Preliminary Geotechnical Engineering Report

Mixed Use Development

Central Avenue and New York Avenue SW

Albuquerque, New Mexico

April 29, 2014

Terracon Project No. 661345024

Prepared for:

HDR Engineering, Inc.
Albuquerque, New Mexico

Prepared by:

Terracon Consultants, Inc.
Albuquerque, New Mexico

April 29, 2014

HDR Engineering, Inc.
2155 Louisiana Boulevard NE, Suite 9500
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Attn: Mr. Danton Bean, P.E.
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Re: Preliminary Geotechnical Engineering Report
Mixed Used Development
Central Avenue and New York Avenue SW
Albuquerque, New Mexico
Terracon Project No. 66145024

Dear Mr. Bean:

Terracon Consultants, Inc. (Terracon) has completed the preliminary geotechnical engineering services for the above referenced project. These services were performed in general accordance with our Proposal Number P6614-0031 dated January 29, 2014. This geotechnical engineering report presents the results of the subsurface exploration and provides preliminary geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Meagan J. Duneman, P.E.
Project Engineer

MICHAEL E. ANDERSON NEW MEXICO 12122 PROFESSIONAL ENGINEER 4/29/14

Michael E. Anderson, P.E.
Principal

Copies to: Addressee (1 via email, 3 via mail)

EXECUTIVE SUMMARY

This geotechnical executive summary should be used in conjunction with the entire report for preliminary design and/or construction purposes. It should be recognized that specific details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled General Comments should be read for an understanding of the report limitations. Supplemental geotechnical studies should be performed to confirm and/or modify the preliminary recommendations contained herein and to develop final design criteria and construction recommendations.

A preliminary geotechnical exploration has been performed for the proposed mixed use development to be located at the intersection of Central Avenue and New York Avenue SW in Albuquerque, New Mexico. Terracon's geotechnical scope of work included the advancement of seven (7) test borings to an approximate depth of about 26-½ feet below existing site grades.

Based on the information obtained from our subsurface exploration, the site is suitable for development of the proposed project. The following geotechnical considerations were identified:

Existing and Previous Development: Previous development at the site consisted of fueling stations consisting of buildings, dispensing islands and underground storage tanks (USTs). The existing development consists of two vacant commercial/retail buildings, existing buildings and structures associated with the vacant El Vado Motel, and asphalt and Portland cement concrete pavement. Therefore, at-grade and below grade structures and elements associated with the previous and existing developments will be encountered during construction. Existing structures and elements will require removal prior to new construction.

Site Soils: The site soils generally consisted of native sand with varying amounts of silt and gravel. Fill material consisting of poorly graded sand with silt and gravel was encountered in one boring located in the area of the previous USTs. The on-site sand soils appear suitable for use as engineered fill beneath foundations, floor slabs, and pavements.

Groundwater: Groundwater was encountered at depths ranging from about 10 to 11 feet below existing ground surface at the time of drilling.

Liquefaction Potential: Based upon the very loose to loose nature of the near surface soils, shallow groundwater, and proximity to existing earthquake fault zones, the site has potential for liquefaction, lateral spreading, and seismic settlement. Stiffer or more rigid foundations may be required to account for potential seismic loading conditions associated with the design earthquake. We recommend that supplemental studies be conducted to better evaluate the risks and magnitudes associated with potential future earthquake events.

Foundations: The buildings at the site may be supported by shallow spread and continuous footings or mat foundations bearing on engineered fill. If spread footings are being considered, the perimeter and interior footings may need to be connected to grade beams and the floor slab to account for potential future design earthquake events.

Floor Slabs: The on-site surface and near surface soils are expected to exhibit non-expansive potential when compacted and subjected to light loading conditions such as those imposed by floor slabs. Construction of floor slabs (associated with the spread footing foundation option) directly on engineered fills composed of on-site sand soils or approved imported soils are considered acceptable for the project, provided some movement can be tolerated. In addition, the floor slab may need to be reinforced and connected to the foundation system as outlined above.

Preliminary Pavement Sections: Automobile parking areas – 2-½" to 3" AC over 6" ABC or 5" to 5-½" PCC; truck drives and drive lanes – 3-½" to 4" AC over 6" ABC or 5-½" to 6" PCC.

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PRELIMINARY GEOTECHNICAL ENGINEERING REPORT
MIXED USE DEVELOPMENT
CENTRAL AVENUE AND NEW YORK AVENUE SW
ALBUQUERQUE, NEW MEXICO

Terracon Project No. 66145024
April 29, 2014

1.0 INTRODUCTION

This preliminary report presents the results of our preliminary geotechnical engineering services to for the proposed mixed use development to be located at the intersection of Central Avenue and New York Avenue SW in Albuquerque, New Mexico. The report addresses the following:

- subsurface soil conditions
- earthwork
- seismic considerations
- lateral earth pressures
- groundwater conditions
- foundation design and construction
- floor slab design and construction
- pavement design and construction

Our geotechnical engineering scope of work for this project included the advancement of seven (7) test borings to a depth of approximately 26-½ feet below existing site grades.

Logs of the borings along with a Site Location Map and Boring Location Plan are included in Appendix A of this report. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included in Appendix B of this report. Descriptions of the field exploration and laboratory testing are included in their respective appendices.

2.0 PROJECT INFORMATION

2.1 Project Description

ITEM	DESCRIPTION
Site layout	Refer to the Site Location Map and Boring Location Plan (Exhibits A1 and A2 in Appendix A)

ITEM	DESCRIPTION
Structures	The project will consist of the development of an approximate 2.7 acres comprising the north and south parcels. We assume that the project may include the construction of one- to two-story commercial retail buildings and some limited multi-family residential structures. Site development may include the construction of asphalt concrete paved parking areas and drives, along with the installation of utilities. In addition, the western portion of New York Avenue will be vacated and a cul-de-sac constructed between the two parcels.
Building construction	Steel frame, steel stud, wood frame, and/or masonry load bearing walls (assumed)
Finished floor elevation	Within 2 to 3 feet of existing site grade (assumed)
Proposed foundation	Spread/continuous footings (assumed)
Maximum loads	Columns: 30 to 100 kips (assumed) Walls: 2 to 4 klf (assumed) Slabs: 150 psf max (assumed)
Grading	Within 2 to 3 feet of existing site grade (assumed)
Cut and fill slopes	Not applicable
Free-standing retaining walls	Not applicable
Below grade areas	Not applicable
Retention/detention	Not applicable

2.2 Site Location and Description

ITEM	DESCRIPTION
Location	North and south of the intersection of Central Avenue and New York Avenue SW in Albuquerque, New Mexico.
Existing site features (site interior)	Two existing developed parcels located on the north and south sides of New York Avenue SW. North of New York Avenue: Two existing vacant buildings, pavement, and utilities. South of New York Avenue: Several vacant buildings, pavement, and utilities associated with the previous El Vado Motel.
Surrounding developments	North: Central Avenue East: Retail/commercial and residential developments West: Central Avenue South: Golf Course
Current ground cover	Building footprints, asphalt pavement, concrete pavement landscaping, and soil

Existing topography	The site is generally flat to gently sloping down to the west and southwest.

3.0 SUBSURFACE CONDITIONS

3.1 Site Geology

The site occupies a position between the gently sloping piedmont surface on the east side of the Albuquerque-Belen basin and the Rio Grande flood plain. The piedmont surface extends from the Sandia Mountains to the Rio Grande. The Albuquerque-Belen basin is part of an interconnected series of north-south aligned grabens and structural basins which have subsided between mountain and highland uplifts comprising the Rio Grande Rift. The complex structural basin was formed during the Tertiary Period, more than seven million years ago, when the Sandia-Manzano fault block was uplifted and tilted. The basin is approximately 100 miles long and varies from 20 to 40 miles wide. The sloping surface of the valley fill consists of a series of coalescing alluvial fans deposited unconformably on the formations of the Santa Fe Group. The Santa Fe Group consists of beds of unconsolidated to loosely consolidated sediments (detritus consisting of gravel, sand, silt, clay, and caliche) locally interbedded with volcanic rocks.

The piedmont soils at and around the site are composed of valley-fill alluvium. The valley-fill alluvium (silt, clay, sand, and gravel) was deposited as arroyo channel fill and lenticular interchannel deposits. These soils range from poorly-sorted mudflow material to well-sorted stream gravel. The variable depositional conditions occasionally created low density/loose layers within the recent arroyo deposits.

Based upon review of geologic maps and our experience in the area, landslides, colluvial soils, and slicken slides, have not been mapped at the project site. No quaternary faults have been identified within a 5 kilometer radius of the site.

3.2 Typical Subsurface Profile

Specific conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs included in Appendix A of this report. Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Description	Approximate Depth to Bottom of Stratum (feet)	Material Encountered	Consistency/Density
Stratum 1	0.3 to 0.5	Asphalt Concrete – ½ to 3 inches Aggregate Base Course – 3 to 3½ inches	Not Applicable
Stratum 2	12	Fill: Poorly graded sand with silt and gravel*	Very Loose to Loose
Stratum 3	26-½	Sand with varying amounts of silt and gravel	Very Loose to Medium Dense

*Encountered in Borings B-02

The sand soils are non-plastic.

Laboratory tests were conducted on selected soil samples and the test results are presented in Appendix B. Laboratory test results indicate that the surface and near surface soils exhibit low compressibility potentials at in-situ moisture contents. The test results indicate that the near surface soils have a low to moderate tendency for hydro-compaction (collapse) potential when wetted under foundation loads. When water is added to samples of laboratory compacted near-surface soils, we anticipate that the compacted near surface soils will exhibit non- to low collapse potential when subjected to light loading conditions such as those imposed by floor slabs.

Laboratory test results indicate that on-site soils have soluble sulfate concentrations of 14 and 26 mg/kg.

3.3 Groundwater

Groundwater was observed at depths ranging from about 10 to 11 feet below existing ground surface in the test borings at the time of field exploration. These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations. Groundwater conditions can change with varying seasonal and weather conditions, and other factors.

Fluctuations in groundwater levels can best be determined by implementation of a groundwater monitoring plan. Such a plan would include installation of groundwater monitoring wells, and periodic measurement of groundwater levels over a sufficient period of time.

The possibility of groundwater fluctuations should be considered when developing final design and construction plans for the project.

4.0 PRELIMINARY RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings. Based upon the very loose to loose nature of the near surface soils, and shallow groundwater, the site has potential for liquefaction, lateral spreading, and seismic settlement. The structural engineer will need to design the foundations for the appropriate site class and seismic design category. Stiffer or more rigid foundations may be required to account for potential seismic loading conditions associated with the design earthquake. We recommend that supplemental studies be conducted to better evaluate the risks and magnitudes associated with potential future earthquake or seismic events.

In addition to the seismic considerations, potentially compressible soils which show low to moderate tendency for movement when elevated in moisture content will require particular attention in the design and construction.

Previous development at the site consisted of fueling stations consisting of buildings, dispensing islands and underground storage tanks (USTs). The existing development consists of two vacant commercial/retail buildings, existing buildings and structures associated with the vacant El Vado Motel, and asphalt and Portland cement concrete pavement. Therefore, at-grade and below grade structures and elements associated with the previous and existing developments will be encountered during construction. Existing structures and elements will require removal prior to new construction.

Approximately 12 feet of fill material associated with the previous USTs was encountered in Boring No. B-02. The fill varied from very loose to loose in relative density. If movement sensitive structures are located in this area, we recommend that the existing fill be removed and recompacted as engineered fill. If the owner is willing to assume more risk and potential increase in maintenance, existing pavement can be supported on the existing fill.

Support of footings, floor slabs, and pavements on or above existing fill soils is discussed in this report. However, even with the recommended construction testing services, there is an inherent risk for the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered until supplemental studies or construction. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill, but can be reduced by performing additional testing and evaluation.

Based on the geotechnical subsurface exploration, the laboratory test results, and our engineering analyses, the proposed building structures can be supported on a

spread/continuous footing or mat foundation system bearing on a zone of engineered fill. A slab-on-grade floor system (associated with the spread footing foundation option) supported on a zone of engineered fill can be used, provided some movement can be tolerated. If spread footings are being considered, the perimeter and interior footings may need to be connected to grade beams and the floor slab reinforced to account for potential future design earthquake events.

On-site sand soils are suitable for use as engineered fill beneath foundations and floor slabs, and pavements.

Geotechnical engineering recommendations for foundation systems and other earth connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of field and laboratory testing (which are presented in Appendices A and B), engineering analyses, and our current understanding of the proposed project.

Supplemental geotechnical studies should be performed to confirm and/or modify the preliminary recommendations contained herein and to develop final design criteria and construction recommendations.

4.2 Earthwork

The following presents recommendations for site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for preliminary design and construction of earth supported elements including foundations, slabs and pavements are contingent upon following the recommendations outlined in this section.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

4.2.1 Site Preparation

Strip and remove existing structures, slabs, pavements, vegetation, debris, and other deleterious materials from proposed new building and pavement areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction.

Demolition of the existing buildings should include complete removal of all foundation systems within the proposed construction area. This should include removal of any loose backfill found adjacent to existing foundations. All materials derived from the demolition of existing structures and pavements should be removed from the site, and not be allowed for use in any on-site fills.

Stripped materials consisting of vegetation and organic materials should be wasted from the site, or used to revegetate landscaped areas or exposed slopes after completion of grading operations. If it is necessary to dispose of organic materials on-site, they should be placed in non-structural areas, and in fill sections not exceeding 5 feet in height.

The site should be initially graded to create a relatively level surface to receive fill, and to provide for a relatively uniform thickness of fill beneath proposed building structures.

Evidence of existing underground utilities and structures was observed during the site reconnaissance. Therefore, such features will likely be encountered during construction. If unexpected fills or underground facilities are encountered, such features should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

4.2.2 Excavation

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

Based on the results from the soil borings, groundwater control measures will be necessary in excavations extending deeper than about 10 to 11 feet below existing site grades. Pumping from sumps may be utilized to control water within excavations. Well points may be required for significant groundwater flow, or where excavations penetrate groundwater to a significant depth. Stabilization of the subsurface soils may be required to provide a stable construction platform.

Due to elevated moisture contents and shallow groundwater conditions, on-site soils may pump or become unstable. Workability may be improved by scarifying and drying. Overexcavation of wet zones and replacement with gravel or rock materials may be necessary. We recommend the use of lightweight excavation equipment to reduce subgrade pumping.

Use of lime, fly ash, kiln dust, cement or geotextiles could also be considered as a stabilization technique. Laboratory evaluation is recommended to determine the effect of chemical stabilization on subgrade soils prior to construction.

4.2.3 Subgrade Preparation

Foundations should be supported on engineered fill. A minimum of three (3) to five (5) feet of engineered fill is recommended below all foundations. The subgrade soils should be removed to minimum depths of three (3) to five (5) feet and a minimum of two (2) to three (3) feet horizontally beyond the edge of foundations. The engineered fill should extend laterally an additional distance of 8 inches for each additional foot of excavation beyond the minimum depths. If engineered fill is placed beneath the entire building, it should extend horizontally a minimum distance of 5 feet beyond the outside edge of perimeter foundations. In addition, a minimum of two (2) to four (4) feet of engineered fill is recommended below the slab-on-grade floor system.

Exposed areas which will receive fill, once properly cleared, should be scarified to a minimum depth of 10 inches, conditioned to near optimum moisture content, and compacted.

Areas of loose soils may be encountered at foundation bearing depth after excavation is completed for footings. When such conditions exist beneath planned footing areas, the subgrade soils should be surficially compacted prior to placement of the foundation system. If sufficient compaction cannot be achieved in-place, the loose soils should be removed and replaced as engineered fill. Due to the potential for instability of the subgrade soils at or near existing groundwater conditions, a gravel or rock layer may be required below the foundation to provide a stable working platform/bearing surface. For placement of engineered fill below footings, the excavation should be widened laterally, at least eight (8) inches for each foot of fill placed below footing base elevations.

Subgrade soils beneath exterior slabs and beneath pavements should be scarified, moisture conditioned and compacted to a minimum depth of 10 inches. The moisture content and compaction of subgrade soils should be maintained until slab or pavement construction.

4.2.4 Fill Materials and Placement

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than six inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Clean on-site sand soils, or approved imported materials meeting the specification contained herein may be used as fill material for the following:

- general site grading
- foundation areas
- interior floor slab areas
- exterior slab areas
- pavement areas
- foundation backfill

On-site or imported soils for use as fill material within proposed building and structure areas should conform to low volume change materials as indicated in the following specifications:

Gradation	**Percent Finer by Weight (ASTM C 136)**
6"	100
3”	70-100
No. 4 Sieve	50-100
No. 200 Sieve	35 (max)
■ Liquid Limit	25 (max)

- Plasticity Index ..... 10 (max)
- Maximum expansive potential (%)*..... 1.0

*Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about 3 percent below optimum water content. The sample is confined under a 100 psf surcharge and submerged/inundated.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed ten inches loose thickness.

4.2.5 Compaction Requirements

Recommended compaction and moisture content criteria for engineered fill materials are as follows:

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction	
		Minimum	Maximum
On-site soils or approved imported fill soils:			
Beneath foundations:	95	-3%	+3%
Beneath slabs:	95	-3%	+3%
Beneath pavements:	95	-3%	+3%
Aggregate base	95	-3%	+3%
Miscellaneous backfill	90	-3%	+3%

4.2.6 Grading and Drainage

All grades must provide effective drainage away from the buildings during and after construction. Water permitted to pond next to the buildings can result in greater soil movements than those discussed in this report. These greater movements can result in unacceptable differential floor slab movements, cracked slabs and walls, and roof leaks. Estimated movements described in this report are based on effective drainage for the life of the structure and cannot be relied upon if effective drainage is not maintained.

Exposed ground should be sloped at a minimum 5 percent away from the building for at least 5 feet beyond the perimeter of the building. After building construction and landscaping, we recommend verifying final grades to document that effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted as necessary, as part of the structure's maintenance program.

Flatwork and pavements will be subject to post construction movement. Maximum grades practical should be used for paving and flatwork to prevent water from ponding. Allowances in final grades should also consider post-construction movement of flatwork, particularly if such movement would be critical. Where paving or flatwork abuts the structure, effectively seal and maintain joints to prevent surface water infiltration.

4.2.7 Corrosion Potential

Laboratory test results indicate that on-site soils have soluble sulfate concentrations of 14 and 26 mg/kg. Results of soluble sulfate testing indicate that ASTM Type I/II Portland cement is suitable for all concrete on and below grade. Foundation concrete should be designed for moderate sulfate exposure in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

Refer to Summary of Laboratory Results contained in Appendix B for the complete results of the various corrosivity testing conducted on the site soils in conjunction with this geotechnical exploration.

4.3 Foundation Recommendations

The buildings can be supported by a shallow spread footing or mat foundation system bearing on engineered fill. If spread footings are being considered, the perimeter and interior footings may need to be connected to grade beams and the floor slab reinforced to account for potential future design earthquake events.

Design recommendations for foundations for the proposed structure and related structural elements are presented in the following paragraphs.

4.3.1 Design Recommendations

DESCRIPTION	VALUE
Foundation Type	Shallow Spread Footings or Mat Foundation
Structures	One (1)-story with elevated ceiling, at-grade building
Bearing Material	Minimum three (3) to five (5) feet thickness of engineered fill below foundations
Allowable Bearing Pressure	1,500 to 2,500 psf
Modulus of Subgrade Reaction	50 to 100 pci
Minimum Dimensions	Columns: 24 inches Walls: 16 inches
Minimum Embedment Depth Below Finished Grade	Exterior: 18 inches Interior: 12 inches

DESCRIPTION	VALUE
Total Estimated Movement	1 inch
Estimated Differential Settlement	½ inch in 40 feet under walls ¾ inch between columns

Finished grade is defined as the lowest adjacent grade within five (5) feet of the foundation for perimeter (or exterior) footings and finished floor level for interior footings. The allowable foundation bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions. The weight of the foundation concrete below grade may be neglected in dead load computations.

Footings should be proportioned to reduce differential foundation movement. Proportioning on the basis of equal total settlement is recommended; however, proportioning to relative constant dead-load pressure will also reduce differential settlement between adjacent footings. Additional foundation movements could occur if water from any source infiltrates the foundation soils; therefore, proper drainage should be provided in the final design and during construction.

Footings, foundations, and masonry walls should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. The use of joints at openings or other discontinuities in masonry walls is recommended.

Foundation excavations and engineered fill placement should be observed by the geotechnical engineer. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

4.3.2 Construction Considerations

Foundations should be supported on engineered fill. A minimum of three (3) to five (5) feet of engineered fill is recommended below all foundations. The subgrade soils should be removed to minimum depths of three (3) to five (5) feet and a minimum of two (2) to three (3) feet horizontally beyond the edge of foundations. The engineered fill should extend laterally an additional distance of 8 inches for each additional foot of excavation beyond the minimum depths. If engineered fill is placed beneath the entire building, it should extend horizontally a minimum distance of 5 feet beyond the outside edge of perimeter foundations.

4.4 Seismic Considerations

4.4.1 Seismic Hazards

Based upon the very loose to loose nature of the near surface soils, and shallow groundwater, the site has potential for liquefaction, lateral spreading, and seismic settlement. Therefore, we recommend that supplemental studies be conducted to better evaluate the risks and magnitudes

associated with potential future earthquake or seismic events. Based upon the supplemental studies, the structural engineer may need to modify (lower) the site classification outlined below and the seismic design category.

4.4.2 2012 International Building Code

DESCRIPTION	VALUE
2012 International Building Code Site Classification (IBC) [1]	D[2]
Site Latitude	N 35.09459°
Site Longitude	W 106.67687°
S_{Ms} Spectral Acceleration for a Short Period	0.656g
S_{M1} Spectral Acceleration for a 1-Second Period	0.309g
S_{Ds} Spectral Acceleration for a Short Period	0.438g
S_{D1} Spectral Acceleration for a 1-Second Period	0.206g
F_a Site Coefficient for a Short Period	1.434
F_v Site Coefficient for a 1-Second Period	2.251

[1] Note: In general accordance with the *2012 International Building Code,* Table 1613.5.2. IBC Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile.

[2] Note: The 2012 International Building Code (IBC) requires a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope does not include the required 100 foot soil profile determination. However, IBC also allows for the geotechnical engineer to use their judgment based upon their experience in the area. Borings extended to a maximum depth of 26-½ feet, and this seismic site class definition considers that medium dense or denser soil continues below the maximum depth of the subsurface exploration. Additional exploration to deeper depths or shear wave velocity profile testing should be performed to confirm the conditions below the current depth of exploration. In addition, supplemental studies should consider the potential for liquefaction and the potential impacts on building design.

4.5 Floor Slab

If a floor slab-on-grade is being considered, the slab may need to be reinforced and connected to perimeter and interior footings to account for potential future design earthquake events.

4.5.1 Design Recommendations

DESCRIPTION	VALUE
Interior floor system	Slab-on-grade concrete.
Floor slab support	Minimum two (2) to four (4) feet of approved on-site or imported soils placed and compacted in accordance with Earthwork section of this report.
Subbase	Compacted subgrade

DESCRIPTION	VALUE
Modulus of subgrade reaction	200 to 250 pounds per square inch per inch (psi/in) (The modulus was obtained based on our experience with similar subgrade conditions, and estimates obtained from ACI design charts.)

Construction of floor slabs directly on engineered fill composed of on-site sand soils is considered acceptable for the project. Some movement of a slab-on-grade floor system is possible should the subgrade soils become elevated in moisture content due to the compression potential of the near surface soils. Additional slab movements could occur if water infiltrates the soils; therefore, proper drainage must be provided in the final design. To reduce potential slab movements, the subgrade soils should be prepared as outlined in the earthwork section of this report.

In areas of exposed concrete, control joints should be saw cut into the slab after concrete placement in accordance with ACI Design Manual, Section 302.1R-37 8.3.12 (tooled control joints are not recommended). Additionally, dowels should be placed at the location of proposed construction joints. To control the width of cracking (should it occur) continuous slab reinforcement should be considered in exposed concrete slabs.

The use of a vapor retarder or barrier should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer and slab contractor should refer to ACI 302 and ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder/barrier.

4.5.2 Construction Considerations

The floor slab should bear on a minimum of two (2) to four (4) feet of engineered fill. Some differential movement of a slab-on-grade floor system is possible should the subgrade soils become elevated in moisture content. Such movements are anticipated to be within general tolerance for normal slab-on-grade construction. To reduce potential slab movements, the subgrade soils should be prepared as outlined in the Earthwork section of this report.

4.6 Lateral Earth Pressures

4.6.1 Design Recommendations

For soils above any free water surface, recommended equivalent fluid pressures for unrestrained foundation elements when using on-site soils as backfill are:

ITEM	SOIL TYPE	VALUE
Active Case	On-site or imported soils	35 to 45 psf/ft

ITEM	SOIL TYPE	VALUE
Passive Case	On-site or imported soils	350 to 425 psf/ft
At-Rest Case	On-site or imported soils	55 to 65 psf/ft
Coefficient of Base Friction	On-site or imported soils	0.30 to 0.40[1]

[1]Note: The coefficient of base friction should be reduced to 0.30 when used in conjunction with passive pressure.

The lateral earth pressures herein do not include any factor of safety and are not applicable for submerged soils/hydrostatic loading. Additional recommendations may be necessary if such conditions are to be included in the design.

Fill against foundations (if applicable) should be compacted to densities specified in the Earthwork section of this report. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors.

4.7 Pavements

4.7.1 Design Recommendations

Based upon the anticipated age and condition of the existing pavement and relatively thin pavement section thickness, we recommend that new pavements be constructed for the planned development.

The design approach used to populate the table below was based on the National Asphalt Pavement Association (NAPA), which is specific to low-volume pavements. Portland Cement Concrete (PCC) pavement thicknesses were based on the American Concrete Institute (ACI) design recommendations.

The preliminary design of pavement thickness was based on the following:

- Traffic Class I for the light duty traffic areas include a maximum of 7,000 design EALs
- Traffic Class II for the heavy duty traffic areas include a maximum 36,500 design EALs
- A soil characterization of good based on the poorly graded sands encountered at the site
- A design life of 20 years

As a minimum, we suggest the following typical pavement sections be considered.

Traffic Area	Alternative	Recommended Pavement Section Thickness (inches)			
		Asphalt Concrete Surface (AC)	Portland Cement Concrete (PCC)	Aggregate Base Course (ABC)	Total
Light Duty Areas	A	2-½ to 3	--	6	8-½ to 9
	B	--	5 to 5-½	--	5 to 5-½
Heavy Duty Areas	A	3-½ to 4	--	6	9-½ to 10
	B	--	5-½ to 6	--	5-½ to 6

These pavement sections are considered minimal sections based upon the expected traffic and the existing subgrade conditions. However, they are expected to function with periodic maintenance and overlays if good drainage is provided and maintained.

Each alternative should be investigated with respect to current material availability and economic conditions. Rigid concrete pavement is recommended in areas of truck traffic and truck turning areas. Concrete, a minimum of 6 inches in thickness, is recommended at the location of dumpsters where trash trucks will park and load

4.7.2 Construction Considerations

Aggregate base course (if used on the site) should consist of a blend of sand and gravel which meets strict specifications for quality and gradation. Use of materials meeting New Mexico State Department of Transportation specifications is recommended. Aggregate base course material should be tested to determine compliance with these specifications prior to importation to the site.

Asphalt concrete (if used on the site) should be obtained from an approved mix design stating the properties, optimum asphalt content, job mix formula, and recommended mixing and placing temperatures. Aggregate used in asphalt concrete should meet a particular gradation. Use of materials meeting New Mexico State Department of Transportation SP-III/SP-IV or City of Albuquerque Type B/Type C specifications is recommended. The mix design should be submitted prior to construction to verify its adequacy. The asphalt materials should be compacted to a minimum of 92% of maximum theoretical density (ASTM D2041).

Preventative maintenance should be planned and provided for through an on-going pavement management program in order to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment.

Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

Pavement design methods are intended to provide structural sections with adequate thickness over a particular subgrade such that wheel loads are reduced to a level that subgrade can support. The support characteristics of the subgrade for pavement design do not account for the shrink movements of the soils encountered on this project. Thus the pavement may be adequate for a structural standpoint, yet still experience cracking and deformation due to shrink related movement of the subgrade. It is, therefore, important to minimize moisture changes in the subgrade to reduce collapse/consolidation movements.

Future performance of pavements constructed at this site will be dependent upon several factors, including:

- Maintaining stable moisture content of the subgrade soils.
- Providing for a planned program of preventative maintenance.

The performance of all pavements can be enhanced by minimizing excess moisture which can reach the subgrade soils. The following recommendations should be considered at the minimum:

- site grading at a minimum 2% grade away from the pavements;
- the subgrade and the pavement surface have a minimum ¼ inch per foot slope to promote proper surface drainage.
- consider appropriate edge drainage and pavement under drain systems,
- install pavement drainage surrounding areas anticipated for frequent wetting
- install joint sealant and seal cracks immediately,
- compaction of any utility trenches for landscaped area to the same criteria as the pavement subgrade.
- seal all landscaped areas in, or adjacent to pavements to minimize or prevent moisture migration to subgrade soils;
- placing compacted, low permeability backfill against the exterior side of curb and gutter; and
- placing curb, gutter and/or sidewalk directly on subgrade soils without the use of base course materials.

5.0 GENERAL COMMENTS

Supplemental geotechnical studies should be performed to confirm and/or modify the preliminary recommendations contained herein and to develop final design criteria and construction recommendations.

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

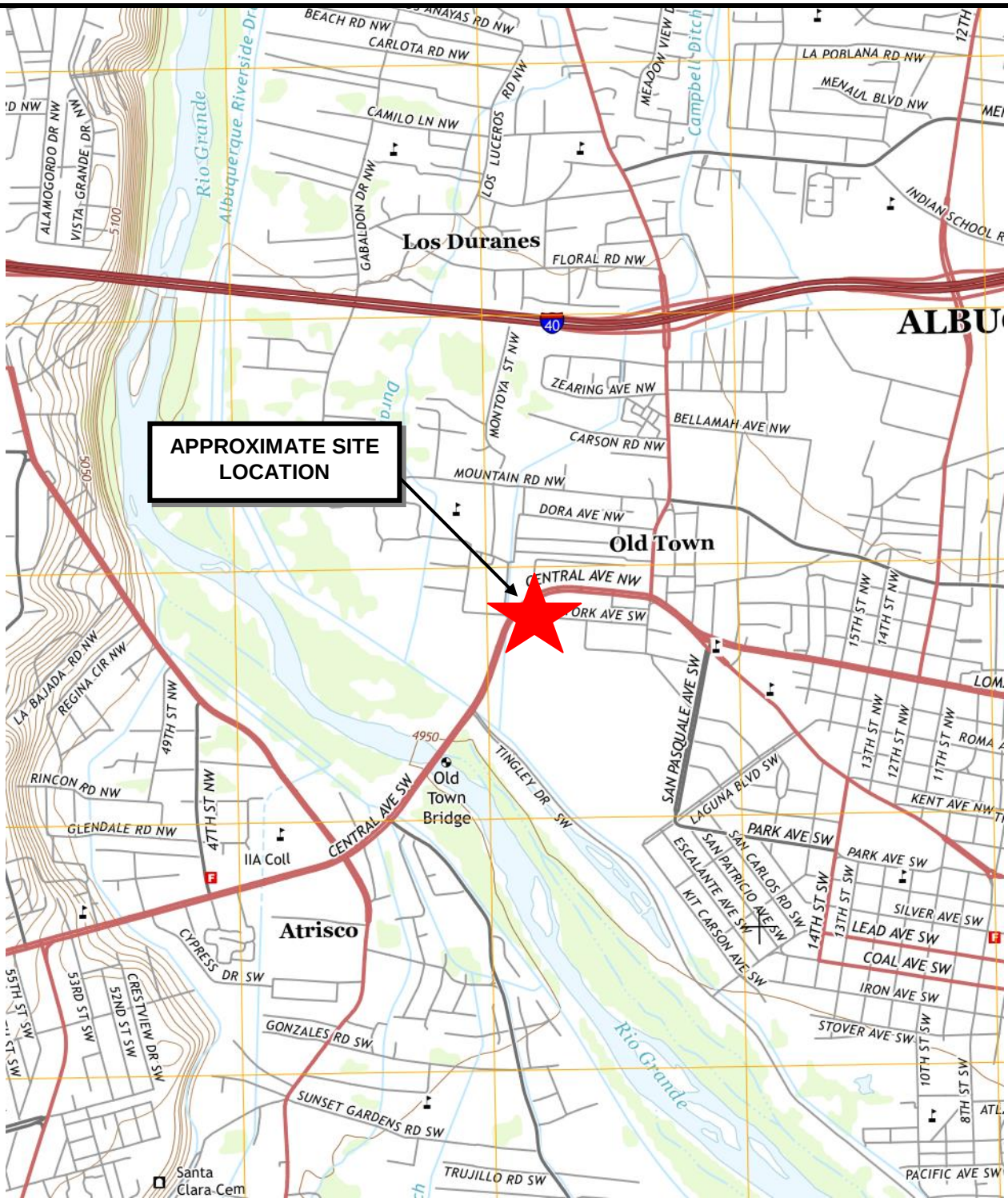
The analysis and preliminary recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until supplemental studies or during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and preliminary recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION



Source: USGS 7.5-Minute Topographic Map Editions “Albuquerque West”, New Mexico, United States, dated 2013.

Project Mngr:	MJD
Drawn By:	N/A
Checked By:	MEA
Approved By:	MEA

Project No.	66145024
Scale	As Shown
File No.	
Date:	4/2014

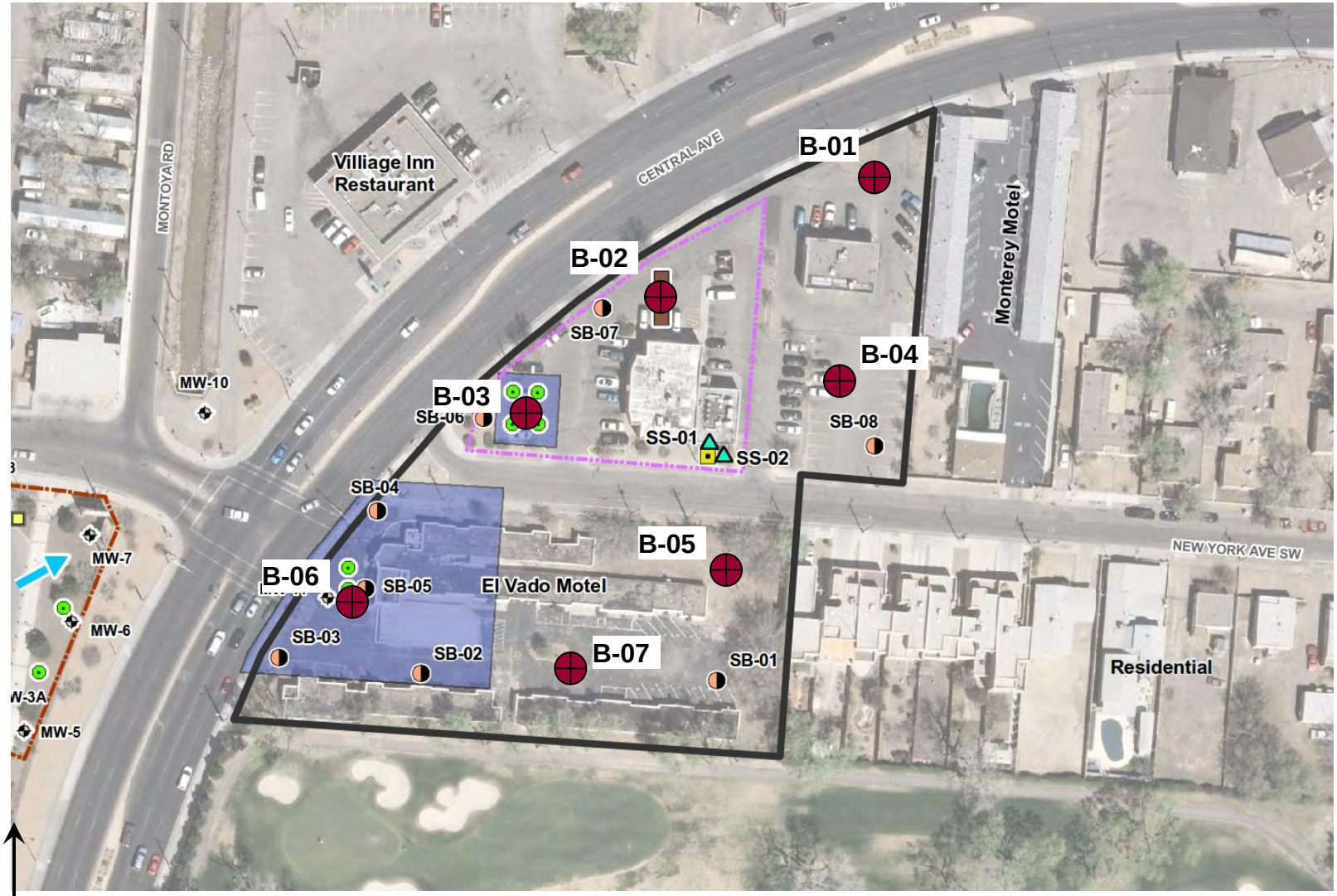
Terracon
Consulting Engineers & Scientists
4905 Hawkins, NE
Albuquerque, New Mexico 87109
505.797.4287 Fax: 505.797.4288

SITE LOCATION MAP

Mixed Use Development
Central Ave. and New York Ave. SW
Albuquerque, New Mexico

FIG No.

A1



B-01 Boring Location

Project Mngr:	MJD
Drawn By:	
Checked By:	MEA
Approved By:	MEA

Project No.	66145024
Scale:	NTS
File No.	
Date:	4/2014

Terracon
Consulting Engineers and Scientists
4905 Hawkins St. NE
Albuquerque, New Mexico 87109
Phone: 505.797.4287 Fax 505.797.4288

BORING LOCATION PLAN

Mixed Use Development
Central Ave. and New York Ave. SE
Albuquerque, New Mexico

FIG. No.

A2

Field Exploration Description

A total of seven (7) test borings were drilled at the site on April 1, 2014. The borings were drilled to a depth of approximately 26-½ feet below the ground surface at the approximate locations shown on the attached Site Location Map and Boring Location Plan. The test borings were located as follows:

Borings	Location	Depths (feet)
B-01, B-03 through B-05 and B-07	Existing paved and unpaved areas	26-½
B-02	Previous underground storage tanks (USTs)	26-½
B-03	Previous fuel dispensing islands	26-½
B-06	Previous fuel dispensing islands	26-½

The test borings were advanced with a truck-mounted CME-75 drill rig utilizing 8-inch diameter hollow-stem augers.

The borings were located in the field by using the proposed site plan and an aerial photograph of the site, and measuring from existing property lines. Latitude and longitude of the borings were determined using a hand-held GPS unit and are indicated on each boring log. The accuracy of boring locations should only be assumed to the level implied by the method used.

Lithologic logs of the borings were recorded by the field engineer during the drilling operations. At selected intervals, samples of the subsurface materials were taken by driving split-spoon or ring-barrel samplers.

Penetration resistance measurements were obtained by driving the split-spoon and ring-barrel samplers into the subsurface materials with a 140-pound automatic hammer falling 30 inches. The penetration resistance value is a useful index in estimating the consistency or relative density of materials encountered.

A CME automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

Groundwater conditions were evaluated in the borings at the time of site exploration. Due to safety considerations, the borings were backfilled and patched (where applicable) upon the completion of drilling operations.

BORING LOG NO. B-01

PROJECT: Mixed Use Development

CLIENT: HDR Engineering, Inc.
Albuquerque, NM

SITE: Central Ave. and New York Ave. SW
Albuquerque, NM

LOCATION See Exhibit A-2

Latitude: 35.095087° Longitude: -106.67601°

DEPTH		FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.2	**ASPHALT CONCRETE**, approximately 2 inches					
0.4	**AGGREGATE BASE COURSE**, approximately 3 inches					
	POORLY GRADED SAND (SP), trace gravel, brown, very loose to loose					
		14	5	94	NP	3
5		2-3-4 N=7	5			
10		2-2-3 N=5	12			
15		2-3-2 N=5	19			
20	clay layer	3-1-2 N=3	37			
25		1-1-2 N=3	19			
26.5	***Boring Terminated at 26.5 Feet***					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings and asphalt patch upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *10 Feet While Drilling*

Terracon
4905 Hawkins, NE
Albuquerque, New Mexico

Boring Started: 4/1/2014 Boring Completed: 4/1/2014

Drill Rig: CME-75 Driller: Envirodrill

Project No.: 66145024 Exhibit: A-4

BORING LOG NO. B-02

PROJECT: Mixed Use Development

CLIENT: HDR Engineering, Inc.
Albuquerque, NM

SITE: Central Ave. and New York Ave. SW
Albuquerque, NM

LOCATION See Exhibit A-2

Latitude: 35.094846° Longitude: -106.676518°

DEPTH	GRAPHIC LOG	DESCRIPTION	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3		**ASPHALT CONCRETE**, approximately 3 inches							
0.5		**AGGREGATE BASE COURSE**, approximately 3 inches							
		FILL - POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), brown, very loose to loose			3-3-4 N=7	4			
5					5	3	110	NP	7
10			▽		1-2-1 N=3	6			
12.0		**POORLY GRADED SAND (SP)**, trace gravel, brown, very loose to loose							
15					1-2-1 N=3	18			
20					1-2-4 N=6	18			
25					2-2-6 N=8	20			
26.5		***Boring Terminated at 26.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings and asphalt patch upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *10 Feet While Drilling*

Terracon
4905 Hawkins, NE
Albuquerque, New Mexico

Boring Started: 4/1/2014 Boring Completed: 4/1/2014

Drill Rig: CME-75 Driller: Envirodrill

Project No.: 66145024 Exhibit: A-5

BORING LOG NO. B-03

PROJECT: Mixed Use Development

CLIENT: HDR Engineering, Inc.
Albuquerque, NM

SITE: Central Ave. and New York Ave. SW
Albuquerque, NM

LOCATION See Exhibit A-2

Latitude: 35.094586° Longitude: -106.676869°

DEPTH	GRAPHIC LOG	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.1								
0.4	**ASPHALT CONCRETE**, approximately 1/2 to 1 inch							
	PORTLAND CEMENT CONCRETE, approximately 3 to 3-1/2 inches							
	POORLY GRADED SAND (SP), trace to with gravel, brown, loose to medium dense							
				4-5-6 N=11	3			
5				15	2			
10		▽		2-2-2 N=4	16		NP	2
15				2-4-3 N=7	17			
20				1-2-2 N=4	21			
25				3-2-3 N=5	17			
26.5	***Boring Terminated at 26.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings and asphalt patch upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *10 Feet While Drilling*

Terracon
4905 Hawkins, NE
Albuquerque, New Mexico

Boring Started: 4/1/2014 Boring Completed: 4/1/2014

Drill Rig: CME-75 Driller: Envirodrill

Project No.: 66145024 Exhibit: A-6

BORING LOG NO. B-04

PROJECT: Mixed Use Development

CLIENT: HDR Engineering, Inc.
Albuquerque, NM

SITE: Central Ave. and New York Ave. SW
Albuquerque, NM

LOCATION See Exhibit A-2

Latitude: 35.094664° Longitude: -106.6761°

DEPTH	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.2 **ASPHALT CONCRETE**, approximately 1-1/2 to 2 inches **POORLY GRADED SAND (SP)**, trace to with gravel, brown, very loose to medium dense							
			6-5-5 N=10	4			
5			12	2	108	NP	2
10	▽		3-3-4 N=7	11			
15			1-1-1 N=2	18			
20			1-1-2 N=3	20			
25			1-1-2 N=3	21			
26.5 ***Boring Terminated at 26.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings and asphalt patch upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *11 Feet While Drilling*

Terracon
4905 Hawkins, NE
Albuquerque, New Mexico

Boring Started: 4/1/2014 Boring Completed: 4/1/2014

Drill Rig: CME-75 Driller: Envirodrill

Project No.: 66145024 Exhibit: A-7

BORING LOG NO. B-05

PROJECT: Mixed Use Development

CLIENT: HDR Engineering, Inc.
Albuquerque, NM

SITE: Central Ave. and New York Ave. SW
Albuquerque, NM

LOCATION See Exhibit A-2

Latitude: 35.094294° Longitude: -106.676374°

DEPTH	GRAPHIC LOG	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
				16	3	102	NP	14
4.0								
5				1-1-1 N=2	1			
10		▽		2-1-1 N=2	15			
15				2-1-3 N=4	18			
20				3-4-3 N=7	14			
25				4-3-5 N=8	15			
26.5								

SILTY SAND (SM), brown, loose

POORLY GRADED SAND (SP), trace gravel, brown, very loose to loose

Boring Terminated at 26.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *10 Feet While Drilling*

Terracon
4905 Hawkins, NE
Albuquerque, New Mexico

Boring Started: 3/31/2014 Boring Completed: 3/31/2014

Drill Rig: CME-75 Driller: Envirodrill

Project No.: 66145024 Exhibit: A-8

BORING LOG NO. B-06

PROJECT: Mixed Use Development

CLIENT: HDR Engineering, Inc.
Albuquerque, NM

SITE: Central Ave. and New York Ave. SW
Albuquerque, NM

LOCATION See Exhibit A-2

Latitude: 35.094193° Longitude: -106.67726°

DEPTH	GRAPHIC LOG	DESCRIPTION	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3		**ASPHALT CONCRETE**, approximately 3 inches							
0.5		**AGGREGATE BASE COURSE**, approximately 3 inches							
		POORLY GRADED SAND (SP), trace to with gravel, brown, very loose to loose			4-3-2 N=5	3			
5					11	2	104	NP	2
10			▽		1-1-1 N=2	11			
15					2-2-2 N=4	18			
20					3-4-4 N=8	20			
25					3-3-2 N=5	13			
26.5		***Boring Terminated at 26.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings and asphalt patch upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *10 Feet While Drilling*

Terracon
4905 Hawkins, NE
Albuquerque, New Mexico

Boring Started: 3/31/2014 Boring Completed: 3/31/2014

Drill Rig: CME-75 Driller: Envirodrill

Project No.: 66145024 Exhibit: A-9

BORING LOG NO. B-07

PROJECT: Mixed Use Development

CLIENT: HDR Engineering, Inc.
Albuquerque, NM

SITE: Central Ave. and New York Ave. SW
Albuquerque, NM

LOCATION See Exhibit A-2

Latitude: 35.094088° Longitude: -106.676748°

DEPTH		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3	**ASPHALT CONCRETE**, approximately 3-1/2 inches							
0.5	**AGGREGATE BASE COURSE**, approximately 3 inches							
	POORLY GRADED SAND (SP), trace to with gravel, brown, very loose to medium dense							
				3-2-3 N=5	4			
5				12	4	104	NP	2
10		▽		1-1-1 N=2	20			
15				4-5-4 N=9	17			
20				3-2-3 N=5	19			
25				4-4-6 N=10	18			
26.5	***Boring Terminated at 26.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings and asphalt patch upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *10 Feet While Drilling*

Terracon
4905 Hawkins, NE
Albuquerque, New Mexico

Boring Started: 3/31/2014 Boring Completed: 3/31/2014

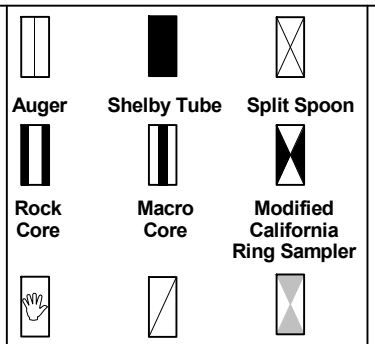
Drill Rig: CME-75 Driller: Envirodrill

Project No.: 66145024 Exhibit: A-10

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



WATER LEVEL

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
N	N value
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

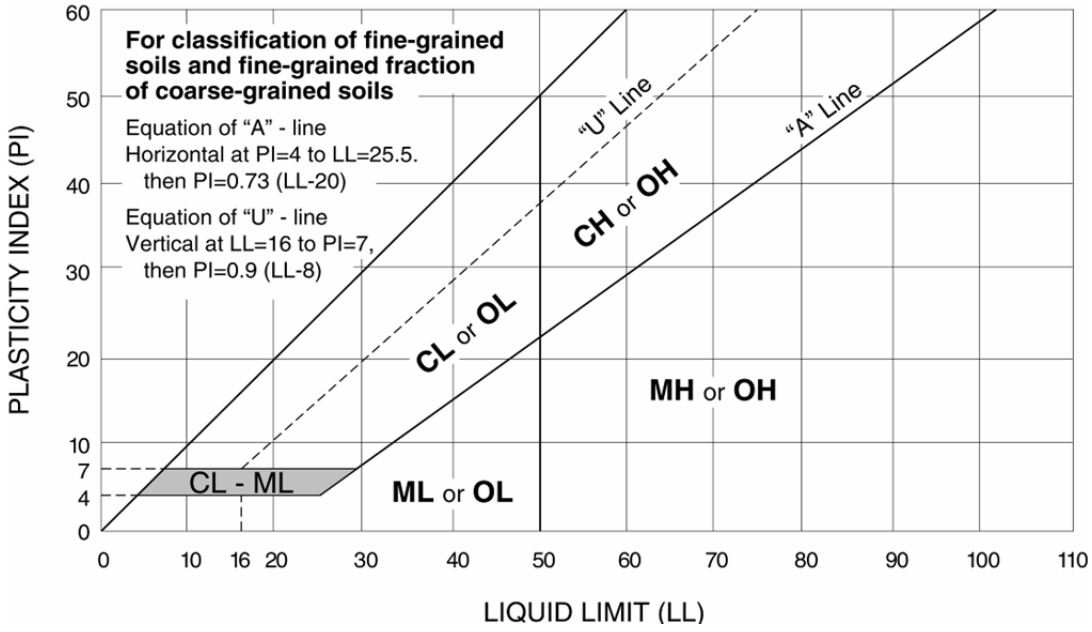
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



Terracon

APPENDIX B

LABORATORY TESTING

Laboratory Testing

Samples retrieved during the field exploration were taken to the laboratory for further observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System (USCS) described in Appendix A. At that time, the field descriptions were confirmed or modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

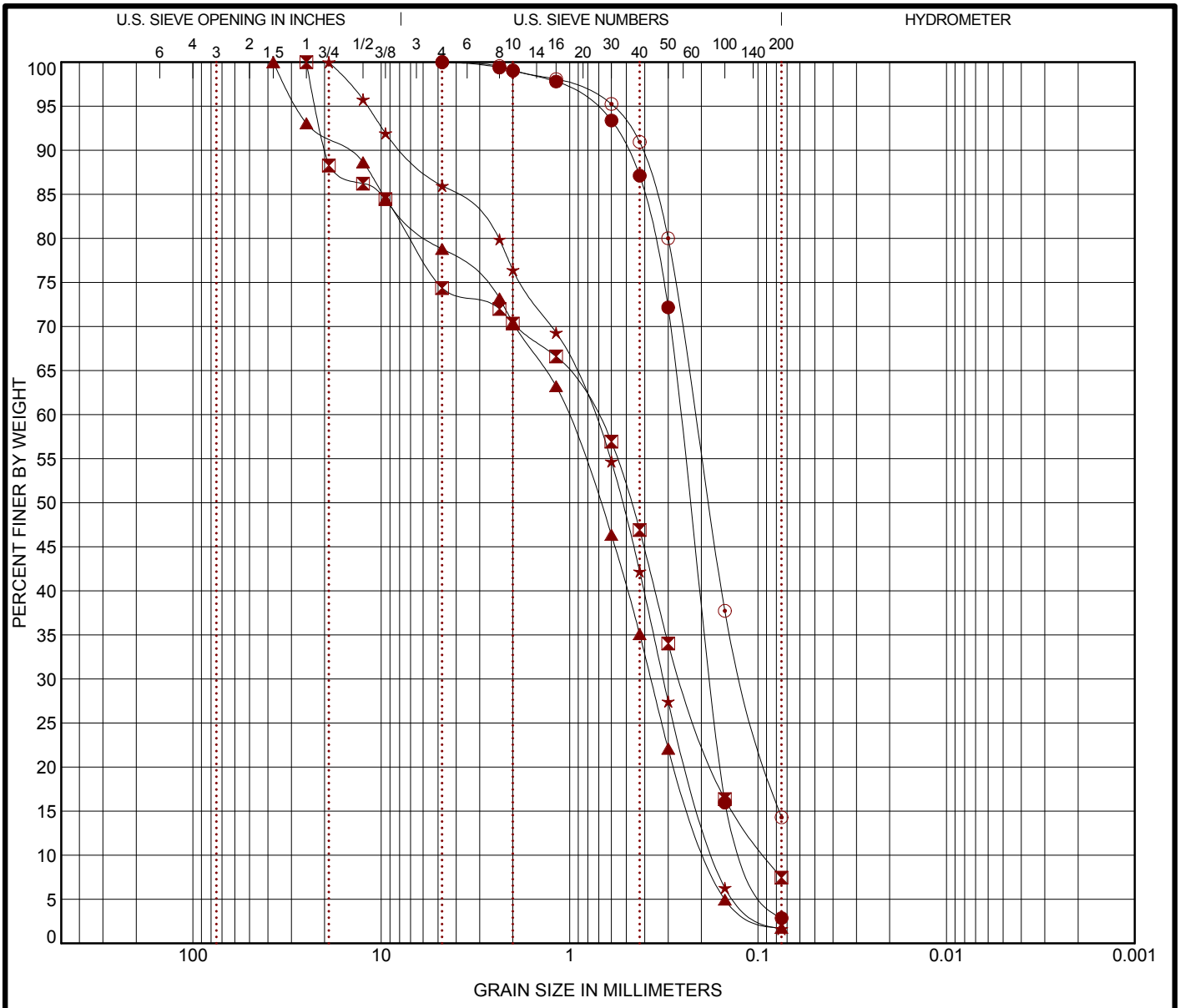
Laboratory tests were conducted on selected soil samples and the test results are presented in this appendix. The laboratory test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance with the applicable ASTM, local or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

- Compression
- Sieve Analysis
- Atterberg Limits
- In-situ Water Content
- In-situ Dry Density
- Soluble Sulfates

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	LL	PL	PI	Cc	Cu
●	B-01	2.5	POORLY GRADED SAND(SP)	NP	NP	NP	1.13	2.36
⊠	B-02	5.0	POORLY GRADED SAND with SILT and GRAVEL(SP-SM)	NP	NP	NP	0.96	8.13
▲	B-03	10.0	POORLY GRADED SAND with GRAVEL(SP)	NP	NP	NP	0.72	5.64
★	B-04	5.0	POORLY GRADED SAND(SP)	NP	NP	NP	0.78	4.53
⊙	B-05	2.5	SILTY SAND(SM)	NP	NP	NP		

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	B-01	2.5	4.75	0.258	0.178	0.109	0.0	97.1	2.9	
⊠	B-02	5.0	25	0.744	0.256	0.091	25.6	66.9	7.4	
▲	B-03	10.0	37.5	1.037	0.371	0.184	21.2	77.0	1.8	
★	B-04	5.0	19	0.767	0.319	0.169	14.0	84.3	1.6	
⊙	B-05	2.5	4.75	0.216	0.119		0.0	85.7	14.3	

PROJECT: Mixed Use Development

SITE: Central Ave. and New York Ave. SW
Albuquerque, NM

Terracon
4905 Hawkins, NE
Albuquerque, New Mexico

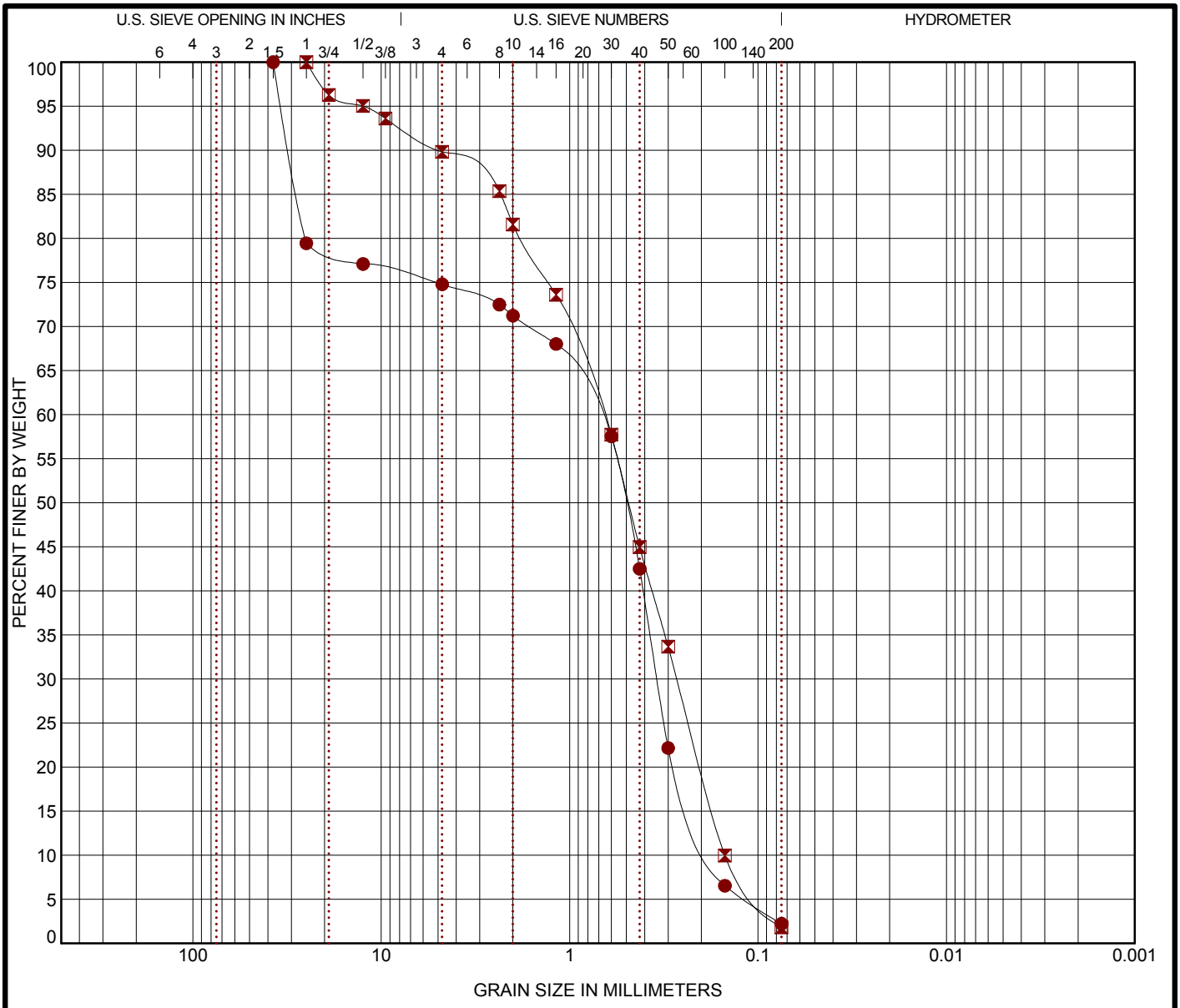
PROJECT NUMBER: 66145024

CLIENT: HDR Engineering, Inc.
Albuquerque, NM

EXHIBIT: B-2

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	LL	PL	PI	Cc	Cu
●	B-06	5.0	POORLY GRADED SAND with GRAVEL(SP)	NP	NP	NP	0.96	4.02
⊠	B-07	5.0	POORLY GRADED SAND(SP)	NP	NP	NP	0.73	4.40

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	B-06	5.0	37.5	0.703	0.343	0.175	25.2	72.6	2.2	
⊠	B-07	5.0	25	0.661	0.27	0.15	10.2	88.0	1.8	

PROJECT: Mixed Use Development

SITE: Central Ave. and New York Ave. SW
Albuquerque, NM

Terracon
4905 Hawkins, NE
Albuquerque, New Mexico

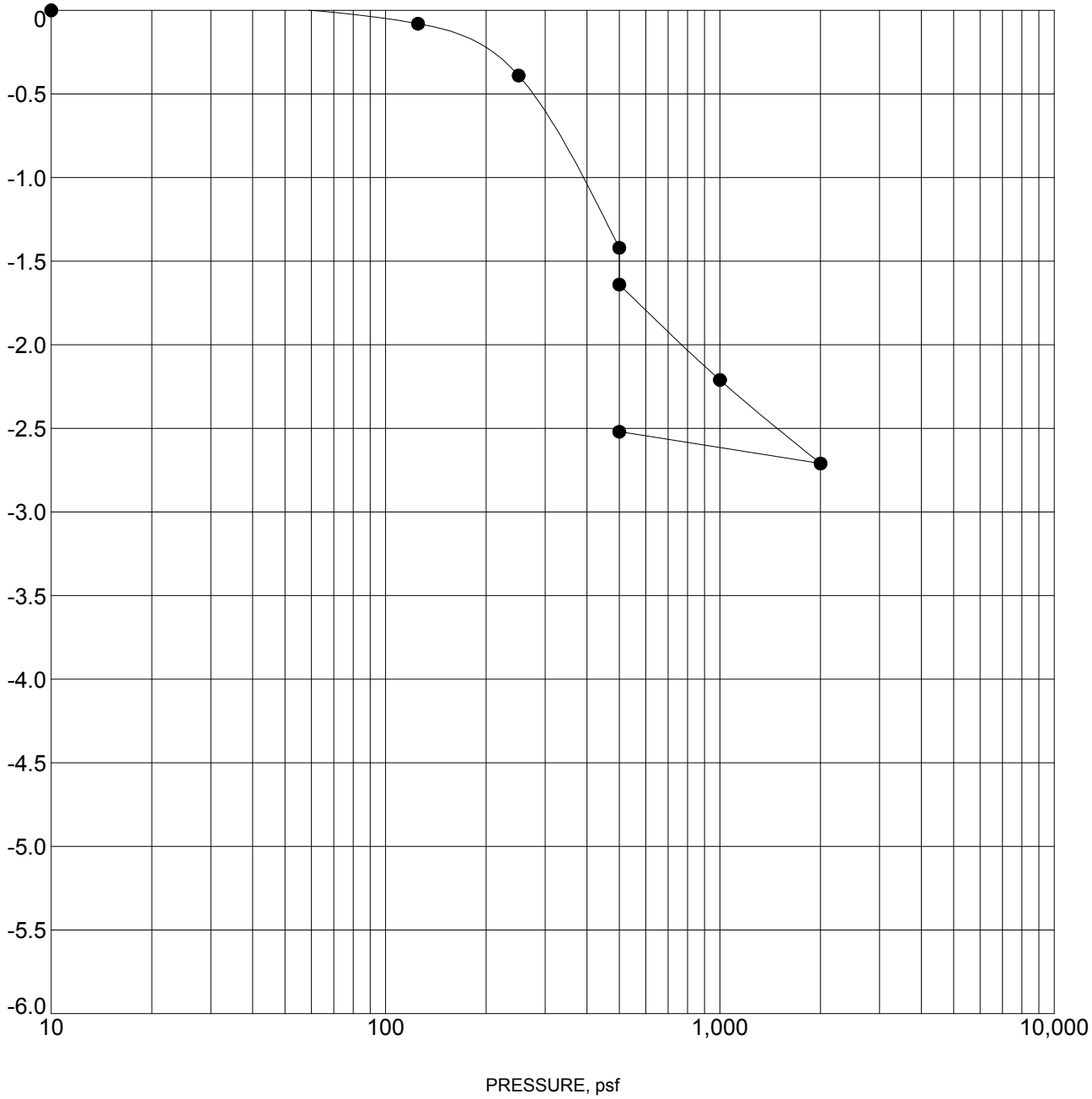
PROJECT NUMBER: 66145024

CLIENT: HDR Engineering, Inc.
Albuquerque, NM

EXHIBIT: B-3

SWELL CONSOLIDATION TEST

ASTM D2435



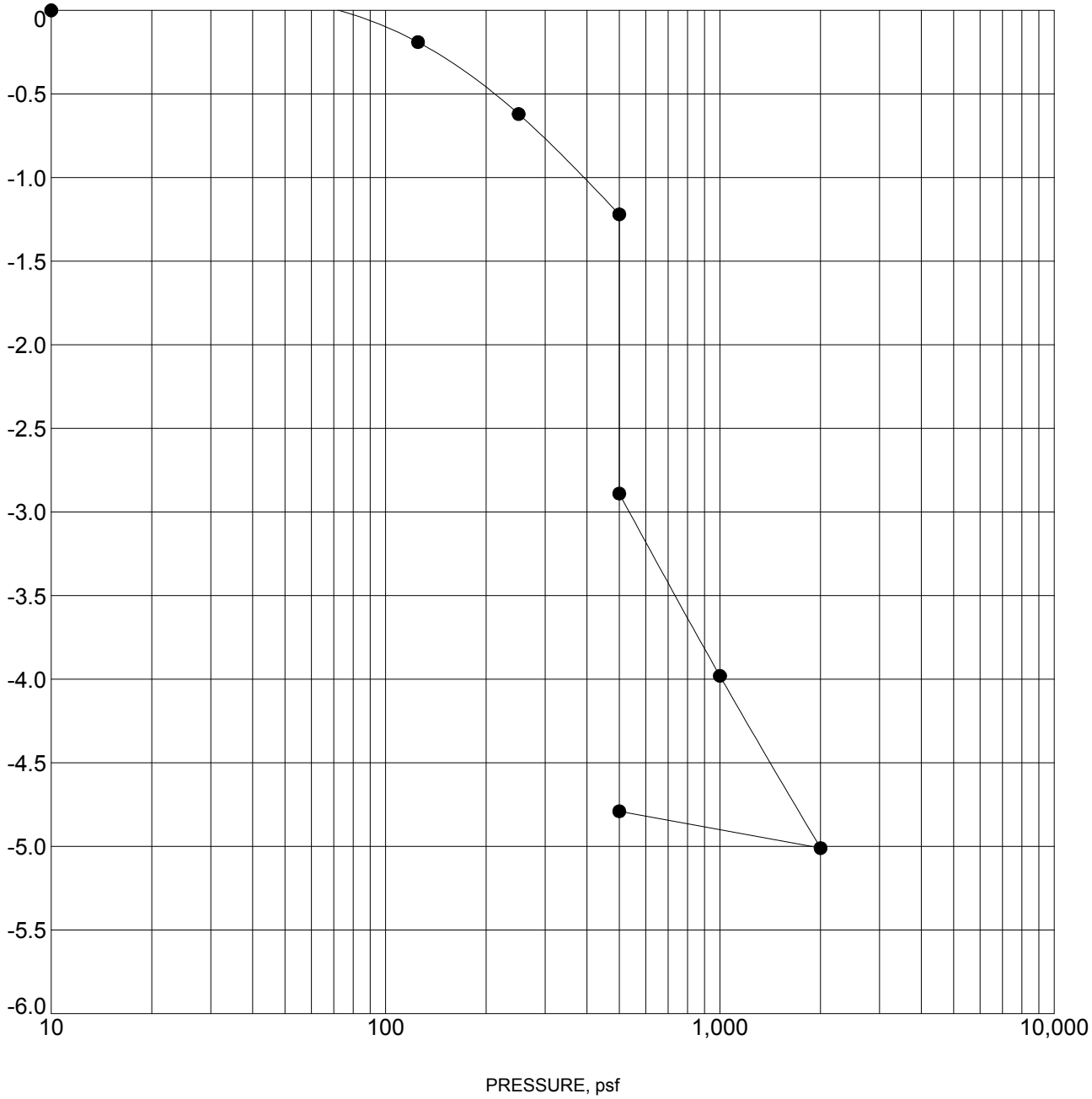
Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-01	2.5 ft	POORLY GRADED SAND(SP)	94	5

NOTES:

PROJECT: Mixed Use Development	Terracon 4905 Hawkins, NE Albuquerque, New Mexico	PROJECT NUMBER: 66145024
SITE: Central Ave. and New York Ave. SW Albuquerque, NM		CLIENT: HDR Engineering, Inc. Albuquerque, NM
		EXHIBIT: B-4

SWELL CONSOLIDATION TEST

ASTM D2435



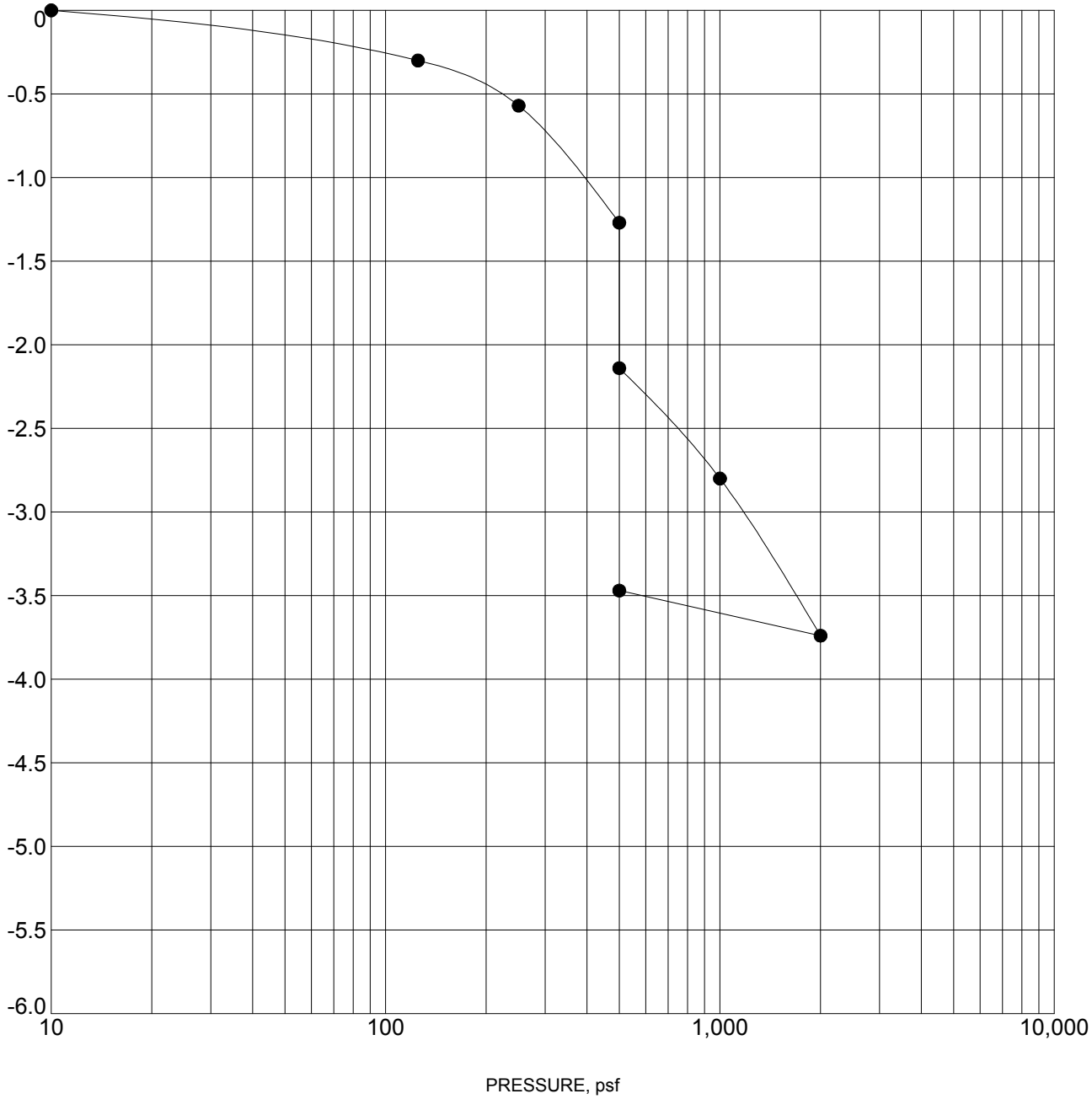
Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-02	5.0 ft	POORLY GRADED SAND with SILT and GRAVEL(SP-SM)	110	3

NOTES:

PROJECT: Mixed Use Development	Terracon 4905 Hawkins, NE Albuquerque, New Mexico	PROJECT NUMBER: 66145024
SITE: Central Ave. and New York Ave. SW Albuquerque, NM		CLIENT: HDR Engineering, Inc. Albuquerque, NM
		EXHIBIT: B-5

SWELL CONSOLIDATION TEST

ASTM D2435



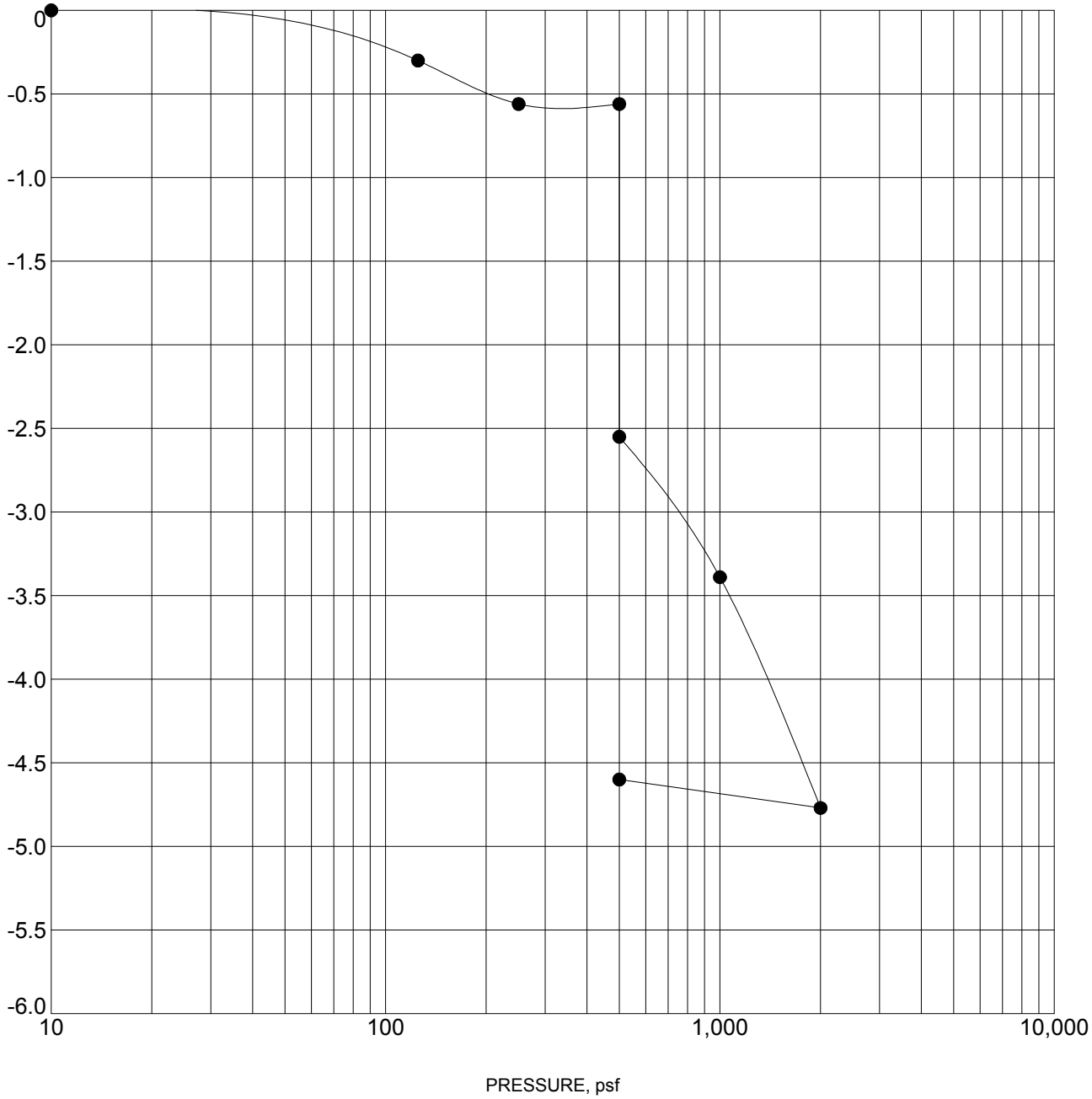
Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-04	5.0 ft	POORLY GRADED SAND(SP)	108	2

NOTES:

PROJECT: Mixed Use Development	Terracon 4905 Hawkins, NE Albuquerque, New Mexico	PROJECT NUMBER: 66145024
SITE: Central Ave. and New York Ave. SW Albuquerque, NM		CLIENT: HDR Engineering, Inc. Albuquerque, NM
		EXHIBIT: B-6

SWELL CONSOLIDATION TEST

ASTM D2435



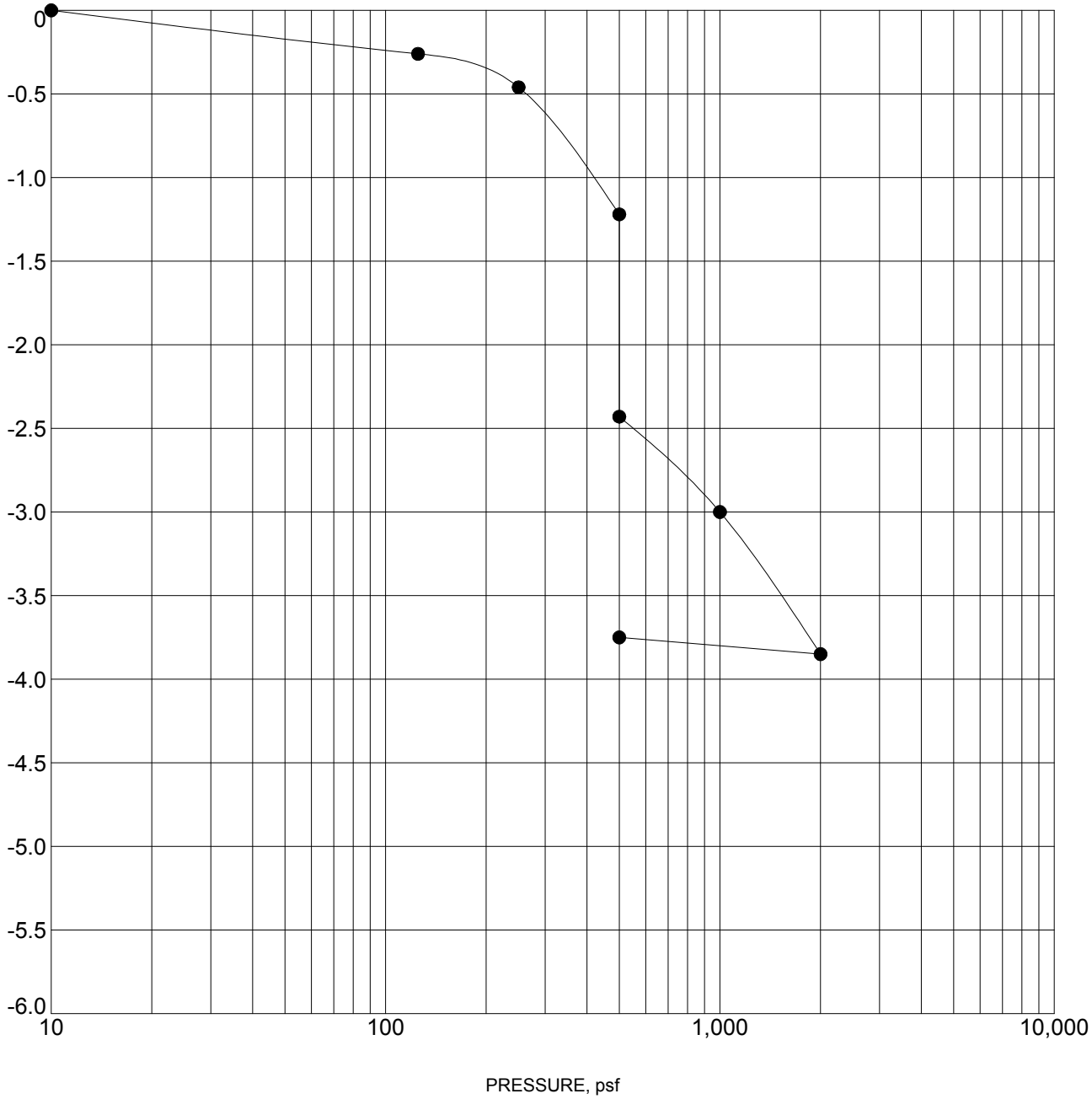
Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-05	2.5 ft	SILTY SAND(SM)	102	3

NOTES:

PROJECT: Mixed Use Development	Terracon 4905 Hawkins, NE Albuquerque, New Mexico	PROJECT NUMBER: 66145024
SITE: Central Ave. and New York Ave. SW Albuquerque, NM		CLIENT: HDR Engineering, Inc. Albuquerque, NM
		EXHIBIT: B-7

SWELL CONSOLIDATION TEST

ASTM D2435



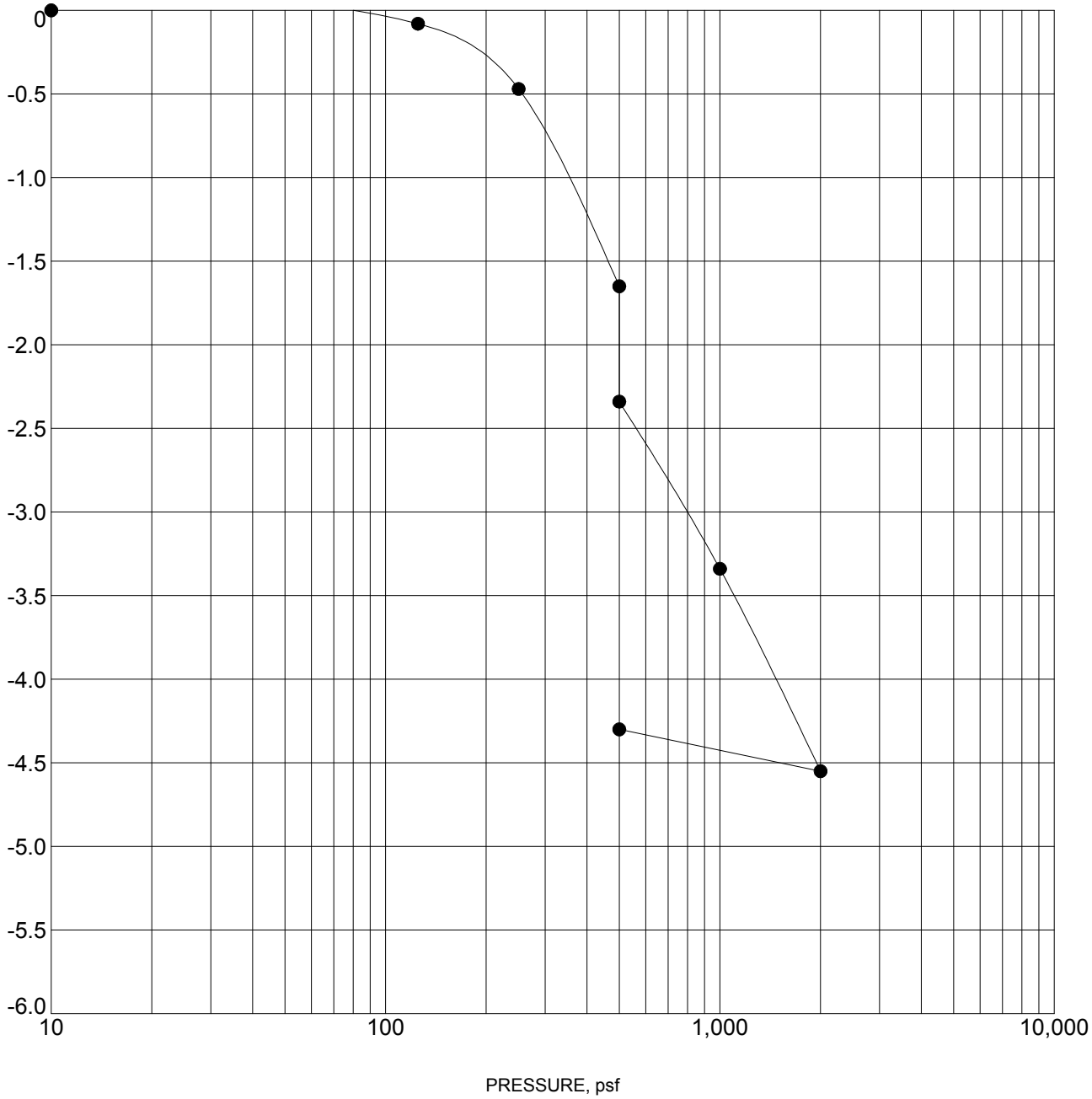
Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-06	5.0 ft	POORLY GRADED SAND with GRAVEL(SP)	104	2

NOTES:

PROJECT: Mixed Use Development	Terracon 4905 Hawkins, NE Albuquerque, New Mexico	PROJECT NUMBER: 66145024
SITE: Central Ave. and New York Ave. SW Albuquerque, NM		CLIENT: HDR Engineering, Inc. Albuquerque, NM
		EXHIBIT: B-8

SWELL CONSOLIDATION TEST

ASTM D2435



Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-07	5.0 ft	POORLY GRADED SAND(SP)	104	4

NOTES:

PROJECT: Mixed Use Development	Terracon 4905 Hawkins, NE Albuquerque, New Mexico	PROJECT NUMBER: 66145024
SITE: Central Ave. and New York Ave. SW Albuquerque, NM		CLIENT: HDR Engineering, Inc. Albuquerque, NM
		EXHIBIT: B-9

Summary of Laboratory Results

BORING ID	Depth	USCS Classification and Soil Description	Compressive Strength (psf)	Liquid Limit	Plastic Limit	Plasticity Index	% <#200 Sieve	% Gravel	% Sand	% Silt	% Clay	Water Content (%)	Dry Density (pcf)
B-01	2.5 - 3.5	POORLY GRADED SAND(SP)		NP	NP	NP	2.9	0.0	97.1			4.7	94.0
B-01	5 - 6.5											5.0	
B-01	10 - 11.5											11.8	
B-01	15 - 16.5											18.9	
B-01	20 - 21.5											37.4	
B-01	25 - 26.5											19.3	
B-02	2.5 - 4											3.8	
B-02	5 - 6	POORLY GRADED SAND with SILT		NP	NP	NP	7.4	25.6	66.9			3.1	109.6
		and GRAVEL(SP-SM)											
B-02	10 - 11.5											6.3	
B-02	15 - 16.5											17.6	
B-02	20 - 21.5											18.2	
B-02	25 - 26.5											19.9	
B-03	2.5 - 4											3.0	
B-03	5 - 6											2.4	
B-03	10 - 11.5	POORLY GRADED SAND with		NP	NP	NP	1.8	21.2	77.0			16.0	
		GRAVEL(SP)											
B-03	15 - 16.5											16.6	
B-03	20 - 21.5											21.3	
B-03	25 - 26.5											17.4	
B-04	2.5 - 4											3.6	
B-04	5 - 6	POORLY GRADED SAND(SP)		NP	NP	NP	1.6	14.0	84.3			1.5	107.6
B-04	10 - 11.5											11.0	
B-04	15 - 16.5											18.3	
B-04	20 - 21.5											19.9	
B-04	25 - 26.5											21.0	
B-05	2.5 - 3.5	SILTY SAND(SM)		NP	NP	NP	14.3	0.0	85.7			2.5	101.6
B-05	5 - 6.5											1.4	
B-05	10 - 11.5											15.4	
B-05	15 - 16.5											17.7	
B-05	20 - 21.5											14.2	
B-05	25 - 26.5											15.4	
B-06	2.5 - 4											2.6	
B-06	5 - 6	POORLY GRADED SAND with		NP	NP	NP	2.2	25.2	72.6			2.4	104.0
		GRAVEL(SP)											
B-06	10 - 11.5											11.4	
B-06	15 - 16.5											18.4	
B-06	20 - 21.5											19.6	
B-06	25 - 26.5											13.4	
B-07	2.5 - 4											3.8	
B-07	5 - 6	POORLY GRADED SAND(SP)		NP	NP	NP	1.8	10.2	88.0			3.9	104.0
B-07	10 - 11.5											19.7	

PROJECT: Mixed Use Development

SITE: Central Ave. and New York Ave. SW
Albuquerque, NM

Terracon
4905 Hawkins, NE
Albuquerque, New Mexico

PROJECT NUMBER: 66145024

CLIENT: HDR Engineering, Inc.
Albuquerque, NM

EXHIBIT: B-10

Summary of Laboratory Results

BORING ID	Depth	USCS Classification and Soil Description	Compressive Strength (psf)	Liquid Limit	Plastic Limit	Plasticity Index	% <#200 Sieve	% Gravel	% Sand	% Silt	% Clay	Water Content (%)	Dry Density (pcf)
B-07	15 - 16.5											17.0	
B-07	20 - 21.5											18.7	
B-07	25 - 26.5											17.9	

PROJECT: Mixed Use Development

SITE: Central Ave. and New York Ave. SW
Albuquerque, NM

Terracon
4905 Hawkins, NE
Albuquerque, New Mexico

PROJECT NUMBER: 66145024

CLIENT: HDR Engineering, Inc.
Albuquerque, NM

EXHIBIT: B-11

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

April 10, 2014

Michael Anderson

Terracon
4905 Hawkins, NE
Albuquerque, NM 87109
TEL: (505) 797-4287
FAX

RE: Mixed Use Development OrderNo.: 1404176

Dear Michael Anderson:

Hall Environmental Analysis Laboratory received 2 sample(s) on 4/3/2014 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

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

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0190

Sincerely,

Andy Freeman

Laboratory Manager

4901 Hawkins NE
Albuquerque, NM 87109

Analytical Report
Lab Order **1404176**
Date Reported: **4/10/2014**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Terracon
Client Sample ID: B1 @ 5'
Project: Mixed Use Development
Collection Date: 4/1/2014
Lab ID: 1404176-001
Matrix: SOIL
Received Date: 4/3/2014 11:45:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS						Analyst: **JRR**	
Sulfate	26	1.5		mg/Kg	1	4/4/2014 5:21:19 PM	12547

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Terracon
Client Sample ID: B7 @ 2.5'
Project: Mixed Use Development
Collection Date: 4/1/2014
Lab ID: 1404176-002
Matrix: SOIL
Received Date: 4/3/2014 11:45:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS						Analyst: **JRR**	
Sulfate	14	1.5		mg/Kg	1	4/7/2014 2:26:02 PM	12547

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1404176**

10-Apr-14

Client: Terracon

Project: Mixed Use Development

Sample ID	**MB-12547**	SampType:	**MBLK**	TestCode:	**EPA Method 300.0: Anions**					
Client ID:	**PBS**	Batch ID:	**12547**	RunNo:	**17824**					
Prep Date:	**4/4/2014**	Analysis Date:	**4/4/2014**	SeqNo:	**513769**	Units:	**mg/Kg**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	ND	1.5								

Sample ID	**LCS-12547**	SampType:	**LCS**	TestCode:	**EPA Method 300.0: Anions**					
Client ID:	**LCSS**	Batch ID:	**12547**	RunNo:	**17824**					
Prep Date:	**4/4/2014**	Analysis Date:	**4/4/2014**	SeqNo:	**513770**	Units:	**mg/Kg**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	28	1.5	30.00	0	94.3	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

ENVIRONMENTAL ANALYSIS LABORATORY

4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: TER-Alb | Work Order Number: 1404176 | RcptNo: 1

Received by/date: CS 04/03/14

Logged By: Anne Thorne 4/3/2014 11:45:00 AM Anne Thorne

Completed By: Anne Thorne 4/3/2014 Anne Thorne

Reviewed By: 04/03/14

Chain of Custody

1. Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
2. Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
3. How was the sample delivered?	Client		

Log In

4. Was an attempt made to cool the samples?	Yes ☐	No ☐	NA ☑
5. Were all samples received at a temperature of >0° C to 6.0°C	Yes ☐	No ☐	NA ☑
6. Sample(s) in proper container(s)?	Yes ☑	No ☐	
7. Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8. Are samples (except VOA and ONG) properly preserved?	Yes ☑	No ☐	
9. Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10. VOA vials have zero headspace?	Yes ☐	No ☐	No VOA Vials ☑
11. Were any sample containers received broken?	Yes ☐	No ☑	
12. Does paperwork match bottle labels? (Note discrepancies on chain of custody)	Yes ☑	No ☐	
13. Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14. Is it clear what analyses were requested?	Yes ☑	No ☐	
15. Were all holding times able to be met? (If no, notify customer for authorization.)	Yes ☑	No ☐	

# of preserved bottles checked for pH: _____ (<2 or >12 unless noted)

Adjusted? _____

Checked by: _____

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: _____ Date _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

17. Additional remarks:

18. Cooler Information

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Terracon	☒ Standard ☐ Rush
Mailing Address: 4905 Hawkins NE ABQ, NM 87109	Project Name: Mixed Use Development
Phone #: mjanneman@terracon.com	Project #: 66145024
email or Fax#: 505.797.4297	Project Manager: Mike Anderson
QA/QC Package: ☐ Standard ☐ Level 4 (Full Validation)	Sampler: MJD
Accreditation ☐ NELAP ☐ Other	On Ice: ☐ Yes ☑ No
☐ EDD (Type)	Sample Temperature: 19.8

Date	Time	Matrix	Sample Request ID	Container Type and # (04/03/14)	Preservative Type	HEAL No. 1404176
4-1-14		Soil	B1@5'	4oz (A)	—	001
		↓	B7@2½'	↓	—	002

Analysis Request

BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH 8015B (GRO / DRO / MRO)	TPH (Method 418.1)	EDB (Method 504.1)	PAH's (8310 or 8270 SIMS)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)
							/			
							/			

Date:	Time:	Relinquished by:	Received by:	Date	Time
4-2-2014	11:45	David Boerner	Ellin Sun	04/03/14	11:45
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks: Due 4/11/14

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the