NM1 - ____57____

BORING PLAN(S)

2013

Jones, Brad A., EMNRD

From: Jones, Brad A., EMNRD
Sent: Thursday, May 30, 2013 5:59 PM
To: 'Charles Fiedler'
Cc: Mark Turnbough; 'wbcsw@aol.com'
Subject: RE: DNCS Supplemental Hydrogeo Workplan-FINAL
Attachments: 2013 0530 DNCS Properties LLC Boring Plan approval.pdf

Please see the attached… it is a copy of your approval. Hardcopies have been placed in the mail. If you have any questions regarding this matter, please do not hesitate to contact me.

Brad

Brad A. Jones
Environmental Engineer
Environmental Bureau
NM Oil Conservation Division
1220 S. St. Francis Drive
Santa Fe, New Mexico 87505
E-mail: brad.a.jones@state.nm.us
Office: (505) 476-3487
Fax: (505) 476-3462

From: Charles Fiedler [mailto:CFiedler@gordonenvironmental.com]
Sent: Thursday, May 30, 2013 3:16 PM
To: Jones, Brad A., EMNRD
Cc: Mark Turnbough; 'wbcsw@aol.com'
Subject: DNCS Supplemental Hydrogeo Workplan-FINAL
Importance: High

Good Afternoon Brad,

Attached is the final document for approval.

Thanks again for the prompt review.

Charles

Charles W. Fiedler, P.E., LEED AP
Senior Project Director
Gordon Environmental, Inc.
213 S. Camino del Pueblo
Bernalillo, NM 87004
C: 505-750-3164
P: 505-867-6990
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State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

David Martin
Cabinet Secretary-Designate

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Jami Bailey, Division Director
Oil Conservation Division

May 30, 2013

Charles Fiedler
Gordon Environmental, Inc.
213 S. Camino del Pueblo
Bernalillo, New Mexico 87004

RE: Hydrogeologic Investigation Boring Plan
Commercial Surface Waste Management Facility
DNCS Properties, LLC – Surface Waste Management Facility
Facility Location: Section 31, Township 17 South, Range 33 East, NMPM, Lea County, New Mexico

Dear Mr. Fiedler:

The Oil Conservation Division (OCD) has received Gordon Environmental Inc.'s boring plan proposal, dated May 30, 2013 and submitted on the behalf of DNCS Properties, LLC, to investigate and characterize the uppermost aquifer and subsurface geology for a proposed commercial surface waste management (landfill and ponds) facility permit located in Section 31, Township 17 South, Range 33 East, NMPM, Lea County, New Mexico. OCD has completed the review and determined that the proposal is adequate to proceed with the site investigation.

OCD agrees that the proposed boring locations appear adequate. However, if the hydrogeologic conditions cannot be determined, additional borings or monitoring wells may be needed.

The OCD appreciates your cooperation in providing a boring plan for review, in order to determine if the submitted application and the proposed site are suitable for consideration of approval. If there are any questions regarding this matter, please do not hesitate to contact me at (505) 476-3487 or brad.a.jones@state.nm.us.

Sincerely,

Brad A. Jones
Environmental Engineer

BAJ/baj

Cc: OCD District I Office, Hobbs
DNCS Properties, LLC, 2028 E. Hackberry Place, Chandler, AZ

Jones, Brad A., EMNRD

From: Charles Fiedler <CFiedler@gordonenvironmental.com>
Sent: Thursday, May 30, 2013 3:16 PM
To: Jones, Brad A., EMNRD
Cc: Mark Turnbough; 'wbcsw@aol.com'
Subject: DNCS Supplemental Hydrogeo Workplan-FINAL
Attachments: DNCS-Supplemental Hydrogeo Workplan 053013-Update.pdf

Importance: High

Good Afternoon Brad,

Attached is the final document for approval.

Thanks again for the prompt review.

Charles

Charles W. Fiedler, P.E., LEED AP
Senior Project Director
Gordon Environmental, Inc.
213 S. Camino del Pueblo
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SUPPLEMENTAL SUBSURFACE INVESTIGATION WORKPLAN

DNCS PROPERTIES, LLC SITE
LEA COUNTY, NEW MEXICO

MAY 30, 2013

SUBMITTED TO:
New Mexico Energy, Minerals and Natural Resources Department
Oil Conservation Division
1220 S. St. Francis Drive
Santa Fe, New Mexico 87505
Phone: 505.476.3440

PREPARED FOR:
DNCS PROPERTIES, LLC.
2028 E. Hackberry PL
Chandler, AZ 85286

PREPARED BY:
Gordon Environmental, Inc.
213 South Camino del Pueblo
Bernalillo, New Mexico 87004
Phone: 505.867.6990

Gordon Environmental, Inc.
Consulting Engineers

SUPPLEMENTAL SUBSURFACE INVESTIGATION WORKPLAN
DNCS PROPERTIES, LLC SITE
LEA COUNTY, NEW MEXICO
MAY 30, 2013

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SUPPLEMENTAL SUBSURFACE INVESTIGATION WORKPLAN
DNCS PROPERTIES, LLC SITE
LEA COUNTY, NEW MEXICO

1.0 PROJECT SUMMARY

The DNCS PROPERTIES, LLC Site has been selected after an exhaustive analysis of both regulatory and non-regulatory criteria as a prime candidate for development of a "Commercial Facility" (i.e., surface waste management facility) for oil and gas wastes permitted under 19.15.36 NMAC (i.e., "Part 36"). The site is currently controlled by DNCS PROPERTIES, LLC (DNCS).

DNCS has completed the initial drilling proposed in the initial Subsurface Investigation Workplan approved by the Oil Conservation Division (OCD) in February 2013. This investigation consisted of a field drilling program that confirmed compliance with the vertical groundwater setback distance of 100' from the proposed deepest landfill excavation grade. Three new borings were advanced to a depth of 150' below ground surface to augment the positive results of the preliminary drilling program. Consistent with regional database, no subsurface water was encountered in any of the five borings installed. Soil samples collected from the three borings are currently being subjected to laboratory analysis as outlined in the initial workplan to confirm geotechnical qualities. All results to-date for hydrogeologic, ecologic, and land use features point to a positive siting result in compliance with 19.15.36.13.

This Supplemental Subsurface Investigation Workplan (the Workplan) defines an additional field drilling and soil testing program to confirm compliance with the vertical groundwater setback distance of 50' to areas proposed for waste processing. Gordon Environmental, Inc. (GEI) is requesting OCD approval of this Workplan, the results of which will become a component of the Application for Permit. We originally met with OCD on 01/28/2013 to discuss the Project; and on 5/15/2013 we met to outline this Supplemental Workplan.

The DNCS Project is proposed to include a 495-acre ± surface waste management facility. The facility will be comprised of an east tract (318-acre ±) that includes the proposed landfill; and a west tract (177-acre ±) for administrative and waste processing facilities. The

planned Application for Permit will provide design and operating details for the landfill and ancillary facilities. DNCS plans to submit an Application for Permit to OCD in compliance with the regulations for siting, design, and operations of a surface waste management facility for oil and gas wastes (19.15.36 NMAC) for all units.

1.1 Project Description

The DNCS site is comprised of 495-acres ± of land located in portions of Section 31, Township 17 South, Range 33 East, NMPM and Section 6, Township 18 South, Range 33 East, NMPM in Lea County, NM (**Figure 1**). **Figure 2** is a site topographic map based on aerial photography taken on 2/28/2013 which shows the proposed supplemental boring locations at the DNCS Facility. It also indicates the locations for the five borings completed to-date (Section 2.1).

1.2 Operations and Waste Processing Design

The DNCS west tract is planned to include waste processing facility consisting of a liquid receiving terminal, oil separation and storage tanks, evaporation ponds and a solidification pad (**Figure 2**). The waste processing activities will be conducted within the footprint identified on the same Figure in the northwest quadrant of the site.

The facility footprint is designed to provide a minimum 200' setback from the potential watercourse that bisects the site. The existing borings (B-1 and B-3 – B-5) were are all drilled to a depth of 150' below ground surface (bgs) on the east tract; which confirmed that a minimum groundwater depth of 100' below the deepest landfill basegrade elevation (i.e., 45' bgs) is maintained. Up to three additional borings (B-6 – B-8) will be drilled to a depth of 75' on the west tract to confirm a minimum groundwater depth of 50' below the deepest potential pond basegrade elevation (i.e., 15' bgs) can be maintained. **Table 1** provides a summary of the boring locations, elevations and depths.

Table 1
Summary of Existing and Proposed Borings
DNCS PROPERTIES, LLC SITE

Boring	Date	Northing	Easting	Elevation (Surface) ft	Elevation (Total Depth) ft	Drilled Depth ft
1	2/12	649096	735916	3957.32	3807.32	150
2	2/12	647515	734481	3942.76	3892.76	50
3	2/13	646949	734727	3940.23	3790.23	150
4	2/13	646996	737635	3968.20	3818.20	150
5	2/13	651053	737531	3979.03	3829.03	150
6	TBD	648645	732760	3939	3864	75
7*	TBD	651325	732579	3969	3894	75
8*	TBD	651319	734950	3972	3897	75

NOTES: NGVD29
Proposed Boring B-6
x, y, z data estimated for Borings 6, 7, & 8
*Potential borings

1.3 Subsurface Investigation Workplan Objectives

The primary objective of this field effort is to verify that a minimum vertical setback of 50 feet exists between viable groundwater and the basegrades of the proposed surface waste management processing units, and to collect additional site-specific subsurface information to identify the stratigraphy. This Workplan describes the proposed drilling program to evaluate the subsurface conditions at the west tract of the proposed DNCS Site in compliance with the requirements of 19.15.36.8.C(15) NMAC and 19.15.36.13.A NMAC. The purpose of this Plan is to outline the rationale and approach by which geologic and hydrogeologic information will be collected to identify site conditions in more detail. This drilling program has been developed and will be implemented with OCD approval, to accomplish the following:

- Refine the geologic/hydrogeologic site database as needed
- Characterize subsurface materials for their geotechnical/engineering properties
- Identify parameters for a groundwater monitoring program, if applicable (this Plan does not propose to install monitor wells in conjunction with this effort)

2.0 WORKPLAN OBJECTIVES

Data obtained from the implementation of this proposed effort will confirm the characterization of the site geology and hydrogeology; as well as provide information regarding the presence of groundwater to a depth of at least 50 feet below the proposed deepest pond basegrade elevation on the tract. DNCS has made a decision to confirm that groundwater is greater than 50 feet below the lowest elevation of the design depth of the proposed ponds (as required in 19.15.36.13.A(5) NMAC) prior to committing the resources required to develop a groundwater monitoring plan (as defined in 19.15.36.14. B).

2.1 Previous Investigations

A Preliminary Investigation was completed in February 2012, followed by a detailed investigation in February of 2013 which provides a significant predicate for the Scope of Work proposed for this Workplan. Borings B-1 through B-5 were drilled during these investigations (**Figure 2**) to confirm the absence of groundwater, and to provide initial geotechnical information to complete the preliminary site evaluation.

2.2 Field Investigation

The proposed Workplan contained herein is documented for formal review and approval by OCD. GEI formulated this Workplan to meet the requirements of the Part 36 Regulations and in response to previous experience on similar projects. GEI will not conduct any subsurface investigations detailed herein until this Workplan is approved by OCD. The field investigation may be refined as the drilling progresses in consultation with OCD.

This Workplan will supplement the data collected from the previous investigations conducted in February 2012 and 2013 (Section 3.1). **Figure 2** illustrates the proposed locations of the following:

- Existing Borings B-1 through B-5
- Proposed Boring B-6
- Potential Borings B-7 and B-8
- Proposed East Landfill
- Proposed West Operations and Waste Processing Area

Boring B-6 proposed in this Workplan will be continuously cored and sampled at select intervals (every 5-ft) to a depth of at least 50 ft below the proposed pond basegrade (i.e., 75' below ground surface) using a drive sampler(s) for:

- Identification of subsurface materials
- Verification that groundwater is not present
- Collection of selected samples for laboratory testing of the required geotechnical properties in conformance with 19.15.36.8.C(15) NMAC.

The detailed logging of B-6 will allow completion of geologic cross-sections with borings previously identified. If these cross-sections confirm the uniformity of materials across the site (as expected) the option to install either Borings B-7 or B-8 will be evaluated relative to the additional useful information that may be acquired from these proposed boring locations. If the decision is made to install either of these Borings, they will be continuously sampled from cuttings, and will be used to confirm the depth to groundwater. The Borings (B-6 and B-7/B-8 if installed) will be drilled in conformance with Part 36 and OCD policies and guidelines to verify that groundwater does not exist beneath the proposed process area within 50 ft of pond basegrades.

Prior to any drilling of the borings, the New Mexico Office of the State Engineer (OSE) field office in Roswell will be contacted regarding the permit requirements for each of the new boring(s). A qualified drilling subcontractor will complete any necessary exploratory boring permit applications and obtain OSE approval for drilling the borings.

The subsurface borings (B-6 through B-8) are proposed at the locations shown on **Figure 2** and minor adjustments to the locations may be necessary as determined in the field. The borings will be drilled using a portable CME 75 or CME 85 drill rig capable of using both hollow-stem auger (HSA) and air rotary methods. Each boring undertaken will be drilled to a total projected depth of 75 ft below ground surface at each respective boring location. During HSA drilling for B-6, split-spoon, California Modified, brass ring or Shelby tube samples will be collected at 5-foot intervals for visual classification and laboratory analysis for geotechnical properties in conformance with (19.15.36.8.C(15)(g) NMAC) as shown on **Table 2** and **Table 3** identifies the OCD Part 36 requirements for soil testing that were provided. In the event that moist soils are encountered, we are prepared to provide standby

time (up to 3 hours per occurrence) to assess the degree of saturation and potential for monitoring groundwater.

Table 2
Summary of Proposed Sampling and Laboratory Testing
DNCS PROPERTIES, LLC SITE

Proposed Geotechnical Borings		No. of Laboratory Tests						
ID	Total Depth	Dry Sieve Analysis	Atterberg Limits	K_{sat}	Classification (USCS)	Moisture Content	Dry Density	Standard Proctor Density
B-6	75	5-6	1-2	1	5-6	5-6	1	1

Notes:
- Standard penetration tests (blow counts) will be recorded at each sampling interval in B-6
- Porosity is calculated from the dry density and moisture content determination from an undisturbed brass ring sample
- Atterberg Limits testing will only be conducted on fine-grained materials

Table 3
OCD Requirements for Soil Testing
(Pursuant to 19.15.36 NMAC)
DNCS PROPERTIES, LLC SITE

Total Porosity:
- Initial Properties: Moisture Content (ASTM D2216 - 10; ASTM D7263-09(2011))
- Dry Bulk Density (ASTM D7263-09(2011))
- Calculated Porosity (ASTM D7263-09(2011)).

Permeability/Saturated Hydraulic Conductivity:
- Standard Test Method for Measurement of Hydraulic Conductivity of Porous Material Using a Rigid-Wall, Compaction-Mold Permeameter (ASTM D5856 - 95(2007))
- Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter. (ASTM D5084 – 10)

Compaction Ratios:
- Proctor Compaction Test. (ASTM D698 – 12)

Swelling Characteristics:
- Atterberg Limits. (ASTM D4318 - 10)

The geotechnical boring(s) undertaken, will be plugged from total depth to existing grade. Plugging will be accomplished using 5 percent bentonite-cement grout slurry in conformance with plugging and abandonment standards of both the New Mexico OSE and the New Mexico Environment Department (NMED). DNCS understands that if groundwater is encountered in these borings, additional drilling will be required to establish monitor wells for sampling and testing.

2.3 Sample Recovery

The unconsolidated and dry sands encountered in the previous drilling programs, and typical of the region, may represent challenges for core sample recovery. The driller plans to deploy the following techniques to improve sample recovery, as necessary:

- "Sand catchers" installed in the shoes of the Core Barrels.
- Use of 4" dia. barrel vs. standard 3" dia. barrel.
- Deployment of split-spoon or California Modified samplers as necessary.
- Back-to-back split spoons with a center bit to ensure undisturbed samples.

2.4 Investigation Results

The results of the implementation of this Workplan comprised of the previous drilling programs and this proposed Supplemental Investigation will be correlated with the regional database. It will serve as the platform for the engineering design of the facility and characterization of the site geology and hydrology as required under 19.15.36.8.C(15) NMAC. Upon completion of this Workplan, the resulting data will be included in the Application for Permit.

3.0 ANALYSIS AND REPORTING

The analysis and reporting required to document the site-specific geology and hydrology per 19.15.36.8.C(15) NMAC, and the siting requirement related to depth to groundwater at the proposed facility (19.15.36.13.A NMAC) includes the following:

- Cataloging and managing soil samples
- Illustrative graphics
- Permit Application text, figures, tables and attachments

3.1 Sample Handling and Cataloging

Select soil samples will be collected from the borings as described in Section 2.2 of this Workplan. The samples will be cataloged, and select samples (representative of the subsurface materials encountered) will be delivered to the geotechnical testing laboratory for testing of select engineering properties (**Table 2**).

3.2 Graphics

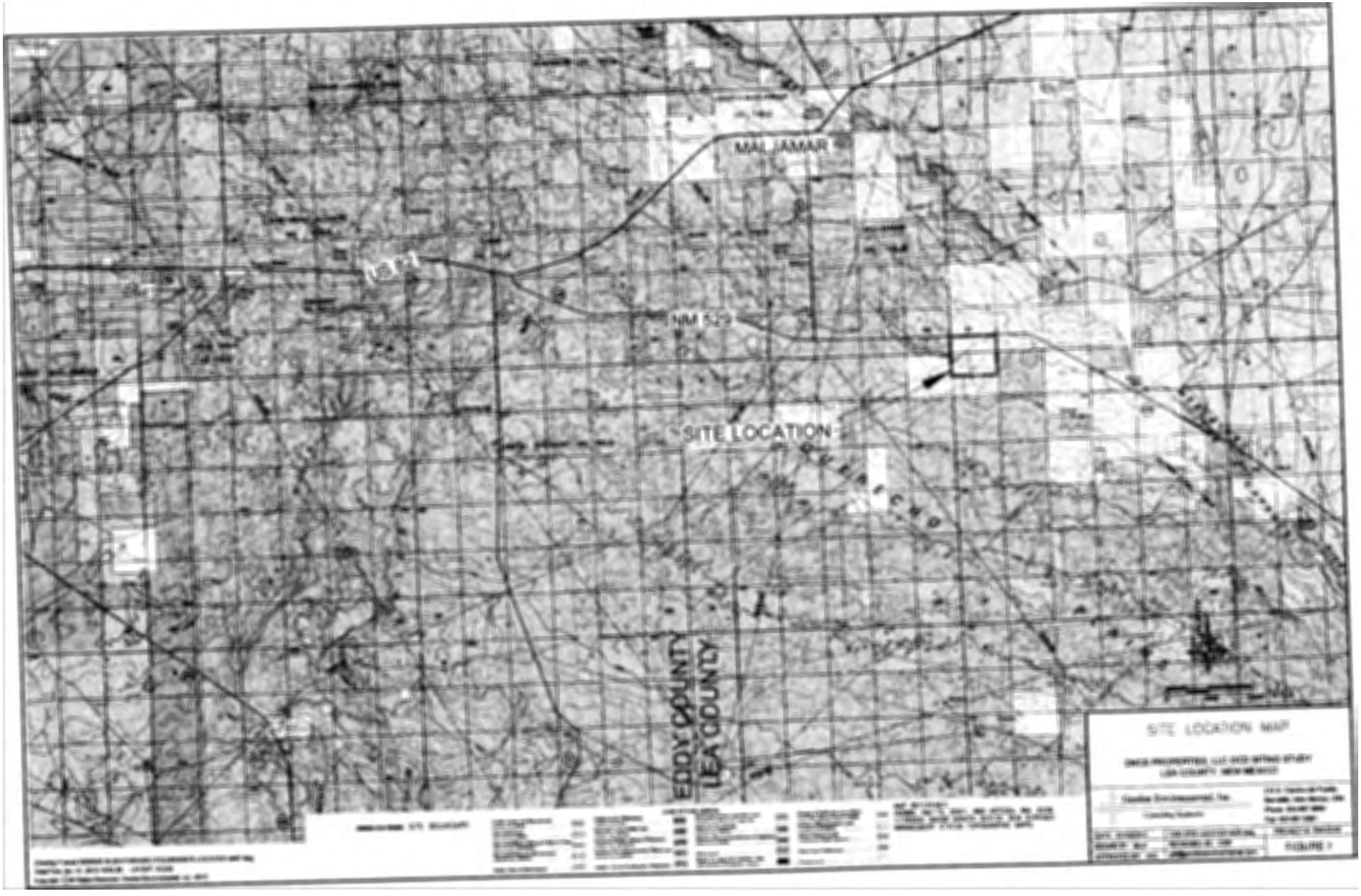
Key graphics required for reporting of regional and site-specific geologic and hydrogeologic investigations include boring logs, well completion diagrams, and hydrogeologic cross sections. These graphics form the basis for proper characterization of the subsurface materials, correlation of the materials across the site, correlation of the materials to the regional setting, and also form the basis for the discussion of the regional and site geologic and hydrogeologic conditions.

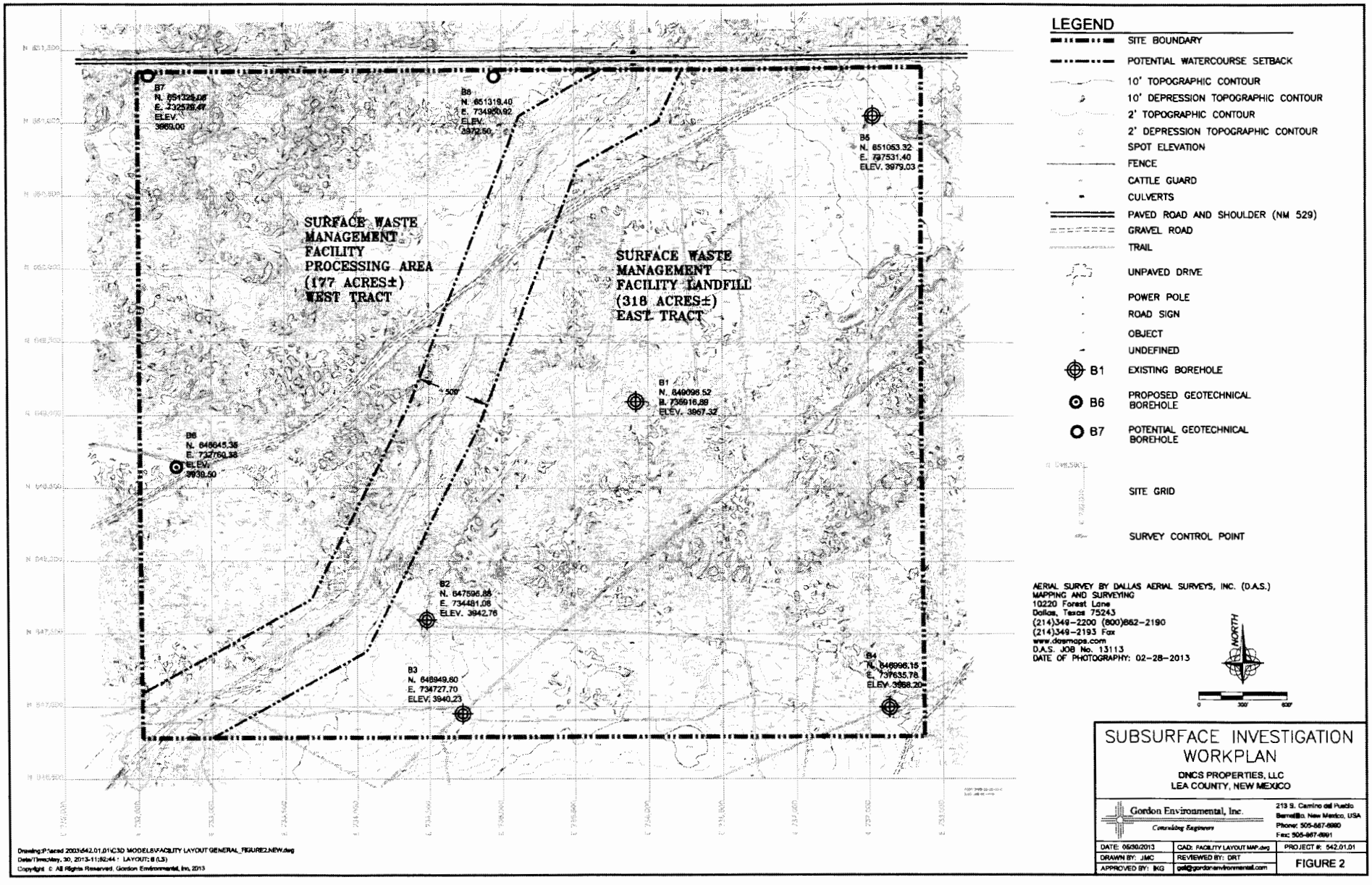
Geologic/hydrogeologic cross-sections are required per 19.15.36.8.C(15)(e) NMAC. The boring logs described above form the basis for development of the cross-sections. These cross-sections will illustrate the correlation of soils and lithology across the site in conformance with 19.15.36.8.C(15)(d) NMAC.

SUPPLEMENTAL SUBSURFACE INVESTIGATION WORKPLAN
DNCS PROPERTIES, LLC SITE
LEA COUNTY, NEW MEXICO

Figures

Figure No.	Title
1	SITE LOCATION MAP
2	TOPOGRAPHIC MAP AND PRELIMINARY SITE LAYOUT


MAL JAMAR
NM 529
SITE LOCATION
EDDY COUNTY
LEA COUNTY
SITE LOCATION MAP
FIGURE 1



LEGEND

- SITE BOUNDARY
- POTENTIAL WATERCOURSE SETBACK
- 10' TOPOGRAPHIC CONTOUR
- 10' DEPRESSION TOPOGRAPHIC CONTOUR
- 2' TOPOGRAPHIC CONTOUR
- 2' DEPRESSION TOPOGRAPHIC CONTOUR
- SPOT ELEVATION
- FENCE
- CATTLE GUARD
- CULVERTS
- PAVED ROAD AND SHOULDER (NM 529)
- GRAVEL ROAD
- TRAIL
- UNPAVED DRIVE
- POWER POLE
- ROAD SIGN
- OBJECT
- UNDEFINED
- B1 EXISTING BOREHOLE
- B6 PROPOSED GEOTECHNICAL BOREHOLE
- B7 POTENTIAL GEOTECHNICAL BOREHOLE
- SITE GRID
- SURVEY CONTROL POINT

AERIAL SURVEY BY DALLAS AERIAL SURVEYS, INC. (D.A.S.)
MAPPING AND SURVEYING
10220 Forest Lane
Dallas, Texas 75243
(214)349-2200 (800)862-2190
(214)349-2193 Fax
www.dasmaps.com
D.A.S. JOB No. 13113
DATE OF PHOTOGRAPHY: 02-28-2013

NORTH

0 300' 600'

SUBSURFACE INVESTIGATION WORKPLAN

DNCS PROPERTIES, LLC
LEA COUNTY, NEW MEXICO

Gordon Environmental, Inc.
Consulting Engineers
213 S. Camino del Pueblo
Bernalillo, New Mexico, USA
Phone: 505-867-6990
Fax: 505-867-6991

DATE: 05/30/2013	CAD: FACILITY LAYOUT MAP.dwg	PROJECT #: 542.01.01
DRAWN BY: JMC	REVIEWED BY: DRT	FIGURE 2
APPROVED BY: BKG	gel@gordonenvironmental.com	

Drawing:P:\acad 2003\542.01.01\C3D MODELS\FACILITY LAYOUT GENERAL_FIGURE2.NEW.dwg
Date/Time:Friday, 30, 2013-11:52:44 - LAYOUT: B (L3)

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

John Bemis
Cabinet Secretary

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Jami Bailey
Division Director
Oil Conservation Division

February 5, 2013

Charles Fiedler
Gordon Environmental, Inc.
213 S. Camino del Pueblo
Bernalillo, New Mexico 87004

RE: Hydrogeologic Investigation Boring Plan
Commercial Surface Waste Management Facility
DNCS Properties, LLC – Surface Waste Management Facility
Facility Location: Section 31, Township 17 South, Range 33 East, NMPM, Lea County, New Mexico

Dear Mr. Fiedler:

The Oil Conservation Division (OCD) has received Gordon Environmental Inc.'s boring plan proposal, dated February 1, 2013 and submitted on the behalf of DNCS Properties, LLC, to investigate and characterize the uppermost aquifer and subsurface geology for a proposed commercial surface waste management (landfill) facility permit located in Section 31, Township 17 South, Range 33 East, NMPM, Lea County, New Mexico. OCD has completed the review and determined that the proposal is adequate to proceed with the site investigation.

OCD agrees that the proposed boring locations appear adequate. However, if the hydrogeologic conditions cannot be determined, additional borings or monitoring wells may be needed.

The OCD appreciates your cooperation in providing a boring plan for review, in order to determine if the submitted application and the proposed site are suitable for consideration of approval. If there are any questions regarding this matter, please do not hesitate to contact me at (505) 476-3487 or brad.a.jones@state.nm.us.

Sincerely,

Brad A. Jones
Environmental Engineer

BAJ/baj

Cc: OCD District I Office, Hobbs
DNCS Properties, LLC, 2028 E. Hackberry Place, Chandler, AZ

(505) 867-6990 **GORDON ENVIRONMENTAL, INC.** 213 S. Camino del Pueblo
(505) 867-6991 Fax *Consulting Engineers* Bernalillo, New Mexico 87004

February 1, 2013

RECEIVED OCD
2013 FEB -4 A 11: 25

Mr. Brad A Jones
Environmental Engineer
New Mexico Energy, Minerals and Natural Resources Department
Oil Conservation Division
1220 S. St. Francis Drive
Santa Fe, New Mexico 87505

Re: DNCS PROPERTIES, LLC Solid Waste Management Facility
Subsurface Investigation Workplan [GEI PN 540.03.02]

Dear Mr. Jones:

Enclosed is a hard copy of the final Subsurface Investigation Workplan as we discussed. We appreciate your input and responsiveness as we have worked through the draft this week and look forward to your approval of this Workplan, and your assistance in the Plan implementation. Please contact us with your questions and comments; and let us know if you require additional hard copies.

Very Truly Yours,
Gordon Environmental, Inc.

Charles W. Fiedler, P.E
Senior Project Director

Attachments:
DNCS Subsurface Investigation Workplan

Cc: Mark Turnbough, Ph.D.
DNCS Properties, LLC

SUBSURFACE INVESTIGATION WORKPLAN

DNCS PROPERTIES, LLC SITE
LEA COUNTY, NEW MEXICO

JANUARY 2013

SUBMITTED TO:
New Mexico Energy, Minerals and Natural Resources Department
Oil Conservation Division
1220 S. St. Francis Drive
Santa Fe, New Mexico 87505
Phone: 505.476.3440

PREPARED FOR:
DNCS PROPERTIES, LLC.
2028 E. Hackberry PL
Chandler, AZ 85286

PREPARED BY:
Gordon Environmental, Inc.
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Bernalillo, New Mexico 87004
Phone: 505.867.6990

Gordon Environmental, Inc.
Consulting Engineers

SUBSURFACE INVESTIGATION WORKPLAN

DNCS PROPERTIES, LLC SITE
LEA COUNTY, NEW MEXICO

JANUARY 2013

SUBMITTED TO:
New Mexico Energy, Minerals and Natural Resources Department
Oil Conservation Division
1220 S. St. Francis Drive
Santa Fe, New Mexico 87505
Phone: 505.476.3440

PREPARED FOR:
DNCS PROPERTIES, LLC.
2028 E. Hackberry PL
Chandler, AZ 85286

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Gordon Environmental, Inc.
Consulting Engineers

1/31/2013 3:04 PM

SUBSURFACE INVESTIGATION WORKPLAN
DNCS PROPERTIES, LLC SITE
LEA COUNTY, NEW MEXICO
JANUARY 2013

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SUBSURFACE INVESTIGATION WORKPLAN
DNCS PROPERTIES, LLC SITE
LEA COUNTY, NEW MEXICO

1.0 PROJECT SUMMARY

The DNCS PROPERTIES, LLC Site has been selected after an exhaustive analysis of both regulatory and non-regulatory criteria as a prime candidate for development of a "Commercial Facility" (i.e., surface waste management facility) for oil and gas wastes permitted under 19.15.36 NMAC (Part 36). The site is currently controlled by DNCS PROPERTIES, LLC (DNCS).

This Subsurface Investigation Workplan (Workplan) defines a field drilling and soil testing program to confirm compliance with the vertical groundwater setback distance of 100'. Gordon Environmental, Inc. (GEI) is requesting Oil Conservation Division (OCD) approval of this Workplan, the results of which will become a primary component of the Application for Permit. We met with OCD on 01/28/2013 to discuss the Project and this Workplan in detail, and followed up this meeting with a submittal of the Workplan on 01/31/13.

The DNCS Project includes a proposed 274-acre ± surface waste management facility. The facility will be comprised of a 203-acre ± landfill, as well as an Administration and Operations Area to support receiving and processing operations for oilfield wastes. The planned Application for Permit will provide design and operating details for the landfill and ancillary facilities. DNCS plans to submit an Application for Permit to OCD in compliance with the regulations for siting, design, and operations of a surface waste management facility for oil and gas wastes (19.15.36 NMAC).

1.1 Project Description

The DNCS site is comprised of 274-acres ± of land located in portions of Section 31, Township 17 South, Range 33 East, NMPM and Section 6, Township 18 South, Range 33 East, NMPM in Lea County, NM (**Figure 1**). **Figure 2** is a site topographic map based on the USGS 7.5 minute Quadrangle for the area which shows the preliminary layout of the DNCS Facility, including the proposed landfill footprint, setbacks, and ancillary operations. It also indicates the location and transect for two borings completed to date (Section 3.2).

The siting portion of the project, of which this Workplan is an integral part, consists of research and fieldwork to address each of the Part 36 siting criteria for surface waste management facilities (19.56.36.13 NMAC). The site has been confirmed on a preliminary basis to meet the other Part 36 siting standards via regional and on-site studies:

- Watercourses
- Floodplains
- Wetlands
- Subsurface mines
- Land use setbacks
- Unstable areas
- Site access
- Mineral rights
- Water wells

Additional field studies are planned once the vertical setback to groundwater is confirmed (i.e., ecological resources).

1.2 Landfill Design

The DNCS land disposal facility is planned as an "area fill" (vs. a "trench fill") with a series of east-west oriented landfill cells (**Figure 2**). The excavation will be conducted within the 203-acre ± footprint identified on the same Figure.

The excavation, based on the preliminary design, ranges in depth form 20' – 45' (see cross-sections **Figures 6**, **7**, **8**, and **9**). The landfill cells are currently shown at either 1,535' or 2,500' in width; and the floor of each cell is 400' ± wide. The perimeter on all four sides of the landfill unit will have a 3:1 sideslope.

The floor of each cell slopes at 2% from east to west, consistent with the surface grades. Each cell would be equipped with a central leachate collection header pipe (6" dia. HDPE); and associated sump, extraction riser, cleanout riser, etc.

The facility footprint is designed to provide a 200' setback from the potential watercourse. The regulatory status of the watercourse will be confirmed as part of future field studies. The existing boring (B-1); and planned borings B-3 – B-5 are all proposed to a depth of 150'

below ground surface (bgs); which is more than adequate to prove up a minimum groundwater depth of 100' below the deepest basegrade elevation (i.e., 45' bgs). **Table 1** provides a summary of the Proposed Boring Locations and elevations.

Table 1
Summary of Existing and Proposed Borings
DNCS PROPERTIES, LLC SITE

Boring	Northing	Easting	Elevation (Surface) ft	Elevation (Total Depth) ft	Drilled Depth ft
1*	649115	735931	3965	3815	150
2*	647593	734483	3948	3898	50
3	646842	734983	3950	3800	150
4	646842	737783	3974	3824	150
5	651302	737783	3989	3839	150

Notes: NGVD29
*Existing drilled in February 2012

1.3 Subsurface Investigation Workplan Objectives

The primary objective of the field effort proposed herein is to collect site-specific subsurface information to identify the stratigraphy, and to verify that a minimum vertical setback of 100 feet exists between viable groundwater and the basegrades of the proposed landfill. This Workplan describes the proposed drilling program to evaluate the subsurface conditions at the proposed DNCS Site in compliance with the requirements of 19.15.36.8.C(15) NMAC and 19.15.36.13.A NMAC. The purpose of this Plan is to outline the rationale and approach by which geologic and hydrogeologic information will be collected to identify site conditions. This drilling program has been developed and will be implemented with OCD approval, to accomplish the following:

- Refine the geologic/hydrogeologic site database as needed
- Characterize subsurface materials for their geotechnical/engineering properties
- Identify parameters for a groundwater monitoring program, if applicable (this Plan does not propose to install monitor wells in conjunction with this effort)

2.0 GEOLOGY AND HYDROGEOLOGY

The local geology of the DNCS site is poorly documented. Most oil and gas well logs in the area do not have detailed lithologic data for strata above the Permian Rustler Formation, which is typically deeper than 1200 feet below ground surface. Generalized geologic and hydrologic information for the area is discussed in Nicholson and Clebsch, (1961), "*Geology and Ground-Water Conditions in Southern Lea County, New Mexico*", New Mexico Bureau of Mines and Mineral Resources Ground-water Report 6. The generalized geologic and hydrologic information for the area west of the site, in Eddy County, is discussed in Hendrickson and Jones, (1952), "*Geology and Ground-Water Resources of Eddy County, New Mexico*", New Mexico Bureau of Mines and Mineral Resources Ground-Water Report 3, 169p. Several revisions to the interpretations of the geolomorphologic, geologic, and stratigraphic relationships of the local deposits have been published since these two studies, i.e., Kelly (1971),Summers (1972), (Bachman (1974), Bachman (1976), Hunt (1977), Bachman (1980), Bachman (1987), Hawley (1993a), Hawley (1993b), Powers and Holt (1993),), Lucas and Anderson (1994a), Lucas and Anderson (1994b), Kennedy (1997), Lehman (1994) , and Ziegler, Kelly and Geismann (2008) (Section 5.0).

2.1 Geomorphology, Geology, and Stratigraphy

An index geomorphic and surface geologic map of the area is presented as **Figure 3**, and a generalized geologic map as **Figure 4.**

A stratigraphic chart representing the expected subsurface geology in the region surrounding the site is presented in **Figure 5.** The only rocks in the chart not expected to exist directly under the site would be the Ogallala Formation. The Ogallala has been removed by erosion in the immediate site area prior to the deposition of Tertiary and Quaternary sediments, but is exposed east of the site on Mescalero Ridge (The Caprock) where it is preserved.

Only late Permian (Ochoan) Rustler Formation and younger rocks are discussed here because potable water is unlikely to occur in rocks deeper or older than these deposits. Domestic, municipal, and stock wells in the general area of the site rarely tap units older than the Rustler Formation rocks.

2.2 Description of Tertiary and Quaternary alluvial and colian deposits

Mescalero Sands, Mescalero Caliche and Gatuña Formations

"The combination of tectonic, surface-fluvial and subsurface-dissolutional processes acting for at least the past 12 to 13 Ma has produced a very complex system of landforms and valley and depression fills in the Carlsbad area. These units are still incompletely characterized and understood, particularly in terms of absolute chronology of events. **(Figure 3)**.... "Nye (1933, p. 11-12) defined a stepped-sequence of geomorphic surfaces (both erosional and constructional) that flank the modern Pecos floodplain in the Roswell artesian-basin segment of the lower Pecos Valley.

The only post-High Plains surface recognized by Nye east of the valley is the Mescalero Plain, a broad undulating surface locally covered by eolian deposits (Mescalero Sand) and disrupted by many solution-subsidence depressions. The surface is separated from the Llano Estacado by the "Mescalero Ridge" escarpment. Relict and shallowly buried parts of the Mescalero Plain, which stabilized in the late Pliocene (?) to middle Pliocene, are characterized by a caprock calcrete unit that has been designated the "Mescalero caliche" by Bachman (1976, 1980).

Nye (1933) correlated the Mescalero plain with the Diamond A plain, a poorly preserved piedmont surface west of the Pecos Valley that is primarily an erosional feature cut on carbonate rocks of the Sacramento uplift. Projected gradients of these two surfaces, neglecting subsequent solution-subsidence effects, place them from 300-500 ft above the modern valley floor. Valley fills and erosion-surface veneers genetically associated with the Mescalero and Diamond A plains have long been referred to as Gatuña Formation (Lang, 1938; Vine, 1963; Bachman, 1976, 1980, 1981, 1984; Powers and Holt, 1993)." (Hawley, 1993a p.2-3). The thickness of the Tertiary and Quaternary strata is unknown under the site, but can be estimated to be up to 400 feet based on interpretations of driller's logs of oil wells in the area.

2.3 Description of Late Triassic and Late Permian strata

Triassic Rocks

"South of Pavo Mesa and along the east side of Crow Flats, Triassic and Permian rocks are contorted, fractured and exposed as chaotic angular blocks.....The Gatuña Formation rests unconformably on this chaotic structure..."(Bachman 1974, p. 55). Triassic-aged Dockum Group (Chinle Group) outcrops are exposed east and south of the site **(Figure 4)**. The Dockum Group is up to 1000 feet thick east of Artesia (Hendrickson and Jones, 1952; p. 23) and consists of redbeds and sandstones. This thickness estimate may also include the underlying late Permian Quartermaster Formation (Dewey Lake Formation).

All Triassic strata in southeastern New Mexico are now considered to be included in the Chinle Group (Lucas and Anderson, 1993b). The sandstone and conglomerate dominated Santa Rosa Formation of the Chinle Group being at the base. The claystone and mudstone dominated San Pedro Arroyo Formation of the Chinle Group conformably overlies the Santa Rosa Formation. The San Pedro Arroyo Formation is reported to be 26 feet thick near The Maroon Cliffs area, 20 miles south of the site, apparently thins to the north, and is absent in the Mesa Diablo Area in northern Chavez County. Triassic rocks unconformably overlie the late Permian (Ochoan) Quartermaster (Dewey Lake) Formation and Rustler Formation strata. Upper Permian (Ochoan) Rustler Formation and Quartermaster Formation (Dewey Lake) rocks are the oldest rocks exposed in the area near the DNCS site (**Figures 3** and **4**).

Quartermaster (Dewey Lake) Formation

The Quartermaster Formation beds (formerly Pierce Canyon redbeds), up to 350 feet thick near Pierce Canyon, at a distance of 40 miles south-southwest of the site, overlie the Rustler Formation rocks. The Quartermaster thins to the north and is absent north of the latitude of Artesia.

Rustler Formation

The Rustler Formation was named by Richardson (1904) for exposures in the Rustler Hills of Culberson County, Texas (Lucas and Anderson, 1993). East of the DNCS site, in the Crow Flats area, Bachman (1974) describes outcrops of Permian Rustler Formation overlain by conglomeratic cross-bedded dark-reddish-brown sandstone of late Triassic age which are overlain by Gatuña Formation strata.

3.0 WORKPLAN OBJECTIVES

Data obtained from the implementation of this proposed effort will confirm the characterization of the site geology and hydrogeology; as well as provide information regarding the presence of groundwater to a depth of at least 100 feet below the proposed deepest landfill basegrade elevation. This data may also be instrumental in defining characterization of the groundwater zone indicated for monitoring; and subsequent placement of the groundwater monitoring well network if applicable (no groundwater monitor wells are proposed with this Plan).

DNCS has made a business decision to confirm that groundwater is greater than 100 feet below the lowest elevation of the design depth of the landfill (as required in 19.15.36.13 A (1)NMAC) prior to committing the resources required to develop a groundwater monitoring plan (as defined in 19.19.15.36.14 B). This decision was made with the understanding that if groundwater exists at this site, 19.15.36.8.B (15) (b) requires "*laboratory analysis, performed by and independent commercial laboratory, for major cations and anions; BTEX; RCRA metals; and TDS of ground water samples of the shallowest fresh water aquifer beneath the proposed site*" as part of the Permit Application. This requirement will necessitate the drilling and installation of a monitor well to provide the required information.

3.1 Preliminary Investigation

A Preliminary Investigation was completed in February 2012, and is a significant predicate for the Scope of Work proposed for this Workplan. Borings B-1 and B-2 were drilled during this initial investigation (**Figure 2**) to confirm the absence of groundwater, and to provide initial geotechnical information to complete the preliminary site screening and to establish the basis for this Workplan. Borings proposed in this Workplan will be continuously cored and sampled at select intervals using a drive sampler(s) for:

- Identification of subsurface materials
- Verification that groundwater is not present
- Collection of selected samples for laboratory testing of the required geotechnical properties in conformance with 19.15.36.8.C(15) NMAC.

3.2 Preliminary Drilling Summary

On February 15, 2012; two exploratory borings (B-1 and B-2) were drilled at the locations shown on **Figure 2**. **Table 2** summarizes the completed information for each of the borings. The borings were drilled by Precision Drilling of Albuquerque, using a CME 85 hollow stem auger (HSA).

Table 2
Summary of DNCS Phase 1 Borings B-1 and B-2
DNCS PROPERTIES, LLC SITE

BORING	GPS COORDINATES	DRILLING METHOD(S)	DEPTH (FBGS)	LITHOLOGY
B-1	N 32° 46.968' W 103° 42.012' Elev. ~3965	A	150 (TD) Elev. ~ 3815	-Coarse-grained soils (i.e., silty sands) were encountered to a depth of 125' below ground surface (bgs). Claystones, likely of the prevalent Chinle formation, were present from 125' to 150' bgs. No free water was encountered during drilling; including the absence of perched water at the sand/claystone interface
B-2	N 32° 46.722' W 103° 42.294' Elev. ~3948	A	50 (TD) Elev. ~3898	-Coarse-grained soils (i.e., silty sands) were encountered to the total depth below ground surface (bgs).

Notes:
A = hollow stem auger (7" OD);
C = continuous core (3.5" OD, 2.5" ID);
R = air rotary;
S = 2" OD, 1.38" ID split spoon sampler NQ = 75 mm OD, 47.6 mm ID wireline core;
TD = total depth drilled;
FBGS = feet below ground surface

The primary purposes of this drilling effort was to determine if shallow groundwater is present beneath the proposed Solid Waste Management Facility (19.15.36.13.A NMAC). The drilling was successful in determining that groundwater is not present beneath the site surface to the total depths of the two borings (**Table 1**) at the locations indicated.

3.3 Field Investigation

The proposed Workplan contained herein is documented for formal review and approval by OCD. GEI formulated this Workplan to meet the requirements of the Part 36 Regulations and in response to previous experience on similar projects. GEI will not conduct any further subsurface investigations until this program is approved by OCD.

Based upon GEI's experience on similar sites, this Workplan has been formulated to meet OCD guidelines and suggestions for hydrogeologic characterization of new Part 36 Surface Waste Management Facilities. The field investigation will be refined as the drilling progresses in consultation with OCD.

This Workplan will supplement the data collected from the Preliminary Investigation conducted in February 2012 (Section 3.1). **Figure 2** illustrates the proposed locations of the following:

- Existing Borings B-1 and B-2
- Three proposed borings (B-3, 4 and 5)
- Landfill unit configuration

The three borings (B-3 through 5) will be drilled with continuous coring and sampling at 5-foot intervals to a depth of at least 100 ft below the proposed landfill basegrade (i.e., 150' below ground surface). The borings will be drilled in conformance with Part 36 and OCD policies and guidelines to verify that groundwater does not exist beneath the proposed landfill within 100 ft of the landfill basegrade.

Prior to any drilling of the borings, the New Mexico Office of the State Engineer (OSE) field office in Roswell must issue permits for exploratory wells for each of the three borings. A qualified drilling subcontractor will complete the necessary exploratory well permit applications and obtain OSE approval for drilling the borings.

Three geotechnical borings (B-3 through 5) are proposed at the locations shown on **Figure 2** and identified in **Table 1**. Minor adjustments to the locations may be necessary as determined in the field. The borings will be drilled using a portable CME 75 or CME 85 drill rig capable of using both hollow-stem auger (HSA) and air rotary methods. Each boring will

be drilled to a total projected depth of 150 ft below ground surface at each respective boring location. During HSA drilling, split-spoon, California Modified, brass ring or Shelby tube samples will be collected at 5-foot intervals for visual classification and laboratory analysis for geotechnical properties in conformance with (19.15.36.8.C(15)(g) NMAC) as shown on **Table 3**. **Table 4** provides the OCD Part 36 requirements for soil testing that were identified. In the event that moist soils are encountered, we are prepared to provide standby time (up to 3 hours per occurrence) to assess the degree of saturation and potential for monitoring.

All three geotechnical borings will be plugged from total depth to existing grade. Plugging will be accomplished using 5 percent bentonite-cement grout slurry in conformance with plugging and abandonment standards of both the New Mexico OSE and the New Mexico Environment Department (NMED). DNCS understands that if groundwater is encountered in these borings, additional borings will be required to establish monitor wells for sampling and assessment of the groundwater quality. This is a business decision, made by the DNCS, to pursue confirmation that groundwater is greater than 100 feet below the lowest elevation of the design depth of the landfill (as required in 19.15.36.13 A (1)NMAC).

Table 3
Summary of Proposed Sampling and Laboratory Testing
DNCS PROPERTIES, LLC SITE

Proposed Geotechnical Borings		No. of Laboratory Tests						
ID	Total Depth	Dry Sieve Analysis	Atterberg Limits	K_{sat}	Classification (USCS)	Moisture Content	Dry Density	Standard Proctor Density
B-3	150	9-10	4-5	2-3	9-10	9-10	3-4	3-4
B-4	150	9-10	4-5	2-3	9-10	9-10	3-4	3-4
B-5	150	9-10	4-5	2-3	9-10	9-10	3-4	3-4

Notes:

- Standard penetration tests (blow counts) will be recorded at each sampling interval
- Porosity is calculated from the dry density and moisture content determination from an undisturbed brass ring sample
- Atterberg Limits testing will only be conducted on fine-grained materials

Table 4

OCD Requirements for Soil Testing
(Pursuant to 19.15.36 NMAC)

Total Porosity:

- Initial Properties: Moisture Content (ASTMD2216 - 10; ASTM D6836 – 68(2006))
- Dry Bulk Density (ASTM D6836)
- Calculated Porosity (ASTM D6836 – 68(2006)).

Permeability/Saturated Hydraulic Conductivity:

- Standard Test Method for Measurement of Hydraulic Conductivity of Porous Material Using a Rigid-Wall, Compaction-Mold Permeameter (ASTM D5856 - 95(2007))
- Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter. (ASTM D5084 – 10)

Compaction Ratios:

- Proctor Compaction Test. (ASTM698 – 07e1)

Swelling Characteristics:

- Atterberg Limits. (ASTM D4318 - 10)

Ancillary but necessary work proposed for the Workplan includes:

- Surveying: A professional surveyor licensed in the state of New Mexico will determine the coordinates (X,Y,Z) of all borings

3.4 Sample Recovery

The unconsolidated and dry sands encountered in the preliminary drilling program, and typical of the region, may represent challenges for core sample recovery. The driller plans to deploy the following techniques to improve sample recovery, as necessary:

- "Sand catchers" installed in the shoes of the Core Barrels.
- Use of 4" dia. barrel vs. standard 3" dia. barrel.
- Deployment of split-spoon or California Modified samplers as necessary.
- Back-to-back split spoons with a center bit to ensure undisturbed samples.

3.5 Investigation Results

The results of the implementation of this Workplan comprised of the preliminary drilling program and this proposed investigation will be correlated with the regional database. It will serve as the platform for the engineering design of the facility and future characterization of the site geology and hydrology as required under 19.15.36.8.C(15) NMAC. Upon completion of this Workplan, the resulting data will be included in the Application for Permit.

4.0 ANALYSIS AND REPORTING

The analysis and reporting required to document the site-specific geology and hydrology per 19.15.36.8.C(15) NMAC, and the siting requirement related to depth to groundwater at the proposed facility (19.15.36.13.A NMAC) includes the following:

- Cataloging and managing soil samples
- Illustrative graphics
- Permit application text, figures, tables and attachments

4.1 Sample Handling and Cataloging

Select soil samples will be collected from the borings as described in Section 3.2 of this Workplan. All of the samples will be cataloged, and select samples (representative of the subsurface materials encountered) will be delivered to the geotechnical testing laboratory for testing of select engineering properties (**Table 2**). GEI works closely with the testing laboratory identifying appropriate analysis methods, sample preparation, and timing to meet the project requirements.

4.2 Graphics

Key graphics required for reporting of regional and site-specific geologic and hydrogeologic investigations include boring logs, well completion diagrams, and hydrogeologic cross sections. These graphics form the basis for proper characterization of the subsurface materials, correlation of the materials across the site, correlation of the materials to the regional setting, and also form the basis for the discussion of the regional and site geologic and hydrogeologic conditions (see Section 2.2).

Logs are detailed graphical representations of subsurface conditions at the location of the boring. The logs will include:

- A standardized visual description of the materials drilled, as determined by the qualified GEI professional, from core, drive, and/or cutting samples, as appropriate
- A record of the intervals sampled
- Drilling and sampling methods
- Rig blow counts (for drive samples)
- Percent core recovered
- Drill time

- Engineering index properties (moisture content, density, and USCS classification) and hydraulic conductivity (where appropriate) as determined by the geotechnical testing laboratory
- Project information (logging geologist/engineer, driller, date completed, rig/boring data, surface elevation, and location coordinates)
- Documentation of *in situ* soil moisture in samples recovered

Geologic/hydrogeologic cross sections are required per 19.15.36.8.C(15)(e) NMAC. The boring logs described above form the basis for development of the cross sections. The cross sections illustrate the correlation of soils and lithology across the site in conformance with 19.15.36.8.C(15)(d) NMAC.

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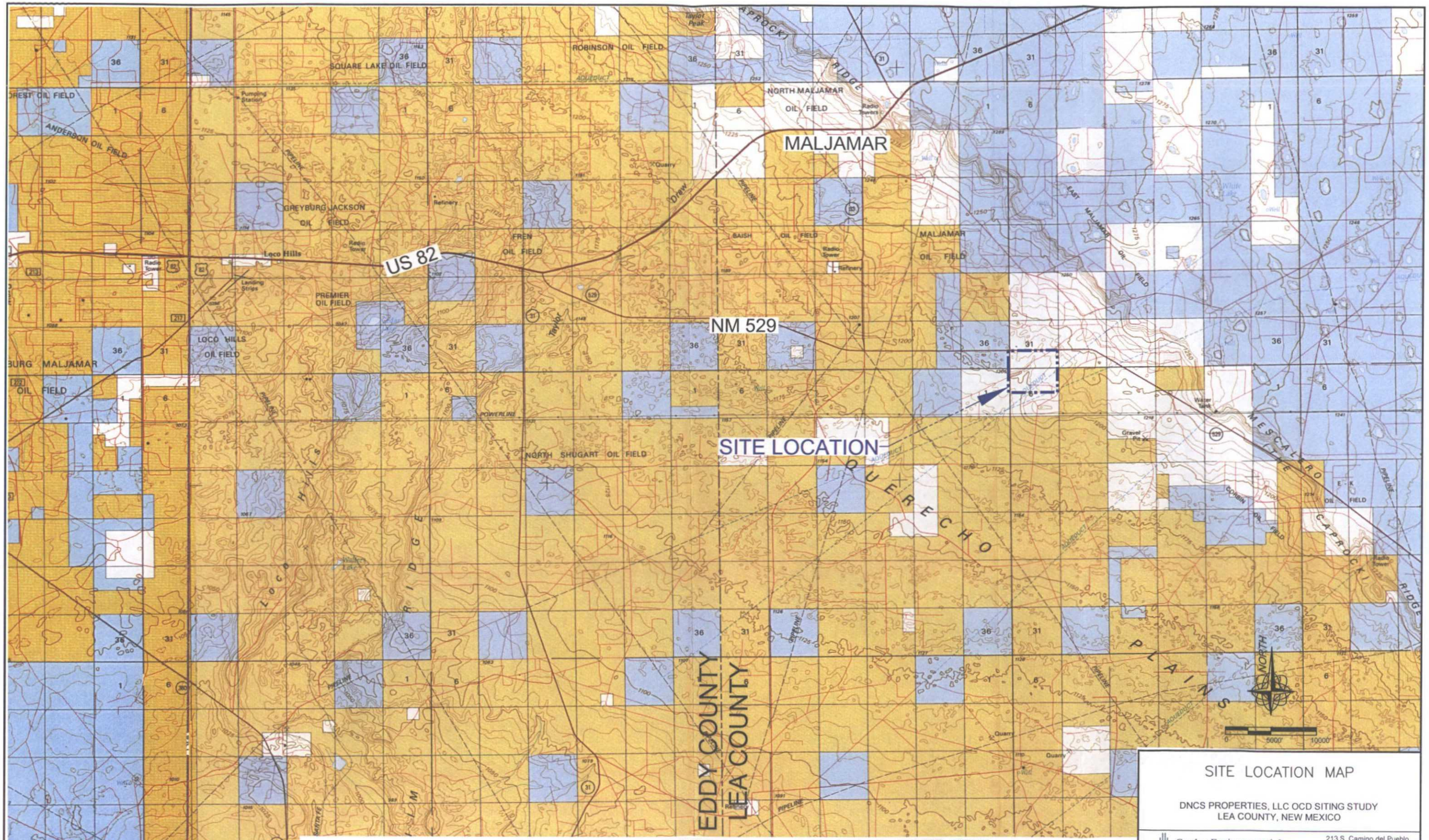
SUBSURFACE INVESTIGATION WORKPLAN
DNCS PROPERTIES, LLC SITE
LEA COUNTY, NEW MEXICO

Figures

Figure No.	Title
1	SITE LOCATION MAP
2	TOPOGRAPHIC MAP AND PRELIMINARY SITE LAYOUT
3	GEOMORPHIC AND SURFACE GEOLOGY MAP
4	GENERALIZED GEOLOGIC MAP
5	PROJECT AREA STRATIGRAPHIC CHART
6	CROSS SECTION A-A'
7	CROSS SECTION B-B'
8	CROSS SECTION C-C'
9	CROSS SECTION D-D'



SITE BOUNDARY

LAND STATUS LEGEND

Public Lands and Monuments (Admin by BLM)		Public Lands Wilderness (Admin by BLM)	NONE	Railroad Jones Land Use Land (Admin by Acquiring Agency)		Oregon & California Land (O&C) Coos Bay Wagon Road (CBWR)	NONE
National Forest (Admin by USFS)		National Forest Wilderness (Admin by USFS)	NONE	National Grasslands (Admin by USFS)	NONE	Bureau of Reclamation Land (Admin by USBOR)	
National Wildlife Refuge & Mgmt Areas (Admin by USF&WS)	NONE	National Wildlife Refuge Wilderness (Admin by USF&WS)	NONE	Military Reservation/Corps of Engineers (Admin by DOD)	NONE	Other Federal Lands (Admin by Titled Agency)	NONE
National Parks and Monuments (Admin by USNPS)	NONE	National Parks/Monuments Wilderness (Admin by USNPS)	NONE	State Land		State Land Wilderness	NONE
Indian Land or Reservation	NONE	Indian Land or Reservation Wilderness	NONE	State, County, City: Wildlife, Park and Outdoor Recreation Areas		Private Land	

MAP REFERENCE:
HOBBS, NM–TX, 2007, AND ARTESIA, NM, 2009
1:100000 30X60 MINUTE SERIES, BLM SURFACE MANAGEMENT STATUS TOPOGRAPHIC MAPS.

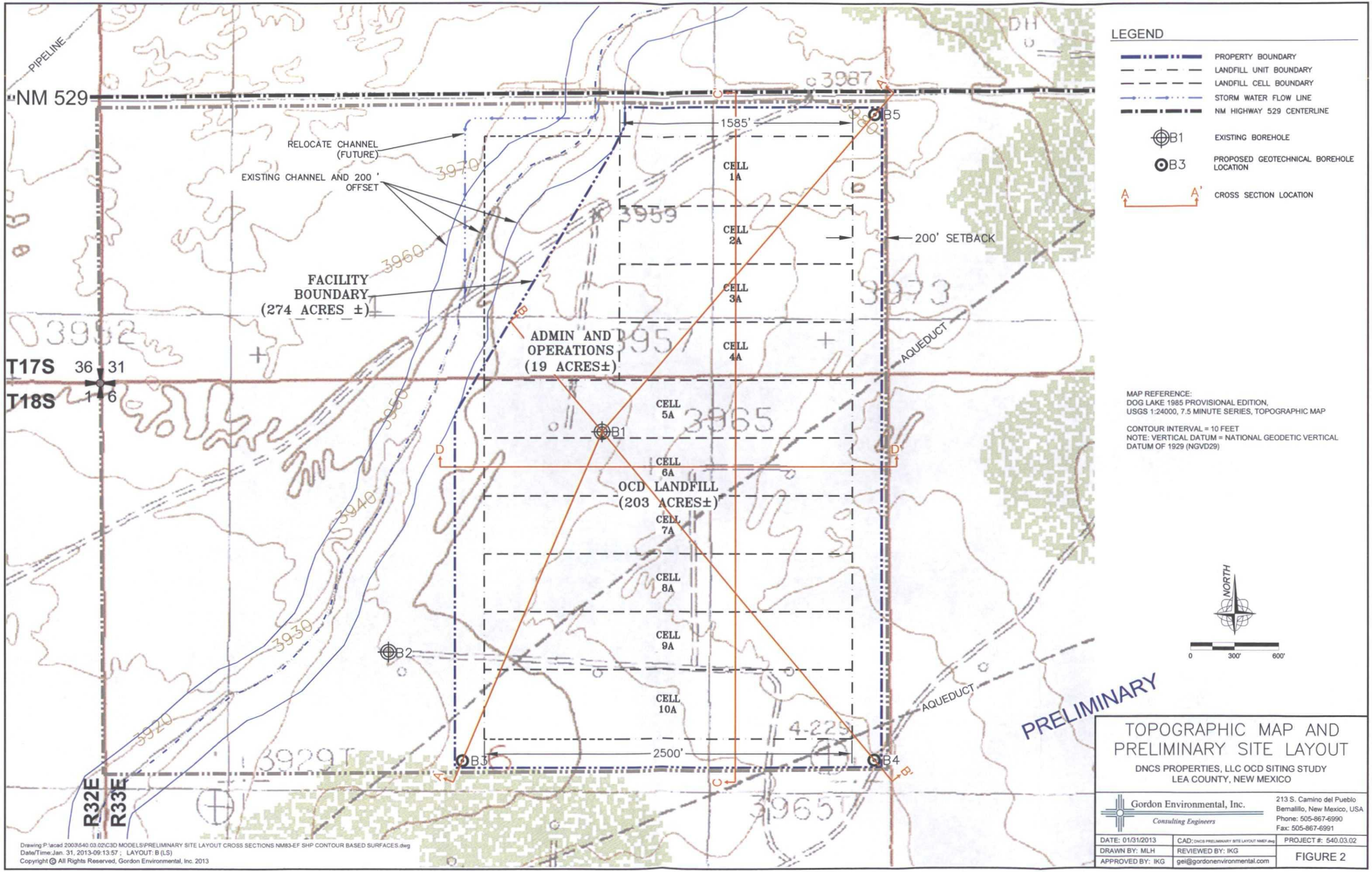
Drawing:P:\acad 2003\540.03.02\HYDROGEO FIGURES\SITE LOCATION MAP.dwg
Date/Time:Jan. 28, 2013-08:26:01 ; LAYOUT: B (LS)

SITE LOCATION MAP

DNCS PROPERTIES, LLC OCD SITING STUDY
LEA COUNTY, NEW MEXICO

Gordon Environmental, Inc.
Consulting Engineers
213 S. Camino del Pueblo
Bernalillo, New Mexico, USA
Phone: 505-867-6990
Fax: 505-867-6991

DATE: 01/25/2013	CAD:SITE LOCATION MAP.dwg	PROJECT #: 540.03.02
DRAWN BY: MLH	REVIEWED BY: CWF	FIGURE 1
APPROVED BY: IKG	gei@gordonenvironmental.com	



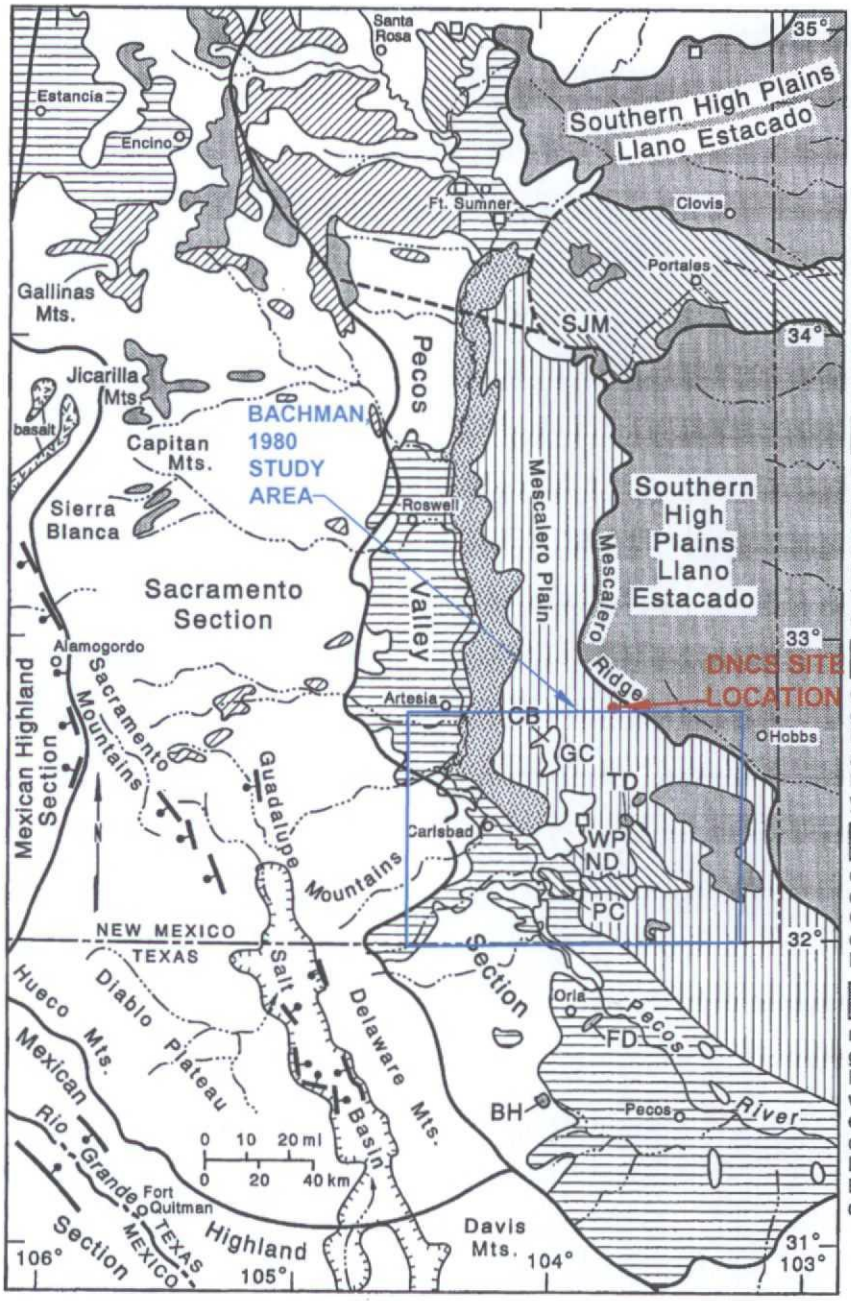
TOPOGRAPHIC MAP AND PRELIMINARY SITE LAYOUT

DNCS PROPERTIES, LLC OCD SITING STUDY
LEA COUNTY, NEW MEXICO

Gordon Environmental, Inc.
Consulting Engineers
213 S. Camino del Pueblo
Bernalillo, New Mexico, USA
Phone: 505-867-6990
Fax: 505-867-6991

DATE: 01/31/2013	CAD: DNCS PRELIMINARY SITE LAYOUT NMEF.dwg	PROJECT #: 540.03.02
DRAWN BY: MLH	REVIEWED BY: IKG	FIGURE 2
APPROVED BY: IKG	gei@gordonenvironmental.com	

Drawing:P:\acad 2003\540.03.02\C3D MODELS\PRELIMINARY SITE LAYOUT CROSS SECTIONS NM83-EF SHP CONTOUR BASED SURFACES.dwg
Date/Time:Jan. 31, 2013-09:13:57 ; LAYOUT: B (LS)



Explanation

Undivided valley fill and Permian bedrock units in Fort Sumner to Carlsbad segment of the Pecos Valley; complex of valley-floor alluvium, terrace deposits and solution-subsidence depression fills (Pliocene–Quaternary), including "upper" Gatuña Formation, with extensive exposures of Dewey Lake–Quartermaster (Ochoan), residual Salado–Rustler (Ochoan), and Artesia Group (Guadalupian) rocks.

Undivided valley and basin fill of the Estancia and Roswell–Artesia basins, and Carlsbad–Pecos segment of the lower Pecos Valley (Delaware basin); complex of fluvial and eolian deposits, and undifferentiated fills of solution-subsidence depressions (Middle Miocene–Quaternary); includes Ogallala and Gatuña Formations, "quartzose and limestone conglomerates", and younger valley fill. Outcrops of Triassic and Permian rocks are locally extensive, and small exposures of Precambrian rocks are present on the Pedernal uplift.

Older surficial sediments of the Mescalero Plain and eastern border of the lower Pecos Valley; complex of eolian, fluvial and depression-fill deposits and pedogenic calcretes (Pliocene to Middle Pleistocene) inset below the High Plains (Llano Estacado) surface and the Ogallala caprock calcrete zone; primarily "upper" Gatuña Formation with Quaternary eolian cover, but includes exposures of "lower" Gatuña–Ogallala, and Triassic and upper Permian rocks in solution-subsidence depressions and tributary valleys.

Older piedmont and valley-fill alluvium, and karst-depression fills on upland erosion surfaces of the upper Pecos Valley and Sacramento sections; coarse gravelly to sandy deposits and pedogenic calcretes (late Miocene to early Pleistocene); includes undivided Ogallala and Gatuña Formations, exposures of Precambrian, upper Paleozoic, and Triassic rocks, and discontinuous cover of younger Quaternary alluvial and eolian deposits.

Older fills of the Portales, and upper and lower Pecos Valley segments; complex of fluvial and eolian deposits, calcretes, and solution-subsidence depression fills (middle Miocene to Quaternary); includes Ogallala and "lower" and "upper" Gatuña Formations, and overlying eolian cover sediments correlative with the Blackwater Draw Formation of the Llano Estacado.

Ogallala Formation (middle Miocene to early Pliocene); thick complex of eolian, fluvial, and minor lacustrine deposits (sand, silt, clay, with local gravelly facies), and caprock calcrete zones east of the Pecos Valley; and thin gravelly to sandy alluvial deposits, with calcrete zones, capping upland valley and piedmont erosion surfaces west of the Pecos. Includes 1) extensive cover of Plio–Pleistocene eolian sediments (Blackwater Draw Formation) on the Southern High Plains (Llano Estacado), and 2) Pliocene–Quaternary alluvium, eolian deposits and karst depression fills west of the High Plains.

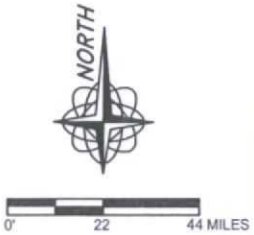
Early to middle Pleistocene ash-fall deposits derived from Jemez and Yellowstone volcanic centers.

Quaternary fault zones.

Physiographic section boundaries.

Index map of southeastern New Mexico region showing location of major physiographic subdivisions and general distribution patterns of upper Cenozoic deposits that include the Ogallala and Gatuña Formations or their correlatives. Occurrences of Plio-Pleistocene volcanic ashes and zones of known Quaternary faults are also shown. BH = Burnt Hills (TX), CB = Clayton Basin (NM), FD = Fourmile Draw (TX), GC = Gatuña Canyon (NM), ND = Nash Draw (NM), PC = Pierce Canyon (NM), TD = The Divide, SJM = San Juan Mesa (NM) and WP = WIPP site.

REFERENCE: HAWLEY, 1993b,FIGURE 1, P. 262



GEOMORPHIC AND SURFACE GEOLOGY MAP

DNCS PROPERTIES, LLC OCD SITING STUDY
LEA COUNTY, NEW MEXICO

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DATE: 01/24/2013	CAD: GEOMORPHIC SURFICAL GEOL.dwg	PROJECT #: 530.01.01
DRAWN BY: MLH	REVIEWED BY: CWF	FIGURE 3
APPROVED BY: IKG	gei@gordonenvironmental.com	

Drawing:P:\acad 2003\540.03.02\HYDROGEO FIGURES\GEOMORPHIC-SURFIC GEOL.dwg
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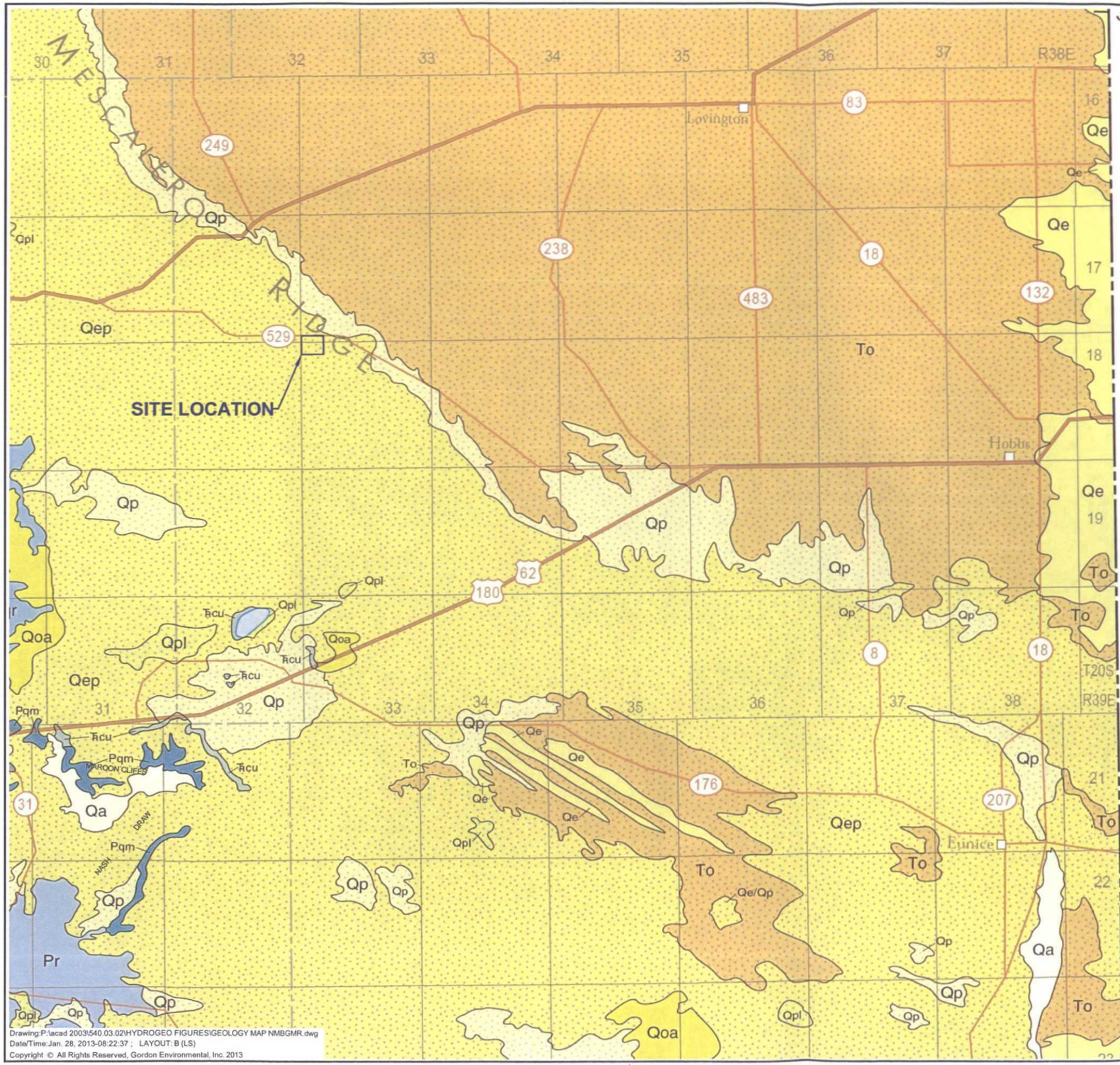

Drawing:P:\acad 2003\540.03.02\HYDROGEO FIGURES\GEOLOGY MAP NMBGMR.dwg
Date/Time:Jan. 28, 2013-08:22:37 ; LAYOUT: B (LS)

DESCRIPTION OF MAP UNITS

QUATERNARY

Qa Alluvium (Holocene to upper Pleistocene)

Qpl Lacustrine and playa deposits (Holocene)--Includes associated alluvial and eolian deposits of major lake basins

Qp Piedmont alluvial deposits (Holocene to lower Pleistocene)--Includes deposits of higher gradient tributaries bordering major stream valleys, alluvial veneers of the piedmont slope, and alluvial fans. May locally include uppermost Pliocene deposits

Qe Eolian deposits (Holocene to middle Pleistocene)

Qep Eolian and piedmont deposits (Holocene to middle Pleistocene)--Interlayered eolian sands and piedmont-slope deposits along the eastern flank of the Pecos River valley, primarily between Roswell and Carlsbad. Typically capped by thin eolian deposits

Qoa Older alluvial deposits of upland plains and piedmont areas, and calcic soils and eolian cover sediments of High Plains region (middle to lower Pleistocene)--Includes scattered lacustrine, playa, and alluvial deposits of the Tahoka, Double Tanks, Tule, Blackwater Draw, and Gatuña Formations, the latter of which may be Pliocene at base; outcrops, however, are basically of Quaternary deposits

TERTIARY

To Ogallala Formation (lower Pliocene to middle Miocene)--Alluvial and Eolian deposits, and petrocalcic soils of the southern High Plains. Locally includes Qoa

TRIASSIC

Tscu Upper Chinle Group/Dockum Group, Red shales with minor siltstone and sandstone. San Pedro Arroyo Formation.

Ts Santa Rosa Formation

PALEOZOIC

Pqm Quartermaster Formation (Upper Permian)--Red sandstone and siltstone (Equivalent to Dewey Lake Red Beds)

Pqr Quartermaster and Rustler Formations (Upper Permian)

Pr Rustler Formation (Upper Permian)--Siltstone, gypsum, sandstone, and dolomite

Psl Salado Formation (Upper Permian) -- Evaporite sequence, dominantly halite

NORTH

0 2.5 5 MILES

REFERENCE:
New Mexico Bureau of Geology and Mineral Resources, 2003, Geologic Map of New Mexico, Scale 1:500,000.

GENERALIZED GEOLOGIC MAP

DNCS PROPERTIES, LLC OCD SITING STUDY
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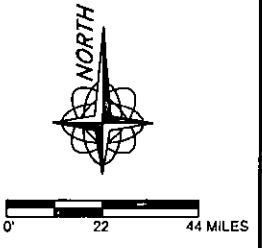
DATE: 01/23/2013	CAD: GEOLOGY MAP 1.dwg	PROJECT #: 540.03.02
DRAWN BY: MLH	REVIEWED BY: GEI	FIGURE 4
APPROVED BY: IKG	gei@gordonenvironmental.com	

Table 1.--Major stratigraphic and time divisions, southeastern New Mexico (Time divisions from Berggren, 1972, in part.)

ERA	SYSTEM	SERIES	FORMATION	AGE ESTIMATE
Cenozoic	Quarternary	Holocene	Windblown sand	
		Pleistocene	Mescalero caliche Gatuna Formation	ca. 500,000 years ca. 600,000+ years
	Tertiary	Pliocene	Ogallala Formation	-5 million years-------
		Miocene		26 million years-------
		Oligocene Eocene Paleocene	Absent Southeastern New Mexico	65 million years-------
Mesozoic	Cretaceous	Upper (Late) Lower (Early	Absent SE N. Mex. Detritus preserved	136 million years------
	Jurassic		Absent SE N. Mex.	190-195 million years--
	Triassic	Upper (Late) Lower	Dockum Group Absent SE N. Mex.	225 million years
Paleozoic	Permian	Ochoan	Dewey Lake Red Beds Rustler Formation Salado Formation Castile Formation	
		Guadalupian Leonardian Wolfcampian	Capitan Limestone and Bell Canyon Fm. Present but not discussed in this report	280 million years-----

REFERENCE: BACHMAN, 1980, TABLE 1, P. 11



PROJECT AREA STRATIGRAPHIC CHART

DNCS PROPERTIES, LLC OCD SITING STUDY
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DATE: 01/24/2013	CAD: GEOMORPHIC SURFICAL GEOL.dwg	PROJECT #: 530.01.01
DRAWN BY: MLH	REVIEWED BY: CWF	FIGURE 5
APPROVED BY: IKG	gei@gordonenvironmental.com	

Drawing:P:\acad 2003\540.03.02\HYDROGEO FIGURES\BACHMAN 1980 STAT CHART.dwg
Date/Time:Jan. 28, 2013-08:21:31 ; LAYOUT: A (P)

SW
A

NE
A'

EXISTING GROUND SURFACE

B-B' BEND IN SECTION

D-D'

C-C'

B1

B3

B5

PROBABLE CENOZOIC GATUÑA FORMATION, MESCALERO CALICHE, AND HOLOCENE EOLIAN SANDS

TOP OF REDBED PALEOSURFACE (INFERRED)

PROBABLE LATE PERMIAN AND LATE TRIASSIC SANDS, SILTS, AND CLAYS

4030 4020 4010 4000 3990 3980 3970 3960 3950 3940 3930 3920 3910 3900 3890 3880 3870 3860 3850 3840 3830 3820 3810 3800

0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500 2600 2700 2800 2900 3000 3100 3200 3300 3400 3500 3600 3700 3800 3900 4000 4100 4200 4300 4400 4500 4600 4700 4800 4900 5000 5100 5200 5300 5400 5500 5600

0 200' 400'

0 20' 40'

PRELIMINARY

CROSS SECTION A–A'

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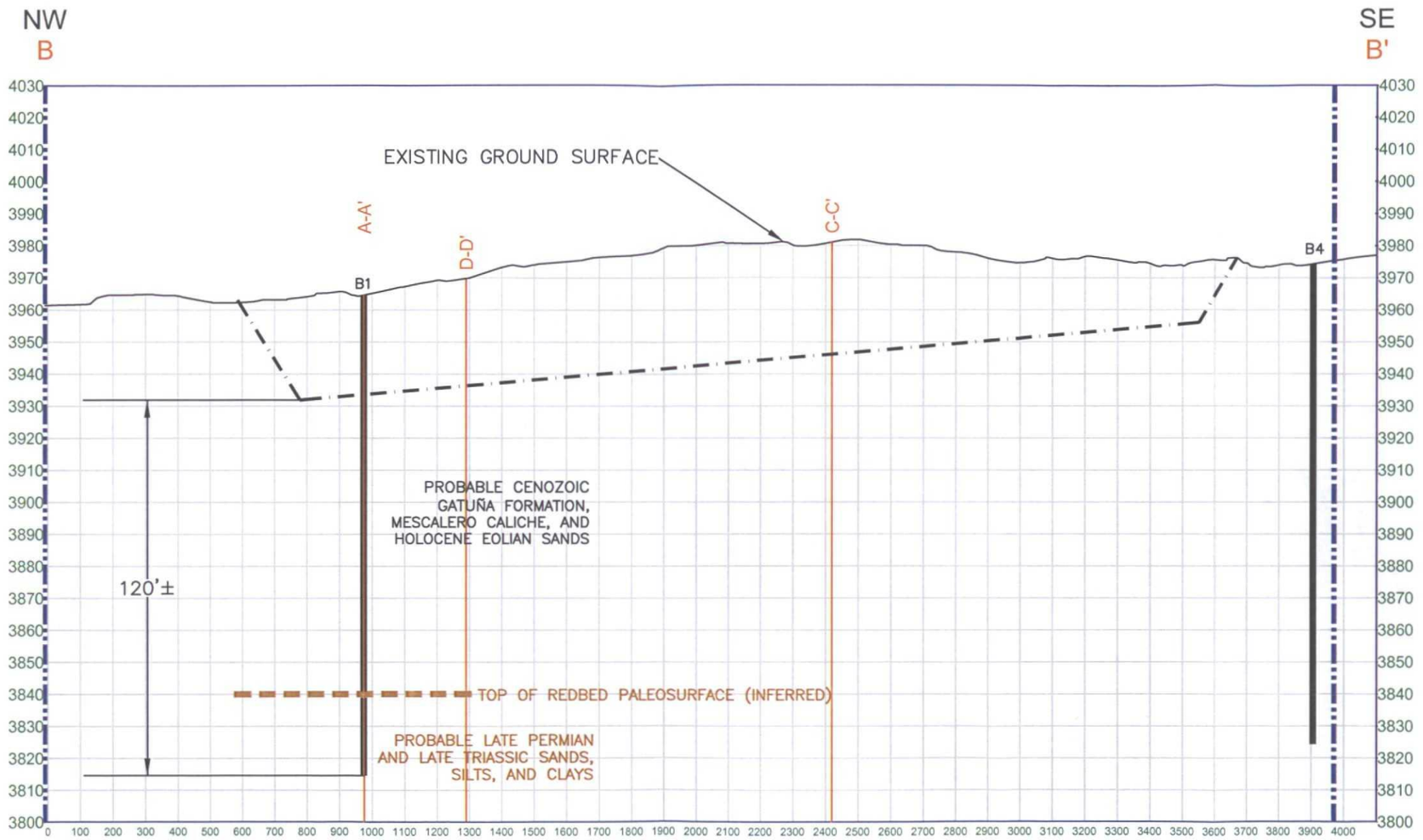
DATE: 01/30/2013	CAD: DNCS PRELIMINARY SITE LAYOUT NM83.dwg	PROJECT #: 540.03.02
DRAWN BY: MLH	REVIEWED BY: IKG	FIGURE 6
APPROVED BY: IKG	gei@gordonenvironmental.com	

Drawing:P:\acad 2003\540.03.02\C3D MODELS\PRELIMINARY SITE LAYOUT CROSS SECTIONS NM83-EF SHP CONTOUR BASED SURFACES.dwg
Date/Time:Jan. 30, 2013-09:25:28 ; LAYOUT: B (LS) (AA)



PRELIMINARY

CROSS SECTION B–B'

DNCS PROPERTIES, LLC OCD SITING STUDY
LEA COUNTY, NEW MEXICO

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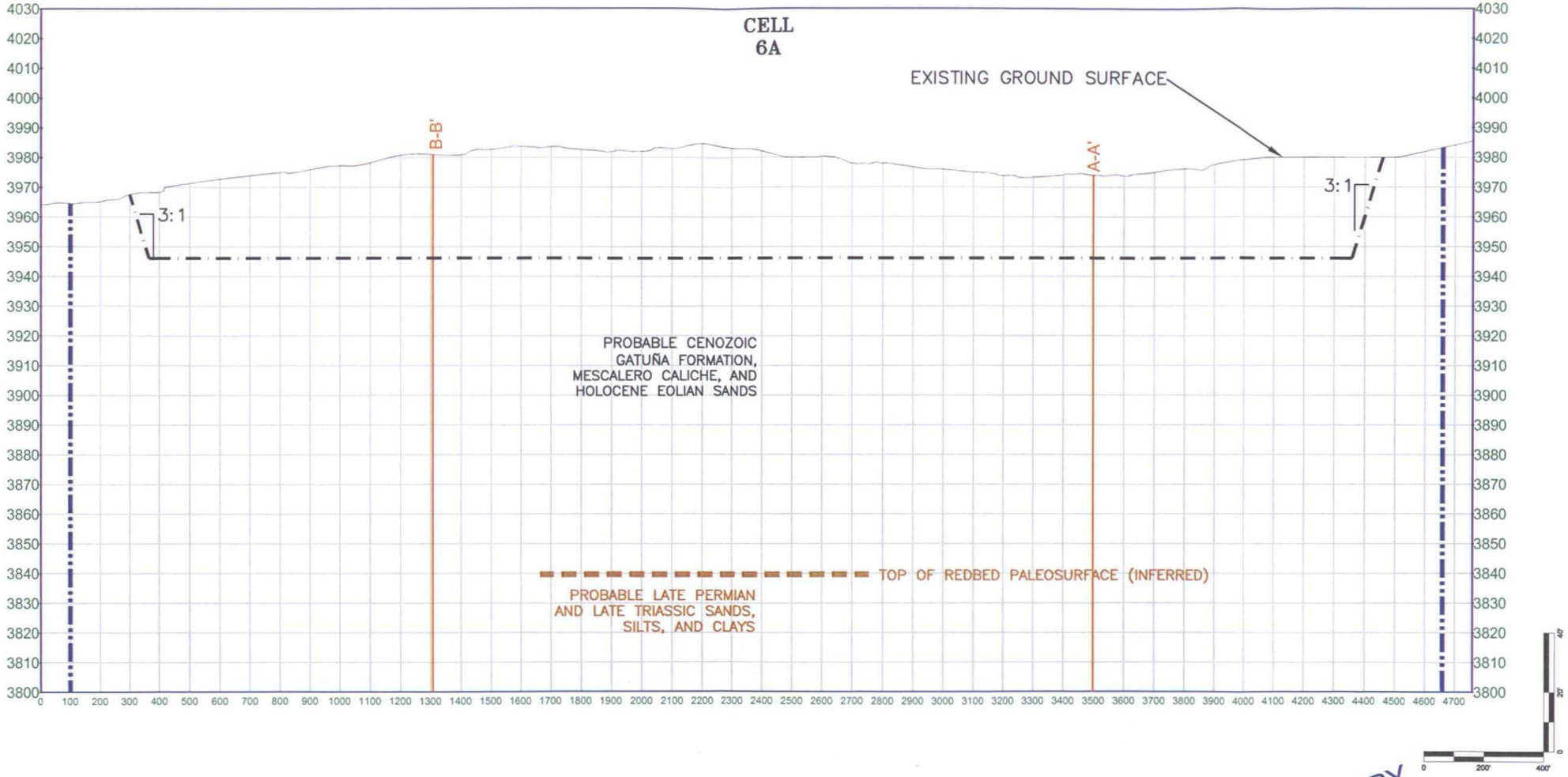
DATE: 01/31/2013	CAD: DNCS PRELIMINARY SITE LAYOUT NMEF.dwg	PROJECT #: 540.03.02
DRAWN BY: MLH	REVIEWED BY: IKG	FIGURE 7
APPROVED BY: IKG	gei@gordonenvironmental.com	

Drawing:P:\acad 2003\540.03.02\C3D MODELS\PRELIMINARY SITE LAYOUT CROSS SECTIONS NM83-EF SHP CONTOUR BASED SURFACES.dwg
Date/Time:Jan. 31, 2013-09:04:33 ; LAYOUT: B (LS) (BB)

S
C

N
C'



PRELIMINARY

CROSS SECTION C–C'

DNCS PROPERTIES, LLC OCD SITING STUDY
LEA COUNTY, NEW MEXICO

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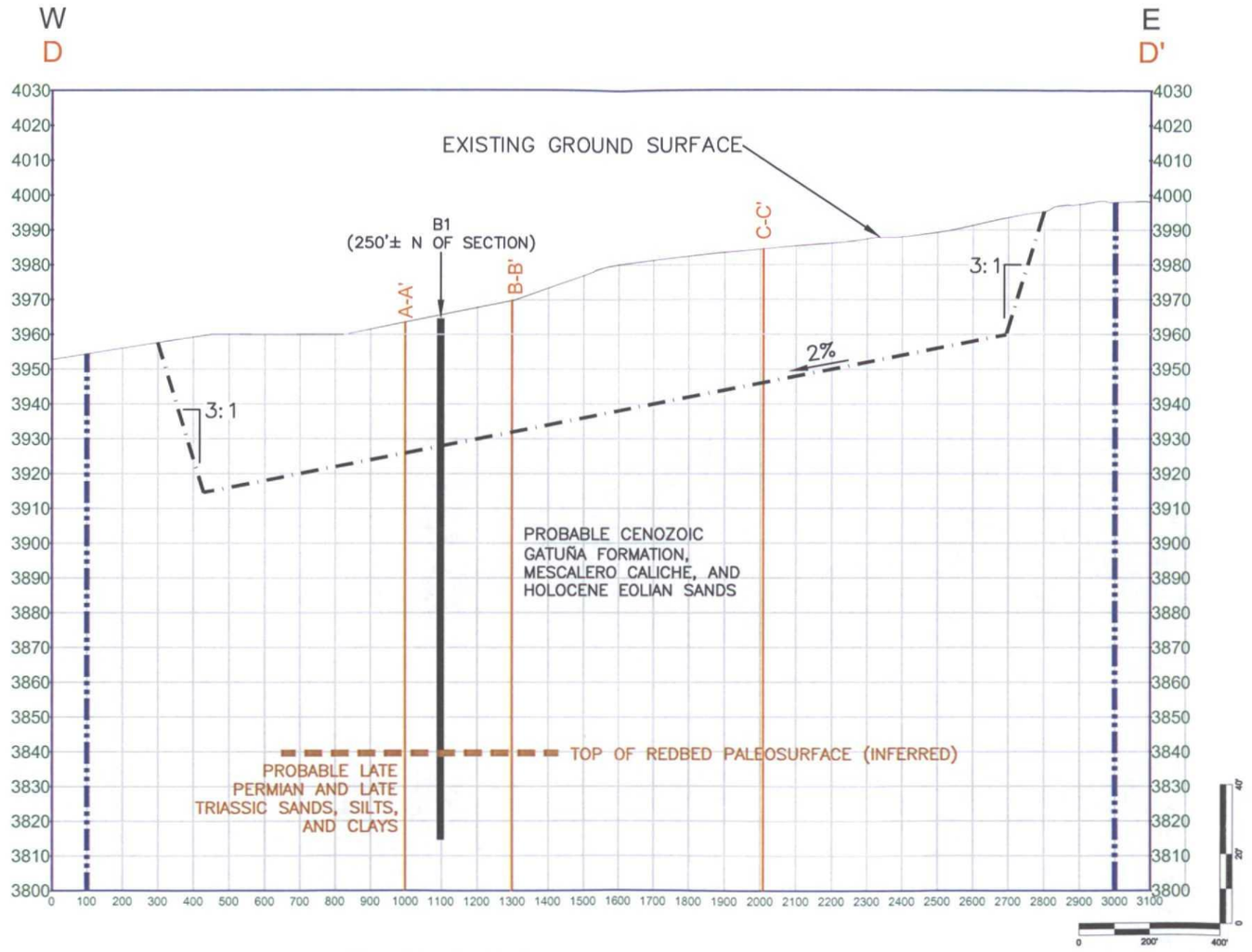
Fax: 505-867-6991

DATE: 01/31/2013	CAD: DNCS PRELIMINARY SITE LAYOUT NMEF.dwg	PROJECT #: 540.03.02
DRAWN BY: MLH	REVIEWED BY: IKG	FIGURE 8
APPROVED BY: IKG	gei@gordonenvironmental.com	

Drawing:P:\acad 2003\540.03.02\C3D MODELS\PRELIMINARY SITE LAYOUT CROSS SECTIONS NM83-EF SHP CONTOUR BASED SURFACES.dwg
Date/Time:Jan. 31, 2013-08:45:02 ; LAYOUT: B (LS) (CC)



EXISTING BORING B1 PROJECTED

PRELIMINARY

CROSS SECTION D–D'

DNCS PROPERTIES, LLC OCD SITING STUDY
LEA COUNTY, NEW MEXICO

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Fax: 505-867-6991

DATE: 01/31/2013	CAD: DNCS PRELIMINARY SITE LAYOUT NMEF.dwg	PROJECT #: 540.03.02
DRAWN BY: MLH	REVIEWED BY: IKG	FIGURE 9
APPROVED BY: IKG	gei@gordonenvironmental.com	

Drawing:P:\acad 2003\540.03.02\C3D MODELS\PRELIMINARY SITE LAYOUT CROSS SECTIONS NM83-EF SHP CONTOUR BASED SURFACES.dwg
Date/Time:Jan. 31, 2013-08:54:37 ; LAYOUT: B (LS) (DD)