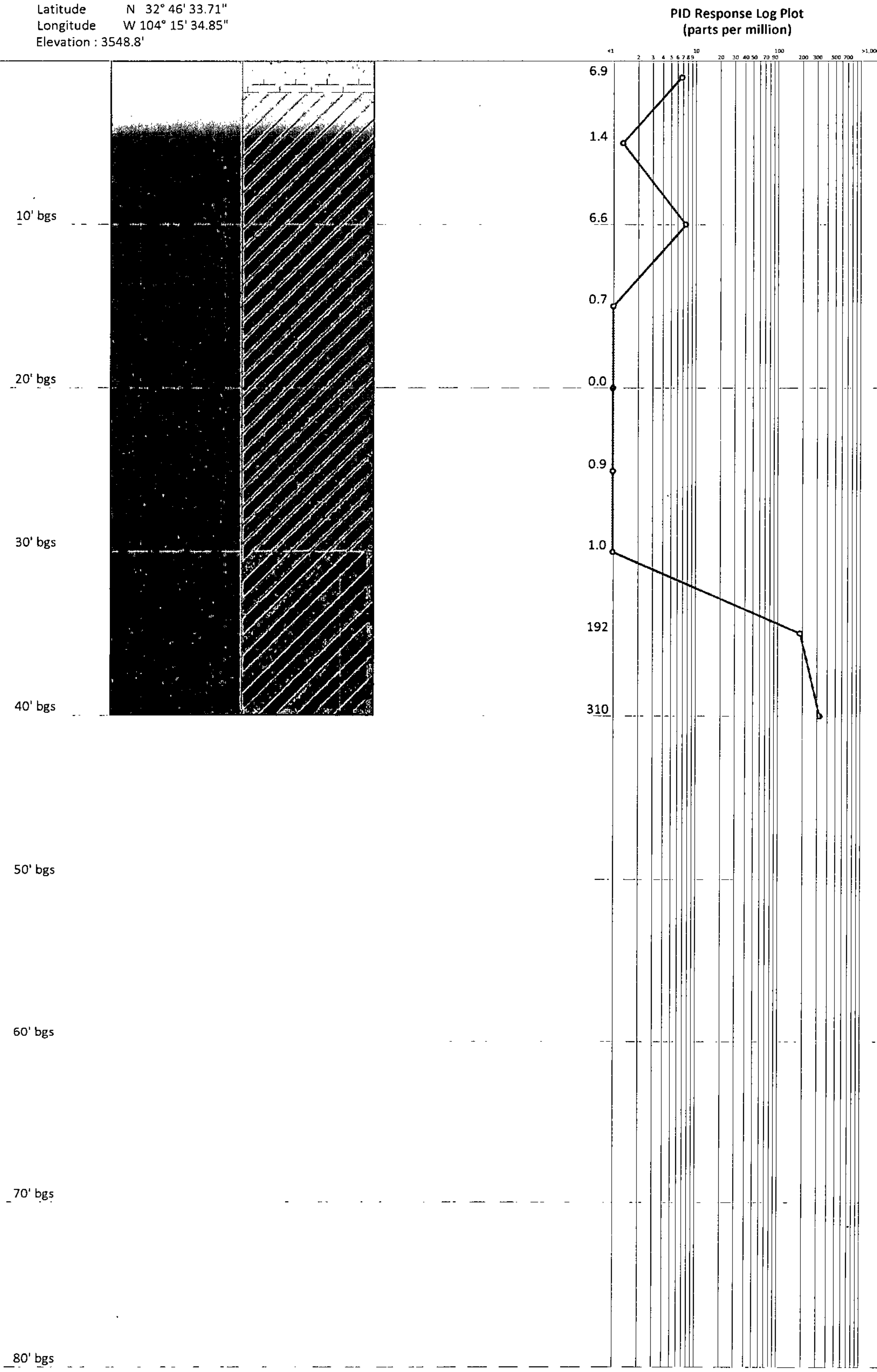
Latitude N 32° 46' 33.71"
Longitude W 104° 15' 34.85"
Elevation : 3548.8'



Lithologic Well Log

Drilling started 7/23/2008, completed 7/24/2008.
Drilled with Air Rotary by Scarborough

SM - Very Pale Brown (10YR 7/3) very fine to medium grained quartz sand, poorly sorted, angular to subangular, compacted, dry, Pink (5YR 7/3) below 0.7'

Gypsum - Pink (5YR 7/3) indurated

CL - Red (2.5YR 4/6) very fine grained quartz sand, moist, with Gypsum stringers, low plasticity

Abundant Gypsum in thin below 25'

CL - Dark Reddish Brown (2.5YR 3/4) with Reddish Brown to Reddish Gray matter, firm to stiff, low plasticity, blocky, hydrocarbon odor below 35'

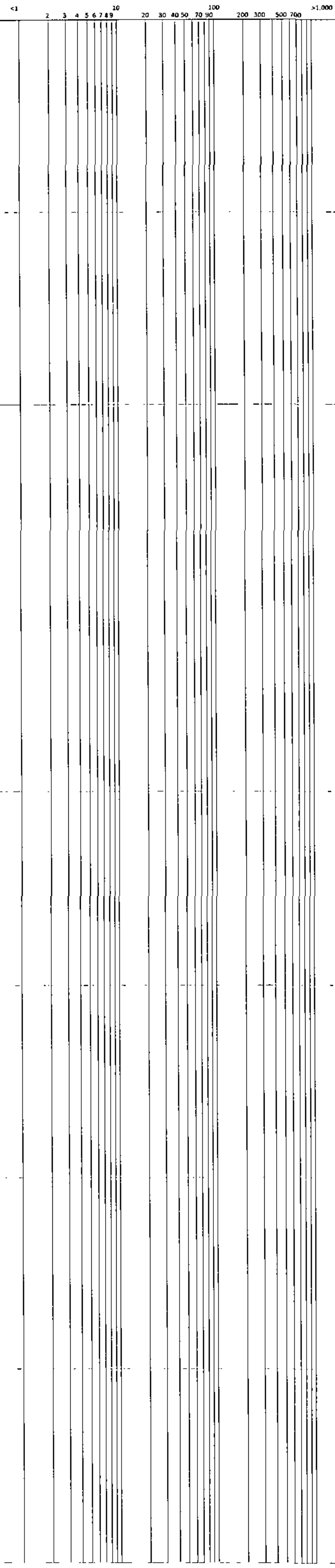
Total Depth 40'

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

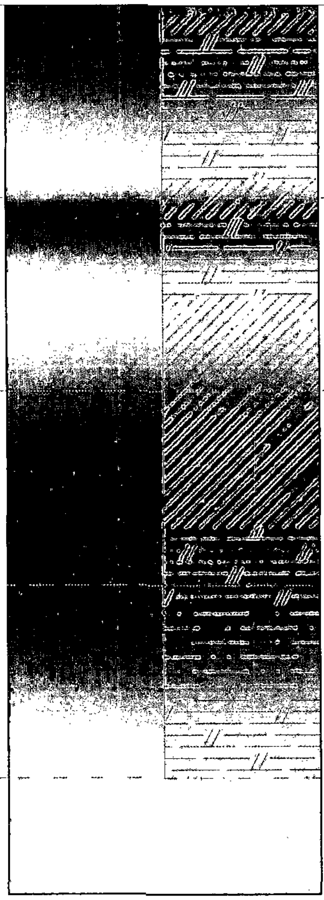
BH-1 Boring Log

PID Response Log Plot
(parts per million)



Lithologic Well Log

Drilling started 6/16/2009, completed 6/16/2009.
Drilled with Air Rotary by Scarborough



GW- Gravel

CL - Yellowish Red (5YR 4/6) very fine grained quartz sand, weak, slight moisture

Gypsum - Gray to Pale Brown (10YR 6/1- 10YR 6/2) thin to thick bedded, friable to hard

10' bgs

CL - Olive Gray (5YR 4/2) very fine grained quartz sand, blocky, moist, medium plasticity

Gypsum - Gray to Pale Brown (10YR 6/1- 10YR 6/2) thin to massive, moderately hard

CL - Dark Reddish Brown (5YR 3/3) very fine grained quartz sand, soft, blocky, moist, low plasticity, interbedded with gypsum beds approximately 1-2 feet thick

20' bgs

Gypsum - Gray to Pale Brown (10YR 6/1- 10YR 6/2) thin to massive

30' bgs

Shale - Gray (10YR 6/1) thin bedded silty

Gypsum - Gray to Pale Brown (10YR 6/1- 10YR 6/2) thin to massive, friable to hard

40' bgs

50' bgs

60' bgs

70' bgs

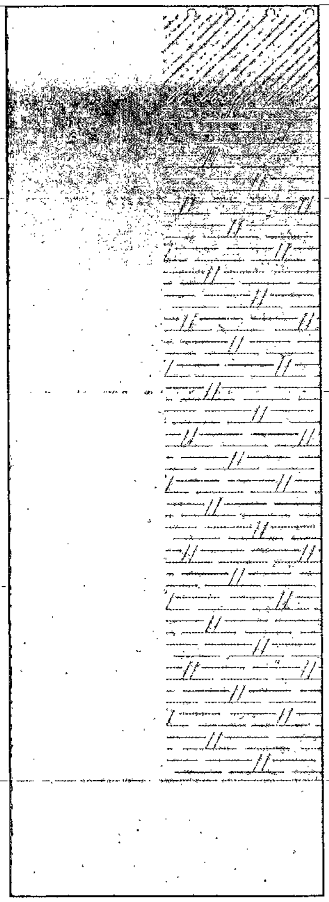
80' bgs

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

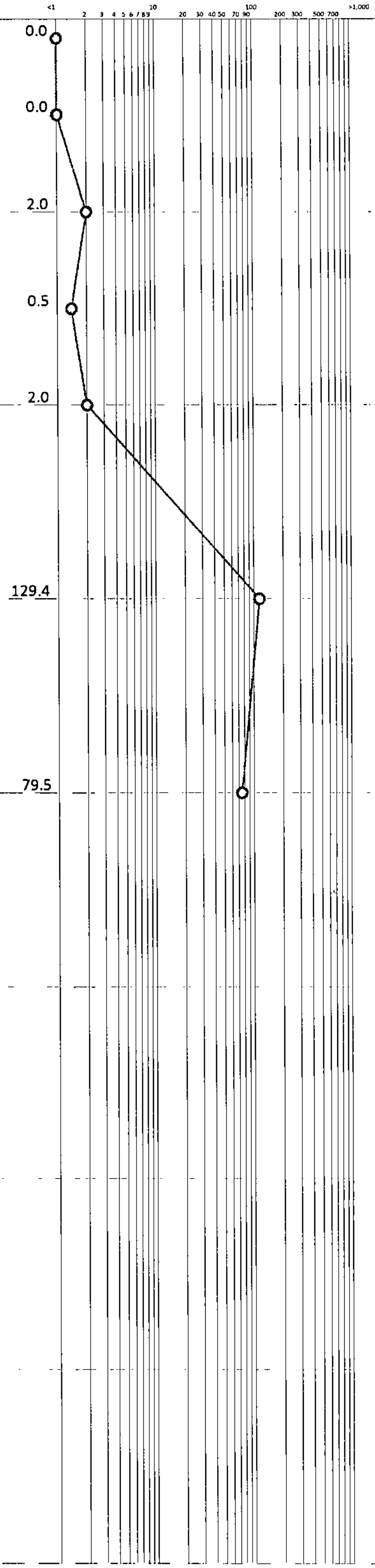
Larson & Associates, Inc.
Environmental Consultants

BH-2 Boring Log

Latitude N 32° 46' 33.28"
Longitude W 104° 15' 39.45"
Elevation : 3544.3'



PID Response Log Plot (parts per million)



Lithologic Well Log

Drilling started 6/16/2009, completed 6/16/2009.
Drilled with Air Rotary by Scarborough

GW- Gravel

CL - Pink (7.5YR 7/3) very fine grained quartz sand, dry, weak. Grayish Brown to Light Olive Brown (2.5YR 5/2 to 2.5YR 5/3)

Gypsum - Gray to Pale Brown (10YR 6/1 to 6/2) thin to massive, hard to friable, interbedded with grayish brown (2.5YR 5/2) silty clay

Bluish Gray (GLEY2 5/1) below 25', hydrocarbon odor, moist at 40'

10' bgs
20' bgs
30' bgs
40' bgs
50' bgs
60' bgs
70' bgs
80' bgs

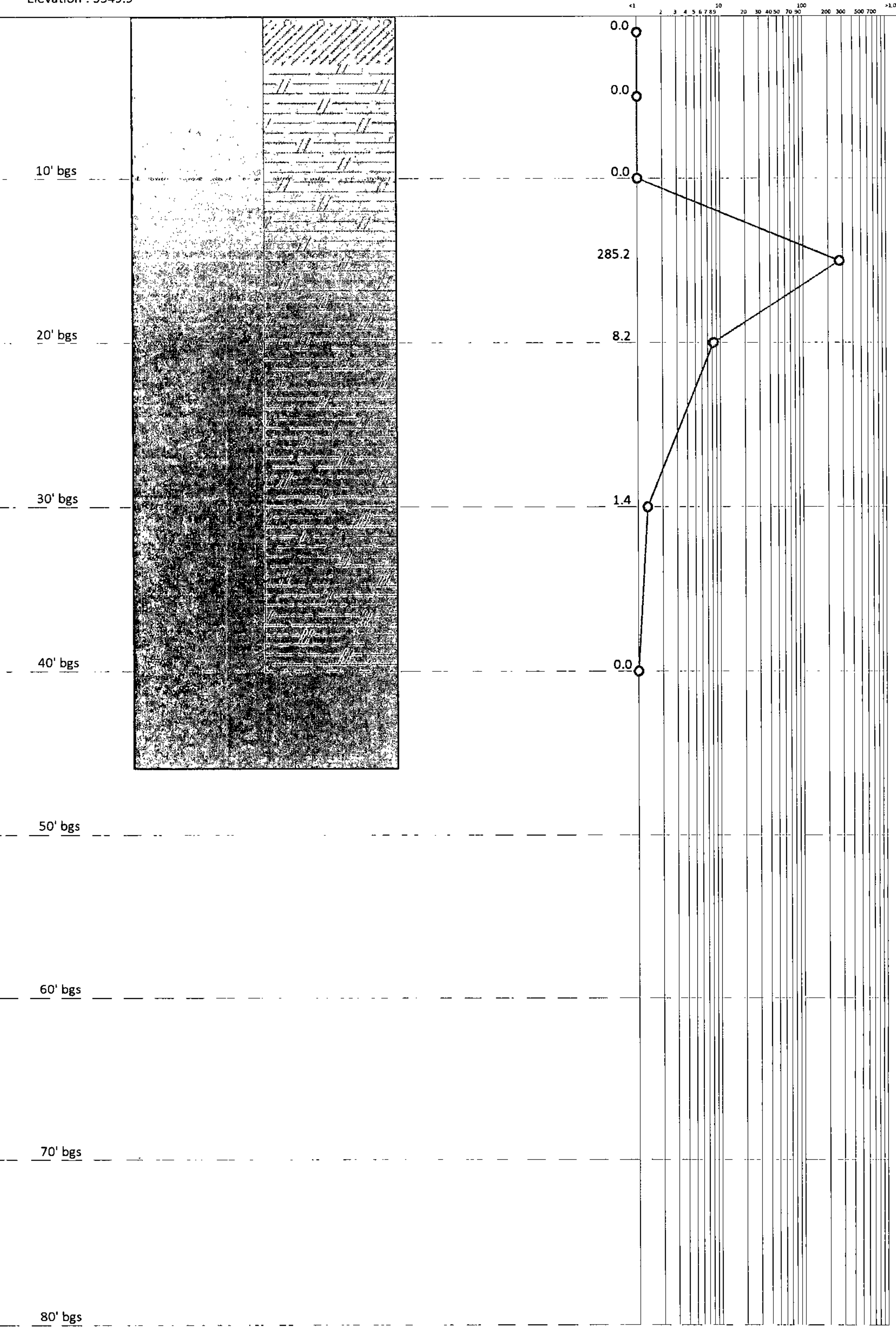
Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

BH-3 Boring Log

Latitude N 32° 46' 34.25"
Longitude W 104° 15' 36.29"
Elevation : 3549.9'

PID Response Log Plot (parts per million)



Lithologic Well Log

Drilling started 6/16/2009, completed 6/16/2009.
Drilled with Air Rotary by Scarborough

GW- Gravel

CL - Pink to Pinkish Gray (7.5YR 7/2 to 7.5YR 7/3) very fine grained quartz sand, weak

Gypsum - Gray to Pale Brown (10YR 6/1 to 6/2) thin to massive, hard to friable, interbedded with gray (10YR 5/1) thin clay beds from 10' to 15', hydrocarbon odor

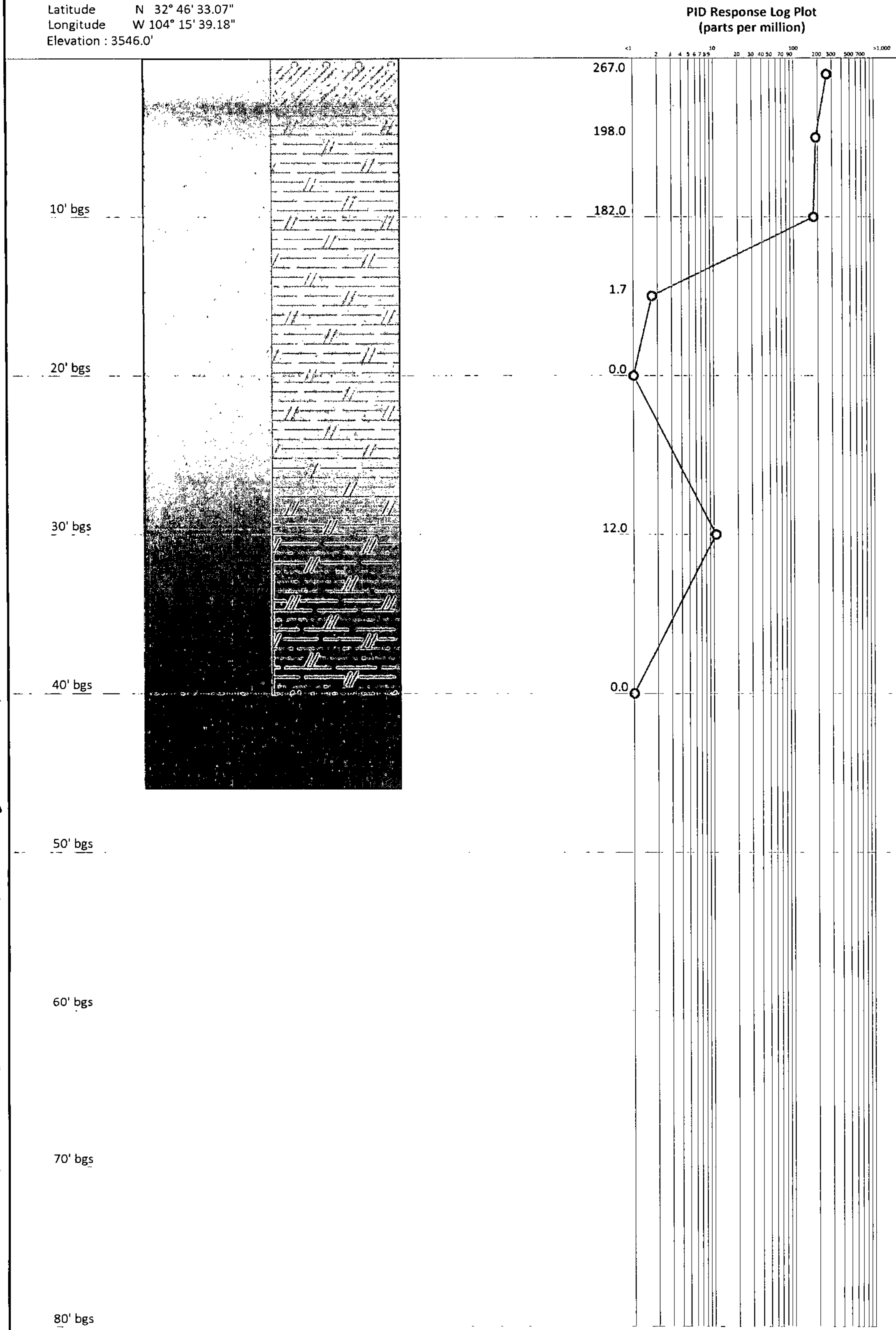
Grayish Brown (2.5Y 5/2) silty clay below 20'

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

BH-4 Boring Log

Latitude N 32° 46' 33.07"
Longitude W 104° 15' 39.18"
Elevation : 3546.0'



Lithologic Well Log

Drilling started 6/17/2009, completed 6/17/2009.
Drilled with Air Rotary by Scarborough

GW- Gravel

CL - Pink to Light Brown (7.5YR 7/3 to 7.5YR 6/3) very fine grained quartz sand, dry

Gypsum - Gray to Pale Brown (10YR 5/1 to 6/1) thin to massive, hard to friable, wet at 7', interbedded with yellowish brown (10YR 5/4) sandy clay at 9', dry below 10' with thin pinkish gray to reddish brown (5YR 7/2 to 4/4) beds of silty and sandy clay, wet below 30'

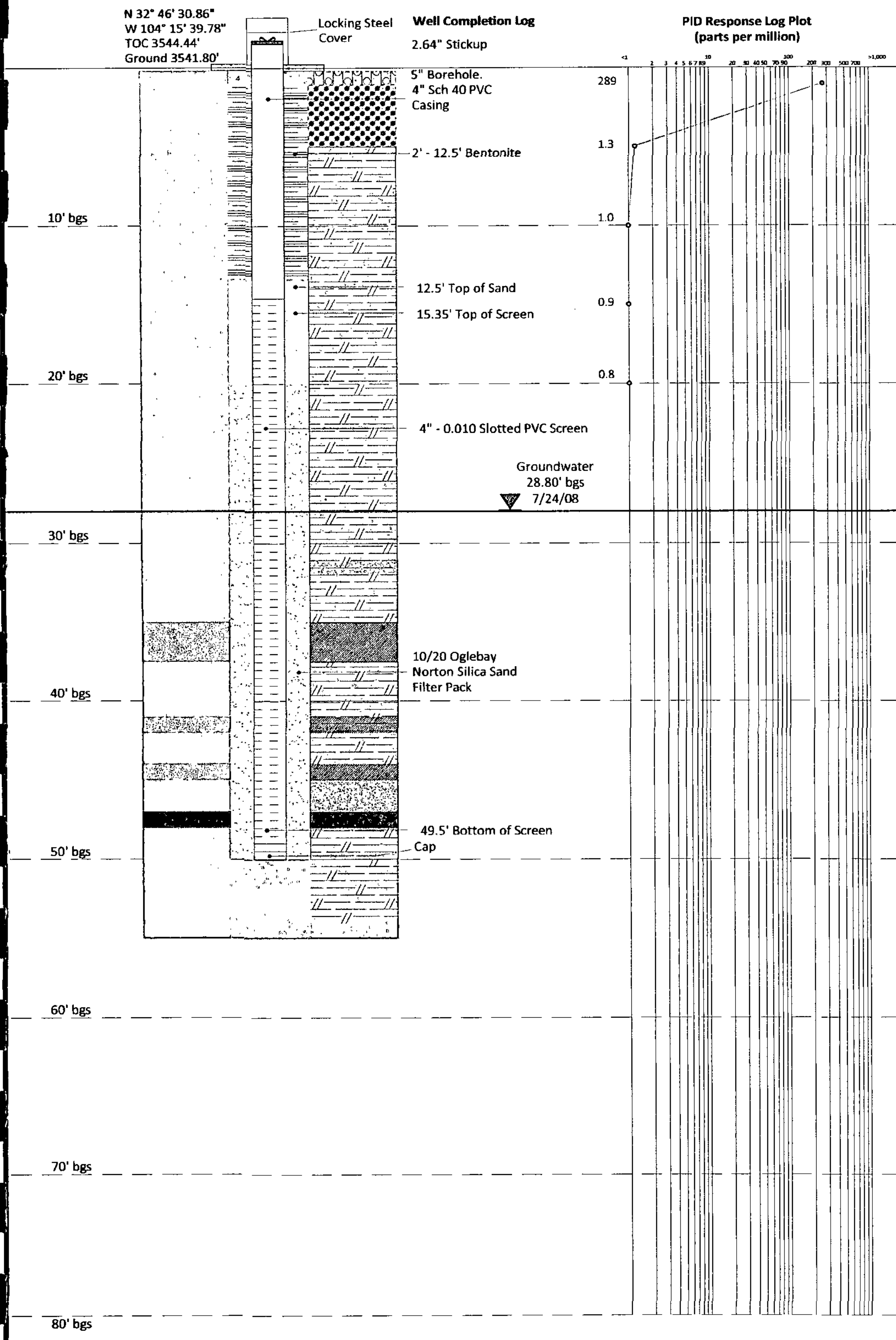
Grayish Brown (2.5Y 5/2) silty clay below 20'

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

BH-5 Boring Log

JWW



Lithologic Well Log

Drilling started 7/24/2008, completed 7/28/2008.
Drilled with Air Rotary by Scarborough Drilling.

ML - Pale brown (10YR 8/3 to 8/4)soft, dry, silt

SC - Pinkish gray (7.5 YR 7/2) to Pale brown (10YR 6/3) very fine grained quartz sand with abundant gypsum in thin stringers

Gypsum - Gray to Pale brown (10YR 6/1 to 6/2) massive to thin bedded; units of thin bedded clay below 25' (7.5 YR 4/2)

NOTE: Natural gas condensate (about 2-3 feet) in boring at 30', air drilling suspended

Inter-bedded with thin units of sand and sandy clay below 30'

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-10 Boring & Completion Log

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

POD NUMBER (WELL NUMBER)	OSE FILE NUMBER(S)		
MW10			
WELL OWNER NAME(S)	**PHONE (OPTIONAL)**		
Frontier Field Services, LLC.			
WELL OWNER MAILING ADDRESS	**CITY**	**STATE**	**ZIP**
PO Box 7	Loco Hills	N.M.	88255

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	32	46	30.86	N
	LONGITUDE	104	15	39.78	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND
* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS

Empire ABO Gas Plant Artesia, New Mexico

2. OPTIONAL

(2.5 ACRE)	(10 ACRE)	(40 ACRE)	(160 ACRE)	SECTION	TOWNSHIP	RANGE
¼	¼	¼	¼	3	18 ☐ NORTH ☑ SOUTH	27 ☑ EAST ☐ WEST

SUBDIVISION NAME	LOT NUMBER	BLOCK NUMBER	UNIT/TRACT
Empire ABO Gas Plant			

HYDROGRAPHIC SURVEY	MAP NUMBER	TRACT NUMBER

3. DRILLING INFORMATION

LICENSE NUMBER	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD1188	Lane Scarborough	John Scarborough Drilling, Inc.

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
07/24/2008	07/28/2008	50		28.80

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT):

DRILLING FLUID: ☑ AIR ☐ MUD ☐ ADDITIVES – SPECIFY:

DRILLING METHOD: ☑ ROTARY ☐ HAMMER ☐ CABLE TOOL ☐ OTHER – SPECIFY:

DEPTH (FT)		BORE HOLE DIA. (IN)	CASING MATERIAL	CONNECTION TYPE (CASING)	INSIDE DIA. CASING (IN)	CASING WALL THICKNESS (IN)	SLOT SIZE (IN)
FROM	TO						
+2	15	5	sch 40 pvc	casing	4		
15	50	5		screen	4		0.010

4. WATER BEARING STRATA

DEPTH (FT)		THICKNESS (FT)	FORMATION DESCRIPTION OF PRINCIPAL WATER-BEARING STRATA (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	YIELD (GPM)
FROM	TO			

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA	TOTAL ESTIMATED WELL YIELD (GPM)

FOR OSE INTERNAL USE

WELL RECORD & LOG (Version 6/9/08)

FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		

MW 10

5. SEAL AND PUMP

TYPE OF PUMP: ☐ SUBMERSIBLE ☐ JET ☑ NO PUMP – WELL NOT EQUIPPED ☐ TURBINE ☐ CYLINDER ☐ OTHER – SPECIFY:

ANNULAR SEAL AND GRAVEL PACK	DEPTH (FT) FROM	DEPTH (FT) TO	BORE HOLE DIA. (IN)	MATERIAL TYPE AND SIZE	AMOUNT (CUBIC FT)	METHOD OF PLACEMENT
	0	2	5	cement		poured
	2	11.5	5	bentonite		poured
	11.5	50	5	10/20 silica sand		poured

6. GEOLOGIC LOG OF WELL

DEPTH (FT) FROM	DEPTH (FT) TO	THICKNESS (FT)	COLOR AND TYPE OF MATERIAL ENCOUNTERED (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	WATER BEARING?
0	25	25	ML- Pale brown, soft, dry	☐ YES ☑ NO
			SC- Pinkish gray to pale brown,vfg quartz sand with abundant	☐ YES ☑ NO
			gypsum in thin stringers	☐ YES ☐ NO
			Gypsum- Gray to pale brown, massive to thin bedded. Clay	☐ YES ☑ NO
			units of thin bedded clay below 25'	☐ YES ☐ NO
25	50	25	Clay - Units of thin bedded clay below 25'	☐ YES ☑ NO
			Note: Natural gas condensate (about 2'-3') in boring at	☐ YES ☐ NO
			30', air drilling suspended, water drilled to total depth	☐ YES ☐ NO
			Water about 28.8"	☐ YES ☐ NO
			Inter-bedded with thin units of sand and sandy clay below 30'	☑ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO

ATTACH ADDITIONAL PAGES AS NEEDED TO FULLY DESCRIBE THE GEOLOGIC LOG OF THE WELL

7. TEST & ADDITIONAL INFO

WELL TEST

METHOD: ☐ BAILER ☐ PUMP ☐ AIR LIFT ☐ OTHER – SPECIFY:

TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

ADDITIONAL STATEMENTS OR EXPLANATIONS:

8. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 20 DAYS AFTER COMPLETION OF WELL DRILLING:

Loe Scarborough — 1-20-09

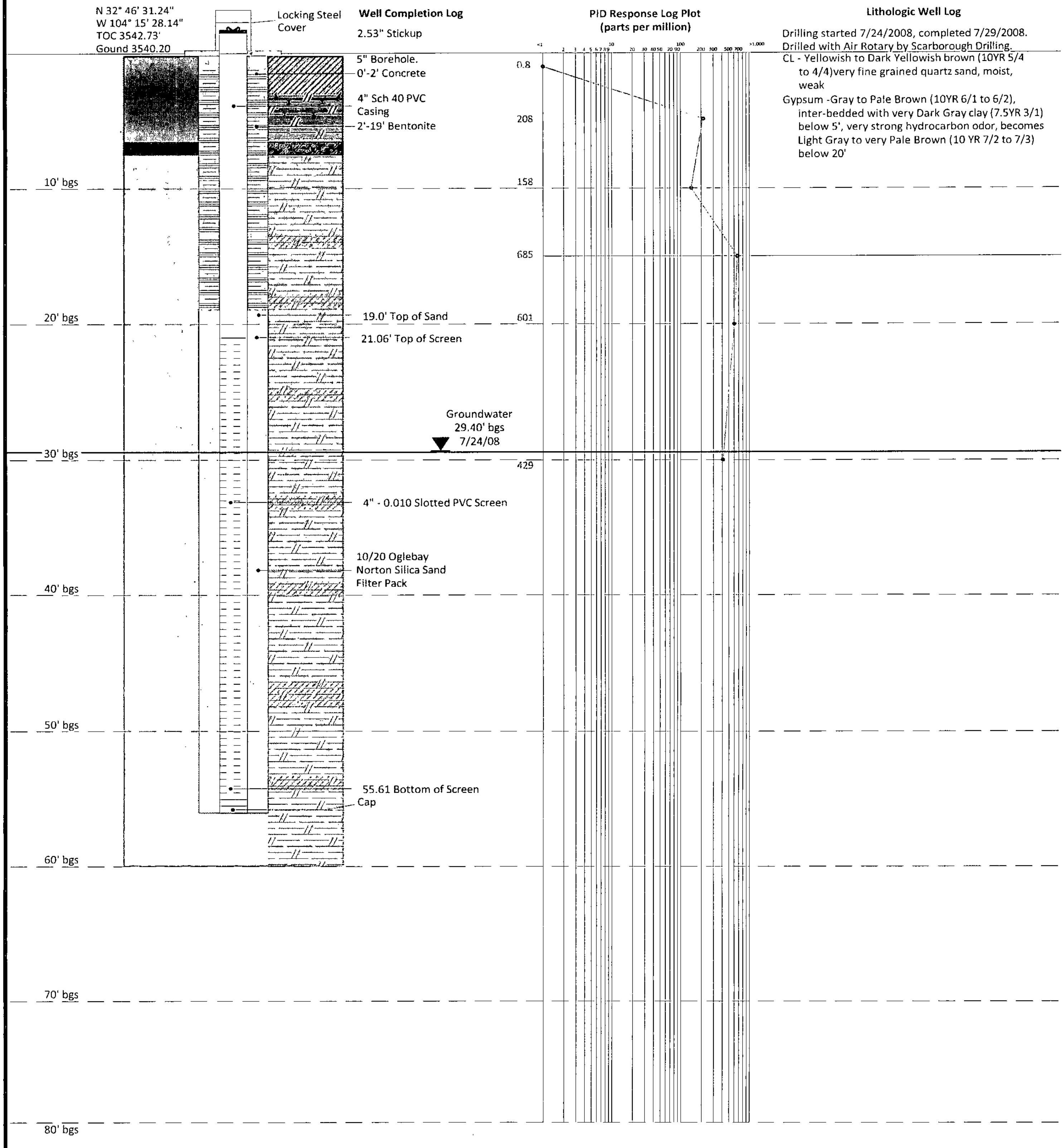
SIGNATURE OF DRILLER — DATE

FOR OSE INTERNAL USE — WELL RECORD & LOG (Version 6/9/08)

FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		PAGE 2 OF 2

JWW

F:\PROJECTS\FRONTIER\6-0141 Monitor Wells\BORING AND MW WELL LOG\WELL LOG MW#11.dwg, 7/29/2009 10:48:12 AM



Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-11 Boring & Completion Log

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

POD NUMBER (WELL NUMBER): MW11	OSE FILE NUMBER(S):
WELL OWNER NAME(S): Frontier Field Services, LLC.	PHONE (OPTIONAL):
WELL OWNER MAILING ADDRESS: PO Box 7	CITY: Loco Hills; STATE: N.M.; ZIP: 88255

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	32	46	31.24 N	* ACCURACY REQUIRED: ONE TENTH OF A SECOND
	LONGITUDE	104	15	28.14 W	* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS: Empire ABO Gas Plant Artesia, New Mexico

2. OPTIONAL

(2.5 ACRE)	(10 ACRE)	(40 ACRE)	(160 ACRE)	SECTION	TOWNSHIP	RANGE
¼	¼	¼	¼	3	18 ☐ NORTH ☑ SOUTH	27 ☑ EAST ☐ WEST

SUBDIVISION NAME: Empire ABO Gas Plant	LOT NUMBER:	BLOCK NUMBER:	UNIT/TRACT:
HYDROGRAPHIC SURVEY:		MAP NUMBER:	TRACT NUMBER:

3. DRILLING INFORMATION

LICENSE NUMBER	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD1188	Lane Scarborough	John Scarborough Drilling, Inc.

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
07/24/2008	07/29/2008	55		29.40

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT):

DRILLING FLUID: ☑ AIR ☐ MUD ☐ ADDITIVES – SPECIFY:

DRILLING METHOD: ☑ ROTARY ☐ HAMMER ☐ CABLE TOOL ☐ OTHER – SPECIFY:

DEPTH (FT) FROM	DEPTH (FT) TO	BORE HOLE DIA. (IN)	CASING MATERIAL	CONNECTION TYPE (CASING)	INSIDE DIA. CASING (IN)	CASING WALL THICKNESS (IN)	SLOT SIZE (IN)
+2	20	5	sch 40 pvc	casing	4		
20	55	5		screen	4		0.010

4. WATER BEARING STRATA

DEPTH (FT) FROM	DEPTH (FT) TO	THICKNESS (FT)	FORMATION DESCRIPTION OF PRINCIPAL WATER-BEARING STRATA (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	YIELD (GPM)

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA	TOTAL ESTIMATED WELL YIELD (GPM)

FOR OSE INTERNAL USE

WELL RECORD & LOG (Version 6/9/08)

FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		PAGE 1 OF 2

MW11

5. SEAL AND PUMP

TYPE OF PUMP: ☐ SUBMERSIBLE ☐ JET ☑ NO PUMP – WELL NOT EQUIPPED ☐ TURBINE ☐ CYLINDER ☐ OTHER – SPECIFY:

ANNULAR SEAL AND GRAVEL PACK	DEPTH (FT) FROM	DEPTH (FT) TO	BORE HOLE DIA. (IN)	MATERIAL TYPE AND SIZE	AMOUNT (CUBIC FT)	METHOD OF PLACEMENT
	0	2	5	cement		poured
	2	19	5	bentonite		poured
	19	55	5	10/20 silica sand		poured

6. GEOLOGIC LOG OF WELL

DEPTH (FT) FROM	DEPTH (FT) TO	THICKNESS (FT)	COLOR AND TYPE OF MATERIAL ENCOUNTERED (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	WATER BEARING?
0	55	55	CL - Yellowish to dark yellowish brown, vfg quartz sand, silt	☐ YES ☐ NO
			clay, moist weak	☐ YES ☐ NO
				☐ YES ☐ NO
			Gypsum- Gray to pale brown, interbedded with very dark	☐ YES ☐ NO
			gray clay below 5', very strong hydrocarbon odor, becomes	☐ YES ☐ NO
			light gray to very pale brown below 20'	☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☑ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO

ATTACH ADDITIONAL PAGES AS NEEDED TO FULLY DESCRIBE THE GEOLOGIC LOG OF THE WELL

7. TEST & ADDITIONAL INFO

WELL TEST

METHOD: ☐ BAILER ☐ PUMP ☐ AIR LIFT ☐ OTHER – SPECIFY:

TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

ADDITIONAL STATEMENTS OR EXPLANATIONS:

8. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 20 DAYS AFTER COMPLETION OF WELL DRILLING:

Joe Scarborough

SIGNATURE OF DRILLER

01/20/2009

DATE

FOR OSE INTERNAL USE

WELL RECORD & LOG (Version 6/9/08)

FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		PAGE 2 OF 2

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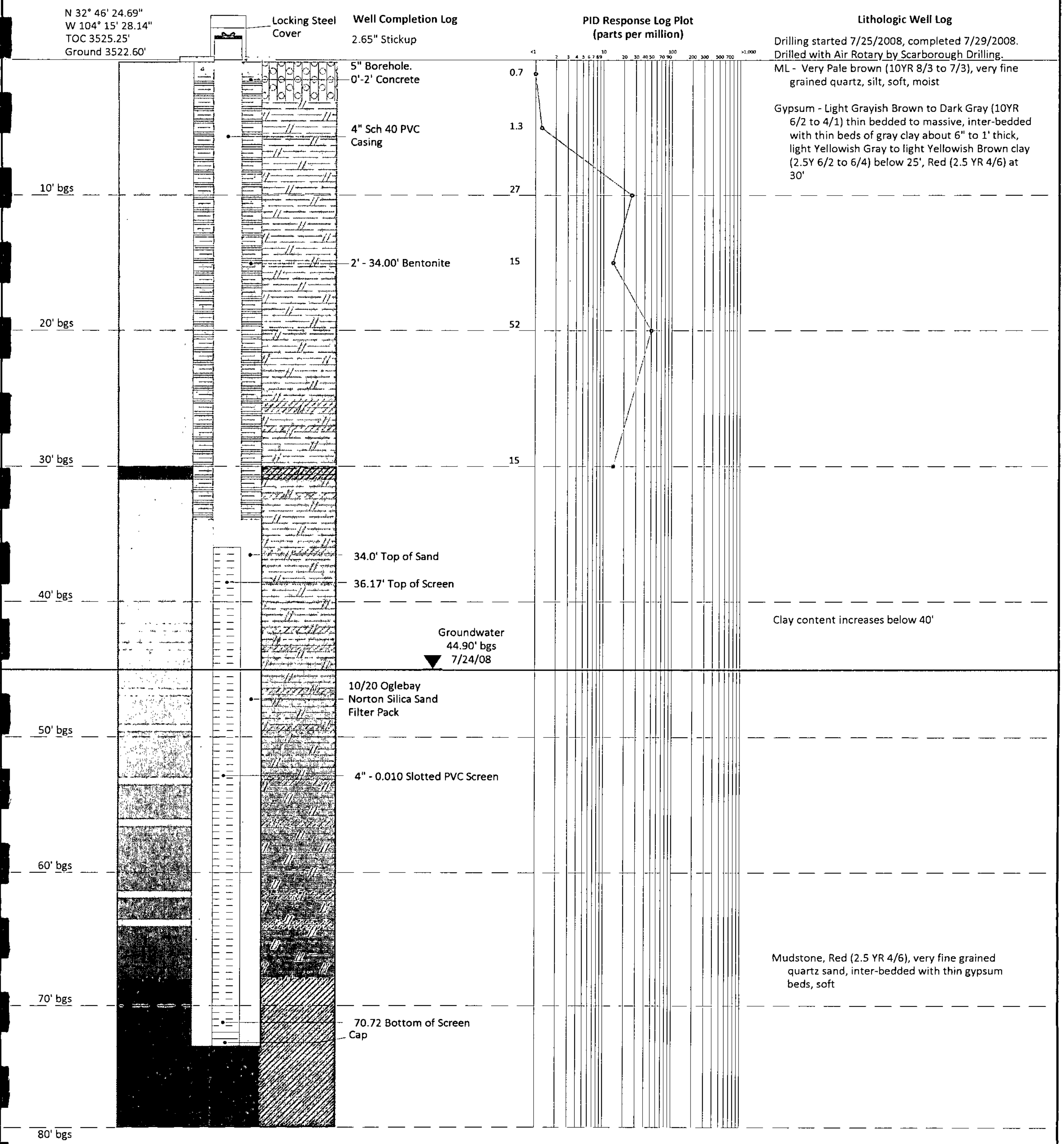


Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-12 Boring & Completion Log

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

POD NUMBER (WELL NUMBER)	OSE FILE NUMBER(S)
MW12	

WELL OWNER NAME(S)	PHONE (OPTIONAL)
Frontier Field Services, LLC.	

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
PO Box 7	Loco Hills	N.M.	88255

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	32	46	24.69	N
	LONGITUDE	104	15	28.14	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND
* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS
Empire ABO Gas Plant Artesia, New Mexico

2. OPTIONAL

(2.5 ACRE)	(10 ACRE)	(40 ACRE)	(160 ACRE)	SECTION	TOWNSHIP	RANGE
¼	¼	¼	¼	3	18 ☐ NORTH ☑ SOUTH	27 ☑ EAST ☐ WEST

SUBDIVISION NAME	LOT NUMBER	BLOCK NUMBER	UNIT/TRACT
Empire ABO Gas Plant			

HYDROGRAPHIC SURVEY	MAP NUMBER	TRACT NUMBER

3. DRILLING INFORMATION

LICENSE NUMBER	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD1188	Lane Scarborough	John Scarborough Drilling, Inc.

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
07/24/2008	07/29/2008	85		44.90

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT):

DRILLING FLUID: ☑ AIR ☐ MUD ☐ ADDITIVES – SPECIFY:

DRILLING METHOD: ☑ ROTARY ☐ HAMMER ☐ CABLE TOOL ☐ OTHER – SPECIFY:

DEPTH (FT) FROM	DEPTH (FT) TO	BORE HOLE DIA. (IN)	CASING MATERIAL	CONNECTION TYPE (CASING)	INSIDE DIA. CASING (IN)	CASING WALL THICKNESS (IN)	SLOT SIZE (IN)
+2	36	5	sch 40 pvc	casing	4		
36	85	5		screen	4		0.010

4. WATER BEARING STRATA

DEPTH (FT) FROM	DEPTH (FT) TO	THICKNESS (FT)	FORMATION DESCRIPTION OF PRINCIPAL WATER-BEARING STRATA (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	YIELD (GPM)

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA	TOTAL ESTIMATED WELL YIELD (GPM)

FOR OSE INTERNAL USE

WELL RECORD & LOG (Version 6/9/08)

FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		PAGE 1 OF 2

MW 18

5. SEAL AND PUMP

TYPE OF PUMP: ☐ SUBMERSIBLE ☐ JET ☑ NO PUMP – WELL NOT EQUIPPED ☐ TURBINE ☐ CYLINDER ☐ OTHER – SPECIFY:

ANNULAR SEAL AND GRAVEL PACK	DEPTH (FT) FROM	DEPTH (FT) TO	BORE HOLE DIA. (IN)	MATERIAL TYPE AND SIZE	AMOUNT (CUBIC FT)	METHOD OF PLACEMENT
	0	2	5	cement		poured
	2	17	5	bentonite		poured
	19	85	5	10/20 silica sand		poured

6. GEOLOGIC LOG OF WELL

DEPTH (FT) FROM	DEPTH (FT) TO	THICKNESS (FT)	COLOR AND TYPE OF MATERIAL ENCOUNTERED (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	WATER BEARING?
0	85	85	ML - Pale brown, very pale brown, vfg quartz, soft, moist	☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
			Gypsum- Light grayish brown, to dark gray thin	☐ YES ☐ NO
			bedded to massive, interbedded with thin beds of gray	☐ YES ☐ NO
			clay about 6" to 1' thick, light yellowish gray to light yellowish	☐ YES ☐ NO
			gray to light yellowish brown clay at 30'	☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☑ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO

ATTACH ADDITIONAL PAGES AS NEEDED TO FULLY DESCRIBE THE GEOLOGIC LOG OF THE WELL

7. TEST & ADDITIONAL INFO

WELL TEST — METHOD: ☐ BAILER ☐ PUMP ☐ AIR LIFT ☐ OTHER – SPECIFY:

TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

ADDITIONAL STATEMENTS OR EXPLANATIONS:

8. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 20 DAYS AFTER COMPLETION OF WELL DRILLING:

Joe Scarborough — SIGNATURE OF DRILLER

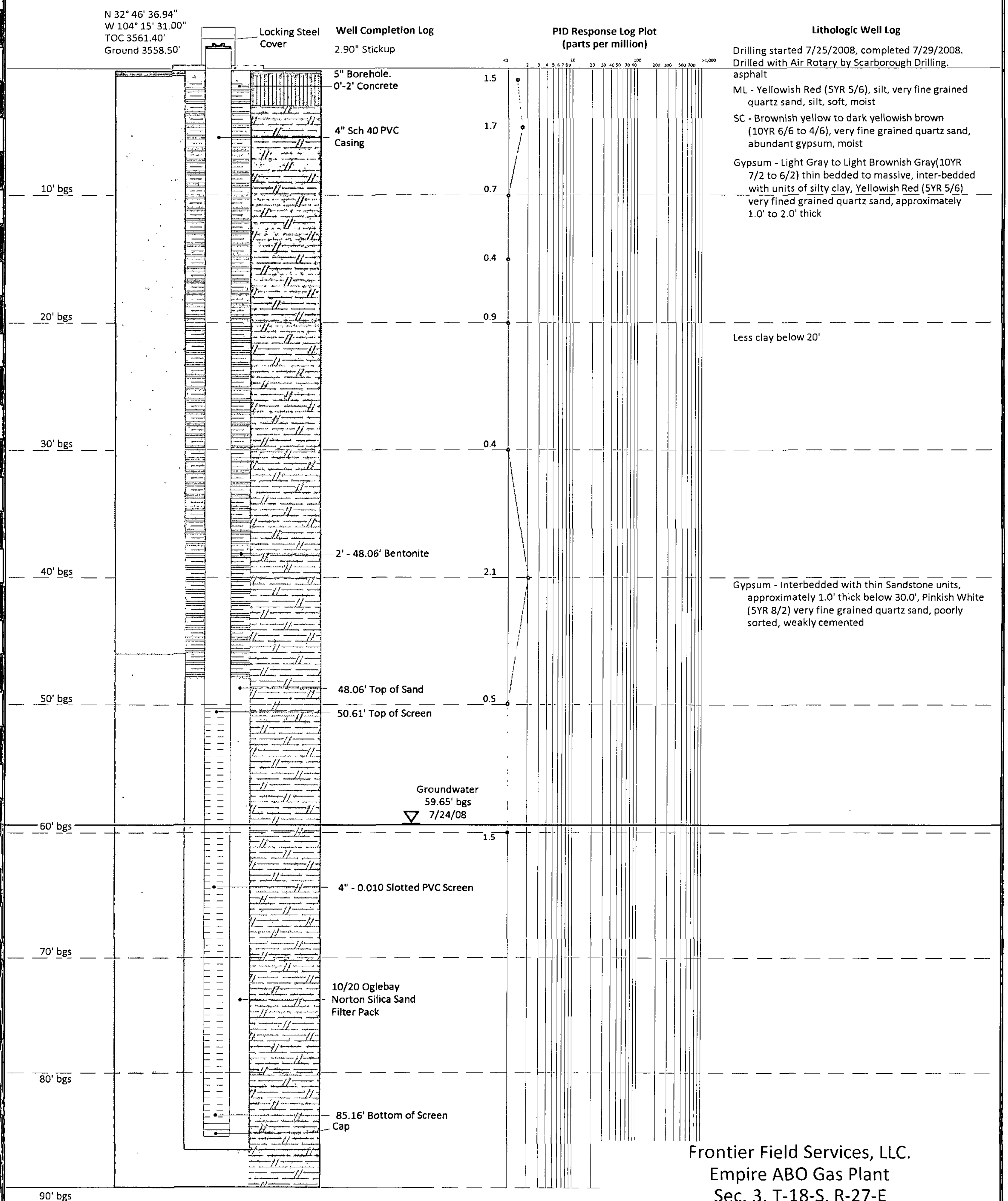
01/20/2009 — DATE

FOR OSE INTERNAL USE

WELL RECORD & LOG (Version 6/9/08)

FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		PAGE 2 OF 2

JWW



Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-13 Boring & Completion Log

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

POD NUMBER (WELL NUMBER): MW13	OSE FILE NUMBER(S):
WELL OWNER NAME(S): Frontier Field Services, LLC.	PHONE (OPTIONAL):
WELL OWNER MAILING ADDRESS: PO Box 7	CITY: Loco Hills; STATE: N.M.; ZIP: 88255

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	32	46	36.94 N	* ACCURACY REQUIRED: ONE TENTH OF A SECOND
	LONGITUDE	104	15	31.00 W	* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS: Empire ABO Gas Plant Artesia, New Mexico

2. OPTIONAL

(2.5 ACRE)	(10 ACRE)	(40 ACRE)	(160 ACRE)	SECTION	TOWNSHIP	RANGE
¼	¼	¼	¼	3	18 ☐ NORTH ☑ SOUTH	27 ☑ EAST ☐ WEST

SUBDIVISION NAME: Empire ABO Gas Plant	LOT NUMBER:	BLOCK NUMBER:	UNIT/TRACT:
HYDROGRAPHIC SURVEY:		MAP NUMBER:	TRACT NUMBER:

3. DRILLING INFORMATION

LICENSE NUMBER	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD1188	Lane Scarborough	John Scarborough Drilling, Inc.

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
07/24/2008	07/29/2008	85		59.65

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT):

DRILLING FLUID: ☑ AIR ☐ MUD ☐ ADDITIVES – SPECIFY:

DRILLING METHOD: ☑ ROTARY ☐ HAMMER ☐ CABLE TOOL ☐ OTHER – SPECIFY:

DEPTH (FT) FROM	TO	BORE HOLE DIA. (IN)	CASING MATERIAL	CONNECTION TYPE (CASING)	INSIDE DIA. CASING (IN)	CASING WALL THICKNESS (IN)	SLOT SIZE (IN)
+2	50	5	sch 40 pvc	casing	4		
50	85	5		screen	4		0.010

4. WATER BEARING STRATA

DEPTH (FT) FROM	TO	THICKNESS (FT)	FORMATION DESCRIPTION OF PRINCIPAL WATER-BEARING STRATA (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	YIELD (GPM)

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA	TOTAL ESTIMATED WELL YIELD (GPM)

FOR OSE INTERNAL USE

WELL RECORD & LOG (Version 6/9/08)

FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		PAGE 1 OF 2

MW13

5. SEAL AND PUMP

TYPE OF PUMP: ☐ SUBMERSIBLE ☐ JET ☑ NO PUMP – WELL NOT EQUIPPED ☐ TURBINE ☐ CYLINDER ☐ OTHER – SPECIFY:

ANNULAR SEAL AND GRAVEL PACK	DEPTH (FT) FROM	DEPTH (FT) TO	BORE HOLE DIA. (IN)	MATERIAL TYPE AND SIZE	AMOUNT (CUBIC FT)	METHOD OF PLACEMENT
	0	2	5	cement		poured
	2	10	5	bentonite		poured
	10	85	5	10/20 silica sand		poured

6. GEOLOGIC LOG OF WELL

DEPTH (FT) FROM	DEPTH (FT) TO	THICKNESS (FT)	COLOR AND TYPE OF MATERIAL ENCOUNTERED (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	WATER BEARING?
0	85	85	ML -Yellowish red silt, vfg quartz sand, soft, moist	☐ YES ☐ NO
			SC - Brownish yellow to dark yellowish brown, vfg quartz sand,	☐ YES ☐ NO
			abundant gypsum, moist	☐ YES ☐ NO
			Gypsum- Light brownish gray thin	☐ YES ☐ NO
			bedded to massive, interbedded with units of silty clay.	☐ YES ☐ NO
			Yellowish red, vfg quartz sand	☐ YES ☐ NO
			Less clay below 20'	☐ YES ☐ NO
				☐ YES ☐ NO
			Gypsum - interbedded with thin sandstone. Pinkish white	☐ YES ☐ NO
			vfg quartz sand poorly sorted	☑ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO

ATTACH ADDITIONAL PAGES AS NEEDED TO FULLY DESCRIBE THE GEOLOGIC LOG OF THE WELL

7. TEST & ADDITIONAL INFO

WELL TEST

METHOD: ☐ BAILER ☐ PUMP ☐ AIR LIFT ☐ OTHER – SPECIFY:

TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

ADDITIONAL STATEMENTS OR EXPLANATIONS:

8. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 20 DAYS AFTER COMPLETION OF WELL DRILLING:

Joe Scarla (signature) 01/20/2009

SIGNATURE OF DRILLER DATE

FOR OSE INTERNAL USE

WELL RECORD & LOG (Version 6/9/08)

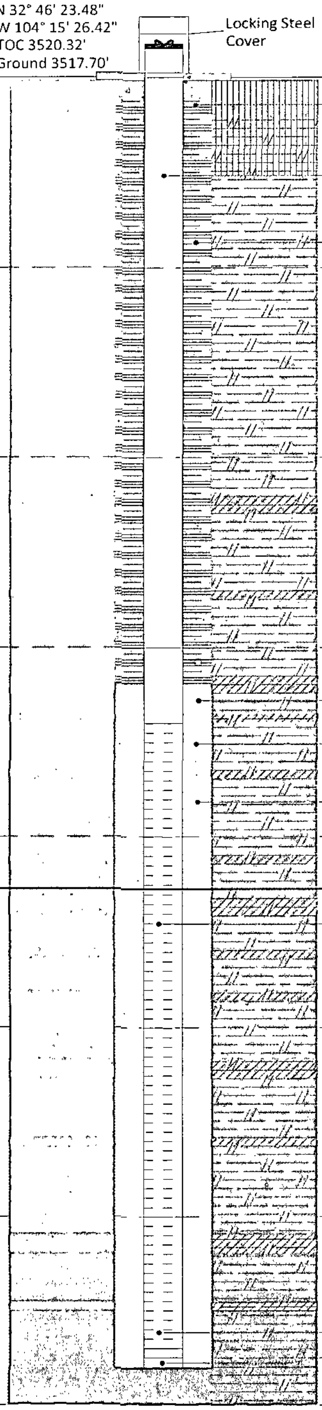
FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		PAGE 2 OF 2

T:\PROJECTS\FRONTIER\6-0141 Monitor Wells\BORING AND MW WELL LOG\WELL LOG MW#14.dwg, 7/29/2009 10:58:03 AM

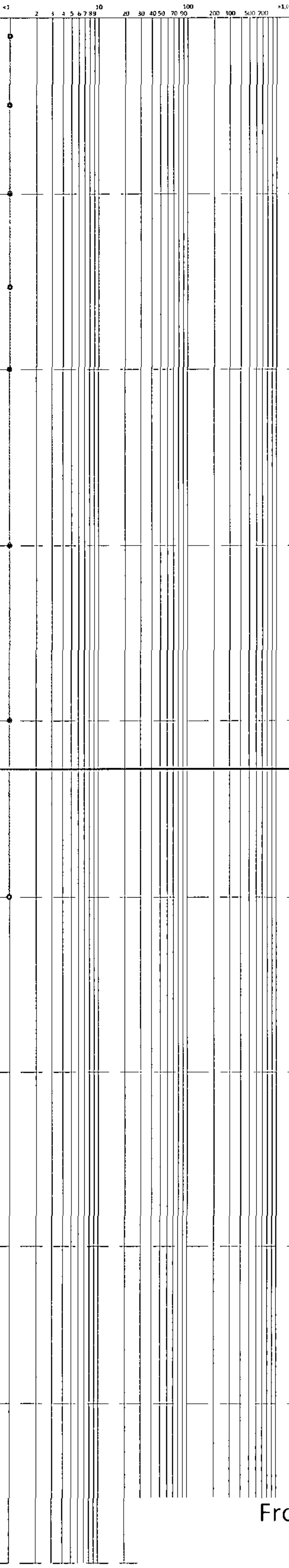
JWW

N 32° 46' 23.48"
W 104° 15' 26.42"
TOC 3520.32'
Ground 3517.70'

Well Completion Log



PID Response Log Plot (parts per million)



Lithologic Well Log

Drilling started 7/25/2008, completed 7/30/2008. Drilled with Air Rotary by Scarborough Drilling.

ML - White (10YR 8/2), silt, very fine grained quartz sand, soft

Gypsum - Light Gray to Dark Gray (10YR 7/2 to 5/1) *thin bedded to massive, inter-bedded with thin* silty clay units approximately 0.5' to 1.0' thick, Light Yellowish Brown (10YR 6/4) Yellowish Red (5YR 5/6), below 20', with Light Yellowish Brown (10YR 6/4) mottles

Mudstone Red (2.5YR 5/6) below 68'

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-14 Boring & Completion Log

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

POD NUMBER (WELL NUMBER)	OSE FILE NUMBER(S)		
MW14			
WELL OWNER NAME(S)	PHONE (OPTIONAL)		
Frontier Field Services, LLC.			
WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
PO Box 7	Loco Hills	N.M.	88255

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	32	46	23.48 N	* ACCURACY REQUIRED: ONE TENTH OF A SECOND
	LONGITUDE	104	15	26.42 W	* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS
Empire ABO Gas Plant Artesia, New Mexico

2. OPTIONAL

(2.5 ACRE)	(10 ACRE)	(40 ACRE)	(160 ACRE)	SECTION	TOWNSHIP	RANGE
¼	¼	¼	¼	3	18 ☐ NORTH ☑ SOUTH	27 ☑ EAST ☐ WEST

SUBDIVISION NAME	LOT NUMBER	BLOCK NUMBER	UNIT/TRACT
Empire ABO Gas Plant			
HYDROGRAPHIC SURVEY		MAP NUMBER	TRACT NUMBER

3. DRILLING INFORMATION

LICENSE NUMBER	NAME OF LICENSED DRILLER			NAME OF WELL DRILLING COMPANY
WD1188	Lane Scarborough			John Scarborough Drilling, Inc.
DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
07/25/2008	07/30/2008	69.5		59.65

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT):

DRILLING FLUID: ☑ AIR ☐ MUD ☐ ADDITIVES – SPECIFY:

DRILLING METHOD: ☑ ROTARY ☐ HAMMER ☐ CABLE TOOL ☐ OTHER – SPECIFY:

DEPTH (FT)		BORE HOLE DIA. (IN)	CASING MATERIAL	CONNECTION TYPE (CASING)	INSIDE DIA. CASING (IN)	CASING WALL THICKNESS (IN)	SLOT SIZE (IN)
FROM	TO						
+2	33.5	5	sch 40 pvc	casing	4		
33.5	69.5	5		screen	4		0.010

4. WATER BEARING STRATA

DEPTH (FT)		THICKNESS (FT)	FORMATION DESCRIPTION OF PRINCIPAL WATER-BEARING STRATA (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	YIELD (GPM)
FROM	TO			

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA	TOTAL ESTIMATED WELL YIELD (GPM)

FOR OSE INTERNAL USE

FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		PAGE 1 OF 2

"MW14"

5. SEAL AND PUMP

TYPE OF PUMP: ☐ SUBMERSIBLE ☐ TURBINE ☐ JET ☐ CYLINDER ☑ NO PUMP – WELL NOT EQUIPPED ☐ OTHER – SPECIFY:

ANNULAR SEAL AND GRAVEL PACK	DEPTH (FT) FROM	DEPTH (FT) TO	BORE HOLE DIA. (IN)	MATERIAL TYPE AND SIZE	AMOUNT (CUBIC FT)	METHOD OF PLACEMENT
	0	2	5	cement		poured
	2	30	5	bentonite		poured
	30	69.5	5	10/20 silica sand		poured

6. GEOLOGIC LOG OF WELL

DEPTH (FT) FROM	DEPTH (FT) TO	THICKNESS (FT)	COLOR AND TYPE OF MATERIAL ENCOUNTERED (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	WATER BEARING?
0	69.5	69.5	ML -White silt, vfg quartz sand, soft	☐ YES ☐ NO
			Gypsum - Lt. gray to dark gray, thin bedded to massive, inter-	☐ YES ☐ NO
			bedded with thin sitly clay units. yellowish brown, yellowish	☐ YES ☐ NO
			red below 20' with light yellowish brown mottles	☐ YES ☐ NO
				☐ YES ☐ NO
			Clay becomes red below 68'	☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☑ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO

ATTACH ADDITIONAL PAGES AS NEEDED TO FULLY DESCRIBE THE GEOLOGIC LOG OF THE WELL

7. TEST & ADDITIONAL INFO

WELL TEST

METHOD: ☐ BAILER ☐ PUMP ☐ AIR LIFT ☐ OTHER – SPECIFY:

TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

ADDITIONAL STATEMENTS OR EXPLANATIONS:

8. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 20 DAYS AFTER COMPLETION OF WELL DRILLING:

Lee Scarborough — SIGNATURE OF DRILLER

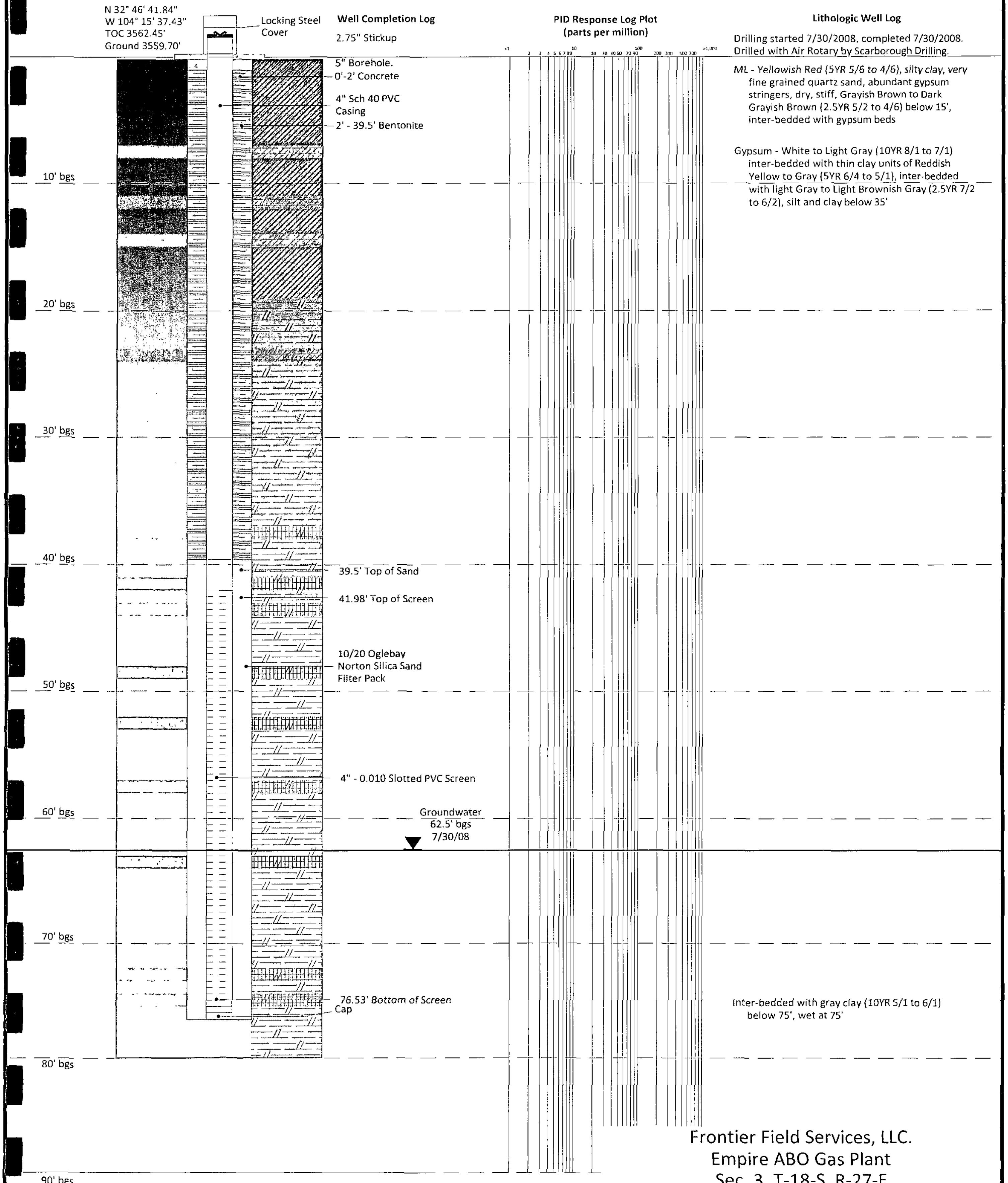
01/20/2009 — DATE

FOR OSE INTERNAL USE

WELL RECORD & LOG (Version 6/9/08)

FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		PAGE 2 OF 2

JWW



Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-15 Boring & Completion Log

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

POD NUMBER (WELL NUMBER): MW15	OSE FILE NUMBER(S):
WELL OWNER NAME(S): Frontier Field Services, LLC.	PHONE (OPTIONAL):
WELL OWNER MAILING ADDRESS: PO Box 7	CITY: Loco Hills STATE: N.M. ZIP: 88255

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	32	46	41.84	N
	LONGITUDE	104	15	37.43	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND
* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS: Empire ABO Gas Plant Artesia, New Mexico

2. OPTIONAL

(2.5 ACRE)	(10 ACRE)	(40 ACRE)	(160 ACRE)	SECTION	TOWNSHIP	RANGE
¼	¼	¼	¼	3	18 ☐ NORTH ☑ SOUTH	27 ☑ EAST ☐ WEST

SUBDIVISION NAME: Empire ABO Gas Plant	LOT NUMBER:	BLOCK NUMBER:	UNIT/TRACT:
HYDROGRAPHIC SURVEY:		MAP NUMBER:	TRACT NUMBER:

3. DRILLING INFORMATION

LICENSE NUMBER: WD1188	NAME OF LICENSED DRILLER: Lane Scarborough	NAME OF WELL DRILLING COMPANY: John Scarborough Drilling, Inc.

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
07/30/2008	07/30/2008	80		35.00

COMPLETED WELL IS: ☐ ARTESIAN ☐ DRY HOLE ☑ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT):

DRILLING FLUID: ☑ AIR ☐ MUD ☐ ADDITIVES – SPECIFY:

DRILLING METHOD: ☑ ROTARY ☐ HAMMER ☐ CABLE TOOL ☐ OTHER – SPECIFY:

DEPTH (FT) FROM	DEPTH (FT) TO	BORE HOLE DIA. (IN)	CASING MATERIAL	CONNECTION TYPE (CASING)	INSIDE DIA. CASING (IN)	CASING WALL THICKNESS (IN)	SLOT SIZE (IN)
+2	42	5	sch 40 pvc	casing	4		
42	80	5		screen	4		0.010

4. WATER BEARING STRATA

DEPTH (FT) FROM	DEPTH (FT) TO	THICKNESS (FT)	FORMATION DESCRIPTION OF PRINCIPAL WATER-BEARING STRATA (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	YIELD (GPM)

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:	TOTAL ESTIMATED WELL YIELD (GPM):

FOR OSE INTERNAL USE

WELL RECORD & LOG (Version 6/9/08)

FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		PAGE 1 OF 2

MW15

5. SEAL AND PUMP

TYPE OF PUMP: ☐ SUBMERSIBLE ☐ JET ☑ NO PUMP – WELL NOT EQUIPPED ☐ TURBINE ☐ CYLINDER ☐ OTHER – SPECIFY:

ANNULAR SEAL AND GRAVEL PACK	DEPTH (FT) FROM	DEPTH (FT) TO	BORE HOLE DIA. (IN)	MATERIAL TYPE AND SIZE	AMOUNT (CUBIC FT)	METHOD OF PLACEMENT
	0	2	5	cement		poured
	2	42	5	bentonite		poured
	42	80	5	10/20 silica sand		poured

6. GEOLOGIC LOG OF WELL

DEPTH (FT) FROM	DEPTH (FT) TO	THICKNESS (FT)	COLOR AND TYPE OF MATERIAL ENCOUNTERED (INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES)	WATER BEARING?
0	69.5	69.5	ML -Yellowish red, silty clay, vfg quartz sand, abundant	☐ YES ☐ NO
			Gypsum strings, dry, stiff, grayish brown to dark	☐ YES ☐ NO
			grayish brown inter-bedded with gypsum beds	☐ YES ☐ NO
				☐ YES ☐ NO
			Gypsum - White to Light gray inter-bedded with thin clay	☐ YES ☐ NO
			units of reddish yellow to gray, inter-bedded with light gray	☐ YES ☐ NO
			to light brownish gray silt, and clay below 35'	☐ YES ☐ NO
				☐ YES ☐ NO
			Inter-bedded with gray clay below 75'	☐ YES ☐ NO
				☑ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO
				☐ YES ☐ NO

ATTACH ADDITIONAL PAGES AS NEEDED TO FULLY DESCRIBE THE GEOLOGIC LOG OF THE WELL

7. TEST & ADDITIONAL INFO

WELL TEST — METHOD: ☐ BAILER ☐ PUMP ☐ AIR LIFT ☐ OTHER – SPECIFY:

TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

ADDITIONAL STATEMENTS OR EXPLANATIONS:

8. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 20 DAYS AFTER COMPLETION OF WELL DRILLING:

[signature] SIGNATURE OF DRILLER

01/20/2009 DATE

FOR OSE INTERNAL USE

WELL RECORD & LOG (Version 6/9/08)

FILE NUMBER	POD NUMBER	TRN NUMBER
LOCATION		PAGE 2 OF 2

JWW

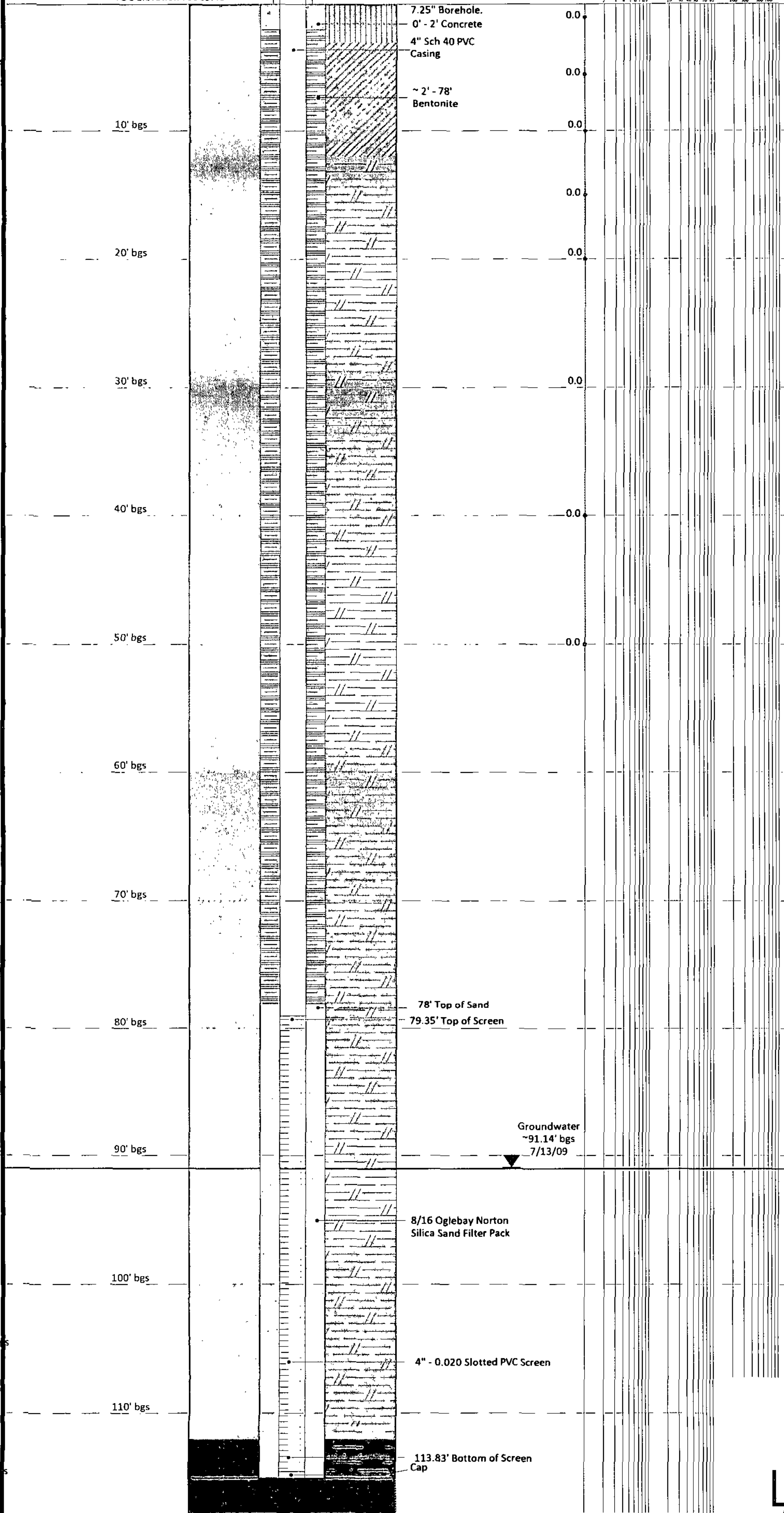
Latitude N 32° 46' 50.74"
Longitude W 104° 15' 36.00"
Elevation : 3582.60'
TOC Elevation : 3585.46'

Well Completion Log
2.86' Stickup

PID Response Log Plot
(parts per million)

Lithologic Well Log

Drilling started 6/23/2009, completed 6/24/2009.
Drilled with Air Rotary by Scarborough



ML - Light Yellowish Brown (10YR 6/4) silt, very fine grained quartz sand

CL - Very Pale Brown to Reddish Brown (10YR 7/3 to 2.5YR 5/4) silty sandy clay, very fine grained quartz sand, moderately firm, dry

Gypsum - Gray to White (10YR 6/1 to 8/1) thin to massive interbedded with units of fine grained quartz sand, and Reddish Brown (5YR 5/4) silty clay; massive to thin bedded gypsum below 30' Gray to White (10YR 6/1 to 8/1)

Interbedded with units of silt and silty clay below 45', very Pale Brown (10YR 8/3) to Gray (10YR 5/1 to 6/1) below 60'

Thin to massive gypsum below 70'

Gypsum Gray to White (10YR 6/1 to 8/1)

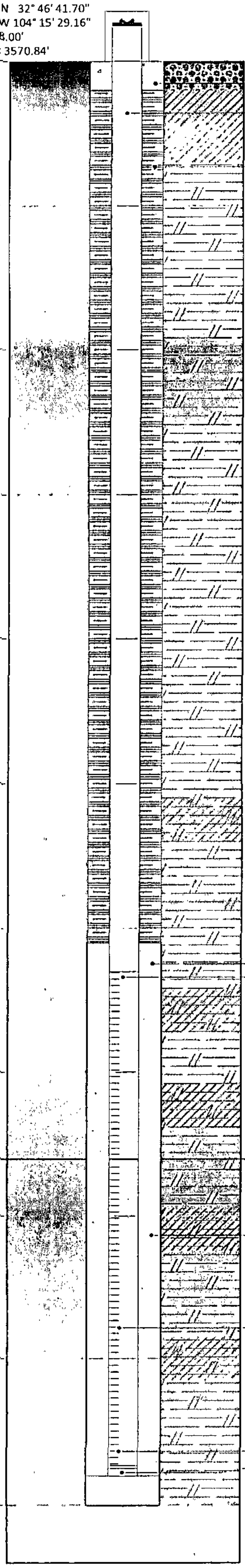
Interbedded with thin sand units below 95' Pale to Light Yellowish Brown (10YR 6/3 to 6/4) very fine grained quartz sand, wet, clayey from 105' to 110'
Mudstone- Red (2.5YR 4/6) silty very fine grained quartz sand at 112'
Total depth at 115'

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-16 Boring and Completion Log

Latitude N 32° 46' 41.70"
Longitude W 104° 15' 29.16"
Elevation : 3568.00'
TOC Elevation : 3570.84'



Well Completion Log

2.84' Stickup
7.25" Borehole.
0' - 2' Concrete
4" Sch 40 PVC Casing
~2' - 62' Bentonite
61.70' Top of Sand
63.54' Top of Screen
Groundwater ~75.77' bgs 7/13/09
8/16 Oglebay Norton Silica Sand Filter Pack
4" - 0.020 Slotted PVC Screen
98.02 Bottom of Screen
Cap

PID Response Log Plot
(parts per million)

Lithologic Well Log

Drilling started 6/23/2009, completed 6/23/2009.
Drilled with Air Rotary by Scarborough

SP - Brown (10YR 4/4 to 5/4) silty clayey sand very fine grained quartz sand, slightly moist
CL - Reddish Brown (5YR 5/4) silty clay, very fine grained quartz sand, interbedded with gypsum

Gypsum - Gray to White (10YR 6/1 to 8/1) thin to massive interbedded with thin units of Olive Yellow to Light Olive Brown (2.5YR 5/6 to 6/6) silty clay, massive to thin bedded gypsum from 20' to 40', interbedded with fine grained quartz sand and silty clay from 40' to 60' Pale Yellow to Reddish Brown (2.5YR 7/4 to 5YR 5/4)

Massive to thin bedded gypsum from 60'-80'

Interbedded with silty sand and silty clay below 85' Pale Brown (10YR 6/3) very fine grained quartz sand

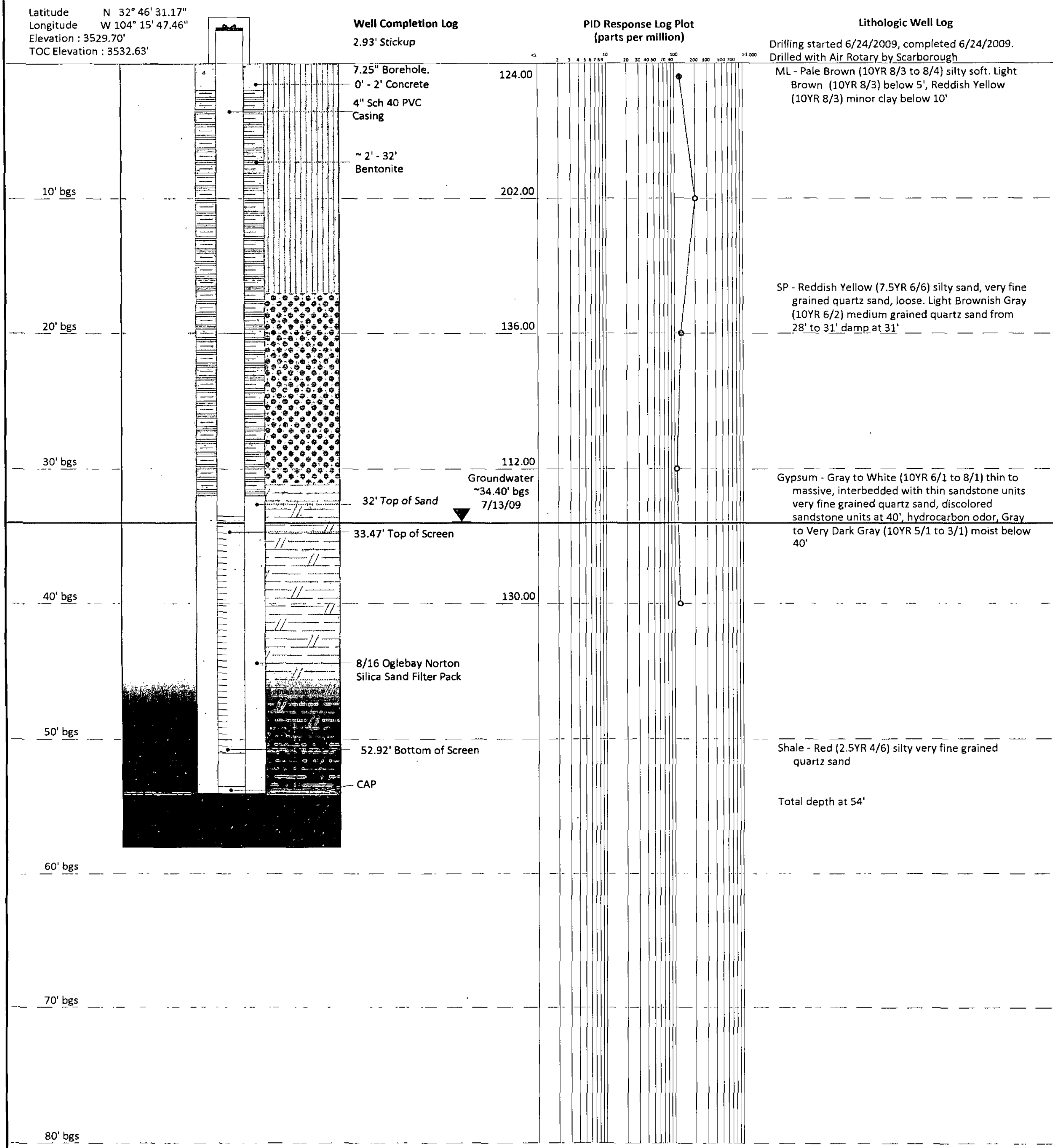
Total depth at 98.02'

10' bgs
20' bgs
30' bgs
40' bgs
50' bgs
60' bgs
70' bgs
80' bgs
90' bgs
100' bgs
110' bgs

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-17 Boring and Completion Log



Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

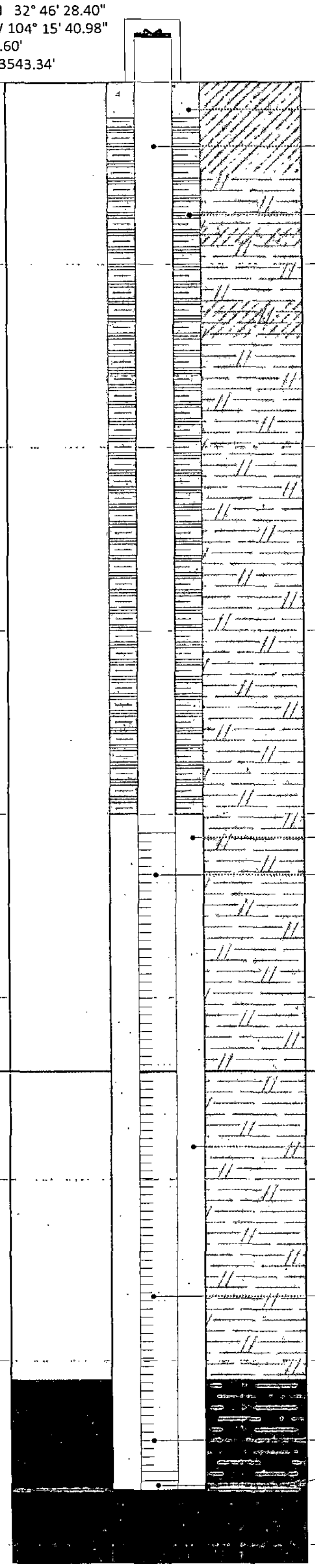
Larson & Associates, Inc.
Environmental Consultants

MW-18 Boring and Completion Log

Latitude N 32° 46' 28.40"
Longitude W 104° 15' 40.98"
Elevation : 3540.60'
TOC Elevation : 3543.34'

Well Completion Log

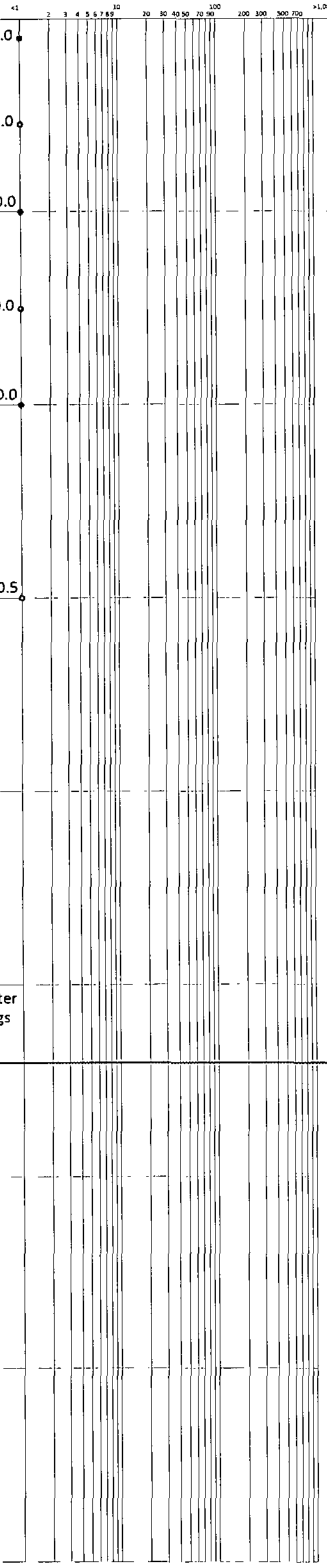
2.74' Stickup



- 7.25" Borehole.
- 0' - 2' Concrete
- 4" Sch 40 PVC CASING
- ~ 2' - 40' Bentonite
- 40' Top of Sand
- 41.55' Top of Screen
- 8/16 Oglebay Norton Silica Sand Filter Pack
- 4" - 0.020 Slotted PVC Screen
- 76.03' Bottom of Screen
- Cap

Groundwater ~54.64' bgs 6/17/09

PID Response Log Plot (parts per million)



	0.0
	0.0
10' bgs	0.0
	0.0
20' bgs	0.0
30' bgs	0.5
40' bgs	
50' bgs	
60' bgs	
70' bgs	
80' bgs	

Lithologic Well Log

Drilling started 6/16/2009, completed 6/17/2009.
Drilled with Air Rotary by Scarborough

CL - Pink to Light Brown (7.5YR 7/3 to 6/3) silty sandy clay mixed with rock and gravel to approximately to 1'. Dry Light Yellow (2.5YR 6/3) below 2'

Gypsum - Gray to Pale Brown (10YR 6/1 to 6/2) thin to massive, friable to hard interbedded with Reddish Brown to Light Yellowish Brown silty clay below 15'

Interbedded with sand, fine to very fine grained quartz sand, wet

Shale - Red (2.5YR 4/6) silty very fine grained quartz sand

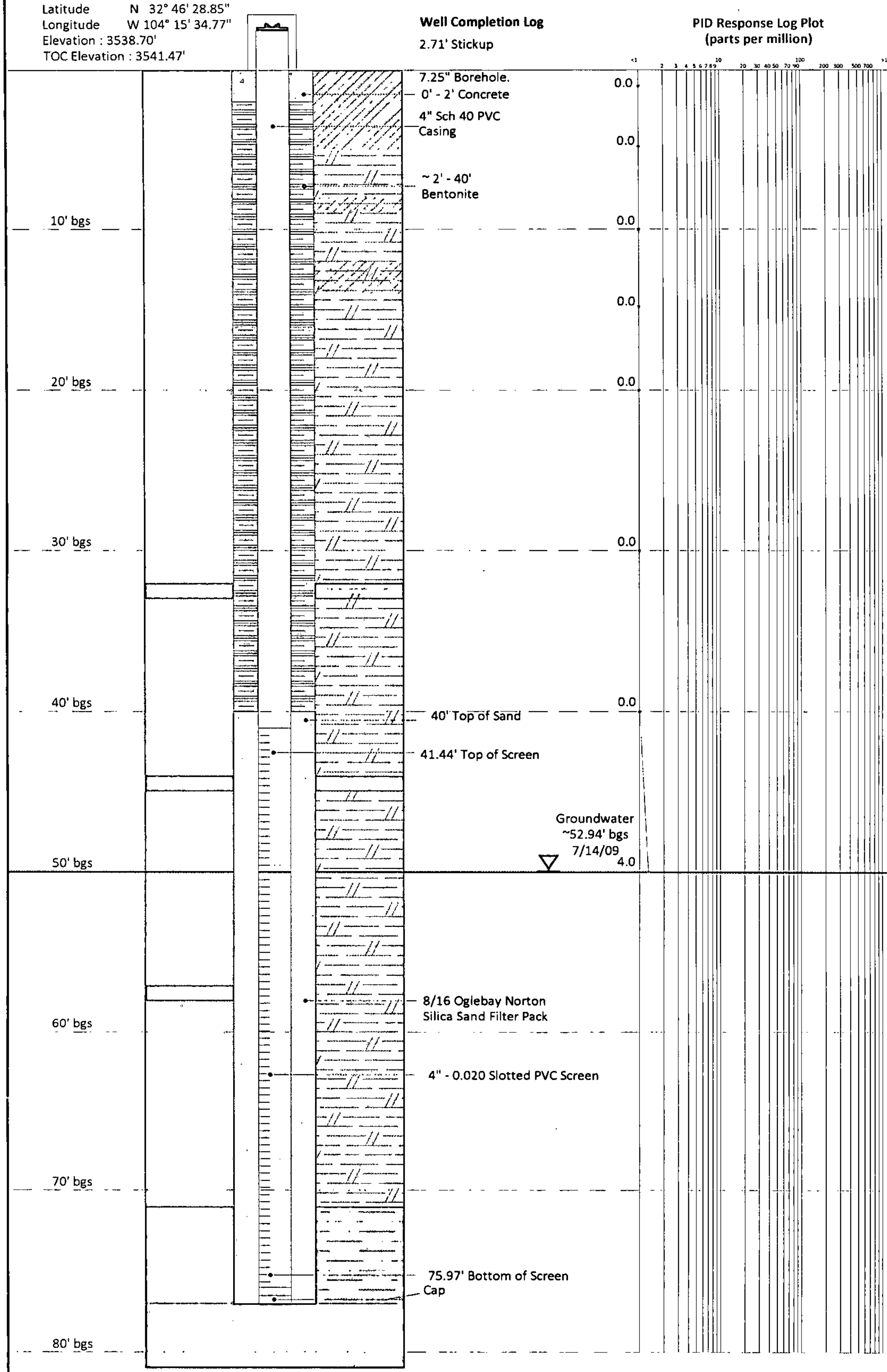
Total depth at 76.59'

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-19 Boring and Completion Log

Latitude N 32° 46' 28.85"
Longitude W 104° 15' 34.77"
Elevation : 3538.70'
TOC Elevation : 3541.47'



Lithologic Well Log

Drilling started 6/17/2009, completed 6/18/2009.
Drilled with Air Rotary by Scarborough

CL - Light Brown (7.5YR 6/4) very fine grained quartz sand, dry, mixed with caliche and gravel from 0' to 2'

Gypsum - Gray to Very Pale Brown (10YR 7/2 to 7/3) thin to massive beds friable to hard, interbedded with Reddish Brown (5YR 4/3 to 4/4) clay and silty clay, very firm clay diminishes below 15'

Damp at 30'

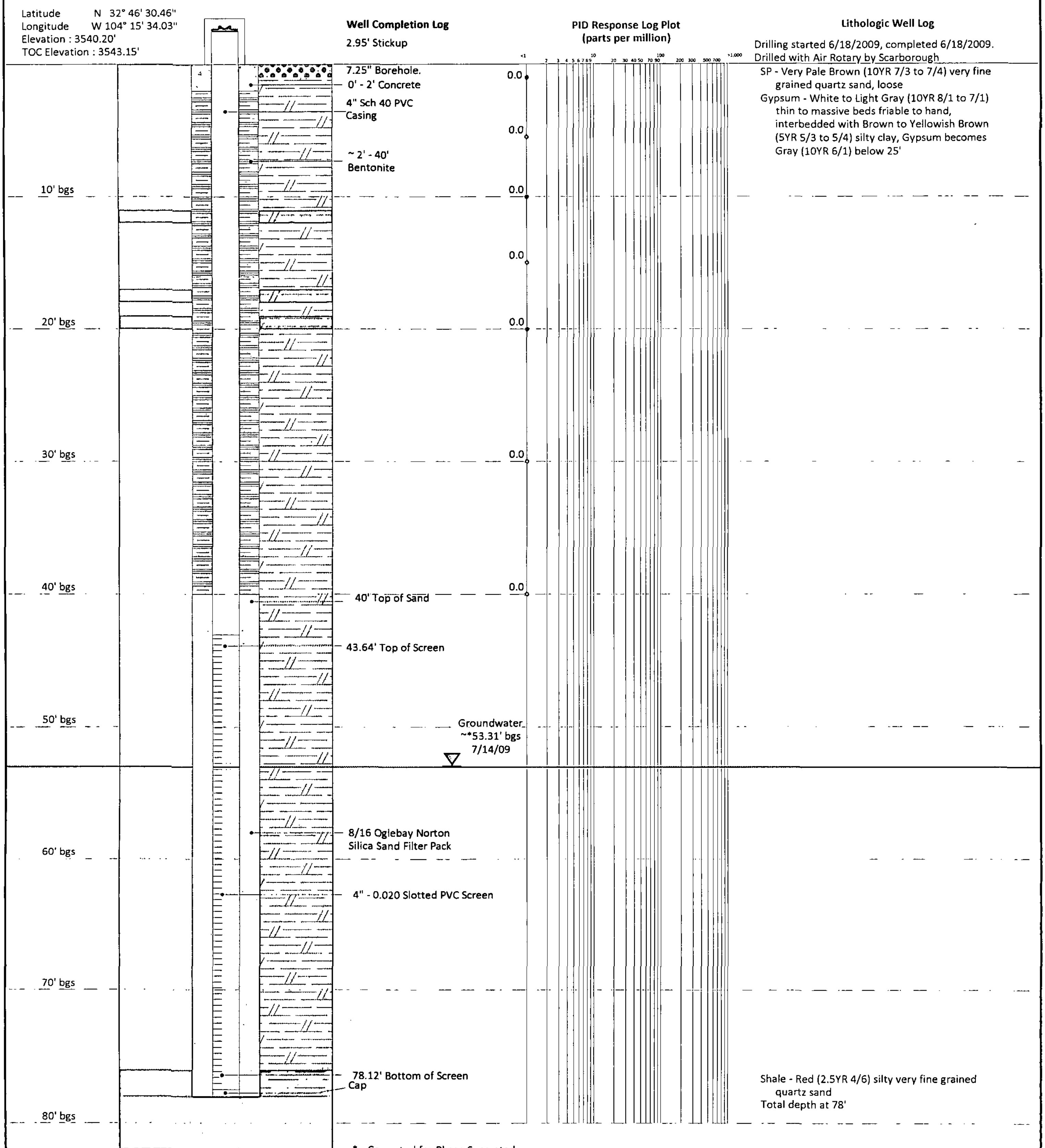
Shale - Red (2.5YR 4/6) silty very fine grained quartz sand

Total depth at 77'

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-20 Boring and Completion Log



* - Corrected for Phase-Seperated Hydrocarbons in Groundwater

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-21 Boring and Completion Log

Latitude N 32° 46' 32.04"
Longitude W 104° 15' 32.29"
Elevation : 3542.9'
TOC Elevation : 3545.87'

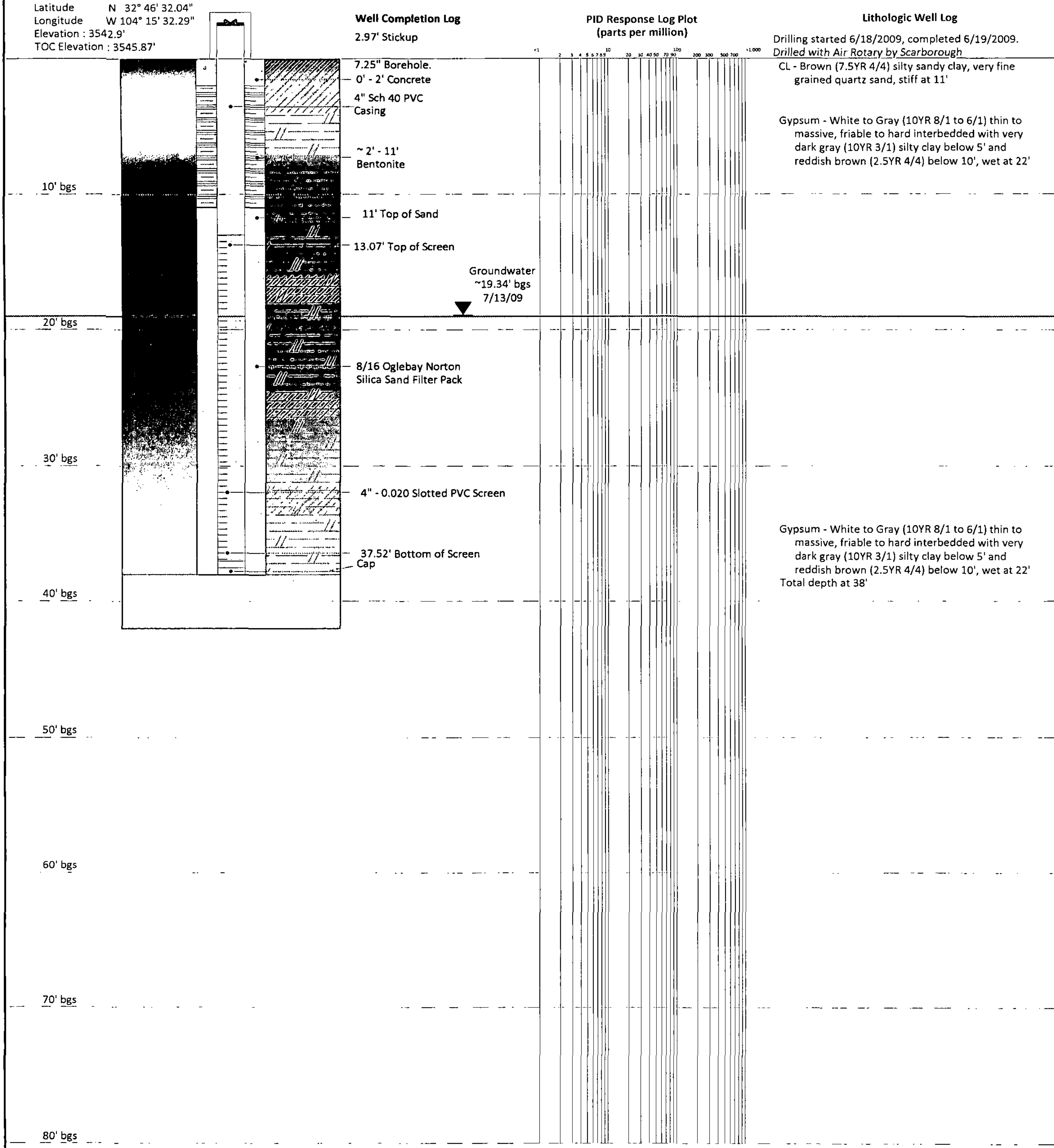
Well Completion Log

2.97' Stickup

PID Response Log Plot (parts per million)

Lithologic Well Log

Drilling started 6/18/2009, completed 6/19/2009.
Drilled with Air Rotary by Scarborough



CL - Brown (7.5YR 4/4) silty sandy clay, very fine grained quartz sand, stiff at 11'

Gypsum - White to Gray (10YR 8/1 to 6/1) thin to massive, friable to hard interbedded with very dark gray (10YR 3/1) silty clay below 5' and reddish brown (2.5YR 4/4) below 10', wet at 22'

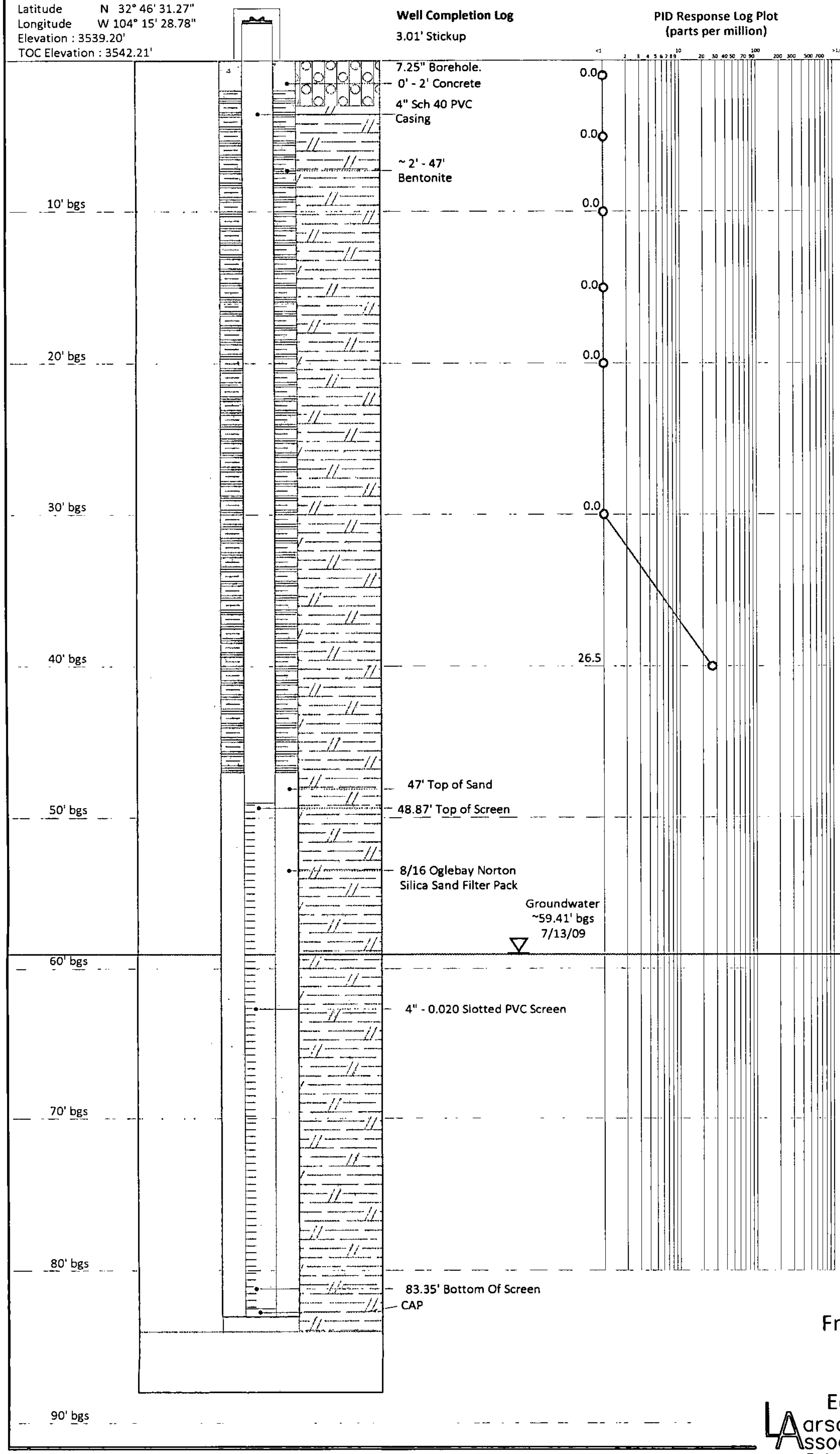
Gypsum - White to Gray (10YR 8/1 to 6/1) thin to massive, friable to hard interbedded with very dark gray (10YR 3/1) silty clay below 5' and reddish brown (2.5YR 4/4) below 10', wet at 22'
Total depth at 38'

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-22 Boring and Completion Log

Latitude N 32° 46' 31.27"
Longitude W 104° 15' 28.78"
Elevation : 3539.20'
TOC Elevation : 3542.21'



Lithologic Well Log

Drilling started 6/19/2009, completed 6/19/2009.
Drilled with Air Rotary by Scarborough

SM - Pink (7.5YR 7/3) very fine grained quartz sand, abundant rock shards from 0' to 2'

Gypsum - White to Gray (10YR 8/1 to 6/1) thin to massive friable, interbedded with Reddish Brown (2.5YR 4/4) silty clay, becomes Light Brown (7.5YR 6/4) below 20', lessens below 25'

Very hard between 42' and 44', interbedded with thin units of Brown (10YR 5/3) silty clay and sandstone below 45'

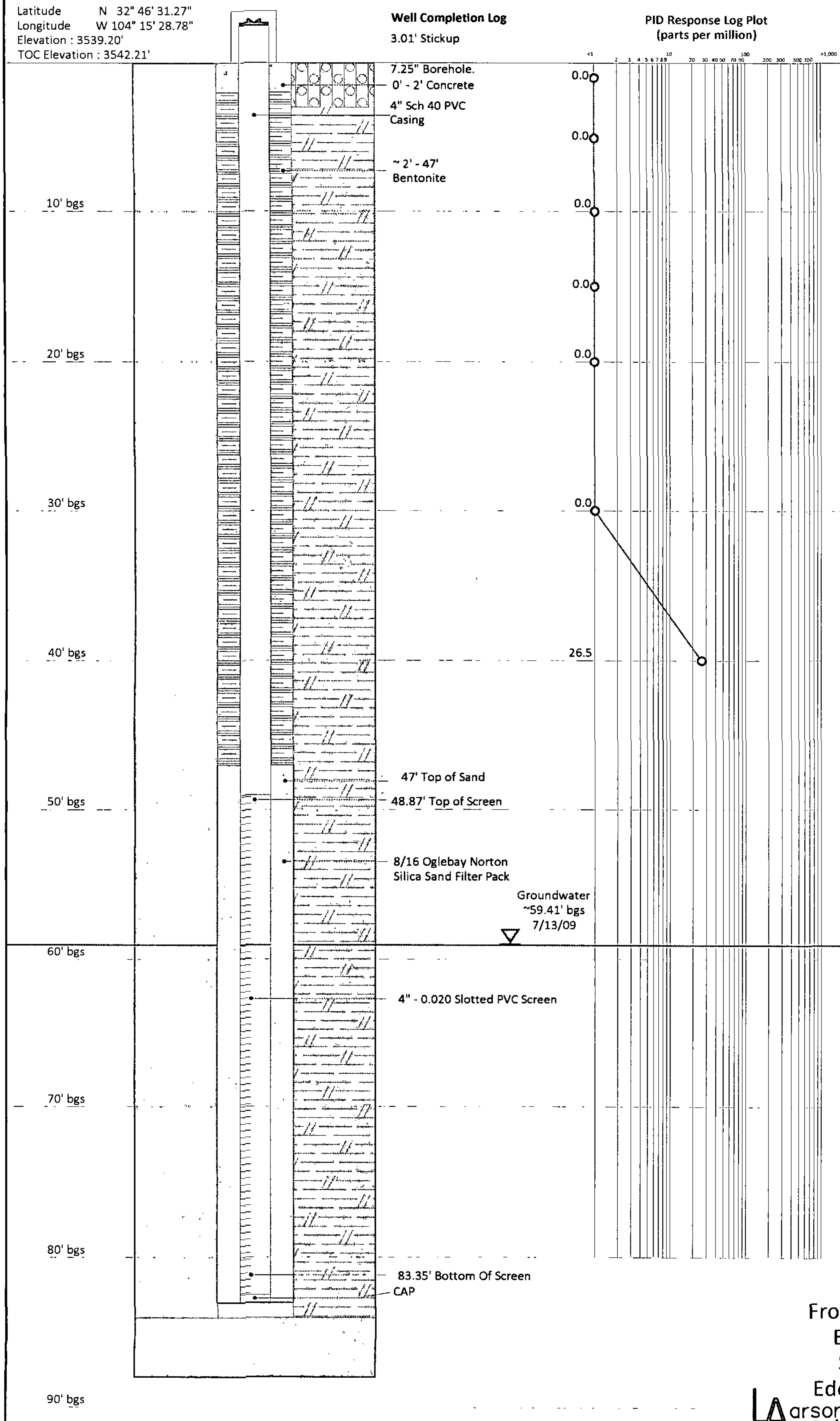
Total depth at 84'

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-23 Boring and Completion Log

Latitude N 32° 46' 31.27"
Longitude W 104° 15' 28.78"
Elevation : 3539.20'
TOC Elevation : 3542.21'



Lithologic Well Log

Drilling started 6/19/2009, completed 6/19/2009.
Drilled with Air Rotary by Scarborough

SM - Pink (7.5YR 7/3) very fine grained quartz sand, abundant rock shards from 0' to 2'

Gypsum - White to Gray (10YR 8/1 to 6/1) thin to massive friable, interbedded with Reddish Brown (2.5YR 4/4) silty clay, becomes Light Brown (7.5YR 6/4) below 20', lessens below 25'

Very hard between 42' and 44', interbedded with thin units of Brown (10YR 5/3) silty clay and sandstone below 45'

Total depth at 84'

Frontier Field Services, LLC.
Empire ABO Gas Plant
Sec. 3, T-18-S, R-27-E
Eddy County, New Mexico

Larson & Associates, Inc.
Environmental Consultants

MW-23 Boring and Completion Log

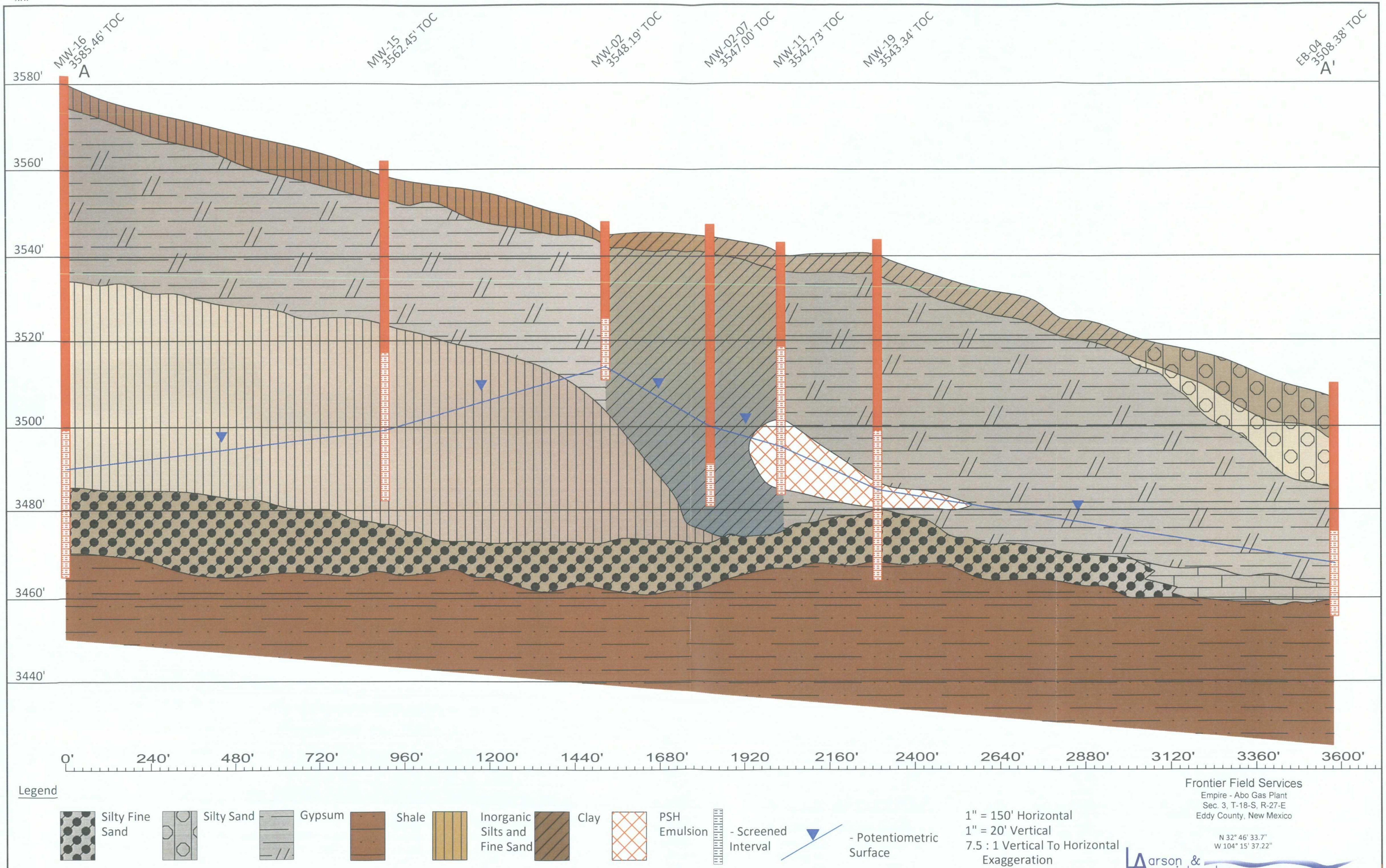


Figure - Northwest to Southeast Cross Section A to A'

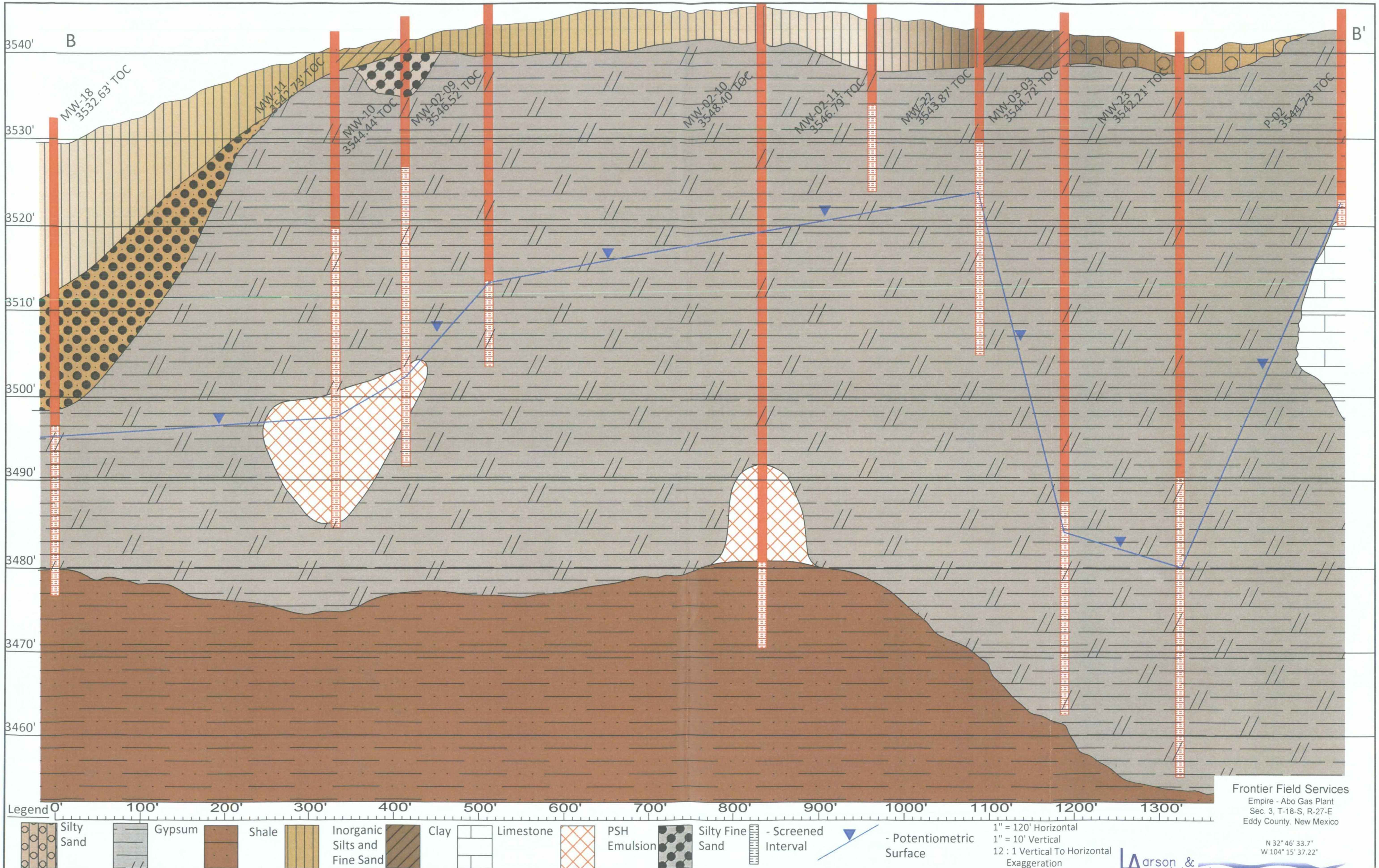


Figure - Northwest to Southeast Cross Section B to B'

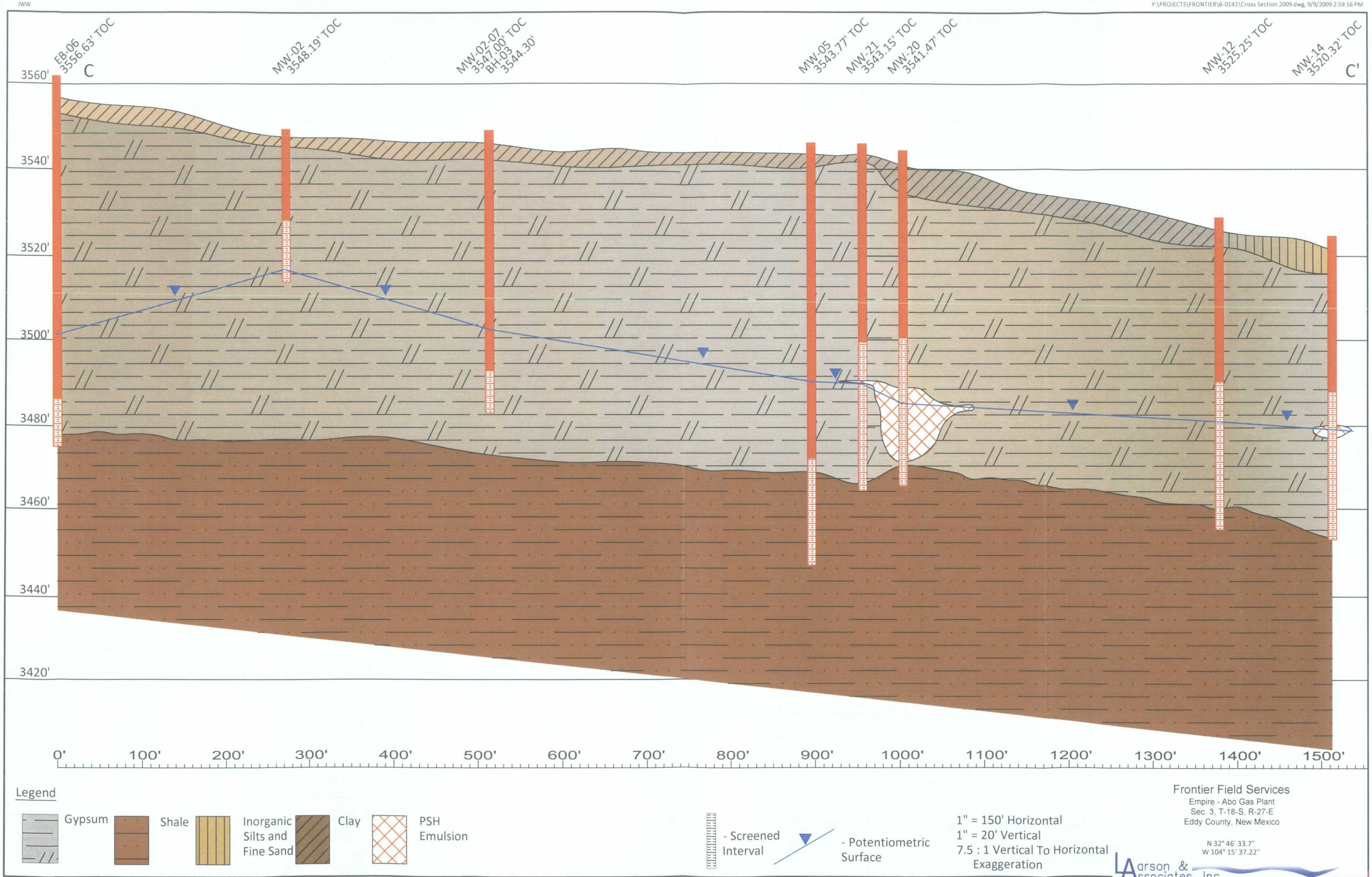
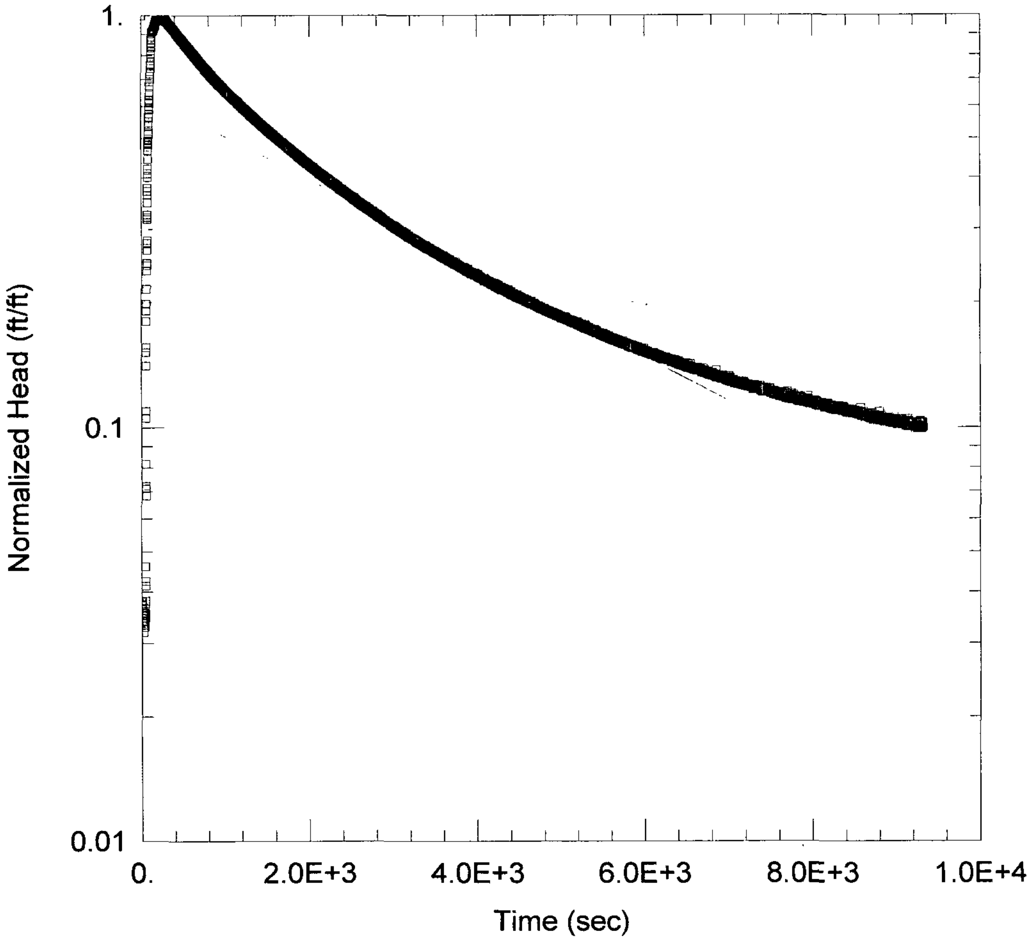


Figure - Northwest to Southeast Cross Section C to C'

Well ID	Falling Head Hydraulic Conductivity (ft/day)				Rising Head Hydraulic Conductivity (ft/day)			
	Test 1	Test 2	Test 3	Average	Test 1	Test 2	Test 3	Average
MW-15	0.06085	0.0593		0.0601				
MW-17	0.1593	0.155		0.1572				
EB-08	0.3992	0.3686	0.06535	0.2777	0.5876	0.2016	0.07751	0.2889
P-01	14.92	0.78	1.71	5.8033	19.24	0.575	0.2358	6.6836
P-05	0.3106	0.4365	0.4051	0.3841	0.3482	0.1414	0.1135	0.2010

Notes	Falling Head Average	1.3365	Rising Head Average	2.3912
Yellow Indicates Outlier Data	Cumulative Average			1.8796
	Biased Data Average (No P-01 Test 1 Data Used)			0.3574



MW-15 TEST 1 FALLING HEAD

Data Set: Z:\...\MW-15 Test 1 Falling Head.aqt
Date: 08/11/09 Time: 16:50:04

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: MW-15 Test 1 Falling Head
Test Date: 7/31/09

AQUIFER DATA

Saturated Thickness: 18.8 ft Anisotropy Ratio (Kz/Kr): 1.

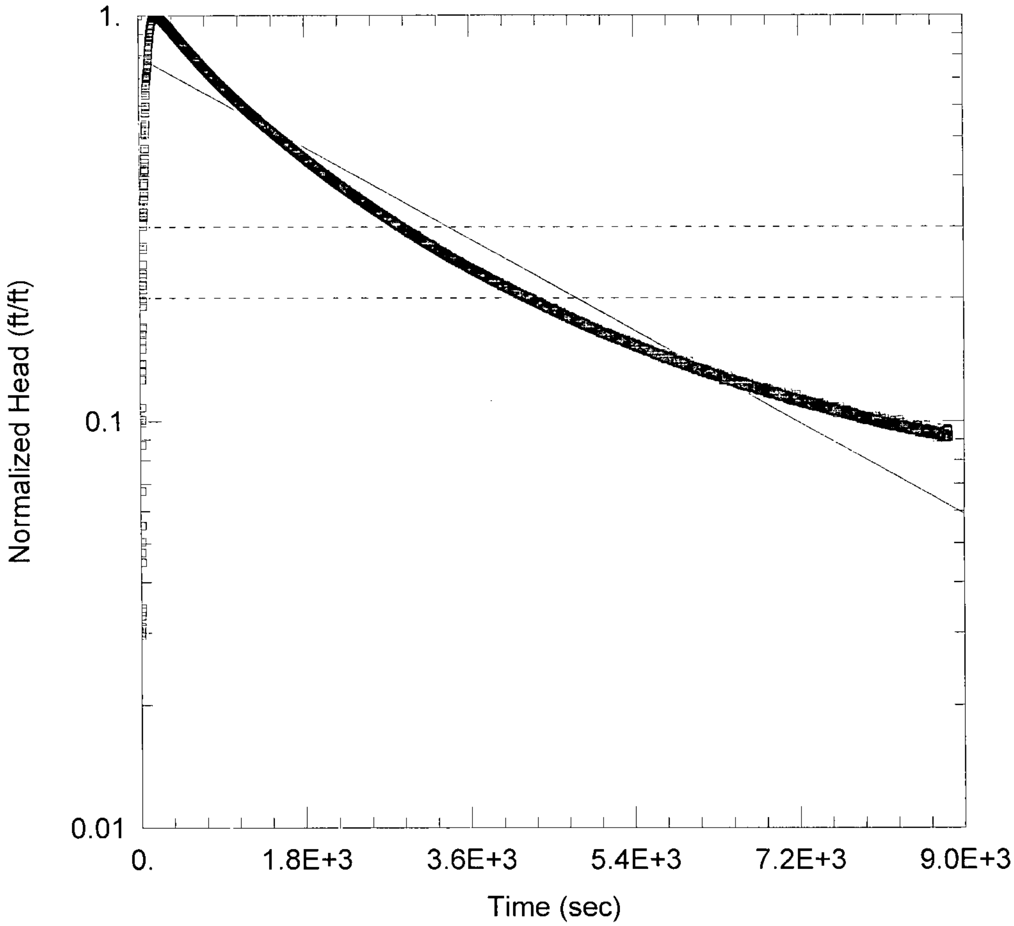
WELL DATA (MW-15 Test 1 Falling Head)

Initial Displacement: 6.15 ft
Total Well Penetration Depth: 77. ft
Casing Radius: 0.166 ft
Static Water Column Height: 15.22 ft
Screen Length: 35. ft
Well Radius: 0.35 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.06085 ft/day y0 = 3.984 ft



MW-15 TEST 2 FALLING HEAD

Data Set:
Date: 08/17/09 Time: 13:58:52

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: MW-15 Test 2 Falling Head
Test Date: 8/03/09

AQUIFER DATA

Saturated Thickness: 20. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-15 Test 2 Falling Head)

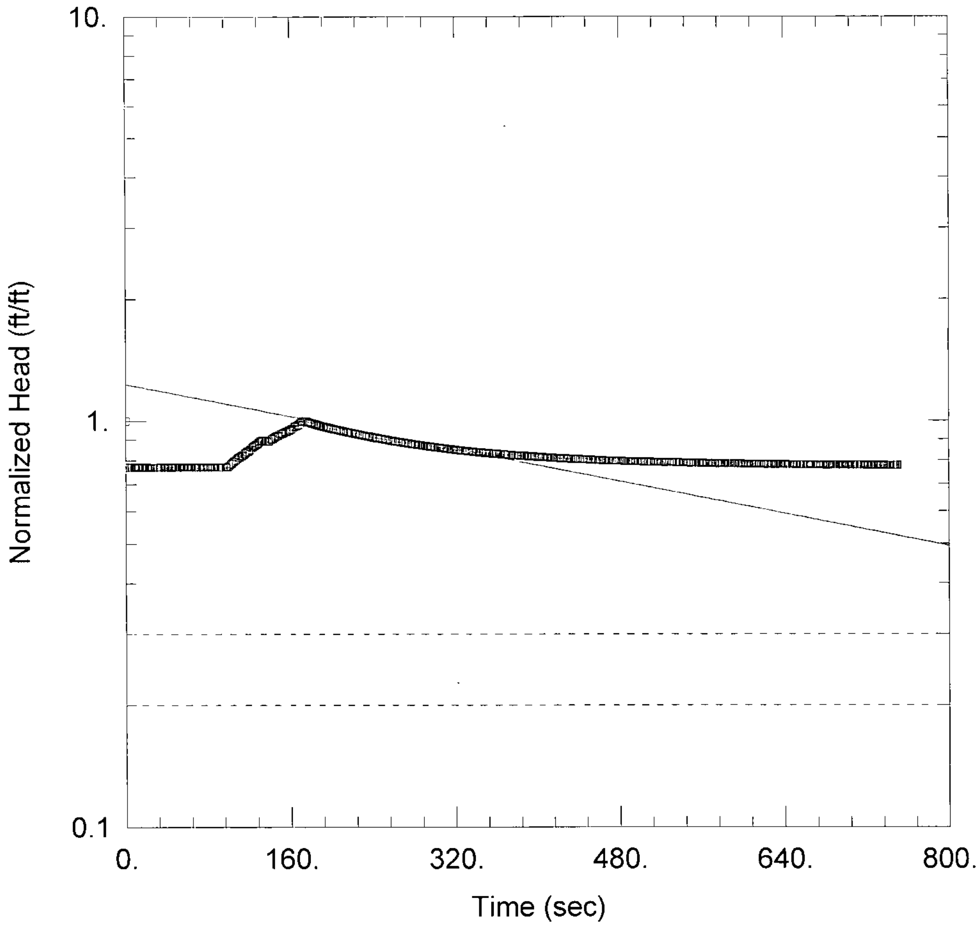
Initial Displacement: 6.17 ft
Total Well Penetration Depth: 35. ft
Casing Radius: 0.166 ft

Static Water Column Height: 15.31 ft
Screen Length: 35. ft
Well Radius: 0.35 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0593 ft/day y0 = 4.887 ft



MW-17 TEST 1 FALLING HEAD

Data Set: Z:\...\MW-17 Test 1 Falling Head.aqt
Date: 08/18/09 Time: 09:24:48

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: MW-17 Test 1 Falling Head
Test Date: 7/31/09

AQUIFER DATA

Saturated Thickness: 30. ft Anisotropy Ratio (Kz/Kr): 1.

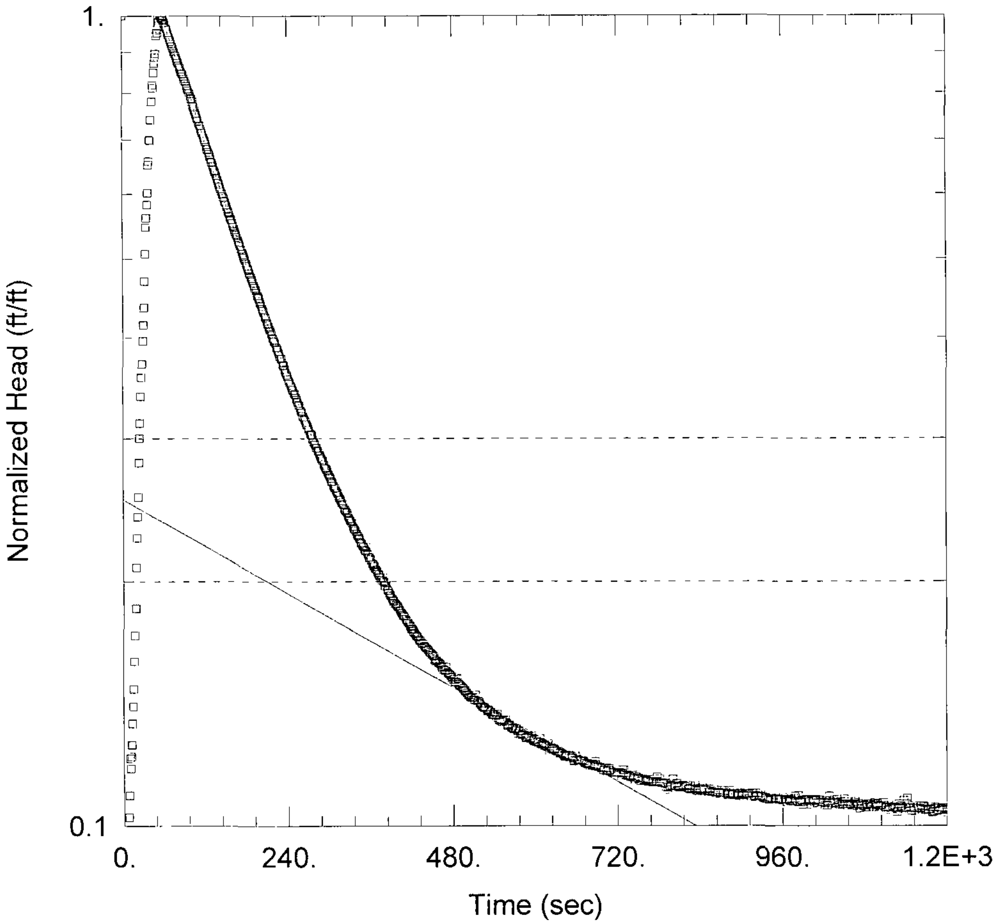
WELL DATA (MW-17 Test 1 Falling Head)

Initial Displacement: 24.75 ft Static Water Column Height: 19.26 ft
Total Well Penetration Depth: 35. ft Screen Length: 35. ft
Casing Radius: 0.166 ft Well Radius: 0.35 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.1593 ft/day y0 = 30.43 ft



MW-17 TEST 2 FALLING HEAD

Data Set: Z:\...\MW-17 Test 2 Falling Head.aqt
Date: 08/18/09 Time: 10:01:43

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: MW-17 Test 2 Falling Head
Test Date: 8/03/09

AQUIFER DATA

Saturated Thickness: 30. ft Anisotropy Ratio (Kz/Kr): 1.

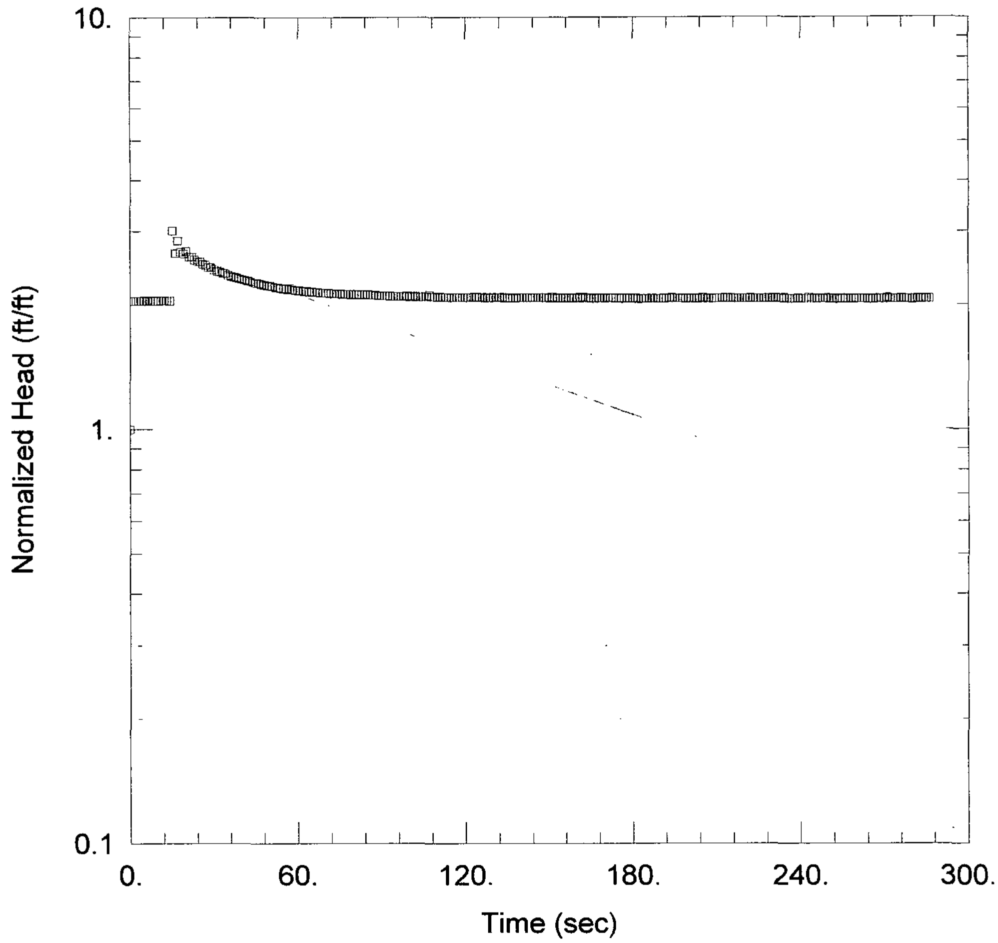
WELL DATA (MW-17 Test 2 Falling Head)

Initial Displacement: 7.4 ft
Total Well Penetration Depth: 35. ft
Casing Radius: 0.166 ft
Static Water Column Height: 19.35 ft
Screen Length: 35. ft
Well Radius: 0.35 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.155 ft/day y0 = 1.866 ft



EB-08 TEST 1 FALLING HEAD

Data Set: Z:\...\EB-08 Test 1 Falling Head.aqt
Date: 08/11/09 Time: 11:43:12

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: EB-08
Test Date: 7/31/09

AQUIFER DATA

Saturated Thickness: 23.61 ft Anisotropy Ratio (Kz/Kr): 1.

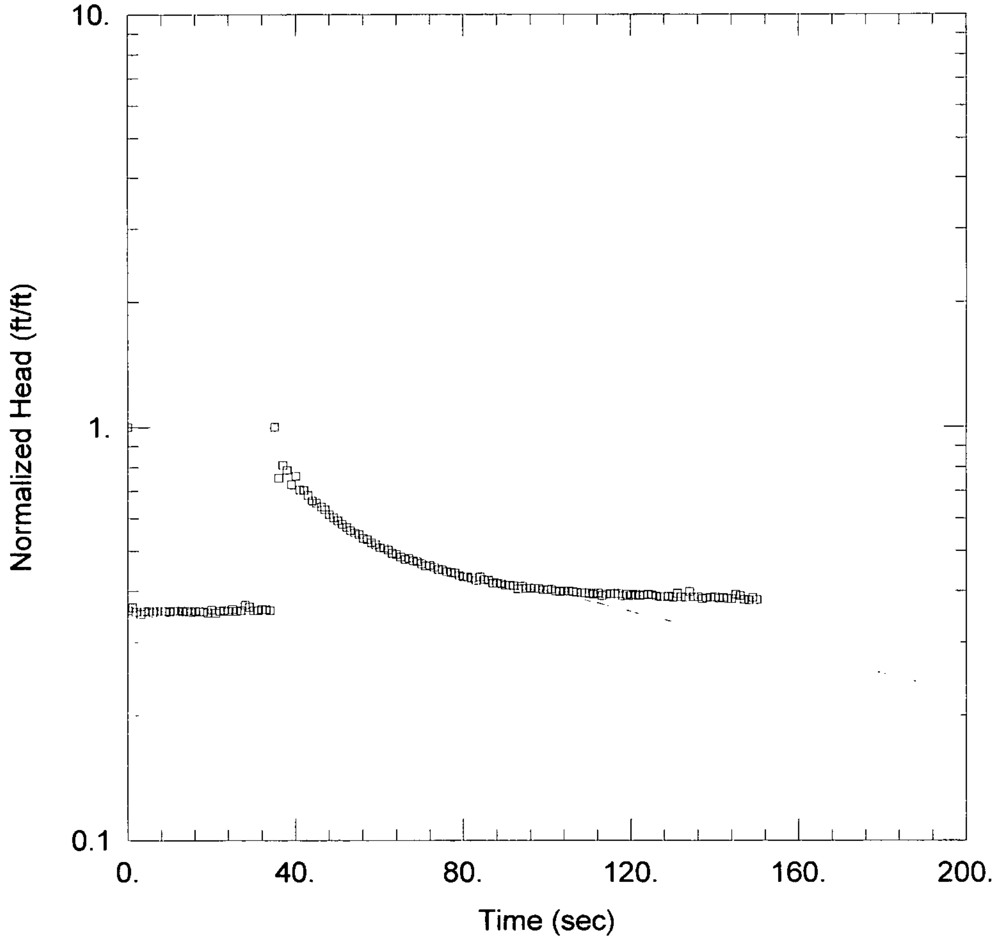
WELL DATA (EB-08 Test 1 Falling Head)

Initial Displacement: 1.3 ft Static Water Column Height: 22.65 ft
Total Well Penetration Depth: 23. ft Screen Length: 15. ft
Casing Radius: 0.0833 ft Well Radius: 0.21 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.3992 ft/day y0 = 3.847 ft



EB-08 TEST 2 FALLING HEAD

Data Set: Z:\...\EB-08 Test 2 Falling Head.aqt
Date: 08/11/09 Time: 14:43:41

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: EB-08 Test 2 Falling Head
Test Date: 7/31/09

AQUIFER DATA

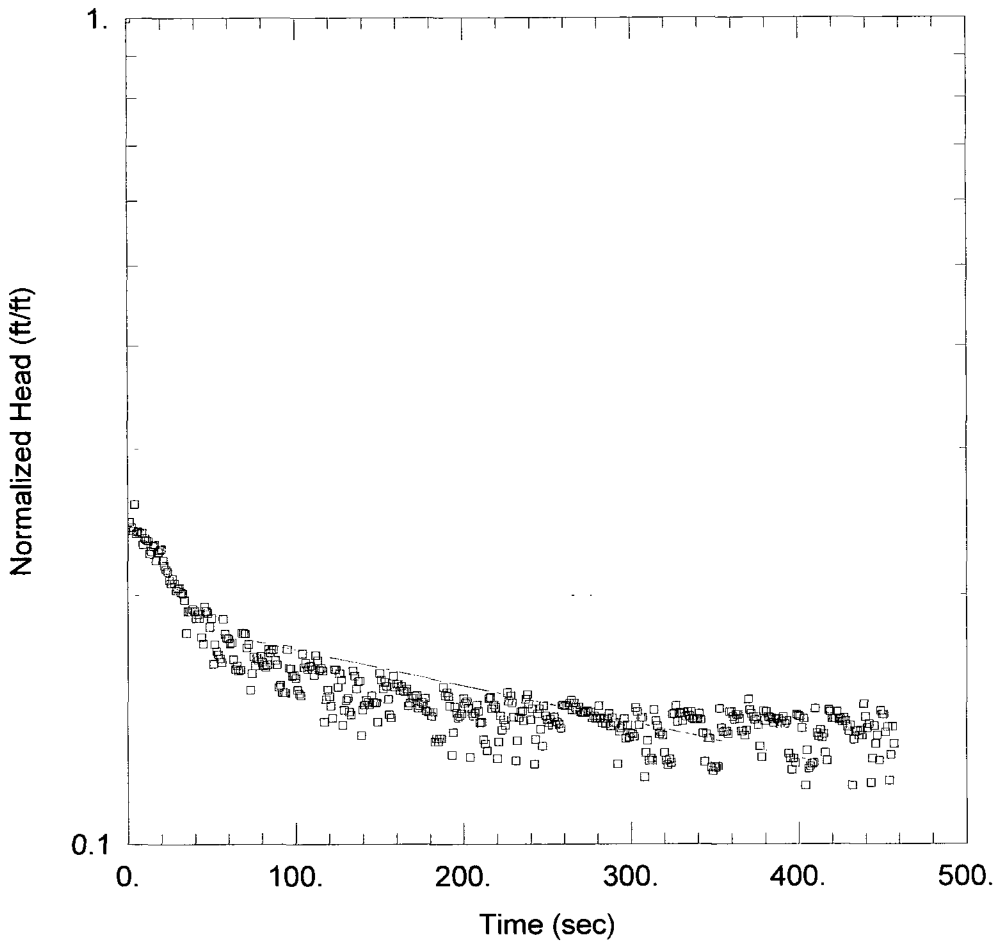
Saturated Thickness: 23.84 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (EB-08 Test 2 Falling Head)

Initial Displacement: 1.835 ft
Static Water Column Height: 22.66 ft
Total Well Penetration Depth: 23. ft
Screen Length: 15. ft
Casing Radius: 0.0833 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.3686 ft/day
y0 = 1.302 ft



EB-08 TEST 3 FALLING HEAD

Data Set: Z:\...\EB-08 Test 3 Falling Head.aqt
Date: 08/11/09 Time: 15:50:52

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: EB-08 Test 3 Falling Head
Test Date: 7/31/09

AQUIFER DATA

Saturated Thickness: 23.61 ft Anisotropy Ratio (Kz/Kr): 1.

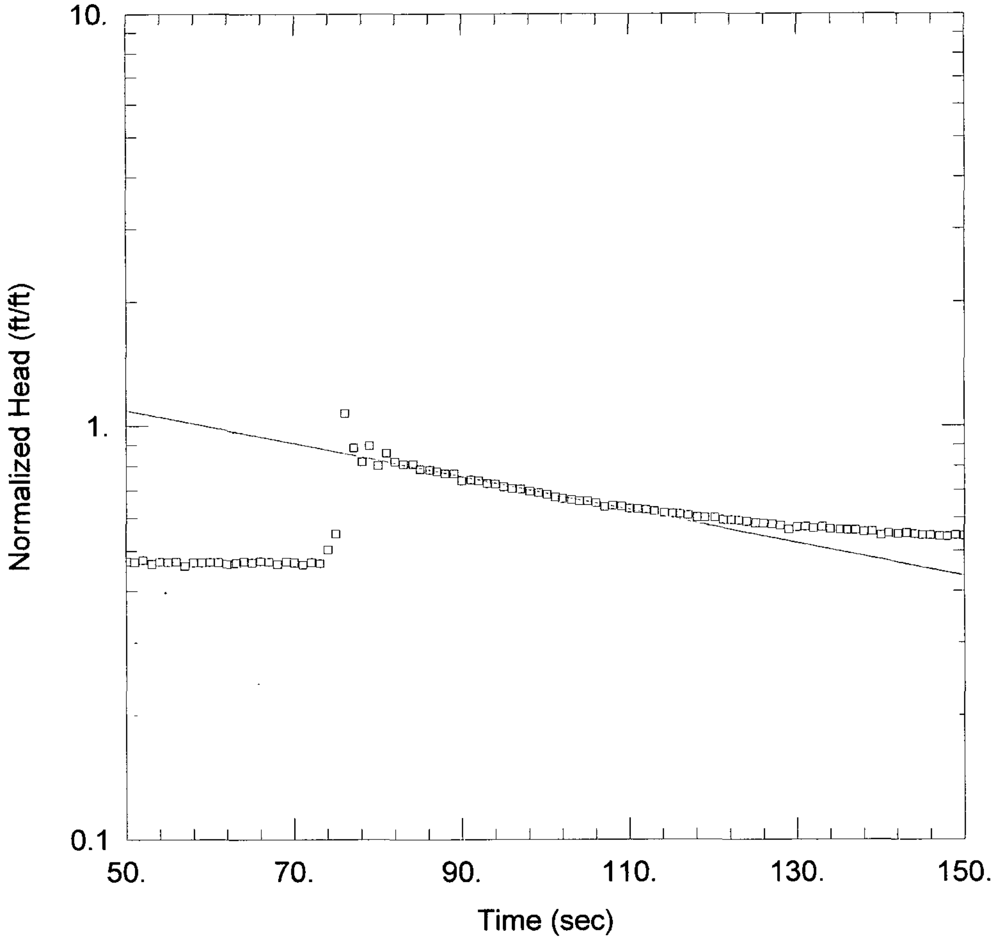
WELL DATA (EB-08 Test 3 Falling Head)

Initial Displacement: 2.5 ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 22.65 ft
Screen Length: 15. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.06535 ft/day y0 = 0.4753 ft



RISING HEAD, SLUG OUT (TRANSLATED)

Data Set: Z:\...\EB-08 test 1 Rising head, translated.aqt
Date: 08/11/09 Time: 15:15:12

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: EB-08
Test Date: 7/31/09

AQUIFER DATA

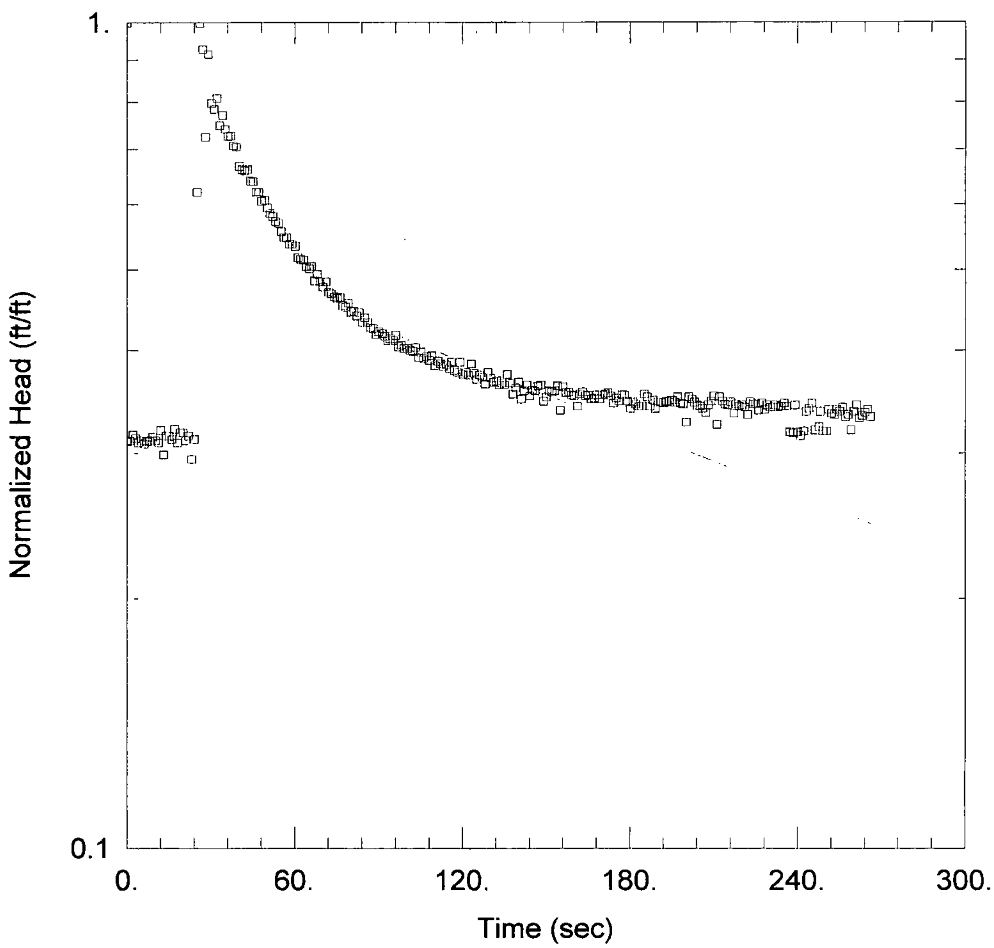
Saturated Thickness: 23.61 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (EB-08 Test 1 Rising Head)

Initial Displacement: 1.5 ft
Total Well Penetration Depth: 22.69 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 22.69 ft
Screen Length: 15. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.5876 ft/day
y0 = 2.589 ft



EB-08 TEST 2 RISING HEAD

Data Set: Z:\...\EB-08 Test 2 Rising head, translated.aqt
Date: 08/11/09 Time: 15:13:15

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: EB-08 Test 2 Rising Head
Test Date: 7/31/09

AQUIFER DATA

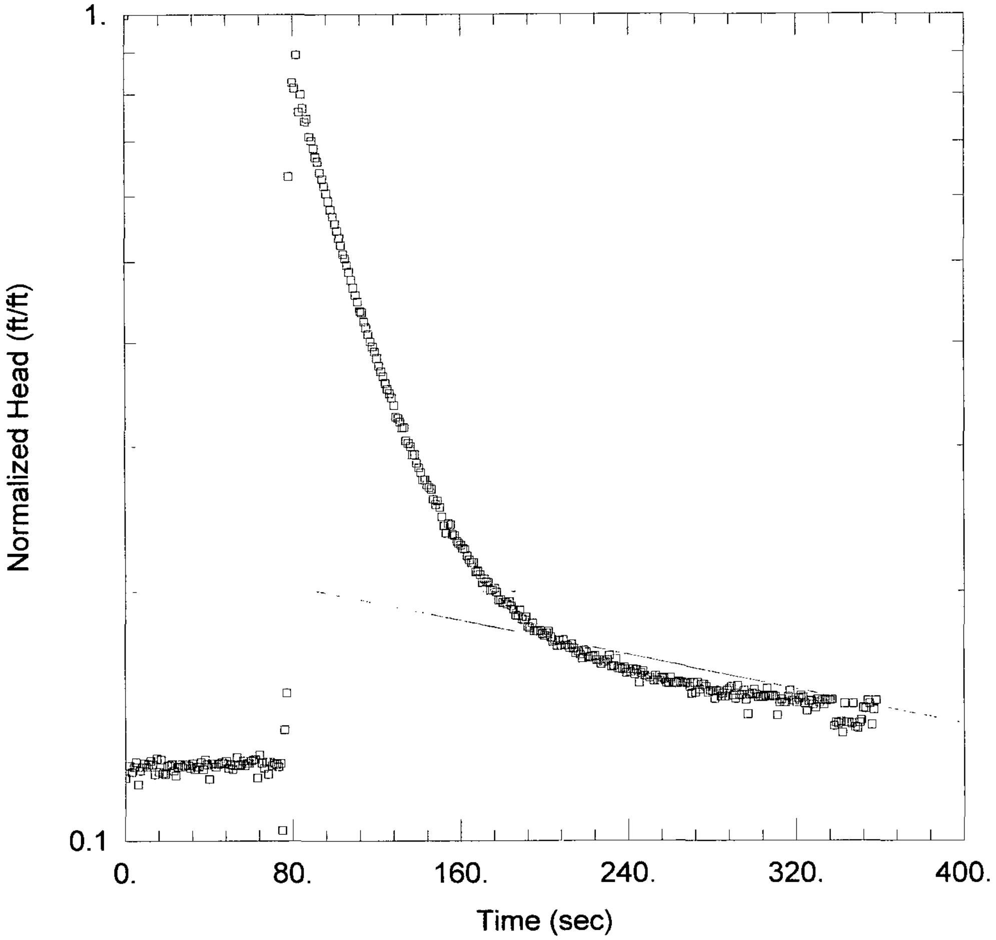
Saturated Thickness: 23.61 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (EB-08 Test 2 Rising Head)

Initial Displacement: 1. ft Static Water Column Height: 22.66 ft
Total Well Penetration Depth: 23. ft Screen Length: 15. ft
Casing Radius: 0.0833 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 0.2016 ft/day y0 = 0.5627 ft



EB-08 TEST 3 RISING HEAD TRANSLATED

Data Set: Z:\...\EB-08 Test 3 Rising head, translated.aqt
Date: 08/11/09 Time: 16:19:51

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: EB-08 Test 3 Rising Head
Test Date: 7/31/09

AQUIFER DATA

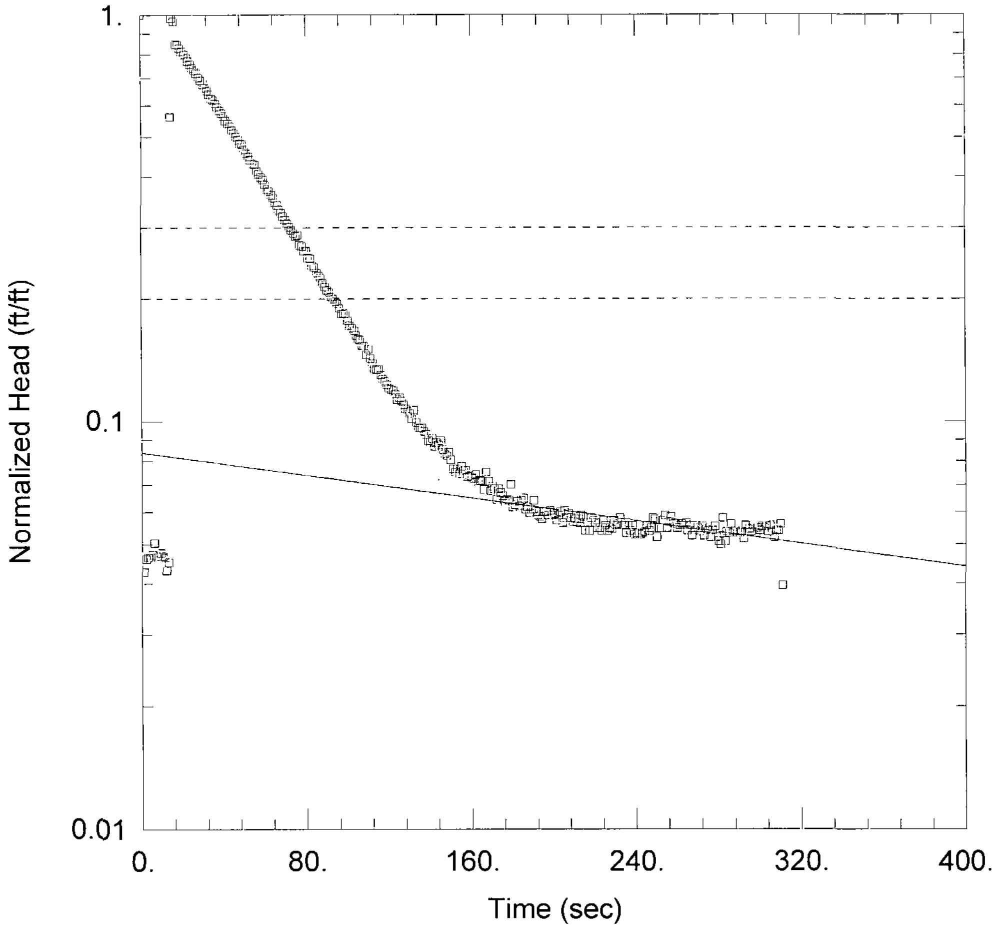
Saturated Thickness: 23.61 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (EB-08 Test 3 Rising Head)

Initial Displacement: 2.4 ft
Static Water Column Height: 22.65 ft
Total Well Penetration Depth: 23. ft
Screen Length: 15. ft
Casing Radius: 0.0833 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.07751 ft/day
y0 = 0.5359 ft



P-01 TEST 1 FALLING HEAD

Data Set: Z:\...\P-01 Test 1 Falling Head.aqt
Date: 08/18/09 Time: 11:41:58

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-01 Test 1 Falling Head
Test Date: 7/31/09

AQUIFER DATA

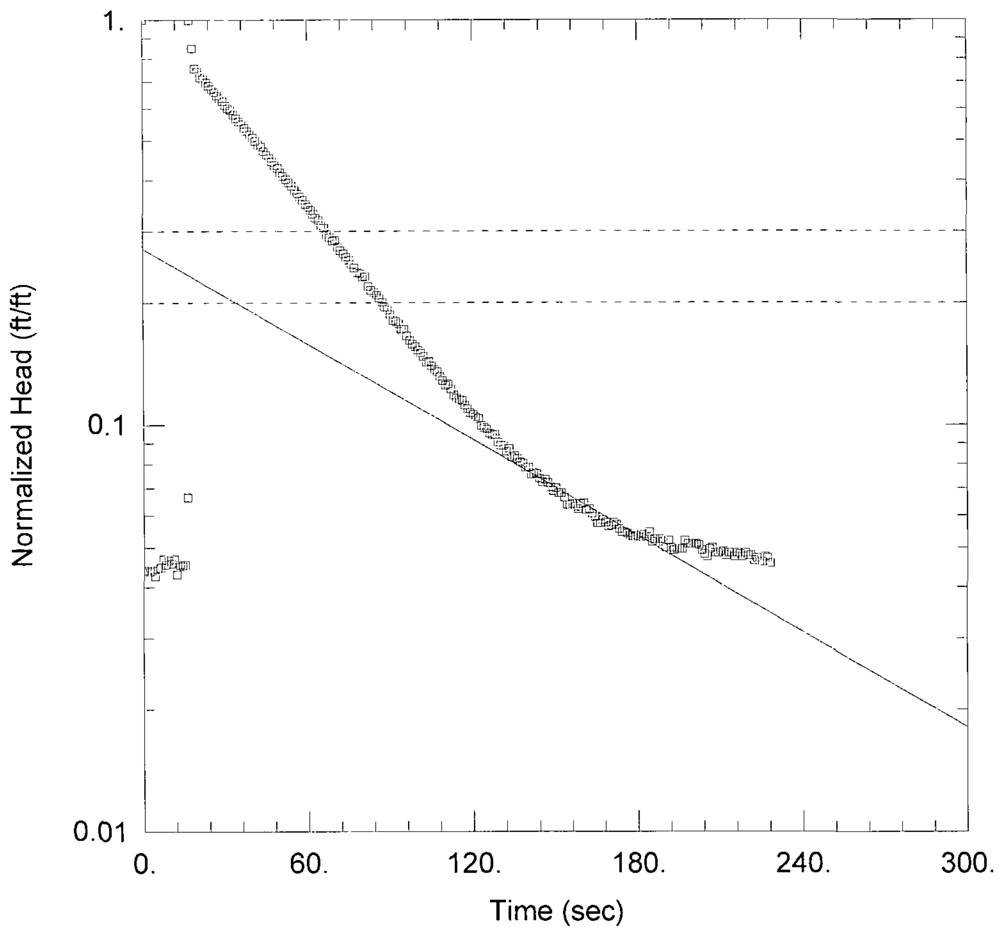
Saturated Thickness: 15.73 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-01 Test 1 Falling Head)

Initial Displacement: 2.5 ft
Static Water Column Height: 15.73 ft
Total Well Penetration Depth: 16. ft
Screen Length: 10. ft
Casing Radius: 0.833 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 14.92 ft/day
y0 = 0.2099 ft



P-01 TEST 2 FALLING HEAD

Data Set: Z:\...\P-01 Test 2 Falling Head.aqt
Date: 08/18/09 Time: 12:58:41

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-01 Test 2 Falling Head
Test Date: 7/31/09

AQUIFER DATA

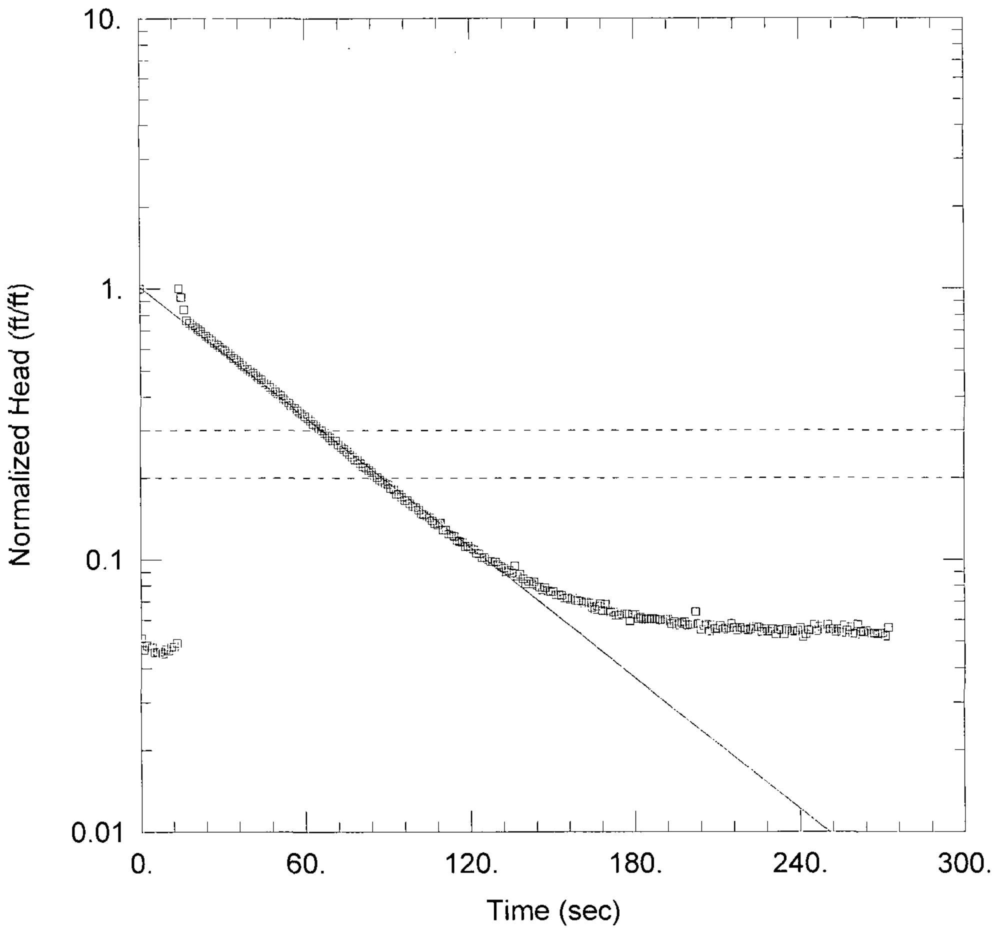
Saturated Thickness: 15.73 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-01 Test 2 Falling Head)

Initial Displacement: 2.86 ft
Total Well Penetration Depth: 15.12 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 15.73 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.78 ft/day
y0 = 0.7776 ft



P-01 TEST 3 FALLING HEAD

Data Set: Z:\...\P-01 Test 3 Falling Head.aqt
Date: 08/18/09 Time: 16:50:34

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-01 Test 3 Falling Head
Test Date: 7/31/09

AQUIFER DATA

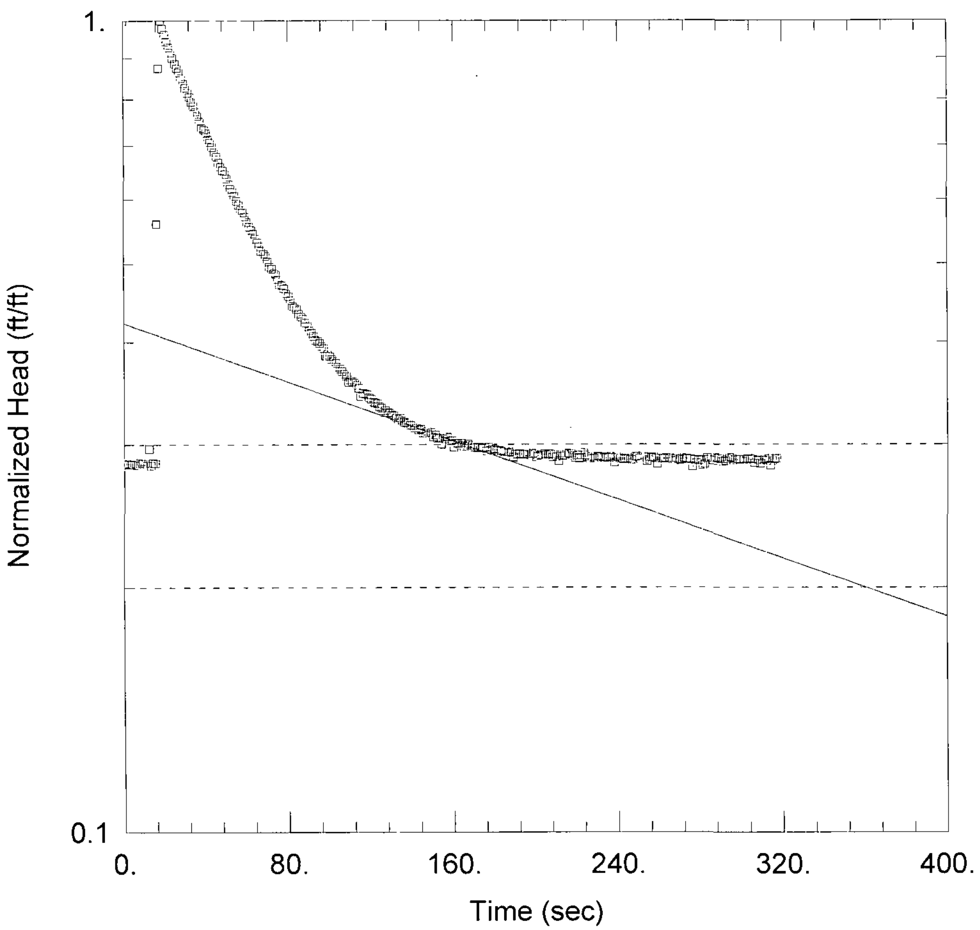
Saturated Thickness: 15.73 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-01 Test 3 Falling Head)

Initial Displacement: 2.81 ft
Static Water Column Height: 15.73 ft
Total Well Penetration Depth: 15.73 ft
Screen Length: 10. ft
Casing Radius: 0.0833 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.71 ft/day
y0 = 2.848 ft



P-01 TEST 1 RISING HEAD

Data Set: Z:\...\P-01 Test 1 Rising Head.aqt
Date: 08/18/09 Time: 12:34:03

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-01 Test 1 Rising Head
Test Date: 7/31/09

AQUIFER DATA

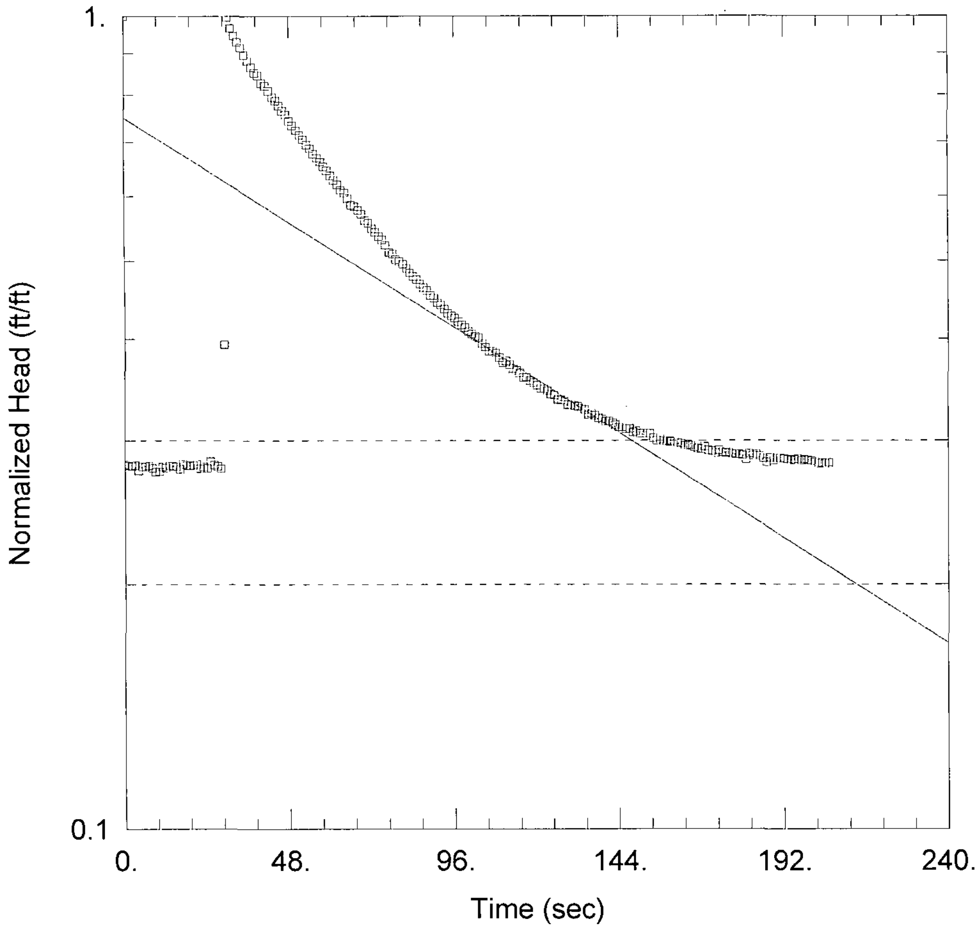
Saturated Thickness: 15.73 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-01)

Initial Displacement: 3.04 ft
Total Well Penetration Depth: 15.73 ft
Casing Radius: 0.833 ft
Static Water Column Height: 15.73 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 19.24 ft/day
y0 = 1.284 ft



P-01 TEST 2 RISNING HEAD

Data Set: Z:\...\P-01 Test 2 Rising Head.aqt
Date: 08/18/09 Time: 16:07:11

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-01 Test 2 Rising Head
Test Date: 7/31/09

AQUIFER DATA

Saturated Thickness: 15.73 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-01 Test 2 Rising Head)

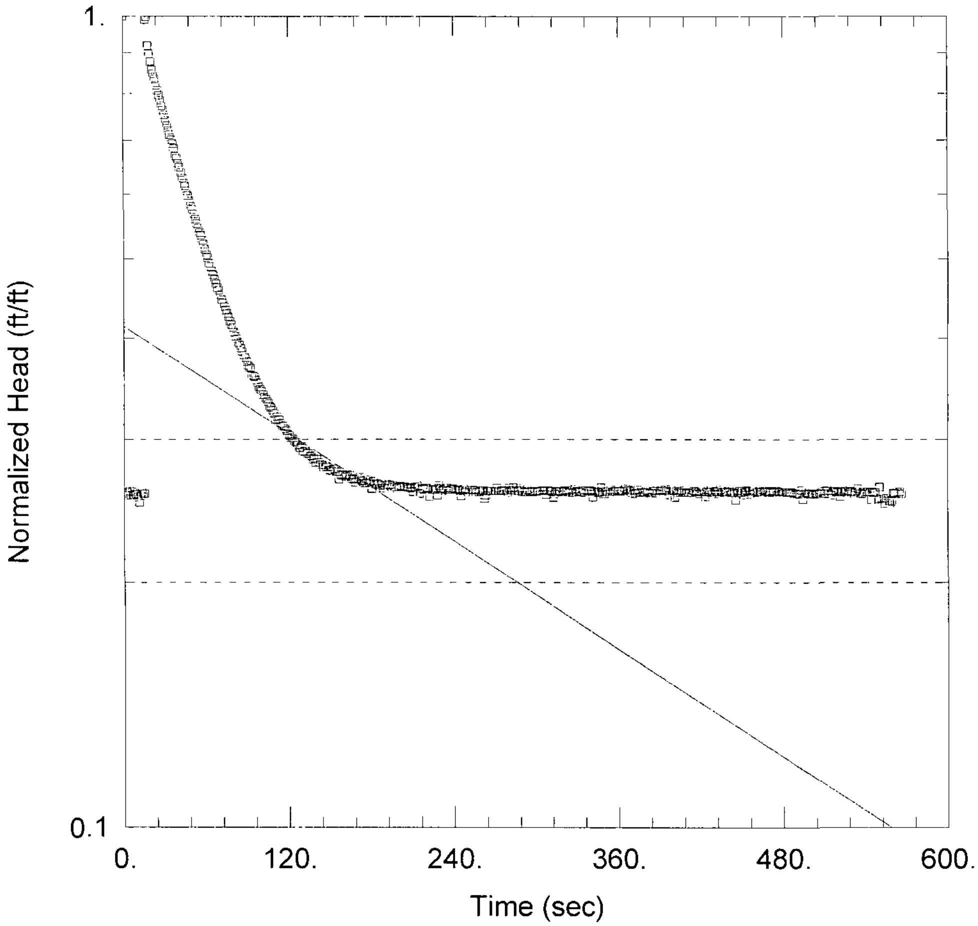
Initial Displacement: 3.12 ft
Total Well Penetration Depth: 15.73 ft
Casing Radius: 0.0833 ft

Static Water Column Height: 15.13 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.575 ft/day y0 = 2.34 ft



P-01 TEST 3 RISING HEAD

Data Set: Z:\...\P-01 Test 3 Rising Head.aqt
Date: 08/19/09 Time: 09:45:45

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-01 Test 3 Rising Head
Test Date: 7/31/09

AQUIFER DATA

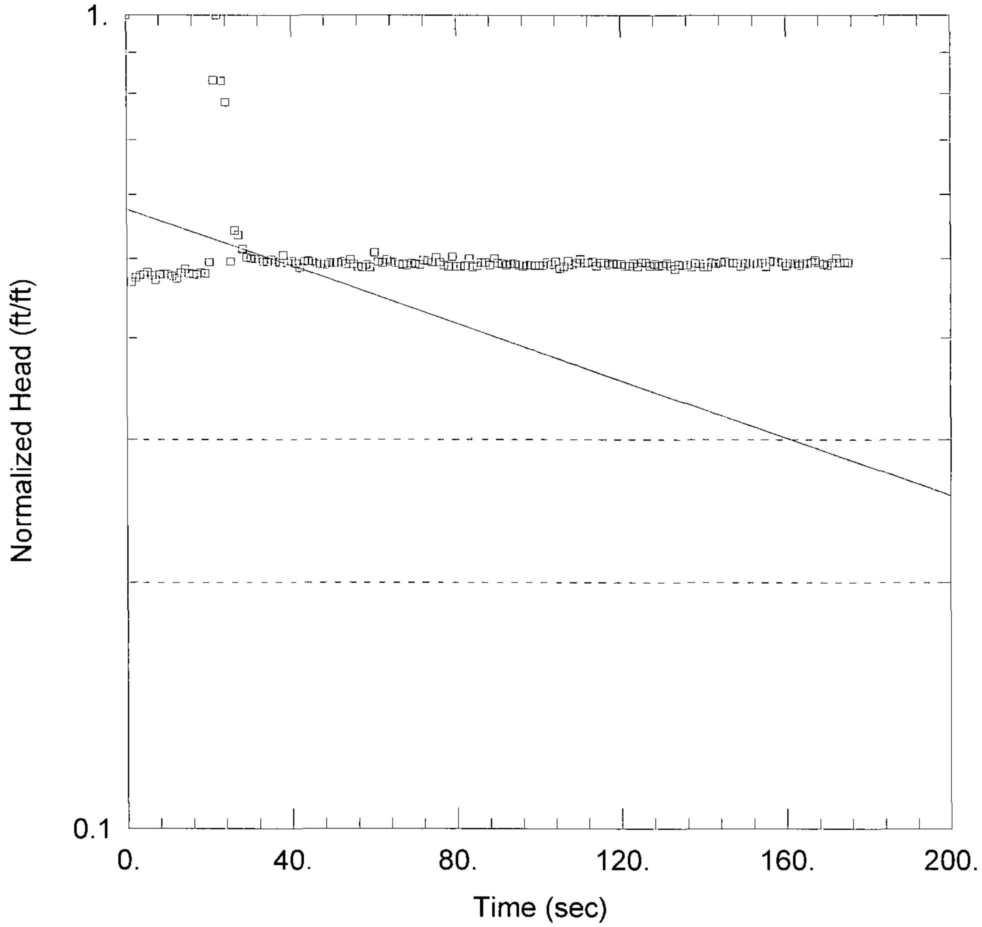
Saturated Thickness: 15.73 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-01 Test 3 Rising Head)

Initial Displacement: 3.3 ft Static Water Column Height: 15.73 ft
Total Well Penetration Depth: 15.73 ft Screen Length: 10. ft
Casing Radius: 0.0833 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 0.2358 ft/day y0 = 1.364 ft



P-05 TEST 1 FALLING HEAD

Data Set: Z:\...\P-05 Test 1 Falling Head.aqt
Date: 08/19/09 Time: 10:40:05

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-05 Test 1 Falling Head
Test Date: 8/03/09

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 1.

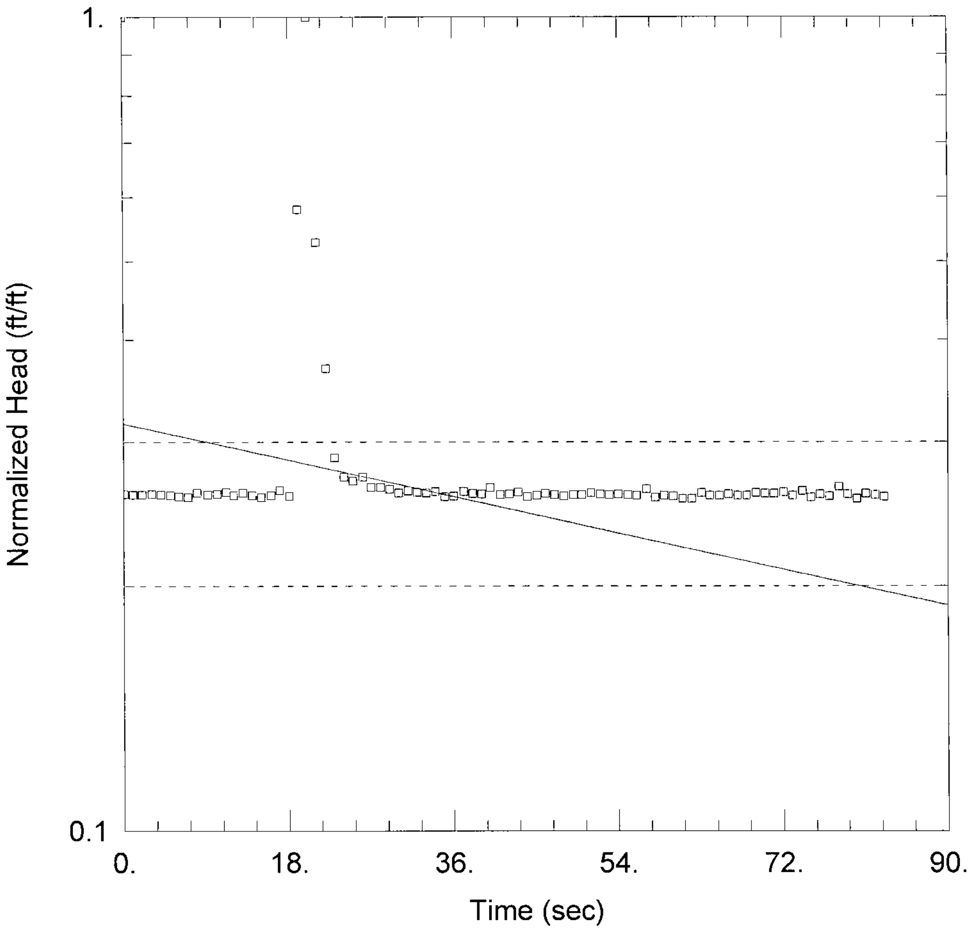
WELL DATA (P-05 Test 1 Falling Head)

Initial Displacement: 1.152 ft Static Water Column Height: 10.57 ft
Total Well Penetration Depth: 10. ft Screen Length: 10. ft
Casing Radius: 0.0833 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.3106 ft/day y0 = 0.6636 ft



P-05 TEST 2 FALLING HEAD

Data Set: Z:\...\P-05 Test 2 Falling Head.aqt
Date: 08/19/09 Time: 13:43:55

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-05 Test 2 Falling Head
Test Date: 8/03/09

AQUIFER DATA

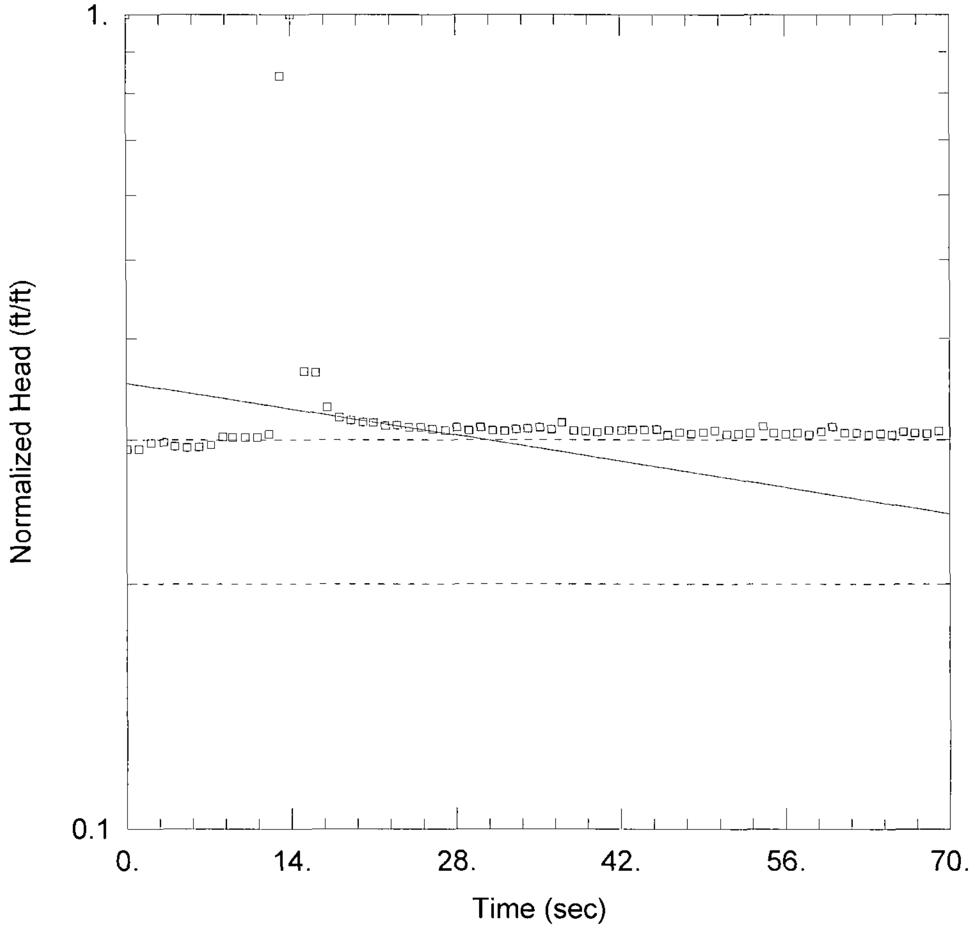
Saturated Thickness: 12. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-05 Test 2 Falling Head)

Initial Displacement: 2.184 ft
Static Water Column Height: 10.57 ft
Total Well Penetration Depth: 10. ft
Screen Length: 10. ft
Casing Radius: 0.0833 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.4365 ft/day
y0 = 0.6901 ft



P-05 TEST 3 FALLING HEAD

Data Set: Z:\...\P-05 Test 3 Falling Head.aqt
Date: 08/19/09 Time: 15:16:05

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-05 Test 3 Falling Head
Test Date: 8/03/09

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 1.

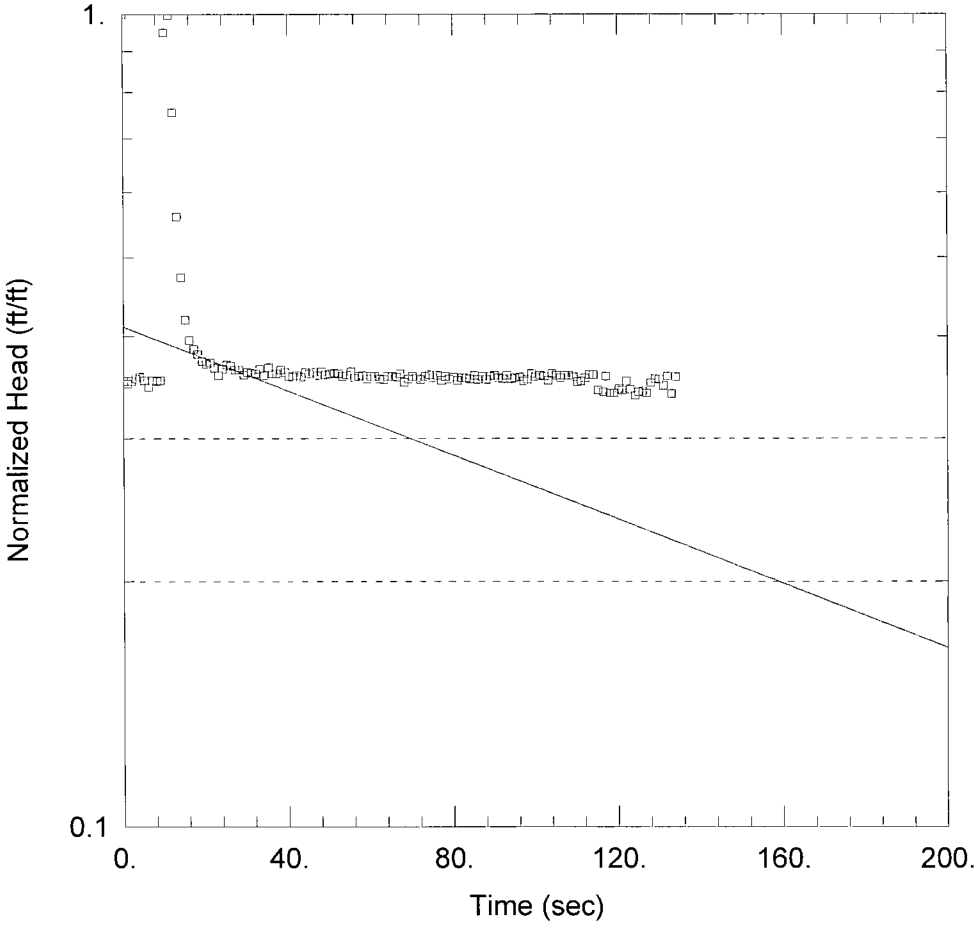
WELL DATA (P-05 Test 3 Falling Head)

Initial Displacement: 1.857 ft Static Water Column Height: 10.57 ft
Total Well Penetration Depth: 10. ft Screen Length: 10. ft
Casing Radius: 0.0833 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.4051 ft/day y0 = 0.6547 ft



P-05 TEST 1 RISING HEAD

Data Set: Z:\...\P-05 Test 1 Rising Head.aqt
Date: 08/19/09
Time: 12:58:34

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-05 Test 1 Rising Head
Test Date: 8/03/09

AQUIFER DATA

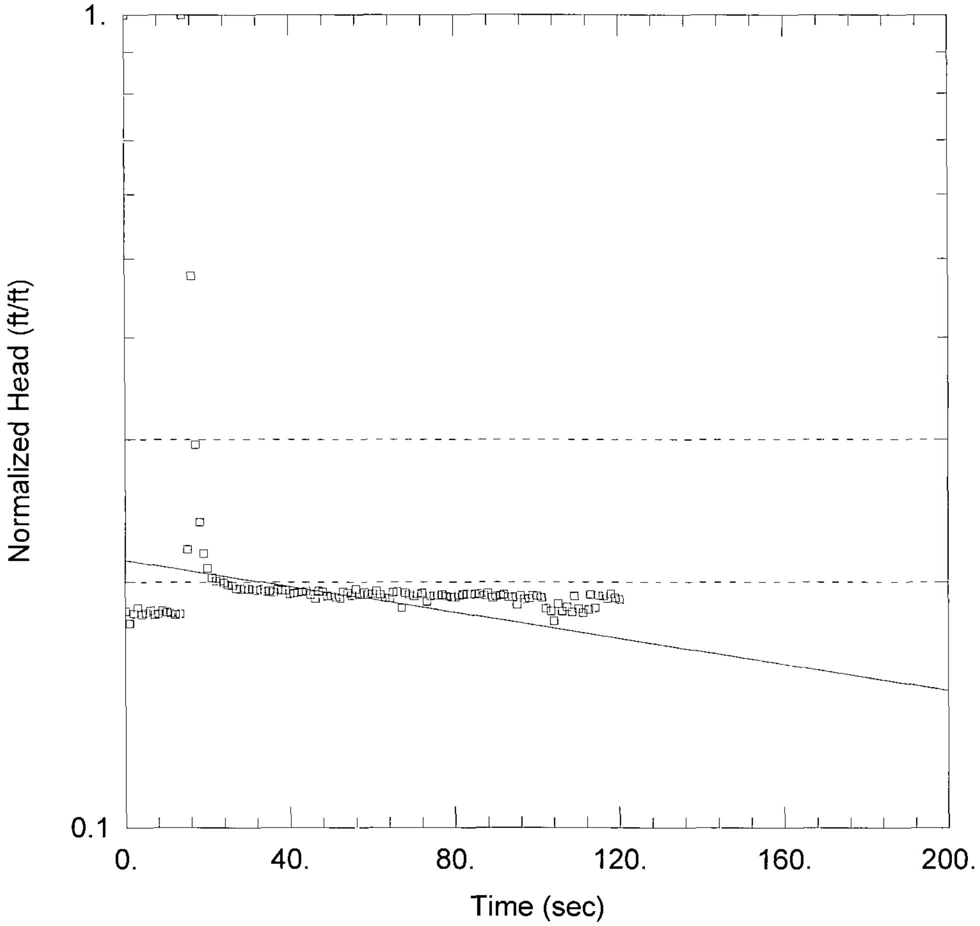
Saturated Thickness: 12. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-05 Test 1 Rising Head)

Initial Displacement: 1.22 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 10.57 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.3482 ft/day
y0 = 0.5018 ft



P-05 TEST 2 RISING HEAD

Data Set: Z:\...\P-05 Test 2 Rising Head.aqt
Date: 08/19/09 Time: 14:55:37

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-05 Test 2 Rising Head
Test Date: 8/03/09

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 1.

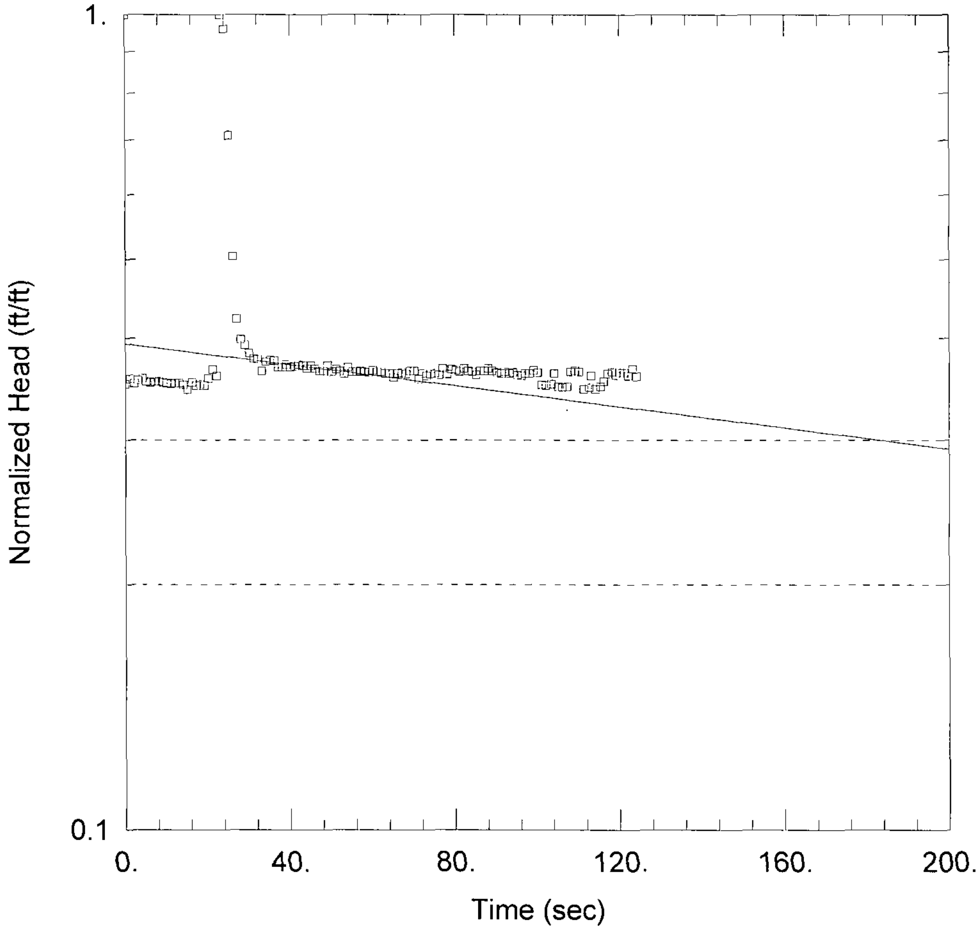
WELL DATA (P-05 Test 2 Rising Head)

Initial Displacement: 2.373 ft Static Water Column Height: 10.57 ft
Total Well Penetration Depth: 10. ft Screen Length: 10. ft
Casing Radius: 0.0833 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.1414 ft/day y0 = 0.5047 ft



P-05 TEST 3 RISING HEAD

Data Set: Z:\...\P-05 Test 3 Rising Head.aqt
Date: 08/19/09 Time: 15:27:00

PROJECT INFORMATION

Company: Larson & Associates, Inc.
Client: Frontier Field Services
Project: 6-0141
Location: Empire Abo Gas Plant
Test Well: P-05 Test 3 Rising Head
Test Date: 8/03/09

AQUIFER DATA

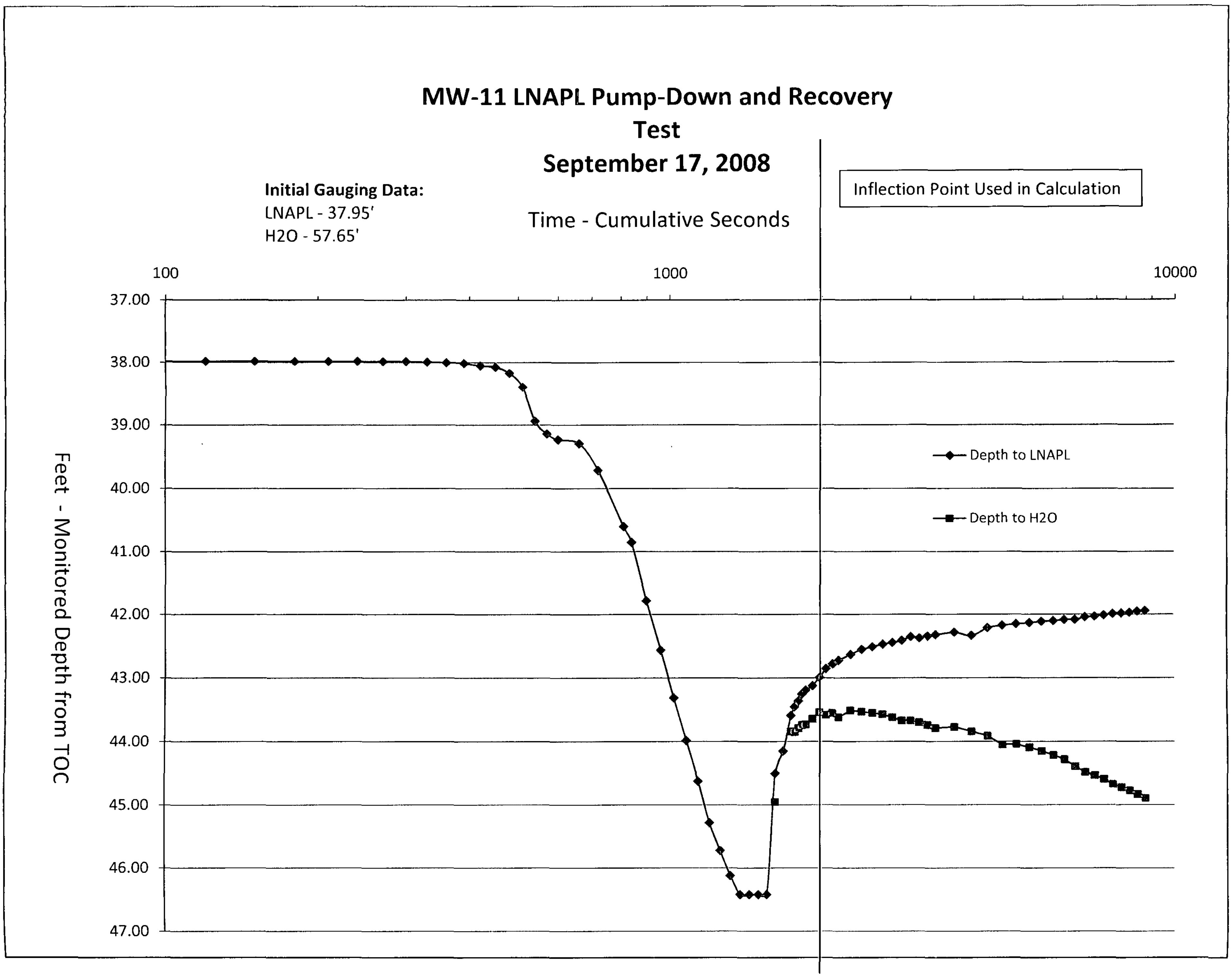
Saturated Thickness: 12. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-05 Test 3 Rising Head)

Initial Displacement: 1.224 ft
Static Water Column Height: 10.57 ft
Total Well Penetration Depth: 10. ft
Screen Length: 10. ft
Casing Radius: 0.0833 ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.1135 ft/day
y0 = 0.4817 ft



Obs. No.	Time Sec	Depth to LNAPL	Depth to H_2O	Obs. No.	Time Sec	Depth to LNAPL	Depth to H2O
1	30	37.97		39	1740	43.59	43.84
2	60	37.98		40	1770	43.45	43.85
3	90	37.98		41	1800	43.36	43.79
4	120	37.98		42	1830	43.25	43.74
5	150	37.98		43	1860	43.19	43.73
6	180	37.98		44	1920	43.12	43.64
7	210	37.98		45	1980	42.99	43.54
8	240	37.98		46	2040	42.85	43.58
9	270	37.98		47	2100	42.78	43.55
10	300	37.98		48	2160	42.72	43.62
11	330	37.99		49	2280	42.63	43.51
12	360	38.00		50	2400	42.55	43.53
13	390	38.01		51	2520	42.51	43.55
14	420	38.05		52	2640	42.47	43.57
15	450	38.07		53	2760	42.44	43.62
16	480	38.17		54	2880	42.41	43.67
17	510	38.40		55	3000	42.35	43.67
18	540	38.94		56	3120	42.37	43.70
19	570	39.14		57	3240	42.34	43.74
20	600	39.23		58	3360	42.32	43.79
21	660	39.29		59	3660	42.28	43.77
22	720	39.71		60	3960	42.33	43.84
23	810	40.60		61	4260	42.21	43.91
24	840	40.85		62	4560	42.17	44.05
25	900	41.78		63	4860	42.15	44.04
26	960	42.56		64	5160	42.13	44.09
27	1020	43.31		65	5460	42.11	44.15
28	1080	43.98		66	5760	42.10	44.21
29	1140	44.62		67	6060	42.08	44.28
30	1200	45.28		68	6360	42.08	44.39
31	1260	45.72		69	6660	42.04	44.48
32	1320	46.12		70	6960	42.03	44.53
33	1380	46.42		71	7260	42.01	44.59
34	1440	46.42		72	7560	41.99	44.67
35	1500	46.42		73	7860	41.98	44.72
36	1560	46.42	Pump Off	74	8160	41.97	44.77
37	1620	44.50	44.95	75	8460	41.95	44.83
38	1680	44.15		76	8760	41.94	44.89

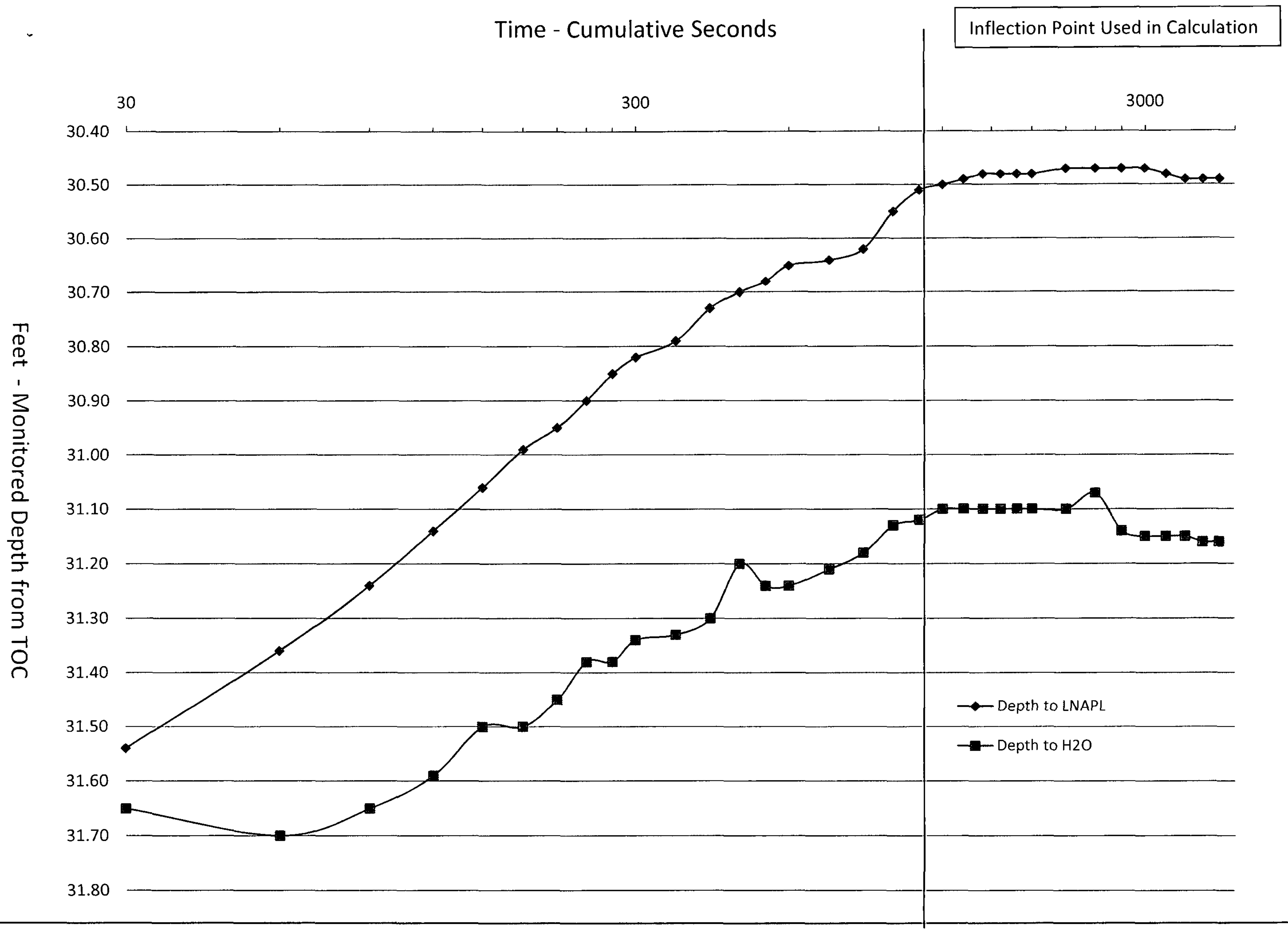
Static D-LNAPL	Static D-H2O	Corrected D-GW
37.95	57.65	41.89

Specific Gravity of 0.8 g/cm^3, based on RT Hicks Consultant 11/18/1996 report.

Charting and calculation based upon *Determination of a Realistic Estimate of Formation Product Thickness Using Monitor Wells: A Field Bailout Test* by Thomas S. Gruszczenski (no date).

Step Number	
5 – Inflection Point	45/1980 sec
6 – S.G. corrected	41.89
7 – Measured Product Thickness	0.55
8 – Inflection Product Thickness	5.04
9 – Capillary Fringe Height	4.49

MW-10 LNAPL Recovery Test
September 18, 2008



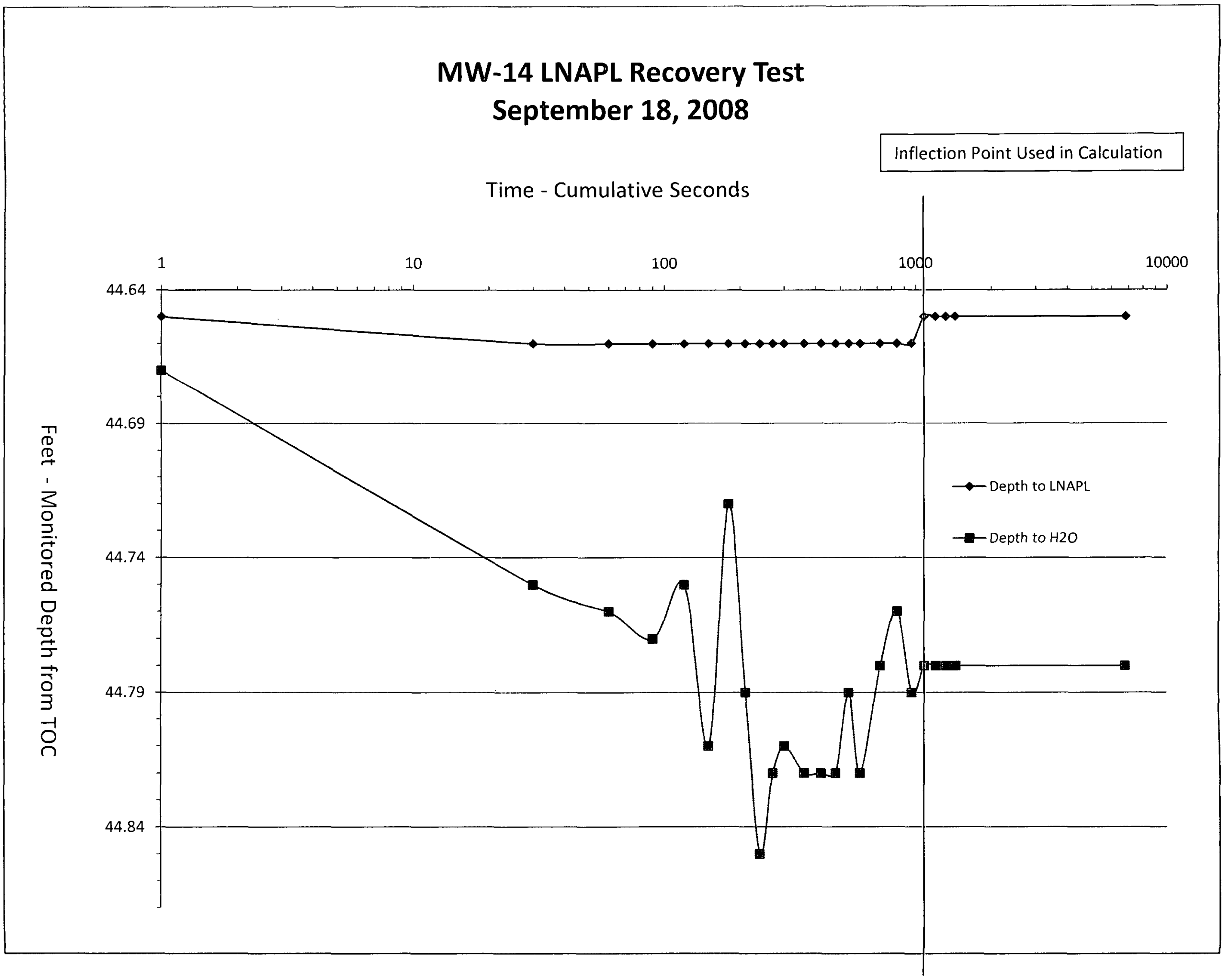
Obs. No.	Time Sec	Depth to LNAPL	Depth to H_2O
1	30	31.54	31.65
2	60	31.36	31.7
3	90	31.24	31.65
4	120	31.14	31.59
5	150	31.06	31.5
6	180	30.99	31.5
7	210	30.95	31.45
8	240	30.90	31.38
9	270	30.85	31.38
10	300	30.82	31.34
11	360	30.79	31.33
12	420	30.73	31.3
13	480	30.70	31.2
14	540	30.68	31.24
15	600	30.65	31.24
16	720	30.64	31.21
17	840	30.62	31.18
18	960	30.55	31.13
19	1080	30.51	31.12
20	1200	30.50	31.10
21	1320	30.49	31.10
22	1440	30.48	31.10
23	1560	30.48	31.10
24	1680	30.48	31.10
25	1800	30.48	31.10
26	2100	30.47	31.10
27	2400	30.47	31.07
28	2700	30.47	31.14
29	3000	30.47	31.15
30	3300	30.48	31.15
31	3600	30.49	31.15
32	3900	30.49	31.16
33	4200	30.49	31.16

Static D-LNAPL	Static D-H2O	Corrected D-GW
29.76	41.25	32.058

Specific Gravity of 0.8 g/cm^3, based on RT Hicks Consultant 11/18/1996 report.

Charting and calculation based upon *Determination of a Realistic Estimate of Formation Product Thickness Using Monitor Wells: A Field Bailout Test* by Thomas S. Gruszczenski (no date).

Step Number	
5 – Inflection Point	19/1080 sec
6 – S.G. corrected	32.058
7 – Measured Product Thickness	0.61
8 – Inflection Product Thickness	0.75
9 – Capillary Fringe Height	0.14



Obs. No.	Time Sec	Depth to LNAPL	Depth to H_2O
1	0	44.65	44.67
2	30	44.66	44.75
3	60	44.66	44.76
4	90	44.66	44.77
5	120	44.66	44.75
6	150	44.66	44.81
7	180	44.66	44.72
8	210	44.66	44.79
9	240	44.66	44.85
10	270	44.66	44.82
11	300	44.66	44.81
12	360	44.66	44.82
13	420	44.66	44.82
14	480	44.66	44.82
15	540	44.66	44.79
16	600	44.66	44.82
17	720	44.66	44.78
18	840	44.66	44.76
19	960	44.66	44.79
20	1080	44.65	44.78
21	1200	44.65	44.78
22	1320	44.65	44.78
23	1440	44.65	44.78
24	6840	44.65	44.78

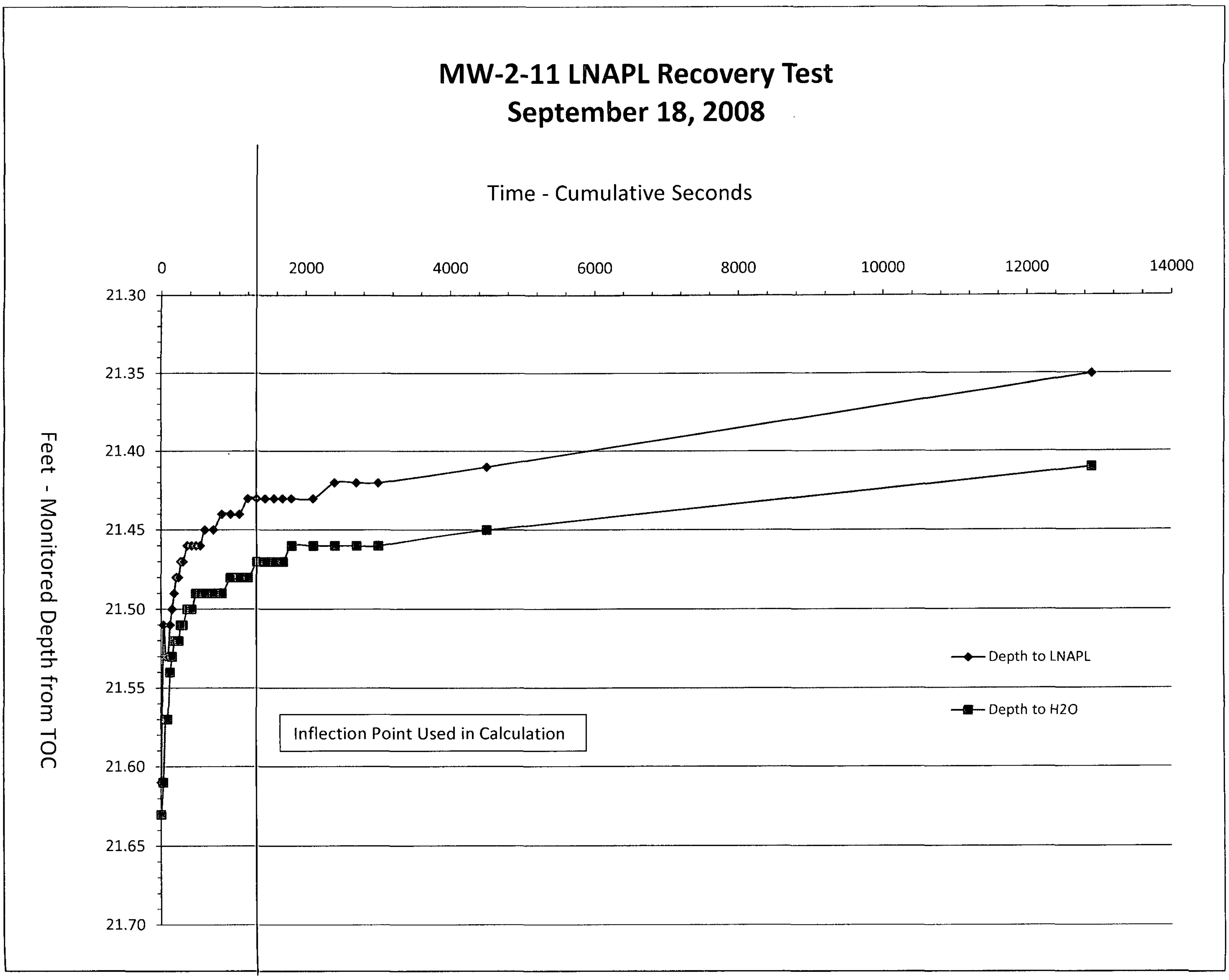
Static D-LNAPL	Static D-H2O	Corrected D-GW
44.63	44.86	44.68

Specific Gravity of 0.8 g/cm^3, based on RT Hicks Consultant 11/18/1996 report.

Charting and calculation based upon *Determination of a Realistic Estimate of Formation Product Thickness Using Monitor Wells: A Field Bailout Test* by Thomas S. Gruszczenski (no date).

Step Number

5 – Inflection Point	20/1080 sec
6 – S.G. corrected	44.68
7 – Measured Product Thickness	0.13
8 – Inflection Product Thickness	0.02
9 – Capillary Fringe Height	0.11



Obs. No.	Time Sec	Depth to LNAPL	Depth to H_2O
1	0	21.61	21.63
2	30	21.51	21.61
3	60	21.53	21.57
4	90	21.53	21.57
5	120	21.51	21.54
6	150	21.50	21.53
7	180	21.49	21.52
8	210	21.48	21.52
9	240	21.48	21.52
10	270	21.47	21.51
11	300	21.47	21.51
12	360	21.46	21.5
13	420	21.46	21.5
14	480	21.46	21.49
15	540	21.46	21.49
16	600	21.45	21.49
17	720	21.45	21.49
18	840	21.44	21.49
19	960	21.44	21.48
20	1080	21.44	21.48
21	1200	21.43	21.48
22	1320	21.43	21.47
23	1440	21.43	21.47
24	1560	21.43	21.47
25	1680	21.43	21.47
26	1800	21.43	21.46
27	2100	21.43	21.46
28	2400	21.42	21.46
29	2700	21.42	21.46
30	3000	21.42	21.46
31	4500	21.41	21.45
32	12900	21.35	21.41

Static D-LNAPL	Static D-H2O	Corrected D-GW
21.23	21.79	21.34

Specific Gravity of 0.8 g/cm^3, based on RT Hicks Consultant 11/18/1996 report.

Charting and calculation based upon *Determination of a Realistic Estimate of Formation Product Thickness Using Monitor Wells: A Field Bailout Test* by Thomas S. Gruszczenski (no date).

Step Number

5 – Inflection Point	22/1320 sec
6 – S.G. corrected	21.34
7 – Measured Product Thickness	0.04
8 – Inflection Product Thickness	0.20
9 – Capillary Fringe Height	0.16

DETERMINATION OF A REALISTIC ESTIMATE OF THE ACTUAL FORMATION PRODUCT THICKNESS USING MONITOR WELLS: A FIELD BAILOUT TEST

Thomas S. Gruszczenski

S&ME, Inc.
4000 DeKalb Technology Parkway
Suite 250
Atlanta, Georgia 30340

ABSTRACT

Various papers have presented factors affecting the accumulation of product in monitor wells. These factors have correlated the apparent product thickness, as measured in monitor wells, with the actual formation product thickness. This paper outlines a field test to determine a realistic estimate of the actual formation product thickness.

This empirical test is similar to a rising head slug test. Product that has accumulated in a monitor well is bailed out and the rising water/product levels are recorded with time using an oil/water interface probe. This test has been performed on various sites underlain by residual Piedmont soils of the southeastern United States.

The results of this test yield two basic curve types. Type one curves were observed in monitor wells with product accumulation less than several inches. This curve type indicates a one to one correspondence between the measured and actual formation product thickness. Type two curves were observed in monitor wells with product accumulation greater than 12 inches. This curve type indicates an inflection point prior to stabilization of water product levels. This inflection point is the actual equilibrium point during the accumulation of water and product. The stabilized water and product levels recorded represents a psuedoequilibrium caused by the difference in specific gravity and height of capillary fringe. This inflection point indicates a 70% to 95% reduction between the measured and actual formation product thickness.

INTRODUCTION

The use of underground storage tanks to store petroleum products has lead to accidental releases of these products to the subsurface. This leaked product will follow the path of least resistance. If the subsurface is isotropic then this flow path will be downward with increasing horizontal migration with depth. The downward movement of product through the subsurface will first be in the vadose zone. The rate of movement through this zone will be controlled by the product characteristics and the soil characteristics. These characteristics would be a function of the lost product volume, flow rate, viscosity, and specific gravity and also the soil porosity, permeability and water saturation.

If the volume of the leaked product is greater than the absorptive capacity of the soil, provided no impermeable horizons were encountered, the product will accumulate on the capillary fringe, above the water table. This rising of fluid in the formation voids above the phreatic water table is a result of the adhesive tension between the soil grains and the ground water. This adhesive tension, which is a positive force, will draw the ground-water upward until it is balanced by the weight, which is a negative force, of the ground-water being drawn upward, above the pheratic water table. The height of the capillary fringe is primarily a function of the soil grain size. Table 1, lists suggested capillary rises based on soil type (Bear, 1979).

Table 1

Soil Type	Capillary Rise (Inches)
Coarse Sand	3/4 - 2
Sand	4 - 14
Fine Sand	14 - 27
Silt	27 - 59
Clay	78 - 160+

The product does not displace this water due to the immiscibility, difference in surface energy and specific gravity of the two fluids. The capillary pressure will be greatest at the top of the capillary fringe due to the decrease in water saturation. Since water has a greater surface tension than gasoline products, this further increases the pressure difference across the interface, hence giving rise to interfacial tension. Thus, gasoline product will accumulate on top of the capillary fringe, which is 100% saturated with water, and above the phreatic water table.

A monitor well installed in the Piedmont soil of the U.S. and screened across the pheratic water table has a much greater diameter than the average grain size of the aquifer. As such, there is no capillary rise in the well bore of any significance.

The use of monitor wells is the most common method of defining product plumes. It has been recognized by those involved with investigating these plumes that the product thickness measured in a monitor well is an apparent product thickness. This apparent product thickness measured has been commonly accepted to be greater than the actual formation thickness.

Various papers have presented evidence to illustrate the apparent product thickness phenomenon. These papers have presented factors effecting the accumulation of product in monitor wells. The two primary factors are the specific gravity of the product and the height of the capillary fringe. Current literature correlates the apparent product thickness with the actual formation thickness using column tests, formation factors and ratios.

If the measured apparent product thickness is greater than the actual formation product thickness, then at some point during the accumulation of product in the well bore, the apparent product thickness equals the actual product thickness. The following test procedure outlines the methodology for determining a realistic estimate of the actual thickness.

TEST PROCEDURE

The test procedure is similar in performance to a rising head slug test. The equipment necessary to perform the test is listed in Table 2.

Table 2
<u>Testing Equipment</u>

- oil/water interface probe
- bailer
- bucket(s)
- clock
- log book
- pencil

The following steps outline the test procedure:

1. Measure and record the stabilized water/product levels.

2. Bail product/water from well. Bailing should continue until all the product is removed from well bore or until it reaches a constant thickness in bailer after numerous bailer volumes are removed.

3. Record the rising water/product interface levels with time while retrieving the probe. Then record the top of product level. Be consistent with recording the levels, that is, always take top of product reading first then take water/product interface. Timing begins upon taking the first reading. Table 3 lists suggested measuring chronology:

Table 3
Suggesting Reading Frequency

Test Interval (minutes)	Reading Frequency (minutes)
0 - 5	30 sec.
5 - 10	1
10 - 30	2
30 - 60	5
60 - 180	10
180+	As necessary to define slope

4. Graph water/product levels vs. time.

5. Observe the slope of water/product interface line and determine inflection point.

6. Determine water level in test well using water levels from monitor wells without any product accumulationor correct elevation by accounting for difference in specific gravity.

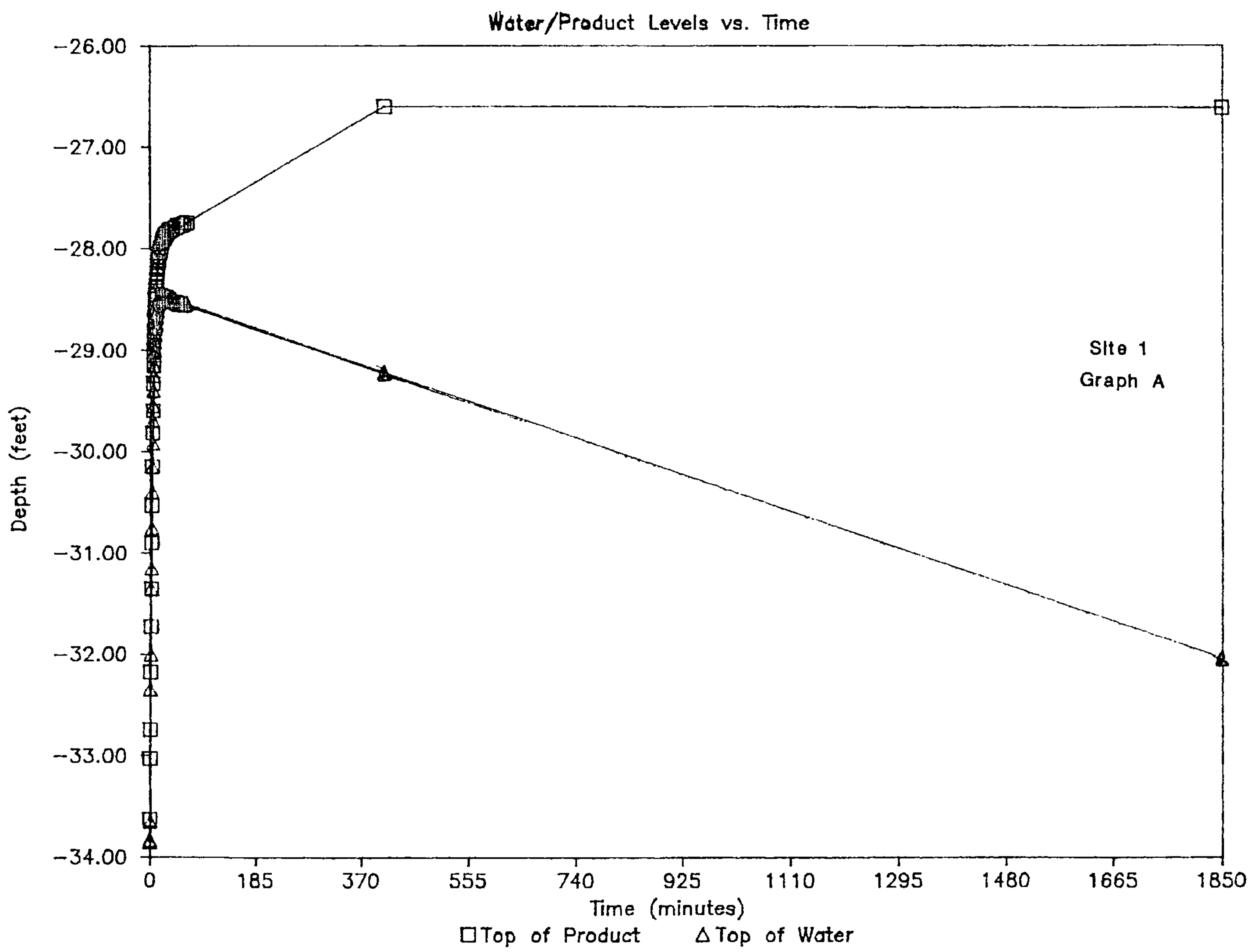
7. Measure difference between product line and water/product interface line at inflection point. This is the actual product thickness.

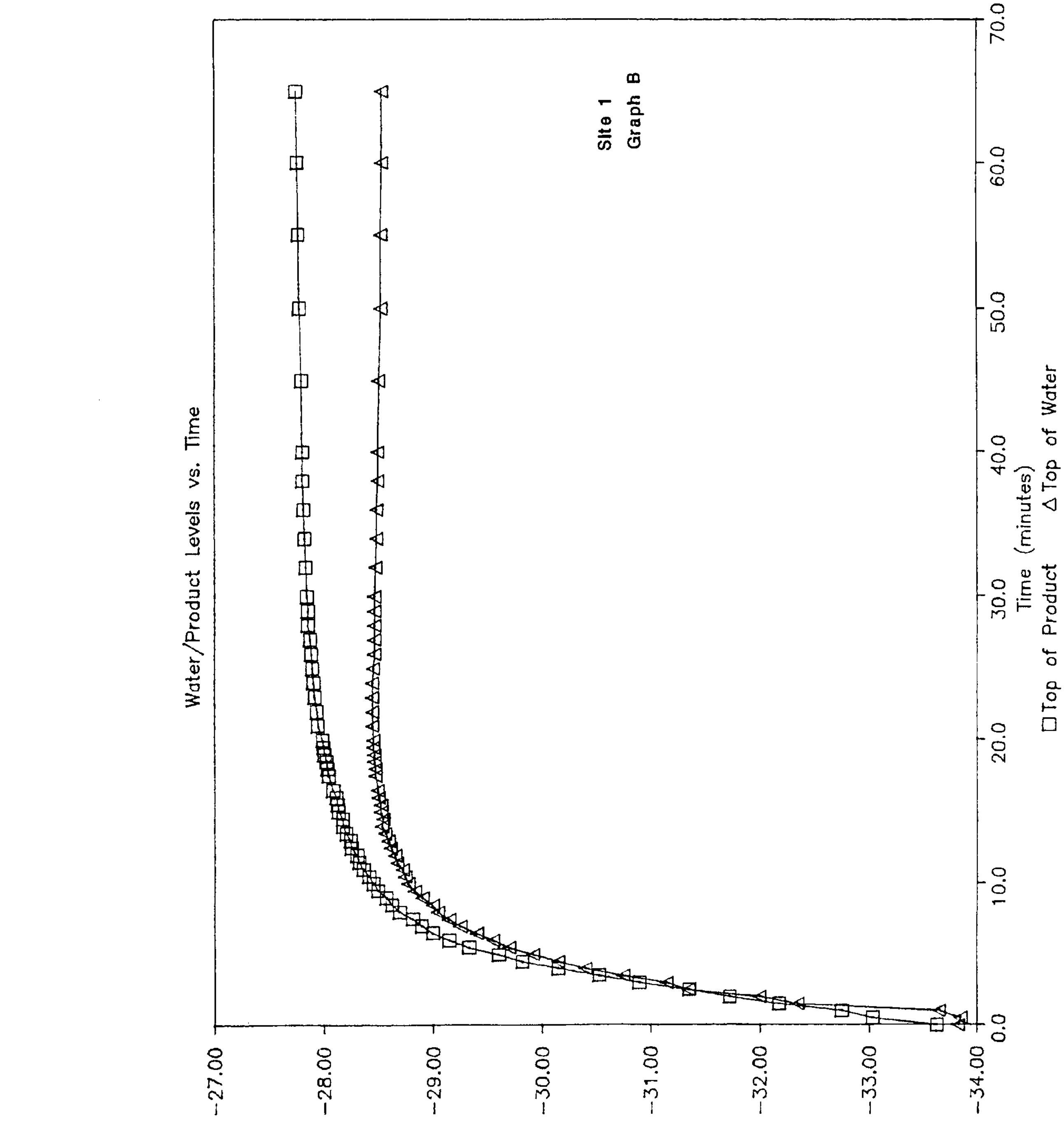
8. Determine the difference between water/product interface level at time of inflection and the stabilized top of product level. This is the sum of the actual product thickness and capillary fringe.

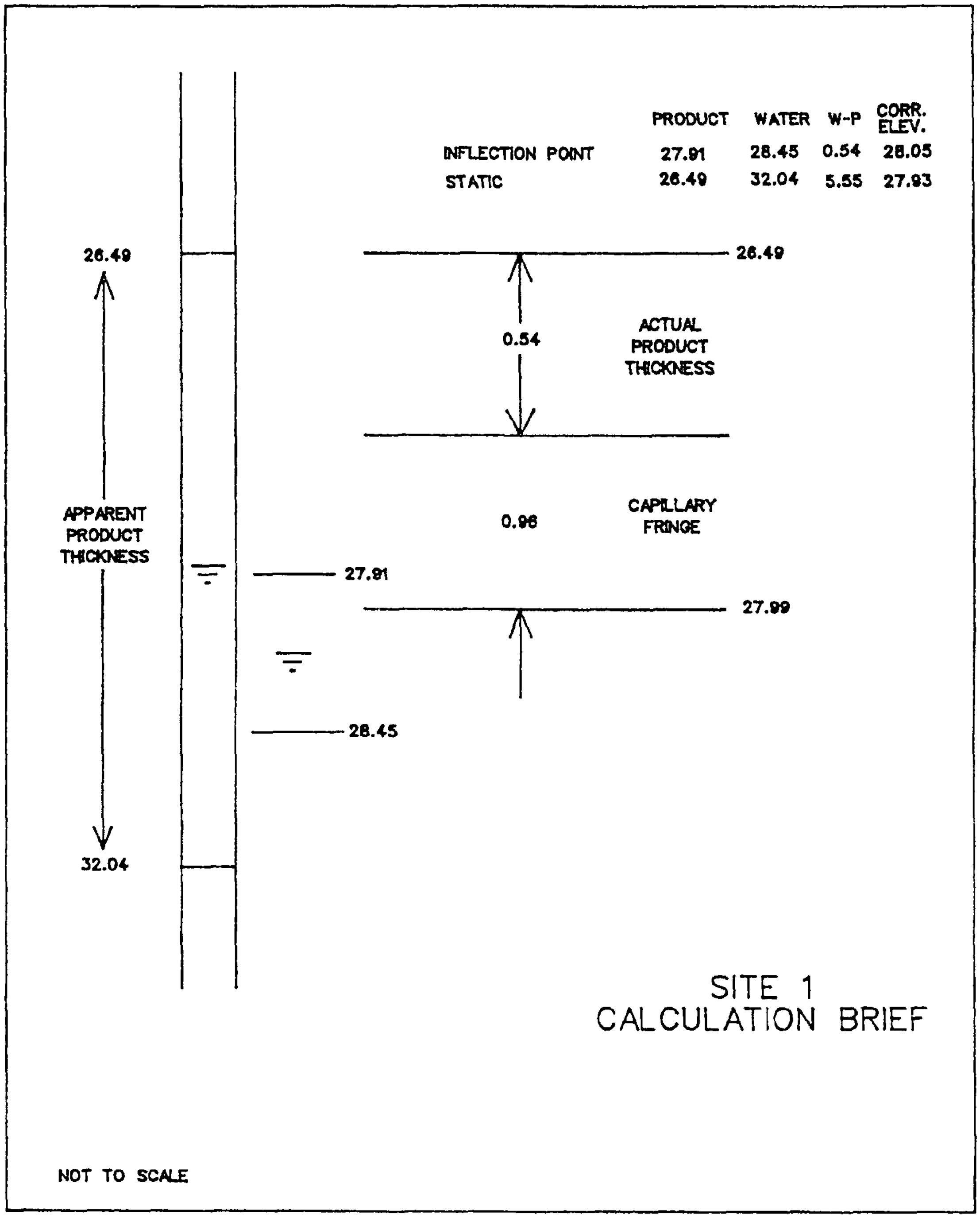
9. Subtract the measurement in 8 from measurement in 7 to obtain height of capillary fringe.

TEST RESULTS

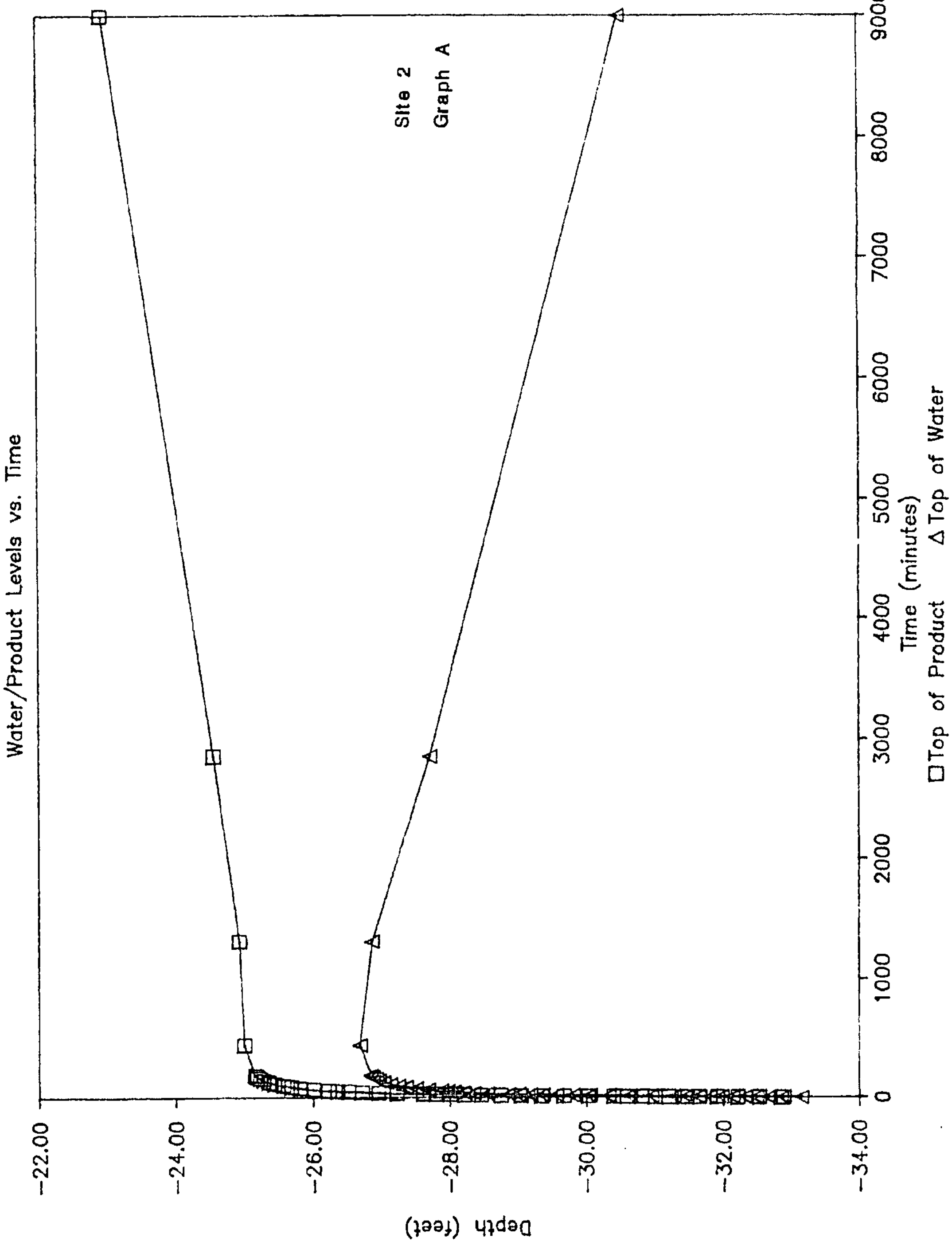
Please refer to the corresponding graphs and calculation brief for each of the four sites. As can be seen from the 'A' graphs, the top of product in the well bore continues to rise with time. However, the water/product interface rises and then starts to fall. The 'B' graphs are an enlarged section of the 'A' graphs illustrates changing from a positive to a negative slope. These site graphs indicate an inflection point prior to the stabilization of the water product levels, and as such they are considered type two curves.


Water/Product Levels vs. Time
Site 1
Graph A
Depth (feet)
-26.00
-27.00
-28.00
-29.00
-30.00
-31.00
-32.00
-33.00
-34.00
0
185
370
555
740
925
1110
1295
1480
1665
1850
Time (minutes)
□ Top of Product
Δ Top of Water

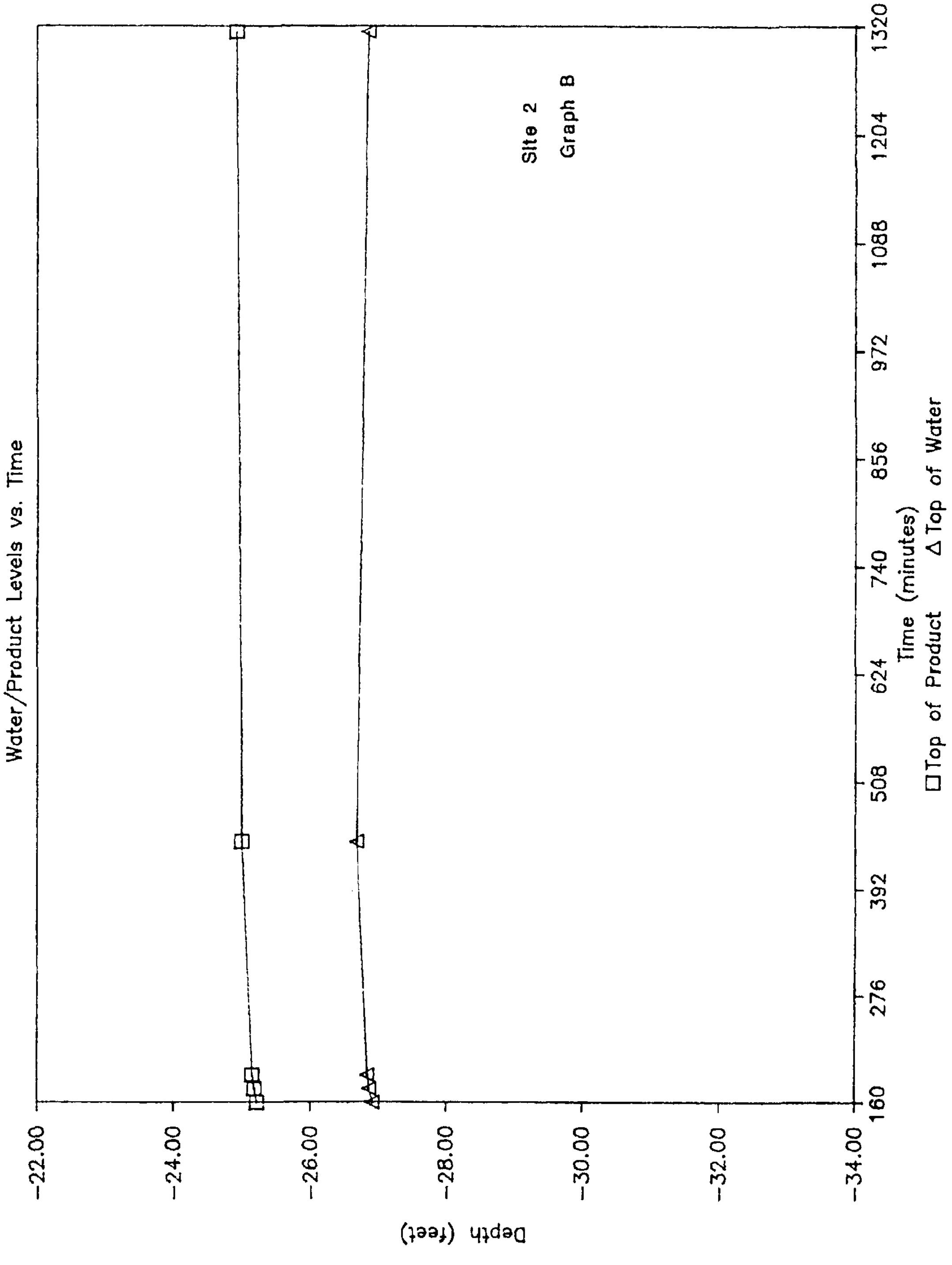

Water/Product Levels vs. Time
Site 1
Graph B
Depth (feet)
-27.00
-28.00
-29.00
-30.00
-31.00
-32.00
-33.00
-34.00
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
Time (minutes)
□ Top of Product
∆ Top of Water

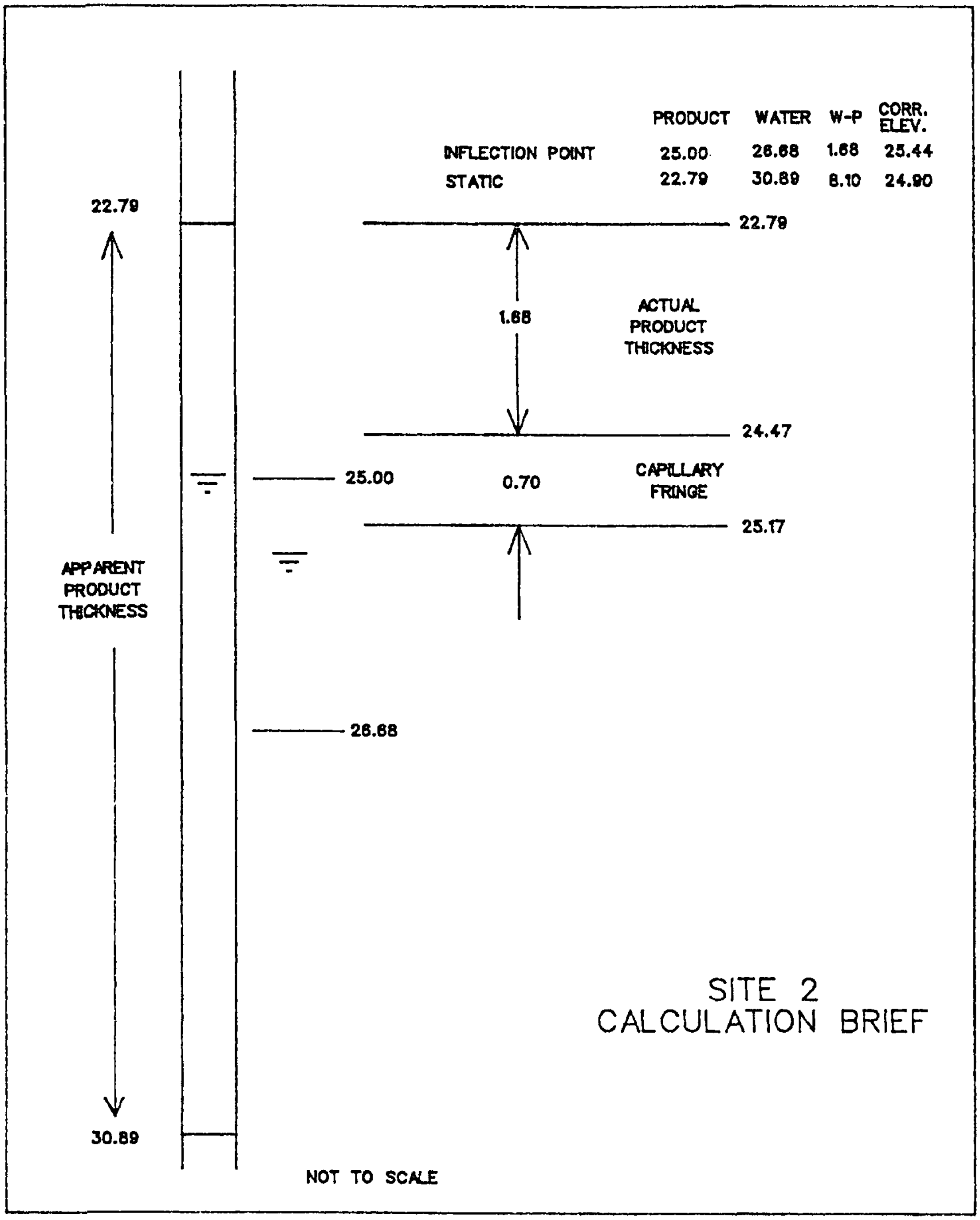


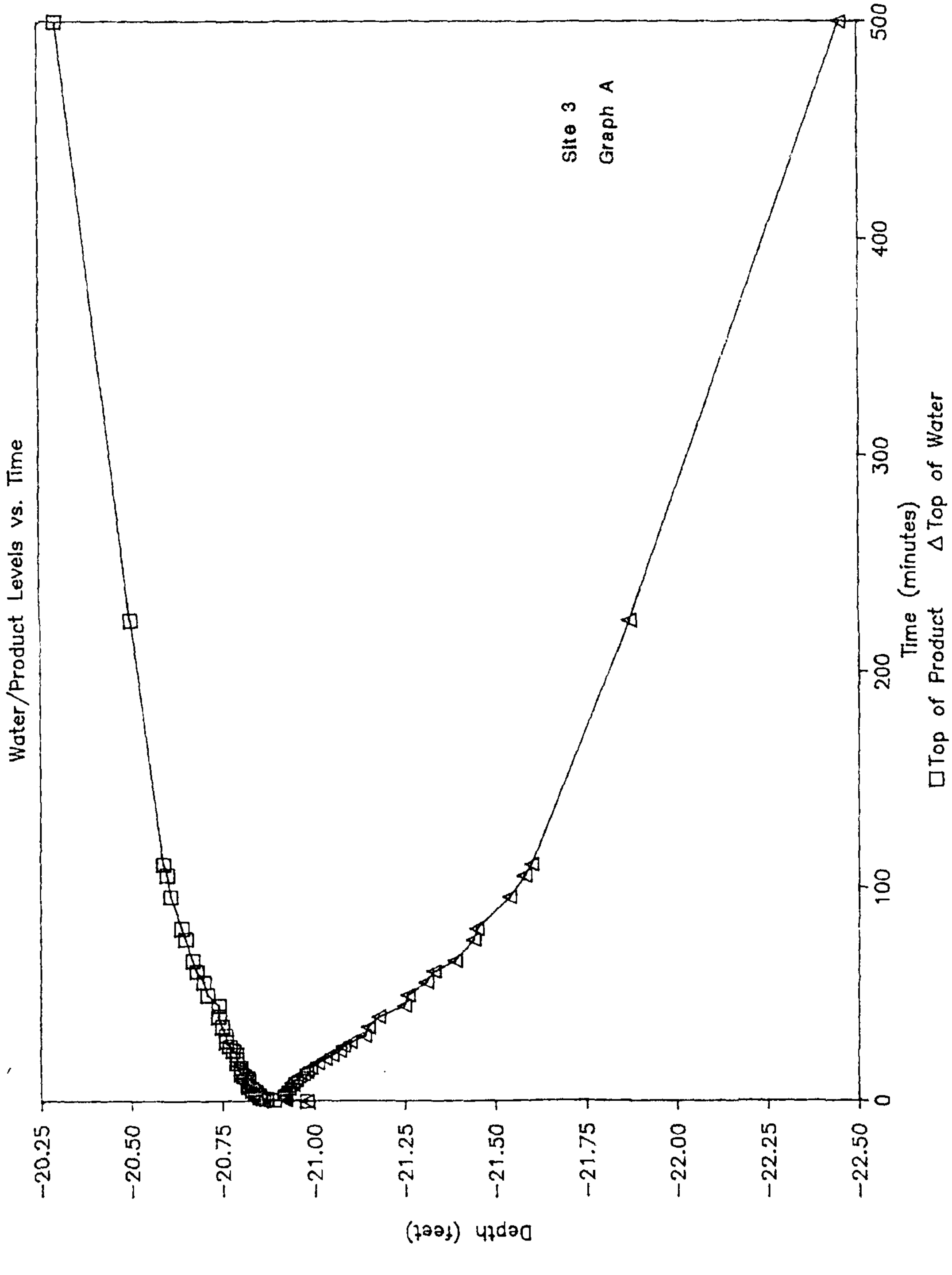
PRODUCT WATER W-P CORR. ELEV.
INFLECTION POINT 27.91 28.45 0.54 28.05
STATIC 26.49 32.04 5.55 27.93
26.49
26.49
0.54
ACTUAL PRODUCT THICKNESS
APPARENT PRODUCT THICKNESS
0.98
CAPILLARY FRINGE
27.91
27.99
28.45
32.04
SITE 1
CALCULATION BRIEF
NOT TO SCALE

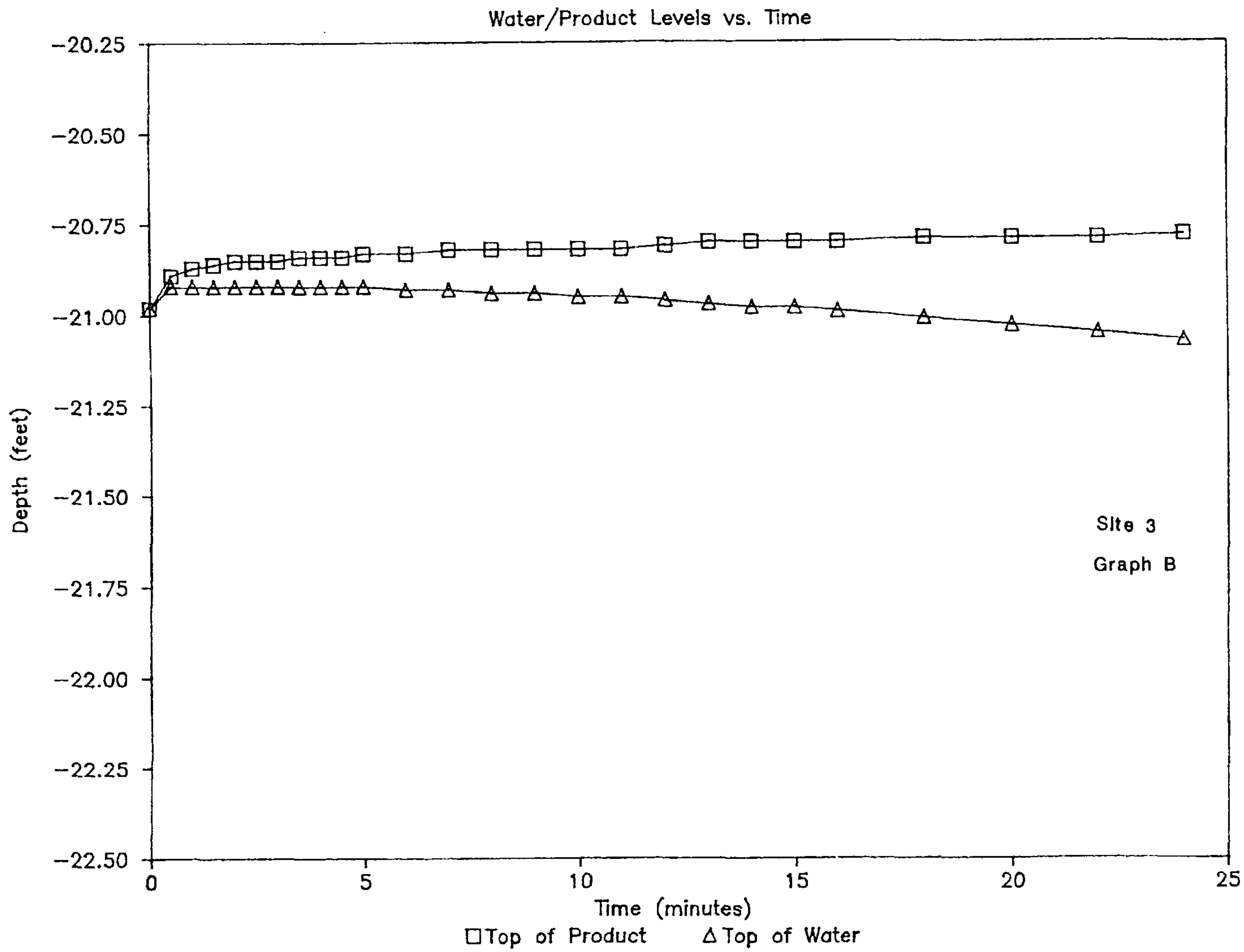


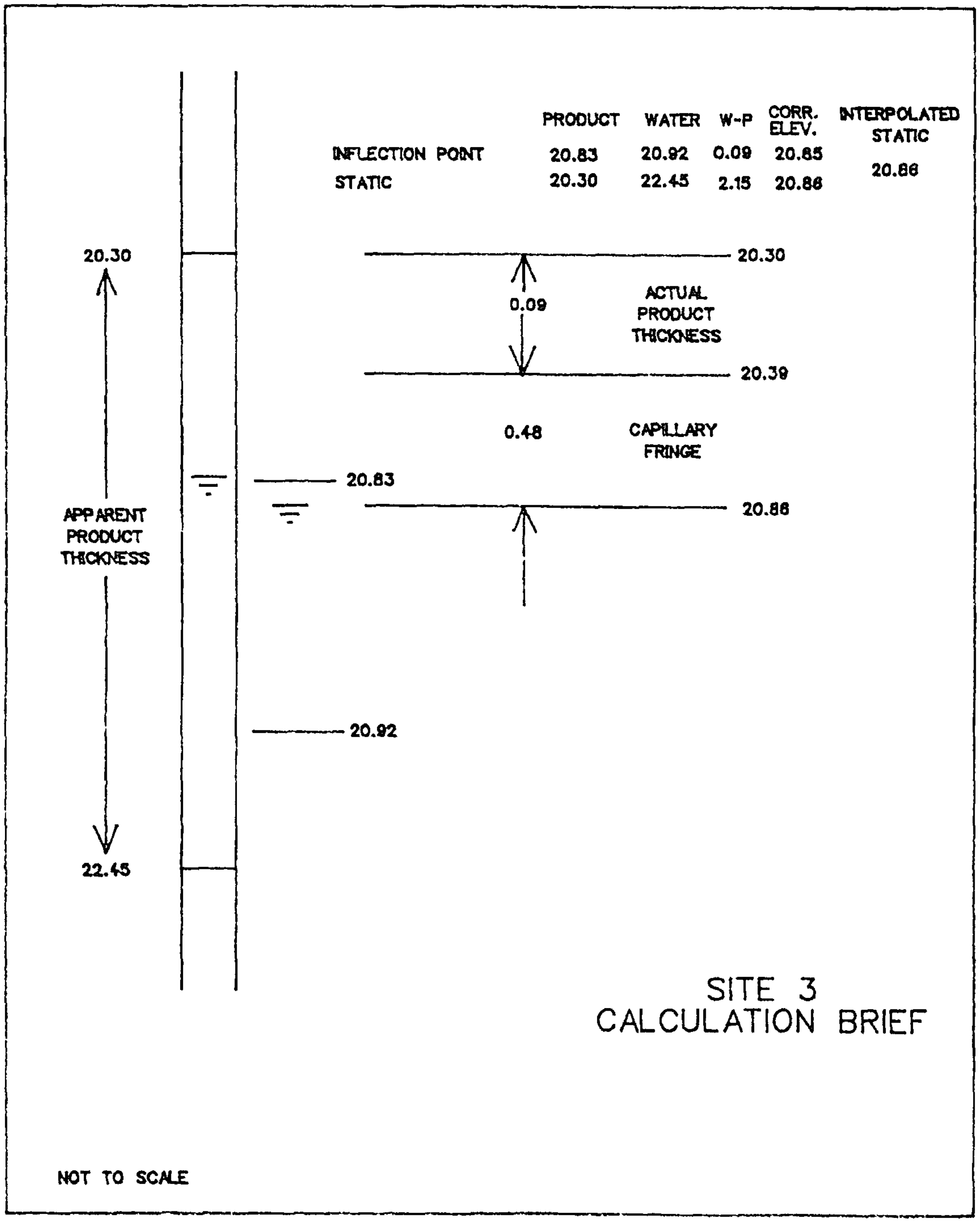
Water/Product Levels vs. Time
Site 2
Graph A
Depth (feet)
-22.00
-24.00
-26.00
-28.00
-30.00
-32.00
-34.00
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Time (minutes)
□Top of Product
ΔTop of Water


Water/Product Levels vs. Time
Site 2
Graph B
Depth (feet)
-22.00
-24.00
-26.00
-28.00
-30.00
-32.00
-34.00
160
276
392
508
624
740
856
972
1088
1204
1320
Time (minutes)
□Top of Product
△Top of Water

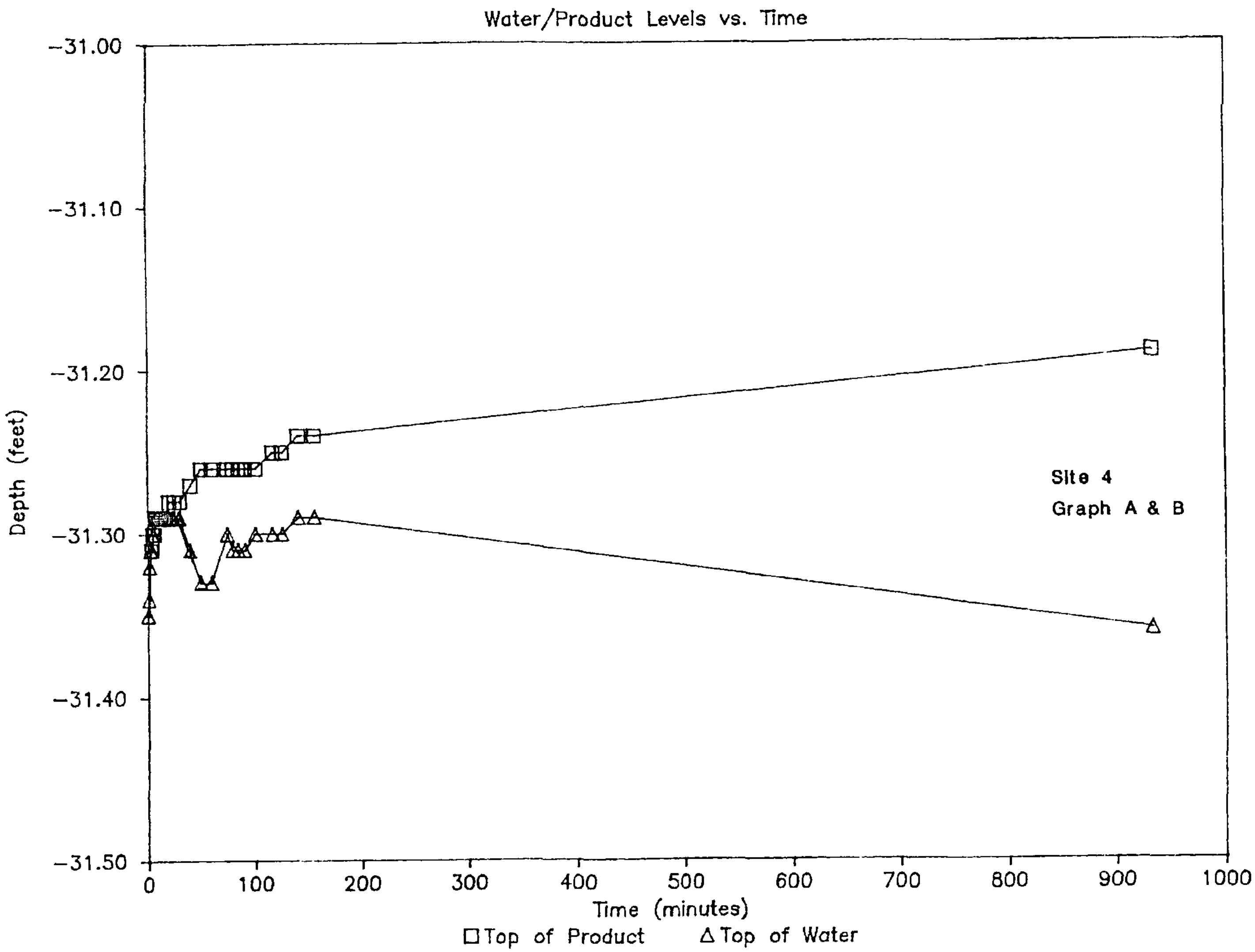

PRODUCT WATER W-P CORR. ELEV.
INFLECTION POINT 25.00 26.68 1.68 25.44
STATIC 22.79 30.89 8.10 24.90
22.79
22.79
1.68
ACTUAL PRODUCT THICKNESS
24.47
25.00
0.70
CAPILLARY FRINGE
25.17
APPARENT PRODUCT THICKNESS
26.68
30.89
NOT TO SCALE
SITE 2
CALCULATION BRIEF


Water/Product Levels vs. Time
Site 3
Graph A
Depth (feet)
-20.25
-20.50
-20.75
-21.00
-21.25
-21.50
-21.75
-22.00
-22.25
-22.50
0
100
200
300
400
500
Time (minutes)
□ Top of Product
Δ Top of Water

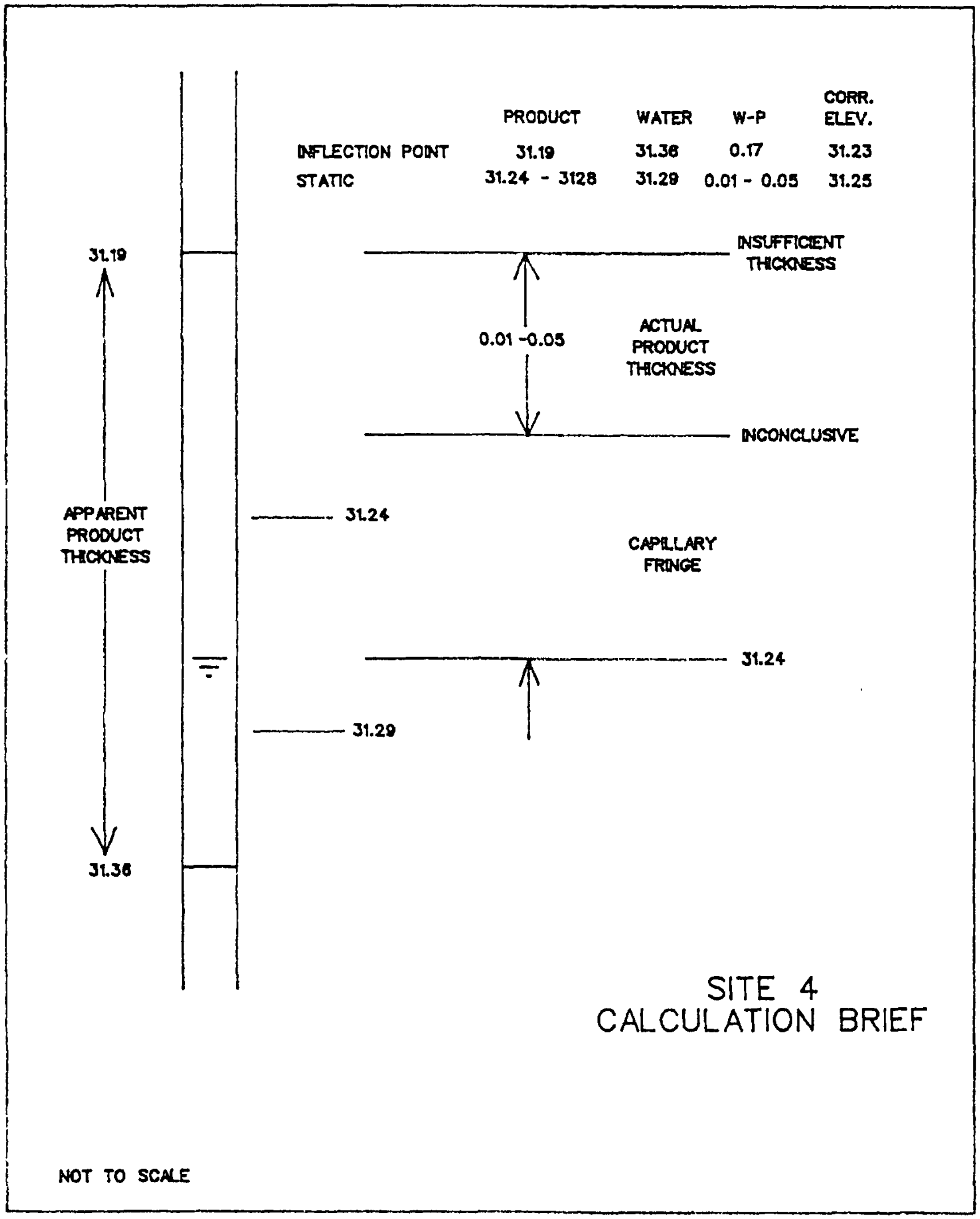

Water/Product Levels vs. Time
-20.25
-20.50
-20.75
-21.00
-21.25
-21.50
-21.75
-22.00
-22.25
-22.50
Depth (feet)
0
5
10
15
20
25
Time (minutes)
Site 3
Graph B
□Top of Product
ΔTop of Water



SITE 3
CALCULATION BRIEF



Water/Product Levels vs. Time
Depth (feet)
-31.00
-31.10
-31.20
-31.30
-31.40
-31.50
Time (minutes)
0
100
200
300
400
500
600
700
800
900
1000
Site 4
Graph A & B
□ Top of Product
Δ Top of Water


PRODUCT
WATER
W-P
CORR. ELEV.
INFLECTION POINT 31.19 31.36 0.17 31.23
STATIC 31.24 - 3128 31.29 0.01 - 0.05 31.25
31.19
INSUFFICIENT THICKNESS
0.01 -0.05
ACTUAL PRODUCT THICKNESS
INCONCLUSIVE
APPARENT PRODUCT THICKNESS
31.24
CAPILLARY FRINGE
31.24
31.29
31.36
SITE 4
CALCULATION BRIEF
NOT TO SCALE

DISCUSSION

Type one curves are characterized by both a rising water/product interface and a rising top of product level. Both a rising water/product interface and a rising top of product level would indicate that the thickness recorded in the monitor well is an actual formation thickness.

Type one curves were observed in original testing. However, subsequent testing performed on the monitor wells with more emphasis on complete bailing of the product from the wells caused a classification change. Since these wells now showed the characteristic rise and fall of water/product elevations observed for the type two curves. Site four is an example of the classification change from type one to type two.

The author maintains that it is possible for this type curve to be observed in sandy aquifers, that is those with a very small capillary fringe. Thus, the concept of a type one curve is still included here.

Type two curves are characterized by a rising product level and a water level that first rises then falls. The point where the water level starts to fall is referred to as the inflection point. The product thickness at this point is the actual product thickness. The stabilized water and product levels that occur after this point is referred to as a psuedoequilibrium.

The four test sites presented here have shown the rise and fall of the water/product interface characterized as Type 2 curve. The inflection point have been shown to correlate with the water table in the vicinity of the well bore from stabilized water/product readings. This water table was interpolated from monitor wells without an accumulation of product on site (Site 3) and interpolated to the test well using the calculated hydraulic gradient. The water table was also calculated by correcting for the difference in specific gravities between the product and water in the well bore. The specific gravity of the product was measured to be 0.74 at Site 1. However, the specific gravity of the product on sites two, three and four was not checked, but was assumed to be 0.74 as the product type was similar. In all sites the water was found to rise to this calculated value, then fall.

The apparent product thickness that is commonly measured during monitoring a site is actually a psuedoequilibrium. This would be the region to the extreme right of the 'A' graphs. This psuedoequilibrium is caused by the drainage of product off of the capillary fringe and the depression of the water in the well bore. The drainage of the product is a result of the head difference between the water table in the well bore and the top of capillary fringe that is supporting the product layer. The depression of the water in the well bore after the inflection point is a result of the difference in specific gravity of two immiscible fluids.

The author maintains that the difference in the actual water table, which has been shown to correlate with the observed inflection point, and the top of the stabilized product level is the sum of the actual formation thickness and the height of the capillary fringe. The soil type across the screened interval at all of the sites presented was generally classified as a fine sand. The values determined for the capillary fringe by this method appear to be reasonable values. An argument could be made that this measurement is the actual product thickness, but this would assume that no capillary fringe exists.

The actual thickness occurring at the inflection point can be explained by comparing the effective permeability values of the two fluids. The effective permeability value is compared rather than the relative permeability value using the assumption that the flow is occurring through separate layers, each of which is assumed to be 100% saturated with the particular fluid phase.

There will be some pendular water remaining in the product layer, which will tend to retard flow. This pendular water will be ignored in order to provide a relative comparison of the effective permeability values.

Given that the fluid phases are considered independent of each other and immiscible, Darcy's Law can be applied to each phase. Thus, Darcy's Law can be rearranged as follows:

$$V = (-k/u)(dP/ds - DG(dz/ds))$$

where:
- V = Volume flux across unit area in unit time along flow path
- K = Intrinsic permeability of medium
- U = Viscosity of the fluid
- dP/ds = Pressure gradient along flow path
- dz/ds = Hydraulic gradient along flow path
- D = Density of fluid
- G = Acceleration of gravity

The hydraulic gradient and pressure are considered to be small, so that the viscosity of the fluid is the controlling factor in this flow regime. Water has a greater viscosity (kinematic viscosity of 1.217 EE-5 ft 2/sec at STP) than regular gasoline, (kinematic viscosity of 0.73 EE-5 ft 2/sec at STP). Since the viscosity is inversley proportional to the volume flux, the volume flux of the product (gasoline) will be greater than the volume flux of water. In reality, however, the pendular water saturation will tend to reduce the flux of product. As such, the volume flux of product may not be greater than the volume flux of water. Under the assumptions, however, they should be on the same order of magnitude. Since the water has been shown to rise to the actual water table at the inflection point, it follows that sufficient time has passed for this to occur. Given that the water has had time to reach equilibrium in the well bore, it also follows that the product has had sufficient time to enter the well bore, provided that the volume flux of water is on the same order of magnitude as the product provides. As such, the product accumulation measured at the inflection point is a reasonable estimate of the actual formation thickness.

SUMMARY

Bailing product from a monitor well and recording the recharge of the water and product levels shows that the water will rise then fall. If the product thickness at the point where the water table begins to fall (inflection point) is measured, an actual formation product thickness can be obtained. The increase in product thickness after this point is a result of the product continuing to drain off of the capillary fringe, which is supporting the product. The distance between the inflection point and the measured stabilized top of product readings is the sum of the capillary fringe and the actual formation thickness.

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BIOGRAPHICAL SKETCH

Thomas S. Gruszczenski received his B.S. in Petroleum Engineering from West Virginia University. He is an Engineer in Training and is employed with S&ME, Inc. in Atlanta, Georgia. He is involved with various ground-water contamination investigations with an emphasis on underground storage tank problems.

FRONTIER FIELD SERVICES, LLC

Emmpire Abo Gas Plant

EM-34 Terrain Conductivity Survey

Profile:	100 North	**Date:**	6/4/2008
Spacing:	200 Feet	**Start:**	**Stop:**
Direction:	West to East	10:52 AM	11:09 AM
Scale:	100 mmhos/m	**Operator:**	ML RB

STATION	10 HD (mmhos/m)	10 VD (mmhos/m)	20 HD (mmhos/m)	20 VD (mmhos/m)	Comments
0 East	11.3	I	16.3	I	
200 East	18.6	21.5	15.9	33.5	
400 East	I	50.7	15.3	153.3	Moved location 25 feet north due to fence
600 East	I	58.6	42.7	I	Electric Substation approximately 25 feet NE
800 East	9.4	13.9	13.8	21.2	
1000 East	8.1	13.6	12.7	30.1	
1200 East	12.1	14.9	12.3	28.5	

Notes:

FRONTIER FIELD SERVICES, LLC
Emmpire Abo Gas Plant
EM-34 Terrain Conductivity Survey

Profile: 200 North | **Date:** 6/4/2008
Spacing: 200 Feet | **Start:** **Stop:**
Direction: West to East | 08:06 AM 08:28 AM
Scale: 100 mmhos/m | **Operator:** ML RB

STATION	10 HD (mmhos/m)	10 VD (mmhos/m)	20 HD (mmhos/m)	20 VD (mmhos/m)	Comments
0 East	12.0	75.4	10.7	63.6	
200 East	23.8	82.4	43.2	I	
400 East	11.5	46.6	13.4	107.2	
600 East	8.3	27.8	11.2	79.2	
800 East	11.0	40.4	18.0	150.6	Overhead power lines west and south
1000 East	8.8	111.3	34.3	195.4	Overhead power lines south
1200 East	15.4	75.5	31.2	I	Overhead power lines south and west

Notes:

FRONTIER FIELD SERVICES, LLC

Emmpire Abo Gas Plant

EM-34 Terrain Conductivity Survey

Profile:	400 North	**Date:**	6/4/2008
Spacing:	200 Feet	**Start:**	**Stop:**
Direction:	East to West	08:33 AM	08:52 AM
Scale:	100 mmhos/m	**Operator:**	ML RB

STATION	10 HD (mmhos/m)	10 VD (mmhos/m)	20 HD (mmhos/m)	20 VD (mmhos/m)	Comments
0 East	9.2	I	9.1	I	
200 East	16.5	27.4	9.4	11.1	
400 East	4.4	I	13.6	I	Telephone cable (N-S) approx. 2 feet east
600 East	11.4	14.3	11.4	18.2	Gas well 50 feet south and 40 feet east
800 East	6.9	15.4	8.6	40.6	Overhead power line approx. 10 feet west
1000 East	6.1	12.5	8.8	22.6	
1200 East	5.5	10.8	7.3	15.3	

Notes:

FRONTIER FIELD SERVICES, LLC
Emmpire Abo Gas Plant
EM-34 Terrain Conductivity Survey

Profile:	600 North	**Date:**	**6/4/2008**
Spacing:	200 Feet	**Start:**	**Stop:**
Direction:	West to East	08:55 AM	09:38 AM
Scale:	100 mmhos/m	**Operator:**	ML RB

STATION	10 HD (mmhos/m)	10 VD (mmhos/m)	20 HD (mmhos/m)	20 VD (mmhos/m)	Comments
0 East	7.2	I	10.0	I	
200 East	11.8	11.4	11.4	12.2	
400 East	19.2	32.5	16.8	29.4	
600 East	12.6	I	11.0	I	
800 East	8.3	I	9.3	I	Overhead power (N-S) approx. 1 foot west
1000 East	10.0	18.8	10.7	19.3	
1200 East	7.0	32.3	7.0	I	Pipeline (NW-SE) approx. 20 feet east

Notes:

FRONTIER FIELD SERVICES, LLC

Emmpire Abo Gas Plant

EM-34 Terrain Conductivity Survey

Profile:	800 North	**Date:**	**6/4/2008**
Spacing:	200 Feet	**Start:**	**Stop:**
Direction:	East to West	09:40 AM	10:00 AM
Scale:	100 mmhos/m	**Operator:**	ML RB

STATION	10 HD (mmhos/m)	10 VD (mmhos/m)	20 HD (mmhos/m)	20 VD (mmhos/m)	Comments
0 East	91.1	I	76.9	I	Pipeline (N-S) approx. 10 feet east
200 East	8.4	21.0	10.5	42.1	
					N-S Reading
400 East	11.1	29.2	10.6	59.3	
					Pipeline station - moved location 40 feet N
600 East	8.6	17.8	9.7	32.5	
800 East	6.8	10.4	8.8	11.6	Overhead power (N-S) approx. 10 feet west
1000 East	7.1	26.7	4.9	118.4	
1200 East	13.3	10.3	9.4	11.2	

Notes: