

Permit Application

FOR RENEWAL

Basin Disposal, Inc.

OCD Facility Permit No.: NM-1-0005

San Juan County, New Mexico

VOLUME IV: SITING AND HYDROGEOLOGY

Submitted To:

**New Mexico Energy, Minerals, and Natural Resources Department
Oil Conservation Division
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November 2019 (Updated 2025) Parkhill
Project #: 01165722

Parkhill

**Basin Disposal, Inc.
Application for Permit Renewal**

November 2019 (Updated December 2022)

TABLE OF CONTENTS

C-137 APPLICATION FOR SURFACE WASTE MANAGEMENT FACILITY

STATEMENT OF APPLICATION

VOLUME I: PERMIT APPLICATION TEXT

SECTION	TITLE
19.15.36	SURFACE WASTE MANAGEMENT FACILITIES

VOLUME II: FACILITY MANAGEMENT PLANS

SECTION	TITLE
1	OPERATIONS, INSPECTION, AND MAINTENANCE PLAN
2	OIL FIELD WASTE MANAGEMENT PLAN
3	HYDROGEN SULFIDE (H ₂ S) PREVENTION AND CONTINGENCY PLAN
4	CLOSURE/POST-CLOSURE PLAN
5	CONTINGENCY PLAN
6	MIGRATORY BIRD PROTECTION PLAN

VOLUME III: ENGINEERING DESIGN AND CALCULATIONS

SECTION	TITLE
1	ENGINEERING DESIGN
2	LINER CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN
3	GEOSYNTHETIC APPLICATION AND COMPATIBILITY DOCUMENTATION
4	STORMWATER MANAGEMENT PLAN
5	WAVE ACTION CALCULATIONS

VOLUME IV: SITING AND HYDROGEOLOGY

SECTION	TITLE
1	SITING CRITERIA
2	HYDROGEOLOGY

LIST OF PERMIT PLANS

SHEET	TITLE
1	SITE LOCATION AND DRAWING INDEX
2.	EXISTING SITE CONDITIONS
3.	GRADING PLAN
4.	CROSS SECTIONS
5.	DRAINAGE PLAN
6.	DRAINAGE CHANNEL PROFILES
7.	ENGINEERING DETAILS
8.	LINER DETAILS

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 1: Siting Criteria

November 2019 (Updated January 2025)

TABLE OF CONTENTS

Section No.	Title	Page
1.0	INTRODUCTION.....	IV.1-1
1.2	Site Location.....	IV.1-1
1.3	Facility Description	IV.1-2
1.3	Purpose.....	IV.1-2
2.0	SITING CRITERIA FOR SURFACE WASTE MANAGEMENT FACILITIES.....	IV.1-2
2.1	Depth to Groundwater	IV.1-3
2.2	Watercourse, Lakebed, Sinkhole, or Playa Lake	IV.1-3
2.3	Wellhead Protection Area; 100-Year Floodplain	IV.1-4
2.4	Wetlands	IV.1-5
2.5	Subsurface Mines.....	IV.1-5
2.6	Land Use Setbacks	IV.1-5
2.7	Unstable Areas.....	IV.1-6
2.7.1	<i>Karst Potential</i>	IV.1-6
2.8	Maximum Size.....	IV.1-7
3.0	SUMMARY	IV.1-7

LIST OF FIGURES

Figure No.	Title
IV.1.1	SITE LOCATION
IV.1.2	SITE PLAN
IV.1.3	USGS QUADRANGLE MAP
IV.1.4A	WELLHEAD PROTECTION AREA MAP
IV.1.4B	LOCATIONS OF WATER WELLS AND SPRINGS
IV.1.5	FEMA FLOODPLAIN MAP
IV.1.6A	NATIONAL WETLANDS INVENTORY MAP
IV.1.6B	WELLS AND WATERCOURSES WITHIN ONE MILE
IV.1.7	MINES, MILLS AND QUARRIES MAP
IV.1.8	AERIAL PHOTO/LAND USE MAP
IV.1.9	KARST TERRAINS MAP
IV.1.10	GEOLOGIC FAULTS MAP
IV.1.11	SEISMIC IMPACT ZONES MAP
IV.1.12	PLATS OF SURVEY

1.0 INTRODUCTION

Basin Disposal, Inc. (BDI) is an existing Surface Waste Management Facility (SWMF) providing oil field waste liquids (OFWL) disposal services. The existing Basin Disposal SWMF is subject to regulation under the New Mexico Oil and Gas Rules, specially 19.15.36 NMAC, administered by the Oil Conservation Division (OCD) of the NM Energy, Minerals, and Natural Resources Department (NMEMNRD). This document is a component of the "Application for Permit Renewal" that proposes continued operations of the existing approved waste processing and disposal capabilities. The Facility is designed in compliance with 19.15.36 NMAC, and will be operated in compliance with a Surface Waste Management Facility Permit issued by the OCD. The Facility is owned and operated by Basin Disposal Inc.

BDI only accepts liquid waste from the production and exploration of oil fields in northwest New Mexico and the surrounding areas. The existing facility is organized in a pattern that allows for specific liquid waste acceptance, treatment, evaporation, or injection of clean liquid.

1.2 Site Location

BDI is located in unincorporated San Juan County on 27.77 acres entirely within Section 3, Township 29 North, Range 11 West approximately 3 miles north of the intersection of Highway 550 and 64 (**Figure IV.1.1**). Coordinates for the approximate center of the BDI site are Latitude 36°45'19.92" and Longitude -107°58'58.73". The site is situated approximately 4 miles north of the San Juan River, and about 4.7 miles south of the Animas River on Crouch Mesa, about 500 feet and 400 feet in elevation above these respective river plains. The site occupies the West Fork of Bloomfield Canyon, an ephemeral drainage channel that drains south to the San Juan River. The site slopes gently to the east and southeast, from a maximum elevation of 5,750 feet to less than 5,700 feet.

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 1: Siting Criteria
November 2019 (Updated January 2025)

1.3 Facility Description

The existing BDI facility is comprised of 27.77 acres and is comprised of the following:

- 2 existing evaporation ponds (1 pending construction)
- 12 existing receiving tanks (6 pending construction)
- 4 existing oily water receiving tanks
- 3 existing skimmed oil tanks
- 3 existing oil heating tanks
- 3 existing settling tanks
- 7 existing oil sales tanks (2 pending construction)
- 3 existing filtered water tanks
- 4 existing bleach tanks
- 1 existing concrete sludge solidification basin
- 2 existing covered below grade tanks (containment sumps)
- 1 existing UIC Class II injection well for disposal of produced water
- 2 existing separation tanks
- Various support facilities including an office, a maintenance building, roads, and a storm water detention basin.

Oil field wastes are delivered to the BDI SWMF from oil and gas exploration and production operations in northwestern New Mexico and southwest Colorado. The Site Plan provided as **Figure IV.1.2** identify the locations of the Disposal facilities, evaporation/storage ponds, and all structures. Perimeter of the site is surrounded by commercial/industrial businesses on three sides and buffered by a bluff on the west side of the Facility.

1.3 Purpose

This section provides compliance demonstrations for the Siting Criteria for Surface Waste Management Facilities specified in the NM Oil and Gas Rules, 19.15.36.13.A-C NMAC. These requirements include depth to groundwater; and proximity of watercourse, floodplains, wetlands, mines, residences/institutions, and unstable areas. The BDI site meets the Siting Requirements applicable to a Surface Waste Management Facility (i.e., 19.15.36.13.A-C NMAC).

2.0 SITING CRITERIA FOR SURFACE WASTE MANAGEMENT FACILITIES

In order to re-confirm the suitability of the proposed BDI site for a Surface Waste Management Facility, an evaluation with respect to each of the Siting Requirements detailed in 19.15.36.13.A-C NMAC was performed and is presented herein. Based upon available information, the proposed BDI site satisfies the size restriction and each of the eight siting criteria. Following is a detailed description of the BDI Site's compliance with the siting criteria. Each siting criterion is defined, applied and discussed individually. The following sections provide the regulatory citation for each

criterion in bold, followed by a narrative response. In most cases, a Figure or study is referenced to demonstrate compliance with applicable standard(s).

2.1 Depth to Groundwater

No other surface waste management facility shall be located where ground water is less than 50 feet below the lowest elevation at which the operator will place oil field waste. (19.15.36.13.A(5) NMAC)

The Oil and Gas Rules define ground water as *“interstitial water that occurs in saturated earth material and is capable of entering a well in sufficient amounts to be used as a water supply”* per 19.15.2.7.G(10) NMAC. A comprehensive subsurface investigation completed by John Shomaker & Associates in 2008 concludes that any shallow groundwater has excessive TDS concentrations; and that the first regulated water-bearing zone is more than 100 feet (ft) below the deepest oil field waste management units (**Volume IV.2**). The upper water-bearing zone will be protected from additional impacts by Basin Disposal's liner systems, surface water controls, operating procedures, etc.

2.2 Watercourse, Lakebed, Sinkhole, or Playa Lake

No surface waste management facility shall be located: within 200 feet of a watercourse, lakebed, sinkhole or playa lake. (19.15.36.13.B(1) NMAC)

The Oil and Gas Rules specifically define watercourses and playa lakes as follows:

“Watercourse” means a river, creek, arroyo, canyon, draw or wash or other channel having definite banks and bed with visible evidence of the occasional flow of water. (19.15.2.7.W(4) NMAC)

“Playa lake” means a level or nearly level area that occupies the lowest part of a completely closed basin and that is covered with water at irregular intervals, forming a temporary lake. (19.15.2.7.P(4) NMAC)

The Facility is not located within 200 feet of a lakebed, sinkhole or playa lake. An ephemeral (intermittent) watercourse does exist immediately south of the facility fence line. Documentation regarding the locations of watercourses, lakebeds, sinkholes and playa lakes with respect to the BDI site is provided in **Figure IV.1.3**. The operations, maintenance and inspections programs instituted at BDI provide protection of fresh water, public health, and the environment equivalent to the required separation from a watercourse, lakebed, sinkhole or playa described in this Part. Existing measures have been proven to be effective in preventing runoff from the facility impacting the arroyo. Therefore, BDI is requesting an exception to the 200-foot separation requirements for watercourses (19.15.36.13.B(1) NMAC). **Figure IV.1.3**, USGS Quadrangle Map (11 inches x 17 inches), shows surface features on and adjacent to the Basin Disposal site, and **Figure IV.1.2** provides detailed topographic information for the footprint of the facility. The "Karst Terrain Map" (**Figure IV.1.9**) also shows that the potential for subsidence features that might create sinkhole or playa conditions are absent from the region.

The map in **Figure IV.1.6B** shows terrain, wells and drainages and the region within a one mile radius of the Facility. No perennial streams or springs are present within one mile of the Basin Disposal Facility; however, several ephemeral washes are present. There are no water wells within one mile of the Basin Disposal Facility. Locations of groundwater monitoring wells in the vicinity of the Basin Disposal Facility are shown in **Figure IV.1.6B**.

2.3 Wellhead Protection Area; 100-Year Floodplain

No surface waste management facility shall be located: within an existing wellhead protection area or 100-year floodplain. (19.15.36.13.B(2) NMAC)

The Oil and Gas Rules specifically define wellhead protection areas as follows:

“Wellhead protection area” means the area within 200 horizontal feet of a private, domestic fresh water well or spring used by less than five households for domestic or stock watering purposes or within 1000 horizontal feet of any other fresh water well or spring. Wellhead protection areas does not include areas around water wells drilled after an existing oil or gas waste storage, treatment or disposal site was established. (19.15.2.7.W(8) NMAC)

In addition, fresh water is defined as follows:

“Fresh water” to be protected includes the water in lakes and playas (regardless of quality, unless the water exceeds 10,000 mg/l TDS and it can be shown that degradation of the particular water body will not adversely affect hydrologically connected fresh ground water), the surface waters of streams regardless of the water quality within a given reach, and underground waters containing 10,000 mg/l or less of TDS except for which, after notice and hearing, it is found there is no present or reasonably foreseeable beneficial use that contamination of such waters would impair. (19.15.2.7.F(3) NMAC)

BDI is not located within an existing wellhead protection area or 100-year floodplain. The Wellhead Protection Area Map (**Figure IV.1.4A**) provides the locations, with 200 ft setbacks, for water supply wells in the area based on data provided by the Office of the State Engineers (OSE). Not only are there no water supply wells on-site, the nearest Wellhead Protection Area is over 1,100 ft from the BDI Facility. The closest municipal water supply well belongs to the city of Bloomfield and is located over 3 miles south-southeast of the BDI site. BDI is not located within 1,000 feet of an existing spring, the closest of which is located approximately 5 miles north of the site in the city of Aztec (**Figure IV.1.4B**).

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM FM35045C0740F, August 2010) was reviewed for 100-year floodplain delineations near the facility (**Figure IV.1.5**). A review of these maps, in addition to site inspections, did not indicate watercourses or surface features characteristic of a regulated floodplain within or adjacent to the site; or any

"waters of the U.S." regulated by ACOE 404. The nearest regulated floodplain is over 1,000 ft from the site to the east.

2.4 Wetlands

No surface waste management facility shall be located: within, or within 500 feet of, a wetland. (19.15.36.13.B(3) NMAC)

The Oil and Gas Rules specifically define wetlands as follows:

“Wetlands” means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions in New Mexico. This definition does not include constructed wetlands used for wastewater treatment purposes. (19.15.2.7.W(9) NMAC)

BDI is not located within 500 ft of a wetland. There are no areas meeting the definition of a regulated wetland on or adjacent to the BDI property as defined by the National Wetland Inventory Mapping Convention. The applicable National Wetlands Inventory Map published by the U.S. Department of the Interior is provided as **Figure IV.1.6A**, which demonstrates that the nearest regulated wetland is over 2.5 miles south-southeast of the BDI site.

2.5 Subsurface Mines

No surface waste management facility shall be located: within the area overlying a subsurface mine. (19.15.36.13.B(4) NMAC)

There are no known records of subsurface mines in the immediate vicinity of the facility location. The "Mines, Mills and Quarries in New Mexico" map generated by New Mexico Energy, Minerals, and Natural Resources Department confirms the absence of these sites in the vicinity of BDI (**Figure IV.1.7**). The nearest subsurface mine is shown to be over 8 miles from the BDI facility.

2.6 Land Use Setbacks

No surface waste management facility shall be located: within 500 feet from the nearest permanent residence, school, hospital, institution or church in existence at the time of initial application. (19.15.36.13.B(5) NMAC)

BDI is in excess of 500 ft from the nearest permanent residence, school, hospital, institution, or church. The examination of land use setbacks for the BDI facility includes a site reconnaissance, aerial photo review and evaluation of adjacent San Juan County parcel (zoning) map (**Figure IV.1.8**). The results of this analysis conclude that:

- The surrounding land uses are primarily industrial/commercial in nature, highly compatible with BDI established and proposed activities.
- Access to BDI and nearby facilities is adequate and compatible with current traffic patterns.
- The nearest residential land use is over 1,000 ft directly south of the site; and other protected land uses are even more remote.
- There is no trend for development of residential, institutional, or educational facilities in the vicinity of the BDI site.

2.7 Unstable Areas

No surface waste management facility shall be located: within an unstable area, unless the operator demonstrates that engineering measures have been incorporated into the surface waste management facility design to ensure that the surface waste management facility's integrity will not be compromised. (19.15.36.13.B(6) NMAC)

The Oil and Gas Rules specifically define unstable area as follows:

“Unstable area” means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of a division-approved facility's structural components. Examples of unstable areas are areas of poor foundation conditions, areas susceptible to mass earth movements and karst terrain areas where karst topography is developed as a result of dissolution of limestone, dolomite, or other soluble rock. Characteristic physiographic features of karst terrain include sinkholes, sinking streams, caves, large springs or blind alleys. (19.15.2.7.U(6) NMAC)

This section addresses regulatory requirements for defining site characteristics related to earth stability at the proposed facility.

2.7.1 Karst Potential

Gordon/PSC performed the following “unstable areas” analysis based on review of potential karst (**Figure IV.1.9**) or other earth stability features within the vicinity of the BDI site. There are no active faults known within 200 ft of the site (**Figure IV.1.10**), and earthquake risk is low (**Figure IV.1.11**). The site topography is characterized by relatively gently sloping surfaces underlain by shale, sandstone, and alluvium. No limestone or other carbonate rock is exposed near the property, and no sinkholes or slumps have been reported within the region (Ward, 1990). Select textural and hydrologic properties of the stratigraphic units encountered in boreholes and in the regional geology are described in the Shomaker report. These properties and the inferred geotechnical characteristics of the units, together with the low seismic risk, document that foundation conditions are suitable for the surface ponds at this site. In summary, the topography of the site, and the nature of the sediments beneath the facility, indicate that the site is stable and suitable for the installation of existing and proposed waste processing and containment facilities.

2.8 Maximum Size

No surface waste management facility shall exceed 500 acres. (19.15.36.13.C NMAC)

The BDI occupies 27.77 acres, in northwest quarter of Section 3, Township 29 North, Range 11 West of the New Mexico Principal Meridian. The Site Location Map, included as **Figure IV.1.1**, identifies the limits of the BDI facility; and the detailed Plat Survey Map is provided as **Figure IV.1.12**. The facility's permitted footprint includes 13.18 acres (Tract 2: Remainder Tract) and 14.59 acres as shown on **Figure IV.1.12**.

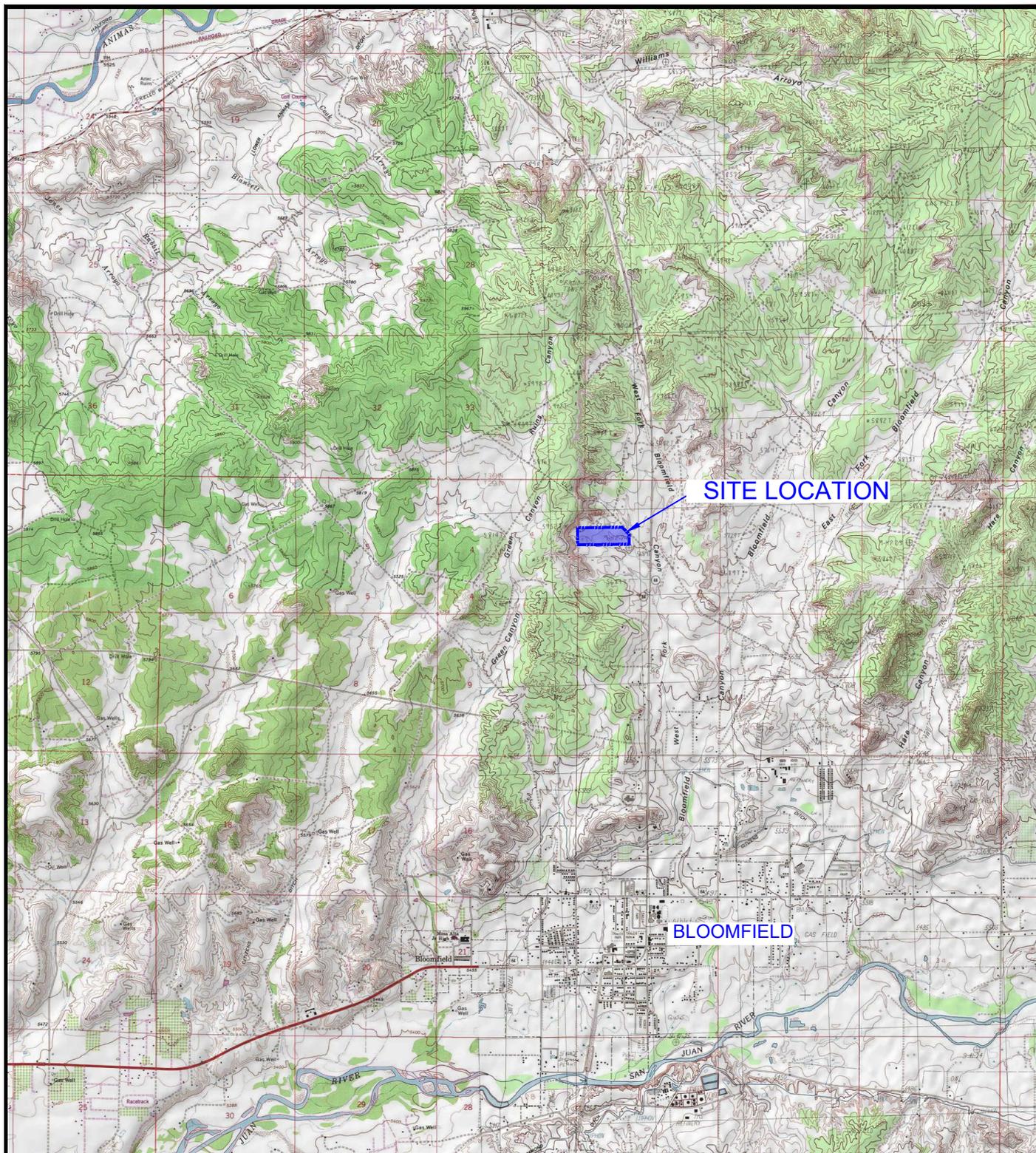
3.0 SUMMARY

In conclusion, the BDI meets and exceeds each of the Part 36 Surface Waste Management Siting Criteria; and has operated with no negative environmental consequences at the same site for over 15 years. BDI offers a long-term sustainable disposal alternative for growing E&P activities in northwest NM.

Due to its unique remote location, BDI does not conflict with any of the regional land uses or cultural resources. Water beneath the site is not produced in useable quantities, and local climatology demonstrates that the BDI is ideally located in an arid zone of low precipitation and high evapotranspiration.

FIGURES

- IV.1.1 SITE LOCATION
- IV.1.2 SITE PLAN
- IV.1.3 USGS QUADRANGLE MAP
- IV.1.4A WELLHEAD PROTECTION AREA MAP
- IV.1.4B LOCATIONS OF WATER WELLS AND SPRINGS
- IV.1.5 FEMA FLOODPLAIN MAP
- IV.1.6A NATIONAL WETLANDS INVENTORY MAP
- IV.1.6B WELLS AND WATERCOURSES WITHIN ONE MILE
- IV.1.7 MINES, MILLS AND QUARRIES MAP
- IV.1.8 AERIAL PHOTO/LAND USE MAP
- IV.1.9 KARST TERRAINS MAP
- IV.1.10 GEOLOGIC FAULTS MAP
- IV.1.11 SEISMIC IMPACT ZONES MAP
- IV.1.12 PLATS OF SURVEY



NOTE:
 1. GEOGRAPHIC CENTER, 36° 45' 19.92" N -107° 58' 58.73" W

Drawing: A:\2022\1657.22\03_DSGN\01_DWG\050_CIVIL\02_CONTENT\FIGURES\SITE LOCATION.dwg
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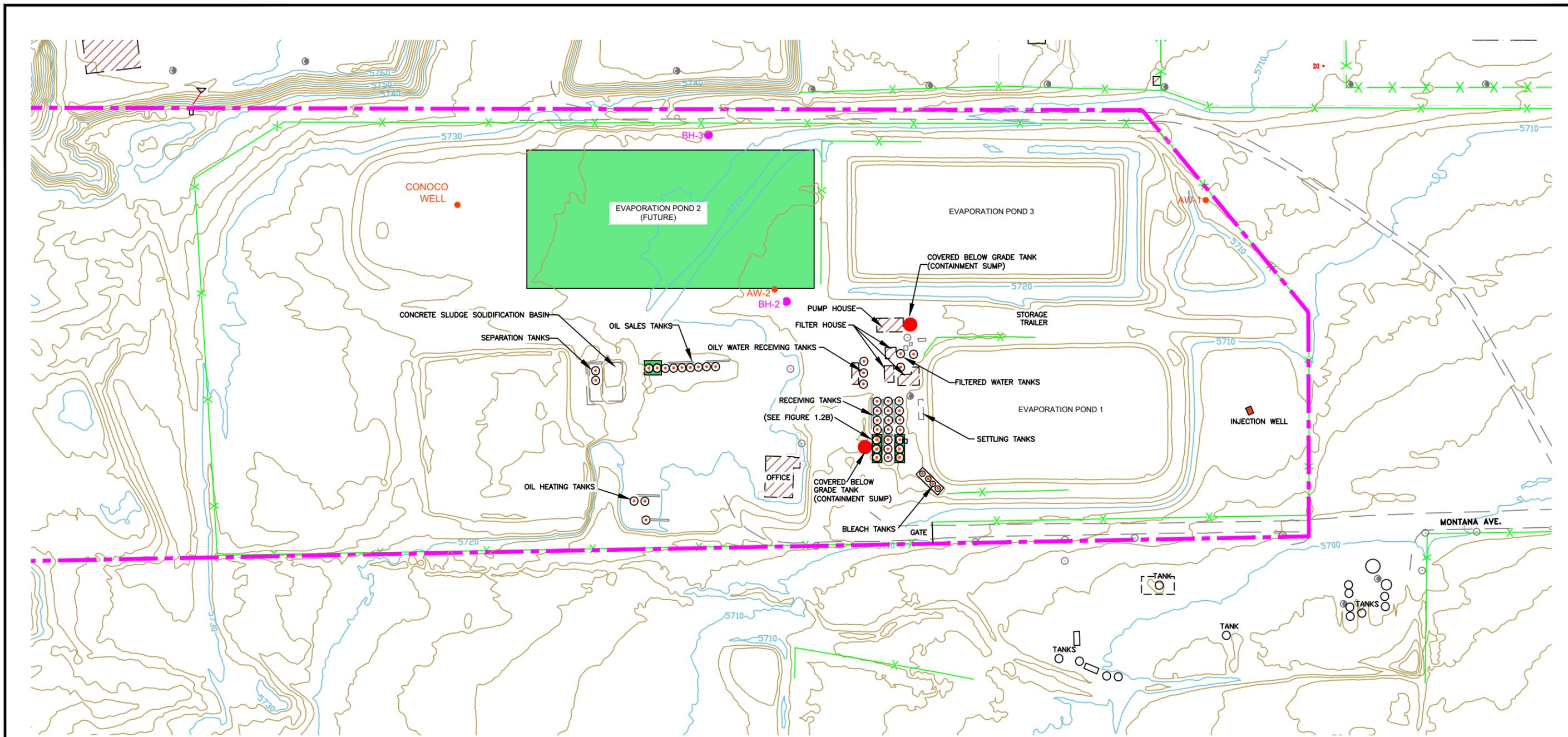
SITE LOCATION MAP

SURFACE WASTE MANAGEMENT FACILITY
 BASIN DISPOSAL, INC.
 SAN JUAN COUNTY, NEW MEXICO



333 Rio Rancho Blvd. NE
 Suite 400
 Rio Rancho, New Mexico,
 Phone: 505-867-6990
 Fax: 505-867-6991

DATE: 07/05/2022	CAD: SITE LOCATION.dwg	PROJECT #: 1657.22
DRAWN BY: DMI	REVIEWED BY: MWK	FIGURE IV.1.1
APPROVED BY: MWK	www.parkhill.com	



BOREHOLE LOCATIONS	
BH-2	LAT 36°45'20.54269"N (NAD 83) LONG 107°59'02.70950"W (NAD83) ELEV: 5717.98 (GROUND)
BH-3	LAT 36°45'22.92950"N (NAD 83) LONG 107°59'04.21563"W (NAD83) ELEV: 5727.46 (GROUND)
AW-1	LAT 36°45'22.01797"N (NAD 83) LONG 107°58'55.15402"W (NAD83) ELEV: 5717.85 (TOP OF CAP)
AW-2	LAT 36°45'20.58589"N (NAD 83) LONG 107°59'02.96163"W (NAD83) ELEV: 5722.20 (TOP OF CAP)

LEGEND			
	PROPERTY BOUNDARY		CONCRETE SLAB
	2' CONTOUR (EXISTING)		ASSESSMENT WELL
	10 CONTOUR (EXISTING)		BOREHOLE LOCATION
	ROADWAY (EXISTING)		TANKS
	FENCE (EXISTING)		LIGHT POLE (EXISTING)
	PERMITTED NOT YET CONSTRUCTED		POWER POLE (EXISTING)
	CULVERT		COVERED BELOW GRADE TANK (CONTAINMENT SUMP)
	STRUCTURE		



SITE PLAN

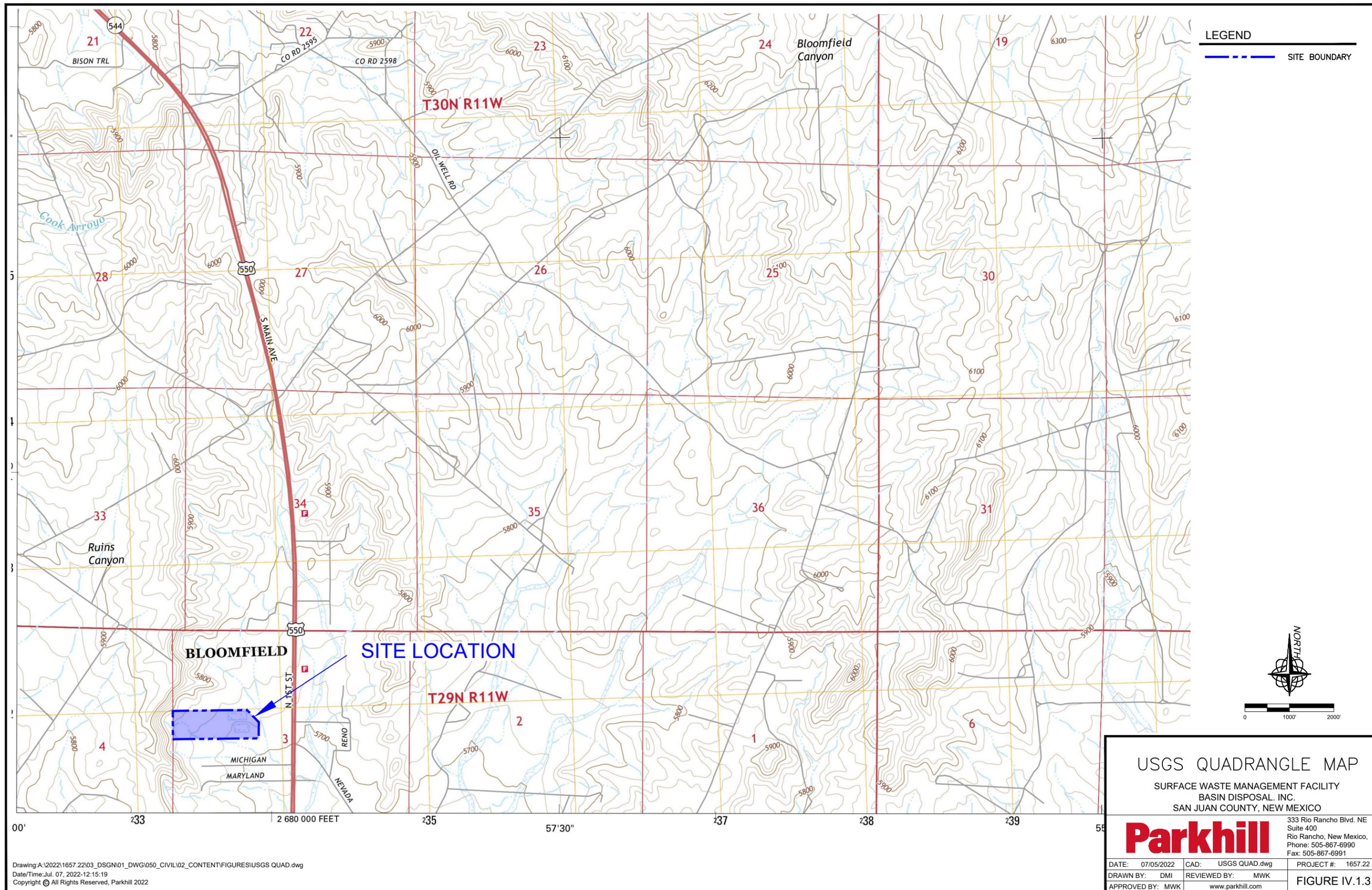
SURFACE WASTE MANAGEMENT
BASIN DISPOSAL, INC.
BLOOMFIELD, NEW MEXICO

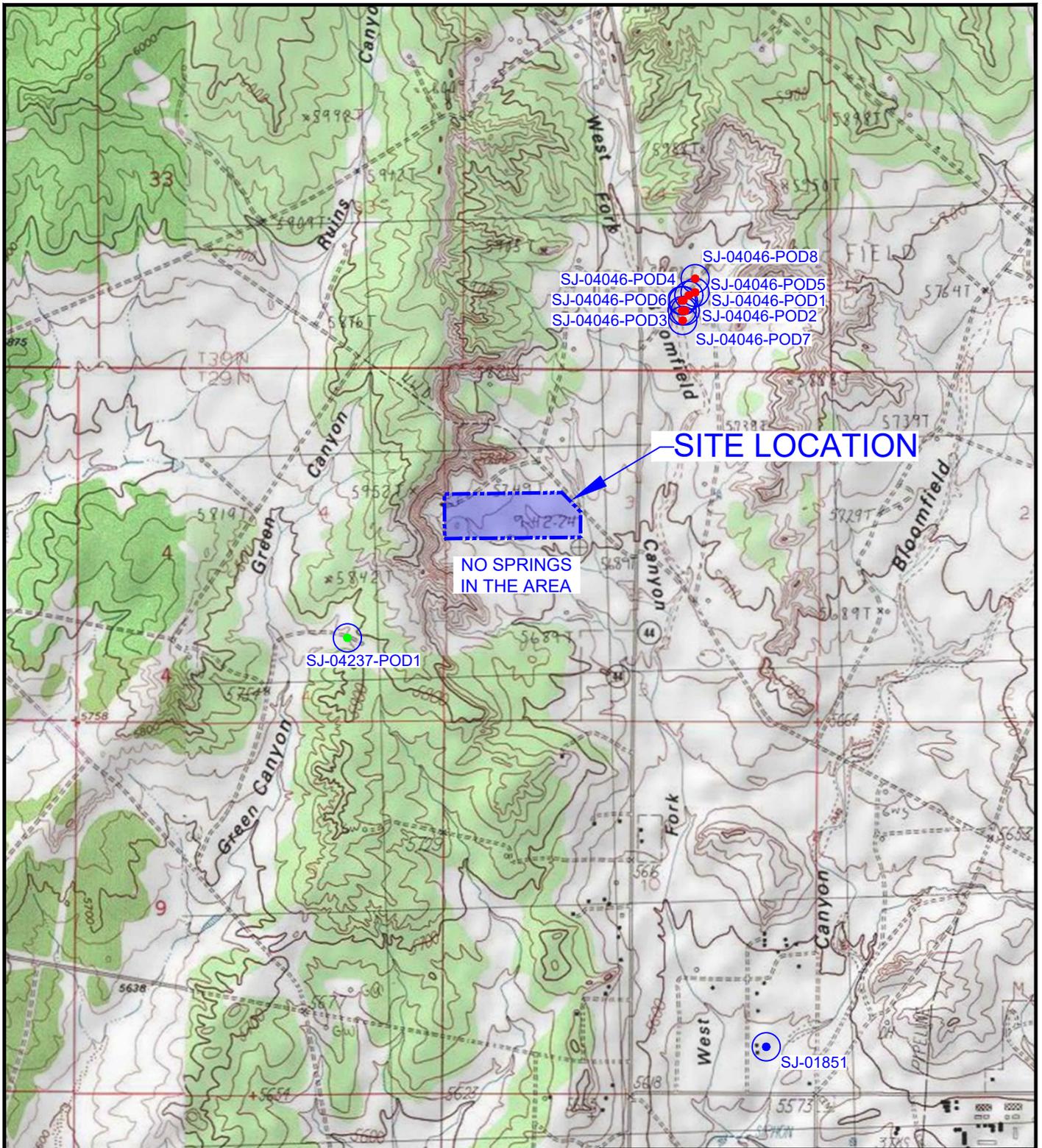
Parkhill

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DATE: 01/14/2025	CAD: SITE PLAN.dwg	PROJECT #: 1657.22
DRAWN BY: DMI	REVIEWED BY: AY	
APPROVED BY: AY	www.parkhill.com	FIGURE IV.1.2

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LEGEND

-  PROPERTY BOUNDARY
-  WATER WELL 200 FT RADIUS
-  DOMESTIC WELL
-  MONITORING WELL
-  POLLUTION CONTROL WELL



NOTE: WATER WELL DATA FROM NMOSE 2019 GIS DATABASE

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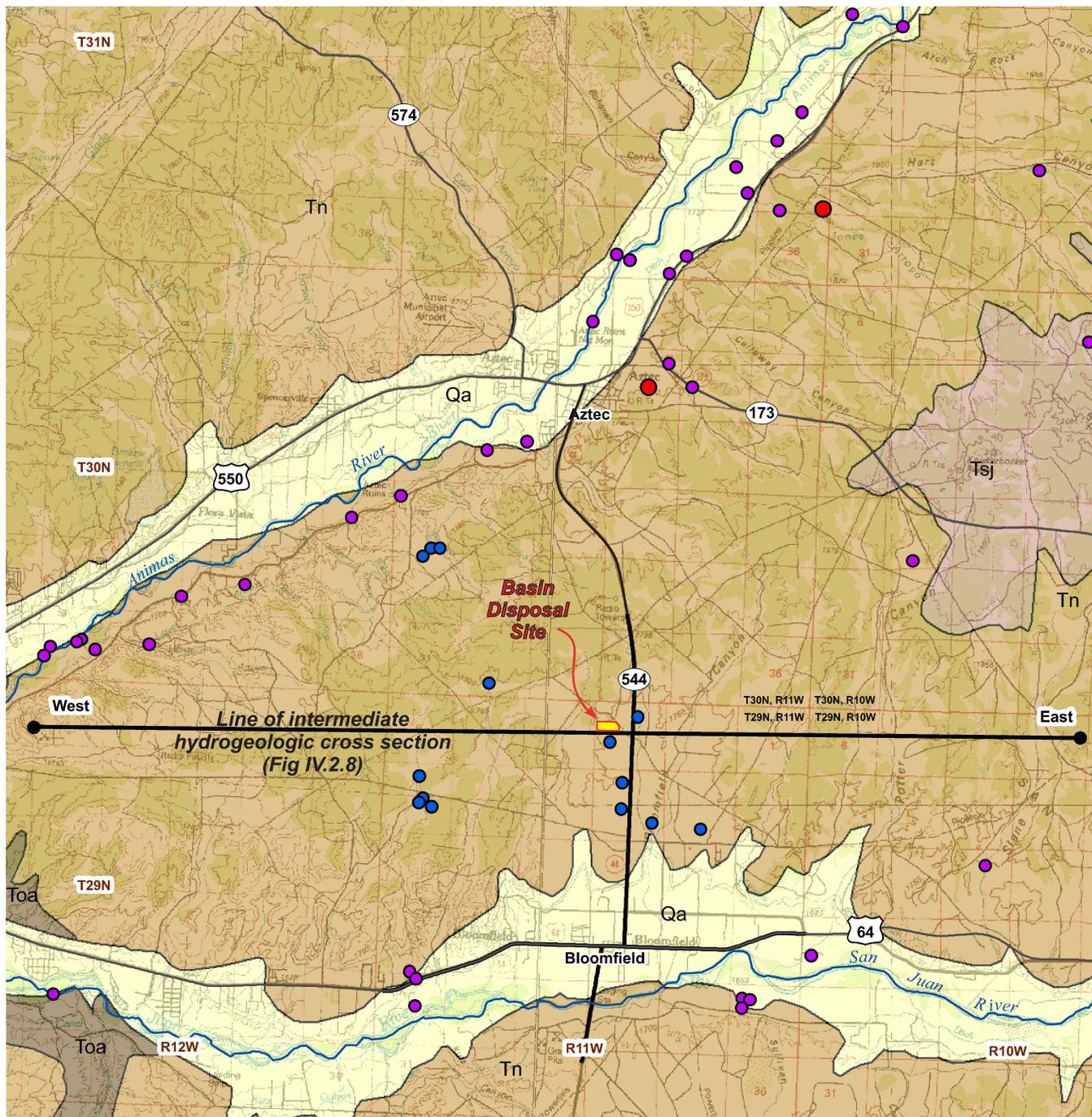
WELLHEAD PROTECTION AREA MAP

SURFACE WASTE MANAGEMENT FACILITY
BASIN DISPOSAL, INC.
SAN JUAN COUNTY, NEW MEXICO



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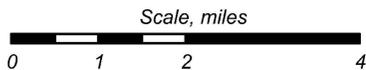
DATE: 07/05/2022	CAD: WELL LOCATION.dwg	PROJECT #: 1657.22
DRAWN BY: DMI	REVIEWED BY: MWK	FIGURE IV.1.4A
APPROVED BY: MWK	www.parkhill.com	



Map and data from: JSAI, 2008b, Figure 1.

Explanation

- NMOSE WATERS Database well
- Stone, et al 1983 well location
- Stone, et al 1983 spring location



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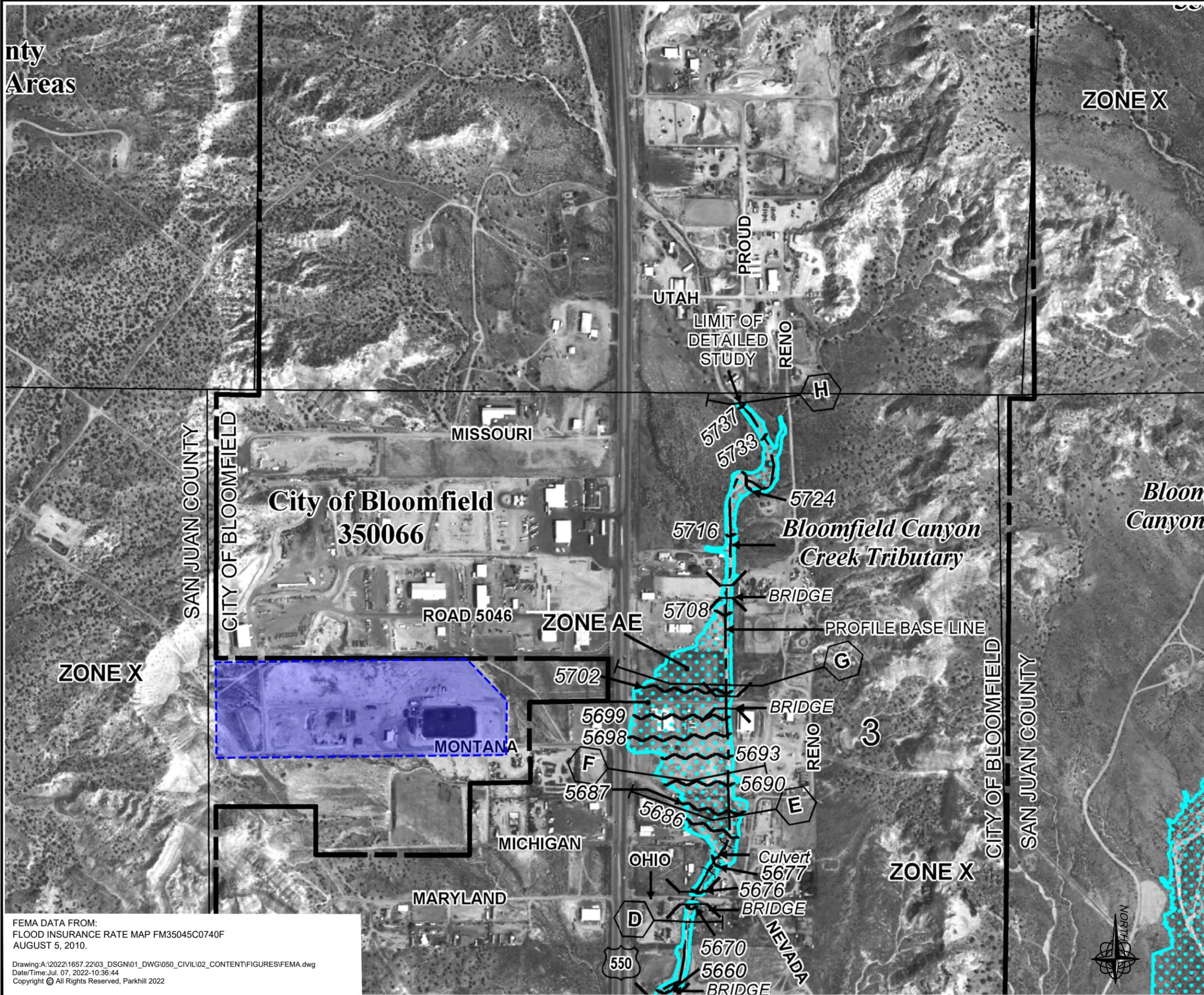
LOCATIONS OF WATER WELLS AND SPRINGS

SURFACE WASTE MANAGEMENT FACILITY
BASIN DISPOSAL, INC.
SAN JUAN COUNTY, NEW MEXICO

Parkhill

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Rio Rancho, New Mexico,
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Fax: 505-867-6991

DATE: 07/05/2022	CAD: WELLS & SPRINGS.dwg	PROJECT #: 1657.22
DRAWN BY: LCK	REVIEWED BY: MWK	FIGURE IV.1.4B
APPROVED BY: MWK	www.parkhill.com	



LEGEND

SITE BOUNDARY

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
 0.2% annual chance floodplain boundary
 Floodway boundary
 Zone D Boundary
 CBRS and OPA Boundary
 Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
 Base Flood Elevation line and value; elevation in feet*
 Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A-A Cross section line
 23-23 Transect line
 97° 07' 30", 32° 22' 30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
 4760000E 1000-meter Universal Transverse Mercator grid values, zones 12 & 13
 600000 FT 5000-foot grid ticks: New Mexico State Plane coordinate system, West Zone (FIPSZONE 3003), Transverse Mercator Projection
 DX5510 X Bench mark (see explanation in Notes to Users section of this FIRM panel)
 ●M1.5 River Mile

MAP REPOSITORIES
 Refer to Map Repositories list on Map Index.

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP PANEL
 AUGUST 5, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

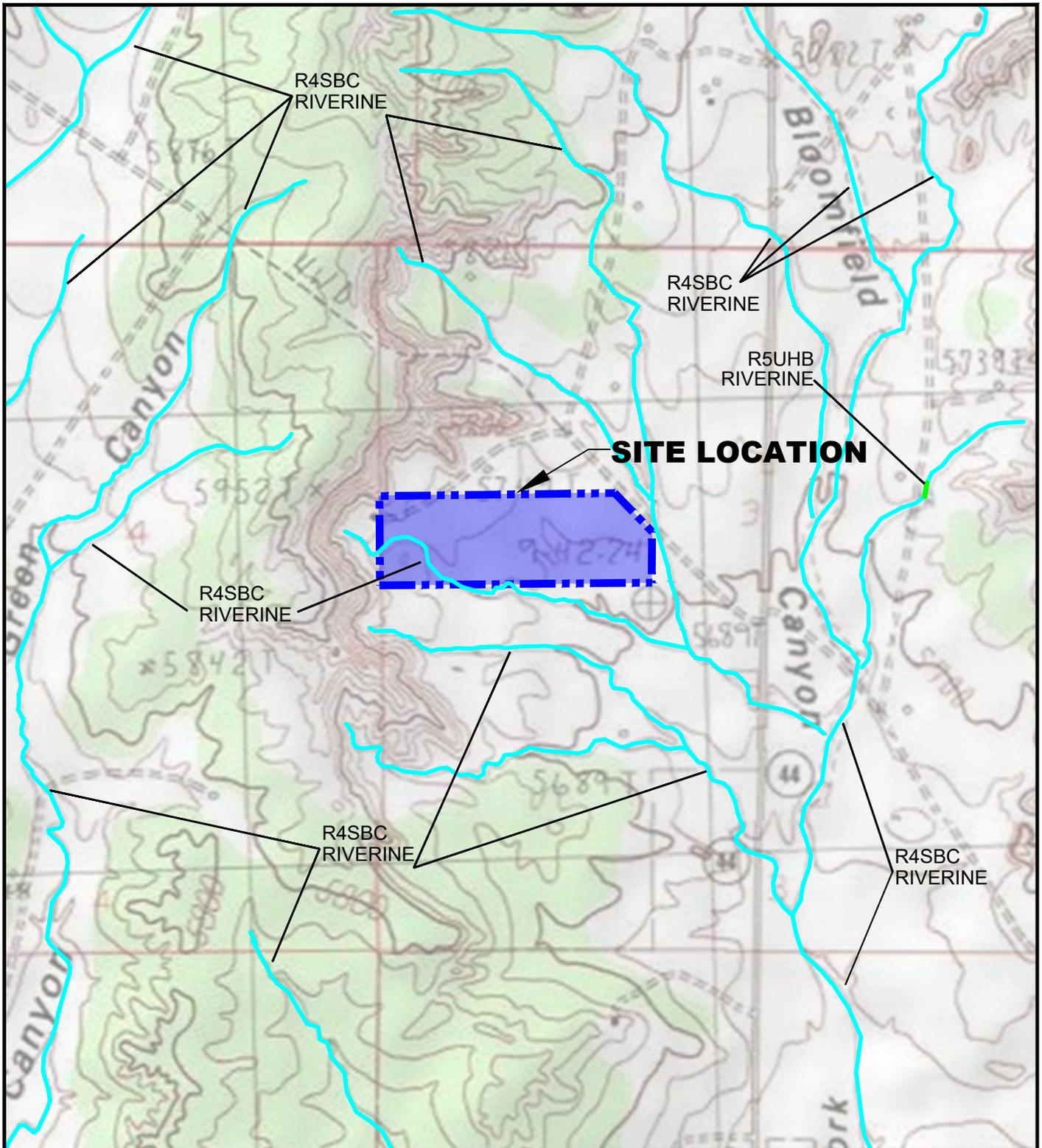
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 FLOOD INSURANCE RATE MAP FM35045C0740F
 AUGUST 5, 2010.

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FEMA FLOODPLAIN MAP
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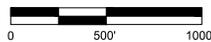
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DRAWN BY: DMI	REVIEWED BY: MWK	FIGURE IV.1.5
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LEGEND

-  BASIN WASTE MANAGEMENT FACILITY
- R4SBC RIVERINE, INTERMITTENT STREAM BED
- R5UHB RIVERINE, UNKNOWN PERENNIAL UNCONSOLIDATED BOTTOM SEMIPERMANENTLY FLOODED

NOTE:
 1. GEOGRAPHIC CENTER, 36° 45' 19.92" N -107° 58' 58.73" W
 2. VECTOR REFERENCE: US FISH AND WILDLIFE SERVICE, NATIONAL WETLANDS INVENTORY DATA 2022.



Drawing: A:\2022\1657.22\03_DSGN\01_DWG\050_CIVIL\02_CONTENT\FIGURES\Volume IV\WETLANDS.dwg
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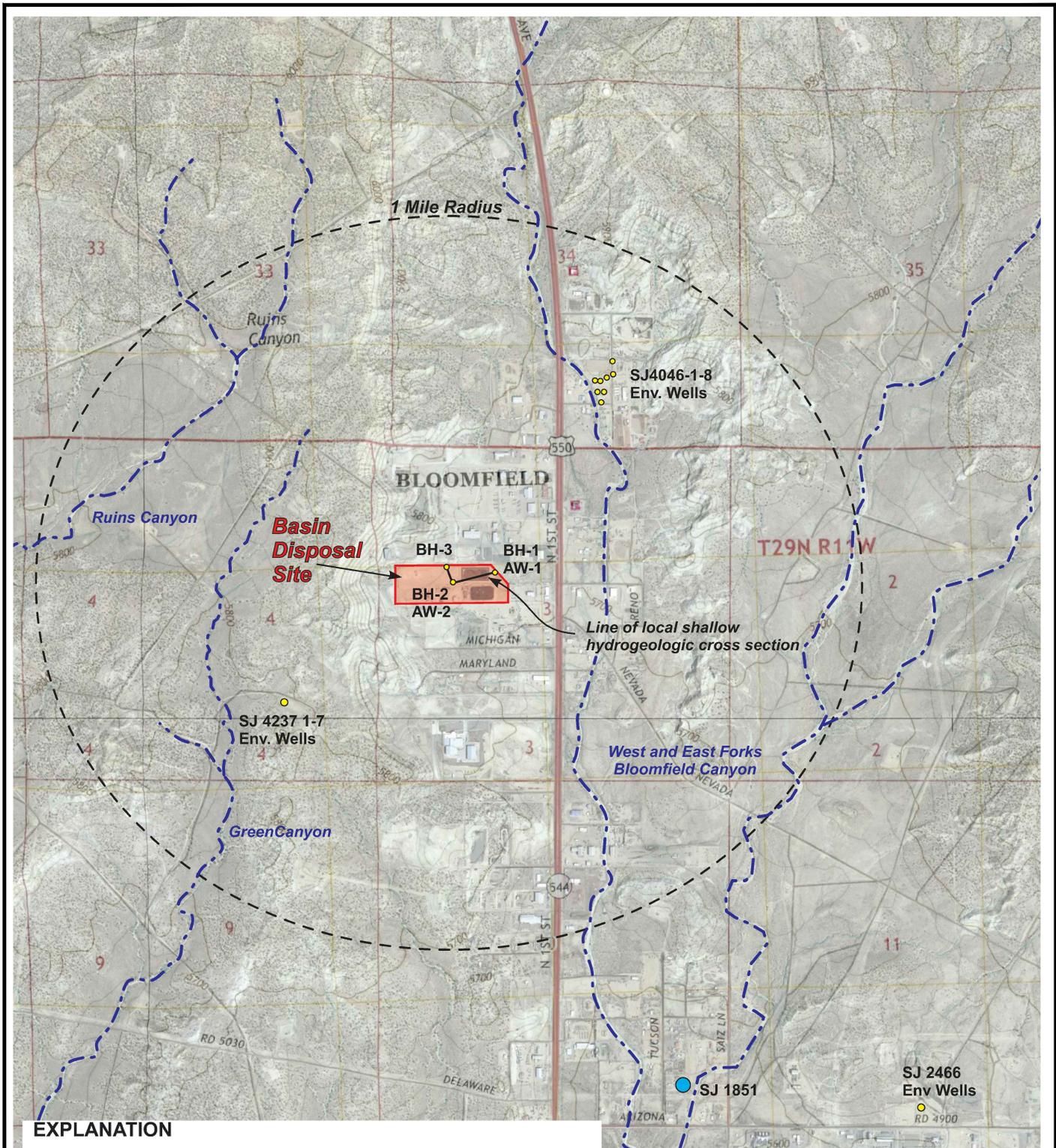
NATIONAL WETLANDS INVENTORY MAP

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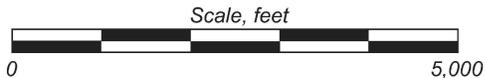
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EXPLANATION

-  SJ 1851 Location of permitted water well showing San Juan Basin NMOSE permit number
-  SJ 4237 1-7 Env. Wells Location of environmental monitoring well or network showing San Juan Basin NMOSE permit number
-  BH-1, AW-1 Location of Basin Disposal Site borings and assessment wells

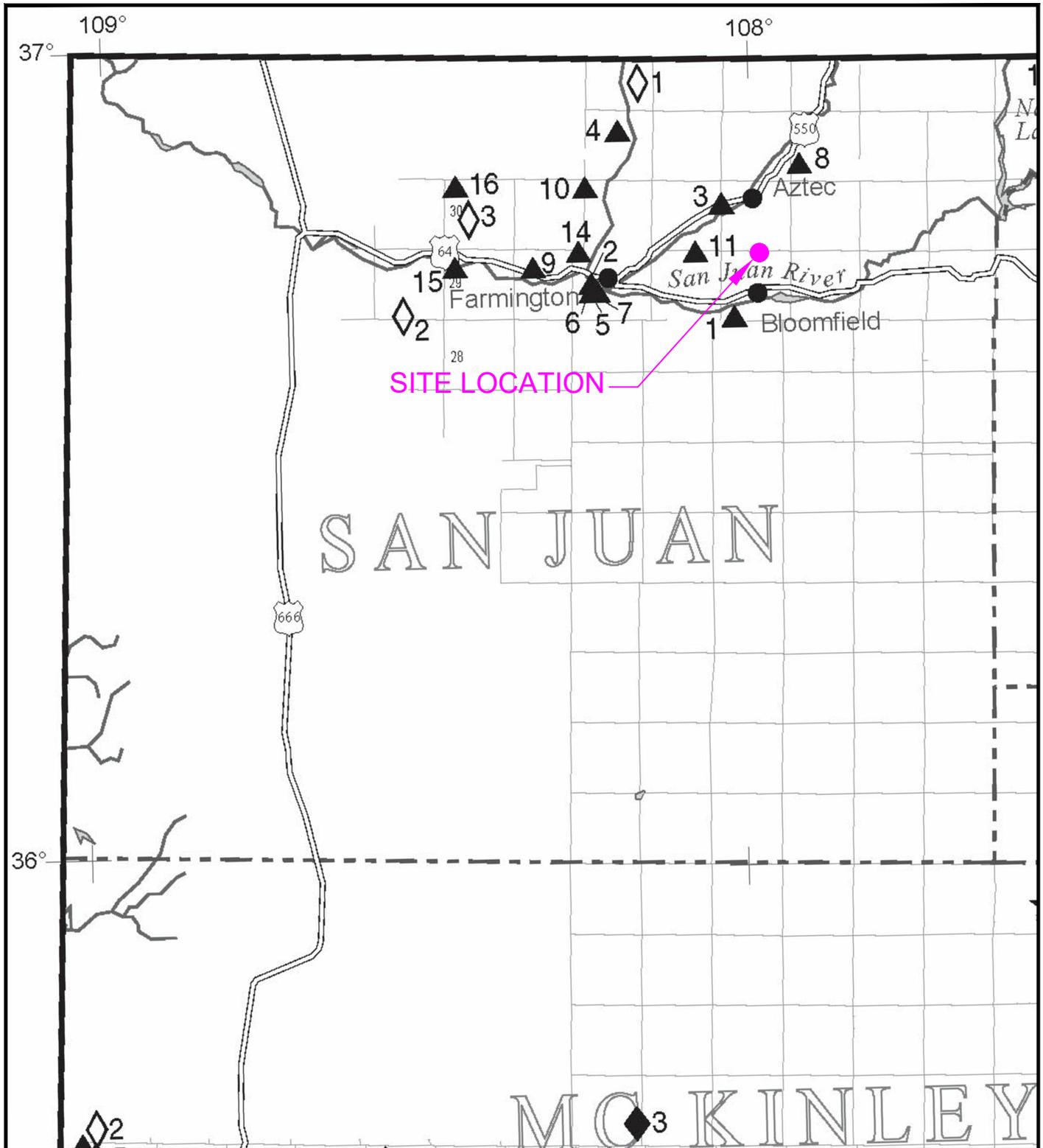


**WELLS AND WATERCOURSES
 WITHIN ONE MILE**
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SAN JUAN

MOCKINLEY

LEGEND

- Town or City
- ▲ Aggregate and stone mining
- ◇ Coal mining
- ★ Industrial minerals, mining, and milling
- Metals
- Potash mining and milling
- Smelters, converters, and refineries
- ◆ Uranium mining and milling



MINES, MILLS AND QUARRIES MAP

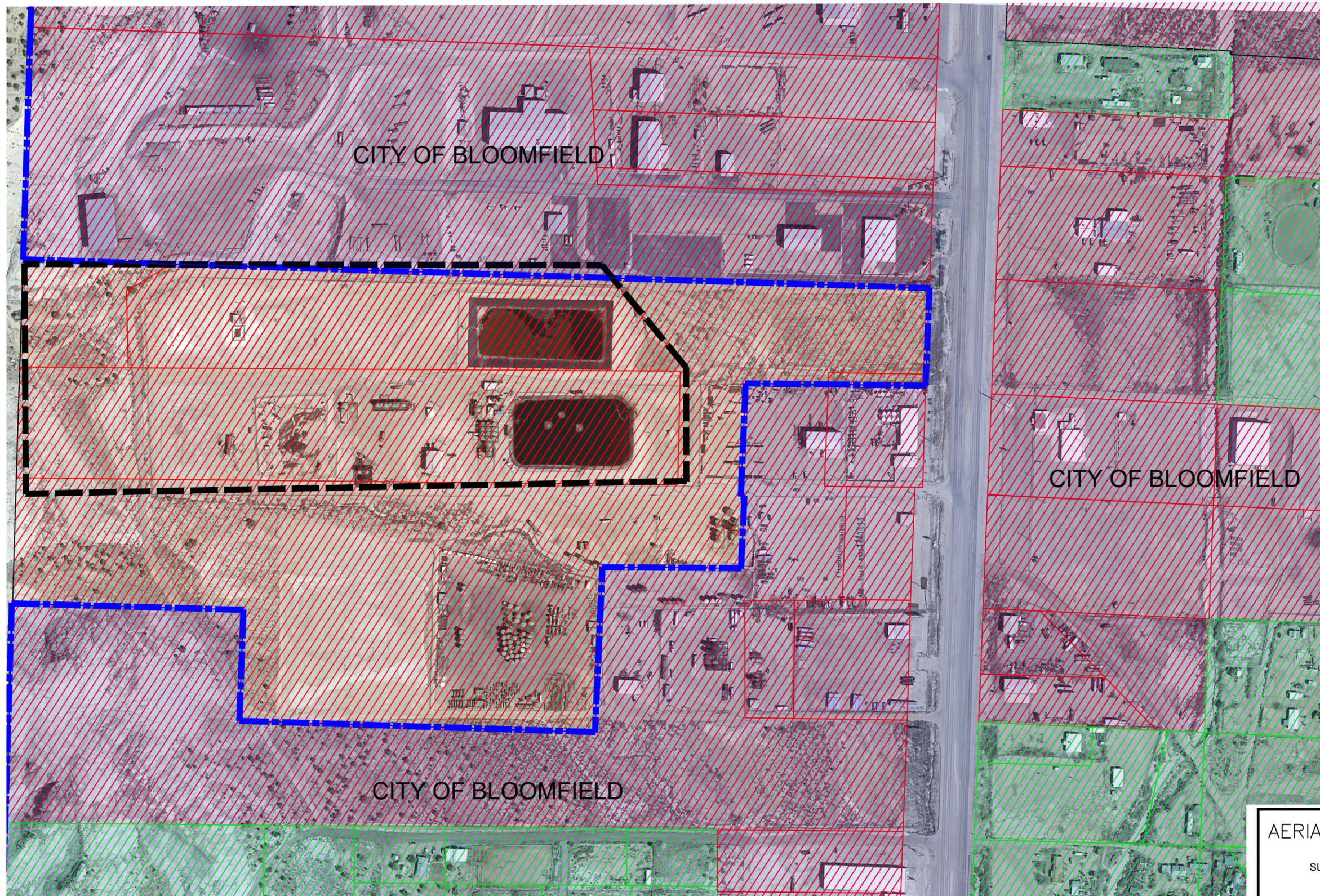
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DATE: 07/05/2022	CAD: MINES.dwg	PROJECT #: 1657.22
DRAWN BY: DMI	REVIEWED BY: MWK	FIGURE IV.1.7
APPROVED BY: MWK	www.parkhill.com	



LEGEND

-  SITE BOUNDARY
-  BLOOMFIELD CITY LIMITS
-  RESIDENTIAL
-  COMMERCIAL /INDUSTRIAL

SOURCE:
San Juan County, New Mexico Parcel Data CD
Created on September 3, 2008.

Jason Brady
Geographic Information Systems DBA

San Juan County
Assessor's Office

Phone: (505) 334-4269
jbrady@sjcounty.net

ADDITIONAL ON-SITE INSPECTION:
J. JORDAN, P.E., 2008



AERIAL PHOTO/LANDUSE MAP

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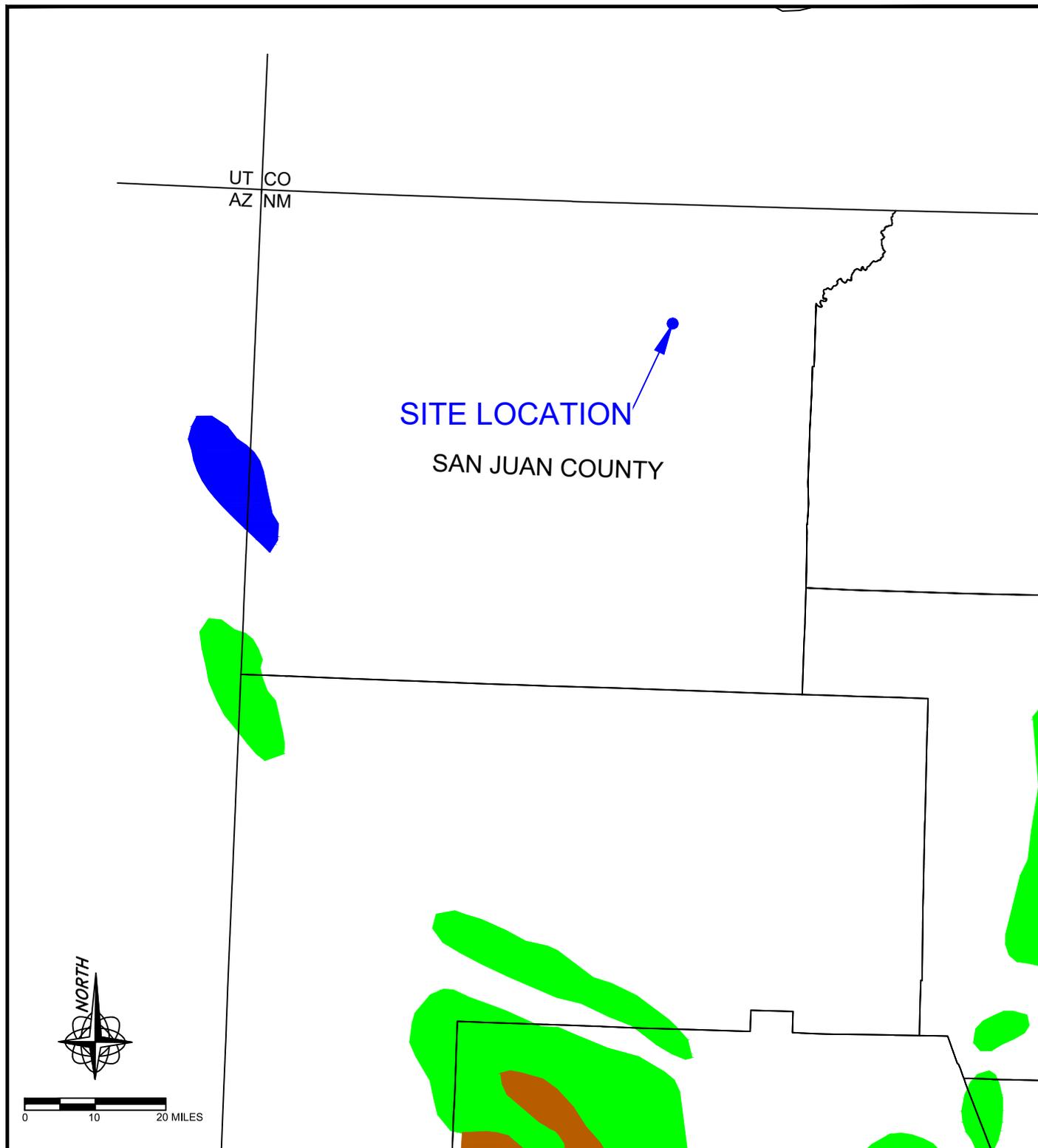
DATE: 07/05/2022	CAD: EVACUATION.dwg	PROJECT #: 1657.22
DRAWN BY: DMI	REVIEWED BY: MWK	FIGURE IV.1.8
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NOTE: IMAGE REFERENCE GOOGLE EARTH 2019

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LEGEND



KARST

Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; in gently dipping to flat-lying beds of carbonate rock



PSEUDOKARST

Fissures and voids present to a depth of 250 ft (75 m) or more in areas of subsidence from piping in thick, unconsolidated material



PSEUDOKARST 2

Fissures, tubes, and tunnels present to a depth of 50 ft. (15 m) in lava

KARST DATA FROM: digital version of U.S. Geological Survey Open File Report 2004-1352, Engineering Aspects of Karst. NATIONAL ATLAS GIS DATA.

Drawing: A:\2022\1657.22\103_DSGN01_DWG\050_CIVIL\02_CONTENT\FIGURES\KARST.dwg
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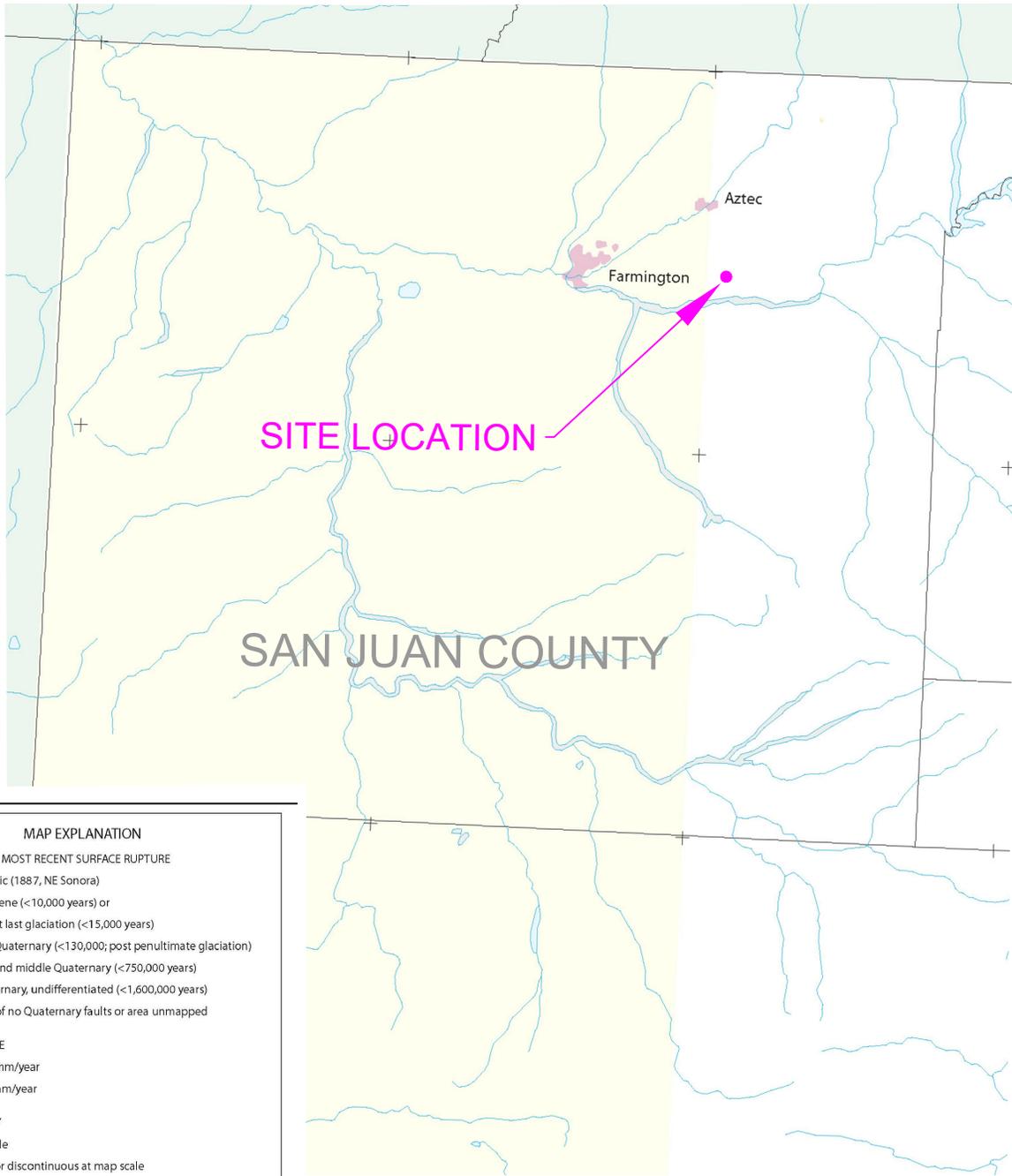
KARST TERRAINS MAP

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SITE LOCATION

SAN JUAN COUNTY

Aztec

Farmington

MAP EXPLANATION

TIME OF MOST RECENT SURFACE RUPTURE

- Historic (1887, NE Sonora)
- Holocene (<10,000 years) or post last glaciation (<15,000 years)
- Late Quaternary (<130,000; post penultimate glaciation)
- Late and middle Quaternary (<750,000 years)
- Quaternary, undifferentiated (<1,600,000 years)
- Area of no Quaternary faults or area unmapped

SLIP RATE

- 1-0.2mm/year
- <0.2mm/year

QUALITY

- Reliable
- - - - - Poor or discontinuous at map scale
- Inferred or concealed

STRUCTURE TYPE

- ▲ Thrust or reverse fault (teeth on upper block)
- ⇌ Right-lateral strike-slip fault
- ⇐ Left-lateral strike-slip fault
- ⊥ Normal fault
- ⊕ Anticline
- ⊖ Syncline
- ⊙ Monocline
- ← Plunge direction

OTHER SYMBOLS

- ⊙ Site of trench across fault
- ↗ Location of fault section boundary

NOTE: Nearest Holocene Fault is approx. 67 miles ESE of BDI Site

FAULT DATA FROM:
 USGS Open File Report OFR 98-521 (digital version)
 Map of Quaternary faults and folds in New Mexico and adjacent areas, 1998,
 by Michael N. Machette, Stephen F. Personius, Keith I. Kelson,
 Kathleen M. Haller, and Richard L. Dart.



GEOLOGIC FAULTS MAP

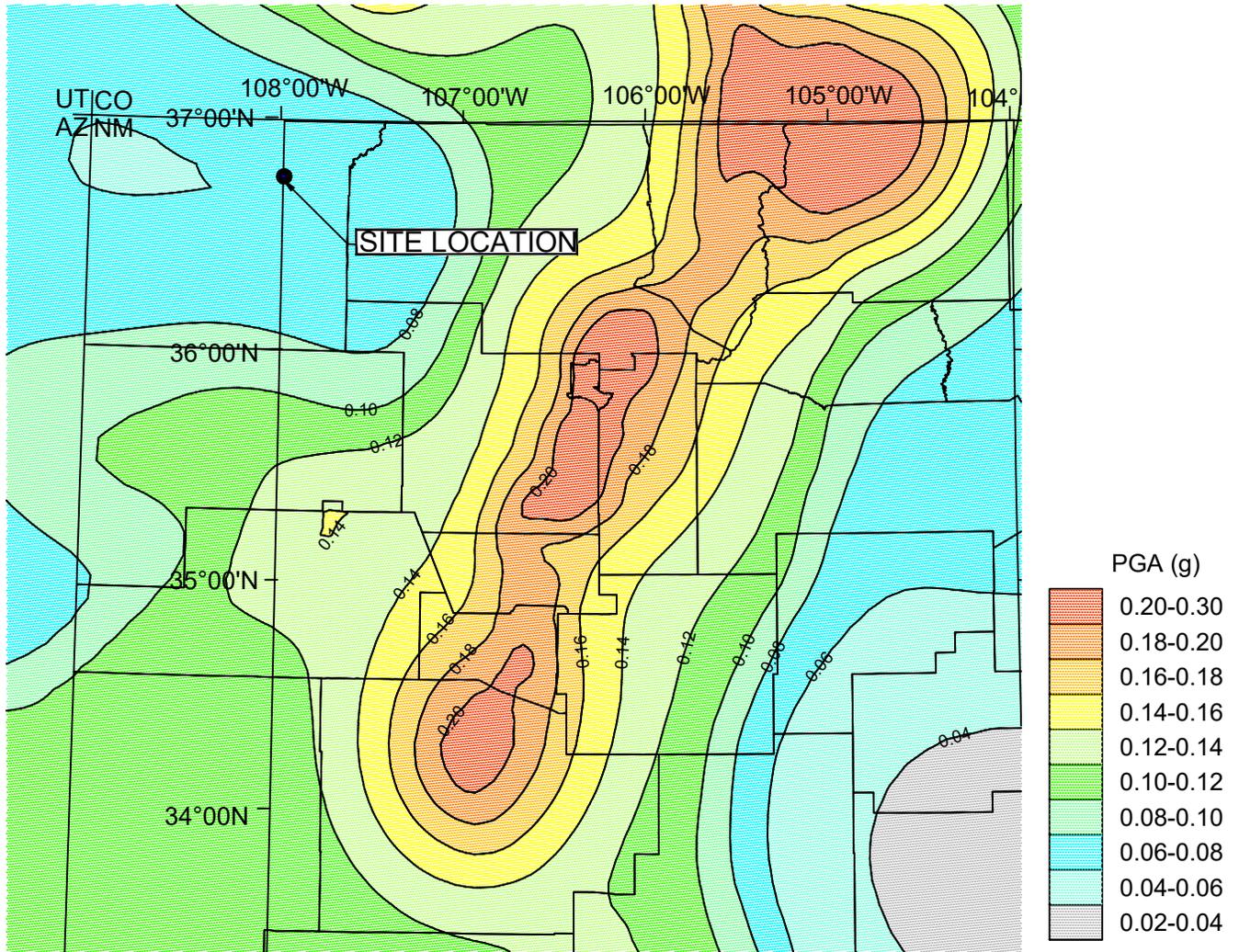
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DRAWN BY: DMI	REVIEWED BY: MWK	FIGURE IV.1.10
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Peak Horizontal Ground Acceleration (g) with 10% Probability of Exceedance in 250 Years



SEISMIC DATA FROM: USGS NATIONAL HAZARD MAPPING PROJECT GIS DATA and Petersen, Mark D., Frankel, Arthur D., Harmsen, Stephen C., Mueller, Charles S., Haller, Kathleen M., Wheeler, Russell L., Wesson, Robert L., Zeng, Yuehua, Boyd, Oliver S., Perkins, David M., Luco, Nicolas, Field, Edward H., Wills, Chris J., and Rukstales, Kenneth S., 2008, Documentation for the 2008 Update of the United States National Seismic Hazard Maps: U.S. Geological Survey Open-File Report 2008-1128, 61

SEISMIC IMPACT ZONES MAP

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DATE: 07/05/2022	CAD: SEISMIC.dwg	PROJECT #: 1657.22
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Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology

November 2019 (Updated January 2025)

TABLE OF CONTENTS

Section No.	Title	Page
1.0	INTRODUCTION.....	IV.2-1
1.1	Site Location.....	IV.2-1
1.2	Facility Description	IV.2-2
2.0	REGIONAL GEOLOGY AND HYDROLOGY	IV.2-2
2.1	Physiographic Setting	IV.2-2
2.2	Structural Setting	IV.2-3
2.3	Surface Geology and Shallow Stratigraphy.....	IV.2-3
2.4	Sources of Hydrogeologic Data	IV.2-4
2.4.1	<i>Permitted and Pre-basin Water Wells</i>	<i>IV.2-4</i>
2.4.2	<i>Area Borings and Monitoring Wells.....</i>	<i>IV.2-5</i>
2.4.3	<i>Basin Disposal Site Soil Boring and Assessment Well Installation</i>	<i>IV.2-5</i>
2.4.4	<i>Groundwater Sampling and Analyses.....</i>	<i>IV.2-6</i>
2.5	Water-Bearing Geologic Units	IV.2-7
3.0	SITE SPECIFIC GEOLOGY AND HYDROGEOLOGY	IV.2-8
3.1	Site Investigation, Data Compilation and Interpretation.....	IV.2-8
3.2	Facility Geotechnical Evaluation	IV.2-9
3.3	Facility Geology.....	IV.2-9
3.4	Facility Hydrogeology	IV.2-10
3.4.1	<i>Quaternary Alluvium</i>	<i>IV.2-10</i>
3.4.2	<i>Nacimiento Formation.....</i>	<i>IV.2-10</i>
3.4.3	<i>Ojo Alamo Sandstone.....</i>	<i>IV.2-10</i>
3.4.4	<i>Groundwater Occurrence and Movement</i>	<i>IV.2-11</i>
4.0	REGULATORY SITING REQUIREMENTS	IV.2-11
4.1	Streams, Springs, Watercourses and Water Wells Within One Mile of the Site.....	IV.2-12
4.2	Laboratory Analyses of Shallow Groundwater Samples.....	IV.2-12
4.3	Depth, Formation Name, Type and Thickness of the Shallowest Fresh Water Aquifer	IV.2-13
4.4	Lithology of Stratigraphic Units Above the Ojo Alamo Sandstone at the Facility	IV.2-13
4.5	Geologic Cross-Sections	IV.2-13
4.6	Potentiometric Surface of Shallow Saturations	IV.2-13
4.7	Depth to Shallow Fresh Groundwater	IV.2-14
4.8	Vicinity Oil and Gas Wells and Saltwater Injection Wells	IV.2-14
5.0	CONCLUSIONS	IV.2-14
6.0	REFERENCES.....	IV.2-15

**Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology**

November 2019 (Updated January 2025)

LIST OF FIGURES

Figure No.	Title
IV.2.1	SITE LOCATION MAP
IV.2.2	PHYSIOGRAPHY OF THE BASIN DISPOSAL SITE VICINITY
IV.2.3	MAJOR STRUCTURAL FEATURES
IV.2.4	SAN JUAN BASIN CROSS SECTION AND STRTIGRAPHIC UNITS
IV.2.5	SURFACE GEOLOGY MAP
IV.2.6	POST TRIASSIC STRATIGRAPHIC UNITS
IV.2.7	LOCATIONS OF REGIONAL WATER WELLS AND SPRINGS
IV.2.8	INTERMEDIATE HYDROGEOLOGIC CROSS SECTION
IV.2.9	REGIONAL POTENTIOMETRIC SURFACE – ALL ZONES
IV.2.10	LOCATIONS OF WELLS AND WATERCOURSES WITHIN ONE MILE
IV.2.11	LOCAL SHALLOW HYDROGEOLOGIC CROSS SECTION
IV.2.12	LOCATONS OF VICINITY OIL AND GAS WELLS

LIST OF TABLES

Table No.	Title
IV.2.1	SUMMARY DATA FROM WELLS AND BORINGS IN THE VICINITY OF THE BASIN DISPOSAL SWMF
IV.2.2.	WATER QUALITY DATA SUMMARY
IV.2.3	SOIL LABORATORY ANALYSIS SUMMARY

LIST OF ATTACHMENTS

Attachment No.	Title
IV.2.A	NMOSE WELL RECORDS FOR NEARBY PERMITTED WELLS
IV.2.B	BORING LOGS AND ASSESSMENT WELL COMPLETIONS FOR THE BASIN DISPOSAL FACILITY INVESTIGATIONS
IV.2.C	GEOTECHNICAL SOIL TESTS - BASIN DISPOSAL SITE
IV.2.D	GROUNDWATER SAMPLE LAB ANALYTICAL REPORTS, BASIN DISPOSAL SITE, 2006 AND 2008 MONITORING EVENTS
IV.2.E	SHOMAKER 2008B – GROUNDWATER INVESTIGATION REPORT
IV.2.F	SHOMAKER 2008C – 11/19/08 TECH MEMO; WELL A-2 WATER QUALITY
IV.2.G	SHOMAKER 2008D – 5/2/09 LTR RPT POND WATER QUALITY COMPARISON

1.0 INTRODUCTION

Basin Disposal, Inc. (BDI) is an existing Surface Waste Management Facility (SWMF) providing oil field waste liquids (OFWL) disposal services. The existing BDI facility is subject to regulation under the New Mexico Oil and Gas Rules, specifically 19.15.36 NMAC, administered by the Oil Conservation Division (OCD) of the NM Energy, Minerals, and Natural Resources Department (NMEMNRD). This document is a component of the "Application for Permit Renewal" that proposes continued operations of the existing approved waste processing and disposal capabilities. The Facility is designed in compliance with 19.15.36 NMAC, and is operated in compliance with a Surface Waste Management Facility Permit issued by the OCD. The Facility is owned and operated by Basin Disposal Inc.

BDI only accepts liquid waste from the production and exploration of oil fields in northwest New Mexico and the surrounding areas. The existing facility is organized in a pattern that allows for specific liquid waste acceptance, treatment, evaporation, or injection of clean liquid.

1.1 Site Location

BDI is located on 27.77 acres entirely within Section 3, Township 29 North, Range 11 West approximately 3 miles north of the intersection of Highway 550 and 64 (**Figure IV.2.1**). Coordinates for the approximate center of the BDI site are Latitude 36°45'19.92" and Longitude -107°58'58.73". The site is situated approximately 4 miles north of the San Juan River, and about 4.7 miles south of the Animas River on Crouch Mesa, about 500 feet and 400 feet in elevation above these respective river plains. The site occupies the West Fork of Bloomfield Canyon, an ephemeral drainage channel that drains south to the San Juan River. The site slopes gently to the east and southeast, from a maximum elevation of 5,750 feet to less than 5,700 feet. Detailed site characterization documentation is provided in **Volume IV**.

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated January 2025)

1.2 Facility Description

The existing BDI facility is comprised of approximately 27.77 acres and is comprised of the following:

- 2 existing evaporation ponds (1 pending construction)
- 12 existing receiving tanks (6 pending construction)
- 4 existing oily water receiving tanks
- 3 existing skimmed oil tanks
- 3 existing oil heating tanks
- 3 existing settling tanks
- 7 existing oil sales tanks (2 pending construction)
- 3 existing filtered water tanks
- 4 existing bleach tanks
- 1 existing concrete sludge solidification basin
- 2 existing covered below grade tanks (containment sumps)
- 1 existing UIC Class II injection well for disposal of produced water
- 2 existing separation tanks
- Various support facilities including an office, a maintenance building, roads, and a storm water detention basin.

Oil field wastes are delivered to the BDI SWMF from oil and gas exploration and production operations in northwestern New Mexico and southwest Colorado. The Site Plan provided as **Figure II.1.2** identify the locations of the Disposal facilities, evaporation/storage ponds, and all structures. Perimeter of the site is surrounded by commercial/industrial businesses on three sides and buffered by a bluff on the west side of the Facility.

2.0 REGIONAL GEOLOGY AND HYDROLOGY

2.1 Physiographic Setting

The BDI Site is located on the Aztec quadrangle map within the northwest quarter of Section 3, Township 29 North, Range 11 West. The Site lies about 4 miles north of the San Juan River, and about 6 miles south of the Animas River on Crouch Mesa, about 500 ft and 400 ft above the respective river plains. The Site is situated in the West Fork of Bloomfield Canyon, an ephemeral drainage that reports south to the San Juan River; the site slopes gently to the east and southeast, from a maximum elevation of 5,750 ft to less than 5,700 ft.

Physiographic drainage features in the vicinity of the BDI site are shown on the photomap in **Figure IV.2.2**. The site lies on Crouch Mesa, between the San Juan River to the south and the Animas River to the north. The site is situated in the West Fork of Bloomfield Canyon, an ephemeral drainage that reports south to the San Juan River; the site slopes gently to the east and southeast, from a maximum elevation of 5,750 feet to less than 5,700 feet.

2.2 Structural Setting

The BDI site is located in the San Juan Basin, a large Late Cretaceous to Early Tertiary-aged basin, which is depicted on the structural geologic features map in **Figure IV.2.3**. The San Juan Basin is bound on the north by the Four Corners Platform and the San Juan Uplift to the northwest and north, the Nacimiento Uplift to the east, the Zuni Uplift to the south and the Defiance Uplift to the west (Stone, et al., 1983, Kelley, 1951). The San Juan Basin contains a maximum sedimentary stratigraphic thickness of about 14,500 feet, as shown on the San Juan Basin Stratigraphic Cross Section in **Figure IV.2.4**. Approximately 12,000 ft of the sedimentary thickness consists of Mesozoic and Tertiary rocks, which are underlain by about 2,500 ft of Paleozoic sedimentary rocks (JSAI, 2008 b).

2.3 Surface Geology and Shallow Stratigraphy

Surface geologic mapping for the Aztec 1° x 2° Quadrangle in San Juan County was compiled by the United States Geological Survey (Manley, Scott and Wobus, 1987). **Figure IV.2.5** presents a portion of this geologic map showing the BDI Facility and the surrounding area. Geologic units that are exposed in the vicinity include Quaternary Alluvium within incised drainages and Tertiary units, including the Bridgetimber Gravel and the Regina and Nacimiento Members of the San Jose Group. Upper Triassic and younger stratigraphic units of the San Juan Basin are summarized in the stratigraphic nomenclature cross section chart in **Figure IV.2.6** (Stone, et al., 1983). Shallow stratigraphic units in the vicinity of the BDI site described by Manley, Scott and Wobus (1987) are identified below.

- **Alluvium (Qal, Holocene)** – Stream deposited clay, silt, sand and gravel on valley floors, thickness up to 10 meters
- **Terrace Gravel (Qg, Pleistocene)** – Well sorted gravel on terraces along major drainages. Locally includes outwash and pediment gravel, thickness 3-17 meters
- **Bridgetimber Gravel (Tbg, Pliocene)** – Bouldery gravel about 383 meters above the Animas River, thickness about 7 meters
- **Regina Member, San Jose Group (Tsr, Eocene)** – Variegated shale and tan to white sandstone
- **Nacimiento Member, San Jose Group (Tn, Paleocene)** – Grey to olive grey shale; minor interbedded sandstone, thickness up to 580 meters.
- **Ojo Alamo Sandstone (Toa, Paleocene)** – Brown cross-bedded sandstone, conglomeratic, thickness 25-65 meters

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Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

The BDI site is situated just west of the deepest area of the San Juan Basin. Geologic units underlying the facility dip gently toward the east. Shallow stratigraphy at the BDI site consists of a thin mantle (less than 50 feet) of Quaternary alluvial sand and silt, which is underlain by relatively dense shale and sandstone of the Nacimiento Formation. Based upon New Mexico Oil Conservation Division (NMOCD) file data, (NMOCD, 2019) the Ojo Alamo Sandstone was struck at a depth of 665 feet at the base of the Nacimiento Formation in API well 30-045-26862, located on the BDI site.

2.4 Sources of Hydrogeologic Data

Available basic hydrogeologic data from wells near the BDI Facility is summarized in **Table IV.2.1**. Information in **Table IV.2.1** includes locations, depths, water levels and producing zones of water wells in the vicinity of the BDI site.

2.4.1 Permitted and Pre-basin Water Wells

Numerous water wells in the region of the BDI site were drilled prior to the administrative declaration of the San Juan Underground Water Basin (San Juan Basin) by the New Mexico Office of the State Engineer (NMOSE). Lithologic logs and records of completions are typically not available for “pre-basin” wells. Prior to the declaration of the San Juan Basin, numerous workers conducted well canvassing in the Basin. Information on more than 3,000 San Juan Basin wells identifying locations, depths, water levels, casing diameters, producing horizons, pump types and well yields and water quality and other available information was compiled and presented by Stone, et al, (1983). Review of the Stone et al (1983) well data indicates that no pre-basin water wells were located in the vicinity of the BDI site.

Water wells drilled after the declaration of the San Juan Basin are permitted by the NMOSE. Upon completion of each well, a Well Record having information on the location, completion details, water level and estimated yield is submitted to the NMOSE. Review of NMOSE on-line files of permitted water wells (NMOSE WATERS DATABASE, 2019) indicates that there are no permitted water wells near the BDI site. John Shomaker and Associates (JSAI, 2008b) compiled information on permitted and pre-basin water wells and springs in the region of the BDI site to prepare the water well and spring location map shown in **Figure IV.2.7**. This map identifies several NMOSE WATERS DATABASE well locations near the site in Sections 3 and 10, T.29N.R.11.W; however, review of current WATERS DATABASE files indicates that the nearest permitted water well in the vicinity of the site is well No. SJ-1851, located approximately 1.5 miles southeast of the BDI site.

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Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

Other NMOSE permitted wells in the vicinity include environmental monitoring wells that were installed for corrective actions on oil and gas development and production sites. Copies of available Well Records and other agency documentation for NMOSE permitted wells in the vicinity of the BDI site are included in **Attachment IV.2.A**.

JSAI (2008b) prepared an intermediate hydrogeologic cross section using water well data from Stone et al (1983) and oil and gas well data available from the New Mexico Oil Conservation Division On-Line Imaging Database (2008), shown in **Figure IV.2.8**. This cross section shows the upper 3000 feet of the Tertiary and Cretaceous section in the region of the BDI site. This cross section was annotated with potentiometric surface data for the Ojo Alamo Sandstone taken from Stone et al (1983).

2.4.2 Area Borings and Monitoring Wells

Resource and environmental characterization projects have yielded information on subsurface stratigraphy and groundwater conditions in the vicinity of the BDI facility. Locations of nearby wells are shown on the well proximity map in **Figure IV.2.10**. Projects include:

- An environmental hydrogeologic site characterization boring and assessment well project for a major permit modification at the Basin Disposal Facility (JSAI, 2008b),
- Installation of environmental remediation and monitoring well networks at oil and gas sites northeast of the BDI site (SJ-4046, 8 wells), southwest of the BDI site (SJ-4237, 7 wells), and southeast of the BDI site (SJ-2466, 8 wells), (NMOSE WATERS DATABASE, 2019)
- Installation of approximately 30 oil and gas exploration and production wells, three water storage wells and three saltwater injection wells in the immediate vicinity of the BDI site (NMOCD IMAGING DATABASE, 2019)

Copies of available boring logs and related well information obtained from these investigations are included in **Attachments IV.2.A** and **IV.2.B**.

2.4.3 Basin Disposal Site Soil Boring and Assessment Well Installation

Basin Disposal Inc. advanced four soil borings (BH-1, H-2, BH-3 and BH-4) on the site in May, 2008 using hollow-stem auger switchable to air rotary coring drilling methods. The boring and assessment well installation and sampling investigation were performed in accordance with a Boring Plan submitted by John Shomaker & Associates Inc. (JSAI, 2008a) and approved by NMOCD. Results of the boring and assessment well study are detailed in a summary report (JSAI, 2008b). A copy of this document is included in **Attachment IV.2.E**.

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

Boreholes BH-2 and BH-3 were drilled to 100 ft below ground level (bgl) to characterize the shallow subsurface stratigraphy and to identify shallow water-bearing zones. Boring and assessment well locations are shown on the well proximity map in **Figure IV.2.10**

The site borings penetrated thin accumulations (12 feet to 42 feet) of sandy-silty Quaternary alluvium atop laterally extensive interbedded shale and sandstone of the Tertiary Nacimiento Formation. Thin and laterally discontinuous fluid saturations were identified in basal alluvium or in the uppermost weathered portion of the Nacimiento Formation in boreholes BH-1 and BH-4. These two borings were completed with 2-inch PVC monitoring well casing, 10-foot screens, annular gravel packs and seals, and were designated Assessment Wells 1 and 2 (BH-1/AW-1 and BH-4/AW2). Since BH-4 was drilled within a few feet of BH-2, no lithologic log was presented for BH-4 (which was completed as AW-2). Lithologic descriptions and soil saturation notations were taken from the log for BH-2 and appended to well completion details for AW-2. Water levels in the completed wells were measured on 5/29/08 and found to be 42.22 ft below grade (AW-1) and 29.25 ft below grade (AW-2). Summary data from the BDI site boring and well installations is included in **Table IV.2.1**. Copies of the lithologic logs and well completion diagrams for the BDI site borings and wells are included in **Attachment IV.2.B**.

Thin, spotty saturations were detected immediately above or near the top of the Nacimiento Formation sediments in Borings BH-1 and BH-2. No saturations were noted more than a few feet below the lower alluvium-Nacimiento contact in these borings. Borings BH-2 and BH-3 were advanced to depths of 100 feet. Moist zones were detected at depths ranging from 30 to 60 feet below the base of the alluvium in Boring 3. The JSAI (2008b) report concluded that the thin and laterally discontinuous saturations observed near the upper surface of the Nacimiento Formation were perched water zones.

2.4.4 Groundwater Sampling and Analyses

Groundwater samples were collected from wells AW-1 and AW-2 on May 27-29, 2008 (JSAI 2008b). The samples from well AW-1 were analyzed for major ions, toxic metals, total petroleum hydrocarbons and volatile organic compounds; the samples from well AW-2 were analyzed for toxic metals. Well AW-2 was sampled on October 30, 2008 (JSAI 2008c) and the samples were analyzed for major ions and toxic metals. Results were transmitted in a Technical Memo dated 11/19/08; a copy of the memo is included in **Attachment IV.2.F**.

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

Summary analytical results are presented in **Table IV.2.2**. Results of lab analyses indicate that the shallow perched water penetrated by wells AW-1 and AW-2 is brackish to saline. Total Dissolved Solids (TDS) in the samples ranged from 24,000 milligrams per liter (mg/L) to 38,000 mg/L). No hydrocarbons were detected in the water sample taken from AW-1.

An aqueous sample was collected from the Basin Disposal Facility clarification pond on August 4, 2006 and analyzed for primary ions and selected metals. Results of these analyses were compared with results of later tests of samples collected from site assessment wells AW-1 and AW-2 (JSAI 2008d) and transmitted in a letter report dated 5/29/09 (JSAI 2008d). The letter report concluded that the waters from the site assessment wells and the pond were dissimilar. A copy of the letter report is included in **Attachment IV.2.G**.

Shallow perched water at the site exceeds New Mexico Water Quality Control Commission standards for chloride, nitrate, sulfate, TDS, lead and selenium. Based upon the level of mineralization (TDS >10,000 mg/L) of the shallow saturations sampled during the investigation, groundwater at the site does not classify as "fresh" as defined by New Mexico Oil and Gas Rules 19.15.2.7.F(3). JSAI (2008b) concluded that the shallow water is also not protectable under New Mexico Water Quality Control Commission regulations 20.6.2.3101.A NMAC.

2.5 Water-Bearing Geologic Units

Water-bearing geologic units in the vicinity of the BDI site include Quaternary alluvial valley fill and terrace deposits, sandstone beds within the Tertiary Nacimiento Formation and the Tertiary Ojo Alamo Sandstone.

Small quantities of moderately mineralized water are locally present in the shallow alluvium and Nacimiento Formation in the region; however, no water wells near the BDI Facility are known to tap these units. Thin, laterally discontinuous, and often ephemeral saturations are locally present in the basal alluvium overlying the denser and less permeable bedrock units, particularly in and around drainages, where stormwater periodically recharges shallow sediments. Local saturations may also be present in basal alluvium in areas where the shale bedrock was deeply incised by drainages prior to deposition of the alluvium, forming buried paleochannels.

The Ojo Alamo Sandstone Aquifer (Tertiary, Paleocene) is laterally extensive in the northeastern portion of the San Juan Basin and yields modest to moderate quantities of good to fair quality

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

groundwater to wells south and west of the Basin Disposal SWMF. Kilmer and Kelly (1992) described the geometry and water-bearing characteristics of the Ojo Alamo Sandstone. The thickness of the Ojo Alamo Sandstone ranges from 72 feet to 313 feet and it is widely tapped for domestic and stock water supply near its outcrop south of U.S Highway 550 (Stone, et al., 1983). The depth to the Ojo Alamo Sandstone, as well as the salinity of its water increases to the north and east and few wells tap the Ojo Alamo Sandstone north and east of U.S. Highway 550. Stone, (et al., 1983) prepared a map projection of the electrical conductance of water within the Ojo Alamo Sandstone, which indicates that the conductance in the vicinity of the Basin Disposal Site is on the order of 5,000 micromhos. This is roughly equivalent to a TDS concentration of 3,200 mg/L.

The Ojo Alamo Sandstone is artesian throughout much of the northeastern San Juan Basin. Stone et al (1983) prepared regional map projections of configuration of the top of the Ojo Alamo and its potentiometric surface. The top of the Ojo Alamo Sandstone near the BDI Facility was projected to be 470 feet below grade (5,000 ft above MSL) and the potentiometric surface was projected to be about 5400 ft above MSL, or approximately 314 feet below land surface. The geometry of the Ojo Alamo Sandstone and its potentiometric surface in the vicinity of the BDI site are depicted on the intermediate hydrogeologic cross section in **Figure IV.2.8** (JSAI 2008b).

3.0 SITE SPECIFIC GEOLOGY AND HYDROGEOLOGY

3.1 Site Investigation, Data Compilation and Interpretation

A site investigation consisting of soil boring, well installation, groundwater sampling and analysis was performed at the BDI Facility in 2008. The site borings penetrated shallow stratigraphic units and hydrogeologic conditions consistent with those depicted in published works and indicated by unpublished agency file data on wells in the vicinity.

The site borings penetrated 18-42 feet of unconsolidated alluvial sands and silts and up to 88 feet of interbedded siltstone and sandstone in the underlying Nacimiento Formation. The alluvium thickens toward the southeast at the Facility and the upper surface of the Nacimiento Formation slopes southeasterly. Thin, perched, laterally discontinuous saturations of mineralized groundwater were detected in the basal alluvium in well AW-1 and in the upper few feet of the Nacimiento Formation in well AW-2. Boring BH-3 was advanced through the alluvium and 88 feet into the Nacimiento Formation, detecting no water.

Laboratory analyses of water samples collected from wells AW-1 and AW-2 indicated that the water is brackish to saline, having TDS concentrations ranging from 29,000 mg/L to 38,000 mg/L. Comparison of shallow groundwater sample water quality with water from the BDI facility clarification pond indicates that the waters are chemically dissimilar (JSAI 2008b).

3.2 Facility Geotechnical Evaluation

During the 2008 site boring investigation, shallow alluvial soil samples were collected from boring BH-1 (AW-1) and analyzed for plasticity, density, moisture content, pore volume and hydraulic conductance. Analytical results are summarized in **Table IV.2.3**; a copy of the soil laboratory report is included in **Attachment IV.2.C**. Laboratory tests indicate that shallow alluvial soils at the site are porous non-plastic sand-silt mixtures with moderate hydraulic conductance averaging 2.815×10^{-3} centimeters per second.

The site geotechnical boring and testing data indicates that an abrupt change in lithology and water-bearing properties occurs at the interface between the shallow unconsolidated and coarser-grained alluvium and the indurated siltstone and sandstone of the Nacimiento Formation below. Prior to deposition of the alluvium, the Nacimiento Formation was exposed and incised by erosion. The alluvium was then deposited on top of the Nacimiento Formation, forming an erosional unconformity and a significant impediment to vertical movement of water through the vadose zone and an important hydrogeologic feature at the Facility. Thin and laterally discontinuous groundwater saturations are perched upon or slightly below the alluvium and Nacimiento Formation contact.

3.3 Facility Geology

The Basin Disposal SWMF borings, as well as those drilled at nearby sites confirm that site conditions are consistent with understanding of shallow stratigraphy and hydrogeology in the area based upon information published by Stone et al (1983), Manley, Scott and Wobus (1987) and others. **Table IV.2.1** provides summary information on Basin Disposal SWMF borings, and vicinity water wells, groundwater monitoring wells and mineral exploration wells. **Figure IV.2.5** is a map showing surface exposures of geologic units in the area. The BDI site borings and groundwater assessment wells penetrated various thicknesses of 10-42 feet of alluvium and up to 88 feet of indurated siltstone and sandstone in the underlying Nacimiento Formation.

3.4 Facility Hydrogeology

Shallow saturations are present in thin and laterally discontinuous basal alluvium atop the Nacimiento Formation and in uppermost few feet of the Nacimiento Formation at depths ranging from 29 feet bgs to 42 feet bgs at the BDI Facility. No saturation was found below the upper few feet of the Nacimiento Formation in site borings, which penetrated up to 88 feet of this horizon. Projections of regional well data indicate that confined brackish water is present in the Ojo Alamo Sandstone Aquifer, which is present at a depth of 665 feet below ground level at the BDI Facility. The following is a summary of the shallow hydrostratigraphy beneath the Basin Disposal site.

3.4.1 Quaternary Alluvium

A thin mantle of alluvium is present atop Nacimiento Formation beds in the west fork of Bloomfield Canyon at the BDI Facility. The alluvium penetrated by BDI Facility borings consists of silt and sand mixtures with caliche and minor gravel. Alluvium is a significant water-bearing zone adjacent to the San Juan and Animas Rivers and locally in major drainages of the San Juan Basin; however, no water wells tap the alluvium in the vicinity of the BDI Facility. Stone et al (1983) cited aquifer test results for 10 tests of wells completed in alluvium in the San Juan Basin; specific capacity measurements ranged from 0.84 gallons per minute per foot (gpm/ft) to 61.0 gpm/ft and averaged 11.57 gpm/ft.

3.4.2 Nacimiento Formation

The Nacimiento Formation is laterally continuous in the region of the BDI Facility and consists of approximately 600 feet of interbedded shale and sandstone. The BDI facility borings penetrated up to 88 feet of Nacimiento Formation, which consisted of interbedded grey siltstone and light to dark sandstone, with minor coal beds. Stone et al (1983) cited no tests of wells completed in the Nacimiento Formation, but did state that water in the Nacimiento Formation is brackish, having average electrical conductance exceeding 2,000 micromhos in the finer grained sections of the unit. Excluding a thin saturation of mineralized water found in the upper few feet of the Nacimiento Formation by BH-2; the BDI site borings found no water in the Nacimiento Formation.

3.4.3 Ojo Alamo Sandstone

The Ojo Alamos Sandstone is utilized for domestic and stock water supply along a belt near its outcrop south and west of U.S. Highway 550. Stone et al (1983) identified several water wells completed in the Ojo Alamo Sandstone in the region of the BDI Facility. The nearest of these wells

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

is located approximately 6.75 miles southwest of the BDI Facility. NMOCD ONLINE IMAGING DATABASE (2019) data indicates that the water injection well (API 30-045-26862) on the BDI Facility penetrated the top of the Ojo Alamo Sandstone at a depth of 665 feet below land surface. The Ojo Alamo Sandstone is artesian; the Stone et al (1983) regional potentiometric surface map of the Ojo Alamo Sandstone projected pressure head value at an elevation of 5400 feet above mean sea level at the BDI Facility. The Stone et al (1983) regional map of conductance of water in the Ojo Alamo Sandstone projected a value of 5000 micromhos in the vicinity of the BDI Facility.

3.4.4 Groundwater Occurrence and Movement

Shomaker (JSAI 2008b) prepared a ground-water elevation map in the region of the BDI Facility based on a combination of water levels in wells completed in shallow units (alluvium and Nacimiento Formation) taken from Stone et al. (1983) and the NMOSE WATERS DATABASE (2008). This map is shown in **Figure IV.2.9**. The projected head value at the BDI Facility is less than 5,600 ft above mean sea level. The projected shallow water level at the BDI Facility is approximately 130 feet below grade and indicated within the Nacimiento Formation. **Figure IV.2.9** indicates that shallow hydraulic gradient is toward the south at a slope of about 0.016 ft/ft, or about 85.5 ft per mile. Based upon lithology of the Nacimiento Formation, water bearing properties are assumed to be low and groundwater flow velocity is also assumed to be low.

Relationships between terrain, subsurface geology and shallow saturations are summarized in the local shallow hydrogeologic cross section presented in **Figure IV.2.11**. The line of this cross-section is shown on the vicinity well location map in **Figure IV.2.10**. Groundwater assessment wells installed at Basin Disposal penetrated 12 to 42 feet of dry alluvium and Nacimiento Formation sandstone and shale and thin and laterally discontinuous saturations of mineralized water.

4.0 REGULATORY SITING REQUIREMENTS

This section addresses regulatory requirements for basic hydrogeologic site data, as well as for demonstration of compliance with siting requirements relative to minimum depth to groundwater, as follows:

19.15.36.8.C.15 NMAC

- (a) a map showing names and locations of streams, springs and other watercourses and water wells within one mile of the site;**
- (b) laboratory analyses, performed by an independent commercial laboratory, for major cations, and anions; BTEX;; RCRA metals; and TDS of groundwater samples of the shallowest fresh water aquifer beneath the proposed site;**

- (c) *depth to, formation name, type and thickness of the shallowest fresh water aquifer;*
- (d) *soil types beneath the proposed surface waste management facility; including a lithologic description of soil and rock members from ground surface down to the top of the shallowest fresh water aquifer;*
- (e) *geologic cross sections;*
- (f) *potentiometric maps for the shallowest fresh water aquifer;*

19.15.36.13.A(5) NMAC

Depth to groundwater: no other surface waste management facility shall be located where groundwater is less than 50 feet below the lowest elevation of the design depth at which the operator will place oil field waste.

4.1 Streams, Springs, Watercourses and Water Wells Within One Mile of the Site

The map in **Figure IV.2.10** shows terrain, wells and drainages and the region within a one mile radius of the Facility. No perennial streams or springs are present within one mile of the Basin Disposal Facility; however, several ephemeral washes are present. There are no water wells within one mile of the Basin Disposal Facility. Locations of groundwater monitoring wells in the vicinity of the Basin Disposal Facility are shown in **Figure IV.2.10**; a summary of vicinity wells is also included in **Table IV.2.1**.

4.2 Laboratory Analyses of Shallow Groundwater Samples

Groundwater samples were collected from wells AW-1 and AW-2 on May 27, May 29 and October 30, 2008 (JSAI 2008b). The samples from well AW-1 and AW-2 were analyzed for major ions, toxic metals, total petroleum hydrocarbons and volatile organic compounds. Summary analytical results are presented in **Table IV.2.2**. Results of lab analyses indicate that the shallow perched water penetrated by wells AW-1 and AW-2 is brackish to saline, with Total Dissolved Solids (TDS) ranging from 24,000 milligrams per liter (mg/L) to 38,000 mg/L). No hydrocarbons were detected in the water sample taken from AW-1. An aqueous sample was collected from the Basin Disposal Facility clarification pond on August 4, 2006 and analyzed for primary ions and selected metals. Results of these analyses were compared with results of later tests of samples collected from site assessment wells AW-1 and AW-2, with the conclusion that the waters from the site assessment wells and the pond were dissimilar (JSAI 2008c).

Total dissolved solids of shallow perched water at the site is greater than 10,000 mg/L and not classified as fresh groundwater. The New Mexico Rules governing Oil and Gas surface waste management facilities (19.15.36 NMAC) do not specify a numerical limit on the maximum level of mineralization of surface and groundwater that is protectable; however, "fresh water" is defined as having a TDS concentration of less than 10,000 mg/L in New Mexico Oil and Gas Rules

19.15.2.7.F(3). New Mexico Oil and Gas Rules governing corrective actions at release sites (19.15.29.12.E, Table 1, NMAC) limit corrective actions to sites where TDS of underlying groundwater has a TDS concentration of 10,000 mg/L. This is consistent with New Mexico Water Quality Control Commission regulations 20.6.2.3101.A NMAC governing protection of water resources.

4.3 Depth, Formation Name, Type and Thickness of the Shallowest Fresh Water Aquifer

The shallowest fresh water aquifer at the Basin Disposal Facility are present in the Ojo Alamo Sandstone, which is approximately 655 feet below land surface at the site. The Ojo Alamo Sandstone is estimated to be 123 feet thick and is a sequence of sandstone, conglomeratic sandstone and shale (Stone et al, 1983).

4.4 Lithology of Stratigraphic Units Above the Ojo Alamo Sandstone at the Facility

Stratigraphic units which are above Ojo Alamo Sandstone at the site include the Nacimiento Formation and veneers of Quaternary colluvium deposits. Site characterization borings drilled on the Basin Disposal site penetrated indurated sandstones and grey organic and coal-bearing siltstones in the Nacimiento Formation.

4.5 Geologic Cross-Sections

Intermediate and shallow local hydrogeologic cross-sections depicting stratigraphy and geometry of the Alluvium, the Nacimiento Formation and the Ojo Alamo Sandstone and associated water bearing zones and potentiometric surface are depicted in **Figures IV.2.8 and IV.2.11**. These diagrams indicate that the depth to shallow thin and laterally discontinuous saline water saturations at the BDI Facility range from about 32 feet to 45 feet below land surface. Depth to the Ojo Alamo Sandstone is 665 feet below land surface at the site.

4.6 Potentiometric Surface of Shallow Saturations

A regional potentiometric surface map was prepared using water level data from numerous wells completed in shallow geologic units in the region of the BDI Facility (JSAI 2008b) and is presented in **Figure IV.2.9**. This map indicates that regional gradient direction is southerly at a magnitude of about 85.5 feet per mile. Stone et al (1983) prepared a regional potentiometric surface map of the Ojo Alamo Sandstone, which is present at a depth of 665 feet at the BDI Facility. This map indicated a northwesterly gradient at a slope of about 26 feet per mile.

4.7 Depth to Shallow Fresh Groundwater

Well logs and water level data from the onsite groundwater assessment wells at the BDI Facility indicate that the shallowest saturated zones at the site are present in thin and laterally discontinuous perched zones atop the Nacimiento Formation at depths of 30 feet to 42 feet; however, this shallow saturation exceeds 10,000 mg/L TDS and is not fresh water. The Ojo Alamo Sandstone is the shallowest potential fresh water bearing zone at the site; depth to the top of the Ojo Alamo Sandstone is approximately 665 feet below land surface.

4.8 Vicinity Oil and Gas Wells and Saltwater Injection Wells

Due to the level of mineralization and discontinuity of the shallow perched saturations that were noted in borings on the BDI site, as well as the long history of oil and gas exploration and production in the immediate vicinity of the property, it is appropriate to review the locations and histories of oil and gas installations in the area. Locations and American Petroleum Institute (API) designations of oil and gas wells and produced water injection wells in the area were determined using the NMOCD ONLINE IMAGING DATABASE (2019) and plotted on the map in **Figure IV.2.12**. This map indicates that several gas wells located close to and upgradient from the BDI Facility were installed in the 1950s. Most of the wells have been produced and decommissioned and no records of gas, oil or water production are available. The nearest of these wells (API 30-045-08791) was drilled in 1959 and remains in production. NMOCD records for this well indicate that approximately 4,000 barrels of co-produced water has been taken from this well since 1992. It is assumed that much or all of the water produced by the oil and gas wells in the area was disposed of in unlined pits at the well locations prior to promulgation of the New Mexico Oil and Gas Act, NMSA 1978. Numerous potential sources of fugitive oilfield water are present in the vicinity of the BDI Facility.

5.0 CONCLUSIONS

Assessment wells AW-1 and AW-2 produced ground water with TDS concentrations of 38,000 mg/L and 24,000 mg/L, respectively. These are above the TDS concentration of 10,000 mg/L for protectable fresh water, per NMAC 19.15.36.8 C. (15) (b), as defined in NMAC 19.15.1.7 F. (3).

The Ojo Alamo Sandstone is regarded as the shallowest fresh water aquifer in the vicinity of the BDI Facility. Depth to the top of the Ojo Alamos Sandstone is approximately 665 feet below land

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

surface. Water within the Ojo Alamo Sandstone is under confined conditions, with a projected head elevation of more than 350 feet above the top of the unit at the BDI Facility.

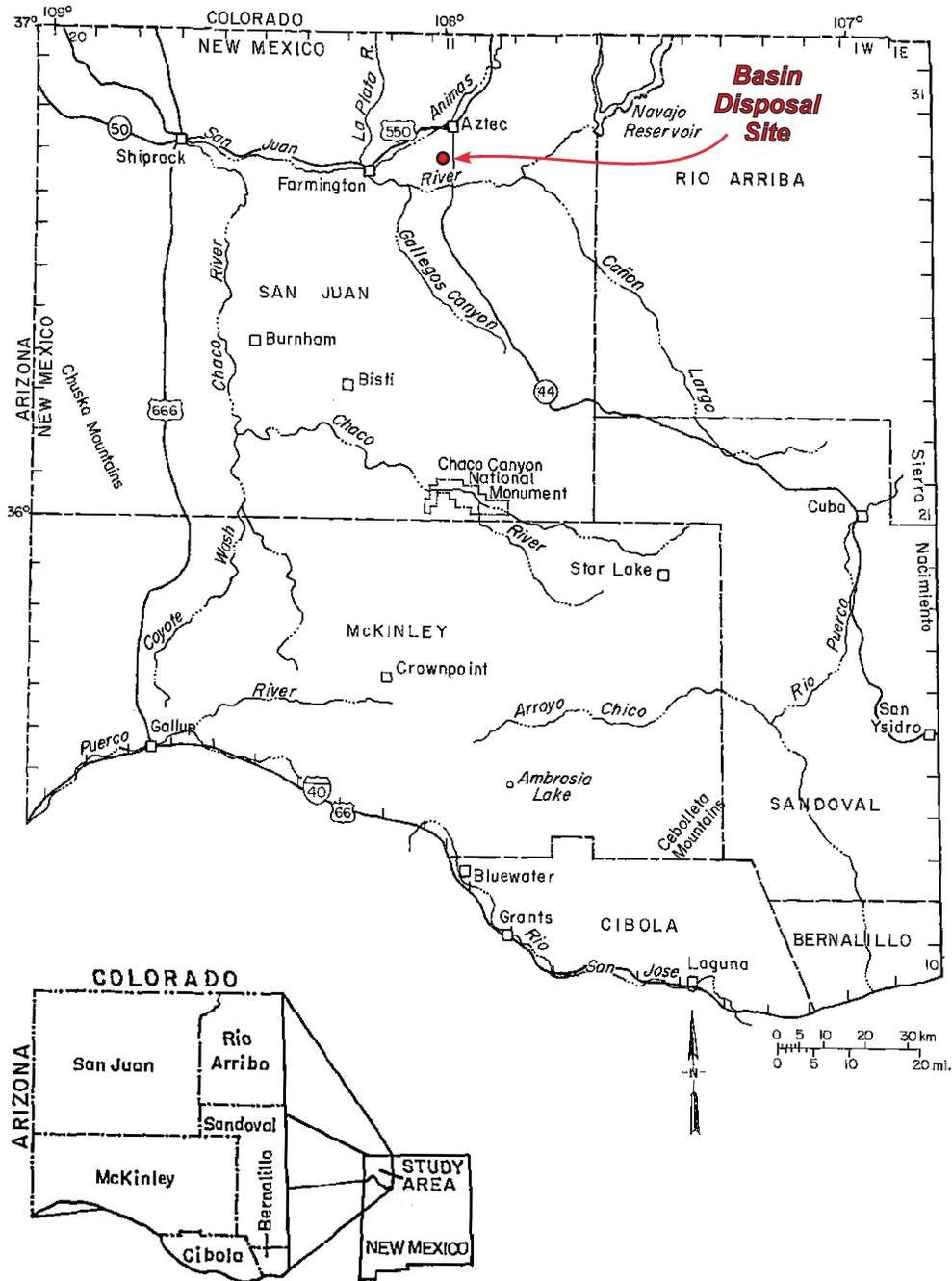
Based upon data from on-site BDI Facility borings, and groundwater monitoring well installations, and area wells, there are no known shallow susceptible fresh water aquifers at the Basin Disposal Facility, or in the vicinity.

6.0 REFERENCES

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FIGURES

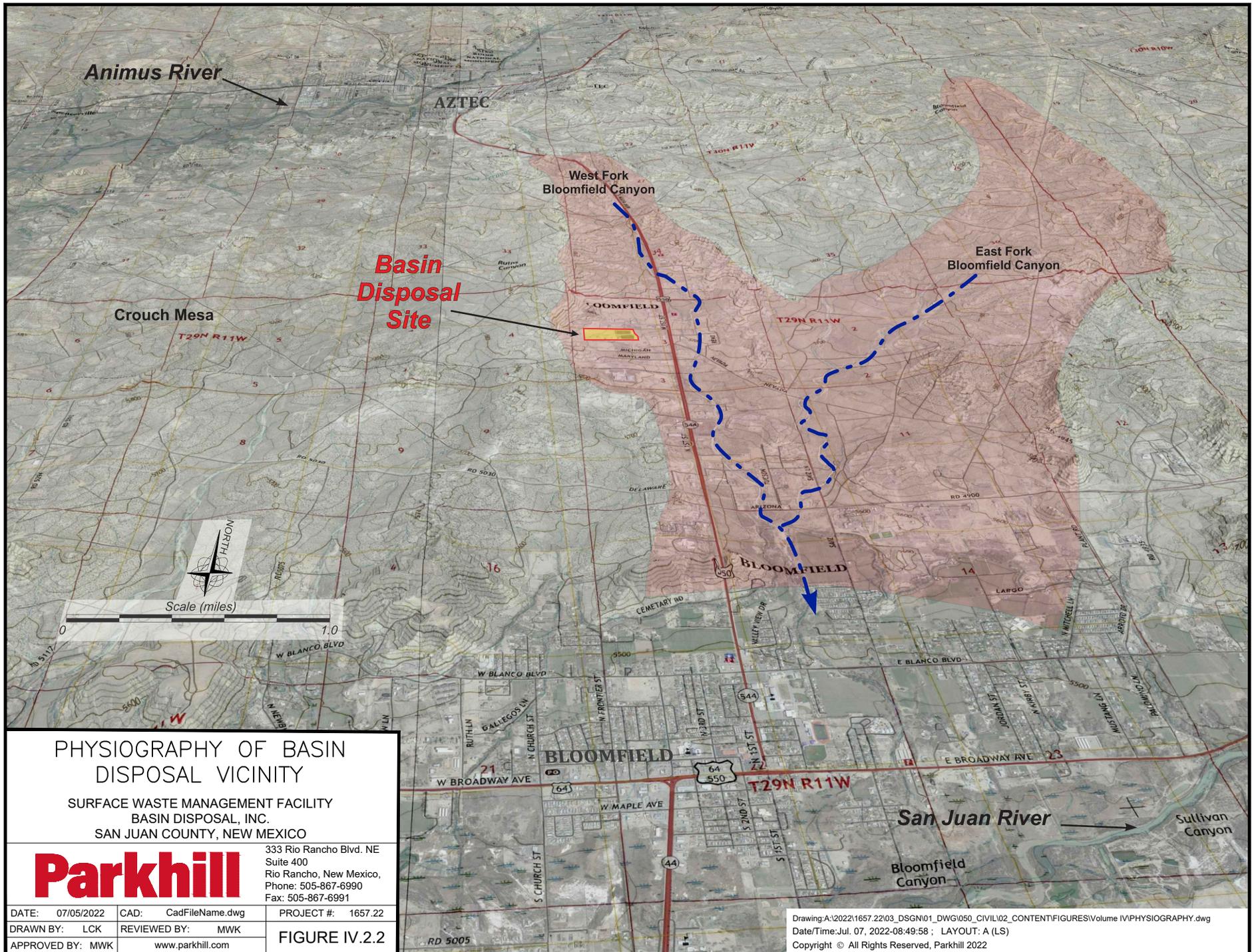
IV.2.1	SITE LOCATION MAP
IV.2.2	PHYSIOGRAPHY OF THE BASIN DISPOSAL SITE VICINITY
IV.2.3	MAJOR STRUCTURAL FEATURES
IV.2.4	SAN JUAN BASIN CROSS SECTION AND STRTIGRAPHIC UNITS
IV.2.5	SURFACE GEOLOGY MAP
IV.2.6	POST TRIASSIC STRATIGRAPHIC UNITS
IV.2.7	LOCATIONS OF REGIONAL WATER WELLS AND SPRINGS
IV.2.8	INTERMEDIATE HYDROGEOLOGIC CROSS SECTION
IV.2.9	REGIONAL POTENTIOMETRIC SURFACE – ALL ZONES
IV.2.10	LOCATIONS OF WELLS AND WATERCOURSES WITHIN ONE MILE
IV.2.11	LOCAL SHALLOW HYDROGEOLOGIC CROSS SECTION
IV.2.12	LOCATONS OF VICINITY OIL AND GAS WELLS



Modified From: Stone, Lyford, Frenzel, Mizell and Pagett, 1983, fig 1

<h2 style="margin: 0;">SITE LOCATION MAP</h2> <p style="margin: 0;">SURFACE WASTE MANAGEMENT FACILITY BASIN DISPOSAL, INC. SAN JUAN COUNTY, NEW MEXICO</p>		
		333 Rio Rancho Blvd. NE Suite 400 Rio Rancho, New Mexico, Phone: 505-867-6990 Fax: 505-867-6991
DATE: 07/05/2022	CAD: SITE LOCATION.dwg	PROJECT #: 1657.22
DRAWN BY: LCK	REVIEWED BY: MWK	<h3 style="margin: 0;">FIGURE IV.2.1</h3>
APPROVED BY: MWK	www.parkhill.com	

Drawing: A:\2022\1657.22\03_DSGN01_DWG\050_CIVIL\02_CONTENT\FIGURES\Volume IV\SITE LOCATION.dwg
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PHYSIOGRAPHY OF BASIN
DISPOSAL VICINITY

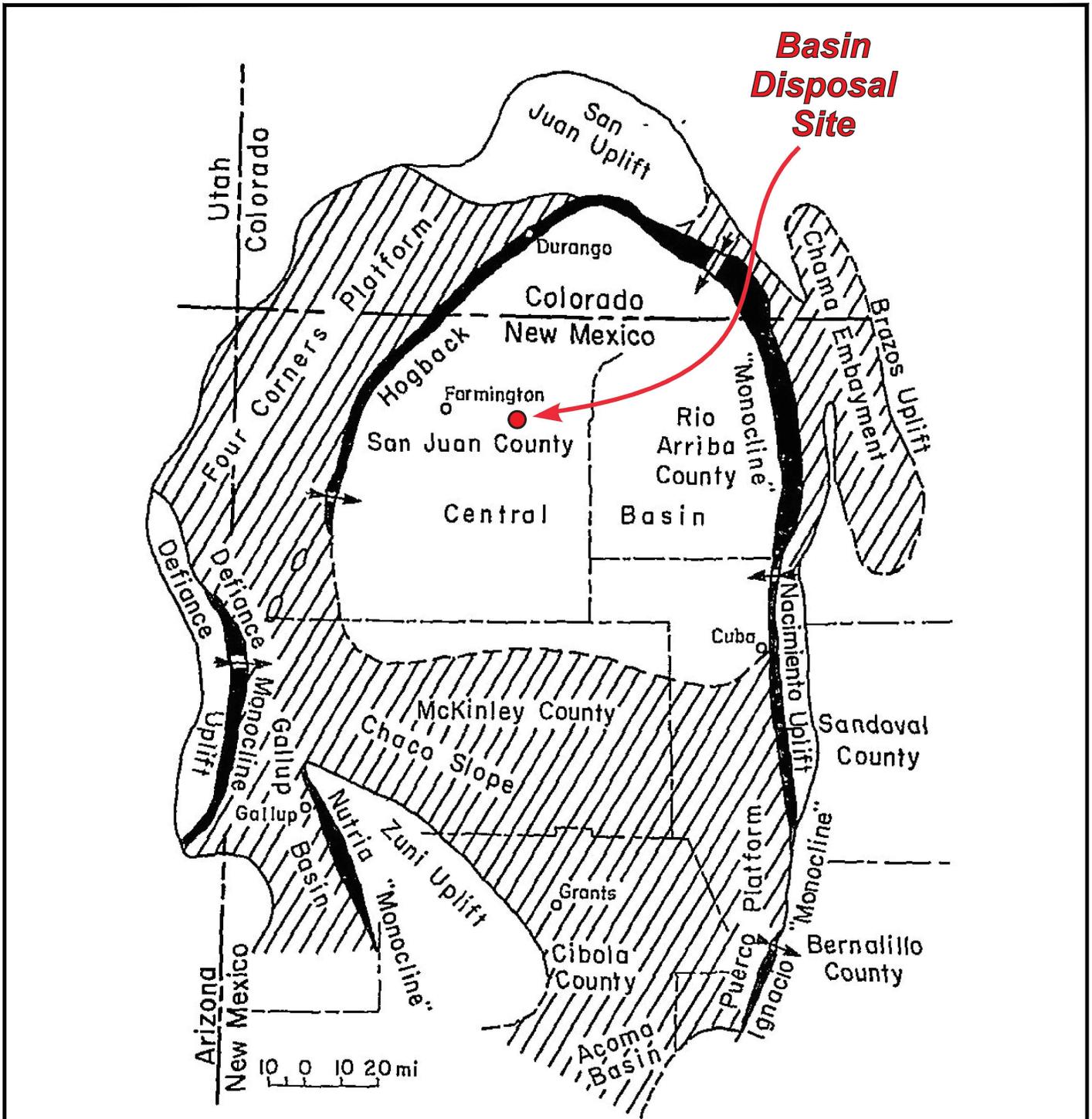
SURFACE WASTE MANAGEMENT FACILITY
BASIN DISPOSAL, INC.
SAN JUAN COUNTY, NEW MEXICO

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Rio Rancho, New Mexico,
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Fax: 505-867-6991

DATE: 07/05/2022	CAD: CadFileName.dwg	PROJECT #: 1657.22
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APPROVED BY: MWK	www.parkhill.com	

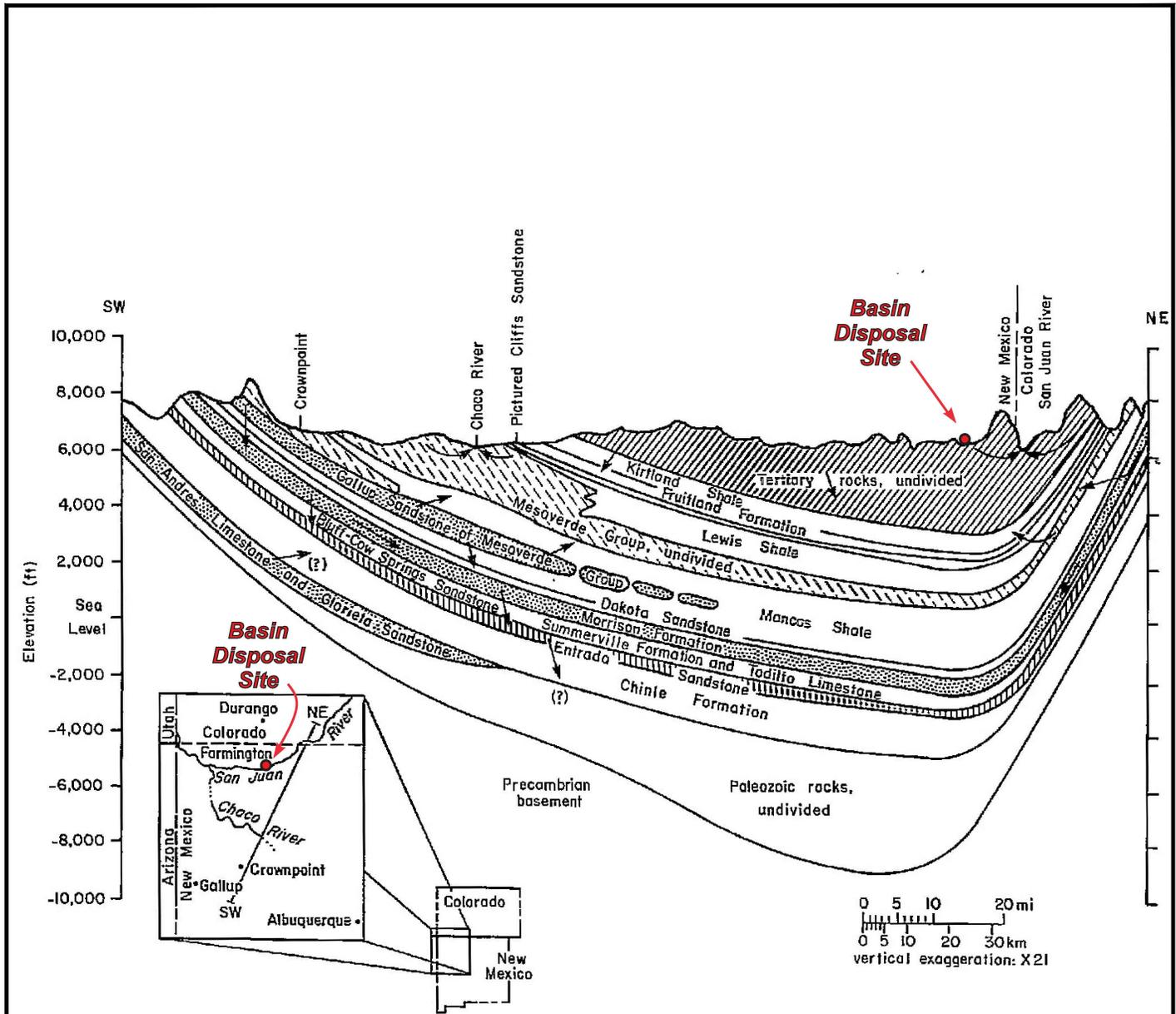
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Modified From: Stone, Lyford, Frenzel, Mizell and Pagett, 1983, fig 4, V.C. Kelley, 1951

<p>SAN JUAN BASIN STRUCTURAL FEATURES</p> <p>SURFACE WASTE MANAGEMENT FACILITY BASIN DISPOSAL, INC. SAN JUAN COUNTY, NEW MEXICO</p>		
<p>Parkhill</p>		<p>333 Rio Rancho Blvd. NE Suite 400 Rio Rancho, New Mexico, Phone: 505-867-6990 Fax: 505-867-6991</p>
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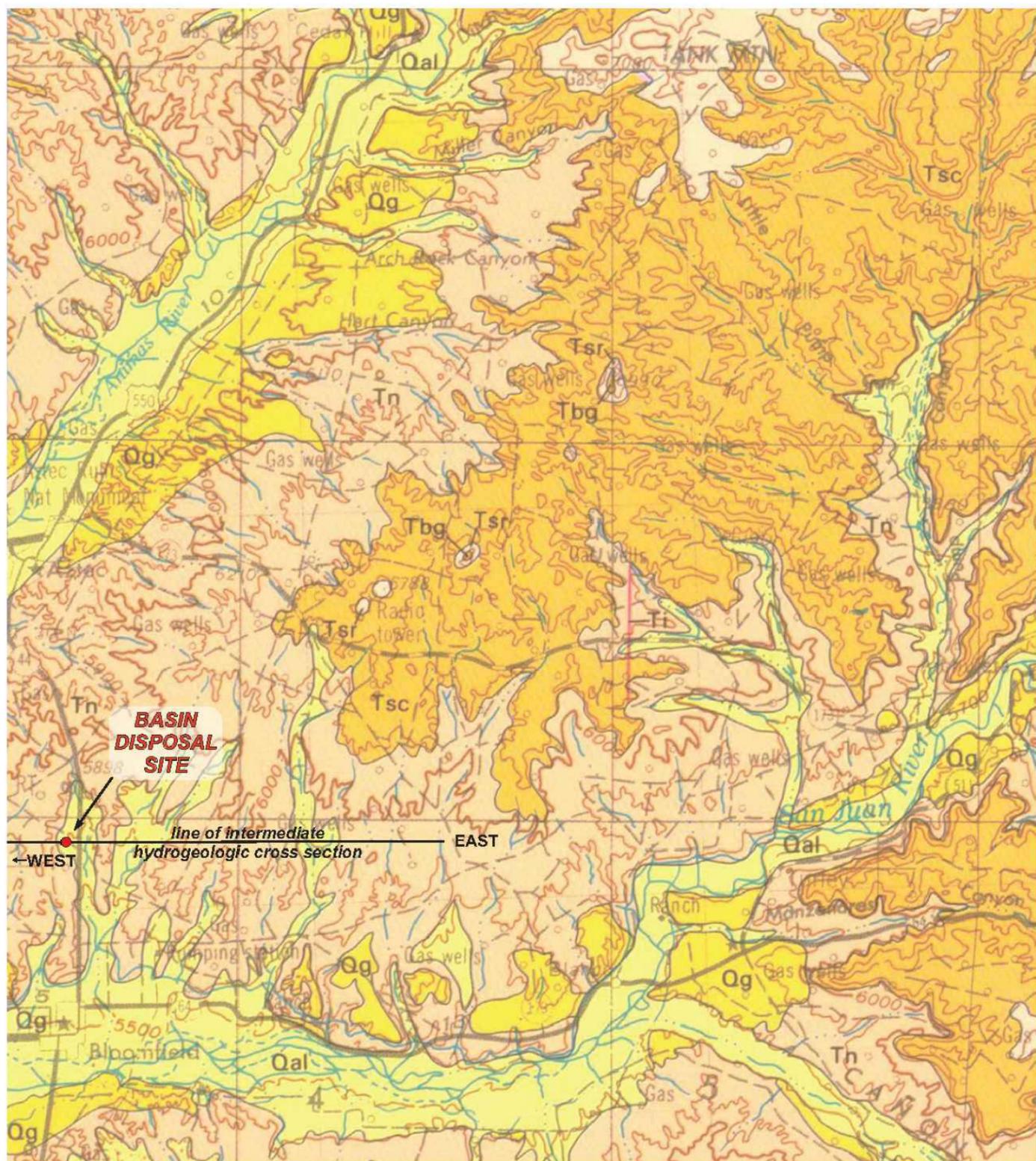
Modified From: Stone, Lyford, Frenzel, Mizell and Pagett, 1983, fig 10

SAN JUAN BASIN
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FIGURE IV.2.4

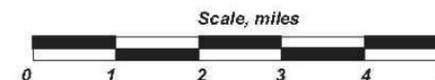
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Descriptions of Geologic Units

- Qal** **Alluvium (Holocene)**—Stream deposited clay, silt, sand, and gravel on valley floors and in lowest terraces. Includes some fan and sheetwash alluvium. As much as 10 m thick
- Qg** **Terrace gravel (Pleistocene)**—Well-sorted gravel on terraces along major streams. Locally includes outwash and pediment gravel. Thickness 3-17 m
- Tbg** **Bridgetimber Gravel (Pliocene)**—Bouldery gravel about 383 m above the Animas River. The age is changed from Pleistocene to Pliocene because of the great height of the formation above the LaPlata and Animas Rivers (it is the highest fluvial pediment deposit), because it has reversed magnetism at outcrops in northern New Mexico (Strobell, written commun., 1979), and because the rock clasts in the formation are so extremely weathered in contrast to clasts in early Pleistocene fluvial deposits. About 7 m thick
- San Jose Formation (Eocene)**
- Tstl** **Tapicitos and Llaves Members, undivided**—Red, tan, and white sandstone and shale. Llaves Member is predominantly sandstone
- Tsr** **Regina Member**—Variegated shale and tan to white sandstone
- Tsc** **Cuba Mesa Member**—Tan conglomeratic sandstone and shale
- Tn** **Nacimiento Formation (Paleocene)**—Gray to olive-gray shale; minor interbedded sandstone in southwest, but to northeast nearly one half of formation is sandstone. Grades into the Animas Formation to the north. Thickness as much as 580 m
- Tea** **Ojo Alamo Sandstone (Paleocene)**—Brown crossbedded sandstone, containing spherical-pebble conglomerate composed of quartzite and chert clasts near base. Grades laterally into the lower part of the Animas Formation to the north. Contains abundant petrified wood. Thickness 25-65 m

Geologic map and descriptions from: Manley, Scott and Wobus, 1987



GEOLOGIC MAP OF THE BASIN DISPOSAL FACILITY AREA

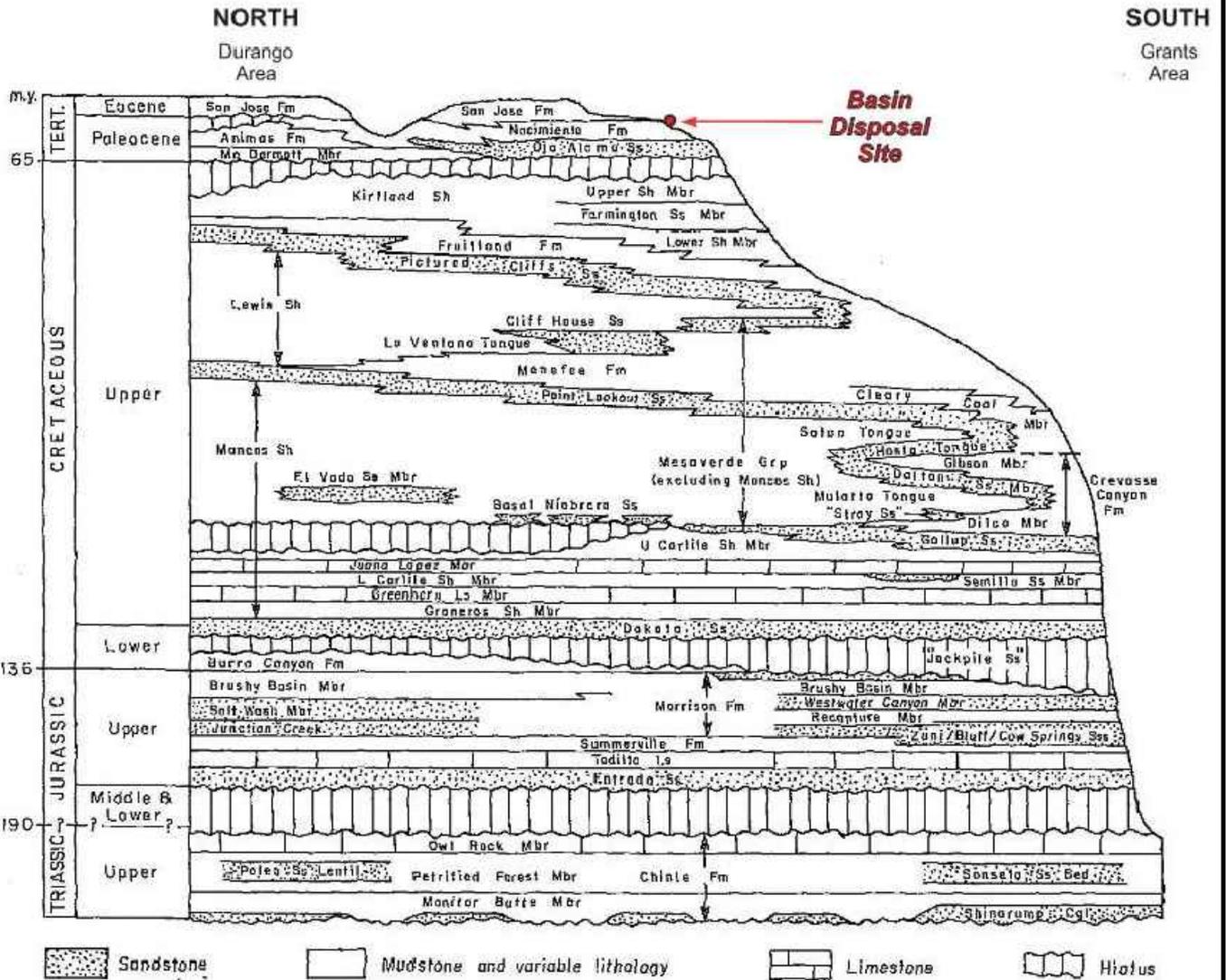
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BLOOMFIELD, NEW MEXICO



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Modified From: Stone, Lyford, Frenzel, Mizell and Pagett, 1983, fig 6

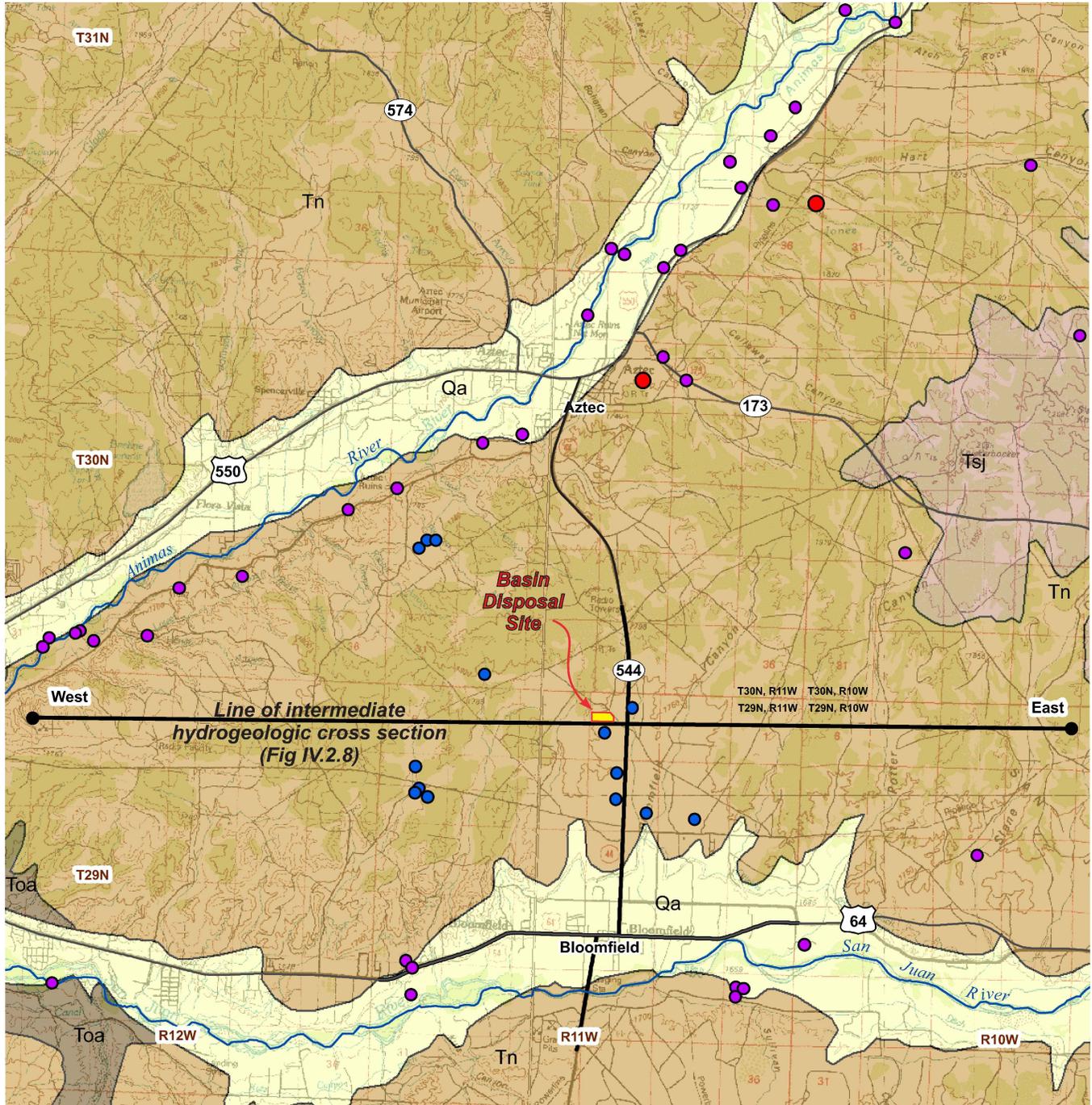
SAN JUAN BASIN POST TRIASSIC STRATIGRAPHIC UNITS

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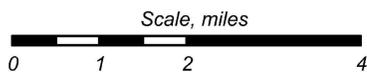
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Map and data from: JSAI, 2008b, Figure 1.

Explanation

- NMOSE WATERS Database well
- Stone, et al 1983 well location
- Stone, et al 1983 spring location



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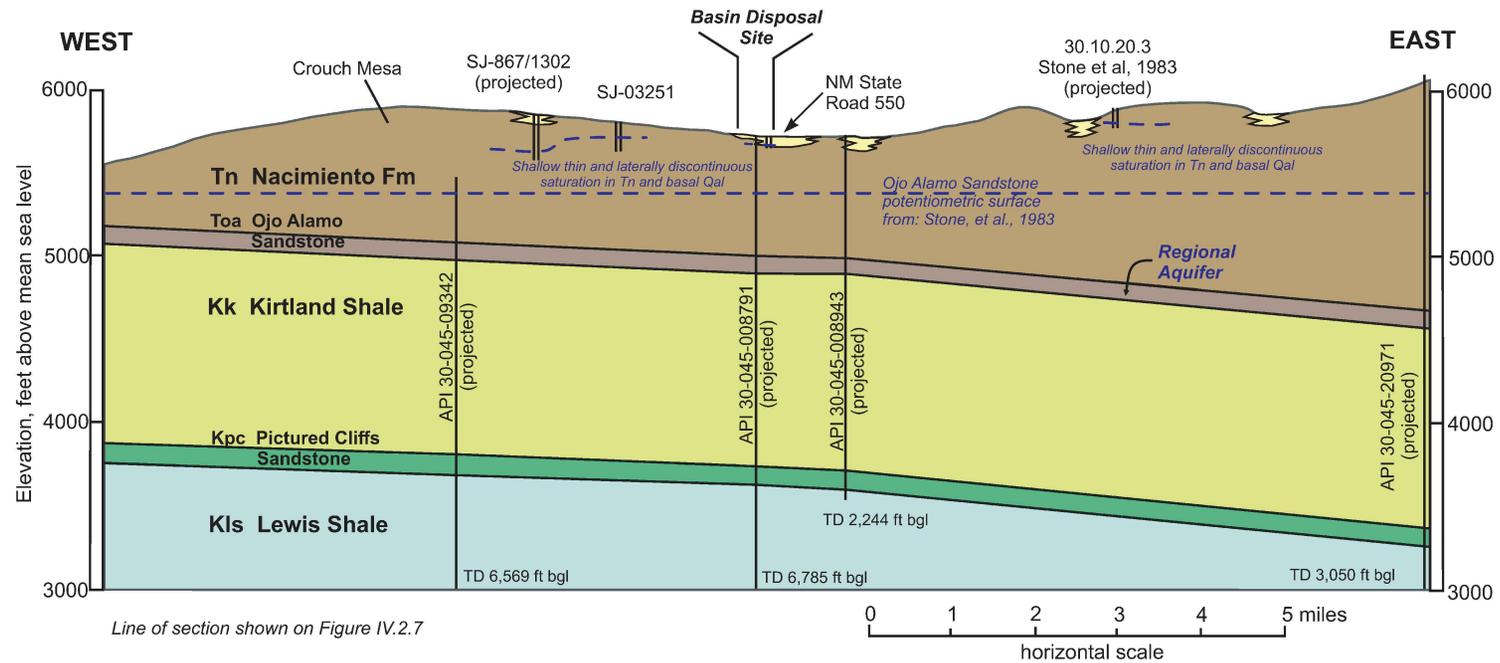
LOCATIONS OF WATER WELLS AND SPRINGS

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Line of section shown on Figure IV.2.7

- Quaternary-age colluvium and alluvium
- Tertiary-age San Jose Formation (on Fig. 1)
- Tertiary-age Nacimiento Formation
- Tertiary-age Ojo Alamo Sandstone
- Cretaceous-age Kirtland Shale
- Cretaceous-age Pictured Cliffs Sandstone
- Cretaceous-age Lewis Shale
- water-level elevation from NMOSE WATERS database and Stone et al., 1983 wells

Modified from: JSAL, 2008b, Figure 4.

**INTERMEDIATE HYDROGEOLOGIC
CROSS-SECTION**

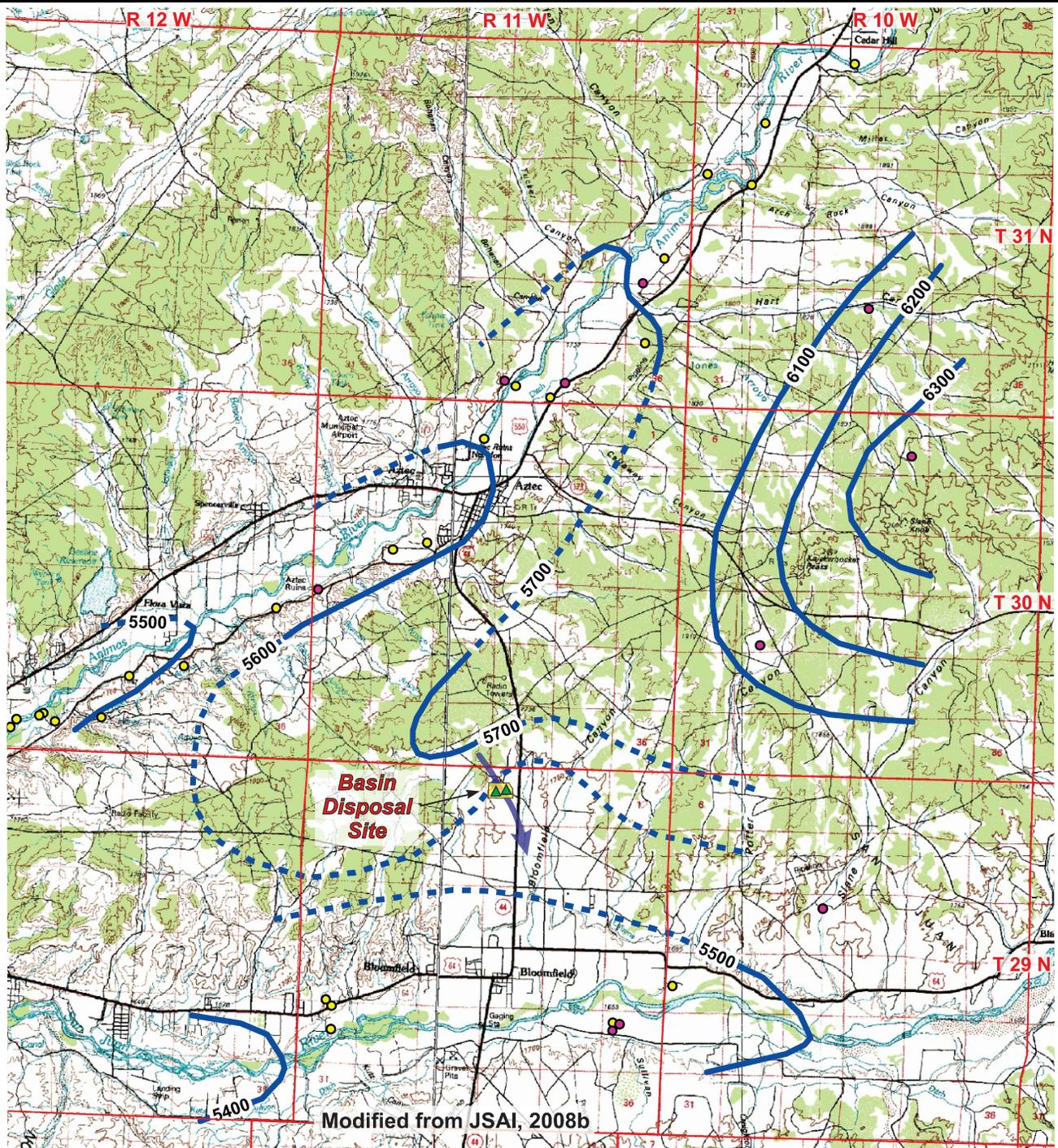
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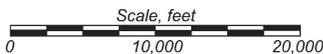
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Explanation

-  Isopleth on line of equal water level elevation (alluvium and Nacimiento Fm)
-  Basin Disposal assessment well locations
-  Qal and Tn wells (Stone et al, 1983)
-  Qal and Tn wells (NMOSE WATERS, 2008)
-  Gradient direction



**REGIONAL POTENTIOMETRIC SURFACE
ALLUVIUM AND NACIMIENTO FM.**

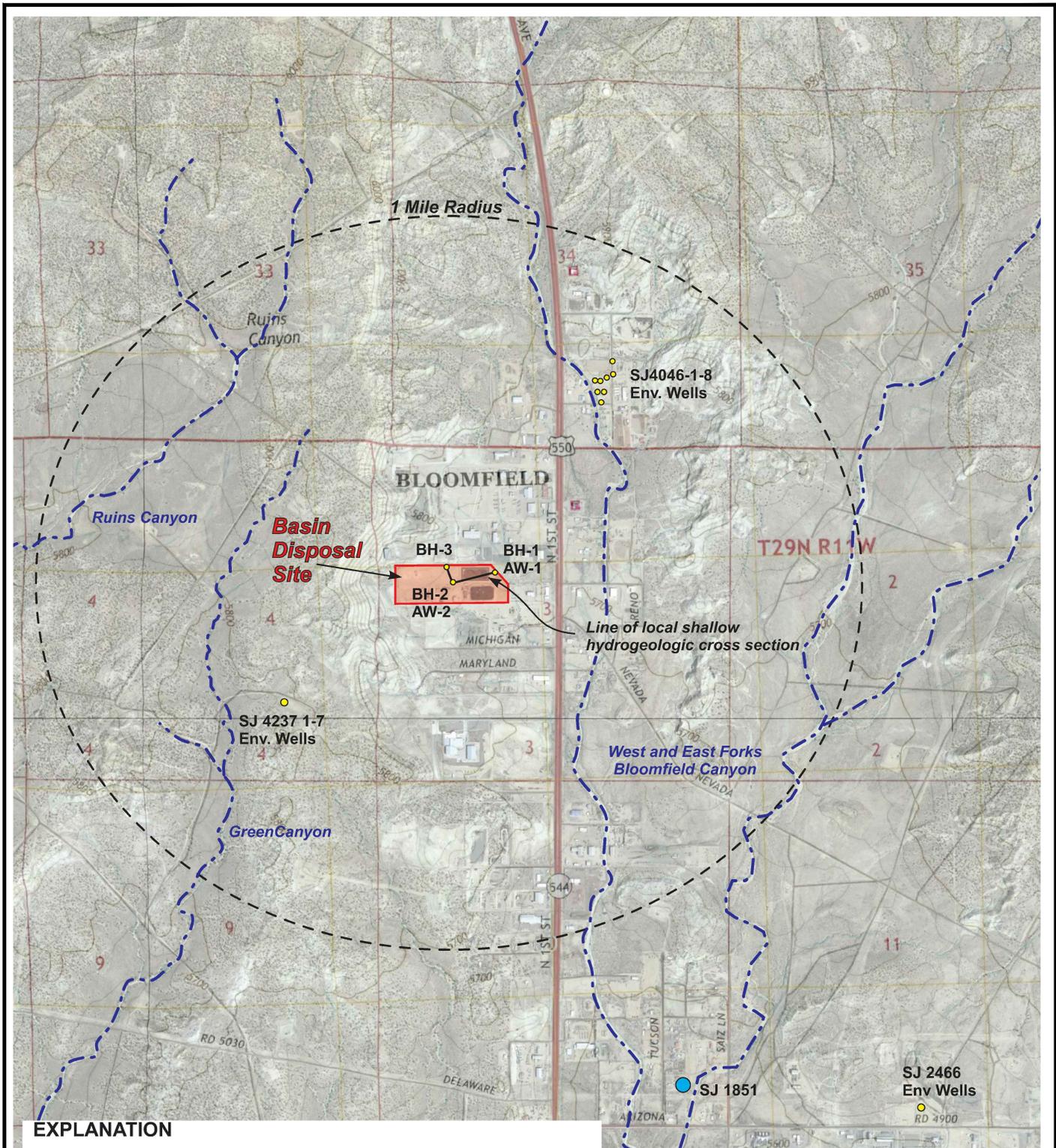
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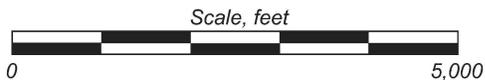
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EXPLANATION

- SJ 1851 Location of permitted water well showing San Juan Basin NMOSE permit number
- SJ 4237 1-7 Env. Wells Location of environmental monitoring well or network showing San Juan Basin NMOSE permit number
- BH-1 AW-1 Location of Basin Disposal Site borings and assessment wells



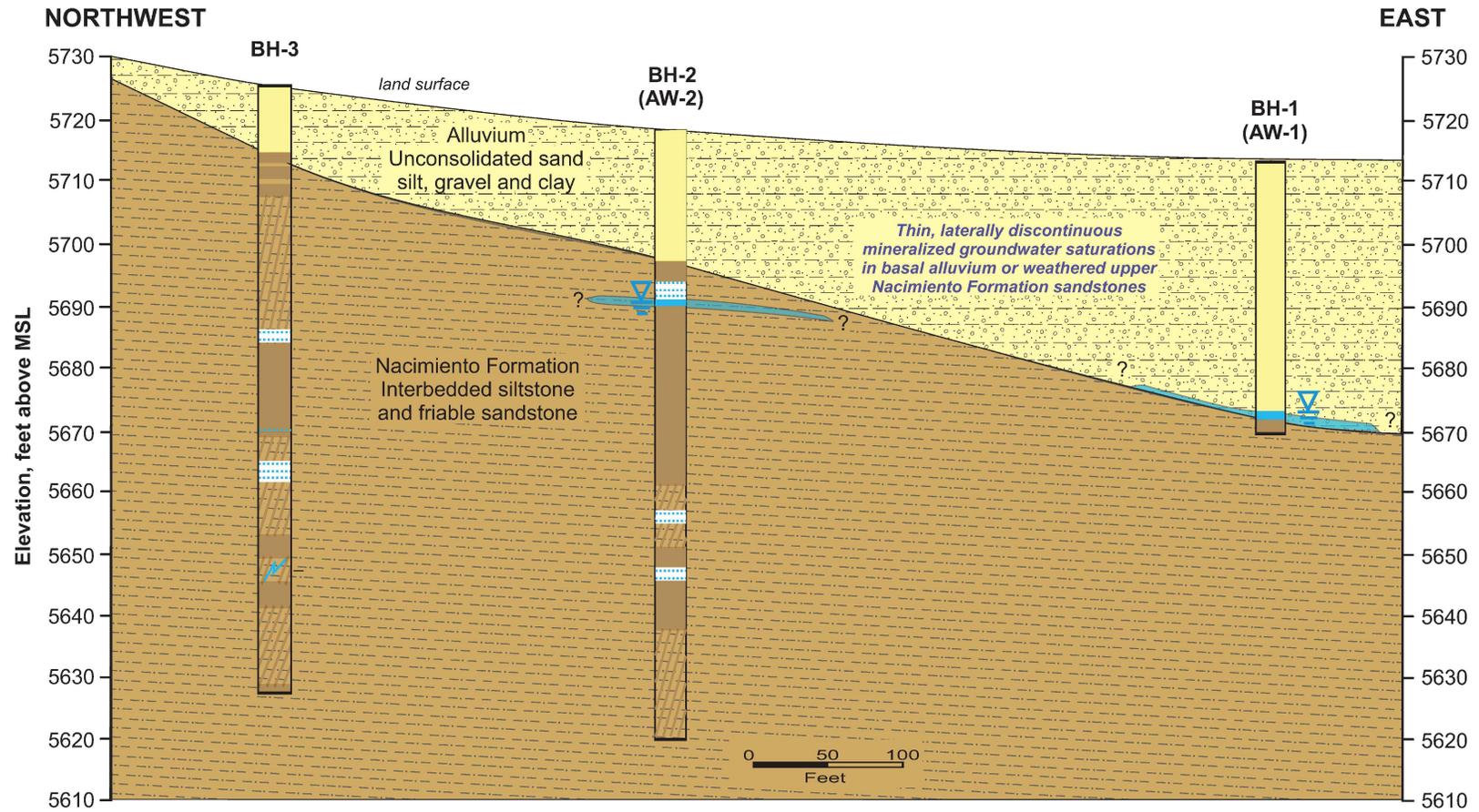
**WELLS AND WATERCOURSES
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Line of section shown on Figure IV.2.9

Boring Log Explanation

- alluvium/fill
- Nacimientto Formation: sandstone member
- Nacimientto Formation: siltstone/shale member
- moisture within siltstone/shale member
- perched shallow water saturation

Modified after JSAI, 2008b

LOCAL HYDROGEOLOGIC
CROSS-SECTION

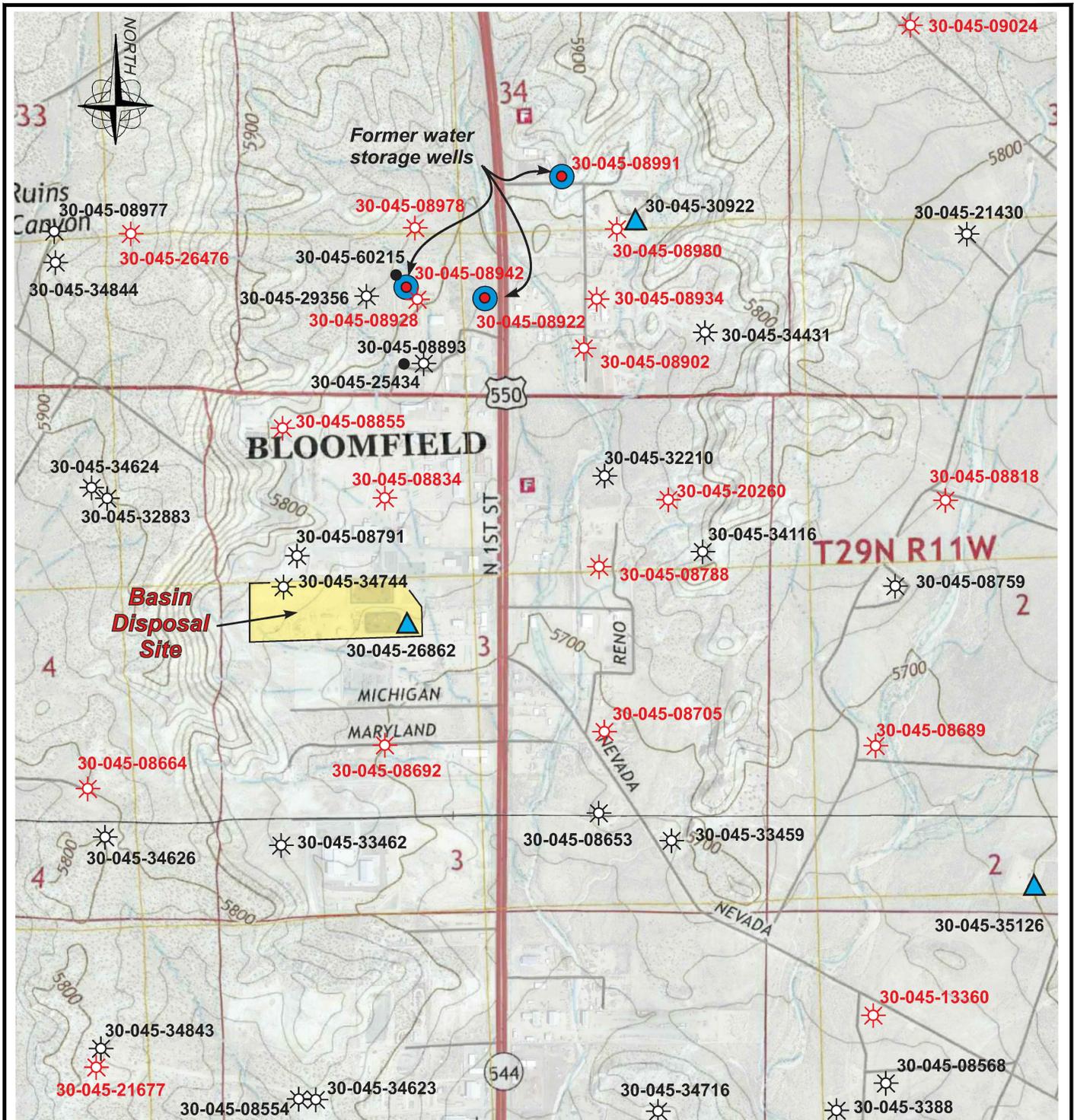
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EXPLANATION

- 30-045-34626 Location of active gas well showing API designation
- 30-045-60215 Location of active oil well showing API designation
- 30-045-08664 Location of abandoned gas well showing API designation
- 30-045-08922 Location of abandoned oil well showing API designation
- 30-045-35126 Location of water injection well showing API designation



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<p>OIL AND GAS WELLS IN THE VICINITY</p> <p>SURFACE WASTE MANAGEMENT FACILITY BASIN DISPOSAL, INC. SAN JUAN COUNTY, NEW MEXICO</p>		
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TABLES

- IV.2.1 SUMMARY DATA FROM WELLS AND BORINGS IN THE VICINITY OF THE BASIN DISPOSAL SWMF
- IV.2.2 WATER QUALITY DATA SUMMARY
- IV.2.3 SOIL LABORATORY ANALYSIS SUMMARY

TABLE IV.2.1 - Summary Data from Borings and Wells Near the Basin Disposal, Inc. Site

Well or Boring	Latitude	Longitude	Use	Owner	Completion Date	¹ LS Elev (ft)	Water Bearing (producing) Zone	Top Casing Elev (ft)	Depth (ft)	WL (ft) Below Top Casing	WL (ft) Below Land Surface	WL Date	WL Elev (ft) above MSL	Source of Data
Basin Disposal Inc. Site Assessment Wells														
AW-1 (BH-1)	36.756119	-107.982000	Monitoring Well	Basin Disposl Inc.	5/19/2008	5715.00	Qal	5717.50	45	44.72	42.22	5/29/2008	5672.78	JSAI 2008b
AW-2 (BH-4)	36.755722	-107.984163	Monitoring Well	Basin Disposl Inc.	5/19/2008	5719.00	Qal-Tn	5721.90	30	32.50	29.6	5/29/2008	5689.40	JSAI 2008b
Basin Disposal Inc Facility Site Assessment Soil Borings														
BH-2	36.755722	-107.984108	Site Boring	Basin Disposl Inc.	5/19/2008	5719.0	Qal-Tn	not cased	101	dry	30		5689.00	JSAI 2008b
BH-3	36.756312	-107.984508	Site Boring	Basin Disposl Inc.	5/22/2008	5727.0	dry	not cased	100	dry	dry			JSAI 2008b
NMOSE Permitted Water Wells														
SJ 1851	36.734788	-107.97231	Domestic	J. Bosse'	6/20/1984	5583	Qal-Tn	-	125	-	48	6/20/1984	5535	NMOSE WATERS DATABASE
SJ 3251	36.762372	-108.01489	Domestic	E. Urie	4/11/2003	5846	Qal-Tn	-	150	-	77	4/11/2003	-	NMOSE WATERS DATABASE
NMOSE Permitted Environmental Wells														
SJ 2466	36.733873	-107.95987	Polution Control	El Paso CGP Company LLC	App. 4/7/1993	5621	shallow	-	66	-	-	-	-	NMOSE WATERS DATABASE
SJ 2466 S	36.733873	-107.95987	Polution Control	El Paso CGP Company LLC	App. 4/7/1993	5621	shallow	-	65	-	-	-	-	NMOSE WATERS DATABASE
SJ 4046 P1	36.763964	107.97639	Monitoring Well	ConocoPhillips Company	Plugged 2/20/2018	5772	shallow	-	41	-	37.1	2/20/2018	5734.9	NMOSE WATERS DATABASE
SJ 4046 P2	36.763561	-107.97630	Monitoring Well	ConocoPhillips Company	Plugged 2/20/2018	5764	shallow	-	41	-	36.0	2/20/2018	5728.0	NMOSE WATERS DATABASE
SJ 4046 P3	36.763566	-107.97644	Monitoring Well	ConocoPhillips Company	Plugged 2/20/2018	5764	shallow	-	46	-	35.4	2/20/2018	5728.6	NMOSE WATERS DATABASE
SJ 4046 P4	36.764169	-107.97612	Monitoring Well	ConocoPhillips Company	Plugged 2/20/2018	5775	shallow	-	53	-	38.6	2/20/2018	5736.4	NMOSE WATERS DATABASE
SJ 4046 P5	36.764276	-107.97582	Monitoring Well	ConocoPhillips Company	Plugged 2/20/2018	5773	shallow	-	48	-	37.6	2/20/2018	5735.4	NMOSE WATERS DATABASE
SJ 4046 P6	36.763962	-107.97647	Monitoring Well	ConocoPhillips Company	Plugged 2/20/2018	5773	shallow	-	58	-	38.7	2/20/2018	5734.3	NMOSE WATERS DATABASE
SJ 4046 P7	36.76317943	-107.97642	Monitoring Well	ConocoPhillips Company	Plugged 2/20/2018	5764	shallow	-	52	-	38.7	2/20/2018	5725.3	NMOSE WATERS DATABASE
SJ 4046 P8	36.764816	-107.97582	Monitoring Well	ConocoPhillips Company	Plugged 2/20/2018	5782	shallow	-	55	-	39.8	2/20/2018	5742.2	NMOSE WATERS DATABASE
SJ 4127 P1	36.732047	-107.96300	Monitoring Well	El Paso CGP Company LLC	App. 11/19/2014	5604	-	-	-	-	-	-	-	NMOSE WATERS DATABASE
SJ 4127 P2	36.728547	-107.96168	Monitoring Well	El Paso CGP Company LLC	Plug Plan 11/19/2014	5571	Dry	-	21	-	Dry	-	Dry	NMOSE WATERS DATABASE
SJ 4127 P3	36.729374	-107.96034	Monitoring Well	El Paso CGP Company LLC	Plug Plan 11/19/2014	5581	Dry	-	31	-	Dry	-	Dry	NMOSE WATERS DATABASE
SJ 4127 P4	36.728201	107.96004	Monitoring Well	El Paso CGP Company LLC	Plug Plan 11/19/2014	5574	Dry	-	21	-	Dry	-	Dry	NMOSE WATERS DATABASE
SJ 4127 P5	36.729033	-107.95917	Monitoring Well	El Paso CGP Company LLC	App. 11/19/2014	5584	-	-	-	-	-	-	-	NMOSE WATERS DATABASE
SJ 4127 P6	36.728054	-107.96160	Monitoring Well	El Paso CGP Company LLC	App. 11/19/2014	5569	-	-	-	-	-	-	-	NMOSE WATERS DATABASE
SJ 4127 P7	36.730715	-107.96078	Monitoring Well	El Paso CGP Company LLC	App. 11/19/2014	5592	-	-	-	-	-	-	-	NMOSE WATERS DATABASE
SJ 4127 P8	36.729210	-107.96075	Monitoring Well	El Paso CGP Company LLC	App. 11/19/2014	5580	-	-	-	-	-	-	-	NMOSE WATERS DATABASE
SJ 4127 P9	36.729942	-107.96068	Monitoring Well	El Paso CGP Company LLC	App. 11/19/2014	5585	-	-	-	-	-	-	-	NMOSE WATERS DATABASE
SJ 4127 P10	36.730017	107.95911	Monitoring Well	El Paso CGP Company LLC	App. 11/19/2014	5592	-	-	-	-	-	-	-	NMOSE WATERS DATABASE
SJ 4127 P11	36.728729	-107.95983	Monitoring Well	El Paso CGP Company LLC	App. 11/19/2014	5579	-	-	-	-	-	-	-	NMOSE WATERS DATABASE
SJ 4237 (7 wells)	36.750750	-107.99268	Polution Control	El Paso CGP Company LLC	App. 4/19/2018	5785	-	-	45	-	-	-	-	NMOSE WATERS DATABASE

TABLE IV.2.1 - Summary Data from Borings and Wells Near the Basin Disposal, Inc. Site

Well or Boring	Latitude	Longitude	Use	Owner	Completion Date	¹ LS Elev (ft)	Water Bearing (producing) Zone	Top Casing Elev (ft)	Depth (ft)	WL (ft) Below Top Casing	WL (ft) Below Land Surface	WL Date	WL Elev (ft) above MSL	Source of Data
NMOCD Permitted Oil and Gas Wells														
30-045-08834	36.7585449	-107.9824448	Gas - Plugged	El Paso CGP Company LLC	5/6/1952 spud date	5739	Kpc		2086					NMOCD on-line file data
30-045-34744	36.756073	-107.9857788	Gas - Active	Hillcorp Energy	1/8/2009 spud date	5734	Kpc		2250					NMOCD on-line file data
30-045-08791	36.7568512	-107.9853745	Gas - Active	Hillcorp Energy	10/19/1959 spud date	5739	Kd		6783					NMOCD on-line file data
30-045-08855	36.7603683	-107.9858322	Gas - Plugged	RH Long	12/08/1958 spud date	5784	Kirtland		1400					NMOCD on-line file data
30-045-08692	36.7519455	-107.9824219	Gas - Plugged	El Paso CGP Company LLC	6/7/1953 spud date	5688	Kpc		2025					NMOCD on-line file data
30-045-33462	36.7492409	-107.9857788	Gas - Active	Hillcorp Energy	2/10/2006 spud date	5729	Kd		6883					NMOCD on-line file data
30-045-25434	36.762146	-107.9814911	Gas - Active	LM Crane	5/1/1980 completion date	5788	Kirtland		1364					NMOCD on-line file data
30-045-08893	36.762146	-107.9817581	Oil - Active	LM Crane	2/14/1947 spud date	5730	Kirtland		1348					NMOCD on-line file data
30-045-29356	36.7639885	-107.9831009	Gas - Active	Hillcorp Energy	3/29/1996 spud date	5822	Kpc-Kf		2350					NMOCD on-line file data
30-045-60215	36.7645149	-107.982132	Oil - Active	LM Crane	3/20/1957 spud date	5809	Ojo Alamo		1326					NMOCD on-line file data
30-045-08928	36.76390	-107.9814148	Gas - Plugged	Philips & Spence	2/3/1935 initial APD approval	5797					No depth or formation data			NMOCD on-line file data
30-045-08978	36.7657661	-107.9814758	Gas - Plugged	Burlington Resources	5/17/1953 spud date	5809	Kf coal		2160					NMOCD on-line file data
30-045-08934	36.763943	-107.9755936	Gas - Plugged	ConocoPhillips Company	3/21/1961 spud date	5760	Kd		6770					NMOCD on-line file data
30-045-08902	36.762596	-107.9760971	Gas - Plugged	Goodrum	9/1/1937 APD approval	5749					No depth or formation data			NMOCD on-line file data
30-045-34431	36.763054	-107.9720535	Gas - Active	Hillcorp Energy	4/14/2008 spud date	5764	Kf coal		2274					NMOCD on-line file data
30-045-32210	36.759125	-107.9753418	Gas - Active	Southland Royalty	4/28/2004 spud date	5726	Kf coal		2233					NMOCD on-line file data
30-045-20260	36.758511	-107.9732225	Gas - Plugged	Thompson E&P	4/16/1968 spud date	5752	Kpc		2147					NMOCD on-line file data
30-045-34116	36.757111	-107.9720917	Gas - Active	Epic Energy LLC	2/21/2007 spud date	5756	Kpc		2200					NMOCD on-line file data
30-045-08788	36.756710	-107.9754715	Gas - Plugged	El Paso Natural Gas	5/12/1953 spud date	5717	Kpc		2067					NMOCD on-line file data
30-045-08705	36.752281	-107.975250	Gas - Plugged	XTO Energy	1/9/1964 spud date	5683	Kd		6608					NMOCD on-line file data
30-045-08705	36.750126	-107.9755173	Gas - Active	Southland Royalty	6/3/1953 spud date	5675	Kpc-Kf coal		2034					NMOCD on-line file data
30-045-33459	36.749329	-107.9731216	Gas - Active	Hillcorp Energy	3/11/2006 spud date	5673	Kd		6865					NMOCD on-line file data
30-045-08664	36.750675	-107.9921112	Gas - Plugged	Burlington Resources	11/18/1961 spud date	5785	Kd		6765					NMOCD on-line file data
30-045-34626	36.749439	-107.9915771	Gas - Active	Hillcorp Energy	5/7/2008 spud date	5789	Kf coal		2288					NMOCD on-line file data
30-045-34624	36.758575	-107.9916229	Gas - Active	Hillcorp Energy	5/23/2008 spud date	5879	Kpc-Kf coal		2377					NMOCD on-line file data
30-045-32883	36.758660	-107.9917755	Gas - Active	Hillcorp Energy	5/8/2005 spud date	5884	Kd		6875					NMOCD on-line file data
30-045-08977	36.765660	-107.993232	Gas - Active	Hillcorp Energy	7/5/1964 spud date	5894	Kd		6801					NMOCD on-line file data
30-045-34844	36.764877	-107.9932022	Gas - Active	Hillcorp Energy	2/23/2009 spud date	5901	Kpc-Kf coal		2431					NMOCD on-line file data
30-045-26476	36.765682	-107.9907608	Gas - Plugged	Burlington Resources	8/2/1985 spud date	5935	Kpc		2394					NMOCD on-line file data
NMOCD Permitted Salt Water Injection Wells														
30-045-26862	36.755203	-107.9816818	Water Disposal	Basin Disposal Inc.	3/7/1988 spud date	5710	Kmv		3905		3652-3698 Kmv injection zone			NMOCD on-line file data
30-045-30922	36.7660522	-107.9743271	Water Disposal - P/A	Agua Moss, LLC	3/24/2002 spud date	5789	Kf-Kmv		7875		3762-3830 Kmv injection zone			NMOCD on-line file data
30-045-358126	36.7482109	-107.9614105	Water Disposal	Hillcorp Energy	9/29/2010 spud date	5692	Kmv		3846		3662-3714 Kmv injection zone			NMOCD on-line file data
NMOCD Permitted Water Storage Wells														
30-045-08942	36.7642593	-107.9818573	H2O storage - P/A	McCoy & Phillips	8/11/1933 APD approval	5725	Qal-Tn		100		Converted to water well			NMOCD on-line file data
30-045-08922	36.7639503	-107.9792328	H2O storage - P/A	DW Stiles	6/8/1958 spud date	5772	Kirtland		1370					NMOCD on-line file data
30-045-08991	36.7672386	-107.9767761	H2O storage - P/A	DW Stiles	8/3/1958 spud date	5792	Kirtland		1355					NMOCD on-line file data

Notes: ¹ Land Surface Elevations: OCD wells taken from OCD on line data (NAD 83); NMOSE wells taken from Google Earth terrain model (WGS-84)

TABLE IV.2.2 - Water Quality Data Summary

Class Lab Method	Inorganic Compounds; all units are milligrams per liter (mg/L)																				Organic Compounds											
	300.0								7470	2540C	EPA Method 6010B										8015B: TPH		418.1: TPH	EPA Method 8021: VOCs								
Analytes	Bromide	Chloride	Fluoride	Nitrate as N	Nitrate+Nitrite as N by IC	Nitrite as N	Phosphorus, Orthophosphate As P	Sulfate	Mercury	Total Dissolved Solids	Arsenic	Barium	Cadmium	Calcium	Chromium	Lead	Magnesium	Potassium	Selenium	Silver	Sodium	Gasoline Range Organics (mg/L)	Diesel Range Organics (mg/L)	Motor Oil Range Organics (mg/L)	Petroleum Hydrocarbons	Benzene (µg/L)	Toluene (µg/L)	Ethybenzene (µg/L)	Xylenes, Total (µg/L)	(MTBE) Methyl tert-butyl ether (µg/L)	1,2,4-Trimethylbenzene (µg/L)	1,3,5-Trimethylbenzene (µg/L)
	NMWQCC Standard	--	250	1.6	10.0	--	10.0	--	600	0.002	1000	0.01	1.0	0.01	--	0.05	0.05	--	--	0.05	0.05	--	--	--	--	5.0	750	700	620	--	--	--

Well Designation Sample Date

Basin Disposal, Inc. Assessment Wells

Well Designation	Sample Date	Bromide	Chloride	Fluoride	Nitrate as N	Nitrate+Nitrite as N by IC	Nitrite as N	Phosphorus, Orthophosphate As P	Sulfate	Mercury	Total Dissolved Solids	Arsenic	Barium	Cadmium	Calcium	Chromium	Lead	Magnesium	Potassium	Selenium	Silver	Sodium	Gasoline Range Organics (mg/L)	Diesel Range Organics (mg/L)	Motor Oil Range Organics (mg/L)	Petroleum Hydrocarbons	Benzene (µg/L)	Toluene (µg/L)	Ethybenzene (µg/L)	Xylenes, Total (µg/L)	(MTBE) Methyl tert-butyl ether (µg/L)	1,2,4-Trimethylbenzene (µg/L)	1,3,5-Trimethylbenzene (µg/L)	
Basin AW-1	5/27/08	6.3	2300	1.7	11.0	11.0	<1.0	<5.0	18000	<0.00020	38000	<0.20	<0.20	<0.020	480	<0.060	0.098	300	15	<0.5	<0.050	10000												
	5/29/08																						<0.050	<1.0	<5.0	--	<1.0	<1.0	<1.0	<2.0	<2.5	<1.0	<1.0	

Basin AW-2	5/29/08										24000	<0.20	<0.20	<0.020	490	<0.060	<0.050	170	39	0.069	<0.005	7800											
	10/30/08	9.5	2600	<1.0	<1.0	<1.0	<1.0	<5.0	17000	<0.00020	29000	<0.10	<0.10	<0.010	420	<0.030	<0.025	230	32	<0.25	<0.025	10000	<0.050	<1.0	<5.0	<0.050	<1.0	<1.0	<1.0	<2.0	<2.5	<1.0	<1.0

Basin Disposal, Inc. Evaporation Pond

Pond Sample	8/4/06		7600	<0.1	<1.0	<1.0		5.3	978	1.0	*15721		3.1		347		0.019	129	571			4970											
-------------	--------	--	------	------	------	------	--	-----	-----	-----	--------	--	-----	--	-----	--	-------	-----	-----	--	--	------	--	--	--	--	--	--	--	--	--	--	--

*Pond sample TDS calculated using tested analytes and ion charge balance assumptions

Basin Disposal, Inc.
 Application for Permit Renewal
 Volume IV: Siting and Hydrogeology
 Section 2: Hydrogeology
 November 2019 (Updated December 2022)

TABLE IV.2.3 - Soil Laboratory Analysis Summary
Falling Head Permeability Test ASTE D5856-95

Boring	Depth of Sample Interval (ft)	Work Completed By	Date	Atterberg Limits			Moisture Content %	In Place Dry Density (lb/ft ³)	Ksat, (cm/sec) [Falling Head]
				Liquid Limit	Plastic Limit	Plasticity Index			
<i>Tests of Borehole Media from Shallow Alluvium</i>									
BH-1/AW-1	5.5-6.0 ft bgl	Vinyard & Associates, Inc.	7/12/2008	N/A	N/A	NP	8.3	89.9	2.83 E-03
BH-1/AW-1	6.5-7.0 ft bgl	Vinyard & Associates, Inc.	7/12/2008	N/A	N/A	NP	8.2	89.5	2.80 E-03

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

ATTACHMENT IV.2.A
NMOSE WELL RECORDS FOR NEARBY PERMITTED WELLS

STATE ENGINEER OFFICE
WELL RECORD

228208

Section 1. GENERAL INFORMATION

(A) Owner of well Joe Bosse Owner's Well No. _____
Street or Post Office Address PO Box 517
City and State Bloomfield, N.M. 87413

Well was drilled under Permit No. SJ 1851 and is located in the:
a. _____ 1/4 _____ 1/4 SE 1/4 SE 1/4 of Section 10 Township 29N Range 11W N.M.P.M.
b. Tract No. _____ of Map No. _____ of the _____
c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ County.
d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in
the _____ Grant.

(B) Drilling Contractor Terry G Hood License No. WD 717
Address Flora Vista, N.M.
Drilling Began 6/18/84 Completed 6/20/84 Type tools Cable Tool Size of hole 6 in.
Elevation of land surface or _____ at well is 5400 ft. Total depth of well 125 ft.
Completed well is shallow artesian. Depth to water upon completion of well 48 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
105	125	20	Blue Water Bearing Sandstone	10

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
6	17		0	73	73			
5	Pvc		65	125	60		105	125

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 5. PLUGGING RECORD

Plugging Contractor _____
Address _____
Plugging Method _____
Date Well Plugged _____
Plugging approved by: _____
State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received 6/28/84 Quad _____ FWL _____ FSL _____
File No. SJ-1851 Use Dom Location No. 29N.11W.10.440 (SJ)

STATE ENGINEER OFFICE
WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Elaine Urie Owner's Well No. _____
Street or Post Office Address 300 E Glenn Mary DR.
City and State Aztec NM 87410

Well was drilled under Permit No. SJ 3251 and is located in the:
a. $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ of Section 32 Township 30N Range 11W N.M.P.M.
b. Tract No. _____ of Map No. _____ of the _____
c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ County.
d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in
the _____ Grant.

(B) Drilling Contractor Terry Hood License No. WD 717
Address Aztec NM
Drilling Began 4/8/03 Completed 4/11/03 Type tools _____ Size of hole 6 in.
Elevation of land surface or _____ at well is _____ ft. Total depth of well 150 ft.
Completed well is shallow artesian. Depth to water upon completion of well 77 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
75	150	75	Sandstone	6

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
6	13		0	14	14			
4 $\frac{1}{2}$	PVC		10	150	140		80	150

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 5. PLUGGING RECORD

Plugging Contractor _____
Address _____
Plugging Method _____
Date Well Plugged _____
Plugging approved by: _____
State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received 4-16-2003 Quad _____ FWL _____ FSL _____
File No. SJ-3251 Use DOMESTIC Location No. 30N. 11W. 32.344



WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

55-4046-PODS

#636264

2013 AUG - 8 AM 11:27

STATE ENGINEER OFFICE
ALBUQUERQUE, NEW MEXICO 87102

1. GENERAL AND WELL LOCATION	OSE POD NUMBER (WELL NUMBER) POD 8- MW-8		OSE FILE NUMBER(S) SJ-4046					
	WELL OWNER NAME(S) Conoco Phillips Company		PHONE (OPTIONAL) (918) 553-0889					
	WELL OWNER MAILING ADDRESS 1380G Plaza Office Bldg.		CITY Bartlesville	STATE OK	ZIP 74004			
	WELL LOCATION (FROM GPS)	DEGREES LATITUDE 36	MINUTES 45	SECONDS 53.52	N * ACCURACY REQUIRED ONE TENTH OF A SECOND W * DATUM REQUIRED WGS 84			
DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS - PLS5 (SECTION, TOWNSHIP, RANGE) WHERE AVAILABLE Bloomfield, NM Sec 34, Township 30N, Ranged 11W								
2. DRILLING & CASING INFORMATION	LICENSE NUMBER WD1210	NAME OF LICENSED DRILLER Matthew Cain		NAME OF WELL DRILLING COMPANY National EWP, Inc.				
	DRILLING STARTED 7/18/2013	DRILLING ENDED 7/18/2013	DEPTH OF COMPLETED WELL (FT) 55'	BORE HOLE DEPTH (FT) 56'	DEPTH WATER FIRST ENCOUNTERED (FT) 30'			
	COMPLETED WELL IS <input type="radio"/> ARTESIAN <input type="radio"/> DRY HOLE <input checked="" type="radio"/> SHALLOW (UNCONFINED)				STATIC WATER LEVEL IN COMPLETED WELL (FT) 30'			
	DRILLING FLUID <input type="radio"/> AIR <input type="radio"/> MUD ADDITIVES - SPECIFY							
	DRILLING METHOD <input type="radio"/> ROTARY <input type="radio"/> HAMMER <input type="radio"/> CABLE TOOL <input checked="" type="radio"/> OTHER - SPECIFY: HSA							
	DEPTH (feet bgl)		BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
	FROM	TO						
	3"	40'	8.25"	Sch 40 PVC Riser	Threaded	2"	.154	
	40'	55'	8.25"	Sch 40 Screen	Threaded	2"	.154	.010
3. ANNULAR MATERIAL	DEPTH (feet bgl)		BORE HOLE DIAM (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT		
	FROM	TO						
	-1'	35'	8.25	Portland Grout Slurry	12	Tremie		
	35'	38'	8.25	3/8 Bentonite Chips	1	Tremie		
38'	55'	8.25	10/20 Silica Sand	6	Tremie			

FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 06/08/2012)

FILE NUMBER 55-4046	POD NUMBER	TRN NUMBER
LOCATION	PAGE 1 OF 2	

4. HYDROGEOLOGIC LOG OF WELL	DEPTH (feet bgl)		THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES (attach supplemental sheets to fully describe all units)	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
	FROM	TO				
	0	56'	56'	Poorly graded sands Silty	<input checked="" type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input checked="" type="radio"/> N	
					<input type="radio"/> Y <input checked="" type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
					<input type="radio"/> Y <input type="radio"/> N	
METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA: <input type="radio"/> PUMP					TOTAL ESTIMATED WELL YIELD (gpm): -1	
<input type="radio"/> AIR LIFT <input checked="" type="radio"/> BAILER <input type="radio"/> OTHER - SPECIFY:						

5. TEST; RIG SUPERVISION	WELL TEST	TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.
	MISCELLANEOUS INFORMATION:	
	Well Pad Completion 3'x3'x4" Concrete With 8" Flush Mount Well Vault	
PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE: Matthew Cain		

6. 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 OF DRILLER / PRINT SIGNEE NAME	7/25/13 _____ DATE

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AZTEC, NEW MEXICO

FOR OSE INTERNAL USE		WR-20 WELL RECORD & LOG (Version 06/08/2012)	
FILE NUMBER	POD NUMBER	TRN NUMBER	
LOCATION			PAGE 2 OF 2



643778

WELL PLUGGING PLAN OF OPERATIONS



NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

OSE Notation: Associated with SJ-4127, but not assigned an OSE POD #.

I. FILING FEE: There is no filing fee for this form.

II. GENERAL / WELL OWNERSHIP:

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: None

Name of well owner: El Paso Natural Gas Co, LLC

Mailing address: 1001 Louisiana Street, Room 956L

City: Houston State: Texas Zip code: 77002

Phone number: (713) 420-3475 E-mail: Joe_Wiley@kindermorgan.com

III. WELL DRILLER INFORMATION:

Well Driller contracted to provide plugging services: National Exploration, Wells, and Pumps

New Mexico Well Driller License No.: WD-1210 Expiration Date: 10/31/15

IV. WELL INFORMATION:

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan.

OSE Notation: See Attachment.

- 1) GPS Well Location: Latitude: _____ deg, _____ min, _____ sec
Longitude: _____ deg, _____ min, _____ sec, NAD 83
- 2) Reason(s) for plugging well: Monitoring wells dry. Abandonments approved by New Mexico Oil Conservation Division – Environmental Bureau (See attachment containing monitoring well GPS locations)
- 3) Was well used for any type of monitoring program? Yes If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.
- 4) Does the well tap brackish, saline, or otherwise poor quality water? No If yes, provide additional detail, including analytical results and/or laboratory report(s): _____
- 5) Static water level: dry feet below land surface / feet above land surface (circle one)
- 6) Depth of the well: 21-31 feet

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- 7) Inside diameter of innermost casing: 4 inches.
- 8) Casing material: PVC
- 9) The well was constructed with:
 an open-hole production interval, state the open interval: _____
 a well screen or perforated pipe, state the screened interval(s): see attached sheet
- 10) What annular interval surrounding the artesian casing of this well is cement-grouted? _____
- 11) Was the well built with surface casing? No If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? _____ If yes, please describe: _____
- 12) Has all pumping equipment and associated piping been removed from the well? NA If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

V. DESCRIPTION OF PLANNED WELL PLUGGING:

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

- 1) Wells will be abandoned by grouting them closed using a cement-bentonite grout slurry (5.2 gallons of water per 94 lb sack of Type I/II Portland cement; 3-5% bentonite with 0.65 gallons of water per each 1% bentonite). Grout shall be emplaced in the PVC screen and casing using a tremie pipe. The entire surface components (i.e., well pad, protective casing, above-grade PVC casing) of the wells will be removed and the upper three feet of the well will be filled with a Portland cement plug. The cement plug will be finished flush with the ground surface.
- 2) Will well head be cut-off below land surface after plugging? YES

VI. PLUGGING AND SEALING MATERIALS:

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

- 1) For plugging intervals that employ cement grout, complete and attach Table A.
- 2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.
- 3) Theoretical volume of grout required to plug the well to land surface: OSE Note: Approx total is 48.3 gallons
- 4) Type of Cement proposed: Portland cement Type I/II

5) Proposed cement grout mix: 5.2 gallons of water per 94 pound sack of Portland cement.

6) Will the grout be: _____ batch-mixed and delivered to the site
X mixed on site

7) Grout additives requested, and percent by dry weight relative to cement: bentonite - 3-5%

8) Additional notes and calculations: _____

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VII. ADDITIONAL INFORMATION: List additional information below, or on separate sheet(s):

Attached is a table containing all monitoring well construction information and GPS coordinates. Wells are dry due to declining local water table. New wells are being drilled to continue the environmental investigation. Those new wells are being permitted separately.

VIII. SIGNATURE:

I, Boyan Nydoske, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

[Signature]
Signature of Applicant

11/14/14
Date

IX. ACTION OF THE STATE ENGINEER:

This Well Plugging Plan of Operations is:

- Approved subject to the attached conditions.
- Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this 25th day of November, 2014

Scott A. Verhines, State Engineer

By: [Signature]
Kimberly Kirby, Water Resource Specialist
Water Rights Division District V

TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.

	Interval 1 -- deepest	Interval 2	Interval 3 -- most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)			
Bottom of proposed interval of grout placement (ft bgl)			
Theoretical volume of grout required per interval (gallons)	OSE Notation: See Attachment		
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement			
Mixed on-site or batch-mixed and delivered?			
Grout additive 1 requested			
Additive 1 percent by dry weight relative to cement			
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

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TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)			
Bottom of proposed sealant of grout placement (ft bgl)			
Theoretical volume of sealant required per interval (gallons)			
Proposed abandonment sealant (manufacturer and trade name)			

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Blanco Gas Plant - South Flare Pit and D Plant Areas
Well Abandonment's Details

Monitoring Well ID	GPS Coordinates			Total Depth (ft)	Screen Interval	Static Water Level	Top of Proposed Interval of Grout Placement (ft bgl)	Bottom of Proposed Interval of Grout Placement (ft bgl)	Theoretical Volume of Grout Required per Interval (gallons)	Proposed Cement Grout Mix Gallons of Water per 94-lb. Sack of Portland Cement	Mixed On-Site or Batch-Mixed and Delivered?	Grout Additive 1 Requested	Additive 1 Percent by Dry Weight Relative to Cement	Grout Additive 2 Requested	Additive 2 Percent by Dry Weight Relative to Cement
	Y	X	Long												
MW-5	2084534.0	2685510.470	107961578008	21.35	8.5 - 18.5	Dry	Ground Surface	21.35	5.2	94 Lbs to 5.2 gal. water	On Site	Bentonite	3% to 5%	NA	NA
MW-6	2084836.0	2685885.720	107960295435	31.3	19.0 - 29.0	Dry	Ground Surface	31.3	5.2	94 Lbs to 5.2 gal. water	On Site	Bentonite	3% to 5%	NA	NA
MW-7	2084408.0	2685970.670	107960007025	21.34	9.0 - 19.0	Dry	Ground Surface	21.34	5.2	94 Lbs to 5.2 gal. water	On Site	Bentonite	3% to 5%	NA	NA

NA - Not applicable

OSE Notation: Plugging grout volume per linear foot for a 4-inch well casing is 0.65 gallons.
 Total linear footage for the three wells is 73.99 ft.
 At 0.65 gallons per linear foot the total theoretical plugging grout volume is 48.3 gallons.

2014 NOV 24 PM 2:07

STATE ENGINEER OFFICE
AZTEC, NEW MEXICO

OFFICE OF THE STATE ENGINEER/INTERSTATE STREAM COMMISSION - AZTEC OFFICE

OFFICIAL RECEIPT NUMBER: **5-5188** DATE: _____ FILE NO.: _____
 RECEIVED: _____ DOLLARS CHECK NO.: _____ CASH: _____
 PAYOR: _____ ADDRESS: _____ CITY: _____ STATE: _____
 ZIP: _____ RECEIVED BY: _____

INSTRUCTIONS: Indicate the number of actions to the left of the appropriate type of filing. Complete the receipt information. **Original** to payor; **pink** copy to Program Support/ASD; **yellow** copy remains in district office, and **goldenrod** copy to accompany application being filed. If you make an error, void original and all copies and submit to Program Support/ASD along with other valid receipts.

A. Ground Water Rights Filing Fees		B. Surface Water Rights Filing Fees		C. Miscellaneous Fees	
1.	Declaration of Water Right	\$ 1.00	1.	Application for Well Driller's License	\$ 50.00
2.	Application to Appropriate or Supplement Domestic 72-12-1 Well	\$125.00	2.	Application for Renewal of Well Driller's License	\$ 50.00
3.	Application for Stock Well	\$ 5.00	3.	Application to Amend Well Driller's License	\$ 50.00
4.	Application to Repair or Deepen 72-12-1 Well	\$ 75.00			
5.	Application for Replacement 72-12-1-1 Well	\$ 75.00			
6.	Application to Change Purpose of Use 72-12-1 Well	\$ 75.00			
7.	Application to Appropriate Irrig., Mun., or Comm. Use Non 72-12-1 Well	\$ 25.00			
8.	Application for Supplemental Non 72-12-1 Well	\$ 25.00			
9.	Application to Change Point of Diversion of Non 72-12-1 Well	\$ 25.00			
10.	Application to Change Place or Purpose of Use Non 72-12-1 Well	\$ 25.00			
11.	Application to Change Point of Diversion and Place and/or Purpose of Use \$ 50.00	\$ 50.00			
12.	Application for Extension of Time \$ 25.00	\$ 25.00			
13.	Proof of Application to Beneficial Use \$ 25.00	\$ 25.00			
14.	Application to Change Point of Diversion and Place and/or Purpose of Use from Surface Water to Ground Water \$ 50.00	\$ 50.00			
15.	Application to Change Point of Diversion and Place and/or Purpose of Use from Ground Water to Ground Water \$ 50.00	\$ 50.00			
16.	Application for Test, Expl. Observ. Well \$ 5.00	\$ 5.00			
17.	Change of Ownership of Water Right \$ 2.00	\$ 2.00			
18.	Application to Repair or Deepen Non 72-12-1 Well \$ 5.00	\$ 5.00			
19.	Application for Replacement Well Non 72-12-1 Well \$ 5.00	\$ 5.00			

All fees are non-refundable



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: SJ-4046 POD1 (MW-1)
 Well owner: Hilcorp Energy Phone No.: 505-564-0733
 Mailing address: PO Box 4700
 City: Farmington State: NM Zip code: 87499

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: GEOMAT Inc.
- 2) New Mexico Well Driller License No.: WD-1762 Expiration Date: 8/30/18
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Kalvin Padilla
- 4) Date well plugging began: 2-20-18 Date well plugging concluded: 2-20-18
- 5) GPS Well Location: Latitude: 36 deg, 45 min, 50.40 sec
Longitude: -107 deg, 58 min, 34.808 sec, WGS 84
- 6) Depth of well confirmed at initiation of plugging as: 41.4 ft below ground level (bgl),
by the following manner: Water Level Indicator
- 7) Static water level measured at initiation of plugging: 37.1 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 2/12/18
- 9) Were all plugging activities consistent with an approved plugging plan? YES If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):

- 10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

For each interval plugged, describe within the following columns:

Depth (ft bgl)	Plugging Material Used (include any additives used)	Volume of Material Placed (gallons)	Theoretical Volume of Borehole/ Casing (gallons)	Placement Method (tremie pipe, other)	Comments ("casing perforated first", "open annular space also plugged", etc.)
	Type II Cement and 5% bentonite	6.5	6.62	Tremmie	Casing cut 6" below ground surface.

2018 MAR -1 PM 11:00
 COUNTY ENGINEER'S OFFICE
 COUNTY OF COCONINO

MULTIPLY	BY	AND OBTAIN
cubic feet x	7.4805	= gallons
cubic yards x	201.97	= gallons

III. SIGNATURE:

I, George A. Madrid, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.

George A. Madrid

Signature of Well Driller

02-27-2018

Date



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: SJ-4046 POD2 (MW-2)

Well owner: Hilcorp Energy Phone No.: 505-564-0733

Mailing address: P.P. Box 4700

City: Farmington State: NM Zip code: 87499

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: GEOMAT Inc.
- 2) New Mexico Well Driller License No.: WD-1762 Expiration Date: 8/30/18
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s):
Kalvin Padilla
- 4) Date well plugging began: 2-20-18 Date well plugging concluded: 2-20-18
- 5) GPS Well Location: Latitude: 36 deg, 45 min, 48.60 sec
Longitude: -107 deg, 58 min, 34.80 sec, WGS 84
- 6) Depth of well confirmed at initiation of plugging as: 40.9 ft below ground level (bgl),
by the following manner: Water Level Indicator
- 7) Static water level measured at initiation of plugging: 36.0 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 2/12/2018
- 9) Were all plugging activities consistent with an approved plugging plan? YES If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):

2/12/2018 11:11:00 AM
 STATE ENGINEER
 NEW MEXICO



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: SJ-4046 POD3 (MW-3)

Well owner: Hilcorp Energy Phone No.: 505-564-0733

Mailing address: PO Box 4700

City: Farmington State: NM Zip code: 87499

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: GEOMAT Inc.
- 2) New Mexico Well Driller License No.: WD-1762 Expiration Date: 8/30/18
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s):
Kalvin Padilla
- 4) Date well plugging began: 2-20-18 Date well plugging concluded: 2-20-18
- 5) GPS Well Location: Latitude: 36 deg, 45 min, XXXX sec
Longitude: -107 deg, 58 min, XXXX sec, WGS 84
34.97
- 6) Depth of well confirmed at initiation of plugging as: 45.5 ft below ground level (bgl),
by the following manner: Water Level Indicator
- 7) Static water level measured at initiation of plugging: 35.4 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 2-12-18
- 9) Were all plugging activities consistent with an approved plugging plan? YES If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):

00-11-NM-1-NM11-00
 RECEIVED
 OFFICE OF THE STATE ENGINEER

- 10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

For each interval plugged, describe within the following columns:

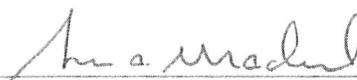
<u>Depth</u> (ft bgl)	<u>Plugging Material Used</u> (include any additives used)	<u>Volume of Material Placed</u> (gallons)	<u>Theoretical Volume of Borehole/ Casing</u> (gallons)	<u>Placement Method</u> (tremie pipe, other)	<u>Comments</u> ("casing perforated first", "open annular space also plugged", etc)
	Type II Cement and 5% bentonite	7.20	7.28	Tremmie	Casing cut 6" below ground surface.

2018 MAR -1 AM 11:00
 STATE ENGINEER
 OFFICE

MULTIPLY	BY	AND OBTAIN
cubic feet x	7.4805 =	gallons
cubic yards x	201.97 =	gallons

III. SIGNATURE:

I, George A. Madrid, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.



Signature of Well Driller

02-27-2018

Date



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: SJ-4046 POD4 (MW-4)

Well owner: Hilcorp Energy Phone No.: 505-564-0733

Mailing address: PO Box 4700

City: Farmington State: NM Zip code: 87499

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: GEOMAT Inc.
- 2) New Mexico Well Driller License No.: WD-1762 Expiration Date: 8/30/18
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Kalvin Padilla
- 4) Date well plugging began: 2-20-18 Date well plugging concluded: 2-20-18
- 5) GPS Well Location: Latitude: 36 deg, 45 min, 51.00 sec
Longitude: -107 deg, 58 min, 34.20 sec, WGS 84
- 6) Depth of well confirmed at initiation of plugging as: 52.5 ft below ground level (bgl),
by the following manner: Water Level Indicator
- 7) Static water level measured at initiation of plugging: 38.6 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 2-12-18
- 9) Were all plugging activities consistent with an approved plugging plan? YES If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):

STATE ENGINEER OFFICE
 ALICE MONTANO
 19 MAR -1 11:11:00

- 10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

For each interval plugged, describe within the following columns:

Depth (ft bgl)	Plugging Material Used (include any additives used)	Volume of Material Placed (gallons)	Theoretical Volume of Borehole/ Casing (gallons)	Placement Method (tremie pipe, other)	Comments (“casing perforated first”, “open annular space also plugged”, etc)
	Type II Cement and 5% bentonite	8.32	8.40	Tremmie	Casing cut 6" below ground surface.

MULTIPLY		BY		AND OBTAIN
cubic feet	x	7.4805	=	gallons
cubic yards	x	201.97	=	gallons

III. SIGNATURE:

I, George A. Madrid, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.

02-27-2018

Signature of Well Driller

Date



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: SJ-4046 POD 5 (MW-5)

Well owner: Hilcorp Energy Phone No.: 505-564-0733

Mailing address: PO Box 4700

City: Farmington State: NM Zip code: 87499

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: GEOMAT Inc.
- 2) New Mexico Well Driller License No.: WD-1762 Expiration Date: 8/30/18
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Kalvin Padilla
- 4) Date well plugging began: 2-20-18 Date well plugging concluded: 2-20-18
- 5) GPS Well Location: Latitude: 36 deg, 45 min, 51.60 sec
Longitude: -107 deg, 58 min, 33.00 sec, WGS 84
- 6) Depth of well confirmed at initiation of plugging as: 48.0 ft below ground level (bgl),
by the following manner: Water Level Indicator
- 7) Static water level measured at initiation of plugging: 37.6 ft bgl
~~XXX~~
- 8) Date well plugging plan of operations was approved by the State Engineer: 2-12-17
- 9) Were all plugging activities consistent with an approved plugging plan? YES If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):



- 10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

For each interval plugged, describe within the following columns:

Depth (ft bgl)	Plugging Material Used (include any additives used)	Volume of Material Placed (gallons)	Theoretical Volume of Borehole/ Casing (gallons)	Placement Method (tremie pipe, other)	Comments ("casing perforated first", "open annular space also plugged", etc)
	Type II Cement and 5% bentonite	7.60	7.68	Tremmie	Casing cut 6" below ground surface.

210 MAR -1 AM 11:00
 STATE OF MISSISSIPPI
 OFFICE OF THE ATTORNEY GENERAL

MULTIPLY	BY	AND OBTAIN
cubic feet x	7.4805 =	gallons
cubic yards x	201.97 =	gallons

III. SIGNATURE:

I, George A. Madrid, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.

Signature of Well Driller

02-27-2018

Date



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: SJ 4046 POD6 (MW-6)

Well owner: Hilcorp Energy Phone No.: 505-564-0733

Mailing address: PO Box 4700

City: Farmington State: NM Zip code: 87499

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: GEOMAT Inc.
- 2) New Mexico Well Driller License No.: WD-1762 Expiration Date: 8/30/18
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Kalvin Padilla
- 4) Date well plugging began: 2-20-18 Date well plugging concluded: 2-20-18
- 5) GPS Well Location: Latitude: 36 deg, 45 min, 50.26 sec
Longitude: -107 deg, 58 min, 35.29 sec, WGS 84
- 6) Depth of well confirmed at initiation of plugging as: 58.0 ft below ground level (bgl),
by the following manner: Water Level Indicator
- 7) Static water level measured at initiation of plugging: 38.7 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 2-12-17
- 9) Were all plugging activities consistent with an approved plugging plan? YES If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):



- 10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

For each interval plugged, describe within the following columns:

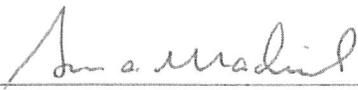
Depth (ft bgl)	Plugging Material Used (include any additives used)	Volume of Material Placed (gallons)	Theoretical Volume of Borehole/ Casing (gallons)	Placement Method (tremie pipe, other)	Comments ("casing perforated first", "open annular space also plugged", etc)
	Type II Cement and 5% bentonite	9.20	9.26	Tremmie	Casing cut 6" below ground surface.

2018 MAR -1 AM 11:00
 STATE ENGINEER
 REGISTERED
 00

MULTIPLY	BY	AND OBTAIN
cubic feet x 7.4805	=	gallons
cubic yards x 201.97	=	gallons

III. SIGNATURE:

I, George A. Madrid, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.



Signature of Well Driller

02-27-2018

Date



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: SJ 4046 POD7 (MW-7)

Well owner: Hilcorp Energy Phone No.: 505-564-0733

Mailing address: PO Box 4700

City: Farmington State: NM Zip code: 87499

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: GEOMAT Inc.
- 2) New Mexico Well Driller License No.: WD-1762 Expiration Date: 8/30/18
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s):
Kalvin Padilla
- 4) Date well plugging began: 2-20-18 Date well plugging concluded: 2-20-18
- 5) GPS Well Location: Latitude: 36 deg, 45 min, 50.78 sec
Longitude: -107 deg, 58 min, 32.28 sec, WGS 84
34.99
- 6) Depth of well confirmed at initiation of plugging as: 52.2 ft below ground level (bgl),
by the following manner: Water Level Indicator
- 7) Static water level measured at initiation of plugging: 38.7 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 2-12-18
- 9) Were all plugging activities consistent with an approved plugging plan? YES If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):

- 10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

For each interval plugged, describe within the following columns:

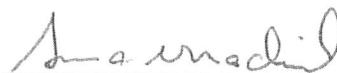
Depth (ft bgl)	Plugging Material Used (include any additives used)	Volume of Material Placed (gallons)	Theoretical Volume of Borehole/ Casing (gallons)	Placement Method (tremie pipe, other)	Comments (“casing perforated first”, “open annular space also plugged”, etc.)
	Type II Cement and 5% bentonite	8.27	8.35	Tremmie	Casing cut 6" below ground surface.

STATE OF ARIZONA
 OFFICE OF THE STATE ENGINEER
 2018 MAR -1 AM 11:01

MULTIPLY	BY	AND OBTAIN
cubic feet x	7.4805	= gallons
cubic yards x	201.97	= gallons

III. SIGNATURE:

I, George A. Madrid, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.



Signature of Well Driller

02-27-2018

Date

Watson, Blaine, OSE

From: Jeff.Walker@ghd.com
Sent: Thursday, March 29, 2018 1:13 PM
To: Watson, Blaine, OSE
Subject: RE: Well Plugging Records; SJ-3885 POD1-POD5 and SJ-4046 POD1-POD8
Attachments: 20180329122939419.pdf

Blaine,

Please see attached corrections to lat/long as called out in your email below. And, yes, SJ4046 MW5 should be 37.6 feet rather than 376.

Please let me know if I can be of further assistance-

Jeff



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: SJ-4046 POD3 (MW-3)

Well owner: Hilcorp Energy Phone No.: 505-564-0733

Mailing address: PO Box 4700

City: Farmington State: NM Zip code: 87499

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: GEOMAT Inc.
- 2) New Mexico Well Driller License No.: WD-1762 Expiration Date: 8/30/18
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Kalvin Padilla
- 4) Date well plugging began: 2-20-18 Date well plugging concluded: 2-20-18
- 5) GPS Well Location: Latitude: 36 deg, 45 min, 48.84 sec
Longitude: -107 deg, 58 min, 35.40 sec, WGS 84
34.97
- 6) Depth of well confirmed at initiation of plugging as: 45.5 ft below ground level (bgl),
by the following manner: Water Level Indicator
- 7) Static water level measured at initiation of plugging: 35.4 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 2-12-18
- 9) Were all plugging activities consistent with an approved plugging plan? YES If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: SJ 4046 POD7 (MW-7)
 Well owner: Hilcorp Energy Phone No.: 505-564-0733
 Mailing address: PO Box 4700
 City: Farmington State: NM Zip code: 87499

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: GEOMAT Inc.
- 2) New Mexico Well Driller License No.: WD-1762 Expiration Date: 8/30/18
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Kalvin Padilla
- 4) Date well plugging began: 2-20-18 Date well plugging concluded: 2-20-18
- 5) GPS Well Location: Latitude: 36 deg, 45 min, 47.33 sec
 Longitude: -107 deg, 58 min, 39.99 sec, WGS 84
- 6) Depth of well confirmed at initiation of plugging as: 52.2 ft below ground level (bgl),
 by the following manner: Water Level Indicator
- 7) Static water level measured at initiation of plugging: 38.7 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 2-12-18
- 9) Were all plugging activities consistent with an approved plugging plan? YES If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: SJ 4046 POD 8 (MW-8)

Well owner: Hilcorp Energy Phone No.: 505-564-0733

Mailing address: PO Box 4700

City: Farmington State: NM Zip code: 87499

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: GEOMAT Inc.
- 2) New Mexico Well Driller License No.: WD-1762 Expiration Date: 8/30/18
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Kalvin Padilla
- 4) Date well plugging began: 2-20-18 Date well plugging concluded: 2-20-18
- 5) GPS Well Location: Latitude: 36 deg, 45 min, 53.36 sec
Longitude: -107 deg, 58 min, 32.28 sec, WGS 84
32.94
- 6) Depth of well confirmed at initiation of plugging as: 55.0 ft below ground level (bgl),
by the following manner: Water Level Indicator
- 7) Static water level measured at initiation of plugging: 39.80 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 2-12-18
- 9) Were all plugging activities consistent with an approved plugging plan? YES If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):



915 Malta Avenue
Farmington, New Mexico 87401

LETTER OF TRANSMITTAL

Tel (505) 327-7928
Fax (505) 326-5721

To: State Engineer Date: February 27, 2018
NMOSE District V Office Project: Hilcorp Martin 34 No. 2
100 Gossett Drive, Suite A Project No.: GEOMAT Project 185-2941
Aztec, New Mexico 87410
 Attn: _____

We are:
 _____ Transmitting
 _____ Returning
X Submitting

For your:
 _____ Review
X Files
 _____ Approval
 _____ Signature

The following:
 _____ Correspondence
 _____ Engineering Report
X Plugging Record

Copies	Date	Description
1	02-27-18	Well Plugging Records for SJ-4046 POD1-POD8, Hilcorp Martin 34 No. 2

Delivery By:

_____ Hand Delivery _____ Express Mail _____ Return Receipt
 _____ First Class Mail _____ Courier Service
X Regular Mail _____ Other

GEOMAT Inc.

By: *M. A. Medel*

Distribution: Addressee (1), Jeff Walker, GHD (1)

Number of this permit E-2466 & S

ACTION OF STATE ENGINEER

~~A licensee pursuant to statute and by the authority vested in me, this application is approved provided it is not exercised to the detriment of any others having existing rights; further provided that all rules and regulations of the State Engineer pertaining to the drilling of ~~XXXXXXXXXXXXXXXXXXXX~~ wells be complied with and further subject to the following conditions:~~

After notice pursuant to statute and by the authority vested in me, this application is approved provided it is not exercised to the detriment of any others having existing rights; is not contrary to conservation of water within the state, and is not detrimental to the public welfare of the state; and further subject to the following Conditions of Approval:

(SEE ATTACHED CONDITIONS OF APPROVAL)

Proof of completion of well shall be filed on or before N/A, 19

Proof of application of water to beneficial use shall be filed on or before N/A, 19

Witness my hand and seal this 7th day of October, A.D., 1993

Eluid L. Martinez, State Engineer

By: C. A. Wohlenberg
C. A. Wohlenberg
Assistant District Supervisor
District I

INSTRUCTIONS

This form shall be executed, preferably typewritten, in triplicate and shall be accompanied by a filing fee of \$5.00. Each of triplicate copies must be properly signed and attested.

A separate application for permit must be filed for each well used.

Secs. 1-4—Fill out all blanks fully and accurately.

Sec. 5—Irrigation use shall be stated in acre feet of water per acre per annum to be applied on the land. If for municipal or other purposes, state total quantity in acre feet to be used annually.

Sec. 6—Describe only the lands to be irrigated or where water will be used. If on unsurveyed lands describe by legal subdivision "as projected" from the nearest government survey corners, or describe by metes and bounds and tie survey to some permanent, easily located natural object.

Sec. 7—If lands are irrigated from any other source, explain in this section. Give any other data necessary to fully describe water right sought.

7/11/2008 10:00 AM

STATE OF ARIZONA

Q= 0.84 T= 20000.00 s=0.00000

DISTANCE FROM PUMPED WELL IN FEET
YEARS 300 500 1000 2640 5280

1	0.05	0.05	0.04	0.04	0.03
5	0.06	0.05	0.05	0.04	0.04
10	0.06	0.05	0.05	0.04	0.04
25	0.06	0.06	0.05	0.05	0.04
50	0.06	0.06	0.06	0.05	0.05
100	0.06	0.06	0.06	0.05	0.05

CONDITIONS OF APPROVAL

FILE: SJ-2466 & S
APPLICANT: El Paso Natural Gas Company

1. Wells MX-19 and MX-26 are hereby numbered SJ-2466 & SJ-2466-S, respectively.
2. The total diversion of water from Wells No. SJ-2466 and SJ-2466-S under this permit shall not exceed 0.420 acre-foot per annum at a pumping rate of 0.25 gallons per minute for each well with a combined total of 0.840 acre-foot per annum.
3. All diversion of water from Wells No. SJ-2466 and SJ-2466-S shall be measured by a totalizing meter, or meters, of a type and at a location(s) approved by and installed in a manner acceptable to the State Engineer.
4. Records of the total amount of water diverted from Wells SJ-2466 and SJ-2466-S shall be submitted in writing to the State Engineer District I Office on or before the 10th day of each month, for the preceding calendar month.
5. The permittee shall ensure that sufficient water rights are provided at all times by dedication, lease retirement, or other means, to offset all effects on the San Juan River which occur now or in the future as a result of pumping from wells under this permit. The permittee shall advise the State Engineer on or before October 30, 1993, of the amount and source of water rights provided for this purpose.
6. No water shall be diverted from Wells SJ-2466 and SJ-2466-S except for pollution recovery purposes. This permit shall expire at the completion of remedial operations or on September 30, 2023, whichever occurs first. Wells No. SJ-2466 and SJ-2466-S shall be capped or plugged and a written report of the action shall be filed with the Office of the State Engineer.
7. The State Engineer retains jurisdiction to administer the conditions of this permit.

Eluid L. Martinez
State Engineer

By:



C. A. Wohlenberg
Assistant District Supervisor
District I

COPIES SENT TO DISTRICT I OFFICE
STATE ENGINEER OFFICE

98 OCT 12 PM 7 42

Approval Date:
October 7, 1993



P. O. BOX 4990
FARMINGTON, NEW MEXICO 87499
PHONE: 505-325-2841

October 10, 1994

Mr. Charles Wollenberg
State Engineer Office
District 1
3311 Candelaria, N.E., Suite A
Albuquerque, NM 87107

SUBJECT: Blanco North Recovery Well - SJ-2466 & S

Dear Mr. Wollenberg:

The Blanco North Recovery Well tank was gauged on September 30, 1994. There were 13 feet 6 inches of water and 6 inches of hydrocarbons in the tank. Therefore, approximately 1,500 gallons of liquids were pumped during the month of September.

If you need additional information or have any questions, please call me at 599-2144.

Sincerely,

EL PASO NATURAL GAS COMPANY

John Lambdin
Compliance Laboratory Superintendent

cc: David Hall, EPNG
Sandra Miller, EPNG
Patrick Marquez, EPNG
Nancy Prince, EPNG
File

STATE ENGINEER'S OFFICE
ALBUQUERQUE, N.M. EX-10

9400113 P 2 : 48



P. O. BOX 4990
FARMINGTON, NEW MEXICO 87499

August 9, 1994

Mr. Charles Wollenberg
State Engineer Office
District 1
3311 Candelaria, N.E. Suite A
Albuquerque, N.M. 87107

Subject : Blanco North Recovery Well - SJ-2466 & S

Dear Mr. Wollenberg:

The Blanco North Recovery Well tank was gauged on June 30th , there was 6 feet 3 inches of water and 5 inches of hydrocarbons in the tank. On July 31st the tank was gauged, and there was 8 feet 7 inches of water and 6 inches of hydrocarbons in the tank.

Therefore, approximately 1372 gallons of liquids was pumped during the month of June and 1421 gallons pumped in July to the aboveground storage tank.

If you need additional information or have any questions, please call me at 599-2176.

Sincerely,

A handwritten signature in cursive script that reads "Anu Pundari".

Anu Pundari
Sr. Compliance Engineer

cc: Mr. David Hall (EPNG)
Ms. Nancy Prince (EPNG)

94AUG11 P 1:43
STATE ENGINEERING OFFICE
ALBUQUERQUE, N. MEX.



**STATE OF NEW MEXICO
STATE ENGINEER OFFICE
ALBUQUERQUE**

ELUID L. MARTINEZ
STATE ENGINEER

DISTRICT 1
3311 CANDELARIA, N.E. SUITE A
ALBUQUERQUE, NM 87107

October 7, 1993

FILE: SJ-2466 & S

Nancy K. Prince
Senior Environmental Scientist
El Paso Natural Gas Company
P. O. Box 1492
El Paso, TX 79978

Greetings:

Enclosed is your copy of the above-numbered Permit to Appropriate the Underground Water of the State of New Mexico, which has been approved subject to the conditions set forth on the reverse side thereof.

No water shall be diverted from WELLS SJ-2466 and SJ-2466-S except for pollution recovery purposes. This permit shall expire at the completion of remedial operations or on September 30, 2023, whichever occurs first. Wells No. SJ-2466 and SJ-2466-S shall be capped or plugged and a written report of the action shall be filed with the Office of the State Engineer.

The State Engineer retains jurisdiction to administer the conditions of this permit.

Sincerely yours,

Robert D. Thompson
Water Resource Specialist
(505) 841-9482

sjr
Enclosure as stated
cc: Santa Fe SEO

33 OCT 12 PM 7 41
STATE ENGINEER OFFICE
ALBUQUERQUE, NM 87107

M E M O R A N D U M

September 20, 1993

FILE: SJ-2466 & S

TO: C. A. Wohlenberg, Assistant District Supervisor

FROM: R. D. Thompson, Water Resource Specialist *RDT*

SUBJECT: Application to Appropriate - El Paso Natural Gas Company

HISTORY: Application No. SJ-2466 & S was filed on April 7, 1993, for permit to appropriate 0.420 acre-foot of water per annum from existing monitor Well MW-19, drilled to approximately 66 feet, with 2-inch casing and 0.420 acre-foot of water per annum from existing monitor Well MW-26, drilled to approximately 65.5 feet, with 4-inch casing, both located in the SW1/4 SW1/4 SE1/4 of Section 11, T29N, R11W, NMPM, on land owned by the Bureau of Land Management. Total appropriation of water from both wells is not to exceed 0.840 acre-foot per annum for pollution recovery purposes.

Notice for publication was issued on July 6, 1993. Affidavit of Publication was filed by The Farmington Daily Times on September 3, 1993, indicating publication dates of July 15, 22, and 29, 1993. No letters of protest or objection were filed.

CONSIDERATIONS: Free phase hydrocarbon liquids were identified on the water surface, and dissolved components in the water north of the EPNG Plant. The NMOCD requested product removal in a letter dated January 21, 1993.

The source of water to be removed is the shallow unconfined aquifer. No water wells tap this aquifer in the immediate vicinity of the proposed recovery operation.

Monitor wells MW-20 through MW-27 were drilled in September, 1992, to investigate the extent of the contamination. Water and floating product will be pumped from either Well MW-19 or MW-26 initially. Upon evaluation of the effectiveness of the system, installation of an additional recovery well will be evaluated.

Based on pump tests conducted in October, 1992, it is anticipated that only a flow rate of 0.25 gallons per minute (0.420 acre-foot per year) can be sustained from one well.

Oil and water will be withdrawn together and placed in an above-ground storage tank near the monitor wells. The accumulated liquids will be transported to an oil field liquid storage tank for recycling.

FILE: SJ-2466 & S
TO: C. A. Wohlenberg
PAGE: 2
DATE: September 20, 1993

The volume of hydrocarbon liquid to be removed was not determined during the initial investigations. It is anticipated at this time that recovery operations may take as long as 30 years.

The two monitor wells are drilled in the valley fill of the San Juan River which includes alluvium and terrace deposits. Our records indicate that no other wells with water rights are drilled into this aquifer within a mile. The nearest well with water rights is Well No. SJ-7, owned by El Paso Natural Gas Company, located in the SW1/4 NE1/4 NE1/4 of Section 14, T29N, R11W, NMPM, which is drilled to approximately 752 feet into the Nacimiento Formation.

When determining effects on surrounding wells, the values used were $Q=0.840$, $T=20,000$, and $s=0.000001$. The transmissivity and storativity values were obtained from Hydrology and Water Resources of San Juan Basin, New Mexico, (Stone, Lyford, Frenzel, Mizell and Padgett). Transmissivity values range from 17,000 sq. ft/day to 40,000 sq. ft/day. A conservative value was chosen in this case. Using these figures, the resulting drawdown on any surrounding wells would be diminimus (see attachment).

Due to the fact that the wells are approximately 2 miles from the San Juan River, the permit should be conditioned to require the applicant to obtain sufficient water rights to offset any effects on the river.

The applicant's efforts to remove pollutants from the ground water aquifer is certainly in the interest of the public welfare and should not be considered contrary to the conservation of water.

RECOMMENDATION: Approve the application subject to the Rules and Regulations of the State Engineer with the following suggested Conditions of Approval:

After notice pursuant to statute and by the authority vested in me, this application is approved provided it is not exercised to the detriment of any others having existing rights; is not contrary to conservation of water within the state, and is not detrimental to the public welfare of the state; and further subject to the following Conditions of Approval:

1. Wells MX-19 and MX-26 are hereby renumbered SJ-2466 and SJ-2466-S, respectively.

RECEIVED
STATE ENGINEER'S OFFICE
SEP 21 12 AM '93

FILE: SJ-2466 & S
TO: C. A. Wohlenberg
PAGE: 3
DATE: September 20, 1993

2. The total diversion of water from Wells No. SJ-2466 and SJ-2466-S under this permit shall not exceed 0.420 acre-foot per annum at a pumping rate of 0.25 gallons per minute for each well with a combined total of 0.840 acre-foot per annum.
3. All diversion of water from Wells No. SJ-2466 and SJ-2466-S shall be measured by a totalizing meter, or meters, of a type and at a location(s) approved by and installed in a manner acceptable to the State Engineer.
4. Records of the total amount of water diverted from Wells SJ-2466 and SJ-2466-S shall be submitted in writing to the State Engineer District I Office on or before the 10th day of each month, for the preceding calendar month.
5. The permittee shall ensure that sufficient water rights are provided at all times by dedication, lease retirement, or other means, to offset all effects on the San Juan River which occur now or in the future as a result of pumping from wells under this permit. The permittee shall advise the State Engineer on or before October 30, 1993, of the amount and source of water rights provided for this purpose.
6. No water shall be diverted from Wells SJ-2466 and SJ-2466-S except for pollution recovery purposes. This permit shall expire at the completion of remedial operations or on September 30, 2023, whichever occurs first. Wells No. SJ-2466 and SJ-2466-S shall be capped or plugged and a written report of the action shall be filed with the Office of the State Engineer.
7. The State Engineer retains jurisdiction to administer the conditions of this permit.

RDT:sjr
cc: SEO, Santa Fe

1993 OCT 12 AM 7 14
STATE ENGINEER DISTRICT I
SANTA FE NEW MEXICO

OK CAW 10 Oct 1993

El Paso
Natural Gas Company

P. O. BOX 4990
FARMINGTON, NEW MEXICO 87499

February 9, 1994

Mr. Charles Wollenberg
State Engineer Office
District 1
3311 Candelaria, N.E. Suite A
Albuquerque, N.M. 87107

Subject : Blanco North Recovery Well - SJ-2466 & S

Dear Mr. Wollenberg:

The Blanco North Recovery Well was gauged on January 29th. There was 10 feet 8 inches of water and 9 inches of hydrocarbons in the tank. Approximately 1225 gallons of liquids was pumped into the aboveground storage tank during the month of January .

If you need additional information or have any questions, please call me at 599-2176.

Sincerely,

Anu Pundari

Anu Pundari
Sr. Compliance Engineer

cc: Mr. David Hall (EPNG)
Ms. Nancy Prince (EPNG)

STATE ENGINEER OFFICE
ALBUQUERQUE, N. MEXICO
94FEB14 8 18



P. O. BOX 1492
EL PASO, TEXAS 79978
PHONE 915-541-2600

October 25, 1993

Mr. Robert D. Thompson
Water Resource Specialist
State Engineer Office
3311 Candelaria, NE Suite A
Albuquerque, NM 87107

Subject: Permits SJ2466 and SJ2466-S
Pollution Recovery Wells

Dear Mr. Thompson:

The above noted permits were received by El Paso Natural Gas on October 12, 1993, with one of the conditions of approval being that EPNG ensure sufficient water rights to offset effects on the San Juan River.

As noted in the permit application, these wells are anticipated to recover less than .840 acre-foot per year. This diversion should be adequately covered by water secured by State Engineer Office License numbers 2740(2), 2740(3), 2800-A and 2865A combined, which allot 1566 acre-foot per year for three EPNG facilities, including the Blanco Compressor Station, where the recovery wells are located.

Please call me at (915) 541-2839, or Anu Pundari at (505) 599-2176 if you have any further questions.

Sincerely,

A handwritten signature in cursive script that reads "Nancy Prince".

Nancy K. Prince
Senior Environmental Scientist
Environmental Affairs Department

NKP/nkp

cc: A. Pundari
G. Garibay
T. Wright
file 5200 w/w

9300127 P 1:14
MEX

El Paso
Natural Gas Company

P. O. BOX 4990
FARMINGTON, NEW MEXICO 87499

September 2, 1993

Mr. Charles Wollenberg
State Engineer Office
District 1
3311 Candelaria, N.E. Suite A
Albuquerque, N.M. 87107

93SEP 3 11:21
DISTRICT 1 OFFICE
ALBUQUERQUE, N. MEXA

Subject : Blanco North Recovery Well - SJ-2466 & S

Dear Mr. Wollenberg:

The Blanco North Recovery Well began pumping on August 2nd. The system is equipped with a totalizing meter. A pneumatic system is utilized to pump the groundwater into a 210 barrel aboveground storage tank. Since the system is powered by air, on occasion, a mixture of air and water is forced through the totalizing meter. Therefore, the meter does not always accurately reflect the amount of water pumped from the recovery wells since it registers both the water and air. If possible, we will modify the system to accurately reflect the amount of water pumped from the recovery wells.

If the system cannot be modified, we will continue to gauge the tank on a monthly basis. The tank was gauged on September 1st. There was 4 feet 3 inches of water and 4 inches of hydrocarbons in the tank. Approximately 2695 gallons of liquid has been pumped during the month of August.

If you need additional information or have any questions, please call me at 599-2176.

Sincerely,



Anu Pundari
Sr. Compliance Engineer

cc: Mr. David Hall (EPNG)
Ms. Nancy Prince (EPNG)

bc: S.Miller/K. Sinclair/File 5200-Groundwater

93SEP 3 9:08

THE ENGINEER OFFICE
DISTRICT I
ALBUQUERQUE, N. MEX.

FEDERAL EXPRESS **AIRBILL** **PACKAGE TRACKING NUMBER** **9903623800**

QUESTIONS? CALL 800-238-5355 TOLL FREE.

31174 9903623800

Date: 9-2-93

RECIPIENT'S COPY

From (Your Name) Please Print: **Anu Pundari Sr. Compliance Engr (505) 599-2176**
 Company: **EL PASO NATURAL GAS**
 Street Address: **614 HILLY AVE**
 City: **FARMINGTON** State: **NM** ZIP Required: **87401**

Your Phone Number (Very Important): **505-599-2176**

To (Recipient's Name) Please Print: **Mr. R.D. Thompson**
 Company: **State Engineer Office District 1**
 Street Address: **3311 Candelaria, N.E., Suite A**
 City: **Albuquerque** State: **New Mexico** ZIP Required: **87107**

Recipient's Phone Number (Very Important): **(505) 841-9442**

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice): **938010653-CCC-0113**

PAYMENT: Cash Check Bill Recipient's FedEx Acct. No. Bill 3rd Party FedEx Acct. No. Bill Credit Card

4 SERVICES (Check only one box)

Priority Overnight (Delivers by next business morning): OTHER PACKAGING FEDEX LETTER FEDEX PAK FEDEX BOX FEDEX TUBE

Standard Overnight (Delivers by the next business morning by Saturday morning): OTHER PACKAGING FEDEX LETTER FEDEX PAK FEDEX BOX FEDEX TUBE

Economy Two-Day (Delivers by second full-day day): ECONOMY GOVT LETTER GOVT PACKAGE

Flight Service (For packages over 150 lbs): OVERNIGHT FREIGHT TWO-DAY FREIGHT

5 DELIVERY AND SPECIAL HANDLING (Check services required)

1 HOLD FOR PICK-UP (Full in Box 11)
 2 DELIVER WEEKDAY
 3 DELIVER SATURDAY (Extra charge) (Not available to all locations)
 4 DANGEROUS GOODS (Extra charge)
 5 DRY ICE (Delivered to Ground Shipper's Declaration not required)
 7 OTHER SPECIAL SERVICE
 8 SATURDAY PICK-UP (Extra charge)
 9 SATURDAY DELIVERY (Extra charge)
 10 HOLIDAY DELIVERY (If offered) (Extra charge)

6 DIM SHIPMENT (Chargeable Weight)

Messages: WEIGHT in Pounds: YOUR DECLARED VALUE (See 10):

1 Regular Stop Drop Box B S C On-Call Stop Station

Emp. No.: Cash Recipient Return Signature Third Party Chg. To Del. Chg. To Hold

Date: **9/2/93**

Received By: **X**

Date/Time Received: **9/2/93**

FedEx Employee Number: **155**

REVISION DATE 11/92 PART #137204 FXEM 4/93 FORMAT #150

© 1993 FEDEX PRINTED IN U.S.A.

El Paso
Natural Gas Company

P. O. BOX 4990
FARMINGTON, NEW MEXICO 87499

September 1, 1993

Mr. R.D. Thompson
State Engineer Office
District 1
3311 Candelaria, N.E. Suite A
Albuquerque, N.M. 87107

Subject : Blanco North Recovery Well - SJ-2466 & S

Attached is an original Affidavit from the Farmington Daily Times that was sent to us. The Daily Times inadvertently did not send the Affidavit to your office.

If you need additional information or have any questions, please call me at 599-2176.

Sincerely,



Anu Pundari
Sr. Compliance Engineer

cc: Mr. Charles Wohlenberg (State Engineer - District I)
Mr. David Hall (EPNG)
Ms. Nancy Prince (EPNG)

93SEP 3 4 9 : 08
STATE ENGINEER OFFICE
DISTRICT 1
ALBUQUERQUE, N. MEX

UNITED STATES POSTAL SERVICE

Official Business



PENALTY FOR PRIVATE USE, \$300

Print your name, address and ZIP Code here

STATE ENGINEER OFFICE, DISTRICT 1
3311 CANDELARIA, NE SUITE A
ALBUQUERQUE, NEW MEXICO 87107



P 048 349 968

POSTAGE WILL BE PAID BY ADDRESSEE
FIRST CLASS PERMIT NO. 151
ALBUQUERQUE, NM 87107
See Page 20

Postage	\$
Certified Fee	
Special Delivery Fee	
Registered Delivery Fee	
Return Receipt (including Postmark) and Date of Delivery	
Return Receipt (including Postmark) Date and Address of Delivery	
TOTAL Postage and Fees	\$
Postmark or Date	SJ-2466 & S 8/26/93

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt Fee will provide you the signature of the person delivered to and the date of delivery.

- I also wish to receive the following services (for an extra fee):
- Addressee's Address
 - Restricted Delivery
- Consult postmaster for fee.

3. Article Addressed to: SJ-2466 & S
El Paso Natural Gas Company
P. O. Box 1492
El Paso, NM 79978

4a. Article Number
P 048 349 968

4b. Service Type
 Registered Insured
 Certified COD
 Express Mail Return Receipt for Merchandise

5. Signature (Addresser's)
 EXAMINER
 DISTRICT 1
 OFFICE
 ALBUQUERQUE, NM 87107
 SEP 1 1993
 Addresser's Address (Only if requested and fee is paid)

6. Signature (Agent)
 10:24
 PS Form 3811, November 1990 # U.S. GPO: 1991-287-506 DOMESTIC RETURN RECEIPT



**STATE OF NEW MEXICO
STATE ENGINEER OFFICE
ALBUQUERQUE**

ELUID L. MARTINEZ
STATE ENGINEER

DISTRICT 1
3311 CANDELARIA, N.E. SUITE A
ALBUQUERQUE, NM 87107

August 26, 1993

CERTIFIED RETURN RECEIPT REQUESTED

FILE: SJ-2466 & S

El Paso Natural Gas Company
P. O. Box 1492
El Paso, NM 79978

Greetings:

Notice for Publication of your application, numbered above, was issued on July 6, 1993.

The Affidavit of Publication was due in this office after the third appearance in a newspaper of general circulation in the county where the proposed well is to be located. To date, this Affidavit of Publication has not been received. We suggest that you contact your newspaper and ask them to send this Affidavit to us immediately.

If the application is for a new appropriation, failure to file proof of publication within 60 days from the date of filing shall cause postponement of the priority date of the application to the date of receipt of such proof in proper form. In the case of any other type of application, failure to file proof within the time allowed will cause the application to be cancelled.

Very truly yours,

R. D. Thompson
Water Resource Specialist
(505) 841-9482

sjr
cc: Santa Fe SEO

93 AUG 27 AM 8 06
STATE ENGINEER OFFICE
SANTA FE NEW MEXICO

171C 5200 -
Groundwater
AP
m
22

AFFIDAVIT OF PUBLICATION

No. 32023

STATE OF NEW MEXICO,
County of San Juan:

C.J. SALAZAR being duly sworn, says: "That she is the CLASSIFIED MANAGER of The Farmington Daily Times, a daily newspaper of general circulation published in English in Farmington, said county and state, and that the hereto attached LEGAL NOTICE

was published in a regular and entire issue of the said Farmington Daily Times, a daily newspaper duly qualified for the purpose within the meaning of Chapter 167 of the 1937 Session Laws of the State of New Mexico for THREE consecutive (////) (WEEKS) on the same day as follows:

First Publication THURSDAY, JULY 15, 1993

Second Publication THURSDAY, JULY 22, 1993

Third Publication THURSDAY, JULY 29, 1993

Fourth Publication _____

and the cost of publication was \$ 166.53

C.J. Salazar

On 7-22-93 C.J. Salazar appeared before me, whom I know personally to be the person who signed the above document.

Jimmy Dick

Notary Public, San Juan County,
New Mexico

My Comm expires: 7-2-96

COPY OF PUBLICATION

LEGAL NOTICE

NOTICE is hereby given that on April 7, 1993, El Paso Natural Gas Company, P.O. Box 1492, El Paso, Texas 79978, filed Application SJ-2466 & S with the State Engineer for Permit to Appropriate the Underground Waters of the State of New Mexico within the San Juan Underground Water Basin.

The applicant proposes to appropriate 0.640 acre-foot of water per annum for pollution recovery purposes from existing monitor Well MW-19, drilled to approximately 66 feet, with 2-inch casing and existing monitor Well MW-26, drilled to approximately 65.5 feet, with 4-inch casing, both located in the SW1/4 SW1/4 SE1/4 of Section 11, Township 29 North, Range 11 West, NMPM, on land owned by the Bureau of Land Management.

Free phase hydrocarbon liquids were identified on the water surface, and dissolved components in the water north of the EPNG Blanco Plant. The source of water to be removed is the shallow unconfined aquifer. Monitor wells were drilled to investigate the extent of the contamination. Water and floating product will be pumped from the wells. Oil and water will be withdrawn together and placed in an above-ground storage tank near the monitor wells. The accumulated liquids will be transported to an oil field liquid storage tank for recycling. The volume of hydrocarbon liquid to be removed was not determined during the initial investigations. It is anticipated at this time that recovery operations may take as long as 30 years to complete.

Any person, firm or corporation or other entity objecting that the granting of the application will be detrimental to the objector's water right shall have standing to file objections or protests. Any person, firm or corporation or other entity objecting that the granting of the application will be contrary to the conservation of water within the state or detrimental to the public welfare of the state and showing that the objector will be substantially and specifically affected by the granting of the application shall have standing to file objections or protests. Provided, however, that the State of New Mexico or any of its branches, agencies, departments, boards, instrumentalities or agencies instrumentalities and institutions shall have standing to file objections or protests. The protest or objections shall be in writing (legible, signed, and include the writer's complete name and mailing address and shall set forth all protestant's or objector's reasons why the application should not be approved and must be filed, in triplicate, with Eluid L. Martinez, State Engineer, 3311 Candelaria, NE, Suite A, Albuquerque, New Mexico 87107, within ten (10) days after the date of the last publication of this Notice.

Legal No. 32023 published in the Farmington Daily Times, Farmington, New Mexico on Thursdays, July 15, 22, and 29, 1993.

Cost \$ 166.53

93SEP 3 P 1:21
DISTRICT OFFICE
ALBUQUERQUE, N. MEXY



'93 JUL 7 AM 10 41
STATE ENGINEER OFFICE
SANTA FE NEW MEXICO

STATE OF NEW MEXICO
STATE ENGINEER OFFICE
ALBUQUERQUE

ELIJAH L. MARTINEZ
STATE ENGINEER

DISTRICT 1
3311 CANDELARIA, N.E. SUITE A
ALBUQUERQUE, NM 87107

July 6, 1993

FILE: SJ-2466 & s

El Paso Natural Gas Company
P. O. Box 1492
El Paso, TX 79978

Greetings:

The Notice for Publication on the following page(s) shall be published at applicant's expense once a week for three (3) consecutive weeks in a newspaper of general circulation in the stream system, or in case of an underground water appropriation the County wherein the well is to be drilled. First publication should be made as soon as possible after receipt of this notice. Publisher's affidavit of such publication must be filed with the State Engineer within sixty (60) days from the date hereon. If the application is for a new appropriation, failure to file proof of publication within the time allowed shall cause postponement of the priority date of the application to the date of receipt of such proof in proper form. In the case of any other type of application, failure to file proof within the time allowed will cause the application to be cancelled.

The accuracy as to the content of the Notice is the responsibility of the applicant and the State Engineer is not obligated for any additional expense incurred by the necessity of readvertisement.

Neither issuance of the Notice, nor lack of protest thereto, in any way indicates favorable action by the State Engineer or approval of the application as requested.

Sincerely,

R. D. Thompson
(505) 841-9482

sjr
Enclosure
cc: Santa Fe SEO
Jacket



P. O. BOX 1492
EL PASO, TEXAS 79978
PHONE 915 541-2600

June 29, 1993

Mr. Charles Wollenberg
State Engineer
Indian School Road
Albuquerque, New Mexico

Dear Mr. Wollenberg,

On April 12, 1993, EPNG submitted an application for a permit to appropriate underground waters of the State of New Mexico pursuant to Rule No. 2, 1-17 for 3 pollution recovery wells at the El Paso Natural Gas (EPNG) Blanco Compressor Station.

Please replace the attachment to that application with the enclosed corrected attachment. Please call me at (915) 541-2839 or Anu Pundari at (505) 599-2176 if you have any questions concerning the information presented on this application.

Sincerely,

Nancy K. Prince
Senior Environmental Scientist
Environmental Affairs Department

NKP/nkp
file 5200 w/w

Attachemnts

- c: A. Pundari
- D. Hall (w/o attachments)
- H. Van (w/o attachments)

POST OFFICE
ALBUQUERQUE, N. MEX.

93 JUL 2 P 1 : 29

7: ADDITIONAL STATEMENTS OR EXPLANATIONS

(To address Section 1-17.1 of Rule No. 2 published in the New Mexico Register August 15, 1991)

Free phase hydrocarbon liquids were identified on the water surface, and dissolved components in the water north of the EPNG Blanco Plant (Figure 1). The NMOCD requested product removal in a letter dated January 21, 1993.

The source of water to be removed is the shallow unconfined aquifer. No water wells tap this aquifer in the immediate vicinity of the proposed recovery operation.

Monitor wells MW-20 through MW-27 (Figure 2) were drilled in September, 1992 to investigate the extent of contamination. Water and floating product will be pumped from either MW-19 or MW-26 initially. Upon evaluation of the effectiveness of the system, installation of an additional recovery well will be evaluated.

Based on pump tests conducted in October, 1992, it is anticipated that only a flow rate of .25 gallons per minute (.420 acre ft/year) can be sustained from one well.

Oil and water will be withdrawn together and placed in an aboveground storage tank near the monitor wells. The accumulated liquids will be transported to an oil field liquid storage tank for recycling.

The volume of hydrocarbon liquid to be removed was not determined during the initial investigations. It is anticipated at this time that recovery operations may take as long as 30 years to complete.

93 JUL 2 P 1 . 29
ALBUQUERQUE, N. MEX.

JUN 25 1995 09:45 FROM EPNG FARMINGTON DU TO 918419485--21 P.

FAX
TRANSMITTAL



EL PASO NATURAL GAS COMPANY

is a major open-access transporter of natural gas serving West Texas, New Mexico, Arizona, southern Nevada and California. California receives more than half the gas from El Paso's 17,500-mile pipeline system, which is connected to every producing basin in the Southwest. El Paso's customer-friendly electronic board, Passport, offers state-of-the-art programs beneficial to producers, marketers, end-users and other pipelines.

NAME OF RECIPIENT <i>Bob Thompson</i>		PAGE(S) TRANSMITTED <i>1 + cover</i>	DATE <i>6/25/95</i>
NAME OF COMPANY <i>State Engineer</i>		CITY/STATE	
ADDRESS		TELEPHONE NUMBER <i>841-9482</i>	
FAX NUMBER (REQUIRED) <i>841-9485</i>			
NAME OF SENDER <i>Anu Pundari</i>		NAME OF COMPANY <input checked="" type="checkbox"/> EL PASO NATURAL GAS	<input type="checkbox"/> OTHER
ADDRESS		CITY/STATE	
<input type="checkbox"/> RETURN <input type="checkbox"/> DO NOT RETURN <i>Please call me or Nancy and let us know if the revised publication notice is OK.</i>		REPLY	FAX NUMBER: () _____
			VERIFY NUMBER: () _____

APR 25-1993 09:45 FROM NG FARMINGTON DIV TO 918419435--21 P.02

NOTICE is hereby given that on April 7, 1993, El Paso Natural Gas Company, P. O. Box 1492, El Paso, Texas 79978, filed Application SJ-2466 & S with the STATE ENGINEER for Permit to Appropriate the Underground Waters of the State of New Mexico within the San Juan Underground Water Basin.

The applicant proposes to appropriate 0.840 acre-foot of water per annum for pollution recovery purposes from *two existing monitor wells,*

both located in the SW1/4 SW1/4 SE1/4 of Section 11, Township 29 North, Range 11 West, NMPM, on land owned by the Bureau of Land Management.

The source of water to be removed is the shallow unconfined aquifer. Monitor wells were drilled to investigate the extent of the contamination. Water and floating product will be pumped from the wells.

It is anticipated at this time that recovery operations will be completed within 10 years.

Any person, firm or corporation or other entity objecting that the granting of the application will be detrimental to the objector's water right shall have standing to file objections or protests. Any person, firm or corporation or other entity objecting that the granting of the application will be contrary to the conservation of water within the state or detrimental to the public welfare of the state and showing that the objector will be substantially and specifically affected by the granting of the application shall have standing to file objections or protests. Provided, however, that the State of New Mexico or any of its branches, agencies, departments, boards, instrumentalities or institutions, and all political subdivisions of the state and their agencies, instrumentalities and institutions shall have standing to file objections or protests. The protest or objections shall be in writing (legible, signed, and include the writer's complete name and mailing address) and shall set forth all protestant's or objector's reasons why the application should not be approved and must be filed, in triplicate, with Eluid L. Martinez, State Engineer, 3311 Candelaria, NE, Suite A, Albuquerque, New Mexico 87107 within ten (10) days after the date of the last publication of this Notice.

NOTE TO PUBLISHER: Immediately after last publication, publisher is requested to file affidavit of such publication with the State Engineer, 3311 Candelaria, NE, suite A, Albuquerque, New Mexico 87107.

Cover Sheet for



FAX



from

DISTRICT 1

STATE ENGINEER OFFICE

TO ATTENTION OF: Anu Lunday

TELEFAX NO. 599-2119

From
OFFICE: Bob Thompson

DATE SENT: 6/23/93

NO. OF PAGES 2 + cover

*R+R 1-17.2
1-15.6.4*

OUR NEW FAX NO.

(505) 841-9485

Cover Sheet for



FAX



from

DISTRICT 1

STATE ENGINEER OFFICE

TO ATTENTION OF: Nancy Bruce

TELEFAX NO. 915-541-5946

From
OFFICE: Bob Thompson

DATE SENT: 6/23/93

NO. OF PAGES 2 + cover

*R+R 1-17.2
1-15.6-4*

OUR NEW FAX NO.

(505) 841-9485

1-15.6.4. Applications to appropriate water will not be granted in declared underground water basins that are stream related, if the State Engineer finds that the appropriation will take 0.1 acre-foot or more from a fully appropriated stream within the year the permit may be exercised.

1-15.6.5. Subsequent applications to appropriate water from the same well will not be granted if the State Engineer finds that the accumulated effects of the proposed appropriation and prior appropriations will take 0.25 acre-foot or more from a stream within the year of the proposed appropriation.

1-15.7. PERMITS REQUIRING INSTALLATION OF A METER. All permits issued for uses of water under Article 1-15.3, except for a single household and stock watering in a grazing operation, shall be metered. If two or more wells are connected to the same distribution system, all water diverted from the wells shall be metered with one or more meters and the total diversion from all wells combined shall be limited to three acre-feet per annum. All wells permitted under Article 1-15.6 shall be metered and the total diversion of water under each permit shall be limited to three acre-feet.

1-15.8. LIMITATIONS UNDER COURT DECREES. The amount and uses of water permitted under Article 1-15 are subject to such limitations as may be imposed by the courts.

1-16. RETENTION OF OLD WELL FOR DOMESTIC USE--REQUIREMENTS. If water rights have been transferred from a well but the owner thereof desires to retain the well for the purposes of Article 1-15, an application must be filed as required by that article. Prior to approval, the State Engineer shall determine whether the subject well can be retained in use without causing waste.

1-17. APPLICATIONS FOR POLLUTION PLUME CONTROL WELLS AND POLLUTION RECOVERY WELLS.

1-17.1. FORM OF APPLICATION. Any person intending to drill or use existing wells for control or recovery of pollution from aquifers within the State of New Mexico shall file an application to do so, in triplicate, on a form provided by the State Engineer and accompanied by the appropriate filing fee as required for an application to appropriate ground water (Article 6). The application shall be complete and adequate to determine the need for the pollution control or recovery operation; the underground water source; the location of points of withdrawal and discharge; the maximum annual quantity of water intended to be withdrawn from such source; the amount, method and place of discharge of the water withdrawn from such wells and the estimated maximum period of time for completion of the pollution control or recovery operations.

1-17.2. EXEMPTION FROM OR MODIFICATION OF THE REQUIREMENT FOR PUBLICATION OF NOTICE OR FILING OF APPLICATION. The requirement for publication of notice of application required by other articles of these rules and regulations may be waived or modified if the State Engineer determines that the effects which may result from the proposed pollution control or recovery operation would not permanently impair existing water rights or that an emergency exists and the delay caused by publication and hearing would not be in the public interest. Publication of notice of the application will be required after the application is approved, if not required before approval. Monitoring wells used exclusively for water level measuring and water sampling shall be exempt from the requirement for filing an application under this article but shall meet the requirements for construction, cementing, casing, testing and plugging where artesian water is encountered (Article 4-15 through 4-20).

1-17.3. CONSIDERATIONS BY THE STATE ENGINEER BEFORE APPROVAL OR DENIAL. Consideration by the State Engineer of an application filed pursuant to Article 1-17 shall include but not be limited to the following:

- a. methods for measurement of the amount of water withdrawn, the amount of water discharged and determination of the amount of water depleted from the aquifer and any related stream system.
- b. the granting of any permit under this article shall not establish a water right or relieve the permittee of any liability for detriment to or impairment of existing water rights.
- c. construction of pollution control, pollution recovery and monitoring wells shall be in a manner that will preclude the commingling of water between an artesian aquifer and water in overlying formation (Article 4-15).
- d. upon completion of the pollution control, recovery or monitoring operation all wells shall be plugged (Article 4) or otherwise maintained so that no water may be diverted from said wells unless a permit authorizing the use of the well is approved by the State Engineer in accordance with the other articles of these rules and regulations.
- e. The State Engineer will retain jurisdiction over permits issued pursuant to this article in order to prevent waste and detriment to or impairment of existing water rights to the extent practicable.

1-17.4. APPLICABILITY OF OTHER RULES AND REGULATIONS. The other articles of these rules and regulations shall also apply if water withdrawn from wells described in this article within a declared underground water basin (Article 7) is to be applied to beneficial use or as otherwise relevant to the application submitted.



STATE OF NEW MEXICO
STATE ENGINEER OFFICE
ALBUQUERQUE

'93 APR 21 AM 10 16
STATE ENGINEER OFFICE
SANTA FE NEW MEXICO
DISTRICT 1
3311 CANDELARIA, N.E. SUITE A
ALBUQUERQUE, NM 87107

ELUID L. MARTINEZ
STATE ENGINEER

April 20, 1993

FILE: SJ-2466 & S

El Paso Natural Gas Company
P. O. Box 1492
El Paso, TX 79978

Greetings:

The Notice for Publication on the following page(s) shall be published at applicant's expense once a week for three (3) consecutive weeks in a newspaper of general circulation in the stream system, or in case of an underground water appropriation the County wherein the well is to be drilled. First publication should be made as soon as possible after receipt of this notice. Publisher's affidavit of such publication must be filed with the State Engineer within sixty (60) days from the date hereon. If the application is for a new appropriation, failure to file proof of publication within the time allowed shall cause postponement of the priority date of the application to the date of receipt of such proof in proper form. In the case of any other type of application, failure to file proof within the time allowed will cause the application to be cancelled.

The accuracy as to the content of the Notice is the responsibility of the applicant and the State Engineer is not obligated for any additional expense incurred by the necessity of readvertisement.

Neither issuance of the Notice, nor lack of protest thereto, in any way indicates favorable action by the State Engineer or approval of the application as requested.

Sincerely,

R. D. Thompson
(505) 841-9482

sjr
Enclosure
cc: Santa Fe SEO
Jacket



**STATE OF NEW MEXICO
STATE ENGINEER OFFICE
ALBUQUERQUE**

ELUID L. MARTINEZ
STATE ENGINEER

DISTRICT 1
3311 CANDELARIA, N.E. SUITE A
ALBUQUERQUE, NM 87107

April 13, 1993

FILE: SJ-2466 & S

Nancy K. Prince
Senior Environmental Scientist
El Paso Natural Gas Company
P. O. Box 1492
El Paso, TX 79978

Dear Ms. Prince:

Enclosed are three copies of the Application for Permit to Appropriate the Underground Waters of the State of New Mexico which was received in this office on April 7, 1993.

Before a notice of publication can be issued, all three copies of the application must be signed, notarized, and returned to us as soon as possible.

Thank you.

Sincerely,

Susan Raffay
Susan Raffay
(505) 841-9482

sr
Enclosures as mentioned

93 APR 19 P 2: 47
STATE ENGINEER OFFICE
DISTRICT 1
ALBUQUERQUE, N. MEX.





**STATE OF NEW MEXICO
STATE ENGINEER OFFICE
ALBUQUERQUE**

ELUID L. MARTINEZ
STATE ENGINEER

DISTRICT 1
3311 CANDELARIA, N.E. SUITE A
ALBUQUERQUE, NM 87107

April 8, 1993

FILE: SJ-22⁴⁶ & S

El Paso Natural Gas Company
P. O. Box 1492
El Paso, TX 79978

ATTENTION: Nancy K. Prince

Dear Ms. Prince:

In accordance with your written request for emergency authorization as detailed in your application received April 7, 1993, for pollution control and recovery within the SW1/4 SW1/4 SE1/4 of Section 11, T29N, R11W, pursuant to Article 1-17 of the Rules and Regulations of the State Engineer Governing Drilling of Wells and Appropriation and Use of Groundwater in New Mexico, authorization to use the pollutant recovery wells is hereby granted provided:

1. That an emergency situation exists due to the need to prevent off-site movement of contaminants and delay caused by publication of Application SJ-2466 & S and hearing would not be in the public interest, and
2. That water shall be diverted only for the purposes stated in your application received April 7, 1993, and that all water diverted shall be discharged as described in the application, and
3. That the recovery wells and discharge point(s) shall be equipped with totalizing meters of a type and at locations approved by and installed in a manner acceptable to the State Engineer, and
4. That records of the total amount of water diverted from the recovery wells shall be submitted to this office, in writing, on or before the 10th day of each month for the preceding calendar month, and

El Paso Natural Gas Company
c/o Nancy K. Prince
Page 2
April 8, 1993

5. That pumping shall cease within 24 hours after notification by the State Engineer. Notification may be verbal followed by a certified letter. Permittee shall have someone available for the duration of pumping to act immediately upon cessation notice from the State Engineer, and the State Engineer shall be provided with the information needed to contact said person, and
6. That issuance of this authorization does not obligate favorable consideration by the State Engineer of the pending application, and
7. That the State Engineer retains jurisdiction in this matter to insure compliance with all conditions of issuance, and
8. That this authorization shall expire on April 7, 1994, or when the State Engineer enters his final decision on the pending application, whichever occurs first.

Sincerely yours,



C. A. Wohlenberg
District I Assistant Supervisor
(505) 841-9482

RDT:sjr
cc: Santa Fe SEO

NOTICE is hereby given that on April 7, 1993, El Paso Natural Gas Company, P. O. Box 1492, El Paso, Texas 79978, filed Application SJ-2466 & S with the STATE ENGINEER for Permit to Appropriate the Underground Waters of the State of New Mexico within the San Juan Underground Water Basin.

The applicant proposes to appropriate 0.840 acre-foot of water per annum for pollution recovery purposes from existing monitor Well MW-19, drilled to approximately 66 feet, with 2-inch casing and existing monitor Well MW-26, drilled to approximately 65.5 feet, with 4-inch casing, both located in the SW1/4 SW1/4 SE1/4 of Section 11, Township 29 North, Range 11 West, NMPM, on land owned by the Bureau of Land Management.

Free phase hydrocarbon liquids were identified on the water surface, and dissolved components in the water north of the EPNG Blanco Plant. The source of water to be removed is the shallow unconfined aquifer. Monitor wells were drilled to investigate the extent of the contamination. Water and floating product will be pumped from the wells. Oil and water will be withdrawn together and placed in an above-ground storage tank near the monitor wells. The accumulated liquids will be transported to an oil field liquid storage tank for recycling. The volume of hydrocarbon liquid to be removed was not determined during the initial investigations. It is anticipated at this time that recovery operations may take as long as 30 years to complete.

Any person, firm or corporation or other entity objecting that the granting of the application will be detrimental to the objector's water right shall have standing to file objections or protests. Any person, firm or corporation or other entity objecting that the granting of the application will be contrary to the conservation of water within the state or detrimental to the public welfare of the state and showing that the objector will be substantially and specifically affected by the granting of the application shall have standing to file objections or protests. Provided, however, that the State of New Mexico or any of its branches, agencies, departments, boards, instrumentalities or institutions, and all political subdivisions of the state and their agencies, instrumentalities and institutions shall have standing to file objections or protests. The protest or objections shall be in writing (legible, signed, and include the writer's complete name and mailing address) and shall set forth all protestant's or objector's reasons why the application should not be approved and must be filed, in triplicate, with Eluid L. Martinez, State Engineer, 3311 Candelaria, NE, Suite A, Albuquerque, New Mexico 87107, within ten (10) days after the date of the last publication of this Notice.

VOID

NOTICE is hereby given that on April 7, 1993, El Paso Natural Gas Company, P. O. Box 1492, El Paso, Texas 79978, filed Application SJ-2466 & S with the STATE ENGINEER for Permit to Appropriate the Underground Waters of the State of New Mexico within the San Juan Underground Water Basin.

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NOTE TO PUBLISHER: Immediately after last publication, publisher is requested to file affidavit of such publication with the State Engineer, 3311 Candelaria, NE, Suite A, Albuquerque, New Mexico 87107.



El Paso
Natural Gas Company

P. O. BOX 1492
EL PASO, TEXAS 79978
PHONE: 915 541 2600

April 2
~~March 22~~, 1993

Mr. Charles Wohlenberg
Water Resource Engineering Specialist
State Engineers Office
3311 Candelaria NE, Suite A
Albuquerque, New Mexico 87107

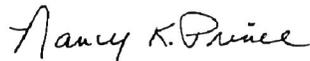
Subject: Request for Permit to Appropriate Underground Waters
San Juan County, New Mexico

Dear Mr. Wohlenberg,

Attached is an application for a permit to appropriate underground waters of the State of New Mexico pursuant to Rule No. 2, 1-17 for two pollution recovery wells at the El Paso Natural Gas (EPNG) Blanco Compressor Station. Also enclosed is our check in the amount of \$50 for the filing fee.

We request permission to begin withdrawing water prior to the publication of notice of these wells due to the urgent nature of the problem. Please call me at (915) 541-2839 if you have any questions concerning the information presented on this application.

Sincerely,



Nancy K. Prince
Senior Environmental Scientist
Environmental Affairs Department

NKP/nkp
file 5200 w/w

Attachments

- c: A. Pundari
- H. Van (w/o Attachments)
- D. Hall (w/o Attachments)

STATE ENGINEERS OFFICE
EL PASO DISTRICT
ALBUQUERQUE, N. MEXICO
83 APR 7 P 1: 11

SI-2466 & 5



P.O. BOX 1492
EL PASO, TX 79978

PAYABLE AT
CITIBANK DELAWARE
A SUBSIDIARY OF CITICORP
ONE PENN'S WAY
NEW CASTLE, DE 19720

62-20
311

007224663 *

04/01/93
Date

PAY TO THE ORDER OF

NEW MEXICO STATE ENGINEER
OFFICE
3311 CANDELARIA NE SUITE A
ALBUQUERQUE NM 87107

PAY AMOUNT
\$50.00

Void After 1 Year



Authorized Signatory

⑈07224663⑈ ⑆031100209⑆ 3869160⑆

Detach and retain this statement for your records

EL PASO NATURAL GAS COMPANY

REMITTANCE ADVICE

Vendor Number
010623 002

Check Date
04/01/93

Check Number
007224663

VOUCHER NUMBER	INVOICE NUMBER	AMOUNT		Net
		Invoice	Discount	
REFER PAYMENT	INQUIRIES TO ACCOUNTS PAYABLE (915) 541-5354			
VOUCHER NO	INVOICE NO	GROSS	DISCOUNT	NET
000194969	CKREQ930326	50.00	.00	50.00
FILING FEE -	POLLUTION RECOVERY WELLS			
@ EPNG BLANCO	COMPRESSOR STATION			
	TOTALS	50.00	.00	50.00

2466
S

STATE ENGINEER OFFICE
DISTRICT 1
ALBUQUERQUE, N. MEX.
93 APR 7 P 1:12

7. ADDITIONAL STATEMENTS OR EXPLANATIONS:

Free phase hydrocarbon liquids were identified on the water surface, and dissolved components in the water at the EPNG Blanco Plant (Figure 1). The NMOCD requested product removal in a letter dated January 21, 1993.

The source of water to be removed is the shallow unconfined aquifer. No water wells tap this aquifer in the immediate vicinity of the proposed recovery operation.

Monitor wells (Figure 2) were drilled as noted below to investigate the extent of contamination. Water and floating product will be pumped from either MW-19 or MW-26 initially. Upon evaluation of the effectiveness of the system, installation of an additional recovery well will be evaluated.

Based on pump tests conducted in October, 1992, it is anticipated that only a flow rate of .25 gallon per minute (.420 acre ft/year) can be sustained from each well.

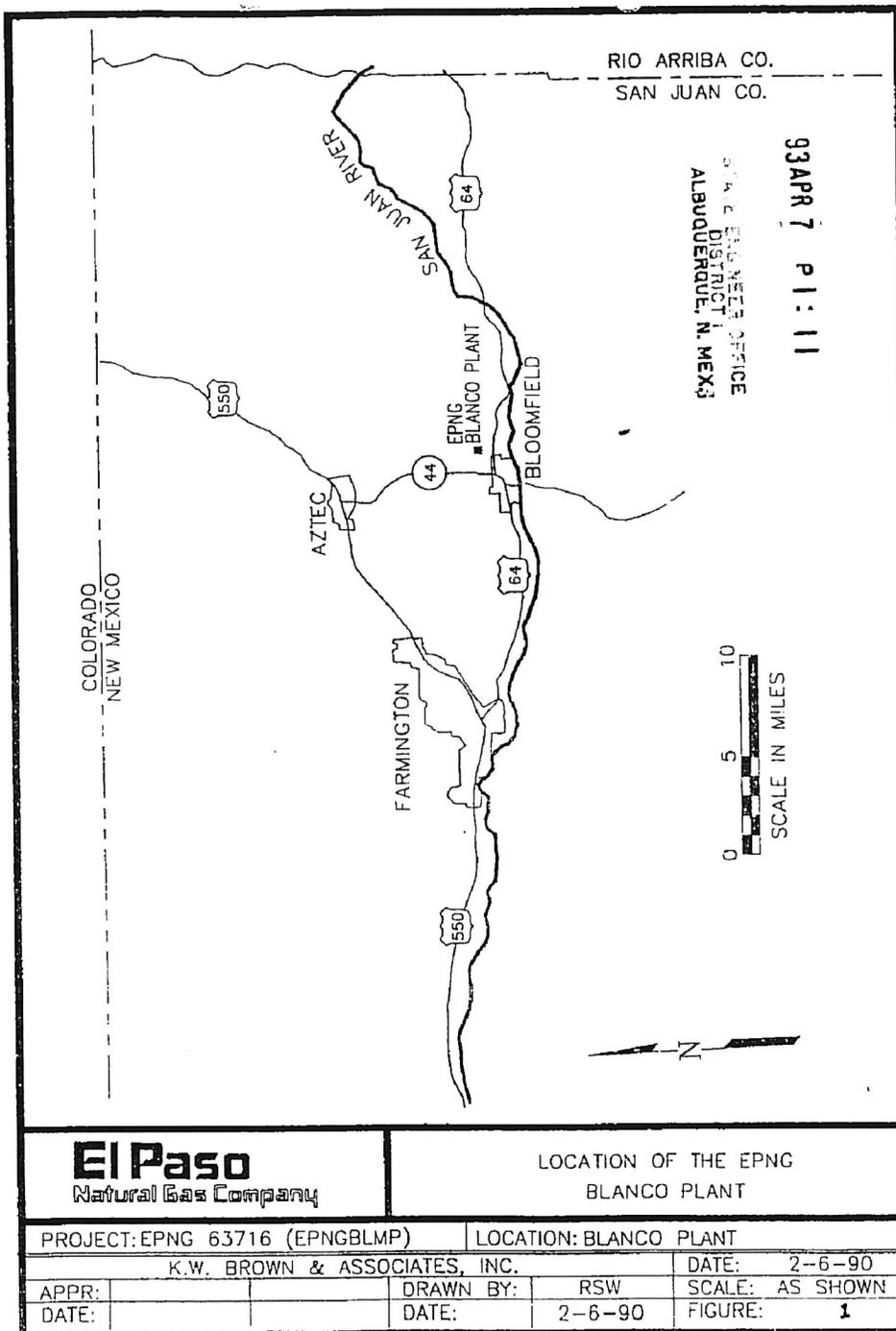
Oil and water will be withdrawn together and placed in an aboveground storage tank near the monitor wells. The accumulated liquids will be transported to an oil field liquid storage tank for recycling.

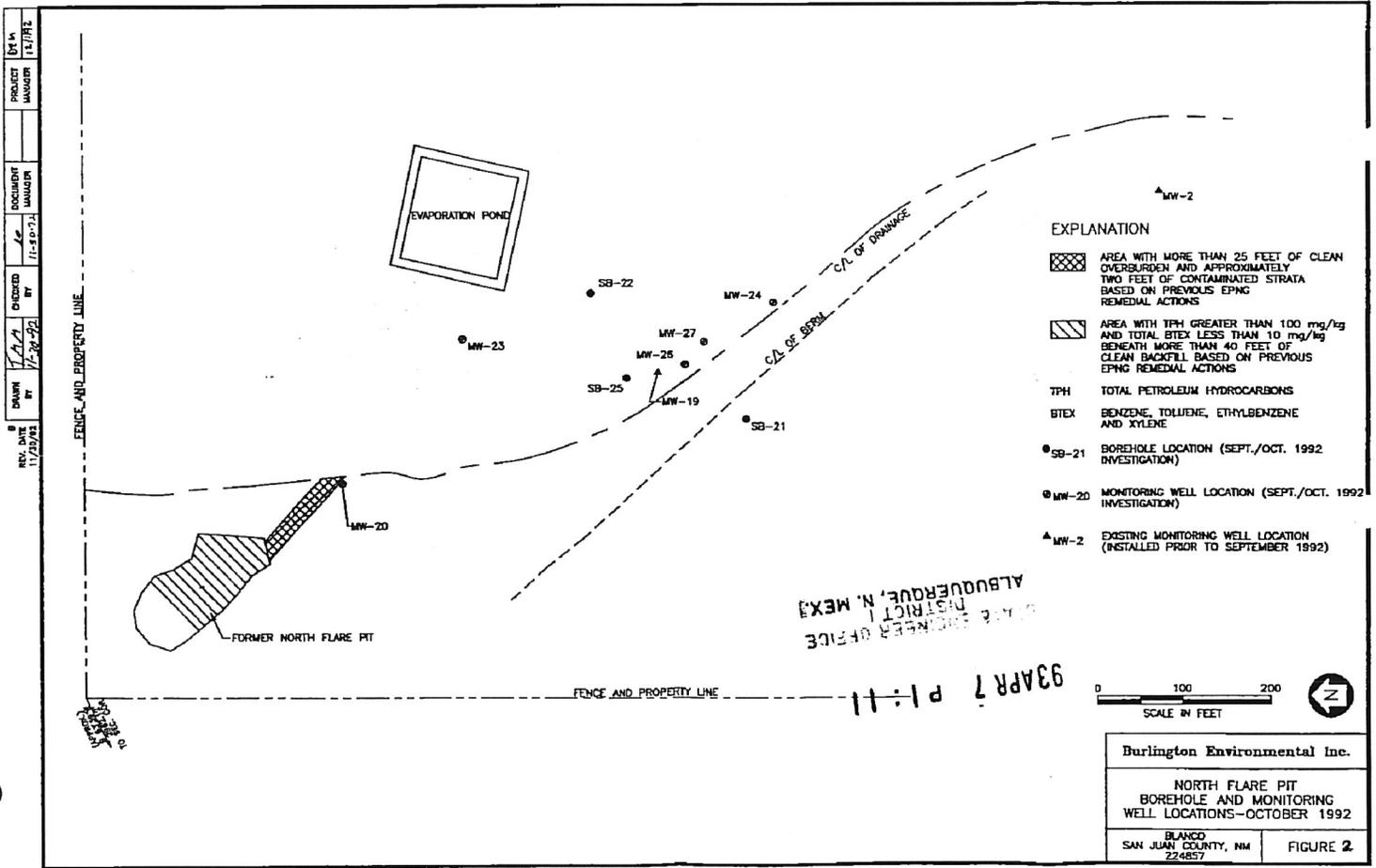
The volume of hydrocarbon liquid to be removed was not determined during the initial investigations. It is anticipated at this time that recovery operations will be completed within 10 years.

TABLE 1

<u>Well Number</u>	<u>Date Drilled</u>	<u>Diameter</u>	<u>Depth</u>	<u>Recovery Anticipated</u>	<u>Fee Due</u>
MW-2	9/2/88	4 in	57.5 ft.	0	0
MW-19	1/11/90	2 in	66	.25gpm	\$25
MW-20	9/17/92	2 in	66	0	0
MW-23	9/21/92	4 in	64	0	0
MW-24	9/22/92	4 in	64.5	0	0
MW-26	9/29/92	4 in	65.5	.25gpm	\$25
MW-27	10/1/92	2 in	70	0	0

93 APR 7 P 1: 11
 ALBUQUERQUE, N. MEX.
 REGIONAL OFFICE





APPLICATION TRACKING RECORD

Application File No. SJ-2466 & S Date Filed 7 April 93
 Name of Applicant El Paso Natural Gas Company
 Entered in Day Log? Yes Entered in S.E.R. File? _____
 Viewed by District Supervisor - Date 7 April 93 Initials AAW
 Particular Basin Area San Juan
 Forwarded to RDT on date 7 April 93
 Notice Sent on Date _____ Affidavit received _____
 Protested? _____ by Whom? _____

NOTES Pollution Control / Recovery
Authorization to start requested
a 1/2 AF/AN - 10 yrs est.
0.840 AF/AN

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

ATTACHMENT IV.2.B
BORING LOGS AND ASSESSMENT WELL COMPLETIONS FOR THE
BASIN DISPOSAL FACILITY INVESTIGATIONS

JOHN SHOMAKER & ASSOCIATES, INC.
Water-Resource and Environmental Consultants
2611 Broadbent Parkway NE, Albuquerque, NM 87107

Borehole Logging Form

Client: Basin Disposal, Inc.		Project: borehole No. 1/AW-1		Hole: 1	1 of 1
Site: Bloomfield, NM				Date: 5/19/2008	
Geologist: EM		Contractor: Hydrogeologic Services		Map:	
Drill Method: auger and split spoon		Rig: Failings-International			
Notes: operation attended by Brad Jones, Env. Engineer with NMEMNR/OCD		Bit size:			
Elevation, ft:		Land Surface:		TOC:	
Sample Depth, ft	Lithology	% Rec.	Moisture Encountered, ft bgl	Description	
0 - 2	fill ?	72		sandy loam	
2 - 4	fill ?	72		same as 0 – 1.5 ft interval	
4 - 6	fill ? alluvium	83		sandy loam changing gradually to a clayey sand; at 58" abrupt contact to a coarse sand	
6 - 6.5	alluvium	100		coarse sand (full core in sleeve)	
6.5 - 7	alluvium	100		loamy sand (full core in sleeve)	
7 - 7.5	alluvium	100		coarse sand (full core in sleeve)	
7.5 - 8	alluvium	100		coarse sand (full core in sleeve)	
8 - 8.5	alluvium	100		silty sand/loamy sand (full core in sleeve)	
8.5 - 10.5	alluvium	100		well-sorted (dry) sand	
10.5 - 12.5	alluvium	100		well-sorted (dry) sand; contact at 12 ft bgl to clay with Stage I caliche	
12.5 - 14.5	alluvium	100		predominantly clay with caliche, layered with sandy loam, layered with silty sand in 6" intervals	
14.5 - 16.5	alluvium	100		coarse sand – bottom tagged ~17 ft bgl, salt xstals grow on wet glued sample 15 ft & down	
17 - 19	alluvium	100		coarse sand; contact at 17.5 ft bgl with a dry silty fine sand	
19 - 21	alluvium	100		loamy sand grading (over a few inches at 19.5 ft bgl) to a white, loamy silt	
21 - 23	alluvium	50		white, silty sand, including some caliche	
24 - 26	alluvium	80		silty sand grading to a sandy silt, grading to a (more consolidated) loamy sand at the base	
26 - 28	alluvium	100		predominantly yellow-white sand – loamy sand, with 2" of sandy loam	
28 - 30	alluvium	92		sandy loam; contact at 28.5 ft bgl with well graded (sorted) sand	
30 - 32	alluvium	100		10" sand; 4" of semi-consolidated sandy loam; with 10" of reddish, fine sand	
32 - 34	alluvium	100		12" fine sand; 12" fine, yellow-white sandy loam	
34 - 36	alluvium	100		6" fine, sandy loam; 12" fine sand; 6" sandy loam with a trace of clay	
36 - 38	alluvium	100		12" gray sand; 6" sandy loam; 6" sand	
38 - 40	alluvium	100		14" medium (slightly cool – moist?) yellow-gray sand; 10" clayey sand (first real clay layer)	
40 - 42	alluvium	100	41.25	15" medium, gray-yellow sand; 9" sand (with feldspar, quartz)	
42 - 43	alluvium sandstone	100		moist, coarse sand; sandstone contact at 42.90 ft bgl; sandstone with green alteration (predominantly quartz, minor feldspar), consolidated, no fizz with HCl; fractured/weathered with horizontal fractures	

JOHN SHOMAKER & ASSOCIATES, INC.
Water-Resource and Environmental Consultants
2611 Broadbent Parkway NE, Albuquerque, NM 87107

Borehole Logging Form

Client: Basin Disposal, Inc.		Project: Coring to 100 ft bgl		Hole: 2	1 of 1
Site: Bloomfield, NM				Date: 5/20/2008	
Geologist: EM		Contractor: Hydrogeologic Services		Map:	
Drill Method: auger and split spoon / direct air with 10-ft core barrel		Rig: Failings-International			
Notes: operation attended by Brad Jones, Env. Engineer of the NMEMNR/OCD		Bit size:			
Elevation, ft:		Land Surface:		TOC:	
Sample Depth, ft	Lithology	% Rec.	Moisture Encountered, ft bgl	Description	
0 - 2	alluvium			loamy sand	
2 - 4	alluvium	good		sandy loam; grading to loamy sand; grading to sandy clay	
4 - 6	alluvium	50		loamy sand; grading to sandy, unsaturated clay; bottom few in. stage I caliche	
6 - 8	alluvium	100		fine sand (with gypsum flakes); grading to medium sand with 10% rounded gravel, salt crystals grow on wet glued samples from 6 ft & down in alluvium	
8 - 10	alluvium	100		medium - coarse sand with 2" gravel layer @ 8.35 ft bgl; gravel is subangular, has weathering rinds; provenance is a mudstone	
10 - 12	alluvium	100		medium - coarse sand; sharp contact @9.5 ft bgl to loam with stage I/II caliche	
12 - 14	alluvium	100		very friable dark-gray, silt(stone) (no-fizz w HCl);almost-consolidated.	
14 - 16	alluvium	75		dark-gray, friable silt(stone), dry; non-lithified but consolidated, with small bits of gravel locally	
16 - 18	alluvium	88		v. consolidated silt(stone); @ 15.8 ft bgl caliche layer	
18 - 20	alluvium	63		consolidated silt(stone), @ 19.8 ft bgl 1/4 in. gravel	
20 - 21	alluvium	?		consolidated (but friable) silt(stone), fract with FeO	
				<i>(split-spoon sampling above)</i>	
				<i>(coring with direct air below)</i>	
21 - 31	siltstone sandstone	25	25 - 30	greenish, siltstone (0.8 ft). Greenish sandstone (0.5 ft); followed by 0.3 ft of loose yellow well-graded. Bottom (?) of the core has a total of 0.9 ft of sandstone. Missing section. Lacquer-like smell. Moist section above sandstone contact	
31 - 41	sandstone	85		sandstone, (quartz, feldspar) with 5% mudstone; in places arkosic	
41 - 51	sandstone	100		same as 31 - 41; with platelets of eroded mudstone	
51 - 61	sandstone siltstone	90	57	sandstone grading to arkose - conglomerate with coal horizons green-gray siltstone contact at 59.3 ft bgl	
61 - 71	siltstone sandstone	85		gray siltstone with fine sandstone (contact @ 69.5 ft bgl)	
71 - 81	siltstone	95		siltstone with coal-horizons; clay-coating on the inside of the core barrel, from local clay lenses (?); no moisture within core when fresh	
81 - 91	siltstone	100		greenish-gray siltstone with coal-horizons, blacker marbling, no minerals seen unaided	
91 - 101	siltstone	100	94	green siltstone with clay horizon approximately 2 in. thick; approx. 1.5 ft of core left in the hole	

JOHN SHOMAKER & ASSOCIATES, INC.
Water-Resource and Environmental Consultants
2611 Broadbent Parkway NE, Albuquerque, NM 87107

Borehole Logging Form

Client: Basin Disposal, Inc.		Project: Coring to 100 ft bgl		Hole: 3	1 of 1
Site: Bloomfield, NM				Date: 5/22/2008	
Geologist: EM		Contractor: Hydrogeologic Services		Map:	
Drill Method: auger and split spoon / direct air with 10 ft core barrel		Rig: Failings-International			
Notes: operation attended by Brad Jones, Env. Engineer of the NMEMNR/OCD		Bit size:			
Elevation, ft:		Land Surface:		TOC:	
Sample Depth, ft	Lithology	Rec. %	Moisture Encountered, ft bgl	Description	
0 - 2	fill	-		medium sand – middle 6” is silty sand; more loamy sand toward the bottom	
2 - 4	fill	80		well-sorted sand; grading to loamy sand; grading to silty sand; grading to well sorted sand	
4 - 6	fill	100		well-sorted sand; clay lens; grading to loamy sand; grading to coarse sand; grading to loamy (yellow) sand	
6 - 8	alluvium	100		loamy (yellow) sand; abrupt contact with loamy(gray) compacted; grading to well-sorted sand	
8 - 10	alluvium	100		well-sorted (dry) sand	
10 - 12	sandstone	60		0.2 ft well-sorted sand; 1 ft weathered sandstone bedrock, non-lithified, white and dry sand	
12 - 14	sandstone	GRAB		yellow, weathered, friable sandstone (dry)	
14 - 16	sandstone	GRAB		yellow, weathered, friable sandstone (dry)	
16 - 18	sandstone	GRAB		yellow, weathered, friable sandstone (dry)	
18 - 20	siltstone	95		17.5 ft bgl brown – gray siltstone (bottom 2” is very friable and calcified, with caliche (non-linked))	
				<i>(split-spoon sampling above)</i>	
				<i>(coring with direct air below)</i>	
20 - 30	siltstone	50		greenish, brown, friable, dry, siltstone. Smells of sulfur. Fracture surface coated by calcite (?) xstals.	
30 - 40	siltstone	100		greenish siltstone, grading to gray siltstone with faint paint thinner smell (33 – 38 ft bgl), grading to green siltstone with FeO on fractures. 3 (6” thick) ss lenses from 33 to 38 ft bgl. At 38 ft bgl a 4” soft (no moisture) clay lens.	
40 - 50	sandstone	100	40.5 - 43.5	sandstone (dolomite, quartz, rare fidspr, mica) with micaceous cross beds (dry), @ 43 ft bgl fract. siltstone lens – to the base sandstone is coal-bearing	
50 - 60	sandstone, siltstone	90	56.5	sandstone with green-gray siltstone contact at 58.5 ft bgl	
60 - 70	siltstone	85		siltstone with friable organic horizons (64 & 65 ft bgl) – no fractures, no moisture, but slippery, talc-like feel, org. are greasy luster, botryoidal in habit	
70 - 80	siltstone	97		same as 60 – 70 ft bgl	
80 - 90	siltstone	100	80.5	siltstone with gypsum-filled fractures, fracture at 80 ft bgl is moist	
90 - 100	siltstone, sandstone	100		same as 60 – 70 ft bgl; sandstone contact @ 99.8 ft bgl	

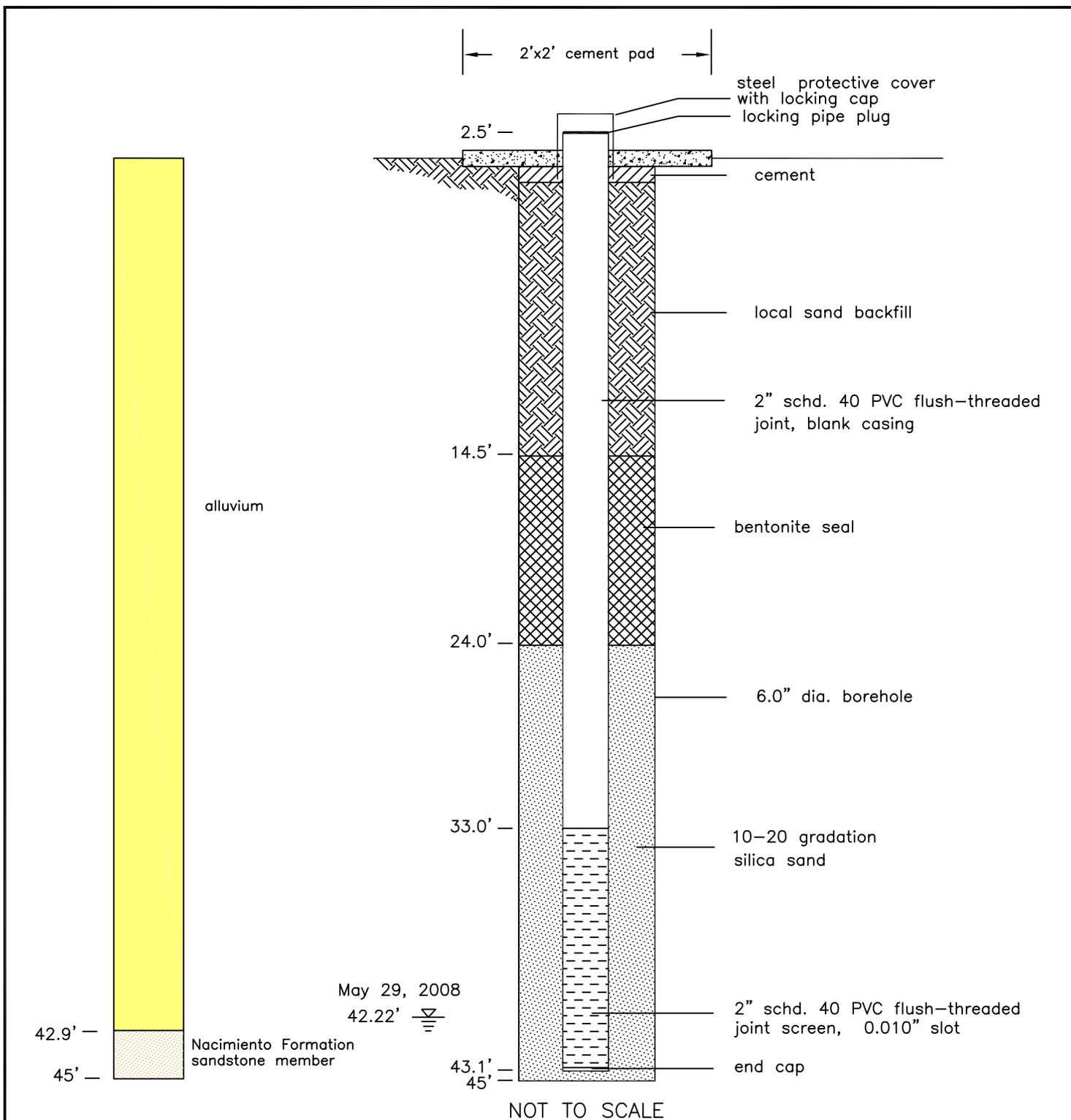


Figure 8. Ground-water initial assessment well AW-1 completion diagram, borehole lithology, and ground-water elevation, Basin Disposal Site, Bloomfield, New Mexico.

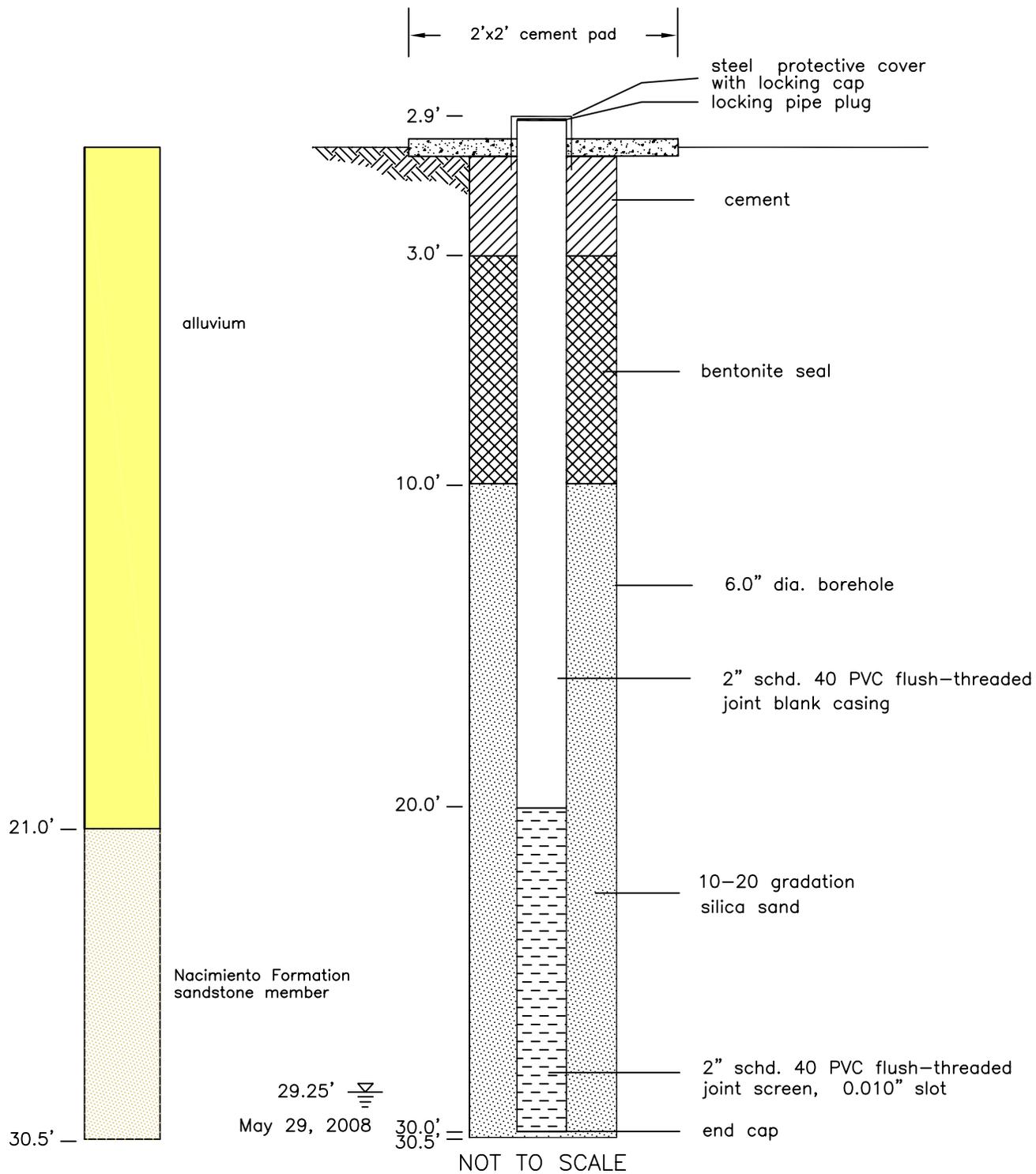


Figure 9. Ground-water initial assessment well AW-2 completion diagram, borehole lithology (from nearby borehole No. 2), and ground-water elevation, Basin Disposal Site, Bloomfield, New Mexico.

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

ATTACHMENT IV.2.C
GEOTECHNICAL SOIL TESTS – BASIN DISPOSAL SITE

==== V =====

Vinyard & Associates, Inc.

8916-A Adams Street NE
 Albuquerque, New Mexico 87113
 505/797-9743 505/797-9749 FAX

==== A =====

Geotechnical Engineering * Materials Testing * Environmental Engineering

June 25, 2008

John Shomaker & Associates, Inc.
 2611 Broadbent Parkway
 Albuquerque, NM 87107

Note: Revised to show atterberg test results.

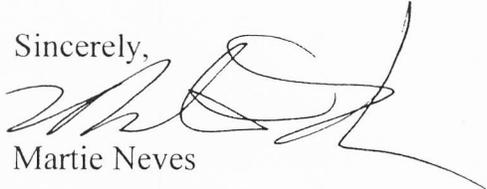
Attn: Mr. Erwin A Melis, Ph.D

Project: Basin Disposal
 V & A Project No. 08-2-282

Gentlemen:

Attached are copies of the Laboratory Test results for the subject project.

Should you have any questions regarding this data, please do not hesitate to call.

Sincerely,

 Martie Neves

Vinyard & Associates, Inc.

 Robert K. Abeyta, S.E.T.

Attachment: Figure No.: 4

cc: Addressee: (1)
 Basin Disposal, Inc. - Attn: Mr. John Volkerding

mn

Falling Head Permeability Test

ASTM D5856-95

Project : Basin Disposal Date: 7/12/2008
 Project No.: 08-2-282
 Sample Number 926 @ 5.5' to 6.0'
 Permeameter No.: b

MDD (pcf):	d	110	Diameter of Specimen, cm:	D	6.172
$\gamma=d/62.4$:	γ	1.763	Area of Specimen, cm ² :	A	29.92
% Compaction:	%	80%	Initial Height of Specimen, cm :	L	7.96
Dry Soil= % * V * γ :	Ws	335.9	Volume, ml, V=A*L	V	238.16
Specific Gravity:	g	2.5	Void Ratio (V-Vs)/Vs :	e	0.77
Vol of Solids,Vs=Ws/g:	Vs	134.3	Constant 2.303 *(a/A)*L :	c	0.194225
Area of Standpipe, cm ² :	a	0.317			

Initial Time	t ₀	8:00 AM	8:02 AM	8:04 AM	8:06 AM	8:08 AM	8:10 AM
Final Time	t _f	8:01 AM	8:03 AM	8:05 AM	8:07 AM	8:09 AM	8:11 AM
Time Interval, min		1	1	1	1	1	1
Elapsed Time, sec:	t	69	71	73	74	74	75
Initial Head, cm	h ₀	182.0	182.0	182.0	182.0	182.0	182.0
Final Head, cm	h _f	15.3	15.3	15.3	15.3	15.3	15.3
Log h ₀ /h _f	l	1.08	1.08	1.08	1.08	1.08	1.08
Water Temp, C	T	22.5	22.5	22.5	22.5	22.5	22.5
Viscosity Corr. Factor	R _t	0.9433	0.9433	0.9433	0.9433	0.9433	0.9433
Coefficient of Permeability, cm/sec	K	3.03E-03	2.95E-03	2.86E-03	2.83E-03	2.83E-03	2.79E-03
Coefficient of Permeability Corrected,	K ₂₀	2.86E-03	2.78E-03	2.70E-03	2.67E-03	2.67E-03	2.63E-03

Average - Coefficient of Permeability, cm/sec	K	2.83E-03
Permeability Corr.,	K ₂₀	2.67E-03

Note : MDD and Specific Gravity are assumed

Moisture content - 8.3

In place dry density 89.9 lb ft³

Atterberg Limit - Liquid Limit NV - Plastic Limit NV - Plasticity Index NP

Falling Head Permeability Test ASTM D5856-95

Project : Basin Disposal Date: 7/12/2008

Project No.: 08-2-282

Sample Number 927 @ 6.5' to 7.0'

Permeameter No.: b

MDD (pcf):	d	110	Diameter of Specimen, cm:	D	6.172
$\gamma=d/62.4$:	γ	1.763	Area of Specimen, cm ² :	A	29.92
% Compaction:	%	78%	Initial Height of Specimen, cm :	L	7.89
Dry Soil= % * V * γ :	Ws	324.6	Volume, ml, V=A*L	V	236.07
Specific Gravity:	g	2.5	Void Ratio (V-Vs)/Vs :	e	0.82
Vol of Solids, Vs=Ws/g:	Vs	129.8	Constant 2.303 *(a/A)*L :	c	0.192517
Area of Standpipe, cm ² :	a	0.317			

Initial Time	t ₀	8:00 AM	8:02 AM	8:04 AM	8:06 AM	8:08 AM	8:10 AM
Final Time	t _f	8:01 AM	8:03 AM	8:05 AM	8:07 AM	8:09 AM	8:11 AM
Time Interval, min		1	1	1	1	1	1
Elapsed Time, sec:	t	71	71	72	73	75	76
Initial Head, cm	h ₀	182.0	182.0	182.0	182.0	182.0	182.0
Final Head, cm	h _f	15.3	15.3	15.3	15.3	15.3	15.3
Log h ₀ /h _f	l	1.08	1.08	1.08	1.08	1.08	1.08
Water Temp, C	T	22.5	22.5	22.5	22.5	22.5	22.5
Viscosity Corr. Factor	R _t	0.9433	0.9433	0.9433	0.9433	0.9433	0.9433
Coefficient of Permeability, cm/sec	K	2.92E-03	2.92E-03	2.88E-03	2.84E-03	2.76E-03	2.73E-03
Coefficient of Permeability Corrected,	K ₂₀	2.75E-03	2.75E-03	2.72E-03	2.68E-03	2.61E-03	2.57E-03

Average - Coefficient of Permeability, cm/sec	K	2.80E-03
Permeability Corr.,	K ₂₀	2.64E-03

Note : MDD and Specific Gravity are assumed

Moisture content - 8.2

In place dru density - 89.5 lbs / ft³

Atterburg Limits Liquid Limit NV - Plastic Limit NV - Plasticity Index NP

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

ATTACHMENT IV.2.D
GROUNDWATER SAMPLE LAB ANALYTICAL REPORTS – BASIN DISPOSAL SITE
2006 AND 2008 MONITORING EVENTS



GE Infrastructure
Water & Process Technologies

WATER ANALYSIS REPORT

BASIN DISPOSAL
 Aztec, NM

Sampled: 04-AUG-2006
 Reported: 16-AUG-2006
 Field Rep: Lambert, John W
 91000497

	POST FILT PROD. WTR Q0808025
Particle Size Distribution	A
Ammonia, Free And Fixed, as N, ppm	35
pH	6.9
Specific Conductance, at 25°C, µmhos	22400
Alkalinity, "P" as CaCO ₃ , ppm	0
Alkalinity, "M" as CaCO ₃ , ppm	1370
Sulfur, Total, as SO ₄ , ppm	978
Chloride, as Cl, ppm	7600
Hardness, Total, as CaCO ₃ , ppm	497
Calcium Hardness, Total, as CaCO ₃ , ppm	347
Magnesium Hardness, Total, as CaCO ₃ , ppm	129
Barium, Total, as Ba, ppm	3.1
Strontium, Total, as Sr, ppm	16.5
Copper, Total, as Cu, ppm	< 0.05
Iron, Total, as Fe, ppm	6.9
Sodium, as Na, ppm	4970

GE imagination at work



GE Infrastructure Water & Process Technologies

WATER ANALYSIS REPORT

BASIN DISPOSAL

Aztec, NM

Sampled: 04-AUG-2006
 Reported: 16-AUG-2006
 Field Rep: Lambert, John W
 91000497

	POST FILT PROD. WTR Q0808025
Potassium, as K, ppm	571
Aluminum, Total, as Al, ppm	0.1
Manganese, Total, as Mn, ppm	0.47
Nitrate, as NO ₃ , ppm	< 1
Phosphate, Total, as PO ₄ , ppm	5.3
Silica, Total, as SiO ₂ , ppm	22
Fluoride, as F, ppm	< 0.1
Lead, Total, as Pb, ppm	0.019
Mercury, Total, as Hg, ppb	1.0
Carbon, Total Organic, as C, ppm	549
Turbidity, NTU	47
Hexane Extractable Material, mg/l	48

GE imagination at work



GE Infrastructure
Water & Process Technologies

WATER ANALYSIS REPORT

BASIN DISPOSAL
Aztec, NM

Sampled: 04-AUG-2006
Reported: 16-AUG-2006
Field Rep: Lambert, John W
91000497

Result Legend

A - This test was aborted for cause. More detail is provided below.

Comments

Sample Name: POST FILT PROD. WTR Lab ID: Q0808025

The Particle Size Distribution report will be sent at a later date under separate cover. For any questions or concerns, please contact Roberto Dominguez at 281-681-5270.

GE imagination at work



GE Infrastructure
Water & Process Technologies

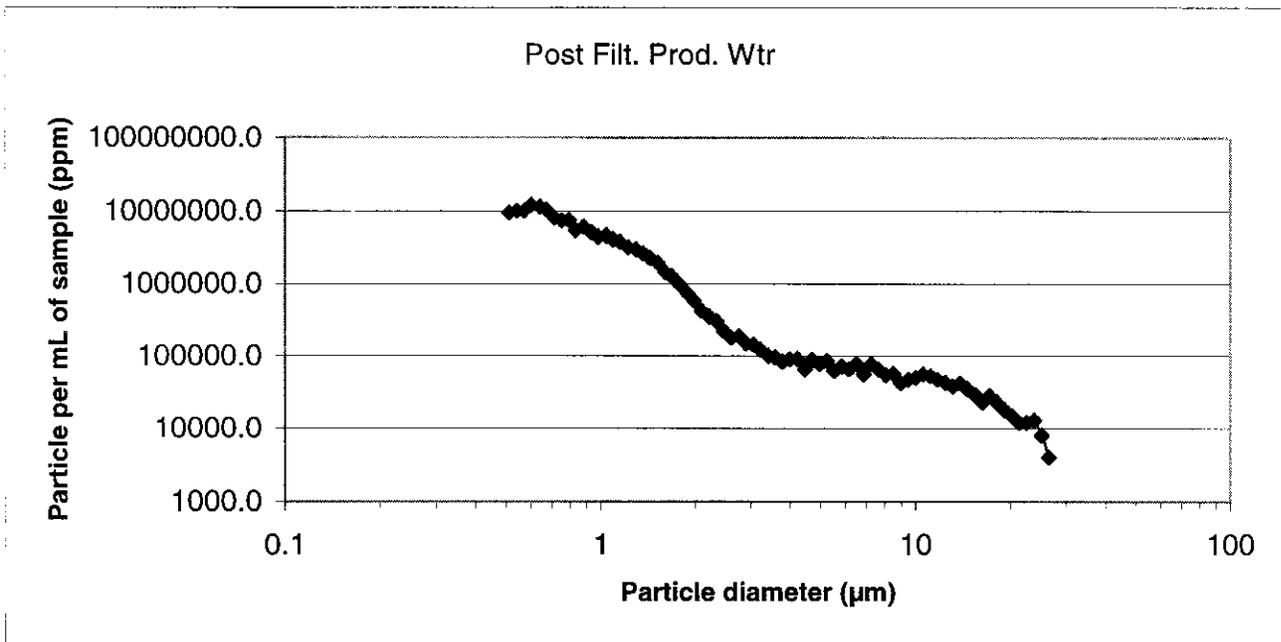
Customer Services Analytical Laboratories 9 669 Grogans Mill Road The Woodlands, TX 77380 (281) 681-5270

Date: August 22, 2006

Customer Name **Basin Disposal**
Address **Aztec, NM**

Ship To#
Field Rep: **John W Lambert**
PE # **91000497**
Sample Date: April 8, 2006
Sample Point: **Post Filt. Prod. Wtr**

Particle Size (microns)	Particles per mL	% of Total Particles	Volume ppm	% of Total Volume	Particle Volume
0.5-1.0	107361999.1	75.6%	20.2208	0.72%	2.02E+08
1.0-2.0	30551000.0	21.5%	39.3963	1.39%	3.94E+08
2.0-4.0	2446000.0	1.7%	27.2570	0.96%	2.73E+08
4.0-6.0	541000.0	0.4%	35.5571	1.26%	3.56E+08
6.0-8.0	343000.0	0.2%	59.1686	2.09%	5.92E+08
8.0-10.0	250000.0	0.2%	95.9334	3.39%	9.6E+08
10.-15.0	314000.0	0.2%	314.9535	11.14%	3.15E+09
15.0-20.0	121000.0	0.1%	317.7735	11.24%	3.18E+09
20.0-30.0	70000.0	0.0%	470.5920	16.64%	4.71E+09
30.0-40.0	14000.0	0.0%	297.2424	10.51%	2.97E+09
40.0-50.0	4000.0	0.0%	173.8154	6.15%	1.74E+09
50-100	1000.0	0.0%	79.0452	2.80%	7.91E+08
100-200	1000.0	0.0%	896.4909	31.71%	8.97E+09
Total	142017999.0	100%	2827.4463	100%	





COVER LETTER

Thursday, June 12, 2008

Erwin Melis
John Shomaker & Assoc.
2611 Broadbent Parkway NE
Albuquerque, NM 87107

TEL: (505) 250-1607

FAX (505) 345-9920

RE: BDI/Bloomfield, NM

Order No.: 0805373

Dear Erwin Melis:

Hall Environmental Analysis Laboratory, Inc. received 1 sample(s) on 5/28/2008 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent.

Reporting limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman", is written over a horizontal line.

Andy Freeman, Business Manager
Nancy McDuffie, Laboratory Manager

NM Lab # NM9425

AZ license # AZ0682

ORELAP Lab # NM100001



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109

Released to Imaging: 4/25/2025 8:35:28 AM 505.345.3975 ■ Fax 505.345.4107

www.hallenvironmental.com

Hall Environmental Analysis Laboratory, Inc.

Date: 12-Jun-08

CLIENT:	John Shomaker & Assoc.	Client Sample ID:	MW-1
Lab Order:	0805373	Collection Date:	5/27/2008 4:45:00 PM
Project:	BDI/Bloomfield, NM	Date Received:	5/28/2008
Lab ID:	0805373-01	Matrix:	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: SLB
Fluoride	1.7	1.0		mg/L	10	5/28/2008 11:27:10 PM
Chloride	2300	20		mg/L	200	5/29/2008 9:53:54 AM
Nitrogen, Nitrite (As N)	ND	1.0		mg/L	10	5/28/2008 11:27:10 PM
Bromide	6.3	1.0		mg/L	10	5/28/2008 11:27:10 PM
Nitrogen, Nitrate (As N)	11	1.0		mg/L	10	5/28/2008 11:27:10 PM
Phosphorus, Orthophosphate (As P)	ND	5.0		mg/L	10	5/28/2008 11:27:10 PM
Sulfate	18000	250		mg/L	500	6/3/2008 8:03:20 PM
EPA METHOD 7470: MERCURY						Analyst: SNV
Mercury	ND	0.00020		mg/L	1	6/4/2008 4:10:28 PM
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst: NMO
Arsenic	ND	0.20		mg/L	10	6/2/2008 10:04:06 AM
Barium	ND	0.20		mg/L	10	6/2/2008 9:03:05 AM
Cadmium	ND	0.020		mg/L	10	6/2/2008 9:03:05 AM
Calcium	480	10		mg/L	10	6/2/2008 9:03:05 AM
Chromium	ND	0.060		mg/L	10	6/2/2008 9:03:05 AM
Lead	0.098	0.050		mg/L	10	6/2/2008 9:03:05 AM
Magnesium	300	10		mg/L	10	6/2/2008 9:03:05 AM
Potassium	15	10		mg/L	10	6/2/2008 9:03:05 AM
Selenium	ND	0.50		mg/L	10	6/2/2008 9:03:05 AM
Silver	ND	0.050		mg/L	10	6/2/2008 9:03:05 AM
Sodium	10000	100		mg/L	100	6/2/2008 8:59:59 AM
SM 2540C TOTAL DISSOLVED SOLIDS						Analyst: KMS
Total Dissolved Solids	38000	2000		mg/L	1	5/29/2008

Qualifiers: * Value exceeds Maximum Contaminant Level
 E Value above quantitation range
 J Analyte detected below quantitation limits
 ND Not Detected at the Reporting Limit
 S Spike recovery outside accepted recovery limits
 B Analyte detected in the associated Method Blank
 H Holding times for preparation or analysis exceeded
 MCL Maximum Contaminant Level
 RL Reporting Limit

Hall Environmental Analysis Laboratory, Inc.

Date: 12-Jun-08

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
 Project: BDI/Bloomfield, NM

Work Order: 0805373

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
---------	--------	-------	-----	------	----------	-----------	------	----------	------

Method: EPA Method 300.0: Anions

Sample ID: MB MBLK Batch ID: R28701 Analysis Date: 5/28/2008 8:39:22 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Nitrogen, Nitrite (As N)	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrogen, Nitrate (As N)	ND	mg/L	0.10
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

Sample ID: MB MBLK Batch ID: R28726 Analysis Date: 5/29/2008 8:44:16 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Nitrogen, Nitrite (As N)	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrogen, Nitrate (As N)	ND	mg/L	0.10
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

Sample ID: MB MBLK Batch ID: R28779 Analysis Date: 6/3/2008 9:01:46 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Nitrogen, Nitrite (As N)	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrogen, Nitrate (As N)	ND	mg/L	0.10
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

Sample ID: LCS LCS Batch ID: R28701 Analysis Date: 5/28/2008 8:56:47 AM

Fluoride	0.5351	mg/L	0.10	107	90	110
Chloride	4.865	mg/L	0.10	97.3	90	110
Nitrogen, Nitrite (As N)	0.9089	mg/L	0.10	90.9	90	110
Bromide	2.542	mg/L	0.10	102	90	110
Nitrogen, Nitrate (As N)	2.497	mg/L	0.10	99.9	90	110
Phosphorus, Orthophosphate (As P)	5.036	mg/L	0.50	101	90	110
Sulfate	10.03	mg/L	0.50	100	90	110

Sample ID: LCS LCS Batch ID: R28726 Analysis Date: 5/29/2008 9:01:41 AM

Fluoride	0.5169	mg/L	0.10	103	90	110
Chloride	4.860	mg/L	0.10	97.2	90	110
Nitrogen, Nitrite (As N)	0.9198	mg/L	0.10	92.0	90	110
Bromide	2.567	mg/L	0.10	103	90	110
Nitrogen, Nitrate (As N)	2.499	mg/L	0.10	100	90	110
Phosphorus, Orthophosphate (As P)	5.070	mg/L	0.50	101	90	110
Sulfate	10.11	mg/L	0.50	101	90	110

Sample ID: LCS LCS Batch ID: R28779 Analysis Date: 6/3/2008 9:19:11 AM

Fluoride	0.5075	mg/L	0.10	101	90	110
Chloride	4.796	mg/L	0.10	95.9	90	110
Nitrogen, Nitrite (As N)	0.9539	mg/L	0.10	95.4	90	110

Qualifiers:

- E Value above quantitation range
- J Analyte detected below quantitation limits
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: 12-Jun-08

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
 Project: BDI/Bloomfield, NM

Work Order: 0805373

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
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Method: EPA Method 300.0: Anions

Sample ID: LCS		LCS			Batch ID: R28779		Analysis Date: 6/3/2008 9:19:11 AM		
Bromide	2.540	mg/L	0.10	102	90	110			
Nitrogen, Nitrate (As N)	2.417	mg/L	0.10	96.7	90	110			
Phosphorus, Orthophosphate (As P)	4.926	mg/L	0.50	98.5	90	110			
Sulfate	9.953	mg/L	0.50	99.5	90	110			

Method: EPA Method 7470: Mercury

Sample ID: MB-16112		MBLK			Batch ID: 16112		Analysis Date: 6/4/2008 3:59:53 PM		
Mercury	ND	mg/L	0.00020						
Sample ID: LCS-16112		LCS			Batch ID: 16112		Analysis Date: 6/4/2008 4:01:38 PM		
Mercury	0.004938	mg/L	0.00020	98.0	80	120			

Method: EPA 6010B: Total Recoverable Metals

Sample ID: MB-16071		MBLK			Batch ID: 16071		Analysis Date: 6/2/2008 7:57:03 AM		
Arsenic	ND	mg/L	0.020						
Barium	ND	mg/L	0.010						
Cadmium	ND	mg/L	0.0020						
Calcium	ND	mg/L	0.50						
Chromium	ND	mg/L	0.0060						
Lead	ND	mg/L	0.0050						
Magnesium	ND	mg/L	0.50						
Potassium	ND	mg/L	1.0						
Selenium	ND	mg/L	0.050						
Silver	ND	mg/L	0.0050						
Sodium	ND	mg/L	0.50						
Sample ID: LCS-16071		LCS			Batch ID: 16071		Analysis Date: 6/2/2008 8:00:07 AM		
Arsenic	0.4967	mg/L	0.020	99.3	80	120			
Barium	0.4886	mg/L	0.010	97.7	80	120			
Cadmium	0.4980	mg/L	0.0020	99.6	80	120			
Calcium	48.11	mg/L	0.50	96.2	80	120			
Chromium	0.4996	mg/L	0.0060	99.9	80	120			
Lead	0.4908	mg/L	0.0050	98.2	80	120			
Magnesium	48.62	mg/L	0.50	97.2	80	120			
Potassium	51.29	mg/L	1.0	103	80	120			
Selenium	0.5031	mg/L	0.050	101	80	120			
Silver	0.4943	mg/L	0.0050	98.9	80	120			
Sodium	50.71	mg/L	0.50	101	80	120			

Method: SM 2540C Total Dissolved Solids

Sample ID: MB-16060		MBLK			Batch ID: 16060		Analysis Date: 5/29/2008		
Total Dissolved Solids	ND	mg/L	20						
Sample ID: LCS-16060		LCS			Batch ID: 16060		Analysis Date: 5/29/2008		
Total Dissolved Solids	1021	mg/L	20	102	80	120			

Qualifiers:

- E Value above quantitation range
- J Analyte detected below quantitation limits
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Sample Receipt Checklist

Client Name SHO

Date Received:

5/28/2008

Work Order Number 0805373

Received by:

TLS

Checklist completed by: [Signature]
Signature

5/28/08
Date

Sample ID labels checked by:

TS
Initials

Matrix:

Carrier name Client drop-off

- Shipping container/cooler in good condition? Yes No Not Present
- Custody seals intact on shipping container/cooler? Yes No Not Present Not Shipped
- Custody seals intact on sample bottles? Yes No N/A
- Chain of custody present? Yes No
- Chain of custody signed when relinquished and received? Yes No
- Chain of custody agrees with sample labels? Yes No
- Samples in proper container/bottle? Yes No
- Sample containers intact? Yes No
- Sufficient sample volume for indicated test? Yes No
- All samples received within holding time? Yes No
- Water - VOA vials have zero headspace? No VOA vials submitted Yes No
- Water - Preservation labels on bottle and cap match? Yes No N/A
- Water - pH acceptable upon receipt? Yes No N/A

Container/Temp Blank temperature?

5°

<6° C Acceptable

If given sufficient time to cool.

COMMENTS:

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____



COVER LETTER

Wednesday, June 11, 2008

Erwin Melis
John Shomaker & Assoc.
2611 Broadbent Parkway NE
Albuquerque, NM 87107

TEL: (505) 250-1607
FAX (505) 345-9920

RE: BDI

Order No.: 0805406

Dear Erwin Melis:

Hall Environmental Analysis Laboratory, Inc. received 3 sample(s) on 5/30/2008 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent.

Reporting limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman".

Andy Freeman, Business Manager
Nancy McDuffie, Laboratory Manager

NM Lab # NM9425
AZ license # AZ0682
ORELAP Lab # NM100001



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109
505.345.3975 ■ Fax 505.345.4107

Hall Environmental Analysis Laboratory, Inc.

Date: 11-Jun-08

CLIENT:	John Shomaker & Assoc.	Client Sample ID:	BDI-MW1-2
Lab Order:	0805406	Collection Date:	5/29/2008 12:45:00 PM
Project:	BDI	Date Received:	5/30/2008
Lab ID:	0805406-01	Matrix:	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: SCC
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	6/3/2008 10:06:43 AM
Motor Oil Range Organics (MRO)	ND	5.0		mg/L	1	6/3/2008 10:06:43 AM
Surr: DNOP	120	58-140		%REC	1	6/3/2008 10:06:43 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: NSB
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	6/2/2008 4:33:33 PM
Surr: BFB	94.1	79.2-121		%REC	1	6/2/2008 4:33:33 PM
EPA METHOD 8021B: VOLATILES						Analyst: NSB
Methyl tert-butyl ether (MTBE)	ND	2.5		µg/L	1	6/2/2008 4:33:33 PM
Benzene	ND	1.0		µg/L	1	6/2/2008 4:33:33 PM
Toluene	ND	1.0		µg/L	1	6/2/2008 4:33:33 PM
Ethylbenzene	ND	1.0		µg/L	1	6/2/2008 4:33:33 PM
Xylenes, Total	ND	2.0		µg/L	1	6/2/2008 4:33:33 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	6/2/2008 4:33:33 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	6/2/2008 4:33:33 PM
Surr: 4-Bromofluorobenzene	86.2	68.9-122		%REC	1	6/2/2008 4:33:33 PM

Qualifiers:	* Value exceeds Maximum Contaminant Level	B Analyte detected in the associated Method Blank
	E Value above quantitation range	H Holding times for preparation or analysis exceeded
	J Analyte detected below quantitation limits	MCL Maximum Contaminant Level
	ND Not Detected at the Reporting Limit	RL Reporting Limit
	S Spike recovery outside accepted recovery limits	

Hall Environmental Analysis Laboratory, Inc.

Date: 11-Jun-08

CLIENT: John Shomaker & Assoc.
Lab Order: 0805406
Project: BDI
Lab ID: 0805406-02

Client Sample ID: BDI-MW2
Collection Date: 5/29/2008 1:15:00 PM
Date Received: 5/30/2008
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst: TES
Arsenic	ND	0.20		mg/L	5	6/6/2008 11:10:05 AM
Barium	ND	0.20		mg/L	5	6/6/2008 11:10:05 AM
Cadmium	ND	0.020		mg/L	5	6/6/2008 11:10:05 AM
Calcium	490	10		mg/L	5	6/6/2008 11:10:05 AM
Chromium	ND	0.060		mg/L	5	6/6/2008 11:10:05 AM
Lead	ND	0.050		mg/L	5	6/6/2008 11:10:05 AM
Magnesium	170	10		mg/L	5	6/6/2008 11:10:05 AM
Potassium	39	10		mg/L	5	6/6/2008 11:10:05 AM
Selenium	ND	0.50		mg/L	5	6/6/2008 11:10:05 AM
Silver	ND	0.050		mg/L	5	6/6/2008 11:10:05 AM
Sodium	7800	100		mg/L	50	6/10/2008 4:53:37 PM
SM 2540C TOTAL DISSOLVED SOLIDS						Analyst: KMS
Total Dissolved Solids	24000	100		mg/L	1	6/2/2008

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- E Value above quantitation range
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- MCL Maximum Contaminant Level
- RL Reporting Limit

Hall Environmental Analysis Laboratory, Inc.

Date: 11-Jun-08

CLIENT: John Shomaker & Assoc.
Lab Order: 0805406
Project: BDI
Lab ID: 0805406-03

Client Sample ID: TRIP BLANK
Collection Date:
Date Received: 5/30/2008
Matrix: TRIP BLANK

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: GASOLINE RANGE						Analyst: NSB
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	6/2/2008 5:33:52 PM
Surr: BFB	89.9	79.2-121		%REC	1	6/2/2008 5:33:52 PM
EPA METHOD 8021B: VOLATILES						Analyst: NSB
Methyl tert-butyl ether (MTBE)	ND	2.5		µg/L	1	6/2/2008 5:33:52 PM
Benzene	ND	1.0		µg/L	1	6/2/2008 5:33:52 PM
Toluene	ND	1.0		µg/L	1	6/2/2008 5:33:52 PM
Ethylbenzene	ND	1.0		µg/L	1	6/2/2008 5:33:52 PM
Xylenes, Total	ND	2.0		µg/L	1	6/2/2008 5:33:52 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	6/2/2008 5:33:52 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	6/2/2008 5:33:52 PM
Surr: 4-Bromofluorobenzene	82.9	68.9-122		%REC	1	6/2/2008 5:33:52 PM

Qualifiers: * Value exceeds Maximum Contaminant Level
 E Value above quantitation range
 J Analyte detected below quantitation limits
 ND Not Detected at the Reporting Limit
 S Spike recovery outside accepted recovery limits

B Analyte detected in the associated Method Blank
 H Holding times for preparation or analysis exceeded
 MCL Maximum Contaminant Level
 RL Reporting Limit

Page 3 of 3

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0805406

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
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Method: EPA Method 8015B: Diesel Range

Sample ID: MB-16080		<i>MBLK</i>				Batch ID: 16080	Analysis Date: 6/3/2008 3:57:00 AM		
Diesel Range Organics (DRO)	ND	mg/L	1.0						
Motor Oil Range Organics (MRO)	ND	mg/L	5.0						
Sample ID: LCS-16080		<i>LCS</i>				Batch ID: 16080	Analysis Date: 6/3/2008 5:06:20 AM		
Diesel Range Organics (DRO)	5.211	mg/L	1.0	104	74	157			
Sample ID: LCSD-16080		<i>LCSD</i>				Batch ID: 16080	Analysis Date: 6/3/2008 5:41:42 AM		
Diesel Range Organics (DRO)	5.384	mg/L	1.0	108	74	157	3.26	23	

Method: EPA Method 8015B: Gasoline Range

Sample ID: 5ML RB		<i>MBLK</i>				Batch ID: R28760	Analysis Date: 6/2/2008 9:22:36 AM		
Gasoline Range Organics (GRO)	ND	mg/L	0.050						
Sample ID: 2.5UG GRO LCS		<i>LCS</i>				Batch ID: R28760	Analysis Date: 6/2/2008 8:34:38 PM		
Gasoline Range Organics (GRO)	0.5012	mg/L	0.050	100	80	115			
Sample ID: 2.5UG GRO LCSD		<i>LCSD</i>				Batch ID: R28760	Analysis Date: 6/2/2008 9:04:46 PM		
Gasoline Range Organics (GRO)	0.5072	mg/L	0.050	101	80	115	1.19	8.39	

Method: EPA Method 8021B: Volatiles

Sample ID: 5ML RB		<i>MBLK</i>				Batch ID: R28760	Analysis Date: 6/2/2008 9:22:36 AM		
Methyl tert-butyl ether (MTBE)	ND	µg/L	2.5						
Benzene	ND	µg/L	1.0						
Toluene	ND	µg/L	1.0						
Ethylbenzene	ND	µg/L	1.0						
Xylenes, Total	ND	µg/L	2.0						
1,2,4-Trimethylbenzene	ND	µg/L	1.0						
1,3,5-Trimethylbenzene	ND	µg/L	1.0						
Sample ID: 100NG BTEX LCS		<i>LCS</i>				Batch ID: R28760	Analysis Date: 6/2/2008 7:34:19 PM		
Methyl tert-butyl ether (MTBE)	19.81	µg/L	2.5	99.1	51.2	138			
Benzene	18.29	µg/L	1.0	91.4	85.9	113			
Toluene	18.19	µg/L	1.0	90.9	86.4	113			
Ethylbenzene	18.56	µg/L	1.0	92.8	83.5	118			
Xylenes, Total	55.54	µg/L	2.0	92.6	83.4	122			
1,2,4-Trimethylbenzene	18.33	µg/L	1.0	90.5	83.5	115			
1,3,5-Trimethylbenzene	17.24	µg/L	1.0	86.2	85.2	113			
Sample ID: 100NG BTEX LCSD		<i>LCSD</i>				Batch ID: R28760	Analysis Date: 6/2/2008 8:04:29 PM		
Methyl tert-butyl ether (MTBE)	21.06	µg/L	2.5	105	51.2	138	6.10	28	
Benzene	19.16	µg/L	1.0	95.8	85.9	113	4.64	27	
Toluene	19.14	µg/L	1.0	95.7	86.4	113	5.09	19	
Ethylbenzene	19.25	µg/L	1.0	96.2	83.5	118	3.64	10	
Xylenes, Total	57.93	µg/L	2.0	96.6	83.4	122	4.22	13	
1,2,4-Trimethylbenzene	19.27	µg/L	1.0	95.2	83.5	115	5.02	21	
1,3,5-Trimethylbenzene	18.03	µg/L	1.0	90.2	85.2	113	4.50	10	

Qualifiers:

- | | | | |
|---|--|----|--|
| E | Value above quantitation range | H | Holding times for preparation or analysis exceeded |
| J | Analyte detected below quantitation limits | ND | Not Detected at the Reporting Limit |
| R | RPD outside accepted recovery limits | S | Spike recovery outside accepted recovery limits |

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0805406

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
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Method: EPA 6010B: Total Recoverable Metals

Sample ID: MB-16089 *MBLK* **Batch ID:** 16089 **Analysis Date:** 6/6/2008 1:12:49 PM

Arsenic	ND	mg/L	0.020						
Barium	ND	mg/L	0.010						
Cadmium	ND	mg/L	0.0020						
Calcium	ND	mg/L	0.50						
Chromium	ND	mg/L	0.0060						
Lead	ND	mg/L	0.0050						
Magnesium	ND	mg/L	0.50						
Potassium	ND	mg/L	1.0						
Selenium	ND	mg/L	0.050						
Silver	ND	mg/L	0.0050						
Sodium	ND	mg/L	0.50						

Sample ID: LCS-16089 *LCS* **Batch ID:** 16089 **Analysis Date:** 6/6/2008 10:47:25 AM

Arsenic	0.5282	mg/L	0.020	106	80	120			
Barium	0.4907	mg/L	0.010	98.1	80	120			
Cadmium	0.5011	mg/L	0.0020	100	80	120			
Calcium	50.71	mg/L	0.50	101	80	120			
Chromium	0.5060	mg/L	0.0060	101	80	120			
Lead	0.4927	mg/L	0.0050	98.5	80	120			
Magnesium	50.86	mg/L	0.50	102	80	120			
Potassium	52.58	mg/L	1.0	105	80	120			
Selenium	0.4768	mg/L	0.050	95.4	80	120			
Silver	0.5005	mg/L	0.0050	100	80	120			
Sodium	53.65	mg/L	0.50	107	80	120			

Method: SM 2540C Total Dissolved Solids

Sample ID: MB-16086 *MBLK* **Batch ID:** 16086 **Analysis Date:** 6/2/2008

Total Dissolved Solids ND mg/L 20

Sample ID: LCS-16086 *LCS* **Batch ID:** 16086 **Analysis Date:** 6/2/2008

Total Dissolved Solids 1007 mg/L 20 101 80 120

Qualifiers:

- E Value above quantitation range
- J Analyte detected below quantitation limits
- R RPD outside accepted recovery limits
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Sample Receipt Checklist

Client Name SHO

Date Received:

5/30/2008

Work Order Number 0805406

Received by:

TLS

Checklist completed by:

Janey Shomin
Signature

5/30/08
Date

Sample ID labels checked by:

TS
Initials

Matrix:

Carrier name Client drop-off

Shipping container/cooler in good condition?

Yes

No

Not Present

Custody seals intact on shipping container/cooler?

Yes

No

Not Present

Not Shipped

Custody seals intact on sample bottles?

Yes

No

N/A

Chain of custody present?

Yes

No

Chain of custody signed when relinquished and received?

Yes

No

Chain of custody agrees with sample labels?

Yes

No

Samples in proper container/bottle?

Yes

No

Sample containers intact?

Yes

No

Sufficient sample volume for indicated test?

Yes

No

All samples received within holding time?

Yes

No

Water - VOA vials have zero headspace?

No VOA vials submitted

Yes

No

Water - Preservation labels on bottle and cap match?

Yes

No

N/A

Water - pH acceptable upon receipt?

Yes

No

N/A

Container/Temp Blank temperature?

7°

<6° C Acceptable

If given sufficient time to cool.

COMMENTS:

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: *Head #2 has very low volume. Per EM don't run Hg 5/30/08*

Corrective Action _____



COVER LETTER

Friday, November 14, 2008

Erwin Melis
John Shomaker & Assoc.
2611 Broadbent Parkway NE
Albuquerque, NM 87107
TEL: (505) 250-1607
FAX (505) 345-9920

RE: BDI

Order No.: 0810632

Dear Erwin Melis:

Hall Environmental Analysis Laboratory, Inc. received 2 sample(s) on 10/30/2008 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman", is written over a horizontal line.

Andy Freeman, Business Manager
Nancy McDuffie, Laboratory Manager

NM Lab # NM9425
AZ license # AZ0682
ORELAP Lab # NM100001
Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109
505.345.3975 ■ Fax 505.345.4107
www.hallenvironmental.com

Hall Environmental Analysis Laboratory, Inc.

Date: 14-Nov-08

CLIENT: John Shomaker & Assoc.
Lab Order: 0810632
Project: BDI
Lab ID: 0810632-01

Client Sample ID: AW-2
Collection Date: 10/30/2008 12:30:00 PM
Date Received: 10/30/2008
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
						Analyst: SCC
EPA METHOD 8015B: DIESEL RANGE						
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	11/5/2008
Motor Oil Range Organics (MRO)	ND	5.0		mg/L	1	11/5/2008
Surr: DNOP	135	58-140		%REC	1	11/5/2008
						Analyst: DAM
EPA METHOD 8015B: GASOLINE RANGE						
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	11/6/2008 11:45:00 PM
Surr: BFB	87.8	59.9-122		%REC	1	11/6/2008 11:45:00 PM
						Analyst: DAM
EPA METHOD 8021B: VOLATILES						
Methyl tert-butyl ether (MTBE)	ND	2.5		µg/L	1	11/6/2008 11:45:00 PM
Benzene	ND	1.0		µg/L	1	11/6/2008 11:45:00 PM
Toluene	ND	1.0		µg/L	1	11/6/2008 11:45:00 PM
Ethylbenzene	ND	1.0		µg/L	1	11/6/2008 11:45:00 PM
Xylenes, Total	ND	2.0		µg/L	1	11/6/2008 11:45:00 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	11/6/2008 11:45:00 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	11/6/2008 11:45:00 PM
Surr: 4-Bromofluorobenzene	81.5	65.9-130		%REC	1	11/6/2008 11:45:00 PM
						Analyst: IC
EPA METHOD 300.0: ANIONS						
Fluoride	ND	1.0		mg/L	10	10/31/2008 1:24:47 PM
Chloride	2600	20		mg/L	200	11/11/2008 1:20:17 AM
Nitrogen, Nitrite (As N)	ND	1.0		mg/L	10	10/31/2008 1:24:47 PM
Bromide	9.5	1.0		mg/L	10	10/31/2008 1:24:47 PM
Nitrogen, Nitrate (As N)	ND	1.0		mg/L	10	10/31/2008 1:24:47 PM
Phosphorus, Orthophosphate (As P)	ND	5.0		mg/L	10	10/31/2008 1:24:47 PM
Sulfate	17000	250		mg/L	500	11/14/2008 6:07:21 AM
						Analyst: SNV
EPA METHOD 7470: MERCURY						
Mercury	ND	0.00020		mg/L	1	11/2/2008 8:01:18 PM
						Analyst: TES
EPA METHOD 6010B: DISSOLVED METALS						
Calcium	420	5.0		mg/L	5	11/3/2008 7:32:10 PM
Magnesium	230	5.0		mg/L	5	11/3/2008 7:32:10 PM
Potassium	32	1.0		mg/L	1	11/3/2008 7:26:31 PM
Sodium	10000	500		mg/L	500	11/3/2008 8:12:50 PM
						Analyst: NMO
EPA 6010B: TOTAL RECOVERABLE METALS						
Arsenic	ND	0.10		mg/L	5	11/5/2008 2:48:32 PM
Barium	ND	0.10		mg/L	5	11/5/2008 1:09:02 PM
Cadmium	ND	0.010		mg/L	5	11/5/2008 1:09:02 PM
Chromium	ND	0.030		mg/L	5	11/5/2008 1:09:02 PM
Lead	ND	0.025		mg/L	5	11/5/2008 1:09:02 PM

Qualifiers: * Value exceeds Maximum Contaminant Level
 E Estimated value
 J Analyte detected below quantitation limits
 ND Not Detected at the Reporting Limit
 S Spike recovery outside accepted recovery limits

B Analyte detected in the associated Method Blank
 H Holding times for preparation or analysis exceeded
 MCL Maximum Contaminant Level
 RL Reporting Limit

Hall Environmental Analysis Laboratory, Inc.

Date: 14-Nov-08

CLIENT: John Shomaker & Assoc.
Lab Order: 0810632
Project: BDI
Lab ID: 0810632-01

Client Sample ID: AW-2
Collection Date: 10/30/2008 12:30:00 PM
Date Received: 10/30/2008
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
						Analyst: NMO
EPA 6010B: TOTAL RECOVERABLE METALS						
Selenium	ND	0.25		mg/L	5	11/5/2008 2:48:32 PM
Silver	ND	0.025		mg/L	5	11/5/2008 1:09:02 PM
						Analyst: LRW
EPA METHOD 418.1: TPH						
Petroleum Hydrocarbons, TR	ND	1.0		mg/L	1	11/4/2008
						Analyst: KMB
SM 2540C: TDS						
Total Dissolved Solids	29000	20		mg/L	1	11/3/2008

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- E Estimated value
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- MCL Maximum Contaminant Level
- RL Reporting Limit

Hall Environmental Analysis Laboratory, Inc.

Date: 14-Nov-08

CLIENT: John Shomaker & Assoc.
 Lab Order: 0810632
 Project: BDI
 Lab ID: 0810632-02

Client Sample ID: Trip Blank
 Collection Date:
 Date Received: 10/30/2008
 Matrix: TRIP BLANK

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
						Analyst: DAM
EPA METHOD 8015B: GASOLINE RANGE						
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	11/7/2008 12:15:26 AM
Surr: BFB	92.3	59.9-122		%REC	1	11/7/2008 12:15:26 AM

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- E Estimated value
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- MCL Maximum Contaminant Level
- RL Reporting Limit

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0810632

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
---------	--------	-------	-----	------	----------	-----------	------	----------	------

Method: EPA Method 300.0: Anions									
Sample ID: MB		MBLK			Batch ID:	R30970	Analysis Date:	10/31/2008 9:38:28 AM	
Fluoride	ND	mg/L	0.10						
Chloride	ND	mg/L	0.10						
Nitrogen, Nitrite (As N)	ND	mg/L	0.10						
Bromide	ND	mg/L	0.10						
Nitrogen, Nitrate (As N)	ND	mg/L	0.10						
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50						
Sulfate	ND	mg/L	0.50						
Sample ID: MB		MBLK			Batch ID:	R30970	Analysis Date:	11/1/2008 12:08:58 AM	
Fluoride	ND	mg/L	0.10						
Chloride	ND	mg/L	0.10						
Nitrogen, Nitrite (As N)	ND	mg/L	0.10						
Bromide	ND	mg/L	0.10						
Nitrogen, Nitrate (As N)	ND	mg/L	0.10						
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50						
Sulfate	ND	mg/L	0.50						
Sample ID: MB		MBLK			Batch ID:	R31092	Analysis Date:	11/10/2008 9:22:52 AM	
Fluoride	ND	mg/L	0.10						
Chloride	ND	mg/L	0.10						
Nitrogen, Nitrite (As N)	ND	mg/L	0.10						
Bromide	ND	mg/L	0.10						
Nitrogen, Nitrate (As N)	ND	mg/L	0.10						
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50						
Sulfate	ND	mg/L	0.50						
Sample ID: MB		MBLK			Batch ID:	R31170	Analysis Date:	11/13/2008 10:06:06 AM	
Fluoride	ND	mg/L	0.10						
Chloride	ND	mg/L	0.10						
Nitrogen, Nitrite (As N)	ND	mg/L	0.10						
Bromide	ND	mg/L	0.10						
Nitrogen, Nitrate (As N)	ND	mg/L	0.10						
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50						
Sulfate	ND	mg/L	0.50						
Sample ID: LCS		LCS			Batch ID:	R30970	Analysis Date:	10/31/2008 9:55:52 AM	
Fluoride	0.5085	mg/L	0.10	102	90	110			
Chloride	5.050	mg/L	0.10	101	90	110			
Nitrogen, Nitrite (As N)	1.014	mg/L	0.10	101	90	110			
Bromide	2.539	mg/L	0.10	102	90	110			
Nitrogen, Nitrate (As N)	2.613	mg/L	0.10	105	90	110			
Phosphorus, Orthophosphate (As P)	5.050	mg/L	0.50	101	90	110			
Sulfate	10.35	mg/L	0.50	103	90	110			
Sample ID: LCS		LCS			Batch ID:	R30970	Analysis Date:	11/1/2008 12:26:23 AM	
Fluoride	0.4930	mg/L	0.10	98.6	90	110			
Chloride	4.784	mg/L	0.10	95.7	90	110			
Nitrogen, Nitrite (As N)	0.9554	mg/L	0.10	95.5	90	110			

Qualifiers:

- E Estimated value
- J Analyte detected below quantitation limits
- R RPD outside accepted recovery limits
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0810632

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
---------	--------	-------	-----	------	----------	-----------	------	----------	------

Method: EPA Method 300.0: Anions

Sample ID: LCS		LCS						Batch ID: R30970	Analysis Date: 11/1/2008 12:26:23 AM
Bromide	2.419	mg/L	0.10	96.8	90	110			
Nitrogen, Nitrate (As N)	2.452	mg/L	0.10	98.1	90	110			
Phosphorus, Orthophosphate (As P)	4.801	mg/L	0.50	96.0	90	110			
Sulfate	9.545	mg/L	0.50	95.5	90	110			
Sample ID: LCS		LCS						Batch ID: R31092	Analysis Date: 11/10/2008 9:40:16 AM
Fluoride	0.4516	mg/L	0.10	90.3	90	110			
Chloride	4.742	mg/L	0.10	94.8	90	110			
Nitrogen, Nitrite (As N)	0.9015	mg/L	0.10	90.2	90	110			
Bromide	2.458	mg/L	0.10	98.3	90	110			
Nitrogen, Nitrate (As N)	2.390	mg/L	0.10	95.6	90	110			
Phosphorus, Orthophosphate (As P)	4.794	mg/L	0.50	95.9	90	110			
Sulfate	9.767	mg/L	0.50	97.7	90	110			
Sample ID: LCS		LCS						Batch ID: R31170	Analysis Date: 11/13/2008 10:23:30 AM
Fluoride	0.4985	mg/L	0.10	99.7	90	110			
Chloride	4.677	mg/L	0.10	93.5	90	110			
Nitrogen, Nitrite (As N)	0.9444	mg/L	0.10	94.4	90	110			
Bromide	2.416	mg/L	0.10	96.6	90	110			
Nitrogen, Nitrate (As N)	2.393	mg/L	0.10	95.7	90	110			
Phosphorus, Orthophosphate (As P)	4.153	mg/L	0.50	83.1	90	110			S
Sulfate	10.03	mg/L	0.50	100	90	110			

Method: EPA Method 418.1: TPH

Sample ID: MB-17541		MBLK						Batch ID: 17541	Analysis Date: 11/4/2008
Petroleum Hydrocarbons, TR	ND	mg/L	1.0						
Sample ID: LCS-17541		LCS						Batch ID: 17541	Analysis Date: 11/4/2008
Petroleum Hydrocarbons, TR	4.660	mg/L	1.0	93.2	78.5	120			
Sample ID: LCSD-17541		LCSD						Batch ID: 17541	Analysis Date: 11/4/2008
Petroleum Hydrocarbons, TR	4.600	mg/L	1.0	92.0	78.5	120	1.30	20	

Method: EPA Method 8015B: Diesel Range

Sample ID: MB-17539		MBLK						Batch ID: 17539	Analysis Date: 11/5/2008
Diesel Range Organics (DRO)	ND	mg/L	1.0						
Motor Oil Range Organics (MRO)	ND	mg/L	5.0						
Sample ID: LCS-17539		LCS						Batch ID: 17539	Analysis Date: 11/5/2008
Diesel Range Organics (DRO)	6.243	mg/L	1.0	125	74	157			
Sample ID: LCSD-17539		LCSD						Batch ID: 17539	Analysis Date: 11/5/2008
Diesel Range Organics (DRO)	6.376	mg/L	1.0	128	74	157	2.10	23	

Qualifiers:

E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	S	Spike recovery outside accepted recovery limits

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0810632

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
---------	--------	-------	-----	------	----------	-----------	------	----------	------

Method: EPA Method 8015B: Gasoline Range

Sample ID: 0810632-01A MSD		MSD				Batch ID: R31040	Analysis Date: 11/7/2008 1:33:48 PM		
Gasoline Range Organics (GRO)	0.4292	mg/L	0.050	85.8	80	115	4.42	8.39	
Sample ID: 5ML RB		MBLK				Batch ID: R31040	Analysis Date: 11/6/2008 9:30:33 AM		
Gasoline Range Organics (GRO)	ND	mg/L	0.050						
Sample ID: 2.5UG GRO LCS		LCS				Batch ID: R31040	Analysis Date: 11/7/2008 4:51:20 AM		
Gasoline Range Organics (GRO)	0.4598	mg/L	0.050	92.0	80	115			
Sample ID: 0810632-01A MS		MS				Batch ID: R31040	Analysis Date: 11/7/2008 1:03:14 PM		
Gasoline Range Organics (GRO)	0.4486	mg/L	0.050	89.7	80	115			

Method: EPA Method 8021B: Volatiles

Sample ID: 100NG BTEX LCS		LCS				Batch ID: R31040	Analysis Date: 11/7/2008 5:21:46 AM		
Methyl tert-butyl ether (MTBE)	24.96	µg/L	2.5	125	51.2	138			
Benzene	20.99	µg/L	1.0	105	85.9	113			
Toluene	21.44	µg/L	1.0	107	86.4	113			
Ethylbenzene	21.56	µg/L	1.0	108	83.5	118			
Xylenes, Total	64.46	µg/L	2.0	107	83.4	122			
1,2,4-Trimethylbenzene	21.72	µg/L	1.0	109	83.5	115			
1,3,5-Trimethylbenzene	20.79	µg/L	1.0	104	85.2	113			

Method: EPA Method 7470: Mercury

Sample ID: MBLK-17519		MBLK				Batch ID: 17519	Analysis Date: 11/2/2008 7:12:41 PM		
Mercury	ND	mg/L	0.00020						
Sample ID: LCS1-17519		LCS				Batch ID: 17519	Analysis Date: 11/2/2008 7:14:28 PM		
Mercury	0.004835	mg/L	0.00020	96.7	80	120			

Method: EPA Method 6010B: Dissolved Metals

Sample ID: MB		MBLK				Batch ID: R30991	Analysis Date: 11/3/2008 5:48:58 PM		
Calcium	ND	mg/L	1.0						
Magnesium	ND	mg/L	1.0						
Potassium	ND	mg/L	1.0						
Sodium	ND	mg/L	1.0						
Sample ID: LCS		LCS				Batch ID: R30991	Analysis Date: 11/3/2008 5:52:02 PM		
Calcium	52.38	mg/L	1.0	104	80	120			
Magnesium	52.25	mg/L	1.0	103	80	120			
Potassium	54.69	mg/L	1.0	99.4	80	120			
Sodium	55.57	mg/L	1.0	110	80	120			

Qualifiers:

- | | | |
|--|----|--|
| E Estimated value | H | Holding times for preparation or analysis exceeded |
| J Analyte detected below quantitation limits | ND | Not Detected at the Reporting Limit |
| R RPD outside accepted recovery limits | S | Spike recovery outside accepted recovery limits |

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0810632

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
---------	--------	-------	-----	------	----------	-----------	------	----------	------

Method: EPA 6010B: Total Recoverable Metals

Sample ID: MB-17522	<i>MBLK</i>	Batch ID: 17522	Analysis Date: 11/5/2008 9:28:24 AM
Barium	ND	mg/L	0.010
Cadmium	ND	mg/L	0.0020
Chromium	ND	mg/L	0.0060
Lead	ND	mg/L	0.0050
Silver	ND	mg/L	0.0050

Sample ID: LCS-17522	<i>LCS</i>	Batch ID: 17522	Analysis Date: 11/5/2008 9:31:36 AM
Barium	0.4770	mg/L	0.010 95.4 80 120
Cadmium	0.4839	mg/L	0.0020 96.8 80 120
Chromium	0.4926	mg/L	0.0060 98.5 80 120
Lead	0.4753	mg/L	0.0050 95.1 80 120
Silver	0.4869	mg/L	0.0050 97.0 80 120

Method: SM 2540C: TDS

Sample ID: MB-17531	<i>MBLK</i>	Batch ID: 17531	Analysis Date: 11/3/2008
Total Dissolved Solids	ND	mg/L	20
Sample ID: LCS-17531	<i>LCS</i>	Batch ID: 17531	Analysis Date: 11/3/2008
Total Dissolved Solids	987.0	mg/L	20 98.7 80 120

Qualifiers:

- | | | | |
|---|--|----|--|
| E | Estimated value | H | Holding times for preparation or analysis exceeded |
| J | Analyte detected below quantitation limits | ND | Not Detected at the Reporting Limit |
| R | RPD outside accepted recovery limits | S | Spike recovery outside accepted recovery limits |

Hall Environmental Analysis Laboratory, Inc.

Sample Receipt Checklist

Client Name SHO

Date Received:

10/30/2008

Work Order Number 0810632

Received by:

ARS

Checklist completed by:

Signature



10/30/08
Date

Sample ID labels checked by:

Initials



Matrix:

Carrier name Client drop-off

Shipping container/cooler in good condition?

Yes

No

Not Present

Custody seals intact on shipping container/cooler?

Yes

No

Not Present

Not Shipped

Custody seals intact on sample bottles?

Yes

No

N/A

Chain of custody present?

Yes

No

Chain of custody signed when relinquished and received?

Yes

No

Chain of custody agrees with sample labels?

Yes

No

Samples in proper container/bottle?

Yes

No

Sample containers intact?

Yes

No

Sufficient sample volume for indicated test?

Yes

No

All samples received within holding time?

Yes

No

Water - VOA vials have zero headspace?

No VOA vials submitted

Yes

No

Water - Preservation labels on bottle and cap match?

Yes

No

N/A

Water - pH acceptable upon receipt?

Yes

No

N/A

Container/Temp Blank temperature?

4°

<6° C Acceptable

If given sufficient time to cool.

COMMENTS:

Client contacted _____

Date contacted: _____

Person contacted _____

Contacted by: _____

Regarding: _____

Comments: _____

Corrective Action _____



HALL ENVIRONMENTAL ANALYSIS LABORATORY
www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109
Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Turn-Around Time: Standard Rush

Project Name: 80I

Project #: Barin Disposal, Inc AW-2

Project Manager: Erwin A. Melis

Sampler: Erwin A. Melis

Container: HEALING

Sample Temperature: 68.0-68.2

Client: JSAI

Mailing Address: 2611 Broadbat Parkway, Abq

Phone #: 345-3407

Email or Fax#: emelis@shonaku.com

QA/QC Package: Standard Level 4 (Full Validation) Other

EDD (Type): _____

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEALING
10/30	12:30	-	AW-2			1
			nb by mistake opened one			
			blank bottle			
			Tripp Blank			2

Date	Time	Relinquished by:	Date	Time
10/30	16:10	<u>Erwin A. Melis</u>	16/10	16:21/09
Date:	Time:	Relinquished by:	Date:	Time:

BTEX + MTBE + TMBs (8021)	BTEX + MTBE + TPH (Gas only)	TPH Method 8015B (Gas/Diesel)	TPH (Method 418.1)	EDB (Method 504.1)	8310 (PNA or PAH)	RCRA 8 Metals	Anions (F, Cl, NO ₃ , NO ₂ , PO ₄ , SO ₄)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	Air Bubbles (Y or N)
										X See attached list	

Remarks:

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

ATTACHMENT IV.2.E
SHOMAKER 2008B – GROUNDWATER INVESTIGATION REPORT

SUBSURFACE AND GROUND-WATER
INVESTIGATION IN SUPPORT
OF THE MODIFICATION OF A
SURFACE WASTE MANAGEMENT FACILITY
BASIN DISPOSAL, INC.
BLOOMFIELD, NEW MEXICO



by

Erwin Melis, PhD

Roger Peery, CPG

prepared for

Basin Disposal, Inc.

Aztec, New Mexico

JOHN SHOMAKER & ASSOCIATES, INC.

Water-Resource and Environmental Consultants

2611 Broadbent Parkway NE

Albuquerque, New Mexico 87107

September 2008

ESR

**SUBSURFACE AND GROUND-WATER INVESTIGATION
IN SUPPORT OF THE MODIFICATION OF A
SURFACE WASTE MANAGEMENT FACILITY
BASIN DISPOSAL, INC.
BLOOMFIELD, NEW MEXICO**

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Aztec, New Mexico

September 2008

80 83

TABLE OF CONTENTS

	page
1.0 INTRODUCTION.....	1
1.1 Background	1
1.2 Objective	2
2.0 METHODS.....	2
3.0 GEOGRAPHY	3
4.0 HYDROGEOLOGY	4
4.1 Regional Water Quality.....	6
4.2 Springs and Watercourses	6
5.0 RESULTS.....	7
5.1 Borehole Depth and Lithology.....	7
5.2 Geotechnical Characterization of Soil Samples	9
5.3 Well Development.....	10
5.4 Depth to Water of the Shallow Ground Water	11
5.5 Site Ground-Water Quality	12
6.0 CONCLUSIONS.....	15
7.0 REFERENCES.....	16

TABLES

page

Table 1. Depth of borehole, lithologic thickness, and measured depth to ground water at Basin Disposal Site, Bloomfield, San Juan County, New Mexico 8

Table 2. Summary of laboratory analyses of alluvium from borehole No. 1, Basin Disposal Site, Bloomfield, New Mexico..... 9

Table 3. Total depth, ground-surface elevation, top of casing, depth to water, and water-level elevations of completed initial assessment wells, Basin Disposal Site, Bloomfield, New Mexico 11

Table 4. Summary of field analyses of specific conductance, pH, and temperature on May 29, 2008 in Basin Disposal AW-1 and AW-2, Bloomfield, New Mexico 12

Table 5. Summary of laboratory analyses of selected organic compounds in ground-water samples from AW-1, Basin Disposal Site, Bloomfield, New Mexico..... 13

Table 6. Summary of water-quality analysis results from AW-1 and AW-2, sampled at the Basin Disposal Site, Bloomfield, San Juan County, New Mexico 14

ILLUSTRATIONS

(follow text)

- Figure 1. Geologic map showing geographic features, including streams, springs, and water wells from the NMOSE WATERS database and Stone et al. (1983), and the line of section of the general cross-section near the Basin Disposal Site, Bloomfield, New Mexico.
- Figure 2. Aerial photograph showing the locations of the existing pond, the drilled boreholes, initial assessment wells, proposed evaporation ponds, and well site of the Conoco-Phillips Martin 3 No. 1, Basin Disposal Site, Bloomfield, New Mexico.
- Figure 3. Geologic map of the area north of Bloomfield, New Mexico showing line of section and NMOSE database wells within a 1-mile radius of the Basin Disposal Site.
- Figure 4. General west-east geologic cross-section across Crouch Mesa, and the Basin Disposal Site, Bloomfield, San Juan County, New Mexico.
- Figure 5. Detailed west to east geologic cross-section including lithologic data from BH-3, BH-2, and BH-1 (AW-1) at the Basin Disposal Site, Bloomfield, New Mexico.
- Figure 6. Topographic map showing water wells from the NMOSE WATERS database and Stone et al. (1983), Basin Disposal Site initial assessment wells, and water-level elevation contours of the alluvial and Nacimiento Formation bedrock aquifers, Basin Disposal Site, Bloomfield, New Mexico.
- Figure 7. Photographs of continuous core samples from borehole No. 2 (BH-2), Basin Disposal Site, Bloomfield, New Mexico.
- Figure 8. Ground-water initial assessment well AW-1 completion diagram, borehole lithology, and ground-water elevation, Basin Disposal Site, Bloomfield, New Mexico.
- Figure 9. Ground-water initial assessment well AW-2 completion diagram, borehole lithology (from nearby borehole No. 2), and ground-water elevation, Basin Disposal Site, Bloomfield, New Mexico.

APPENDICES
(follow illustrations)

Appendix A. Lithologic logs

Appendix B. Summary of sample horizons where small samples were shared with the NMOCD during coring operations at borehole No. 2 and borehole No. 3, at the Basin Disposal Site, Bloomfield, San Juan County, New Mexico

Appendix C. NMOSE wells (from WATERS) within a 2-mile radius of the Basin Disposal Site, Bloomfield, New Mexico

Appendix D. Copy of laboratory measurement of hydraulic conductivity and plasticity index (Atterberg test) for AW-1 alluvial soil samples

Appendix E. Copy of laboratory reports and chain-of-custody documentation for ground-water samples

JSAI

**SUBSURFACE AND GROUND-WATER INVESTIGATION
IN SUPPORT OF THE MODIFICATION OF A
SURFACE WASTE MANAGEMENT FACILITY,
BASIN DISPOSAL, INC., BLOOMFIELD, NEW MEXICO**

1.0 INTRODUCTION

John Shomaker & Associates, Inc. (JSAI) was contracted by Basin Disposal, Inc. to perform a hydrogeologic investigation of the northern part of the Basin Disposal 30-acre property at 500 Montana, Bloomfield, New Mexico. The subject property is located within the city limits of Bloomfield, about 4 miles north of center of Bloomfield, and west of New Mexico Highway 544 connecting Bloomfield and Aztec (Fig. 1). Basin Disposal collects produced water from oil and gas wells in the area, processes it, and conveys it into an evaporation pond, before the saline water is filtered and then injected into a deep aquifer using an injection well. Basin Disposal would like to expand its current storage capacity and construct one or two new evaporation ponds, and hydrogeologic and pedologic data pertaining to the Site are required by New Mexico Administrative Code (NMAC 19.15.36.13), enforced by the New Mexico Energy, Minerals and Natural Resources Department, Oil Conservation Division (NMOCD).

JSAI has completed a hydrogeologic and pedologic investigation of the Basin Disposal Site. The investigation was conducted in accordance with the NMOCD approved workplan of May 13, 2008 (JSAI, 2008) between May 19 and May 26, 2008. NMOCD Environmental Engineer Brad A. Jones was present on-site during the investigation from May 19, 2008 through May 23, 2008.

1.1 Background

The Basin Disposal facility was constructed in 1985 and operates as a “Commercial Surface Waste Management Facility” with permit number NM-1-005 (order date of October 16, 1987). JSAI performed an initial site visit of the Basin Disposal Site during February 2008. Based on this visit, JSAI submitted a workplan to the NMOCD detailing drilling and coring operations at the Site to gather hydrogeologic data. The workplan was approved on May 13, 2008 (JSAI, 2008). Drilling and coring commenced on May 19, 2008.

This hydrogeologic report uses the results of the on-site investigation, other site-based information from Basin Disposal, preliminary engineering drawings provided by C-W-E, Inc., and published and unpublished regional hydrogeologic data.

1.2 Objective

The primary objectives of the investigation at Basin Disposal were as follows: 1) to determine whether a 50-ft separation exists between the lowest ground elevation of the proposed evaporation pond and the ground-water table, pursuant to Regulation 19.15.36.13 NMAC, 2) to characterize the alluvium and bedrock at the Site and obtain samples for laboratory geotechnical analysis, and 3) to determine the quality of shallow ground water, if it is present.

2.0 METHODS

This hydrogeologic investigation at the Basin Disposal Site began on May 19, 2008 and is summarized below:

1. A total of four (4) boreholes (BH-1 through BH-4) were drilled by Hydrogeological Services of Albuquerque, New Mexico, with a single rig using a combination of hollow-stem auger drilling and direct-air rotary coring at approved locations with clean equipment. Boreholes BH-1 and BH-4 were completed as ground-water initial assessment wells AW-1 and AW-2, respectively (Fig. 2).
2. Continuous soil samples (alluvium) were collected using split-spoon sampling methods at BH-1 (AW-1), BH-2, and BH-3. Continuous core samples were collected from bedrock below the alluvium. Alluvium samples, drill cuttings, and core samples were described by JSAI personnel in the field (Appendix A). NMOCD's Brad Jones collected samples at selected intervals; these intervals are marked in Appendix A. BH-4 (AW-2) is 20 ft west of BH-2 and was not sampled.
3. Several split-spoon samples were collected at the AW-1 location from the 6 to 8.5 feet below ground level (ft bgl) interval. Two of these samples were submitted to Vinyard & Associates Engineering Consultants of Albuquerque, New Mexico for hydraulic conductivity, plasticity, moisture content, and pore volume analysis.

4. Initial assessment wells AW-1 and AW-2 were completed at the two sites where either shallow ground water in the alluvium or moisture in clay lenses was present. Wells were completed with 2-inch schedule 40 PVC, flush-threaded casing, and 10 ft of 0.010-inch wide manufactured screen. The screened interval was set to span the water table as measured at the time of construction. The annulus from the bottom of the screen to about 10 ft above the screen was filled with 10-20 gradation silica sand, above which about 10 ft of bentonite was emplaced in order to prevent surface-water infiltration and contamination. Wellheads were completed using above ground completion, and both well casings were secured with locking caps. Well completion diagrams are presented as Figure 8 and 9.
5. Initial assessment wells were developed using dedicated, disposable bailers on May 27 and May 29, 2008. Field measurements consisting of pH, specific conductance, and temperature of produced water were periodically measured throughout well development and purging.
6. After the water level in the wells recovered, depth to water was measured to the nearest 0.01 ft. Water-quality samples were collected after purging three well volumes and submitted to Hall Environmental Analysis Laboratory for analysis.

3.0 GEOGRAPHY

The Basin Disposal Site is located within the northwest quarter of Section 3, Township 29 North, Range 11 West (Fig. 1). The Site lies about 4 miles north of the San Juan River, and about 6 miles south of the Animas River on Crouch Mesa, about 500 ft and 400 ft above the respective river plains. The Site occupies the West Fork of Bloomfield Canyon, an ephemeral drainage that drains south to the San Juan River; the Site slopes gently to the east and southeast, from a maximum elevation of 5,750 ft to less than 5,700 ft. Based on our review of preliminary engineering drawings, the elevation of the base of the lowest evaporation pond is located approximately 5,709 ft above mean sea level (amsl), with a sump at approximately 5,704 ft amsl. The final design may have the base of the sump as low as 5,700 ft amsl (personal communication, John Volkerding).

4.0 HYDROGEOLOGY

The Basin Disposal Site is located within the San Juan Basin, a large Late Cretaceous to Early Tertiary-aged elliptical-shaped basin related to sedimentary deposition outboard of continental convergence along the Pacific margin. The San Juan Basin consists of about 12,000 ft of Early Tertiary- and Mesozoic-age sedimentary rocks, on top of about 2,500 ft of Paleozoic-age sedimentary rocks all tilted in toward a point more than 40 miles east-southeast of Bloomfield (Stone et al., 1983). Figure 3 presents a geologic map showing the Basin Disposal Site and the surrounding area. Figure 4 presents a general west to east geologic cross-section, whereas Figure 5 is a detailed geologic cross-section through the Site. At the Site, a relatively thin layer of alluvium overlies the Paleocene-aged Nacimiento Formation. The alluvium regionally consists of clay, silt, sand, and gravel (Brown and Stone, 1979). The Nacimiento Formation consists of white, medium- to coarse-grained, arkosic sandstones, alternating with grey to black mudstones. The total thickness of the Nacimiento Formation regionally ranges from 418 to 2,232 ft, but at the Conoco-Phillips Martin 3 No. 1 gas well, about 500 ft northwest of the Site (Fig. 2), the Tertiary section, including the Nacimiento Formation is noted to be less than 845 ft (NMOCD, 2008). Beds within the Nacimiento Formation dip very slightly to the basin center, or to the southeast (Brown and Stone, 1979). Immediately below the Nacimiento Formation lie 81 to 96 ft of Tertiary-aged Ojo Alamo Sandstone (NMOCD, 2008), followed by at least 1,100 ft of the Cretaceous-aged Fruitland Formation-Kirtland Shale (Stone et al., 1983).

Records of wells within a 6- to 10-mile radius show few completed wells away from the immediate confines of the Animas River and the San Juan River valleys and near the Basin Disposal Site. Stone et al. (1983) lists 15 bedrock wells completed into the Nacimiento Formation and 36 alluvial wells in the area. Only six of the bedrock wells and two alluvial wells are more than 2 miles from either river. The New Mexico Office of the State Engineer (NMOSE) WATERS database (WATERS) lists ten additional wells with completion dates and/or well completion information recorded within a 2-mile radius of the Site (see Appendix B for NMOSE wells). An additional six wells are recorded in WATERS that have expired permits or no completion dates. These wells may or may not have been completed. Four of the WATERS-listed well permit applications are within a 1-mile radius of the Site. Permit number SJ-01887 is expired and conceivably was never drilled. Permit numbers SJ-01995, SJ-02086, and SJ-03658 are applications to appropriate ground water with no further known information. It is possible that these wells were never drilled and completed.

Wells completed in the Nacimiento Formation range in depth from 10 to 975 ft, and average 306 ft. Reported water levels in these wells range between 2 and 280 ft bgl and average 60 ft bgl (Stone et al., 1983). Away from the rivers, water levels in bedrock wells average 127 ft bgl. Riverside alluvial wells have depths between 6 and 70 ft and average 37 ft, whereas alluvial thicknesses near the river axes average about 60 ft (Brown and Stone, 1979). Reported water levels in alluvial wells range between 3 and 45 ft bgl and average 19.6 ft bgl (Stone et al., 1983). Away from the rivers, lithologic logs in WATERS indicate between 6 and 73 ft (average 37 ft) of alluvium, whereas these wells average 143 ft in depth, suggesting that most of these wells are completed into bedrock (Appendix B). Water levels in these wells have a bimodal distribution. NMOSE-listed wells with little alluvial thickness have deeper water levels (245 ft bgl), whereas wells with larger alluvial thickness have shallower water levels (56 ft bgl). Brown and Stone (1979) reported that perched water is common in the alluvium. The closest well, NMOSE file number SJ-01851, 8,500 ft to the southeast (Fig. 3), was completed to a depth of 125 ft bgl (73 ft of alluvium); it has a water depth of 48 ft bgl and most likely produces water from both the alluvium and bedrock. Alluvial thickness at the Basin Disposal Site ranged from 10.5 ft (borehole No. 3) to 42.9 ft (AW-1), and averaged 24.8 ft (Fig. 5).

Regional ground-water elevation at the Basin Disposal Site is based on a combination of water wells listed in Stone et al. (1983) and WATERS-listed wells, and is estimated as less than 5,600 ft amsl (Fig. 6). This indicates that the regional ground-water table at the Site is deeper than 100 ft bgl and suggests that the ground-water present in AW-1 and AW-2 at the Site is perched. Other evidence of perched ground water includes dry sandstone below wet 'bridging and swelling' clays and mudstones, present in BH-2 and BH-3, and deeper water levels in bedrock wells in the area (SJ-01302, SJ-03668), and well 29.10.16.2143 (Stone et al., 1983). The potentiometric surface elevation map (Fig. 6) shows that bedrock wells and alluvial wells mostly have similar water levels where they are in close proximity to each other. These wells likely have water levels representative of the shallow aquifer because these wells draw water from both aquifers. Ground water flows to the south-southeast at the Basin Disposal Site, as is shown on the water-level elevation contour map (Fig. 6). The hydraulic gradient in the area is about 0.01 ft/ft.

4.1 Regional Water Quality

All ground water in the area has been found to have a relatively high specific conductance and a corresponding elevated total dissolved solids (TDS) concentration except where the shallow “infiltration of irrigation and river water decreases the specific conductance of [ground] water” (Stone et al., 1983). Ground-water quality in wells completed in the alluvium within a 6- to 12-mile radius of the Basin Disposal Site varies compared to wells completed in the underlying Nacimiento Formation. The average specific conductance of 23 wells completed in the Nacimiento Formation is 5,660 micromhos per centimeter ($\mu\text{mhos/cm}$), whereas the average specific conductance of 54 wells completed in the alluvium is 1,690 $\mu\text{mhos/cm}$. Chloride concentrations are as high as 4,100 milligrams per liter (mg/L) and sulfate concentrations as high as 4,300 mg/L have been noted within the Nacimiento Formation (Stone et al., 1983, table 6). Brown and Stone (1979) report that well drillers in the area avoid drilling into the Nacimiento Formation due to the presence of “salty” waters at the alluvial/bedrock contact, and poor-quality sodium-, calcium-, sulfate-rich waters within the Nacimiento Formation. Near Aztec, shallow alluvial ground water was also found to be high in TDS, sulfate, and manganese (JSAI, 2003).

4.2 Springs and Watercourses

The nearest listed spring, Peach Spring, is more than 5 miles to the north and Thurston Spring is more than 8 miles to the northeast (White and Kues, 1992). Both springs have their use listed as “stock watering” and “domestic,” and no yield is provided for either spring. Thurston Spring is sourced from the Nacimiento Formation and drains to the Animas River, away from the Basin Disposal Site (Stone et al., 1983). The source for the Peach Spring is not listed. The nearest river is the San Juan, about 4 miles south of the Basin Disposal Site. A map showing the river, springs, and the NMOSE WATERS database wells and the wells listed in table 1 of Stone et al. (1983) is included as Figure 1.

5.0 RESULTS

5.1 Borehole Depth and Lithology

Four boreholes were drilled between May 19, 2008 and May 27, 2008 on the Basin Disposal Site. Two boreholes were drilled to about 100 ft bgl to characterize the subsurface sediments and lithology and the relative moisture content. After shallow ground water was found two of the four boreholes were completed as ground-water initial assessment wells to a total depth of about 43 and 31 ft, respectively (Table 1). Locations are shown on Figure 2, and well completion details are shown on Figures 8 and 9. The lithology of each borehole was described from continuous core samples collected from three of the four boreholes. AW-2 (BH-4) was drilled and completed about 20 ft west of BH-2 after BH-2 was found to have shallow ground water. BH-2 was logged and plugged and abandoned; BH-4 was not logged.

Perched ground water was present in the alluvium at BH-1 (AW-1) 41.25 ft bgl and above the Nacimiento Formation sandstone contact at 42.90 ft bgl. Moist zones within the Nacimiento Formation siltstone and sandstone members were present in BH-2 at 25 to 30 ft bgl, at 57 ft bgl, and at 94 ft bgl. Moist zones within the Nacimiento Formation siltstone and sandstone members were present in BH-3 at 40.5 to 43.5 ft bgl, at 56.5 ft bgl, and at 80.5 ft bgl. Moist zones within the Nacimiento Formation were characterized by slightly damp horizons of less consolidated sandstone, and locally, of shale/siltstone that stuck to the inside of the core barrel. Locally, the siltstone horizons were unconsolidated, and clay coated the inside of the core barrel and the outside of the core (Figure 7). Moist zones occurred near visible fractures in the bedrock, or above lithology changes, where presumably a less permeable member of the Nacimiento Formation retards vertical ground-water flow. The alluvium in general consists of sandy loam to well graded sand with few (about 5 percent) clay members that were documented to be less than 1 ft thick. The Nacimiento Formation consists of interbedded mudstones, siltstones, and sandstones, with small amounts of coal, and arkose/conglomerate. Detailed lithologic logs are presented in Appendix A.

Table 1. Depth of borehole, lithologic thickness, and measured depth to ground water at Basin Disposal Site, Bloomfield, San Juan County, New Mexico

well name	depth of borehole, ft bgl	alluvium type	alluvial interval, ft bgl	interpreted Nacimiento Formation interval, ft	measured depth to ground water, ft bgl
BH-1/ AW-1	45.0	loamy sand	0 – 42.9	42.9 – 845	42.22
BH-2	101.0	sand and loamy sand	0 – 23.5	23.5 – 845	-
BH-3	100.0	sand fill and silt	0 – 10.5	10.5 – 845	-
BH-4/ AW-2	30.5	mostly sand	-	~25 - 845	29.25

ft bgl - feet below ground level

The unconsolidated alluvium at the Site ranges from about 10 to 43 ft bgl, and is thicker at the eastern edge of the Site, closer to the West Fork of Bloomfield Canyon drainage. The alluvium thins to the west, toward the lower slopes of Crouch Mesa rising to 5,920 ft amsl, a quarter of a mile west of the Site. Individual siltstone and sandstone members of the Nacimiento Formation, between about 3 to 37 ft thick, occur below the alluvium and are covered by an approximately 10 ft thick friable, weathered bedrock horizon.

5.2 Geotechnical Characterization of Soil Samples

Selected samples of the unconsolidated alluvium were collected during drilling using a split-spoon sampler and preserved in capped 6-inch brass sleeves. On May 19, 2008, five samples were collected at BH-1 from the interval between 6 to 8.5 ft bgl, the approximate lower elevation of the proposed evaporation pond, and stored in sealed plastic bags. Of all the samples collected from BH-1, two samples, the 6.5 to 7.0 ft bgl sample (Sample 1) and the 7.5 to 8.0 ft bgl sample (Sample 2) were selected for detailed geotechnical analysis. Sample 1 is loamy sand; Sample 2 is coarse sand. The samples were submitted to Vinyard & Associates to be analyzed for porosity, permeability, and conductivity in the laboratory according to ASTM standards D5856-95, and D4318-05 (Atterberg Limits). Testing for porosity according to ASTM standard D4044-84 (2004) was not commercially available due to the “hazardous material involved,” instead laboratory density, unit weight, and moisture content were determined by standard methods, giving an estimate on the pore volume. The results are summarized in Table 2, whereas the laboratory report is attached as Appendix C.

Table 2. Summary of laboratory analyses of alluvium from borehole No. 1, Basin Disposal Site, Bloomfield, New Mexico

depth, ft bgl	BH-1/ AW-1							
	hydraulic conductivity, cm/sec	Atterberg limit tests			laboratory density ¹ , g/cm ³	unit weight (dry), lb/ft ³	moisture content, percent	pore volume, percent
		liquid limit	plastic limit	plasticity index ²				
6.5 – 7.0	2.83E-3	-	non- plastic	NA	2.5	89.9	8.3	43.6
7.5 – 8.0	2.80E-3	-	non- plastic	NA	2.5	89.5	8.2	45.0

¹ – assumed specific gravity
ft bgl - feet below ground level
g/cm³ - grams per cubic centimeter
N/A - not applicable

²plasticity index - range between liquid and plastic limit
cm/sec - centimeters per second
lb/ft³ - pound per cubic foot

The two soil samples from BH-1 (AW-1) were classified in the field as loamy sand and coarse sand, or well-graded sands, with little or no fines. The obtained porosity or pore volume (n) corresponds to a void ratio (e), or the ratio of the void volume to solids volume (total volume minus void volume) of between 0.77 and 0.82. This indicates the volume of all air and water-filled voids as a percentage of the total volume of the core sample. The dry unit weight (γ_d) is equal to the weight of the solids in the sample over the total volume of the sample, and the three parameters, porosity, void ratio, and dry unit weight of the two samples, are typical for loose, uniform sand (Peck et al., 1974), confirming our field classification. Strength and compressibility were not calculated from these parameters. The average hydraulic conductivity (per ASTM D5856-95) of the samples compares with an approximate coefficient of permeability of 10^{-2} centimeters per second (cm/s) for sand (table 2-2; Scott and Schoustra, 1968). Atterberg limit tests for the two samples detected no plastic limit, or no appreciable clay content to the samples. Correspondingly, there is no liquid limit for the sample.

5.3 Well Development

The ground-water initial assessment wells were developed using dedicated, disposable bailers on May 27 and May 29, 2008. The depth to water, pH, specific conductance, and temperature of produced water were measured before development and periodically throughout development. Water levels in the two initial assessment wells were fairly constant, although AW-2 was bailed dry after about 4 well volumes on May 29, 2008; however, water was present in the well after 5 minutes. AW-1 had a pre-development water level of 42.37 ft bgl on May 27, 2008, and a water level of 41.88 ft bgl on May 29, 2008; AW-2 had a pre-development water level of 29.25 ft bgl on May 29, 2008, and a water level of 29.60 ft bgl 100 minutes after development. Specific conductance in AW-1 slowly increased during bailing, whereas pH, specific conductance and temperature in AW-2 stabilized quickly.

5.4 Depth to Water of the Shallow Ground Water

Depths to water were measured on May 27 and 29, 2008 prior to development and again prior to sampling. Sampling occurred on 2 days. AW-1 was sampled for inorganics on May 27, 2008, and for organics on May 29, 2008. On May 29, 2008 water was present in AW-2 and it was sampled for some selected inorganics. Well completion depths, screen intervals, ground surface elevations, and water elevations are reported in Table 3. Initial assessment well elevations were determined on a U.S. Geological Survey topographic map from locations that were plotted using a handheld Garmin® GPS unit. Depth to water for the two initial assessment wells shows shallower water levels to the west and deeper water levels at the eastern end of the Basin Disposal Site (Table 1; Fig. 5). Regional ground-water-flow direction is presumed to be to the southeast with an unknown local ground-water gradient due to the apparent disconnectedness of the perched ground-water lenses.

Table 3. Total depth, ground-surface elevation, top of casing, depth to water, and water-level elevations of completed initial assessment wells, Basin Disposal Site, Bloomfield, New Mexico

	UTM coordinates, m easterly ¹	UTM coordinates, m northerly ¹	total depth of well, ft bgl	screen interval, ft bgl	ground- surface elevation, ft amsl	top of casing, ft agl	water level on 5/29/08, ft bgl	ground- water elevation, ft amsl
AW-1	233,845	4,071,760	45.0	33.0 – 43.1	~5,715.0	2.5	42.22	5,669.8
AW-2	233,652	4,071,721	30.0	20.0 – 30.0	~5,719.0	2.9	29.60	5,689.8

¹ reference is NAD 1927

m - meters

ft bgl - feet below ground level

ft agl - feet above ground level

ft amsl - feet above mean sea level

5.5 Site Ground-Water Quality

Field water-quality data for initial assessment wells AW-1 and AW-2 (Table 4) indicate extremely elevated values of specific conductance when compared to the background water-quality data obtained from Stone et al. (1983; table 1 and table 6). AW-1 shows slightly higher specific conductance values than AW-2, in addition to increasing specific conductance values during bailing. Water from AW-2 had consistently high, but precise specific conductance values. A lacquer-like odor was detected during drilling of the nearby BH-2, but was not detected in AW-2 (BH-4).

Table 4. Summary of field analyses of specific conductance, pH, and temperature on May 29, 2008 in Basin Disposal AW-1 and AW-2, Bloomfield, New Mexico

	specific conductance, $\mu\text{S}/\text{cm}$	pH	temperature, $^{\circ}\text{C}$
AW-1	31,900 \pm 30	7.31	16.8
AW-2	26,600 \pm 30	7.80	19.1

$^{\circ}\text{C}$ - degrees Celsius

$\mu\text{S}/\text{cm}$ - microSiemens per centimeter

A laboratory analysis of water from AW-2 indicated no significant differences in metals concentrations compared to water produced from AW-1, indicating that the ground water at both initial assessment wells, one within the alluvium, the other a bedrock well, is similar. Only water from AW-1 was analyzed according to U.S. Environmental Protection Agency (EPA) method 8021B, EPA method 8015B-GRO, and EPA method 8015B-DRO. Water from AW-2 was not analyzed for organic compounds. Ground water collected from AW-1 yielded concentrations of these organics below the laboratory detection limit (see Table 5).

Water produced from AW-1 had elevated concentrations of TDS, chloride, fluoride, nitrate, sulfate, and lead (EPA method 6010 measures total recoverable metals) when compared to the New Mexico Water Quality Control Commission (NMWQCC) standards (see Table 6). The high TDS concentration resulted in elevated detection limits for some parameters, and as a result, detection limits for arsenic, cadmium, and chromium concentrations are above the applicable NMWQCC standards (Table 6). The laboratory report and chain-of-custody documentation are attached as Appendix D.

Table 5. Summary of laboratory analyses of selected organic compounds in ground-water samples from AW-1, Basin Disposal Site, Bloomfield, New Mexico

constituent	unit	AW-1	NMWQCC standards
date sampled		5/29/2008	
diesel range organics	mg/L	<1.0	no standard
motor range organics	mg/L	<5.0	no standard
gasoline range organics	mg/L	<0.050	no standard
MTBE	µg/L	<2.5	no standard
benzene	µg/L	<1.0	10 µg/L
toluene	µg/L	<1.0	750 µg/L
ethylbenzene	µg/L	<1.0	750 µg/L
total xylenes	µg/L	<2.0	620 µg/L
1, 2, 4-trimethylbenzene	µg/L	<1.0	no standard
1, 3, 5-trimethylbenzene	µg/L	<1.0	no standard

NMWQCC - New Mexico Water Quality Control Commission

mg/L - milligrams per liter

µg/L - micrograms per liter

MTBE - methyl tertiary butyl ether

Table 6. Summary of water-quality analysis results from AW-1 and AW-2, sampled at the Basin Disposal Site, Bloomfield, San Juan County, New Mexico

constituent	unit	AW-1	AW-2	NMWQCC discharge standards
date sampled		5/27/2008	5/29/2007	
TDS	mg/L	38,000	24,000	1,000
bromide	mg/L	6.3	NA	no standards
chloride	mg/L	2,300	NA	250
fluoride	mg/L	1.7	NA	1.6
nitrate	mg/L	11	NA	10 (total)
phosphorus	mg/L	<5.0	NA	no standards
sulfate	mg/L	18,000	NA	600
arsenic (total)	mg/L	<0.20	<0.20	0.10
barium	mg/L	<0.20	<0.20	1.0
cadmium	mg/L	<0.020	<0.020	0.01
calcium	mg/L	480	490	no standard
chromium	mg/L	<0.060	<0.060	0.05
lead	mg/L	0.098	<0.050	0.05
magnesium	mg/L	300	170	no standard
mercury	mg/L	<0.00020	NA	0.002
potassium	mg/L	15	39	no standard
selenium	mg/L	<0.50	<0.50	0.05
silver	mg/L	<0.050	<0.050	0.05
sodium	mg/L	10,000	7,800	no standard

¹ - action level for public water supply systems

NMWQCC - New Mexico Water Quality Control Commission

bold - result exceeds standard

TDS - total dissolved solids

mg/L - milligrams per liter

NA - not analyzed

6.0 CONCLUSIONS

The following conclusions are based on the findings from the ground-water investigation at the Basin Disposal Site.

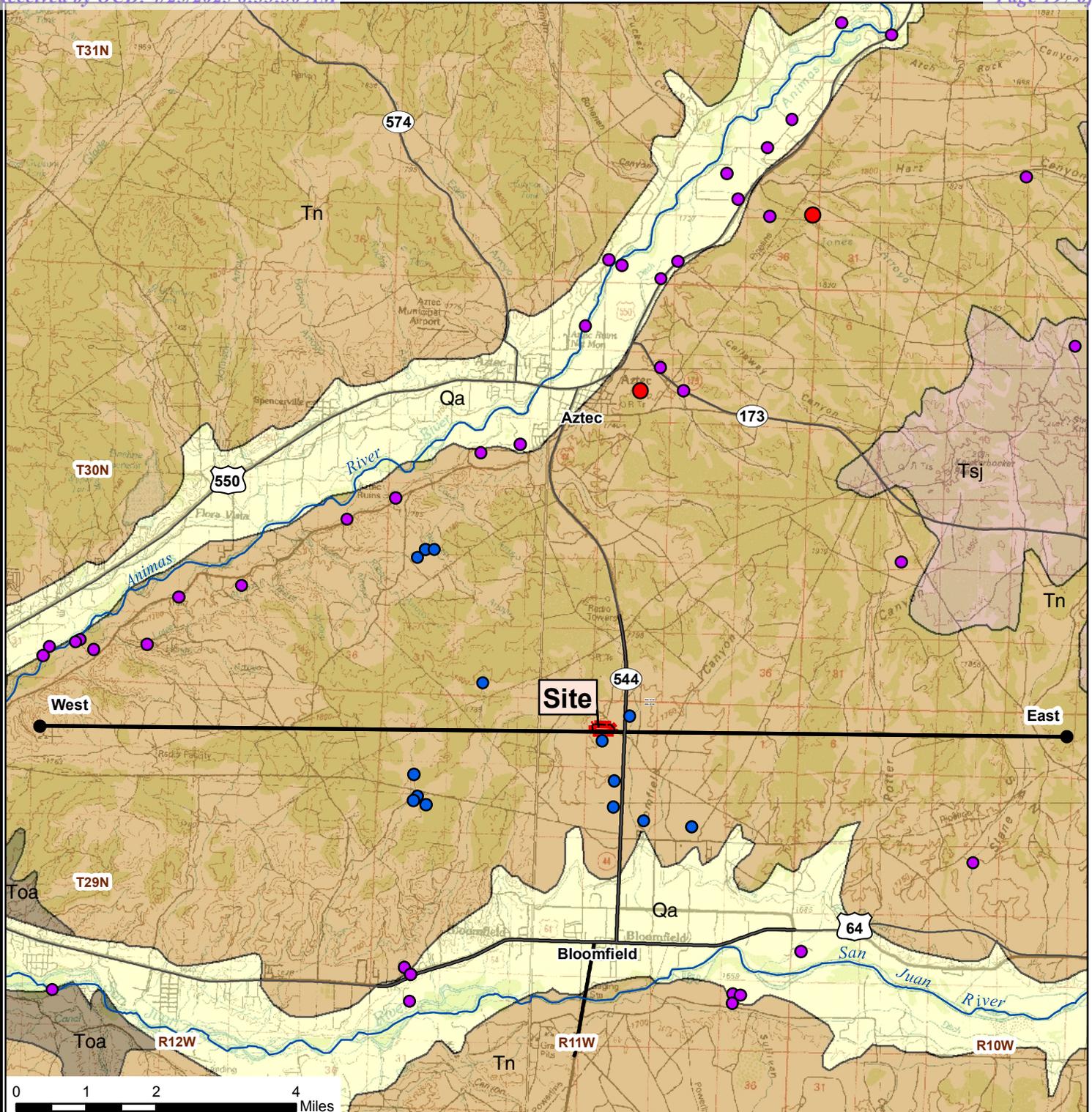
1. Initial assessment wells AW-1 and AW-2 produced ground water with TDS concentrations of 38,000 mg/L and 24,000 mg/L, respectively. These are above the TDS concentration of 10,000 mg/L for fresh water (to be protected), per NMAC 19.15.36.8 C. (15) (b), as defined in NMAC 19.15.1.7 F. (3). Therefore, the shallow ground-water system is not within the jurisdiction of the NMOCD.
2. Initial assessment well AW-1 produced ground water with elevated concentrations of TDS, chloride, fluoride, nitrate, sulfate, and lead. Concentrations of total arsenic, cadmium, and chromium were below laboratory detection limits; however, the detection limit was above NMWQCC standards. Benzene, toluene, ethylbenzene, and xylenes (BTEX), gasoline range organics, and diesel range organics concentrations were below the laboratory detection limits, which are below NMWQCC standards.
3. At three of the four boreholes, there is less than 50 ft separation between the shallow ground water and the base of the proposed evaporation pond. However, the shallow ground water is perched. The estimated depth to the regional ground water is greater than 100 ft bgl, with a corresponding elevation of below 5,600 ft amsl. There is a 50 ft separation between the regional water table and the lowest proposed elevation of the new evaporation pond. The regional ground-water flow direction is to the south-southeast.
4. The Site is underlain by 10 to 43 ft of loamy sand alluvium, 10 to 16 ft of weathered (friable) Nacimiento Formation, and more than 82.5 ft of dry Nacimiento Formation consisting of alternating siltstone and sandstone, that are locally fractured, and are moist at or above lithologic and structural contacts. At the Basin Disposal Site, the Nacimiento Formation is less than 845 ft thick.
5. No known ground-water supply wells are within a 1-mile radius of the Site. The NMOSE WATERS database has records of three “applications to appropriate ground water” and one expired drilling permit in a 1-mile radius of the Basin Disposal Site. It is possible that these wells were never drilled and completed.
6. Laboratory results for the well-sorted sandy alluvium at the Basin Disposal Site indicate that the hydraulic conductivity is about 8.0 ft/day.

7.0 REFERENCES

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ILLUSTRATIONS



Explanation

- NMOSE WATERS database well
- Stone et al. database
- property boundary
- See Figure 4 for explanation of geologic units
- spring
- line of section (see Figure 4)
- well

Figure 1. Geologic map showing geographic features, including streams, springs, and water wells from the NMOSE WATERS database and Stone et al. (1983), and the line of section of the general cross-section near the Basin Disposal Site, Bloomfield, New Mexico.

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Figure 2. Aerial photograph showing the locations of the existing pond, the drilled boreholes, initial assessment wells proposed evaporation ponds, and well site of the Conoco-Phillips Martin 3 No. 1, Basin Disposal Site, Bloomfield, New Mexico.

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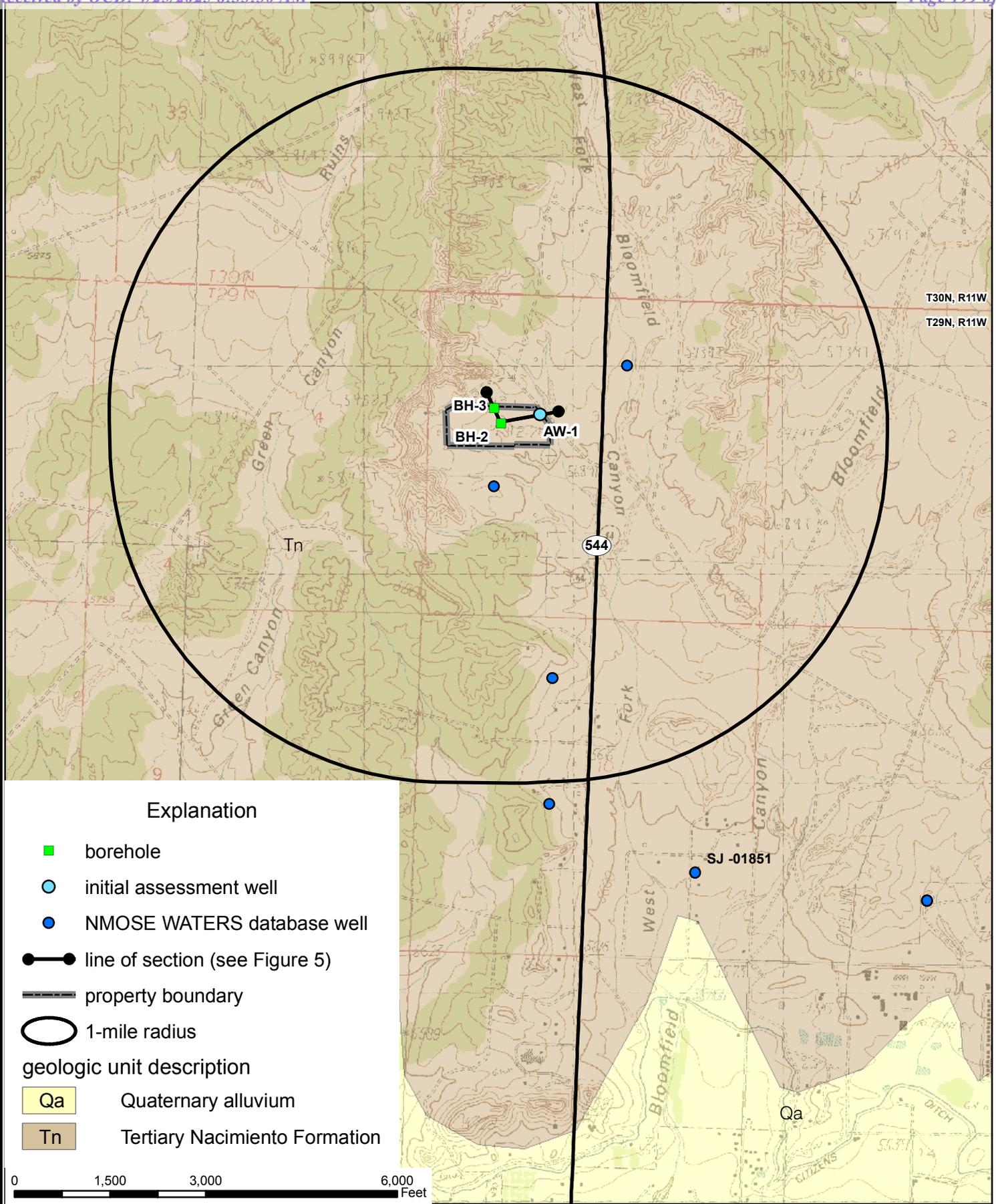


Figure 3. Geologic map of the area north of Bloomfield, New Mexico showing line of section and NMOSE database wells within a 1-mile radius of the Basin Disposal Site.

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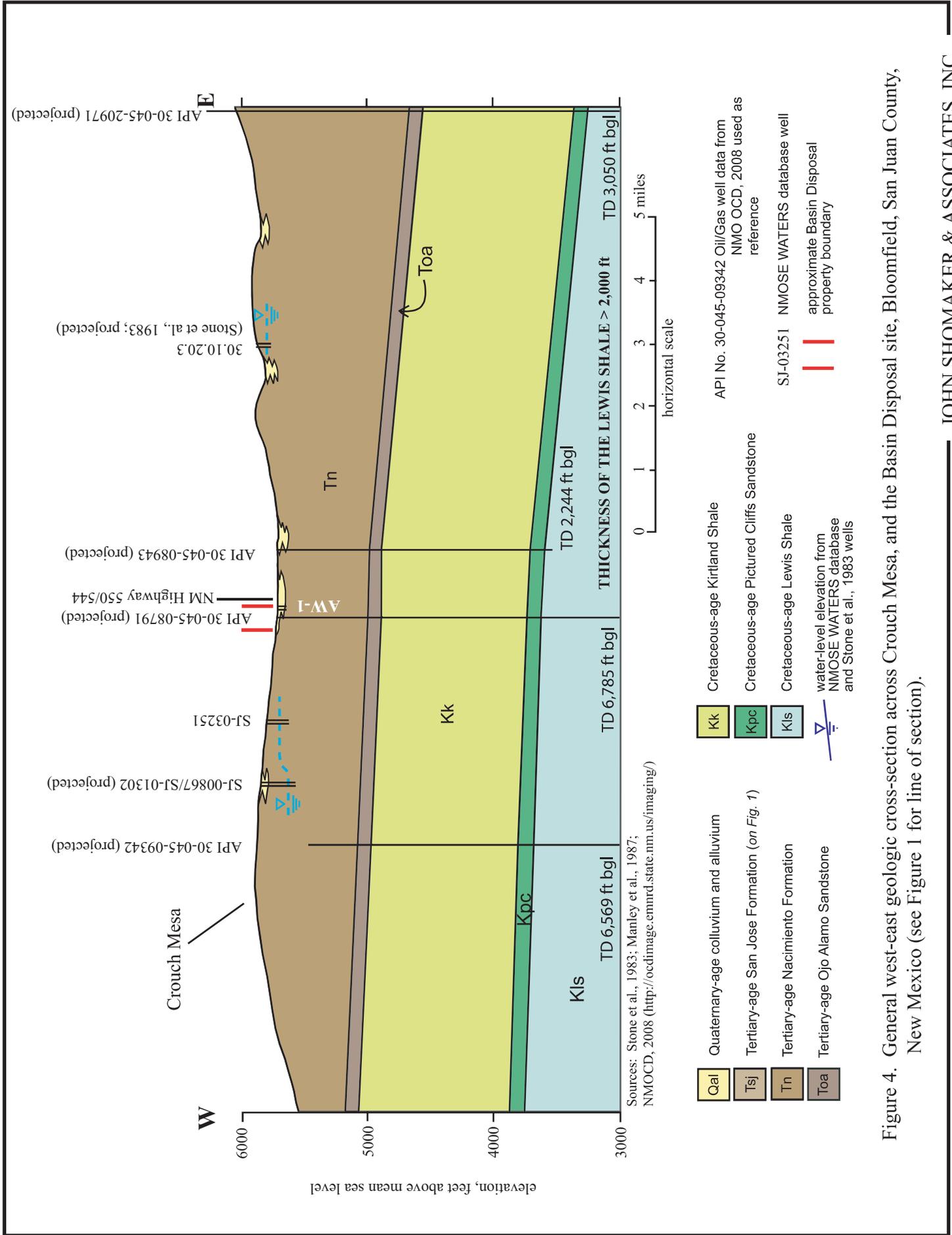


Figure 4. General west-east geologic cross-section across Crouch Mesa, and the Basin Disposal site, Bloomfield, San Juan County, New Mexico (see Figure 1 for line of section).

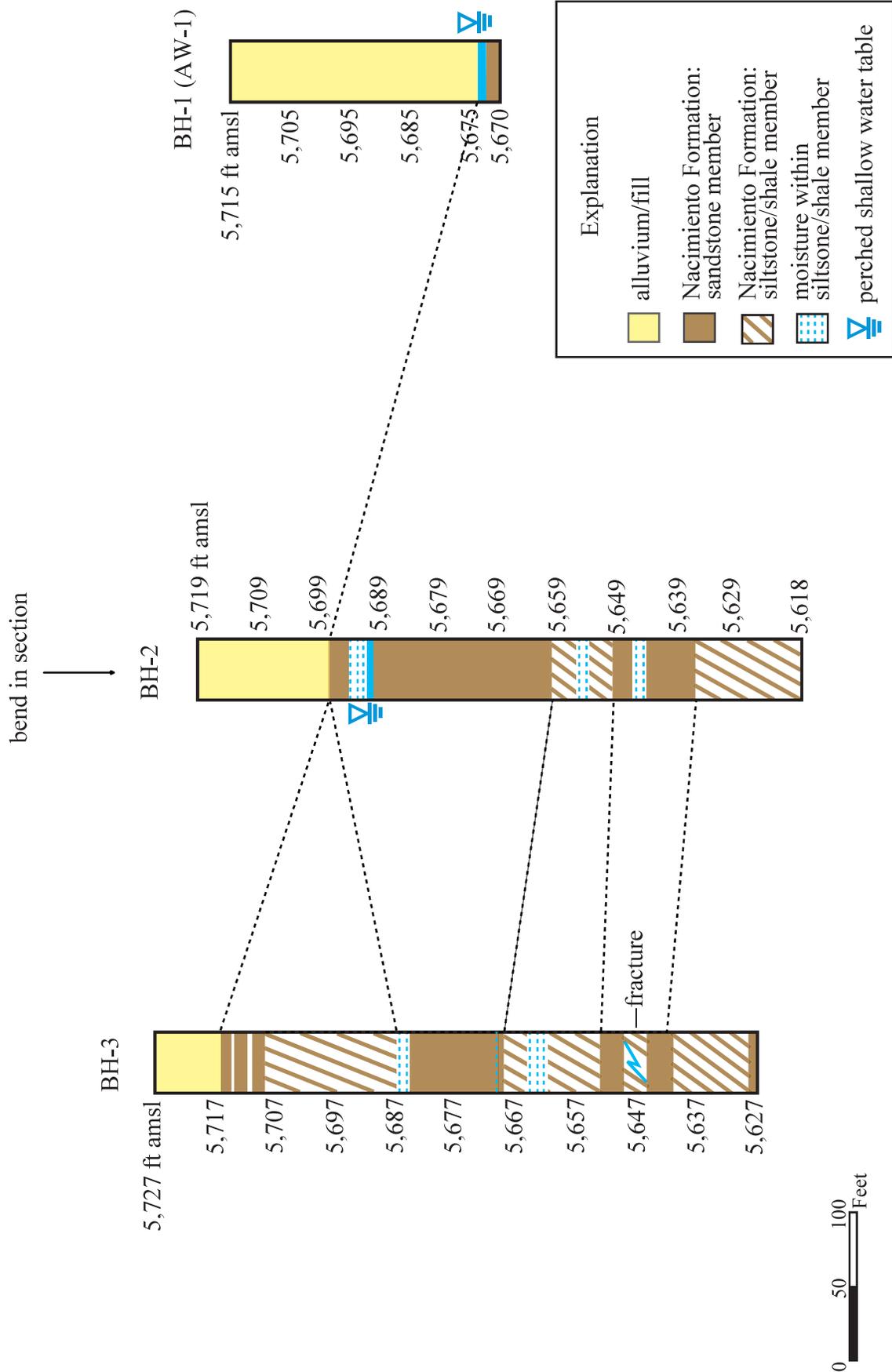
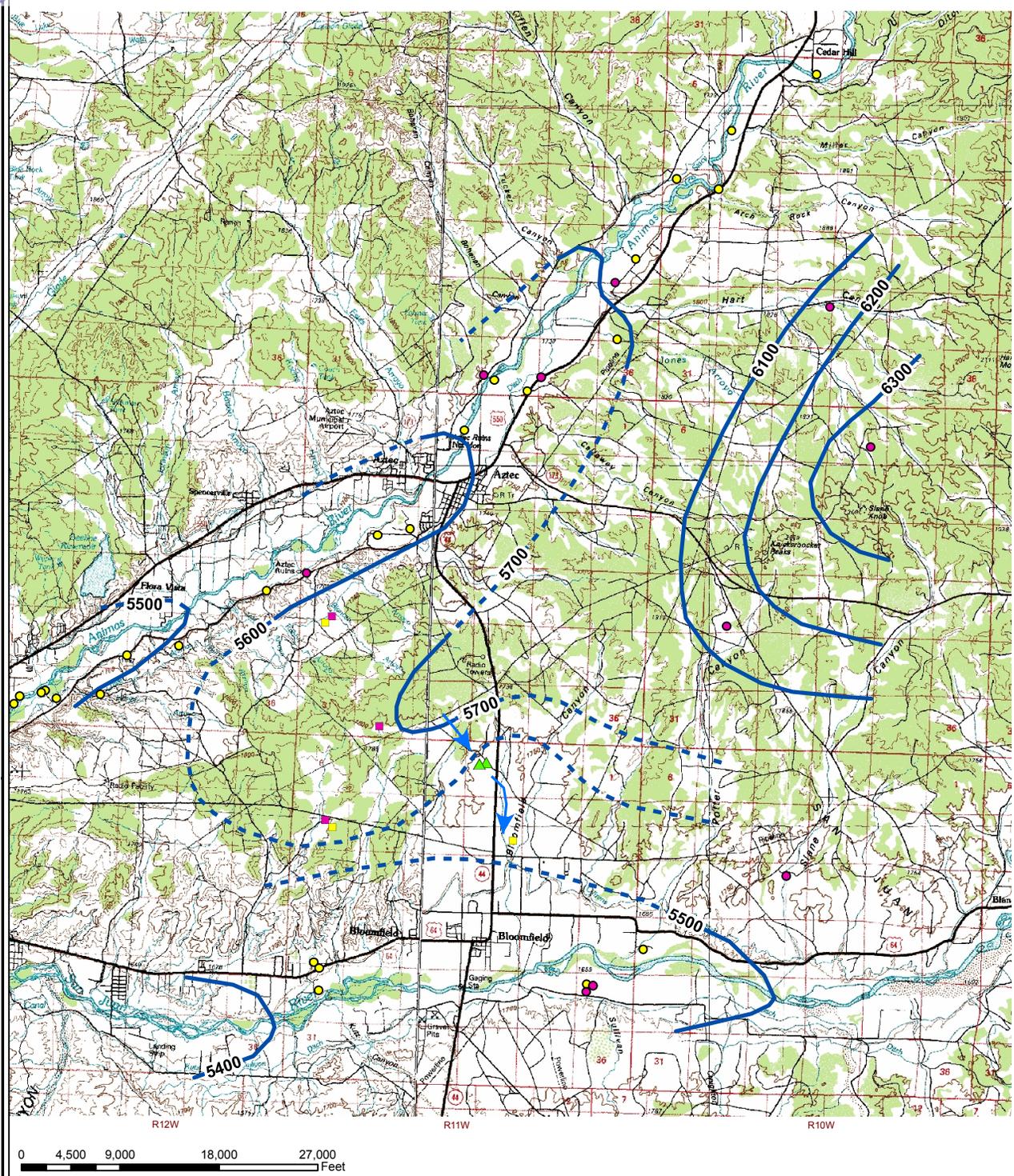


Figure 5. Detailed west to east geologic cross-section including lithologic data from BH-3, BH-2, and BH-1 (AW-1) at the Basin Disposal Site, Bloomfield, New Mexico (see Figure 3 for line of section).



Explanation		
	water-level elevation contour, ft amsl	
	dashed where inferred	
	direction of ground-water flow	
	Basin Disposal Site initial assessment well	
	NMOSE WATERS database well	
	Quaternary alluvial aquifer well	
	Tertiary Nacimiento Formation bedrock aquifer well	
	Stone et al. (1983) well	
	Quaternary alluvial aquifer well	
	Tertiary Nacimiento Formation bedrock aquifer well	

Figure 6. Topographic map showing water wells from the NMOSE WATERS database and Stone et al. (1983), Basin Disposal Site initial assessment wells, and water-level elevation contours of the alluvial and Nacimiento Formation bedrock aquifers, Basin Disposal Site, Bloomfield, New Mexico.



Slightly moist, less consolidated sandstone horizon within the Nacimiento Formation adhering to the core barrel in borehole No. 2 (BH-2).



Moist, clay-rich zones, 'missing' from the core and smeared on the core and the inside of the core barrel in borehole No. 2 (BH-2).

Figure 7. Photographs of continuous core samples from borehole No. 2 (BH-2), Basin Disposal Site, Bloomfield, New Mexico.

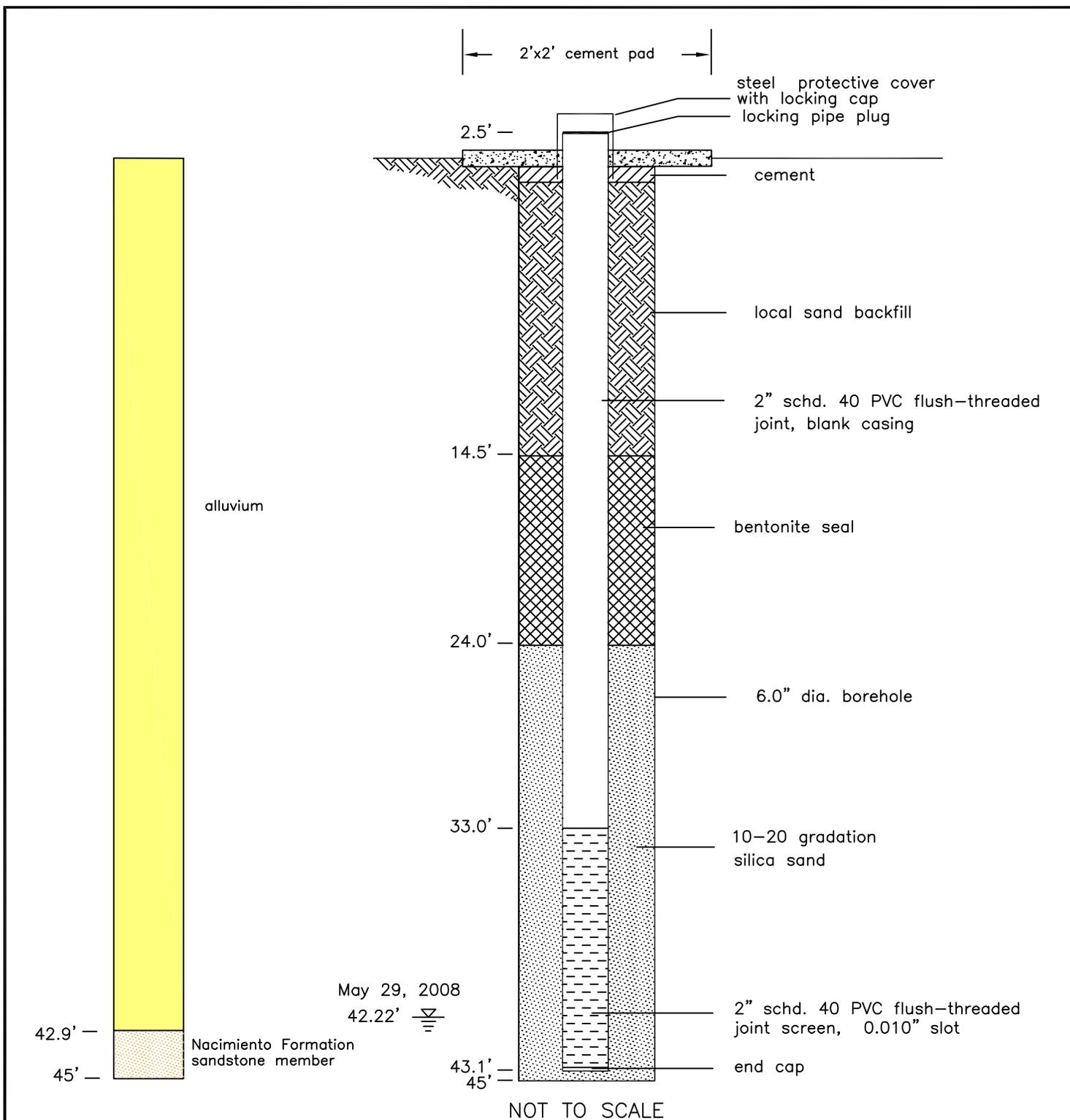


Figure 8. Ground-water initial assessment well AW-1 completion diagram, borehole lithology, and ground-water elevation, Basin Disposal Site, Bloomfield, New Mexico.

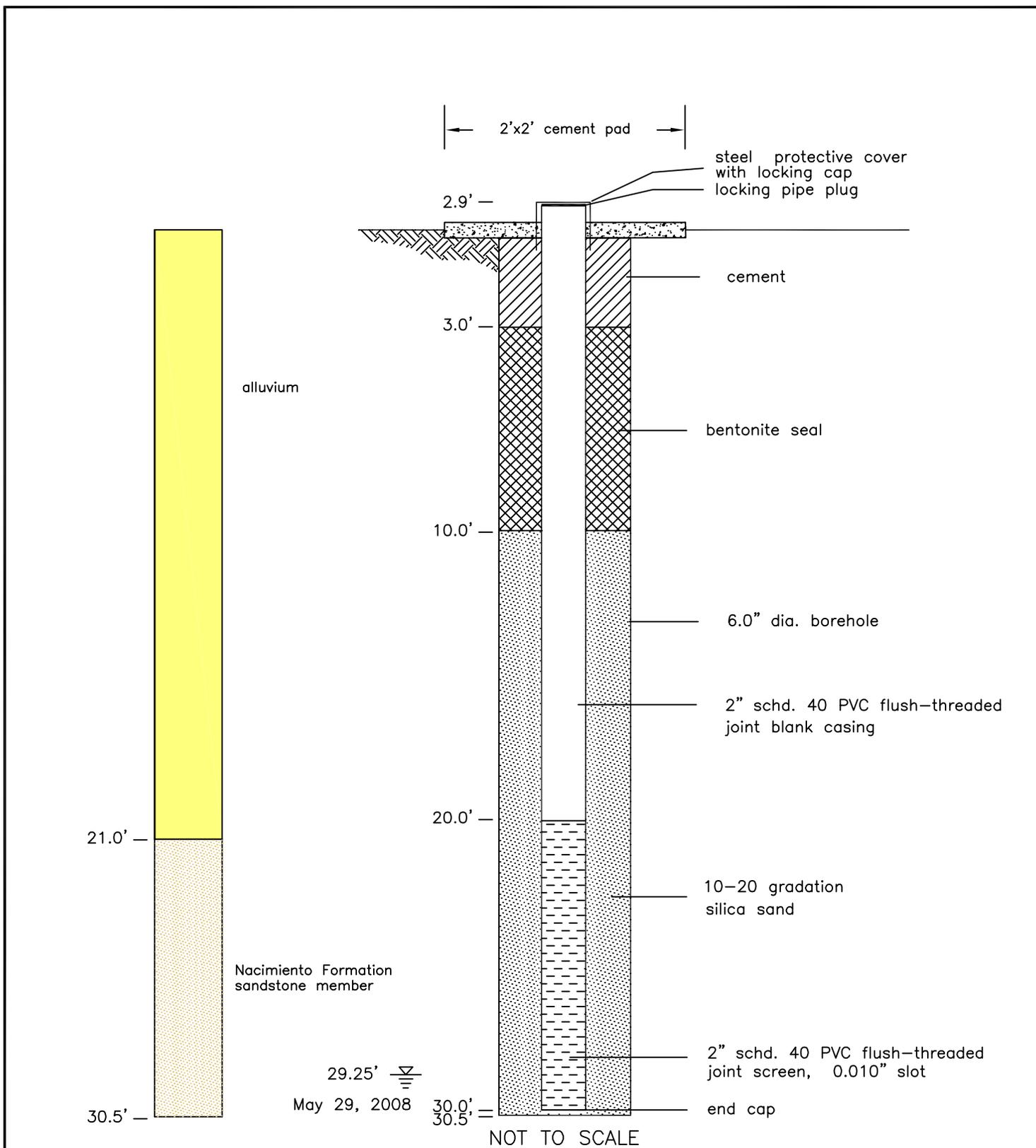


Figure 9. Ground-water initial assessment well AW-2 completion diagram, borehole lithology (from nearby borehole No. 2), and ground-water elevation, Basin Disposal Site, Bloomfield, New Mexico.

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APPENDICES

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Appendix A
Lithologic logs

JOHN SHOMAKER & ASSOCIATES, INC.
Water-Resource and Environmental Consultants
2611 Broadbent Parkway NE, Albuquerque, NM 87107

Borehole Logging Form

Client: Basin Disposal, Inc.		Project: borehole No. 1/AW-1		Hole: 1	1 of 1
Site: Bloomfield, NM				Date: 5/19/2008	
Geologist: EM		Contractor: Hydrogeologic Services		Map:	
Drill Method: auger and split spoon		Rig: Failings-International			
Notes: operation attended by Brad Jones, Env. Engineer with NMEMNR/OCD		Bit size:			
Elevation, ft:		Land Surface:		TOC:	
Sample Depth, ft	Lithology	% Rec.	Moisture Encountered, ft bgl	Description	
0 - 2	fill ?	72		sandy loam	
2 - 4	fill ?	72		same as 0 – 1.5 ft interval	
4 - 6	fill ? alluvium	83		sandy loam changing gradually to a clayey sand; at 58" abrupt contact to a coarse sand	
6 - 6.5	alluvium	100		coarse sand (full core in sleeve)	
6.5 - 7	alluvium	100		loamy sand (full core in sleeve)	
7 - 7.5	alluvium	100		coarse sand (full core in sleeve)	
7.5 - 8	alluvium	100		coarse sand (full core in sleeve)	
8 - 8.5	alluvium	100		silty sand/loamy sand (full core in sleeve)	
8.5 - 10.5	alluvium	100		well-sorted (dry) sand	
10.5 - 12.5	alluvium	100		well-sorted (dry) sand; contact at 12 ft bgl to clay with Stage I caliche	
12.5 - 14.5	alluvium	100		predominantly clay with caliche, layered with sandy loam, layered with silty sand in 6" intervals	
14.5 - 16.5	alluvium	100		coarse sand – bottom tagged ~17 ft bgl, salt xstals grow on wet glued sample 15 ft & down	
17 - 19	alluvium	100		coarse sand; contact at 17.5 ft bgl with a dry silty fine sand	
19 - 21	alluvium	100		loamy sand grading (over a few inches at 19.5 ft bgl) to a white, loamy silt	
21 - 23	alluvium	50		white, silty sand, including some caliche	
24 - 26	alluvium	80		silty sand grading to a sandy silt, grading to a (more consolidated) loamy sand at the base	
26 - 28	alluvium	100		predominantly yellow-white sand – loamy sand, with 2" of sandy loam	
28 - 30	alluvium	92		sandy loam; contact at 28.5 ft bgl with well graded (sorted) sand	
30 - 32	alluvium	100		10" sand; 4" of semi-consolidated sandy loam; with 10" of reddish, fine sand	
32 - 34	alluvium	100		12" fine sand; 12" fine, yellow-white sandy loam	
34 - 36	alluvium	100		6" fine, sandy loam; 12" fine sand; 6" sandy loam with a trace of clay	
36 - 38	alluvium	100		12" gray sand; 6" sandy loam; 6" sand	
38 - 40	alluvium	100		14" medium (slightly cool – moist?) yellow-gray sand; 10" clayey sand (first real clay layer)	
40 - 42	alluvium	100	41.25	15" medium, gray-yellow sand; 9" sand (with feldspar, quartz)	
42 - 43	alluvium sandstone	100		moist, coarse sand; sandstone contact at 42.90 ft bgl; sandstone with green alteration (predominantly quartz, minor feldspar), consolidated, no fizz with HCl; fractured/weathered with horizontal fractures	

JOHN SHOMAKER & ASSOCIATES, INC.
Water-Resource and Environmental Consultants
2611 Broadbent Parkway NE, Albuquerque, NM 87107

Borehole Logging Form

Client: Basin Disposal, Inc.		Project: Coring to 100 ft bgl		Hole: 2	1 of 1
Site: Bloomfield, NM				Date: 5/20/2008	
Geologist: EM		Contractor: Hydrogeologic Services		Map:	
Drill Method: auger and split spoon / direct air with 10-ft core barrel		Rig: Failings-International			
Notes: operation attended by Brad Jones, Env. Engineer of the NMEMNR/OCD		Bit size:			
Elevation, ft:		Land Surface:		TOC:	
Sample Depth, ft	Lithology	% Rec.	Moisture Encountered, ft bgl	Description	
0 - 2	alluvium			loamy sand	
2 - 4	alluvium	good		sandy loam; grading to loamy sand; grading to sandy clay	
4 - 6	alluvium	50		loamy sand; grading to sandy, unsaturated clay; bottom few in. stage I caliche	
6 - 8	alluvium	100		fine sand (with gypsum flakes); grading to medium sand with 10% rounded gravel, salt crystals grow on wet glued samples from 6 ft & down in alluvium	
8 - 10	alluvium	100		medium - coarse sand with 2" gravel layer @ 8.35 ft bgl; gravel is subangular, has weathering rinds; provenance is a mudstone	
10 - 12	alluvium	100		medium - coarse sand; sharp contact @9.5 ft bgl to loam with stage I/II caliche	
12 - 14	alluvium	100		very friable dark-gray, silt(stone) (no-fizz w HCl);almost-consolidated.	
14 - 16	alluvium	75		dark-gray, friable silt(stone), dry; non-lithified but consolidated, with small bits of gravel locally	
16 - 18	alluvium	88		v. consolidated silt(stone); @ 15.8 ft bgl caliche layer	
18 - 20	alluvium	63		consolidated silt(stone), @ 19.8 ft bgl 1/4 in. gravel	
20 - 21	alluvium	?		consolidated (but friable) silt(stone), fract with FeO	
				<i>(split-spoon sampling above)</i>	
				<i>(coring with direct air below)</i>	
21 - 31	siltstone sandstone	25	25 - 30	greenish, siltstone (0.8 ft). Greenish sandstone (0.5 ft); followed by 0.3 ft of loose yellow well-graded. Bottom (?) of the core has a total of 0.9 ft of sandstone. Missing section. Lacquer-like smell. Moist section above sandstone contact	
31 - 41	sandstone	85		sandstone, (quartz, feldspar) with 5% mudstone; in places arkosic	
41 - 51	sandstone	100		same as 31 - 41; with platelets of eroded mudstone	
51 - 61	sandstone siltstone	90	57	sandstone grading to arkose - conglomerate with coal horizons green-gray siltstone contact at 59.3 ft bgl	
61 - 71	siltstone sandstone	85		gray siltstone with fine sandstone (contact @ 69.5 ft bgl)	
71 - 81	siltstone	95		siltstone with coal-horizons; clay-coating on the inside of the core barrel, from local clay lenses (?); no moisture within core when fresh	
81 - 91	siltstone	100		greenish-gray siltstone with coal-horizons, blacker marbling, no minerals seen unaided	
91 - 101	siltstone	100	94	green siltstone with clay horizon approximately 2 in. thick; approx. 1.5 ft of core left in the hole	

JOHN SHOMAKER & ASSOCIATES, INC.
Water-Resource and Environmental Consultants
2611 Broadbent Parkway NE, Albuquerque, NM 87107

Borehole Logging Form

Client: Basin Disposal, Inc.		Project: Coring to 100 ft bgl		Hole: 3	1 of 1
Site: Bloomfield, NM				Date: 5/22/2008	
Geologist: EM		Contractor: Hydrogeologic Services		Map:	
Drill Method: auger and split spoon / direct air with 10 ft core barrel		Rig: Failings-International			
Notes: operation attended by Brad Jones, Env. Engineer of the NMEMNR/OCD		Bit size:			
Elevation, ft:		Land Surface:		TOC:	
Sample Depth, ft	Lithology	Rec. %	Moisture Encountered, ft bgl	Description	
0 - 2	fill	-		medium sand – middle 6” is silty sand; more loamy sand toward the bottom	
2 - 4	fill	80		well-sorted sand; grading to loamy sand; grading to silty sand; grading to well sorted sand	
4 - 6	fill	100		well-sorted sand; clay lens; grading to loamy sand; grading to coarse sand; grading to loamy (yellow) sand	
6 - 8	alluvium	100		loamy (yellow) sand; abrupt contact with loamy(gray) compacted; grading to well-sorted sand	
8 - 10	alluvium	100		well-sorted (dry) sand	
10 - 12	sandstone	60		0.2 ft well-sorted sand; 1 ft weathered sandstone bedrock, non-lithified, white and dry sand	
12 - 14	sandstone	GRAB		yellow, weathered, friable sandstone (dry)	
14 - 16	sandstone	GRAB		yellow, weathered, friable sandstone (dry)	
16 - 18	sandstone	GRAB		yellow, weathered, friable sandstone (dry)	
18 - 20	siltstone	95		17.5 ft bgl brown – gray siltstone (bottom 2” is very friable and calcified, with caliche (non-linked))	
				<i>(split-spoon sampling above)</i>	
				<i>(coring with direct air below)</i>	
20 - 30	siltstone	50		greenish, brown, friable, dry, siltstone. Smells of sulfur. Fracture surface coated by calcite (?) xstals.	
30 - 40	siltstone	100		greenish siltstone, grading to gray siltstone with faint paint thinner smell (33 – 38 ft bgl), grading to green siltstone with FeO on fractures. 3 (6” thick) ss lenses from 33 to 38 ft bgl. At 38 ft bgl a 4” soft (no moisture) clay lens.	
40 - 50	sandstone	100	40.5 - 43.5	sandstone (dolomite, quartz, rare fldspr, mica) with micaceous cross beds (dry), @ 43 ft bgl fract. siltstone lens – to the base sandstone is coal-bearing	
50 - 60	sandstone, siltstone	90	56.5	sandstone with green-gray siltstone contact at 58.5 ft bgl	
60 - 70	siltstone	85		siltstone with friable organic horizons (64 & 65 ft bgl) – no fractures, no moisture, but slippery, talc-like feel, org. are greasy luster, botryoidal in habit	
70 - 80	siltstone	97		same as 60 – 70 ft bgl	
80 - 90	siltstone	100	80.5	siltstone with gypsum-filled fractures, fracture at 80 ft bgl is moist	
90 - 100	siltstone, sandstone	100		same as 60 – 70 ft bgl; sandstone contact @ 99.8 ft bgl	

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Appendix B.

Summary of sample horizons where small samples were shared with the NMOCD during coring operations at borehole No. 2 and borehole No. 3, at the Basin Disposal Site, Bloomfield, San Juan County, New Mexico

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APPENDIX B.

Table B1. Summary of sample horizons where small samples were shared with the NMOCD during coring operations at borehole No. 2 and borehole No. 3, at the Basin Disposal Site, Bloomfield, San Juan County, New Mexico

number	unit	borehole No. 2 sample depth, ft bgl	borehole No. 3 sample depth, ft bgl
sampling date		5/22/2008	5/23/2007
1	Tn	~20	31.1
2	Tn	~21	33.5
3	Tn	35.4	34.3
4	Tn	49.8	38.6
5	Tn	57.2	39.8
6	Tn	61.1	41.6
7	Tn	62.4	42.6
8	Tn	66.8	45.4
9	Tn	~70.5	47.8
10	Tn	80.6	55.8
11	Tn	~81.2	59.7
12	Tn	89.7	63.1
13	Tn	94.5	67.7
14	Tn	98.5	69.2
15	Tn	-	74.6
16	Tn	-	76.7
17	Tn	-	79.8
18	Tn	-	84.7
19	Tn	-	89.6
20	Tn	-	95.2
21	Tn	-	99.7

Tn - Nacimiento Formation

ft bgl - feet below ground level

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Appendix C

**NMOSE wells (from WATERS) within a 2-mile radius of the
Basin Disposal Site, Bloomfield, New Mexico**

Appendix C. NMOSE wells (from WATERS) within a 2-mile radius of the Basin Disposal Site, Bloomfield, New Mexico

JSAI No.	DB File Nbr	Use	Diver-sion	Owner	POD Number	Source	Tws	Rng	Sec	q	q	UTM Zone	Easting	Northing	Completion Date	Well depth	Water depth	Yield, gpm	Alluvial depth, ft	Notes				
1	SJ 00867	DOM	3	S. L. Brannin	SJ 867	shallow	29N 11W 07 4	11W 07 4				13	229570	4069949	1/31/1979	77	55	5	65					
2	SJ 01302	DOM	3	R. W. Brannin	SJ 1302	shallow	29N 11W 07 4 1	11W 07 4 1				13	229381	4070147	1/30/1981	250	210	2.5	6					
3	SJ 01851	DOM	3	J. Bosse	SJ 1851	shallow	29N 11W 10 4 4	11W 10 4 4				13	234586	4069572	6/20/1984	125	48	10	73	closest				
4	SJ 01887	DOM	0	P. Hargis	SJ 1887		29N 11W 03 3	11W 03 3				13	233625	4071417	presumably not drilled - expired permit									
5	SJ 01891	DOM	3	E. Walker	SJ 1891		29N 11W 07 4 1 3	11W 07 4 1 3				13	229280	4070046	8/23/1984	157		?	33	no casing - dry?				
6	SJ 01995	DOM	3	R. Dettterra	SJ 1995		29N 11W 03 2 3	11W 03 2 3				13	234260	4071994	application to appropriate ground water only									
7	SJ 02086	DOM	3	R. Doerr	SJ 2086		29N 11W 10 3 2 4	11W 10 3 2 4				13	233890	4069898	application to appropriate ground water only									
8	SJ 02466	POL	0.84	El Paso Nat. Gas Co.	SJ 2466	shallow	29N 11W 11 4 3 3	11W 11 4 3 3				13	235694	4069436		66	recovery well							
9					SJ 2466 S	shallow	29N 11W 11 4 3 3	11W 11 4 3 3				13	235694	4069436		65								
10	SJ 03658	DOM	3	M. Maurer	SJ 3658		29N 11W 10 1 4 2	11W 10 1 4 2				13	233903	4070499	application to appropriate ground water only									
11	SJ 03749	DOM	3	M. J. Baird	SJ 3749	POD1	29N 11W 07 2 3 1	11W 07 2 3 1				13	229292	4070646	application to appropriate ground water only									
12	SJ 02854	DOM	3	C. D. & M. J. Atwood	SJ 2854		30N 11W 30 2 1 1	11W 30 2 1 1				13	229565	4075823	application to appropriate ground water only									
13	SJ 03077	DOM	3	L. McGaha	SJ 3077	shallow	30N 11W 30 2 1 1	11W 30 2 1 1				13	229565	4075823	4/6/2001	75	70	2	15					
14	SJ 03224	DOM	3	D. Dufur	SJ 3224	shallow	30N 11W 30 1 2 4	11W 30 1 2 4				13	229376	4075638	4/24/2003	80	30	3	30					
15	SJ 03251	DOM	3	E. Urie	SJ 3251	shallow	30N 11W 32 3 4 4	11W 32 3 4 4				13	230879	4072752	4/11/2003	150	77	6	14					
16	SJ 03668	DOM	3	C. Colson	SJ 3668	shallow	30N 11W 30 2 1 2	11W 30 2 1 2				13	229765	4075823	8/12/2005	380	280	5	60	"Fill"				
SUM																AVERAGE					142.5	110	4.8	37

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Appendix D

Copy of laboratory measurement of hydraulic conductivity and plasticity index (Atterberg test) for AW-1 alluvial soil samples

==== V =====

Vinyard & Associates, Inc.

8916-A Adams Street NE
 Albuquerque, New Mexico 87113
 505/797-9743 505/797-9749 FAX

==== A =====

Geotechnical Engineering * Materials Testing * Environmental Engineering

June 25, 2008

Note: Revised to show atterberg test results.

John Shomaker & Associates, Inc.
 2611 Broadbent Parkway
 Albuquerque, NM 87107

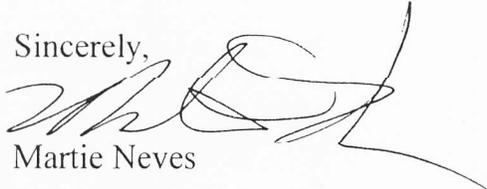
Attn: Mr. Erwin A Melis, Ph.D

Project: Basin Disposal
 V & A Project No. 08-2-282

Gentlemen:

Attached are copies of the Laboratory Test results for the subject project.

Should you have any questions regarding this data, please do not hesitate to call.

Sincerely,

 Martie Neves

Vinyard & Associates, Inc.

 Robert K. Abeyta, S.E.T.

Attachment: Figure No.: 4

cc: Addressee: (1)
 Basin Disposal, Inc. - Attn: Mr. John Volkerding

mn

Falling Head Permeability Test

ASTM D5856-95

Project : Basin Disposal Date: 7/12/2008

Project No.: 08-2-282

Sample Number 926 @ 5.5' to 6.0'

Permeameter No.: b

MDD (pcf):	d	110	Diameter of Specimen, cm:	D	6.172
$\gamma=d/62.4$:	γ	1.763	Area of Specimen, cm ² :	A	29.92
% Compaction:	%	80%	Initial Height of Specimen, cm :	L	7.96
Dry Soil= % * V * γ :	Ws	335.9	Volume, ml, V=A*L	V	238.16
Specific Gravity:	g	2.5	Void Ratio (V-Vs)/Vs :	e	0.77
Vol of Solids,Vs=Ws/g:	Vs	134.3	Constant 2.303 *(a/A)*L :	c	0.194225
Area of Standpipe, cm ² :	a	0.317			

Initial Time	t₀	8:00 AM	8:02 AM	8:04 AM	8:06 AM	8:08 AM	8:10 AM
Final Time	t_f	8:01 AM	8:03 AM	8:05 AM	8:07 AM	8:09 AM	8:11 AM
Time Interval, min		1	1	1	1	1	1
Elapsed Time, sec:	t	69	71	73	74	74	75
Initial Head, cm	h₀	182.0	182.0	182.0	182.0	182.0	182.0
Final Head, cm	h_f	15.3	15.3	15.3	15.3	15.3	15.3
Log h ₀ /h _f	l	1.08	1.08	1.08	1.08	1.08	1.08
Water Temp, C	T	22.5	22.5	22.5	22.5	22.5	22.5
Viscosity Corr. Factor	R_t	0.9433	0.9433	0.9433	0.9433	0.9433	0.9433
Coefficient of Permeability, cm/sec	K	3.03E-03	2.95E-03	2.86E-03	2.83E-03	2.83E-03	2.79E-03
Coefficient of Permeability Corrected,	K₂₀	2.86E-03	2.78E-03	2.70E-03	2.67E-03	2.67E-03	2.63E-03

Average - Coefficient of Permeability, cm/sec	K	2.83E-03
Permeability Corr.,	K₂₀	2.67E-03

Note : MDD and Specific Gravity are assumed

Moisture content - 8.3

In place dry density 89.9 lb ft³

Atterberg Limit - Liquid Limit NV - Plastic Limit NV - Plasticity Index NP

Falling Head Permeability Test

ASTM D5856-95

Project : Basin Disposal Date: 7/12/2008

Project No.: 08-2-282

Sample Number 927 @ 6.5' to 7.0'

Permeameter No.: b

MDD (pcf):	d	110	Diameter of Specimen, cm:	D	6.172
$\gamma=d/62.4$:	γ	1.763	Area of Specimen, cm ² :	A	29.92
% Compaction:	%	78%	Initial Height of Specimen, cm :	L	7.89
Dry Soil= % * V * γ :	Ws	324.6	Volume, ml, V=A*L	V	236.07
Specific Gravity:	g	2.5	Void Ratio (V-Vs)/Vs :	e	0.82
Vol of Solids, Vs=Ws/g:	Vs	129.8	Constant 2.303 *(a/A)*L :	c	0.192517
Area of Standpipe, cm ² :	a	0.317			

Initial Time	t ₀	8:00 AM	8:02 AM	8:04 AM	8:06 AM	8:08 AM	8:10 AM
Final Time	t _f	8:01 AM	8:03 AM	8:05 AM	8:07 AM	8:09 AM	8:11 AM
Time Interval, min		1	1	1	1	1	1
Elapsed Time, sec:	t	71	71	72	73	75	76
Initial Head, cm	h ₀	182.0	182.0	182.0	182.0	182.0	182.0
Final Head, cm	h _f	15.3	15.3	15.3	15.3	15.3	15.3
Log h ₀ /h _f	l	1.08	1.08	1.08	1.08	1.08	1.08
Water Temp, C	T	22.5	22.5	22.5	22.5	22.5	22.5
Viscosity Corr. Factor	R _t	0.9433	0.9433	0.9433	0.9433	0.9433	0.9433
Coefficient of Permeability, cm/sec	K	2.92E-03	2.92E-03	2.88E-03	2.84E-03	2.76E-03	2.73E-03
Coefficient of Permeability Corrected,	K ₂₀	2.75E-03	2.75E-03	2.72E-03	2.68E-03	2.61E-03	2.57E-03

Average - Coefficient of Permeability, cm/sec	K	2.80E-03
Permeability Corr.,	K ₂₀	2.64E-03

Note : MDD and Specific Gravity are assumed

Moisture content - 8.2

In place dru density - 89.5 lbs / ft³

Atterburg Limits Liquid Limit NV - Plastic Limit NV - Plasticity Index NP

JSAI

Appendix E

**Copy of laboratory reports and chain-of-custody documentation
for ground-water samples**



COVER LETTER

Thursday, June 12, 2008

Erwin Melis
John Shomaker & Assoc.
2611 Broadbent Parkway NE
Albuquerque, NM 87107

TEL: (505) 250-1607
FAX (505) 345-9920

RE: BDI/Bloomfield, NM

Order No.: 0805373

Dear Erwin Melis:

Hall Environmental Analysis Laboratory, Inc. received 1 sample(s) on 5/28/2008 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent.

Reporting limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman", is written over a horizontal line.

Andy Freeman, Business Manager
Nancy McDuffie, Laboratory Manager

NM Lab # NM9425
AZ license # AZ0682
ORELAP Lab # NM100001



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

Date: 12-Jun-08

CLIENT: John Shomaker & Assoc.
Lab Order: 0805373
Project: BDI/Bloomfield, NM
Lab ID: 0805373-01

Client Sample ID: MW-1
Collection Date: 5/27/2008 4:45:00 PM
Date Received: 5/28/2008
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: SLB
Fluoride	1.7	1.0		mg/L	10	5/28/2008 11:27:10 PM
Chloride	2300	20		mg/L	200	5/29/2008 9:53:54 AM
Nitrogen, Nitrite (As N)	ND	1.0		mg/L	10	5/28/2008 11:27:10 PM
Bromide	6.3	1.0		mg/L	10	5/28/2008 11:27:10 PM
Nitrogen, Nitrate (As N)	11	1.0		mg/L	10	5/28/2008 11:27:10 PM
Phosphorus, Orthophosphate (As P)	ND	5.0		mg/L	10	5/28/2008 11:27:10 PM
Sulfate	18000	250		mg/L	500	6/3/2008 8:03:20 PM
EPA METHOD 7470: MERCURY						Analyst: SNV
Mercury	ND	0.00020		mg/L	1	6/4/2008 4:10:28 PM
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst: NMO
Arsenic	ND	0.20		mg/L	10	6/2/2008 10:04:06 AM
Barium	ND	0.20		mg/L	10	6/2/2008 9:03:05 AM
Cadmium	ND	0.020		mg/L	10	6/2/2008 9:03:05 AM
Calcium	480	10		mg/L	10	6/2/2008 9:03:05 AM
Chromium	ND	0.060		mg/L	10	6/2/2008 9:03:05 AM
Lead	0.098	0.050		mg/L	10	6/2/2008 9:03:05 AM
Magnesium	300	10		mg/L	10	6/2/2008 9:03:05 AM
Potassium	15	10		mg/L	10	6/2/2008 9:03:05 AM
Selenium	ND	0.50		mg/L	10	6/2/2008 9:03:05 AM
Silver	ND	0.050		mg/L	10	6/2/2008 9:03:05 AM
Sodium	10000	100		mg/L	100	6/2/2008 8:59:59 AM
SM 2540C TOTAL DISSOLVED SOLIDS						Analyst: KMS
Total Dissolved Solids	38000	2000		mg/L	1	5/29/2008

Qualifiers: * Value exceeds Maximum Contaminant Level
 E Value above quantitation range
 J Analyte detected below quantitation limits
 ND Not Detected at the Reporting Limit
 S Spike recovery outside accepted recovery limits
 B Analyte detected in the associated Method Blank
 H Holding times for preparation or analysis exceeded
 MCL Maximum Contaminant Level
 RL Reporting Limit

Hall Environmental Analysis Laboratory, Inc.

Date: 12-Jun-08

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.

Project: BDI/Bloomfield, NM

Work Order: 0805373

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
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Method: EPA Method 300.0: Anions

Sample ID: MB *MBLK* Batch ID: R28701 Analysis Date: 5/28/2008 8:39:22 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Nitrogen, Nitrite (As N)	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrogen, Nitrate (As N)	ND	mg/L	0.10
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

Sample ID: MB *MBLK* Batch ID: R28726 Analysis Date: 5/29/2008 8:44:16 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Nitrogen, Nitrite (As N)	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrogen, Nitrate (As N)	ND	mg/L	0.10
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

Sample ID: MB *MBLK* Batch ID: R28779 Analysis Date: 6/3/2008 9:01:46 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Nitrogen, Nitrite (As N)	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrogen, Nitrate (As N)	ND	mg/L	0.10
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

Sample ID: LCS *LCS* Batch ID: R28701 Analysis Date: 5/28/2008 8:56:47 AM

Fluoride	0.5351	mg/L	0.10	107	90	110
Chloride	4.865	mg/L	0.10	97.3	90	110
Nitrogen, Nitrite (As N)	0.9089	mg/L	0.10	90.9	90	110
Bromide	2.542	mg/L	0.10	102	90	110
Nitrogen, Nitrate (As N)	2.497	mg/L	0.10	99.9	90	110
Phosphorus, Orthophosphate (As P)	5.036	mg/L	0.50	101	90	110
Sulfate	10.03	mg/L	0.50	100	90	110

Sample ID: LCS *LCS* Batch ID: R28726 Analysis Date: 5/29/2008 9:01:41 AM

Fluoride	0.5169	mg/L	0.10	103	90	110
Chloride	4.860	mg/L	0.10	97.2	90	110
Nitrogen, Nitrite (As N)	0.9198	mg/L	0.10	92.0	90	110
Bromide	2.567	mg/L	0.10	103	90	110
Nitrogen, Nitrate (As N)	2.499	mg/L	0.10	100	90	110
Phosphorus, Orthophosphate (As P)	5.070	mg/L	0.50	101	90	110
Sulfate	10.11	mg/L	0.50	101	90	110

Sample ID: LCS *LCS* Batch ID: R28779 Analysis Date: 6/3/2008 9:19:11 AM

Fluoride	0.5075	mg/L	0.10	101	90	110
Chloride	4.796	mg/L	0.10	95.9	90	110
Nitrogen, Nitrite (As N)	0.9539	mg/L	0.10	95.4	90	110

Qualifiers:

- E Value above quantitation range
- J Analyte detected below quantitation limits
- RPD outside accepted recovery limits
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: 12-Jun-08

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.

Project: BDI/Bloomfield, NM

Work Order: 0805373

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
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Method: EPA Method 300.0: Anions

Sample ID: LCS LCS Batch ID: R28779 Analysis Date: 6/3/2008 9:19:11 AM

Bromide	2.540	mg/L	0.10	102	90	110			
Nitrogen, Nitrate (As N)	2.417	mg/L	0.10	96.7	90	110			
Phosphorus, Orthophosphate (As P)	4.926	mg/L	0.50	98.5	90	110			
Sulfate	9.953	mg/L	0.50	99.5	90	110			

Method: EPA Method 7470: Mercury

Sample ID: MB-16112 MBLK Batch ID: 16112 Analysis Date: 6/4/2008 3:59:53 PM

Mercury ND mg/L 0.00020

Sample ID: LCS-16112 LCS Batch ID: 16112 Analysis Date: 6/4/2008 4:01:38 PM

Mercury 0.004938 mg/L 0.00020 98.0 80 120

Method: EPA 6010B: Total Recoverable Metals

Sample ID: MB-16071 MBLK Batch ID: 16071 Analysis Date: 6/2/2008 7:57:03 AM

Arsenic	ND	mg/L	0.020						
Barium	ND	mg/L	0.010						
Cadmium	ND	mg/L	0.0020						
Calcium	ND	mg/L	0.50						
Chromium	ND	mg/L	0.0060						
Lead	ND	mg/L	0.0050						
Magnesium	ND	mg/L	0.50						
Potassium	ND	mg/L	1.0						
Selenium	ND	mg/L	0.050						
Silver	ND	mg/L	0.0050						
Sodium	ND	mg/L	0.50						

Sample ID: LCS-16071 LCS Batch ID: 16071 Analysis Date: 6/2/2008 8:00:07 AM

Arsenic	0.4967	mg/L	0.020	99.3	80	120			
Barium	0.4886	mg/L	0.010	97.7	80	120			
Cadmium	0.4980	mg/L	0.0020	99.6	80	120			
Calcium	48.11	mg/L	0.50	96.2	80	120			
Chromium	0.4996	mg/L	0.0060	99.9	80	120			
Lead	0.4908	mg/L	0.0050	98.2	80	120			
Magnesium	48.62	mg/L	0.50	97.2	80	120			
Potassium	51.29	mg/L	1.0	103	80	120			
Selenium	0.5031	mg/L	0.050	101	80	120			
Silver	0.4943	mg/L	0.0050	98.9	80	120			
Sodium	50.71	mg/L	0.50	101	80	120			

Method: SM 2540C Total Dissolved Solids

Sample ID: MB-16060 MBLK Batch ID: 16060 Analysis Date: 5/29/2008

Total Dissolved Solids ND mg/L 20

Sample ID: LCS-16060 LCS Batch ID: 16060 Analysis Date: 5/29/2008

Total Dissolved Solids 1021 mg/L 20 102 80 120

Qualifiers:

- E Value above quantitation range
- J Analyte detected below quantitation limits
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Sample Receipt Checklist

Client Name SHO

Date Received:

5/28/2008

Work Order Number 0805373

Received by: TLS

Checklist completed by:

[Signature]
Signature

5/28/08
Date

Sample ID labels checked by:

TS
Initials

Matrix:

Carrier name Client drop-off

- Shipping container/cooler in good condition? Yes No Not Present
- Custody seals intact on shipping container/cooler? Yes No Not Present Not Shipped
- Custody seals intact on sample bottles? Yes No N/A
- Chain of custody present? Yes No
- Chain of custody signed when relinquished and received? Yes No
- Chain of custody agrees with sample labels? Yes No
- Samples in proper container/bottle? Yes No
- Sample containers intact? Yes No
- Sufficient sample volume for indicated test? Yes No
- All samples received within holding time? Yes No
- Water - VOA vials have zero headspace? No VOA vials submitted Yes No
- Water - Preservation labels on bottle and cap match? Yes No N/A
- Water - pH acceptable upon receipt? Yes No N/A
- Container/Temp Blank temperature? **5°** <6° C Acceptable
If given sufficient time to cool.

COMMENTS:

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

Chain-of-Custody Record

Client: JSAI / Casio Melis

Address: 2611 Broadhead Place NE

Alb., NM 87107

Phone #: 345-3407

email or Fax#: emelis@shomaker.com

QA/QC Package:

Standard Level 4 (Full Validation)

Other _____

EDD (Type) _____

Turn-Around Time:

Standard Rush

Project Name:

BD I / Bloomfield, NM

Project #:

Project Manager:

Eshwin Melis

Sampler:

EM

On Ice: Yes No

Sample Temperature: 5

Date

Time

Sample Request ID

Container Type and #

Preservative Type

HEAL No.

5/27 16:45

0702-1

0805373

-1

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

BTEX + MTBE + TMB's (8021)

BTEX + MTBE + TPH (Gas only)

TPH Method 8015B (Gas/Diesel)

TPH (Method 418.1)

EDB (Method 504.1)

EDC (Method 8260)

8310 (PNA or PAH)

Anions (F, Cl, NO₃, NO₂, PO₄, SO₄)

8081 Pesticides / 8082 PCBs

8260B (VOA)

8270 (Semi-VOA)

Air Bubbles (Y or N)

see attached

Date: 5/27

Time: 14:00

Relinquished by: E. Melis

Relinquished by: _____

Received by: Jan S

Time: 5:28 PM

Received by: Jan S

Time: 5:28 PM

Remarks: Cancel 8021/6001/80 analysis

per EM

AT 5/28/08



COVER LETTER

Wednesday, June 11, 2008

Erwin Melis
John Shomaker & Assoc.
2611 Broadbent Parkway NE
Albuquerque, NM 87107

TEL: (505) 250-1607
FAX (505) 345-9920

RE: BDI

Order No.: 0805406

Dear Erwin Melis:

Hall Environmental Analysis Laboratory, Inc. received 3 sample(s) on 5/30/2008 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent.

Reporting limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman".

Andy Freeman, Business Manager
Nancy McDuffie, Laboratory Manager

NM Lab # NM9425
AZ license # AZ0682
ORELAP Lab # NM100001



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109
505.345.3975 ■ Fax 505.345.4107

Hall Environmental Analysis Laboratory, Inc.

Date: 11-Jun-08

CLIENT:	John Shomaker & Assoc.	Client Sample ID:	BDI-MW1-2
Lab Order:	0805406	Collection Date:	5/29/2008 12:45:00 PM
Project:	BDI	Date Received:	5/30/2008
Lab ID:	0805406-01	Matrix:	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: SCC
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	6/3/2008 10:06:43 AM
Motor Oil Range Organics (MRO)	ND	5.0		mg/L	1	6/3/2008 10:06:43 AM
Surr: DNOP	120	58-140		%REC	1	6/3/2008 10:06:43 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: NSB
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	6/2/2008 4:33:33 PM
Surr: BFB	94.1	79.2-121		%REC	1	6/2/2008 4:33:33 PM
EPA METHOD 8021B: VOLATILES						Analyst: NSB
Methyl tert-butyl ether (MTBE)	ND	2.5		µg/L	1	6/2/2008 4:33:33 PM
Benzene	ND	1.0		µg/L	1	6/2/2008 4:33:33 PM
Toluene	ND	1.0		µg/L	1	6/2/2008 4:33:33 PM
Ethylbenzene	ND	1.0		µg/L	1	6/2/2008 4:33:33 PM
Xylenes, Total	ND	2.0		µg/L	1	6/2/2008 4:33:33 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	6/2/2008 4:33:33 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	6/2/2008 4:33:33 PM
Surr: 4-Bromofluorobenzene	86.2	68.9-122		%REC	1	6/2/2008 4:33:33 PM

Qualifiers:	* Value exceeds Maximum Contaminant Level	B Analyte detected in the associated Method Blank
	E Value above quantitation range	H Holding times for preparation or analysis exceeded
	J Analyte detected below quantitation limits	MCL Maximum Contaminant Level
	ND Not Detected at the Reporting Limit	RL Reporting Limit
	S Spike recovery outside accepted recovery limits	

Hall Environmental Analysis Laboratory, Inc.

Date: 11-Jun-08

CLIENT: John Shomaker & Assoc.
Lab Order: 0805406
Project: BDI
Lab ID: 0805406-02

Client Sample ID: BDI-MW2
Collection Date: 5/29/2008 1:15:00 PM
Date Received: 5/30/2008
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst: TES
Arsenic	ND	0.20		mg/L	5	6/6/2008 11:10:05 AM
Barium	ND	0.20		mg/L	5	6/6/2008 11:10:05 AM
Cadmium	ND	0.020		mg/L	5	6/6/2008 11:10:05 AM
Calcium	490	10		mg/L	5	6/6/2008 11:10:05 AM
Chromium	ND	0.060		mg/L	5	6/6/2008 11:10:05 AM
Lead	ND	0.050		mg/L	5	6/6/2008 11:10:05 AM
Magnesium	170	10		mg/L	5	6/6/2008 11:10:05 AM
Potassium	39	10		mg/L	5	6/6/2008 11:10:05 AM
Selenium	ND	0.50		mg/L	5	6/6/2008 11:10:05 AM
Silver	ND	0.050		mg/L	5	6/6/2008 11:10:05 AM
Sodium	7800	100		mg/L	50	6/10/2008 4:53:37 PM
SM 2540C TOTAL DISSOLVED SOLIDS						Analyst: KMS
Total Dissolved Solids	24000	100		mg/L	1	6/2/2008

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- E Value above quantitation range
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- MCL Maximum Contaminant Level
- RL Reporting Limit

Hall Environmental Analysis Laboratory, Inc.

Date: 11-Jun-08

CLIENT: John Shomaker & Assoc.
Lab Order: 0805406
Project: BDI
Lab ID: 0805406-03

Client Sample ID: TRIP BLANK
Collection Date:
Date Received: 5/30/2008
Matrix: TRIP BLANK

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: GASOLINE RANGE						Analyst: NSB
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	6/2/2008 5:33:52 PM
Surr: BFB	89.9	79.2-121		%REC	1	6/2/2008 5:33:52 PM
EPA METHOD 8021B: VOLATILES						Analyst: NSB
Methyl tert-butyl ether (MTBE)	ND	2.5		µg/L	1	6/2/2008 5:33:52 PM
Benzene	ND	1.0		µg/L	1	6/2/2008 5:33:52 PM
Toluene	ND	1.0		µg/L	1	6/2/2008 5:33:52 PM
Ethylbenzene	ND	1.0		µg/L	1	6/2/2008 5:33:52 PM
Xylenes, Total	ND	2.0		µg/L	1	6/2/2008 5:33:52 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	6/2/2008 5:33:52 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	6/2/2008 5:33:52 PM
Surr: 4-Bromofluorobenzene	82.9	68.9-122		%REC	1	6/2/2008 5:33:52 PM

Qualifiers: * Value exceeds Maximum Contaminant Level
 E Value above quantitation range
 J Analyte detected below quantitation limits
 ND Not Detected at the Reporting Limit
 S Spike recovery outside accepted recovery limits
 B Analyte detected in the associated Method Blank
 H Holding times for preparation or analysis exceeded
 MCL Maximum Contaminant Level
 RL Reporting Limit

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0805406

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
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Method: EPA Method 8015B: Diesel Range

Sample ID: MB-16080		<i>MBLK</i>			Batch ID: 16080	Analysis Date: 6/3/2008 3:57:00 AM			
Diesel Range Organics (DRO)	ND	mg/L	1.0						
Motor Oil Range Organics (MRO)	ND	mg/L	5.0						
Sample ID: LCS-16080		<i>LCS</i>			Batch ID: 16080	Analysis Date: 6/3/2008 5:06:20 AM			
Diesel Range Organics (DRO)	5.211	mg/L	1.0	104	74	157			
Sample ID: LCSD-16080		<i>LCSD</i>			Batch ID: 16080	Analysis Date: 6/3/2008 5:41:42 AM			
Diesel Range Organics (DRO)	5.384	mg/L	1.0	108	74	157	3.26	23	

Method: EPA Method 8015B: Gasoline Range

Sample ID: 5ML RB		<i>MBLK</i>			Batch ID: R28760	Analysis Date: 6/2/2008 9:22:36 AM			
Gasoline Range Organics (GRO)	ND	mg/L	0.050						
Sample ID: 2.5UG GRO LCS		<i>LCS</i>			Batch ID: R28760	Analysis Date: 6/2/2008 8:34:38 PM			
Gasoline Range Organics (GRO)	0.5012	mg/L	0.050	100	80	115			
Sample ID: 2.5UG GRO LCSD		<i>LCSD</i>			Batch ID: R28760	Analysis Date: 6/2/2008 9:04:46 PM			
Gasoline Range Organics (GRO)	0.5072	mg/L	0.050	101	80	115	1.19	8.39	

Method: EPA Method 8021B: Volatiles

Sample ID: 5ML RB		<i>MBLK</i>			Batch ID: R28760	Analysis Date: 6/2/2008 9:22:36 AM			
Methyl tert-butyl ether (MTBE)	ND	µg/L	2.5						
Benzene	ND	µg/L	1.0						
Toluene	ND	µg/L	1.0						
Ethylbenzene	ND	µg/L	1.0						
Xylenes, Total	ND	µg/L	2.0						
1,2,4-Trimethylbenzene	ND	µg/L	1.0						
1,3,5-Trimethylbenzene	ND	µg/L	1.0						
Sample ID: 100NG BTEX LCS		<i>LCS</i>			Batch ID: R28760	Analysis Date: 6/2/2008 7:34:19 PM			
Methyl tert-butyl ether (MTBE)	19.81	µg/L	2.5	99.1	51.2	138			
Benzene	18.29	µg/L	1.0	91.4	85.9	113			
Toluene	18.19	µg/L	1.0	90.9	86.4	113			
Ethylbenzene	18.58	µg/L	1.0	92.8	83.5	118			
Xylenes, Total	55.54	µg/L	2.0	92.6	83.4	122			
1,2,4-Trimethylbenzene	18.33	µg/L	1.0	90.5	83.5	115			
1,3,5-Trimethylbenzene	17.24	µg/L	1.0	86.2	85.2	113			
Sample ID: 100NG BTEX LCSD		<i>LCSD</i>			Batch ID: R28760	Analysis Date: 6/2/2008 8:04:29 PM			
Methyl tert-butyl ether (MTBE)	21.06	µg/L	2.5	105	51.2	138	6.10	28	
Benzene	19.16	µg/L	1.0	95.8	85.9	113	4.64	27	
Toluene	19.14	µg/L	1.0	95.7	86.4	113	5.09	19	
Ethylbenzene	19.25	µg/L	1.0	96.2	83.5	118	3.64	10	
Xylenes, Total	57.93	µg/L	2.0	96.6	83.4	122	4.22	13	
1,2,4-Trimethylbenzene	19.27	µg/L	1.0	95.2	83.5	115	5.02	21	
1,3,5-Trimethylbenzene	18.03	µg/L	1.0	90.2	85.2	113	4.50	10	

Qualifiers:

- | | |
|--|--|
| E Value above quantitation range | H Holding times for preparation or analysis exceeded |
| J Analyte detected below quantitation limits | ND Not Detected at the Reporting Limit |
| R RPD outside accepted recovery limits | S Spike recovery outside accepted recovery limits |

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0805406

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
---------	--------	-------	-----	------	----------	-----------	------	----------	------

Method: EPA 6010B: Total Recoverable Metals

Sample ID: MB-16089 *MBLK* **Batch ID:** 16089 **Analysis Date:** 6/6/2008 1:12:49 PM

Arsenic	ND	mg/L	0.020
Barium	ND	mg/L	0.010
Cadmium	ND	mg/L	0.0020
Calcium	ND	mg/L	0.50
Chromium	ND	mg/L	0.0060
Lead	ND	mg/L	0.0050
Magnesium	ND	mg/L	0.50
Potassium	ND	mg/L	1.0
Selenium	ND	mg/L	0.050
Silver	ND	mg/L	0.0050
Sodium	ND	mg/L	0.50

Sample ID: LCS-16089 *LCS* **Batch ID:** 16089 **Analysis Date:** 6/6/2008 10:47:25 AM

Arsenic	0.5282	mg/L	0.020	106	80	120
Barium	0.4907	mg/L	0.010	98.1	80	120
Cadmium	0.5011	mg/L	0.0020	100	80	120
Calcium	50.71	mg/L	0.50	101	80	120
Chromium	0.5060	mg/L	0.0060	101	80	120
Lead	0.4927	mg/L	0.0050	98.5	80	120
Magnesium	50.86	mg/L	0.50	102	80	120
Potassium	52.58	mg/L	1.0	105	80	120
Selenium	0.4768	mg/L	0.050	95.4	80	120
Silver	0.5005	mg/L	0.0050	100	80	120
Sodium	53.65	mg/L	0.50	107	80	120

Method: SM 2540C Total Dissolved Solids

Sample ID: MB-16086 *MBLK* **Batch ID:** 16086 **Analysis Date:** 6/2/2008

Total Dissolved Solids ND mg/L 20

Sample ID: LCS-16086 *LCS* **Batch ID:** 16086 **Analysis Date:** 6/2/2008

Total Dissolved Solids 1007 mg/L 20 101 80 120

Qualifiers:

- | | |
|--|--|
| E Value above quantitation range | H Holding times for preparation or analysis exceeded |
| J Analyte detected below quantitation limits | ND Not Detected at the Reporting Limit |
| R RPD outside accepted recovery limits | S Spike recovery outside accepted recovery limits |

Hall Environmental Analysis Laboratory, Inc.

Sample Receipt Checklist

Client Name SHO

Date Received:

5/30/2008

Work Order Number 0805406

Received by: TLS

Checklist completed by:

Janey Shonuin
Signature

5/30/08
Date

Sample ID labels checked by:

TS
Initials

Matrix:

Carrier name Client drop-off

- Shipping container/cooler in good condition? Yes No Not Present
- Custody seals intact on shipping container/cooler? Yes No Not Present Not Shipped
- Custody seals intact on sample bottles? Yes No N/A
- Chain of custody present? Yes No
- Chain of custody signed when relinquished and received? Yes No
- Chain of custody agrees with sample labels? Yes No
- Samples in proper container/bottle? Yes No
- Sample containers intact? Yes No
- Sufficient sample volume for indicated test? Yes No
- All samples received within holding time? Yes No
- Water - VOA vials have zero headspace? No VOA vials submitted Yes No
- Water - Preservation labels on bottle and cap match? Yes No N/A
- Water - pH acceptable upon receipt? Yes No N/A

Container/Temp Blank temperature?

7°

<6° C Acceptable

If given sufficient time to cool.

COMMENTS:

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: *Head #2 has very low volume. Per EM don't run Hg 5/30/08*

Corrective Action _____



www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Turn-Around Time: Standard Rush
 Project Name: **B O I**
 Project #: **B O I / Bloomfield**
 Project Manager: **Erwin Melis**
 Sampler: **Erwin Melis**
 Ice Yes No
 Sample Temperature

Chain-of-Custody Record
 Client: **JSAI**
 Address: **2611 Broadben Plwy**
Alb., NM 87107
 Phone #: **345-3407**
 email or Fax#: **emelis@shomaker.com**
 QA/QC Package:
 Standard Level 4 (Full Validation)
 Other _____
 EDD (Type) _____

Date	Time	Sample Request ID	Container Type and #	Preservative Type	HEAL No.
5/29/08	12:45	B O I - MW 1 - 2			08054010
5/29/08	13:15	B O I - MW 2			1
		trip blank			2
		Spikes			3

<input checked="" type="checkbox"/>	BTEX + MTBE + TMB's (8021)
<input checked="" type="checkbox"/>	BTEX + MTBE + TPH (Gas only)
<input checked="" type="checkbox"/>	TPH Method 8015B (Gas/Diesel)
	TPH (Method 418.1)
	EDB (Method 504.1)
	EDC (Method 8260)
	8310 (PNA or PAH)
	Anions (F, Cl, NO ₃ , NO ₂ , PO ₄ , SO ₄)
	8081 Pesticides / 8082 PCBs
	8260B (VOA)
	8270 (Semi-VOA)
	Cat/Anion total
	BCPH B minus H ₂ S
	Air Bubbles (Y or N)

Date: **5/29/08** Time: **10:45** Relinquished by: **Erwin A. Melis**
 Date: _____ Time: _____ Relinquished by: _____
 Received by: **5/30/08 10:45**
Erwin Melis
 Received by: _____

Remarks: **On the second sample do TDS please - please by another cabin if possible.**

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

ATTACHMENT IV.2.F
SHOMAKER 2008C – 11/19/08 TECH MEMO; WELL A-2 WATER QUALITY

JOHN SHOMAKER & ASSOCIATES, INC.

WATER-RESOURCE AND ENVIRONMENTAL CONSULTANTS

2611 BROADBENT PARKWAY NE
ALBUQUERQUE, NEW MEXICO 87107
(505) 345-3407, FAX (505) 345-9920
www.shomaker.com

MEMORANDUM

To: John Volkerding, PhD, Basin Disposal, Inc.

From: Erwin A. Melis, PhD, Hydrogeologist, JSAI

Date: November 19, 2008

Subject: Results from water-quality testing of assessment well No. 2 at Basin Disposal, Inc., Bloomfield, San Juan County, New Mexico

This memorandum describes the results of water-quality testing at the second assessment well (AW-2) at Basin Disposal, Inc. Locations of the two assessment wells (No. 1 and No. 2) are shown on the map attached as Figure 1. The objective of the assessment wells was to test for the presence of ground water at the site. Our report of September 2008 (JSAI, 2008¹) described perched ground water at the site with a total dissolved solids concentration of between 24,000 and 38,000 milligrams per liter (mg/L), above the above the total dissolved solids (TDS) concentration of 10,000 mg/L for fresh water (to be protected), per NMAC 19.15.36.8 C. (15) (b), as defined in NMAC 19.15.1.7 F. (3). This memorandum adds the results of a water-quality analysis at AW-2 to the AW-1 results given in our previous report (JSAI, 2008).

Well Development and Field Ground-Water Quality

Prior to sampling, well AW-2 was purged by hand using a dedicated, disposable bailer on October 30, 2008. The depth to water, pH, specific conductance, and temperature of produced water were periodically measured during purging. On October 30, 2008, AW-2 had an initial water level of 17.74 feet below ground level (ft bgl), and a post sampling water level of 20.31 ft bgl. Specific conductance values in AW-2 were within 3 percent before and after bailing, whereas pH and temperature in AW-2 were essentially constant during development.

¹ [JSAI] John Shomaker & Associates, Inc., 2008, Subsurface and Ground-Water Investigation in Support of the Modification of a Surface Waste Management Facility, Basin Disposal, Inc., Bloomfield, New Mexico: consultant's report, 16 p.

Field water-quality data for AW-2 (Table 1) indicate elevated values of specific conductance during the October 30, 2008 sampling event. During the October 30, 2008 sampling event, water at AW-2 was clear, without the lacquer-like odor that was detected during drilling of the nearby BH-2 on May 27, 2008. A summary of the field water-quality measurements is provided in Table 1.

Table 1. Summary of field measurement of specific conductance, pH, and temperature in Basin Disposal AW-2, October 30, 2008, Bloomfield, New Mexico

	specific conductance, $\mu\text{S}/\text{cm}$	pH	temperature, $^{\circ}\text{C}$
AW-2	31,190 \pm 30	7.51	17.2

$^{\circ}\text{C}$ - degrees Celsius

$\mu\text{S}/\text{cm}$ - microSiemens per centimeter

Ground-Water Quality Results - Organics

Water from AW-2 was analyzed according to U.S. Environmental Protection Agency (EPA) method 8021B, EPA method 8015B-GRO, EPA method 8015B-DRO, and also EPA method 418.1 (Total Petroleum Hydrocarbons) on October 30, 2008. Concentrations of organic parameters analyzed were below the laboratory detection limits (Table 2). Attached is a copy of the full laboratory results, which contains QA/QC results and the chain-of-custody form for the October 30, 2008 sampling event.

Table 2. Summary of laboratory analyses of selected organic compounds in ground-water samples collected October 30, 2008 from AW-2, Basin Disposal Site, Bloomfield, New Mexico

constituent	unit	AW-2	NMWQCC standard
diesel range organics	mg/L	<1.0	no standard
motor range organics	mg/L	<5.0	no standard
gasoline range organics	mg/L	<0.05	no standard
MTBE	$\mu\text{g}/\text{L}$	<2.5	no standard
benzene	$\mu\text{g}/\text{L}$	<1.0	10
toluene	$\mu\text{g}/\text{L}$	<1.0	750
ethylbenzene	$\mu\text{g}/\text{L}$	<1.0	750
total xylenes	$\mu\text{g}/\text{L}$	<2.0	620
1, 2, 4-trimethylbenzene	$\mu\text{g}/\text{L}$	<1.0	no standard
1, 3, 5-trimethylbenzene	$\mu\text{g}/\text{L}$	<1.0	no standard
total petroleum hydrocarbons	mg/L	<1.0	no standard

NMWQCC - New Mexico Water Quality Control Commission
mg/L - milligrams per liter

$\mu\text{g}/\text{L}$ - micrograms per liter
MTBE - methyl tert-butyl ether

Water-Quality Results – Cations, Anions, RCRA Metals

Samples of ground water from AW-2 were also collected for laboratory analysis for major cations, anions, and RCRA metals. Water produced from AW-2 had elevated concentrations of TDS, chloride, and sulfate (EPA method 300.0) when compared to the New Mexico Water Quality Control Commission (NMWQCC) standards (see Table 3). The high TDS concentration resulted in elevated detection limits for some parameters, and as a result, detection limits for arsenic, cadmium, and selenium concentrations are at or above the applicable NMWQCC standards (Table 3). The laboratory report and chain-of-custody documentation are attached.

Table 3. Summary of water-quality analysis results from AW-2, sampled at the Basin Disposal Site, Bloomfield, San Juan County, New Mexico

constituent	unit	AW-2	NMWQCC discharge standard
date sampled		10/30/2008	
TDS	mg/L	29,000	1,000
bromide	mg/L	9.5	no standards
chloride	mg/L	2,600	250
fluoride	mg/L	<1.0	1.6
nitrite	mg/L	<1.0	no standard
nitrate	mg/L	<1.0	10 (total)
phosphorus	mg/L	<5.0	no standards
sulfate	mg/L	17,000	600
arsenic (total)	mg/L	<0.10	0.10
barium	mg/L	<0.10	1.0
cadmium	mg/L	<0.01	0.01
calcium	mg/L	420	no standard
chromium	mg/L	<0.03	0.05
lead	mg/L	<0.025	0.05
magnesium	mg/L	230	no standard
mercury	mg/L	<0.0002	0.002
potassium	mg/L	32	no standard
selenium	mg/L	<0.25	0.05
silver	mg/L	<0.025	0.05
sodium	mg/L	10,000	no standard

NMWQCC - New Mexico Water Quality Control Commission
bold - result exceeds standard

TDS - total dissolved solids
 mg/L - milligrams per liter

Em:em

Enc: Figure 1

Copy of full laboratory report



Figure 1. Aerial photograph showing the locations of the existing pond, the drilled boreholes, initial assessment wells, proposed evaporation ponds, and well site of the Conoco-Phillips Martin 3 No. 1, Basin Disposal Site, Bloomfield, New Mexico.

JOHN SHOMAKER & ASSOCIATES, INC.



COVER LETTER

Friday, November 14, 2008

Erwin Melis
John Shomaker & Assoc.
2611 Broadbent Parkway NE
Albuquerque, NM 87107
TEL: (505) 250-1607
FAX (505) 345-9920

RE: BDI

Order No.: 0810632

Dear Erwin Melis:

Hall Environmental Analysis Laboratory, Inc. received 2 sample(s) on 10/30/2008 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman", is written over a horizontal line.

Andy Freeman, Business Manager
Nancy McDuffie, Laboratory Manager

NM Lab # NM9425
AZ license # AZ0682
ORELAP Lab # NM100001
Texas Lab# T104704424-08-TX



Hall Environmental Analysis Laboratory, Inc.

Date: 14-Nov-08

CLIENT: John Shomaker & Assoc.
Lab Order: 0810632
Project: BDI
Lab ID: 0810632-01

Client Sample ID: AW-2
Collection Date: 10/30/2008 12:30:00 PM
Date Received: 10/30/2008
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
						Analyst: SCC
EPA METHOD 8015B: DIESEL RANGE						
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	11/5/2008
Motor Oil Range Organics (MRO)	ND	5.0		mg/L	1	11/5/2008
Surr: DNOP	135	58-140		%REC	1	11/5/2008
						Analyst: DAM
EPA METHOD 8015B: GASOLINE RANGE						
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	11/6/2008 11:45:00 PM
Surr: BFB	87.8	59.9-122		%REC	1	11/6/2008 11:45:00 PM
						Analyst: DAM
EPA METHOD 8021B: VOLATILES						
Methyl tert-butyl ether (MTBE)	ND	2.5		µg/L	1	11/6/2008 11:45:00 PM
Benzene	ND	1.0		µg/L	1	11/6/2008 11:45:00 PM
Toluene	ND	1.0		µg/L	1	11/6/2008 11:45:00 PM
Ethylbenzene	ND	1.0		µg/L	1	11/6/2008 11:45:00 PM
Xylenes, Total	ND	2.0		µg/L	1	11/6/2008 11:45:00 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	11/6/2008 11:45:00 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	11/6/2008 11:45:00 PM
Surr: 4-Bromofluorobenzene	81.5	65.9-130		%REC	1	11/6/2008 11:45:00 PM
						Analyst: IC
EPA METHOD 300.0: ANIONS						
Fluoride	ND	1.0		mg/L	10	10/31/2008 1:24:47 PM
Chloride	2600	20		mg/L	200	11/11/2008 1:20:17 AM
Nitrogen, Nitrite (As N)	ND	1.0		mg/L	10	10/31/2008 1:24:47 PM
Bromide	9.5	1.0		mg/L	10	10/31/2008 1:24:47 PM
Nitrogen, Nitrate (As N)	ND	1.0		mg/L	10	10/31/2008 1:24:47 PM
Phosphorus, Orthophosphate (As P)	ND	5.0		mg/L	10	10/31/2008 1:24:47 PM
Sulfate	17000	250		mg/L	500	11/14/2008 6:07:21 AM
						Analyst: SNV
EPA METHOD 7470: MERCURY						
Mercury	ND	0.00020		mg/L	1	11/2/2008 8:01:18 PM
						Analyst: TES
EPA METHOD 6010B: DISSOLVED METALS						
Calcium	420	5.0		mg/L	5	11/3/2008 7:32:10 PM
Magnesium	230	5.0		mg/L	5	11/3/2008 7:32:10 PM
Potassium	32	1.0		mg/L	1	11/3/2008 7:26:31 PM
Sodium	10000	500		mg/L	500	11/3/2008 8:12:50 PM
						Analyst: NMO
EPA 6010B: TOTAL RECOVERABLE METALS						
Arsenic	ND	0.10		mg/L	5	11/5/2008 2:48:32 PM
Barium	ND	0.10		mg/L	5	11/5/2008 1:09:02 PM
Cadmium	ND	0.010		mg/L	5	11/5/2008 1:09:02 PM
Chromium	ND	0.030		mg/L	5	11/5/2008 1:09:02 PM
Lead	ND	0.025		mg/L	5	11/5/2008 1:09:02 PM

Qualifiers: * Value exceeds Maximum Contaminant Level
 E Estimated value
 J Analyte detected below quantitation limits
 ND Not Detected at the Reporting Limit
 S Spike recovery outside accepted recovery limits

B Analyte detected in the associated Method Blank
 H Holding times for preparation or analysis exceeded
 MCL Maximum Contaminant Level
 RL Reporting Limit

Hall Environmental Analysis Laboratory, Inc.

Date: 14-Nov-08

CLIENT:	John Shomaker & Assoc.	Client Sample ID:	AW-2
Lab Order:	0810632	Collection Date:	10/30/2008 12:30:00 PM
Project:	BDI	Date Received:	10/30/2008
Lab ID:	0810632-01	Matrix:	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst: NMO
Selenium	ND	0.25		mg/L	5	11/5/2008 2:48:32 PM
Silver	ND	0.025		mg/L	5	11/5/2008 1:09:02 PM
EPA METHOD 418.1: TPH						Analyst: LRW
Petroleum Hydrocarbons, TR	ND	1.0		mg/L	1	11/4/2008
SM 2540C: TDS						Analyst: KMB
Total Dissolved Solids	29000	20		mg/L	1	11/3/2008

Qualifiers:	*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
	E	Estimated value	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
	ND	Not Detected at the Reporting Limit	RL	Reporting Limit
	S	Spike recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

Date: 14-Nov-08

CLIENT: John Shomaker & Assoc.
 Lab Order: 0810632
 Project: BDI
 Lab ID: 0810632-02

Client Sample ID: Trip Blank
 Collection Date:
 Date Received: 10/30/2008
 Matrix: TRIP BLANK

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
Analyst: DAM						
EPA METHOD 8015B: GASOLINE RANGE						
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	11/7/2008 12:15:26 AM
Surr: BFB	92.3	59.9-122		%REC	1	11/7/2008 12:15:26 AM

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- E Estimated value
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- MCL Maximum Contaminant Level
- RL Reporting Limit

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0810632

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
---------	--------	-------	-----	------	----------	-----------	------	----------	------

Method: EPA Method 300.0: Anions

Sample ID: MB **MBLK** **Batch ID:** R30970 **Analysis Date:** 10/31/2008 9:38:28 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Nitrogen, Nitrite (As N)	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrogen, Nitrate (As N)	ND	mg/L	0.10
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

Batch ID: R30970 **Analysis Date:** 11/1/2008 12:08:58 AM

Sample ID: MB **MBLK**

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Nitrogen, Nitrite (As N)	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrogen, Nitrate (As N)	ND	mg/L	0.10
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

Batch ID: R31092 **Analysis Date:** 11/10/2008 9:22:52 AM

Sample ID: MB **MBLK**

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Nitrogen, Nitrite (As N)	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrogen, Nitrate (As N)	ND	mg/L	0.10
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

Batch ID: R31170 **Analysis Date:** 11/13/2008 10:06:06 AM

Sample ID: MB **MBLK**

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Nitrogen, Nitrite (As N)	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrogen, Nitrate (As N)	ND	mg/L	0.10
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

Batch ID: R30970 **Analysis Date:** 10/31/2008 9:55:52 AM

Sample ID: LCS **LCS**

Fluoride	0.5085	mg/L	0.10	102	90	110
Chloride	5.050	mg/L	0.10	101	90	110
Nitrogen, Nitrite (As N)	1.014	mg/L	0.10	101	90	110
Bromide	2.539	mg/L	0.10	102	90	110
Nitrogen, Nitrate (As N)	2.613	mg/L	0.10	105	90	110
Phosphorus, Orthophosphate (As P)	5.050	mg/L	0.50	101	90	110
Sulfate	10.35	mg/L	0.50	103	90	110

Batch ID: R30970 **Analysis Date:** 11/1/2008 12:26:23 AM

Sample ID: LCS **LCS**

Fluoride	0.4930	mg/L	0.10	98.6	90	110
Chloride	4.784	mg/L	0.10	95.7	90	110
Nitrogen, Nitrite (As N)	0.9554	mg/L	0.10	95.5	90	110

Qualifiers:

- E Estimated value
- J Analyte detected below quantitation limits
- R RPD outside accepted recovery limits
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0810632

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
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Method: EPA Method 300.0: Anions

Sample ID: LCS		LCS			Batch ID:	R30970	Analysis Date:	11/1/2008 12:26:23 AM	
Bromide	2.419	mg/L	0.10	96.8	90	110			
Nitrogen, Nitrate (As N)	2.452	mg/L	0.10	98.1	90	110			
Phosphorus, Orthophosphate (As P)	4.801	mg/L	0.50	96.0	90	110			
Sulfate	9.545	mg/L	0.50	95.5	90	110			
Sample ID: LCS		LCS			Batch ID:	R31092	Analysis Date:	11/10/2008 9:40:16 AM	
Fluoride	0.4516	mg/L	0.10	90.3	90	110			
Chloride	4.742	mg/L	0.10	94.8	90	110			
Nitrogen, Nitrite (As N)	0.9015	mg/L	0.10	90.2	90	110			
Bromide	2.458	mg/L	0.10	98.3	90	110			
Nitrogen, Nitrate (As N)	2.390	mg/L	0.10	95.6	90	110			
Phosphorus, Orthophosphate (As P)	4.794	mg/L	0.50	95.9	90	110			
Sulfate	9.767	mg/L	0.50	97.7	90	110			
Sample ID: LCS		LCS			Batch ID:	R31170	Analysis Date:	11/13/2008 10:23:30 AM	
Fluoride	0.4985	mg/L	0.10	99.7	90	110			
Chloride	4.677	mg/L	0.10	93.5	90	110			
Nitrogen, Nitrite (As N)	0.9444	mg/L	0.10	94.4	90	110			
Bromide	2.416	mg/L	0.10	96.6	90	110			
Nitrogen, Nitrate (As N)	2.393	mg/L	0.10	95.7	90	110			
Phosphorus, Orthophosphate (As P)	4.153	mg/L	0.50	83.1	90	110	S		
Sulfate	10.03	mg/L	0.50	100	90	110			

Method: EPA Method 418.1: TPH

Sample ID: MB-17541		MBLK			Batch ID:	17541	Analysis Date:	11/4/2008	
Petroleum Hydrocarbons, TR	ND	mg/L	1.0						
Sample ID: LCS-17541		LCS			Batch ID:	17541	Analysis Date:	11/4/2008	
Petroleum Hydrocarbons, TR	4.660	mg/L	1.0	93.2	78.5	120			
Sample ID: LCSD-17541		LCSD			Batch ID:	17541	Analysis Date:	11/4/2008	
Petroleum Hydrocarbons, TR	4.600	mg/L	1.0	92.0	78.5	120	1.30	20	

Method: EPA Method 8015B: Diesel Range

Sample ID: MB-17539		MBLK			Batch ID:	17539	Analysis Date:	11/5/2008	
Diesel Range Organics (DRO)	ND	mg/L	1.0						
Motor Oil Range Organics (MRO)	ND	mg/L	5.0						
Sample ID: LCS-17539		LCS			Batch ID:	17539	Analysis Date:	11/5/2008	
Diesel Range Organics (DRO)	6.243	mg/L	1.0	125	74	157			
Sample ID: LCSD-17539		LCSD			Batch ID:	17539	Analysis Date:	11/5/2008	
Diesel Range Organics (DRO)	6.376	mg/L	1.0	128	74	157	2.10	23	

Qualifiers:

E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	S	Spike recovery outside accepted recovery limits

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0810632

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
---------	--------	-------	-----	------	----------	-----------	------	----------	------

Method: EPA Method 8015B: Gasoline Range

Sample ID: 0810632-01A MSD		MSD				Batch ID: R31040	Analysis Date: 11/7/2008 1:33:48 PM		
Gasoline Range Organics (GRO)	0.4292	mg/L	0.050	85.8	80	115	4.42	8.39	
Sample ID: 5ML RB		MBLK				Batch ID: R31040	Analysis Date: 11/6/2008 9:30:33 AM		
Gasoline Range Organics (GRO)	ND	mg/L	0.050						
Sample ID: 2.5UG GRO LCS		LCS				Batch ID: R31040	Analysis Date: 11/7/2008 4:51:20 AM		
Gasoline Range Organics (GRO)	0.4598	mg/L	0.050	92.0	80	115			
Sample ID: 0810632-01A MS		MS				Batch ID: R31040	Analysis Date: 11/7/2008 1:03:14 PM		
Gasoline Range Organics (GRO)	0.4486	mg/L	0.050	89.7	80	115			

Method: EPA Method 8021B: Volatiles

Sample ID: 100NG BTEX LCS		LCS				Batch ID: R31040	Analysis Date: 11/7/2008 5:21:46 AM		
Methyl tert-butyl ether (MTBE)	24.96	µg/L	2.5	125	51.2	138			
Benzene	20.99	µg/L	1.0	105	85.9	113			
Toluene	21.44	µg/L	1.0	107	86.4	113			
Ethylbenzene	21.56	µg/L	1.0	108	83.5	118			
Xylenes, Total	64.46	µg/L	2.0	107	83.4	122			
1,2,4-Trimethylbenzene	21.72	µg/L	1.0	109	83.5	115			
1,3,5-Trimethylbenzene	20.79	µg/L	1.0	104	85.2	113			

Method: EPA Method 7470: Mercury

Sample ID: MBLK-17519		MBLK				Batch ID: 17519	Analysis Date: 11/2/2008 7:12:41 PM		
Mercury	ND	mg/L	0.00020						
Sample ID: LCS1-17519		LCS				Batch ID: 17519	Analysis Date: 11/2/2008 7:14:28 PM		
Mercury	0.004835	mg/L	0.00020	96.7	80	120			

Method: EPA Method 6010B: Dissolved Metals

Sample ID: MB		MBLK				Batch ID: R30991	Analysis Date: 11/3/2008 5:48:58 PM		
Calcium	ND	mg/L	1.0						
Magnesium	ND	mg/L	1.0						
Potassium	ND	mg/L	1.0						
Sodium	ND	mg/L	1.0						
Sample ID: LCS		LCS				Batch ID: R30991	Analysis Date: 11/3/2008 5:52:02 PM		
Calcium	52.38	mg/L	1.0	104	80	120			
Magnesium	52.25	mg/L	1.0	103	80	120			
Potassium	54.69	mg/L	1.0	99.4	80	120			
Sodium	55.57	mg/L	1.0	110	80	120			

Qualifiers:

- | | | |
|--|----|--|
| E Estimated value | H | Holding times for preparation or analysis exceeded |
| J Analyte detected below quantitation limits | ND | Not Detected at the Reporting Limit |
| R RPD outside accepted recovery limits | S | Spike recovery outside accepted recovery limits |

QA/QC SUMMARY REPORT

Client: John Shomaker & Assoc.
Project: BDI

Work Order: 0810632

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
---------	--------	-------	-----	------	----------	-----------	------	----------	------

Method: EPA 6010B: Total Recoverable Metals

Sample ID: MB-17522 *MBLK* **Batch ID:** 17522 **Analysis Date:** 11/5/2008 9:28:24 AM

Barium	ND	mg/L	0.010
Cadmium	ND	mg/L	0.0020
Chromium	ND	mg/L	0.0060
Lead	ND	mg/L	0.0050
Silver	ND	mg/L	0.0050

Sample ID: LCS-17522 *LCS* **Batch ID:** 17522 **Analysis Date:** 11/5/2008 9:31:36 AM

Barium	0.4770	mg/L	0.010	95.4	80	120
Cadmium	0.4839	mg/L	0.0020	96.8	80	120
Chromium	0.4926	mg/L	0.0060	98.5	80	120
Lead	0.4753	mg/L	0.0050	95.1	80	120
Silver	0.4869	mg/L	0.0050	97.0	80	120

Method: SM 2540C: TDS

Sample ID: MB-17531 *MBLK* **Batch ID:** 17531 **Analysis Date:** 11/3/2008

Total Dissolved Solids ND mg/L 20

Sample ID: LCS-17531 *LCS* **Batch ID:** 17531 **Analysis Date:** 11/3/2008

Total Dissolved Solids 987.0 mg/L 20 98.7 80 120

Qualifiers:

- | | |
|--|--|
| E Estimated value | H Holding times for preparation or analysis exceeded |
| J Analyte detected below quantitation limits | ND Not Detected at the Reporting Limit |
| R RPD outside accepted recovery limits | S Spike recovery outside accepted recovery limits |

Hall Environmental Analysis Laboratory, Inc.

Sample Receipt Checklist

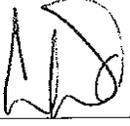
Client Name SHO

Date Received:

10/30/2008

Work Order Number 0810632

Received by: ARS



Sample ID labels checked by:



Checklist completed by:

10/30/08

Initials

Signature

Date

Matrix:

Carrier name Client drop-off

- Shipping container/cooler in good condition? Yes No Not Present
- Custody seals intact on shipping container/cooler? Yes No Not Present Not Shipped
- Custody seals intact on sample bottles? Yes No N/A
- Chain of custody present? Yes No
- Chain of custody signed when relinquished and received? Yes No
- Chain of custody agrees with sample labels? Yes No
- Samples in proper container/bottle? Yes No
- Sample containers intact? Yes No
- Sufficient sample volume for indicated test? Yes No
- All samples received within holding time? Yes No
- Water - VOA vials have zero headspace? No VOA vials submitted Yes No
- Water - Preservation labels on bottle and cap match? Yes No N/A
- Water - pH acceptable upon receipt? Yes No N/A
- Container/Temp Blank temperature? 4° <6° C Acceptable
If given sufficient time to cool.

COMMENTS:

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____



HALL ENVIRONMENTAL ANALYSIS LABORATORY
www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109
Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Turn-Around Time:
 Standard Rush
 Project Name: **80 I**
 Project #: **Barin Disposal, Inc AW-2**
 Project Manager: **Edwin A. Melis**
 Sampler: **Edwin A. Melis**

Chain-of-Custody Record
 Client: **JSAI**
 Mailing Address: **2611 Breadbeat Parkway, Abq**
 Phone #: **345-3407**
 Email or Fax#: **emelis@shonales.com**
 QA/QC Package:
 Standard Level 4 (Full Validation)
 Other
 EDD (Type) _____

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	TPH Method 8015B (Gas/Diesel)	TPH (Method 418.1)	EDB (Method 504.1)	8310 (PNA or PAH)	RORA 8 Metals	Anions (F, Cl, NO ₃ , NO ₂ , PO ₄ , SO ₄)	8081 Pesticides / 8082 PCBs	8260B (VOA)	8270 (Semi-VOA)	Air Bubbles (Y or N)
10/30	12:30	- AW-2	nb by mistake opened one bleach bottle	1											X See attached list
			Trip Blank	2											

Relinquished by: **[Signature]** Date: **10/30/07**
 Relinquished by: **[Signature]** Date: **16:10 10/30/07**

Date: **10/30** Time: **16:10**
 Date: _____ Time: _____

Remarks:

Basin Disposal, Inc.
Application for Permit Renewal
Volume IV: Siting and Hydrogeology
Section 2: Hydrogeology
November 2019 (Updated December 2022)

ATTACHMENT IV.2.G
SHOMAKER 2008D – 5/2/09 LTR RPT POND WATER QUALITY COMPARISON

JOHN SHOMAKER & ASSOCIATES, INC.

WATER-RESOURCE AND ENVIRONMENTAL CONSULTANTS



2611 BROADBENT PARKWAY NORTHEAST
ALBUQUERQUE, NEW MEXICO 87107
(505) 345-3407, FAX (505) 345-9920
www.shomaker.com

May 22, 2009

John Volkerding, Ph.D.
Basin Disposal, Inc.
P.O. Box 100
Aztec, New Mexico 87410

Re: Ground-water and pond-water comparison at Basin Disposal, Inc., Bloomfield, NM

Dear John:

This letter report is in response to the May 1, 2009 New Mexico Oil Conservation Division (NMOCD) request for additional information, and compares water-quality test results of perched ground water at the Basin Disposal Site to the pond water at the Basin Disposal facility and to regional “fresh” ground water. Water-quality test results of the perched water were obtained from the two assessment wells drilled in May of 2008 and sampled on May 27, and October 30, 2008 at Basin Disposal, Inc. (NMOCD Permit application Volume IV, Section 2; JSAI, 2008; JSAI Memorandum of November 19, 2008). Basin Disposal’s pond water was sampled by GE Osmonics on August 4, 2006, with the laboratory report completed by GE Infrastructure, Water and Process Technology Division on August 16, 2006. Locations of the two assessment wells (AW-1 and AW- 2) and the existing pond are shown on the map attached as Figure 1. The five regional wells used as an average to represent the background “fresh” ground-water quality are summarized from Stone et al., 1983 and are shown in Figure 2. Water-quality results are presented in Table 1.

Basin Disposal Assessment Wells

Borehole data strongly suggest that ground water at the Site is present under perched conditions. Physical evidence includes moist fracture zones, moist ‘clay-rich’ areas prone to dissolution within the Nacimiento Formation cores retrieved during drilling at the Site, and assessment wells that collected ground water at the Site, above a level at which a core in the same borehole was dry. On May 29, 2008, two assessment wells, AW-1 and AW-2 at Basin Disposal, Inc., had respective water elevations of 5,672.83 and 5,690.05 ft above mean sea-level (ft amsl) (figures 7 and 8 in JSAI, 2008 used with Bore Hole Survey dated December 2, 2008 and provided by Basin Disposal, Inc.). In contrast, the regional water-level elevation is between 5,600 ft and 5,500 ft amsl (figure 6 in JSAI, 2008).

JOHN SHOMAKER & ASSOCIATES, INC.
WATER-RESOURCE AND ENVIRONMENTAL CONSULTANTS

John Volkerding, Ph.D.

- 2 -

May 22, 2009

Ground water in these assessment wells was submitted for analysis and the total dissolved solids (TDS), anions, mercury, dissolved metals, and the total recoverable metals are summarized from reports by JSAI (2008; JSAI Memorandum dated November 19, 2008). Perched ground water at the Site has TDS concentrations of between 24,000 and 38,000 mg/L, above the TDS concentration of 10,000 mg/L for fresh water (to be protected), per NMAC 19.15.36.8 C. (15) (b), as defined in NMAC 19.15.1.7 F. (3), and outside the jurisdiction of the NMOCD (JSAI, 2008). Water produced from the assessment wells had elevated concentrations of TDS, chloride, fluoride, nitrate, sulfate, and lead (EPA method 6010 measures total recoverable metals) when compared to the New Mexico Water Quality Control Commission (NMWQCC) standards (see Table 1). The ground water in the assessment wells can be classified as Na-SO₄ type water on a Piper diagram (Figure 3). Piper diagrams plot the number of major ions in water, balancing mass and electric charge.

Regional Ground-Water Quality

As mentioned in the ground-water investigation (JSAI, 2008), regional ground water has a relatively high average specific conductance and TDS content, except where shallow recharge decreases these parameters (Stone et al., 1983). Recharge occurs from the Animas River, the San Juan River, and irrigation canals in the floodplain, lowering the average specific conductance of ground water in alluvial wells (1,690 micromhos per centimeter; $\mu\text{mhos/cm}$) as compared to water from wells completed in the underlying Nacimiento Formation (5,660 $\mu\text{mhos/cm}$).

Water-quality results for wells completed in the Nacimiento Formation on Crouch Mesa, near the Basin Disposal Site, are unavailable (Stone et al., 1983). Wells in the Nacimiento Formation but south of the San Juan River are characterized as Na-Ca-SO₄ ground water. This same characterization applies to alluvial ground water in an 8-mile radius of the Basin Disposal Site. In these wells, ground water contains high concentrations of calcium, sodium, and sulfate, and is also classified as Na-Ca-SO₄ type water (see Table 1).

The “fresh” ground-water aquifer probably encompasses the Ojo Alamo Sandstone in addition to the Nacimiento Formation, which lies on top of a relatively impermeable Kirtland Shale. For the purposes of this report the Kirtland Shale is considered an aquiclude. The thickness of the Nacimiento Formation and the Ojo Alamo Sandstone under the Basin Disposal Site is considered to be less than 941 ft (NMOCD oil & gas well records). Taking the thickness of these units and subtracting the unsaturated thickness based on water-elevation contours leads to an estimated maximum saturated thickness of at most 869 ft under the Basin Disposal Site and in some areas significantly less.

Disposal Pond Water Quality

Disposal-pond water, sampled on August 4, 2006 and reported by the laboratory on August 16, 2006, can be classified as a Na-Cl (sodium-chloride) type water that plots in different regions of a tri-linear (Piper) diagram (Figure 3).

John Volkerding, Ph.D.

- 3 -

May 22, 2009

Table 1. Summary of water-quality analysis results at the Basin Disposal Site and the surrounding area in Bloomfield, San Juan County, New Mexico

constituent	unit	AW-1 water sample	AW-2 water sample	average of 5 wells in a 8-mile radius (Stone et al., 1983)	Basin Disposal surface pond water sample	NMWQCC discharge standards
date sampled		5/27/2008	10/30/2008	ranges from 1933 to 1974	08/04/2006	
water type ¹		Na-SO ₄	Na-SO ₄	Na-Ca-SO ₄	Na-Cl	not applicable
TDS	mg/L	38,000	29,000	1,577	15,721 ²	1,000
bromide	mg/L	6.3	9.5	NA	NA	no standards
chloride	mg/L	2,300	2,600	25	7,600	250
fluoride	mg/L	1.7	<1.0	0.7	<0.1	1.6
nitrate	mg/L	11	<1.0	1.9	<1.0	10 (total)
phosphorus	mg/L	<5.0	<5.0	NR	5.3	no standards
sulfate	mg/L	18,000	17,000	1,249	978	600
arsenic (total)	mg/L	<0.20	<0.10	NA	NA	0.10
barium	mg/L	<0.20	<0.10	NA	3.1	1.0
cadmium	mg/L	<0.020	<0.010	NA	NA	0.01
calcium	mg/L	480	420	188	139	no standard
chromium	mg/L	<0.060	<0.030	NA	NA	0.05
lead	mg/L	0.098	<0.025	NA	0.019	0.05
magnesium	mg/L	300	230	24	31.5	no standard
mercury	mg/L	<0.00020	<0.00020	NA	0.001	0.002
potassium	mg/L	15	32	6	571	no standard
selenium	mg/L	<0.50	<0.25	NR	NA	0.05
silver	mg/L	<0.050	<0.025	NA	NA	0.05
sodium	mg/L	10,000	10,000	650	4,970	no standard

¹ - water type calculated by aqueous geochemistry software AquaChem, version 3.7.42 by Waterloo Hydrogeologic² - calculated total dissolved solids concentration from charge balance

NMWQCC - New Mexico Water Quality Control Commission

TDS - total dissolved solids

bold - result exceeds standard

mg/L - milligrams per liter

NA - not analyzed

ND - not determined

John Volkerding, Ph.D.

- 4 -

May 22, 2009

Conclusions

In summary, the water in the disposal ponds, assessment wells, and the regional “fresh” ground water are distinct and different from each other. The pond water has a higher chloride and lower sulfate concentration compared to the perched water in the assessment wells. In turn, assessment well (perched) water has higher concentrations of sulfate, TDS, and sodium compared to the regional “fresh” ground water in either bedrock or alluvial aquifers near the Basin Disposal Site (Stone et al., 1983). The differences in water quality indicate that the perched water is not from the disposal ponds, and that there is little or no hydraulic connection between the perched aquifer and the water in the regional “fresh” ground-water system.

Sincerely,

JOHN SHOMAKER & ASSOCIATES, INC.



Erwin A. Melis, Ph.D.
Hydrogeologist

Em:em

Enc: Figures 1, 2, and 3

References:

- [JSAI] John Shomaker & Associates, Inc., 2008, Subsurface and ground-water investigation in support of the modification of a surface waste management facility Basin Disposal, Inc. Bloomfield, New Mexico: consultant’s report to Basin Disposal, Inc., 14 p., plus figures and appendices.
- [JSAI] John Shomaker & Associates, Inc., Memorandum of November 19, 2008, Results from water-quality testing of assessment well No. 2 at Basin Disposal, Inc., Bloomfield, San Juan County, New Mexico, 3 p.
- Stone, W.J., Lyford, F.P., Frenzel, P.F., Mizell, N.H., and Padgett, E.T., 1983, Hydrogeologic Map of the San Juan Basin, New Mexico: New Mexico Bureau of Mines and Mineral Resources, Hydrologic Report 6, scale 1:500,000.

JOHN SHOMAKER & ASSOCIATES, INC.
WATER-RESOURCE AND ENVIRONMENTAL CONSULTANTS



Figure 1. Aerial photograph showing the locations of the existing pond, the drilled boreholes, initial assessment wells, proposed evaporation ponds, and well site of the Conoco-Phillips Martin 3 No. 1, Basin Disposal Site, Bloomfield, New Mexico.

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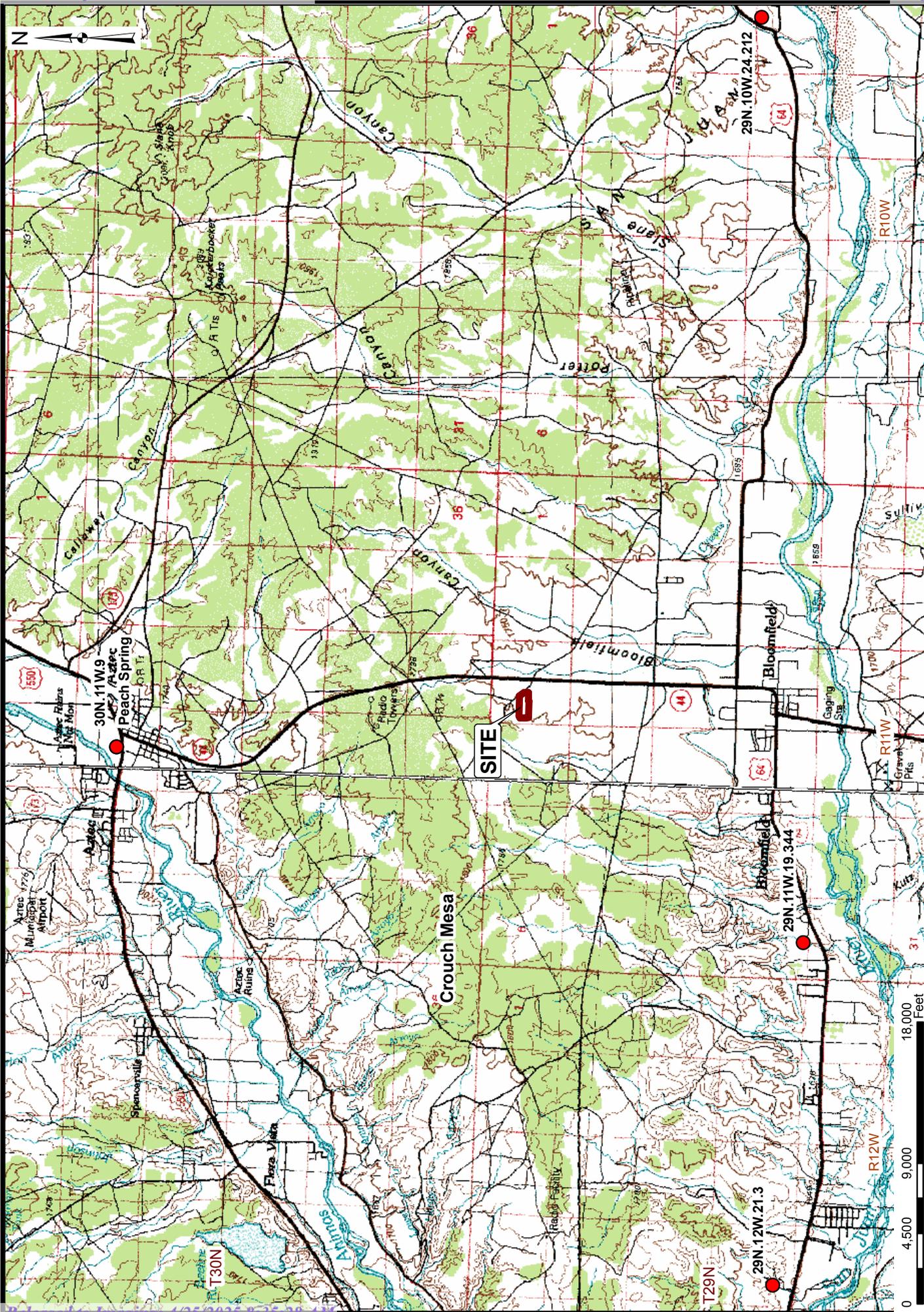


Figure 2. Topographic map of the Crouch Mesa area showing regional wells used to calculate the ground-water quality (Stone et al., 1983) within an 8-mile radius of the Basin Disposal site, Bloomfield, New Mexico.

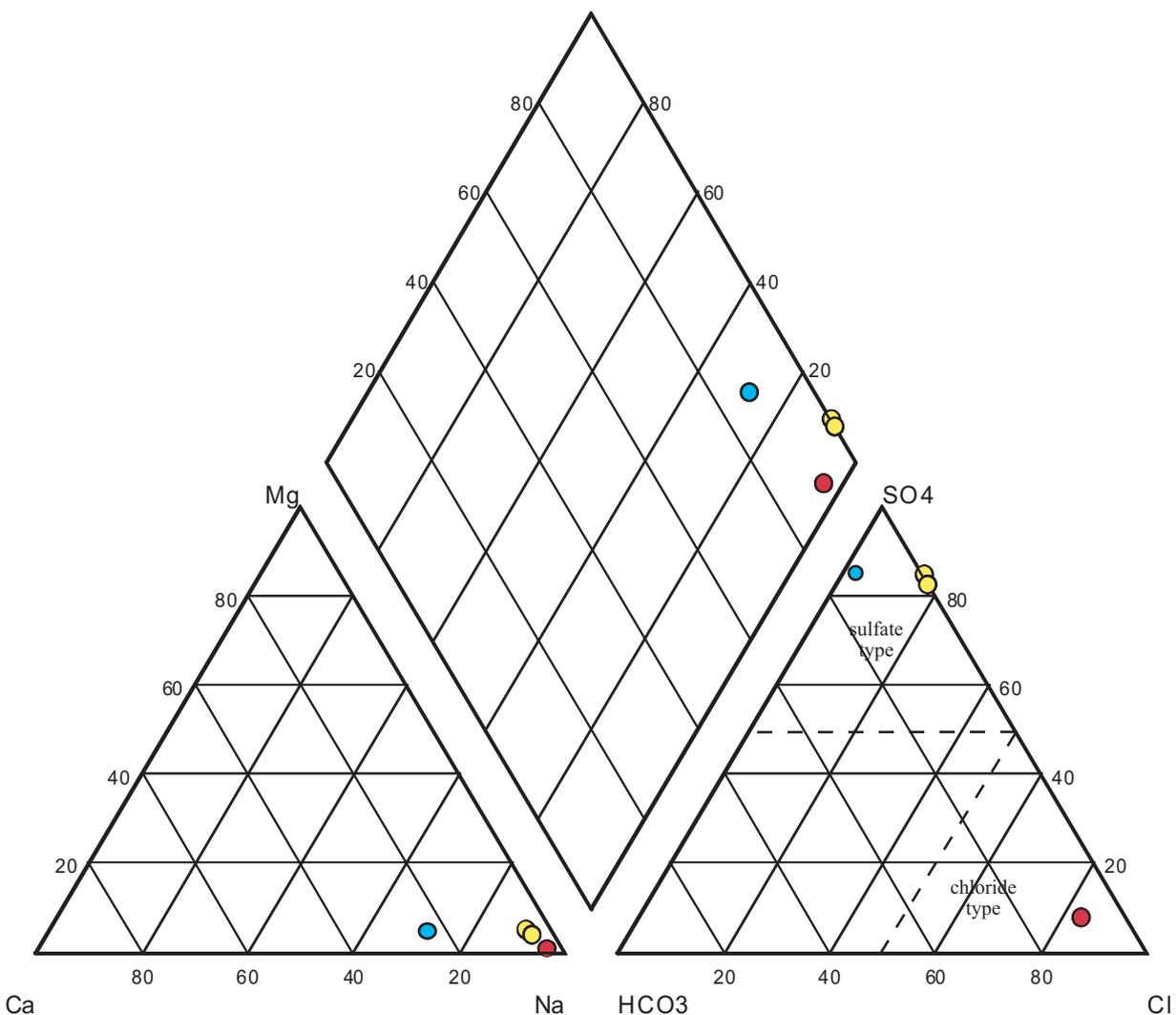
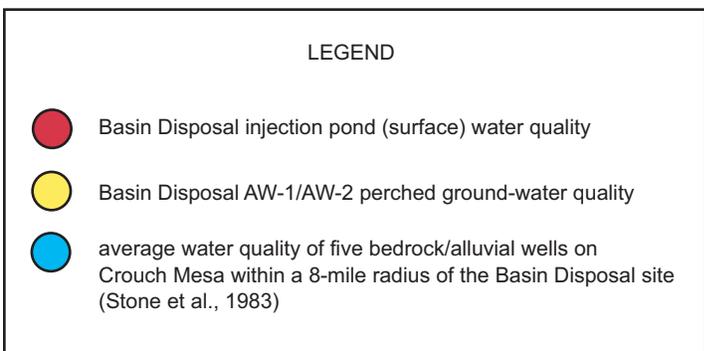


Figure 3. Tri-linear (Piper) diagram of three distinct types of water quality, including injection pond water, at the Basin Disposal site, north of Bloomfield, San Juan County, New Mexico.

Sante Fe Main Office
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General Information
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Online Phone Directory
<https://www.emnrd.nm.gov/ocd/contact-us>

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 455605

CONDITIONS

Operator: BASIN DISPOSAL INC P.O. Box 100 Aztec, NM 87410	OGRID: 1739
	Action Number: 455605
	Action Type: [C-137] Non-Fee SWMF Submittal (SWMF NON-FEE SUBMITTAL)

CONDITIONS

Created By	Condition	Condition Date
lbarr	None	4/25/2025