ADDENDUM # 3

INVITATION TO BID NO: ITB 2022-799

PROJECT: NM173 PHASE 1 WATERLINE RELOCATION

BID DUE DATE/ TIME: Monday, February 28, 2022, 3:00 PM

NON-MANDATORY PRE-BID MEETING: Tuesday, February 22, 2022, 10:00 AM, East Aztec Pump Station, 1891 Navajo Dam Road, HWY 173, Aztec, NM 87410

LAST DAY FOR QUESTIONS: Thursday, February 24, 2022, 10:00 AM

This addendum includes:

1. Geotechnical report.

GEOTECHNICAL ENGINEERING REPORT
NM 173 WATERLINE IMPROVEMENT
AZTEC, NEW MEXICO

DRAFT REPORT
DATED July 30, 2021

Submitted To:

Paul O'Neil, P.E.
Short, Elliot, Hendrickson, Inc.
934 Main Avenue
Durango, Colorado 81301

Submitted By:

GEOMAT Inc.
915 Malta Avenue
Farmington, New Mexico 87401

July 30, 2021
GEOMAT Project 212-3731

GEOMAT INC.
915 Malta Avenue ◆ Farmington, NM 87401 ◆ Tel (505) 327-7928 ◆ Fax (505) 326-5721

July 30, 2021

Paul O'Neil, P.E.
Short, Elliot, Hendrickson, Inc.
934 Main Avenue
Durango, Colorado 81301

RE: Geotechnical Engineering Study
NM 173 Waterline Improvement
Aztec, New Mexico
GEOMAT Project No. 212-3731

GEOMAT Inc. (GEOMAT) has completed the geotechnical engineering exploration for the proposed Waterline Improvement along NM 173 in Aztec, New Mexico. This study was performed in general accordance with the scope of work described in our Proposal No. 192-12-19, dated January 29, 2020.

The results of our engineering study, including the geotechnical recommendations, site plan, boring records, and laboratory test results are attached.

We have appreciated being of service to you in the geotechnical engineering phase of this project. If you have any questions concerning this report, please contact us.

Sincerely yours,
GEOMAT Inc.

DRAFT REPORT
DATED July 30, 2021

Douglas N. Hood
Staff Professional

Matthew J. Cramer, P.E.
President, Principal

Copies to: Addressee (1)

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DRAFT REPORT
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GEOTECHNICAL ENGINEERING REPORT
NM 173 WATERLINE IMPROVEMENT
AZTEC, NEW MEXICO
GEOMAT PROJECT NO. 212-3731

INTRODUCTION

This report contains the results of our geotechnical engineering exploration for the proposed NM 173 Waterline Improvements in Aztec, New Mexico, as shown on the Site Plans in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations about:

- subsurface soil conditions
- groundwater conditions
- lateral soil pressures
- soil resistivity and corrosivity
- earthwork
- excavation conditions
- pipeline backfill

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The opinions and recommendations contained in this report are based upon the results of field and laboratory testing, engineering analyses, and experience with similar soil conditions, structures, and our understanding of the proposed project as stated below.

PROPOSED CONSTRUCTION

We understand that approximately 20,600 feet of new 8", C900 waterline will be installed along NM Hwy 173 to replace an existing 6" and 8" line. The new waterline will begin near the intersection of NM Hwy 173 and Old Spanish Trail then continue east along NM Hwy 173 for approximately 20,600 feet, then northeast along County Road 2550, where it will tie into an existing storage tank east of County Road 2550.

SITE EXPLORATION

Our scope of services performed for this project included a site reconnaissance by a staff professional, a subsurface exploration program, laboratory testing and engineering analyses.

Field Exploration:

Subsurface conditions along the proposed waterline were explored on July 13, 19, 20 & 23, 2021, by drilling 16 exploratory borings and excavating 30 test pits at the approximate locations shown on the Site Plans in Appendix A. The borings and test pits were drilled and excavated at

client designated spacing of approximately 450 to 850 foot intervals along the proposed waterline to depths of approximately 10 feet below the existing ground surface (bgs). The boring and test pit were numbered to correspond with the client provided designations.

The borings were advanced using CME-45 and CME-55 truck-mounted drill rigs with continuous-flight, 7.25-inch O.D. hollow-stem auger. Borings drilled on July 13th were drilled using the CME-55 drill rig, while borings drilled on July 23rd were drilled using the CME-45 drill rig. The borings were continuously monitored by a staff professional from our office who examined and classified the subsurface materials encountered, obtained representative samples, observed groundwater conditions, and maintained a continuous log of each boring.

The test pits were excavated on July 19th & 20th using a CASE 580 Super M Extendahoe with a 24" bucket that did not contain rock teeth. The test pits were continuously monitored by a professional from our office who examined and classified the subsurface materials encountered, obtained representative samples, observed groundwater conditions, and maintained a continuous log of each test pit.

Soil samples were obtained from the borings using a standard 2-inch O.D. split spoon sampler. The sampler was driven using a 140-pound hammer falling 30 inches. The standard penetration resistance was determined by recording the number of hammer blows required to advance the sampler in six-inch increments. Representative bulk samples of subsurface materials were also obtained from both borings and test pits. Soils were classified in accordance with the Unified Soil Classification System described in Appendix A. Boring and test pit logs were prepared and are presented in Appendix A.

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Groundwater evaluations were made in each boring at the time of site exploration. Soils were classified in accordance with the Unified Soil Classification System described in Appendix A. Boring logs were prepared and are presented in Appendix A.

Laboratory Testing:

Samples retrieved during the field exploration were transported to our laboratory for further evaluation. At that time, the field descriptions were confirmed or modified as necessary, and laboratory tests were performed to evaluate the index properties of the subsurface materials.

SITE CONDITIONS

NM 173 is located on the northern edge of Aztec, New Mexico, to the east of highway 550. In general, there is a moderate increase in surface elevation from west to east along NM173. The highway is bordered on the north and south extents by rising hills with bedrock outcroppings.

The ground surface along the highway ranged from sharp downward slopes away from the highway to relatively level surfaces. CR 2550 is in a subdivision to the west of NM 173, and is bordered by residential land on all sides. The ground surface along CR 2550 also ranges from sharp downward slopes away from the road to relatively level surfaces. The vegetation along the highway ranges small bushes and trees to large bushes and medium-sized trees at the time of exploration. The following photographs depict a boring and test pit.

View of Drill Rig at Boring B-29
View to the East

View of Backhoe at Boring TP-8
View to the West

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SUBSURFACE CONDITIONS

Soil Conditions:

As presented on Boring and Test Pit Logs in Appendix A, in the borings and test pits we generally encountered loose to very dense soils. Sandy or clayey soils were encountered to the full depth explored (10 feet) in borings and test pits TP-4, TP-6, B-7, TP-9 through TP-13, TP-15, TP-16, TP-19, TP-21 through B-23, TP-25, TP-28, TP-30, TP-31, TP-34, B-35, and TP-38. In the remaining borings and test pits rock was encountered within the 10-foot exploration. Borings B-5, and Test Pits TP-8, TP-18, TP-24, TP-36, TP-39, TP-40, TP-41, TP-42, TP-43, TP-44, and TP-47 were all terminated short of their planned depths of 10 feet due to bucket refusal on bedrock. Boring B-11 was terminated short of its planned depth of 10 feet due to conflict with an unmarked utility.

Groundwater Conditions:

Groundwater was not encountered in the borings to the depths explored. Groundwater elevations can fluctuate over time depending upon precipitation, irrigation, runoff and infiltration of surface water. We do not have any information regarding the historical fluctuation of the groundwater level in this vicinity.

Laboratory Test Results:

Laboratory analyses of representative samples indicate the sandy and silty soils have fines contents (silt- and/or clay-sized particles passing the U.S. No. 200 sieve) ranging from approximately 6 to 68 percent. Plasticity indices of the soils ranged from 0 to 26. Representative samples of the clay soils have a fines content ranging from approximately 54 to 68 percent with plasticity indices ranging from 15 to 16. The in-place moisture of the soils ranges from approximately 2.1 to 11.4 percent.

Corrosivity and resistivity analyses were conducted on samples taken from test pits TP-6, TP-21, TP-34, and TP-46 along the alignment. Results are discussed in detail in the following report section.

Results of all laboratory tests are presented in Appendix B.

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EARTHWORK RECOMMENDATIONS:

General Considerations:

The opinions contained in this report for the proposed construction are contingent upon compliance with recommendations presented in this section. The presence of underground utilities, including gas, electric, water, and communication lines, should be expected and appropriate precautions taken during excavation.

Excavation:

We present the following general comments regarding our opinion of the excavation conditions for the designers' information with the understanding that they are opinions based on our boring and test pit data. More accurate information regarding the excavation conditions should be evaluated by contractors or other interested parties from test excavations using the equipment that will be used during construction.

Based on our subsurface evaluation it appears that shallow excavations in soils at the site will be possible using standard excavation equipment. Excavations that encounter formational rock are expected to be difficult in some areas. The test pits were excavated using a CASE 580 Super M Extendahoe with a 24" bucket equipped with standard teeth. We anticipate that heavy-duty equipment and/or specialized methods may be necessary to advance excavations to the planned depths. Consideration could be given to the use of a trackhoe with rock teeth, hydraulic hoe ram, bulldozer with ripper claw, a rock trencher, etc. Although unanticipated, if it is determined that blasting is required, the contractor shall contact the owner to determine any restrictions associated with blasting. We recommend that the contractors or other interested parties evaluate

the excavatability of the rock using the equipment or methods that will be used during construction prior to submitting bids.

Excavations deeper than a few feet are likely to experience caving or sloughing. Sloping, shoring, or bracing of excavation walls, along with dewatering techniques, are likely to be necessary to maintain safe, stable excavations.

Excavation Safety:

Construction of stable temporary excavations is the responsibility of the contractor. Temporary slopes and excavations should be designed and constructed in accordance with the Department of Labor Occupational Safety and Health Administration 29 CFR Part 1926, Subpart P, Occupational Safety and Health Standards – Excavations ("*OSHA Construction Standards for Excavations*").

According to *OSHA Construction Standards for Excavations*, all excavations greater than four feet in depth must be sloped, shored, or braced. Spoils must be placed at least two feet from the edge of the excavation to reduce the potential for sidewall failure due to excessive lateral pressures. Other details regarding excavation safety, as described in Subpart P, shall be followed.

Conditions affecting stability of slopes and excavations can change over time depending on variables such as weather, vibration or surcharges due to nearby equipment, etc. The contractor's designated Competent Person (as defined in subpart P) shall monitor and assess conditions affecting soil stability during construction.

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Pipe Foundation:

Pipes should be bedded on a stable subgrade which is free of water. Any areas where pumping soils or otherwise unstable subgrade conditions are encountered must be stabilized before laying pipe. If such conditions are encountered during construction, GEOMAT should be contacted to provide specific recommendations for stabilization.

Pipe Embedment:

As required in the NMSSPWC specifications, a minimum thickness of eight (8.0) inches of embedment (bedding) material should be placed on top of the subgrade to support and protect the pipe. Once the pipe has been placed and aligned, shading material should be placed to a minimum of eight (8.0) inches above the top of the pipe. Hand tamping or similar techniques should be employed to ensure that the bedding material completely supports the haunch of the pipe.

Embedment material below the pipe should be compacted to a minimum density of 95 percent of the ASTM D1557 maximum dry density. To avoid damage to the pipe, mechanical compaction equipment should not be used over the pipe in the embedment zone.

Embedment material should be a granular soil such as sand, silty/clayey sand, or fine-grained gravel. It should be free of coarse-grained gravel particles or cobbles. Silt, clay, or organic soils are not suitable for use as embedment material. Soils used for embedment should have a fines content (percentage of silt and/or clay-sized particles passing the U.S. No. 200 sieve) of less than 50 percent.

Alternatively, flowable fill could be used as embedment material. The use of flowable fill could be appropriate in situations where placing personnel and/or compaction equipment in excavations is impractical due to closely-spaced adjacent utilities or unstable excavations.

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Backfill:

Excavations should be backfilled to the planned finished grades using native or imported soils that are free of debris, rubble, frozen soil, organic material, or other deleterious material. Fill material should be free of cobbles or boulders greater than six inches in diameter. Additionally, backfill material should conform to any specifications provided by the pipe manufacturer.

Backfill material in non-structural areas should be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557. Soils should be compacted at moisture contents near optimum. Material should be placed in horizontal lifts in thicknesses that permit compaction to the required densities with the equipment being used.

Backfill under pavements or other structures should conform to NMDOT or NMSSPWC specifications as applicable.

The existing soils along some of the alignment are fine-grained, and as such, are expected to be moisture sensitive. The fine-grained native soils may pump or become unstable or unworkable

at high water contents. It is anticipated that proper moisture-density control during placement and compaction will be required.

Compliance:

The recommendations in this report depend upon compliance with **Earthwork** recommendations. To assess compliance, observation and testing should be performed by GEOMAT.

PAVEMENT REPAIRS:

Existing bituminous pavement removed in connection with construction shall be cut with a saw or other suitable tool. Care shall be taken to assure that the edge of removed pavement does not vary from a straight line more than two inches for any given section of removed pavement.

Patching of removed pavement shall conform to applicable NMDOT or NMSSPWC specifications.

No edge of a pavement patch shall be in a wheel path; the edge shall be either between wheel paths or on the centerline of the road. If the outer edge of the paved surface is damaged, the paving shall be replaced to between the wheel paths of the lane damaged. If the damage extends beyond the outer wheel, the paving shall be replaced to the centerline of the road.

Trench backfill under pavements, and within 5 feet of the edge of the pavement, should be compacted to a minimum of 95 percent of the ASTM D1557 maximum dry density.

For trenching that will be within 5 feet of the outside edge of the pavement, the backfill should be compacted to a density of not less than 90 percent of the maximum dry density, as determined by ASTM D1557 or in accordance with applicable NMDOT or NMSSPWC specifications.

ADDITIONAL OPINIONS AND RECOMMENDATIONS

Corrosion and Cement Type:

A representative sample of soil from the borings was tested to evaluate the potential for the on-site soils to corrode buried metal and/or concrete. The samples were tested for pH, electrical resistivity, and soluble sulfates and chlorides. Results of these tests are summarized in the following table.

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Corrosivity Test Results						
Sample No.	**Boring No.**	**Sample Depth (ft)**	**pH**	**Resistivity (ohm-cm)**	**Sulfates (%)**	**Chlorides (%)**
4105	TP-6	2	7.27	764	0.104	ND
4110	TP-21	2	7.68	439	0.171	ND
4114	TP-34	9	8.27	3480	0.007	0.002
4139	TP-46	3	8.47	6090	ND	ND

*ND – Not Detected

Corrosion of Concrete:

The soluble sulfate content of the samples tested ranged from Not Detected to 0.171 percent (by weight), which may be characterized as mild to moderate potential for corrosion (IBC Table 1904.3). According to the American Concrete Institute Building Code 318, there are no restrictions on the type of cement to be used. All concrete should be designed, mixed, placed, finished, and cured in accordance with the guidelines presented by the American Concrete Institute (ACI).

Corrosion of Metals:

Corrosion of buried ferrous metals can occur when electrical current flows from the metal into the soil. As the resistivity of the soil decreases, the flow of electrical current increases, increasing the potential for corrosion. A commonly accepted correlation between soil resistivity and corrosion of ferrous metals is shown in the following table.

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Resistivity (ohm-cm)	Corrosivity
0 to 1,000	Severely Corrosive
1,000 to 2,000	Corrosive
2,000 to 10,000	Moderately Corrosive
>10,000	Mildly Corrosive

The samples tested had a resistivity value ranging from 439 to 6090 ohm-cm. Based on these laboratory results and the table above, the on-site soils would be characterized as severely to moderately corrosive toward ferrous metals. The potential for corrosion should be taken into account during the design process.

Site Classification:

Based on the subsurface conditions encountered in the borings and test pits, we estimate that a Site Class of C is appropriate for the site according to Table 20.3-1 of the ASCE 7-10 Standard in accordance with the 2015 International Building Code. This parameter was estimated based on extrapolation of data beyond the deepest depth explored, using methods allowed by the code. Actual shear wave velocity testing/analysis and/or exploration to a depth of 100 feet were not performed as part of our scope of services for this project.

Lateral Earth Pressures:

Recommended equivalent fluid pressures for unrestrained foundation elements are presented in the following table:

- Active**:**
  Granular soil backfill (on-site sand).....35 psf/ft
  Undisturbed subsoil .....30 psf/ft

- Passive:
  Foundation walls .....250 psf/ft

- Coefficient of base friction: 0.40
  The coefficient of base friction should be reduced to 0.30 when used in conjunction with passive pressure.

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Where the design includes restrained elements, the following equivalent fluid pressures are recommended:

- **At rest:**
  Granular soil backfill (on-site sand).....50 psf/ft
  Undisturbed subsoil.....60 psf/ft

Fill against retaining walls should be compacted to densities specified in **Earthwork** Medium to high plasticity clay soils should not be used as backfill against the vault walls. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Over compaction may cause excessive lateral earth pressures that could result in wall movement.

GENERAL COMMENTS

It is recommended that GEOMAT be retained to provide a general review of final design plans and specifications in order to confirm that earthwork recommendations in this report have been interpreted and implemented. In the event that any changes of the proposed project are planned, the opinions and recommendations contained in this report should be reviewed and the report modified or supplemented as necessary.

GEOMAT should also be retained to provide services during the construction phase of the project. Construction testing, including field and laboratory evaluation of fill and/or backfill materials, should be performed to determine whether applicable project requirements have been met.

The analyses and recommendations in this report are based in part upon data obtained from the field exploration. The nature and extent of variations beyond the location of test excavations may not become evident until construction. If variations then appear evident, it may be necessary to re-evaluate the recommendations of this report.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities at the same time. No warranty, express or implied, is intended or made. We prepared the report as an aid in design of the proposed project. This report is not a bidding document. Any contractor reviewing this report must draw his own conclusions regarding site conditions and specific construction equipment and techniques to be used on this project.

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This report is for the exclusive purpose of providing geotechnical engineering and/or testing information and recommendations. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken. This report has also not addressed any geologic hazards that may exist on or near the site.

This report may be used only by the Client and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on and off site), or other factors may change over time and additional work may be required with the passage of time. Any party, other than the Client, who wishes to use this report, shall notify GEOMAT in writing of such intended use. Based on the intended use of the report, GEOMAT may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements, by the Client or anyone else, will release GEOMAT from any liability resulting from the use of this report by an unauthorized party.

Appendix A

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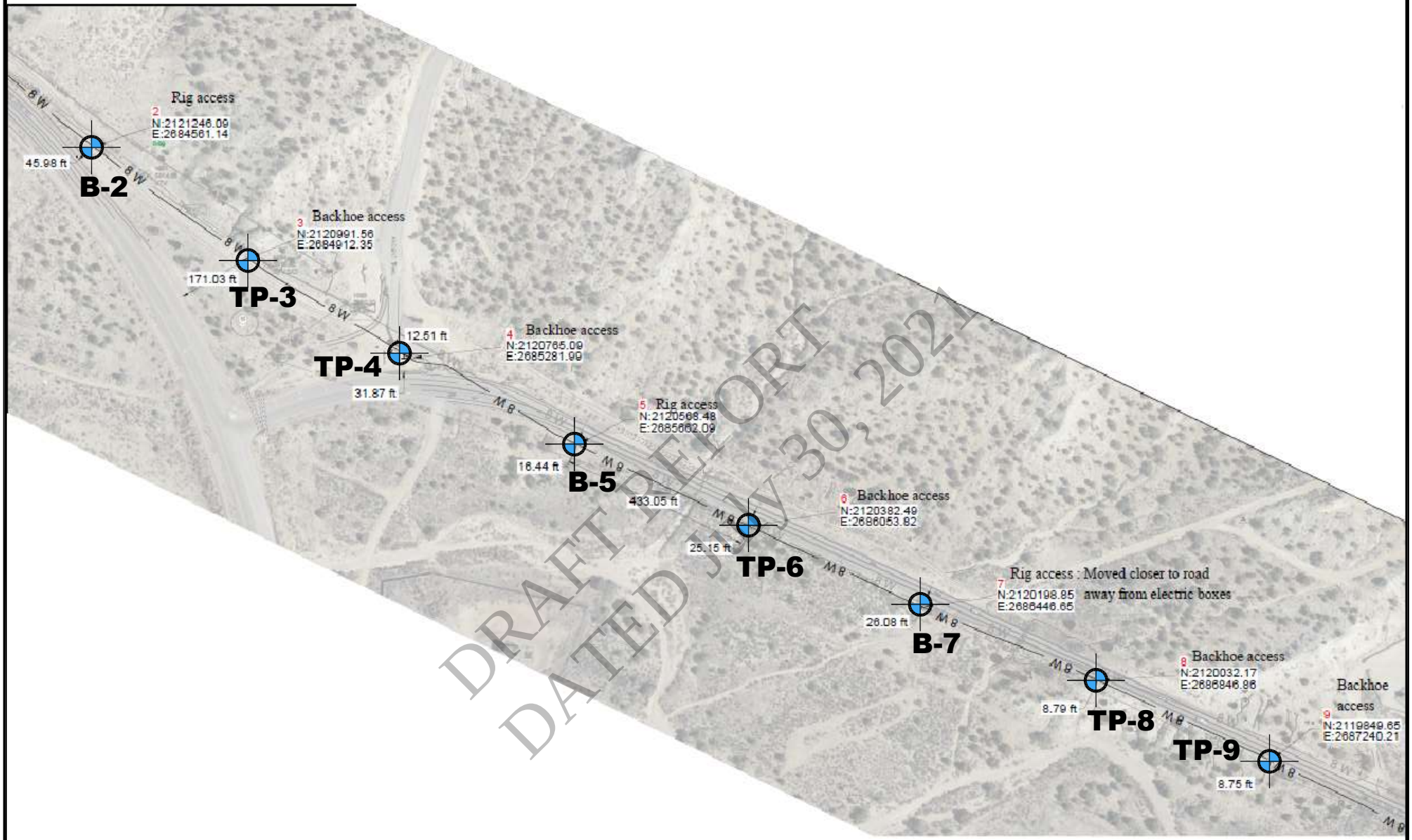
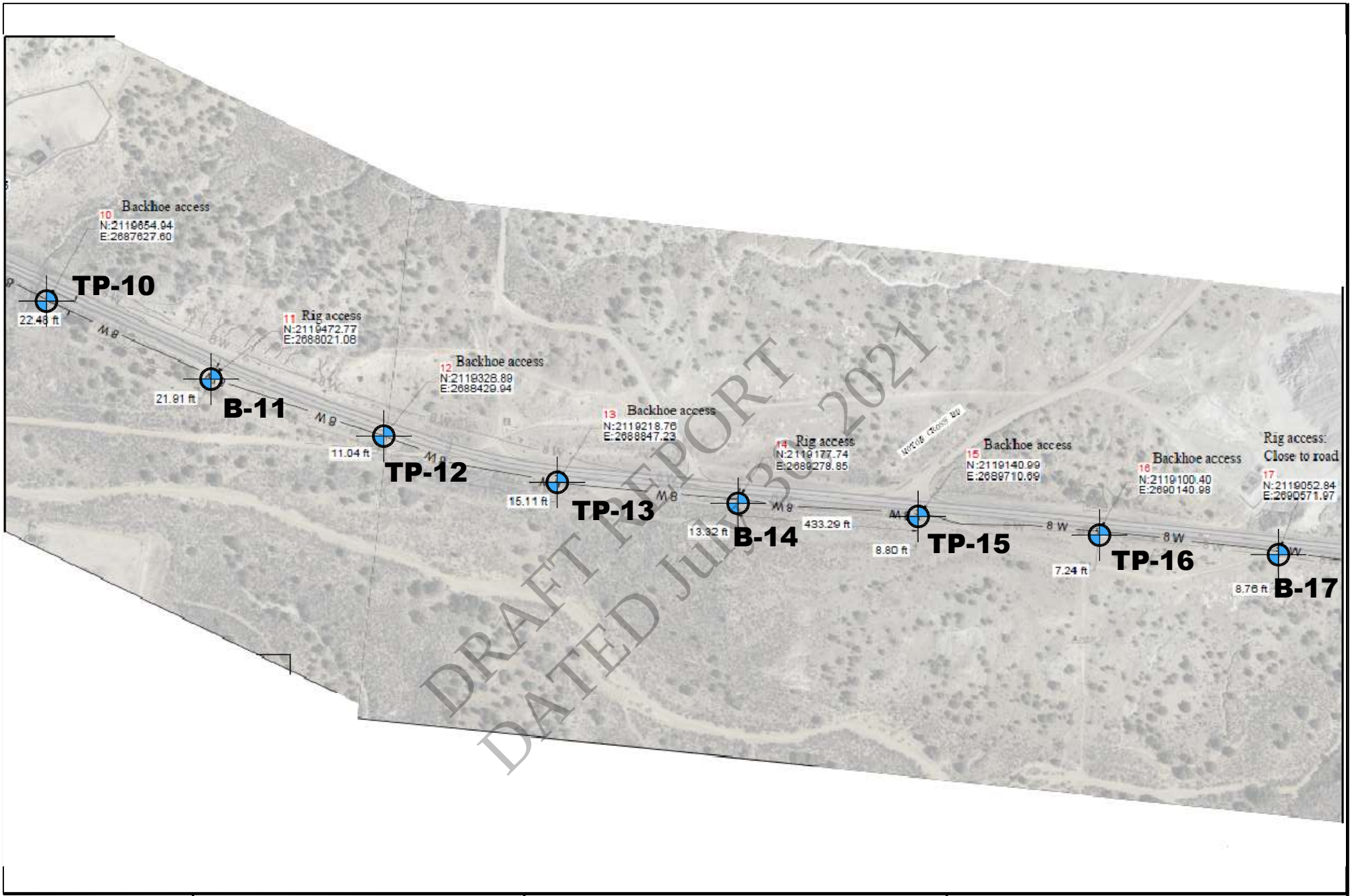


Approximate Not to Scale	SITE PLAN Boring Locations (approximate) GEOMAT Project No. 212-3731 Date of Exploration: July 13, 19,20 &23, 2021	PROJECT NM 173 Waterline Improvement Project Aztec, New Mexico

GEOMAT INC.



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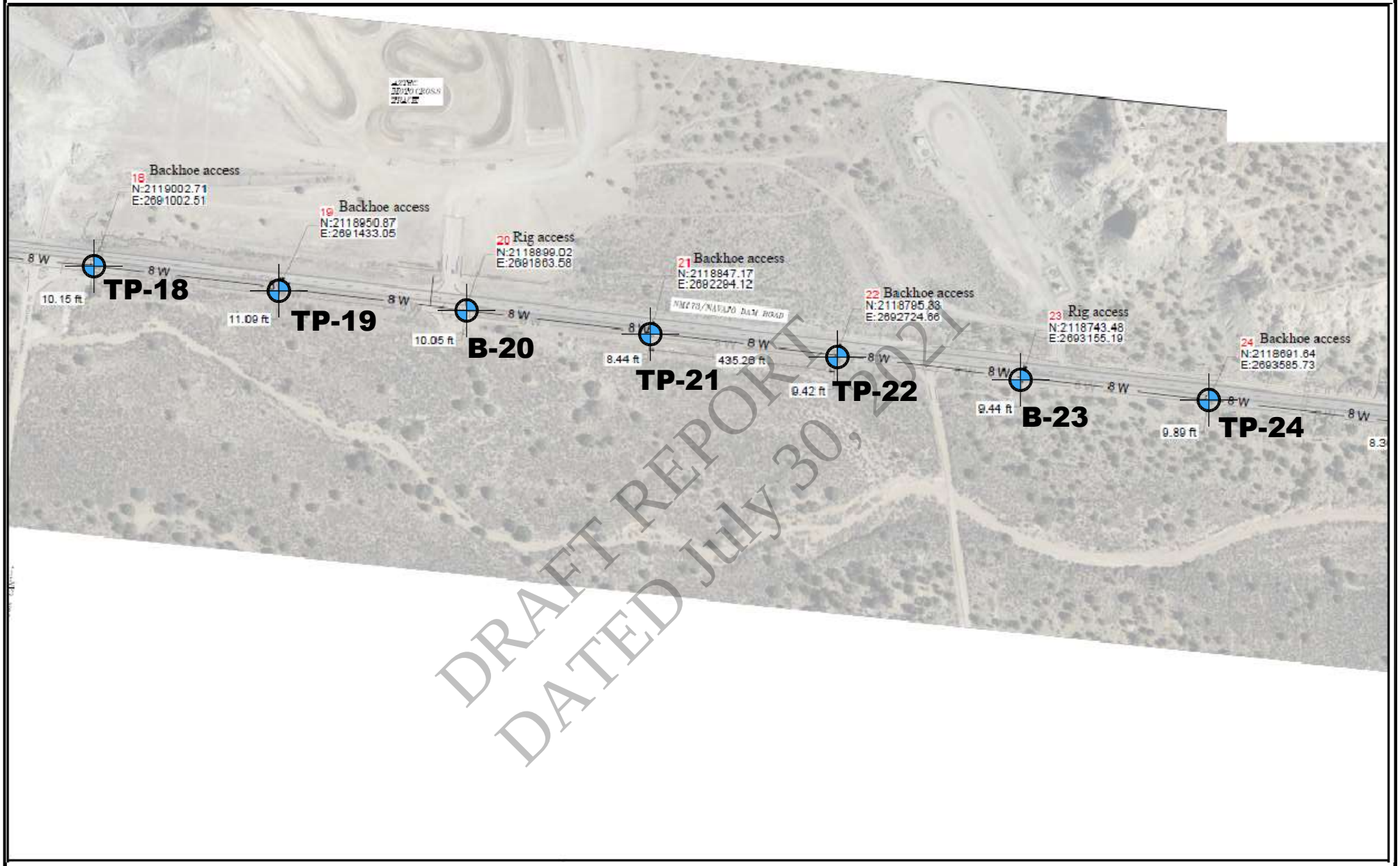

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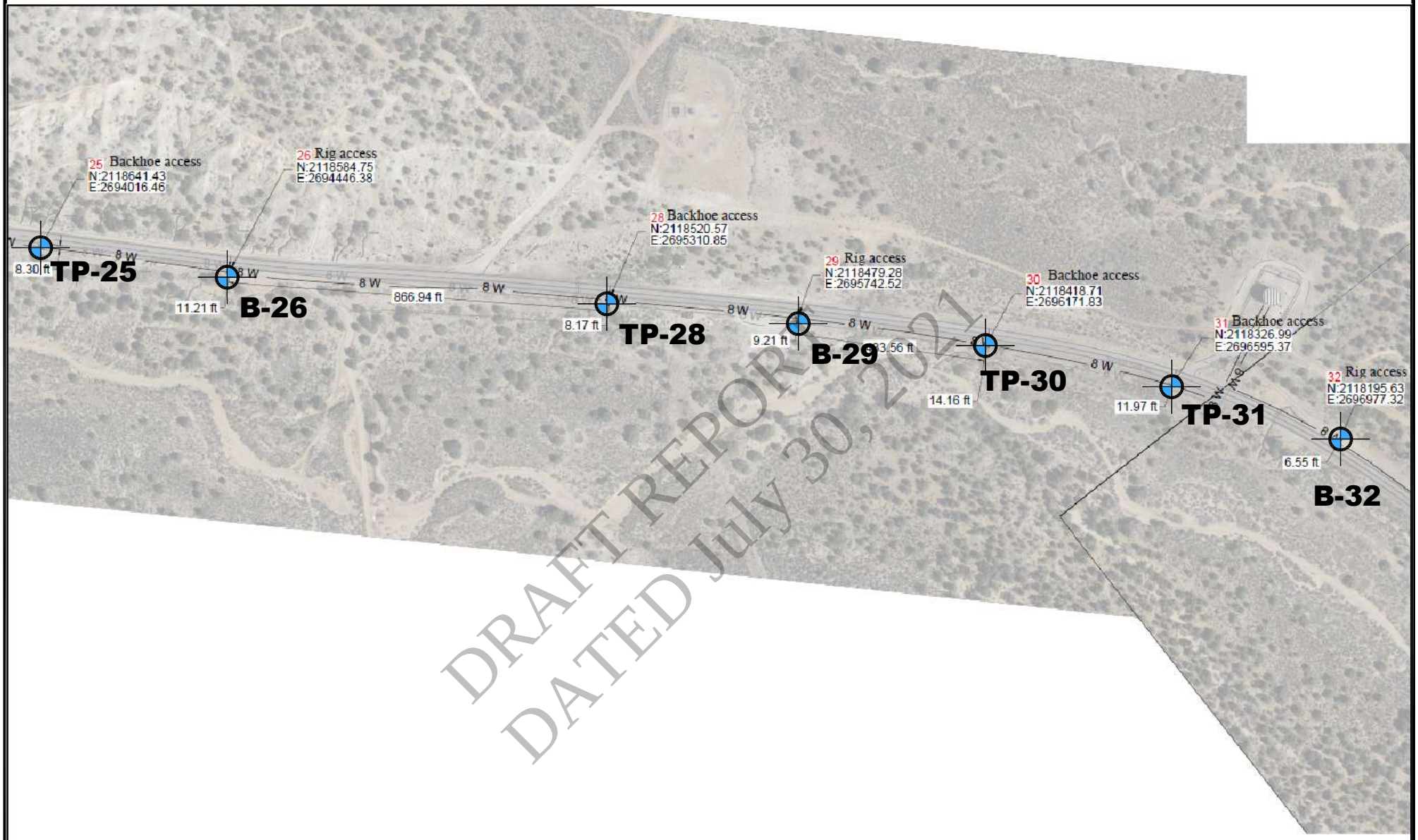

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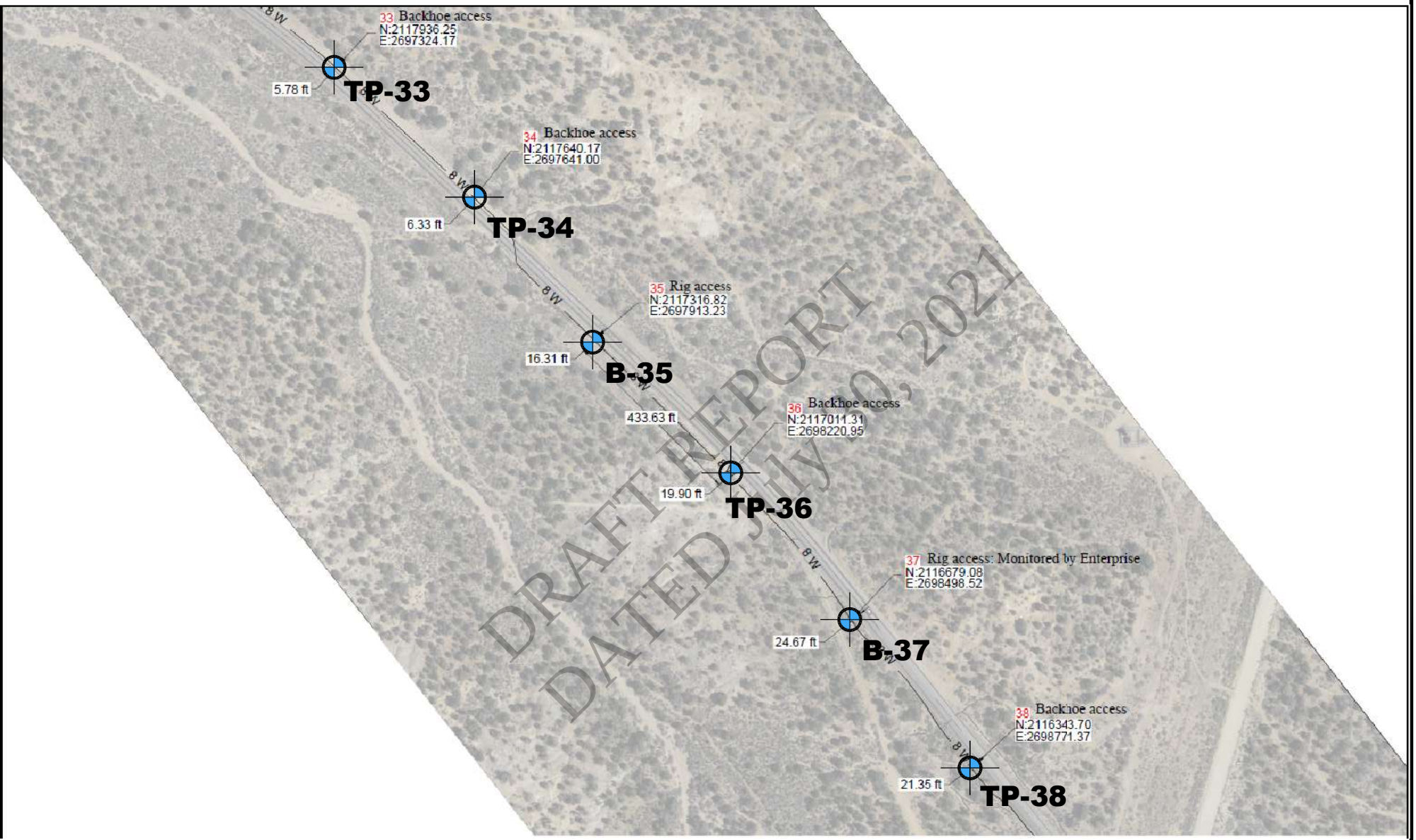

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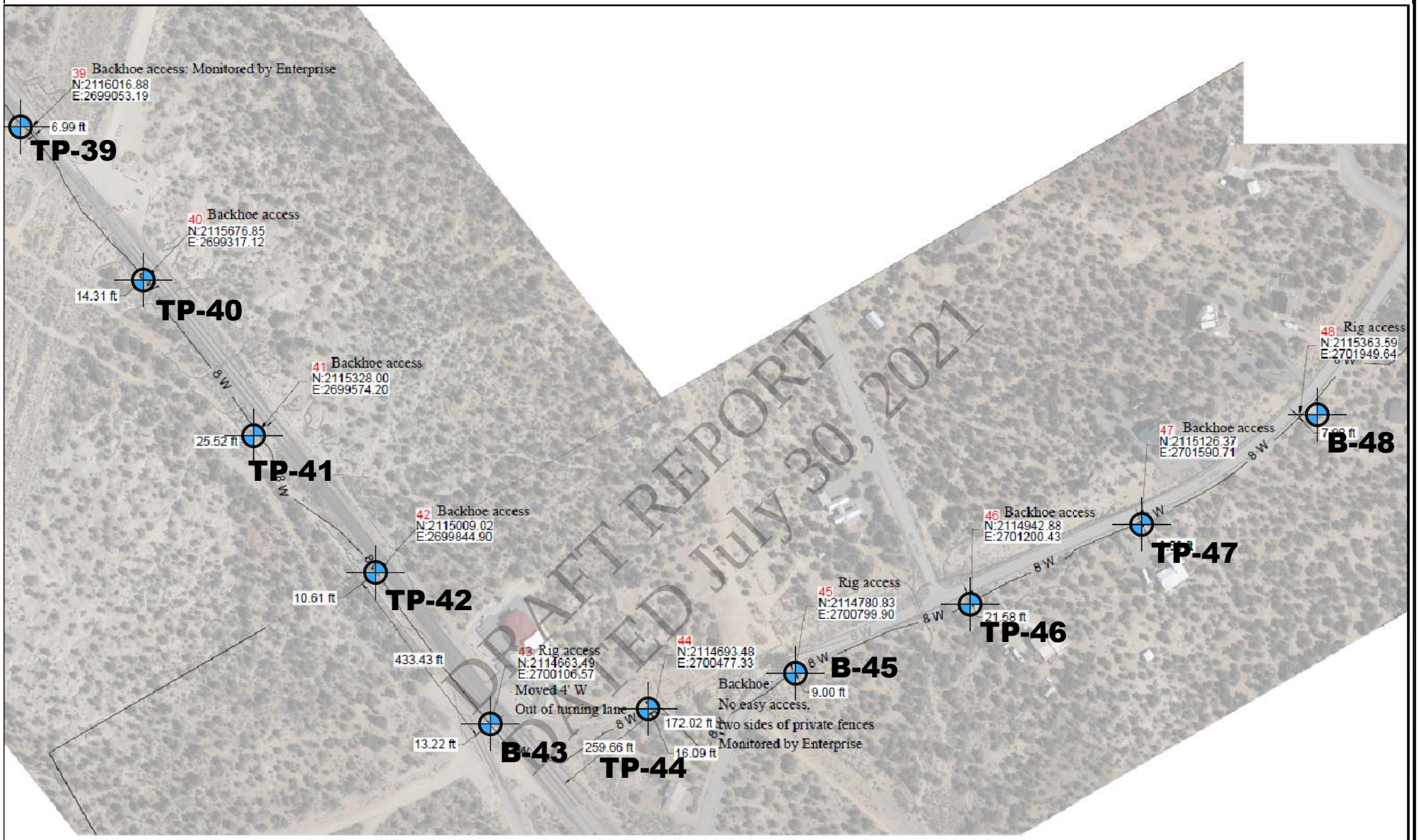
GEOMAT INC.



Approximate Not to Scale	SITE PLAN Boring Locations (approximate) GEOMAT Project No. 212-3731 Date of Exploration: July 13, 19,20 &23, 2021	PROJECT NM 173 Waterline Improvement Project Aztec, New Mexico

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Boring B-2

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results				Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)							
									1	Sandy lean CLAY, tan/grey, very stiff, slightly damp
									2	
				12-12-10	SS		CL		3	
									4	
	54	15	9.9	10-19-26	SS				5	hard
									6	
									7	Sandy SHALE, grey/tan, moderatly weathered, slightly damp
									8	
							RK		9	
									10	
				35-50/6"	SS				11	hard
									12	Total Depth 11 feet
									13	
									14	
									15	

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A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Test Pit TP-3

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	Laboratory Results: % Passing #200 Sieve	Laboratory Results: Plasticity Index	Laboratory Results: Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
							SM		1	Silty SAND, tan/brown, fine- to medium- grained, damp
									2	
	32	26	11.4			GRAB	SC		3	Clayey SAND, brown/grey, fine- to medium- grained, damp
						GRAB			4	
									5	SANDSTONE, brown/red, fine- to coarse- grained, well cemented, sligthly weathered, slightly damp tan/brown, weakly cemented
						GRAB			6	claystone lense, black/brown, damp
							RK		7	tan/brown, weakly cemented, moderately weathered, slightly damp
									8	
									9	
									10	
									10	Total Depth 10 feet
									11	
									12	
									13	
									14	
									15	

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GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-4

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results				Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)							
							SC		0	Clayey SAND, brown/grey, fine- to medium- grained, slightly damp
						GRAB			1	Silty SAND, brown, fine- to coarse- grained, damp
									2	
									3	
									4	
							SM		5	
									6	
									7	
									8	
									9	
									10	Total Depth 10 feet
									11	
									12	
									13	
									14	
									15	

DRAFT REPORT DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Boring B-5

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
				4-7-7	SS		SM		1 2 3 4 5	Silty SAND, tan/brown, fine- to coarse- grained, medium dense, slightly damp to damp
				6-9-10	SS		RK		6 7	SANDSTONE, tan/white, fine- to medium- grained, medium dense, weakly cemented, slightly weathered, slightly damp
									8 9 10 11 12 13 14 15	Auger Refusal, Well cemented sandstone Total Depth 7 feet

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DATED July 30, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Test Pit TP-6

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
	12	NP	2.2			GRAB	SW-SM		1 2 3 4 5 6 7 8 9 10	Well-graded SAND with silt, tan/brown, fine- to coarse-grained, slightly damp light tan
									11 12 13 14 15	Total Depth 10 feet

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DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Boring B-7

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-55
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/13/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
									1	Silty SAND, light tan, fine- to coarse- grained, loose, slightly damp
									2	
				3-3-4	SS				3	
									4	
				3-3-3	SS		SM		5	loose
									6	
									7	
									8	
									9	
				4-6-6	SS				10	medium dense
									11	Total Depth 10½ feet
									12	
									13	
									14	
									15	

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A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Test Pit TP-8

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
						GRAB	SM		1 2 3 4	Silty SAND, tan/brown, fine- to coarse- grained, carbonate pocket, slightly damp
							RK		5 6 7 8	SANDSTONE, grey, fine- to medium- grained, weakly cemented, slight salt precipitation, slightly damp
									9 10 11 12 13 14 15	Bucket Refusal at 8 Feet Total Depth 8 feet

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DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-9

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
	30	NP	5.3			GRAB	SM		1 2 3 4 5 6 7 8 9 10	Silty SAND, tan/brown, fine- to medium- grained, slightly damp
									11 12 13 14 15	Total Depth 10 feet

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DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-10

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results				Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)							
							SM		1	Silty SAND, tan/brown, fine- to medium- grained, slightly damp
									2	
									3	brown
									4	
									5	
									6	
						GRAB			7	
									8	tan/brown
									9	
									10	
									10	Total Depth 10 feet
									11	
									12	
									13	
									14	
									15	

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GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Boring B-11

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-55
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/13/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
					GRAB				1	Silty SAND, tan/brown, fine- to coarse- grained, loose, slightly damp
				3-3-4	SS		SM		2	
									3	tan
									4	terminated due to utility conflict Total Depth 4 feet
									5	
									6	
									7	
									8	
									9	
									10	
									11	
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Test Pit TP-12

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	Laboratory Results: % Passing #200 Sieve	Laboratory Results: Plasticity Index	Laboratory Results: Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
									1	Silty SAND, brown, fine- to coarse- grained, damp
							SM		2	
									3	tan/brown, slightly damp
	14	11	4.4			GRAB			4	
							SC		5	Clayey SAND, tan/brown, slightly damp, slight weathering
									6	
									7	Silty SAND, tan/brown, fine- to coarse- grained, slightly damp
							SM		8	
									9	
									10	
									11	Total Depth 10 feet
									12	
									13	
									14	
									15	

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GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-13

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	Laboratory Results: % Passing #200 Sieve	Laboratory Results: Plasticity Index	Laboratory Results: Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
	17	5	4.0			GRAB	SM/SC		1 2 3 4 5 6 7 8 9 10	Silty, clayey SAND, brown, fine- to medium- grained, damp tan/brown, slightly damp, trace carbonate fine- to coarse- grained, damp
									11 12 13 14 15	Total Depth 10½ feet

DRAFT REPORT DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Boring B-14

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-55
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Bulk and Split spoon samples
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/13/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
					GRAB		SM		1	Silty SAND, tan/brown, fine- to coarse- grained, slightly damp
									2	
				6-9-9	SS				3	SANDSTONE, brown, fine- to coarse- grained, medium dense, moderalty cemented, very poor recovery
									4	
				5-6-6	SS				5	
							RK		6	tan, medium dense, weakly cemented
									7	
									8	
									9	
				6-12-12	SS				10	brown, medium dense, poor recovery
									11	Total Depth 10½ feet
									12	
									13	
									14	
									15	

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A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Test Pit TP-15

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results				Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)							
						GRAB	SM		1	Silty SAND, brown, fine- to medium- grained, damp to slightly damp
									2	
									3	
									4	
									5	
									6	
									7	
									8	
									9	clay lense
									10	
										Total Depth 10 feet
									11	
									12	
									13	
									14	
									15	

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DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-16

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
						GRAB	SM		1–10	Silty SAND, tan/brown, fine- to coarse- grained, slightly damp
									10	Total Depth 10 feet

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DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Boring B-17

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
							SM		1	Silty SAND, grey/white, fine- to medium- grained, damp
									2	
				7-10-12	SS		RK		3	SHALE, grey/tan, fine- to medium- grained, very stiff, slightly weathered, slightly damp
									4	
									5	
				13-24-50/6"	SS				6	SILTSTONE, grey/white, fine- grained, hard, moderatly cemented, slightly weathered, slightly damp
							RK		7	
									8	
									9	
				50/6"	SS		RK		10	SHALE, grey/red, fine- to medium- grained, hard, moderatly cemented, moderatly weathered, slightly damp
									11	Total Depth 10½ feet
									12	
									13	
									14	
									15	

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A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Test Pit TP-18

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
							SM		1	Silty SAND, light tan/tan, fine- to coarse- grained, slightly damp
							RK		2	SANDSTONE, white/tan, fine- to coarse- grained, moderatly cemented, slightly weathered, slightly damp
									3	Bucket Refusal at 2 feet Total Depth 2 feet
									4	
									5	
									6	
									7	
									8	
									9	
									10	
									11	
									12	
									13	
									14	
									15	

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DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-19

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results				Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)							
									1	Silty SAND, tan/brown, fine- to coarse- grained, damp to slightly damp
									2	
							SM		3	
									4	
									5	
	44	17	7.3			GRAB			6	Clayey SAND, brown, fine- to medium- grained, slightly damp
									7	
							SC		8	
									9	
									10	
									11	Total Depth 10 feet
									12	
									13	
									14	
									15	

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DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Boring B-20

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-55
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Bulk and Split spoon samples
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/13/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	Laboratory Results: % Passing #200 Sieve	Laboratory Results: Plasticity Index	Laboratory Results: Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
	25	12	7.9	6-7-6	SS		SM		1 2 3 4 5	Silty SAND, white to tan, fine- to coarse- grained, medium dense, slightly damp
				8-14-17	SS		RK		6 7 8	SILTSTONE, grey, fine-grained, dense, slightly weathered, slightly damp
				18-50/6"	SS		RK		9 10 11	SANDSTONE, brown to grey, fine- to medium- grained, very dense, damp
									12 13 14 15	Total Depth 11 feet

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DATED July 30, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Test Pit TP-21

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	
	17	14	5.6			GRAB	SM		1	Silty SAND, tan/brown, fine- to medium- grained, slightly damp
									2	clayey sand lense
									3	
									4	
									5	
									6	
									7	
									8	tan, fine- to coarse- grained
									9	
									10	
									11	Total Depth 10 feet
									12	
									13	
									14	
									15	

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DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-22

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results				Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)							
									1	Silty SAND, brown, fine- to coarse- grained, slightly damp
									2	
									3	
									4	tan/brown
							SM		5	
						GRAB			6	
									7	
									8	
									9	
									10	
									11	Total Depth 10 feet
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Fax (505) 326-5721

Boring B-23

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
							SM		1	Silty SAND, brown, fine- to medium- grained, damp
									2	
	68	NP	2.6	2-3-5	SS		ML		3	Sandy SILT, tan/brown, fine- to medium- grained, medium stiff to stiff, slightly damp
									4	
							SM		5	Silty SAND, tan/brown, fine- to medium- grained, medium dense, slightly damp
				5-6-6	SS				6	tan/brown
									7	
									8	
									9	
				4-6-8	SS				10	
									11	
									12	Total Depth 11 feet
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Test Pit TP-24

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	
						GRAB	SM		1–7	Silty SAND, tan/brown, fine- to medium- grained, slightly damp
							RK		8	SANDSTONE, tan/brown to grey/tan, fine- to coarse- grained, weakly cemented, slightly weathered, slightly damp
									9	Bucket Refusal at 8½ feet Total Depth 8½ feet
									10–15	

DRAFT REPORT
DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-25

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
						GRAB	SM		1–10	Silty SAND, tan/brown, fine- to coarse- grained, slightly damp
									10	Total Depth 10 feet

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DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Boring B-26

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
									1	Silty SAND, tan/brown, fine- to medium- grained, slightly damp
									2	
				3-4-5	SS				3	fine- to coarse- grained, loose, damp
							SM		4	
									5	
				5-6-8	SS				6	white, medium dense
									7	
									8	
									9	SANDSTONE, white/tan, fine- to coarse- grained, medium dense, weakly cemented, slightly weathered, damp
							RK		10	
				5-7-7	SS				11	
									12	Total Depth 11 feet
									13	
									14	
									15	

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DATED July 30, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Test Pit TP-28

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/20/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
	8.1	NP	4.6			GRAB	SM		1 2 3 4 5 6 7 8 9 10	Silty SAND, tan/brown, fine- to medium- grained, damp to slightly damp
									11 12 13 14 15	Total Depth 10 feet

DRAFT REPORT
DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Boring B-29

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Bulk and Split spoon samples
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
							SC		1	Clayey SAND, tan, fine- to coarse- grained, damp
									2	
				3-3-4	SS		SM		3	Silty SAND, white/grey, fine- to coarse- grained, loose, slightly damp
									4	
									5	
				10-17-50/3"	SS		RK		6	SANDSTONE, grey/white, fine- to coarse- grained, very dense, weakly to moderatly cemented, slightly weathered, damp
										shale lense
					GRAB				7	
									8	
									9	
				50/6"	SS				10	grey, fine- to medium- grained, very dense, moderatly cemented, slightly weathered
									11	Total Depth 10½ feet
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Fax (505) 326-5721

Test Pit TP-30

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/20/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
	15	NP	2.3			GRAB	SM		1 2 3 4 5 6 7 8 9 10	Silty SAND, tan/brown, fine- to coarse- grained, slightly damp
									11 12 13 14 15	Total Depth 10 feet

DRAFT REPORT
DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-31

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/20/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
						GRAB	SM		1	Silty SAND, tan/brown, fine- to coarse- grained, slightly damp
									2	
									3	
									4	
									5	
									6	trace gravel
									7	
									8	
									9	
									10	Total Depth 10 feet
									11	
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Boring B-32

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Bulk and Split spoon samples
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	Laboratory Results: % Passing #200 Sieve	Laboratory Results: Plasticity Index	Laboratory Results: Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
				4-5-8	SS		SM		1 2 3	Silty SAND, brown, fine- to coarse- grained, medium dense, damp
				12-15-16	SS		SC		4 5 6 7	Clayey SAND, grey, fine- to medium- grained, slightly damp grey/tan, very stiff
					GRAB				8	SHALE, dark brown, fine- grained, damp
	68	16	9.0	26-47-50/6"	SS		RK		9 10 11	tan/grey, hard, moderatly cemented, moderatly weathered
									12 13 14 15	Total Depth 11½ feet

DRAFT REPORT
DATED July 30, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Fax (505) 326-5721

Test Pit TP-33

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/20/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
	12	NP	6.1			GRAB	SP-SM		1	Poorly-graded SAND with silt, brown, fine- to medium- grained, damp
							SM		2	Silty SAND, brown, fine- to medium- grained, damp
									3	
									4	
									5	
									6	
									7	
									8	
							RK		9	SANDSTONE, brown/red, fine- to coarse- grained, weakly cemented, slight to moderatly weathered, damp
									10	Total Depth 10 feet
									11	
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-34

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/20/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
	5.6	NP	2.1			GRAB	SM		1 2 3 4 5 6 7 8 9 10	Silty SAND, tan/brown, fine- to coarse- grained, damp
									11 12 13 14 15	Total Depth 10 feet

DRAFT REPORT
DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Boring B-35

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	Laboratory Results: % Passing #200 Sieve	Laboratory Results: Plasticity Index	Laboratory Results: Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
									1	Silty SAND, tan/brown, fine- to coarse- grained, damp
									2	
				4-4-5	SS				3	loose
									4	
				4-3-3	SS		SM		5	loose
									6	
									7	
									8	
									9	
				2-3-2	SS				10	loose
									11	
									12	Total Depth 11½ feet
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Test Pit TP-36

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/20/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results				Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)							
						GRAB	SM		1	Silty SAND, tan, fine- to coarse- grained, slightly damp
							RK		2	SANDSTONE, tan/brown, fine- to coarse- grained, weakly to moderatly cemented, slightly weathered, slightly damp
									3	Bucket Refusal at 2 feet Total Depth 2 feet
									4	
									5	
									6	
									7	
									8	
									9	
									10	
									11	
									12	
									13	
									14	
									15	

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DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Boring B-37

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
							SM		1	Silty SAND, tan/brown, fine- to coarse- grained, slightly damp
				14-21-24	SS				2	SANDSTONE, white/tan/grey, fine- to coarse- grained, dense to very dense moderatly cemented, moderatly weathered, slightly damp
									3	
									4	
				30-50/6"	SS				5	
							RK		6	
									7	
									8	
									9	
				29-50/6"	S				10	
									11	tan/grey, fine- to medium- grained, weakly to moderatly cemented, slightly weathered, damp
									12	Total Depth 11 feet
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

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Tel (505) 327-7928
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Test Pit TP-38

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/20/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
									1	Silty SAND, tan/brown, fine- to coarse- grained, slightly damp
									2	
									3	light tan/brown
									4	
							SM		5	
									6	
	7.5	NP	1.9			GRAB			7	
									8	damp
									9	
									10	
									10	Total Depth 10 feet
									11	
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-39

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/20/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
							SM		1	Silty SAND, tan/brown, fine- to medium- grained, slightly damp
							RK		2	SANDSTONE, tan/brown, fine- to coarse- grained, weakly cemented, slightly to moderatly weathered, slightly damp
									3	Bucket Refusal at 3 Feet Total Depth 3 feet
									4	
									5	
									6	
									7	
									8	
									9	
									10	
									11	
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED JULY 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

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Test Pit TP-40

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/20/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
							SM		1	Silty SAND, tan/brown, fine- to coarse- grained, slightly damp
							RK		2	SANDSTONE, tan/brown/white, fine- to coarse- grained, weakly to moderatly cemented, slightly weathered, slightly damp
									3	Bucket Refusal at 2 Feet Total Depth 2 feet
									4	
									5	
									6	
									7	
									8	
									9	
									10	
									11	
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED JULY 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

GEOMAT INC.
915 Malta Avenue
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Test Pit TP-41

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/20/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results				Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)							
							SM		1	Silty SAND,tan/white, fine- to medium- grained, slightly damp
									2	
							RK		3	SANDSTONE, light tan/brown, fine- to coarse- grained, weakly cemented, slightly weathered, damp
									4	Bucket Refusal at 3 Feet Total Depth 3 feet
									5	
									6	
									7	
									8	
									9	
									10	
									11	
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED JUNE 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

GEOMAT INC.
915 Malta Avenue
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Test Pit TP-42

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/20/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
						GRAB	SM		1	Silty SAND, tan/white/brown, fine- to coarse- grained, slightly damp
							RK		2	SANDSTONE, white/tan, fine- to coarse- grained, weakly to moderatly cemented, slightly weathered, slightly damp
									3	Bucket Refusal at 3 Feet Total Depth 3 feet
									4	
									5	
									6	
									7	
									8	
									9	
									10	
									11	
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

GEOMAT INC.
915 Malta Avenue
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Boring B-43

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
							SM		1	Silty SAND, tan/brown, fine- to coarse- grained, damp
									2	SANDSTONE, brown/grey, fine- to coarse- grained, very dense, weakly to moderatly cemented, slightly weathered, slightly damp
				24-50/6"	SS				3	
									4	
				48-50/6"	SS				5	
							RK		6	tan/grey/white, weakly cemented, moderatly weathered
									7	
									8	
									9	
				50/6"	SS				10	white/tan/black
									11	Total Depth 10½ feet
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED July 20, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

GEOMAT INC.
915 Malta Avenue
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Test Pit TP-44

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	Laboratory Results: % Passing #200 Sieve	Laboratory Results: Plasticity Index	Laboratory Results: Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
						GRAB	SM		1 2 3	Silty SAND, brown to grey, fine- to medium- grained, slightly damp
							RK		4 5	SANDSTONE, grey, fine- to coarse- grained, weakly cemented, slightly weathered, slightly damp
									6 7 8 9 10 11 12 13 14 15	Bucket Refusal at 5 Feet Total Depth 5 feet

DRAFT REPORT
DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

GEOMAT INC.
915 Malta Avenue
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Boring B-45

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
							SM		1	Sitly SAND, orange/tan, fine- to coarse- grained, slightly damp
									2	
				12-13-24	SS				3	SANDSTONE, orange/tan, fine- to medium- grained, dense to very dense, moderatly cemented, moderatly weathered, slightly damp
									4	
				21-32-42	SS				5	SANDSTONE with shale pockets, grey/brown
									6	
							RK		7	
									8	
									9	
				37-50/6"	SS				10	tan/red/grey, weakly to moderalty cemented
									11	
									12	Total Depth 11 feet
									13	
									14	
									15	

DRAFT REPORT DATED JUNE 30, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

GEOMAT INC.
915 Malta Avenue
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Test Pit TP-46

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results										
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
	12	NP	1.9			GRAB	SW-SM		1	Well-graded SAND with silt, tan /brown, fine- to coarse-grained, slightyl damp
									2	
									3	
									4	
									5	
							SM		6	Silty SAND with Gravel, tan/brown, fine- to coarse- grained, slightly damp
									7	
						GRAB	RK		8	SILTSTONE, red/grey, fine- grained, weakly cemented, moderatly weathered, slightly damp
									9	
									10	
									11	Total Depth 10 feet
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

GEOMAT INC.
915 Malta Avenue
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Test Pit TP-47

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: Case 580 Extendahoe
Excavation Method: 24" Bucket
Sampling Method: Bulk samples from backhoe
Hammer Weight: N/A
Hammer Fall: N/A

Date Excavated: 7/19/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Test Pit Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results: Dry Density (pcf)	Laboratory Results: % Passing #200 Sieve	Laboratory Results: Plasticity Index	Laboratory Results: Moisture Content (%)	Field Dry Density (pcf)	Field Moisture Content (%)	Sample Type	USCS	Soil Symbol	Depth (ft)	Soil Description
							SM		1	Silty SAND, tan/brown, fine- to coarse- grained, slightly damp
									2	
							RK		3	SANDSTONE with Shale Pockets, tan/brown/grey, fine- to coarse- grained, weakly to moderatly cemented, slightly to moderatly weathered
									4	
									5	Bucket Refusal at 4.5 Feet Total Depth 4½ feet
									6	
									7	
									8	
									9	
									10	
									11	
									12	
									13	
									14	
									15	

DRAFT REPORT DATED JULY 30, 2021

GRAB = Grab Sample MC = Modified California (Ring Sample) SS = Split Spoon ND = Nuclear Densometer D = Disturbed Bulk Sample

GEOMAT INC.
915 Malta Avenue
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Boring B-48

Project Name: NM 173 Waterline Improvement
Project Number: 212-3731
Client: Short, Elliot, Hendrickson, Inc.
Site Location: Aztec, New Mexico
Rig Type: CME-45
Drilling Method: 7.25" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 7/23/2021
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DH
Remarks: None

Laboratory Results				Blows per 6"	Sample Type & Length (in)	Symbol	Material Type	Soil Symbol	Depth (ft)	Soil Description
Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)							
									1	SANDSTONE, tan/white, fine- to coarse- grained, very dense, moderalty cemented, slightly weathered, slightly damp to damp
									2	
				50/6"	SS				3	
									4	
				50/6"	SS		RK		5	
									6	
									7	
									8	
									9	
				50/6"	SS				10	
									11	Total Depth 10½ feet
									12	
									13	
									14	
									15	

DRAFT REPORT
DATED July 30, 2021

A = Auger Cuttings R = Ring-Lined Barrel Sampler SS = Split Spoon GRAB = Manual Grab Sample D = Disturbed Bulk Sample PP = Pocket Penetrometer

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			Group Symbols	Typical Names
Coarse-Grained Soils More than 50% retained on No. 200 sieve	**Gravels** 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils 50% or more passes No. 200 sieve	**Silts and Clays** Liquid Limit 50 or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays Liquid Limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous free sands or silts, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, mucic & other highly organic soils

CONSISTENCY OR RELATIVE DENSITY CRITERIA

Standard Penetration Test
Density of Granular Soils

Penetration Resistance, N (blows/ft.)	Relative Density
0-4	Very Loose
5-10	Loose
11-30	Medium Dense
31-50	Dense
>50	Very Dense

Standard Penetration Test
Density of Fine-Grained Soils

Penetration Resistance, N (blows/ft.)	Consistency	Unconfined Compressive Strength (Tons/ft2)
<2	Very Soft	<0.25
2-4	Soft	0.25-0.50
4-8	Firm	0.50-1.00
8-15	Stiff	1.00-2.00
15-30	Very Stiff	2.00-4.00
>30	Hard	>4.0

U.S. Standard Sieve Sizes

>12"	12"	3"	3/4"	#4	#10	#40	#200

Boulders	Cobbles	Gravel		Sand			Silt or Clay
		coarse	fine	coarse	medium	fine	

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MOISTURE CONDITIONS

Dry	Absence of moist, dusty, dry to the touch
Slightly Damp	Below optimum moisture content for compaction
Moist	Near optimum moisture content, will moisten the hand
Very Moist	Above optimum moisture content
Wet	Visible free water, below water table

MATERIAL QUANTITY

trace	0-5%
few	5-10%
little	10-25%
some	25-45%
mostly	50-100%

OTHER SYMBOLS

R Ring Sample
S SPT Sample
B Bulk Sample
▼ Ground Water

BASIC LOG FORMAT:

Group name, Group symbol, (grain size), color, moisture, consistency or relative density. Additional comments: odor, presence of roots, mica, gypsum, coarse particles, etc.

EXAMPLE:

SILTY SAND w/trace silt (SM-SP), Brown, loose to med. Dense, fine to medium grained, damp

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST DRILLING EQUIPMENT & PROCEDURES

Description of Subsurface Exploration Methods

Drilling Equipment – Truck-mounted drill rigs powered with gasoline or diesel engines are used in advancing test borings. Drilling through soil or softer rock is performed with hollow-stem auger or continuous flight auger. Carbide insert teeth are normally used on bits to penetrate soft rock or very strongly cemented soils which require blasting or very heavy equipment for excavation. Where refusal is experienced in auger drilling, the holes are sometimes advanced with tricone gear bits and NX rods using water or air as a drilling fluid.

Coring Equipment – Portable electric core drills are used when recovery of asphalt or concrete cores is necessary. The core drill is equipped with either a 4" or 6" diameter diamond core barrel. Water is generally used as a drilling fluid to facilitate cooling and removal of cuttings from the annulus.

Sampling Procedures - Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D1586 test procedure. In most cases, 2" outside diameter, 1 3/8" inside diameter, samplers are used to obtain the standard penetration resistance. "Undisturbed" samples of firmer soils are often obtained with 3" outside diameter samplers lined with 2.42" inside diameter brass rings. The driving energy is generally recorded as the number of blows of a 140-pound, 30-inch free fall drop hammer required to advance the samplers in 6-inch increments. These values are expressed in blows per foot on the boring logs. However, in stratified soils, driving resistance is sometimes recorded in 2- or 3-inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and the realistic penetration values obtained for consideration in design. "Undisturbed" sampling of softer soils is sometimes performed with thin-walled Shelby tubes (ASTM D1587). Tube samples are labeled and placed in watertight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings. Where samples of rock are required, they are obtained by NX diamond core drilling (ASTM D2113).

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Boring Records - Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487), with appropriate group symbols being shown on the logs.

Appendix B

DRAFT REPORT
DATED July 30, 2021

LAB NO.	BORING / TEST PIT	SAMPLE DEPTH (ft)	ASTM D698		SIEVE ANALYSIS, CUMULATIVE PERCENT PASSING												Moisture %	ATTERBERG LIMITS			CLASSIFICATION
			Density	Moisture	3/4"	1/2"	3/8"	No. 4	No. 8	No. 10	No. 16	No. 30	No. 40	No. 50	No. 100	No. 200		LL	PL	PI	
4104	TP-3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	32	11.4	46	20	26	Clayey **SAND** (SC)
4105*	TP-6	2	-	-	100	100	100	100	99	99	92	62	47	35	21	12	2.2	NLL	NPL	NP	Well-graded **SAND** with silt (SW-SM)
4106	TP-9	7	-	-	100	100	100	100	99	99	97	83	70	57	39	30	5.3	NLL	NPL	NP	Silty **SAND** (SM)
4107	TP-12	4	-	-	100	100	100	100	98	98	92	67	53	43	29	14	4.4	29	18	11	Clayey **SAND** (SC)
4108	TP-13	1.5-4	119	11.5	100	99	99	98	98	97	95	83	71	61	38	17	4.0	23	18	5	Silty, clayey **SAND** (SC-SM)
4109	TP-19	5	-	-	-	-	-	-	-	-	-	-	-	-	-	44	7.3	33	16	17	Clayey **SAND** (SC)
4110*	TP-21	2	-	-	100	100	100	99	97	97	91	74	63	51	32	17	5.6	30	16	14	Clayey **SAND** (SC)
4111	TP-28	4	-	-	100	100	100	100	99	99	98	84	68	44	18	8.1	4.6	NLL	NPL	NP	Poorly-graded **SAND** with silt (SP-SM)
4112	TP-30	6	-	-	100	100	100	99	98	97	89	64	51	40	25	15	2.3	NLL	NPL	NP	Silty **SAND** (SM)
4113	TP-33	1	-	-	-	-	-	-	-	-	-	-	-	-	-	12	6.1	NLL	NPL	NP	Poorly-graded **SAND** with silt (SP-SM)
4114*	TP-34	9	-	-	100	100	100	100	100	100	95	66	45	28	12	5.6	2.1	NLL	NPL	NP	Poorly-graded **SAND** with silt (SP-SM)
4138	TP-38	7	-	-	100	100	100	99	97	96	87	58	43	30	15	7.5	1.9	NLL	NPL	NP	Well-graded **SAND** with silt (SW-SM)
4139*	TP-46	3	-	-	100	100	100	99	97	96	85	49	39	32	19	12	1.9	NLL	NPL	NP	Well-graded **SAND** with silt (SW-SM)
4174	B-2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	54	9.9	35	20	15	Sandy lean **CLAY** (CL)
4175	B-23	3	-	-	-	-	-	-	-	-	-	-	-	-	-	68	2.6	NLL	NPL	NP	Sandy **SILT** (ML)
4176	B-32	10	-	-	-	-	-	-	-	-	-	-	-	-	-	68	9.0	37	21	16	Sandy Lean **CLAY** (CL)
4177	B-20	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	25	7.9	38	26	12	Silty **SAND** (SM)

NLL = No Liquid Limit
NPL = No Plastic Limit
NP = Non-Plastic
* = Corrosivity sample

GEOMAT INC.

SUMMARY OF SOIL TESTS

Project	NM 173 Waterline Improvement
Job No.	212-3731
Location	Aztec, New Mexico
Date of Exploration	July, 13, 19, 20 & 23, 2021

DRAFT REPORT
DATED July 30, 2021

LABORATORY TESTING PROCEDURES

Laboratory testing is performed by trained personnel in our accredited laboratory or may be subcontracted by GEOMAT through a qualified outside laboratory if necessary. Actual types and quantities of tests performed for any project will be dependent upon subsurface conditions encountered and specific design requirements.

The following is an abbreviated table of laboratory testing that may be performed by GEOMAT with the applicable standards listed. Testing for a specific project may include all or a selected subset of the laboratory work listed. Laboratory testing beyond those listed may be available and could be incorporated into the project scope at the discretion of GEOMAT.

PROCEDURE	ASTM	AASHTO
Moisture Content	ASTM D2216	AASHTO T 265
Sieve Analysis	ASTM C136	AASHTO T 27
Fines Content	ASTM D1140	T 11
Hydrometer	ASTM D422	T 88
Atterberg Limits	ASTM D4318	AASHTO T 89/T 90
Soil Compression/Expansion	ASTM D2435	T 216
Soil Classification	ASTM D2487	M 145
Direct Shear	ASTM D3080	T 236
Unconfined Compressive Strength of Soils	ASTM D2166	T 208
Unconfined Compressive Strength of Rock Cores	ASTM D4543	-

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Appendix C

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

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responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

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