

Geotechnical Engineering Report

Circle K Retail Store
SWC of NM Hwy 516 and CR 350
Flora Vista, New Mexico
January 31, 2014
Terracon Project No. 69135013

Prepared for:
Circle K
Tempe, Arizona

Prepared by:
Terracon Consultants, Inc.
Flora Vista, New Mexico

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January 31, 2014



Circle K
1130 West Warner Road, Building B
Tempe, Arizona 85284

Attn: Mr. Bill Bunch
P: (602) 728-6639
E: wbunch@CircleK.com

Re: Geotechnical Engineering Report
Circle K Retail Store
SWC of NM Hwy 516 and CR 350
Flora Vista, New Mexico
Terracon Project No. 69135013

Dear Mr. Bunch:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. These services were performed in general accordance with our Proposal Number P69130116 dated November 4, 2013. This geotechnical engineering report presents the results of the subsurface exploration and provides 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.



Zachary C. St. Jean
Zachary C. St. Jean, P.E.
Office Manager

Michael E. Anderson, P.E.
Principal

Copies to: Addressee (1 via email, 4 via mail)



Terracon Consultants, Inc. #4A CR 3499 Flora Vista, New Mexico 87415
P [505] 334 2900 F [505] 334 9703 terracon.com

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EXECUTIVE SUMMARY

This geotechnical executive summary should be used in conjunction with the entire report for 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.

A geotechnical exploration has been performed for the proposed Circle K Retail Store located SWC of NM Hwy 516 and CR 350 in Flora Vista, New Mexico. Terracon's geotechnical scope of work included the advancement of six (6) test borings to approximate depths of 6-½ to 21-½ 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:

Site Development: An existing one-story single-family residence with two associated site buildings are located at the site. These features will need to be razed or removed prior to new construction. In addition, existing below ground utilities within and adjacent to the site were observed and should be considered in the design and development of the project.

Site Soils: The site soils generally consisted of lean clay underlain by sand with varying amounts of silt, clay, and gravel. Groundwater was not encountered at the time of drilling. On-site soils are suitable for use as engineered fill. Some blending of the clay with on-site or imported sand soils will be required to meet the specifications in this report.

Foundations: The proposed building, fuel dispenser islands and canopies, trash enclosure walls, and monument sign at the site may be supported by shallow spread footings bearing on engineered fill.

Floor Slabs: The on-site surface and near surface soils are expected to exhibit low to moderate collapse potential and non-to low expansion potential when compacted and subjected to light loading conditions such as those imposed by the floor slab. Construction of the floor slab directly on engineered fill composed on-site sand soils or approved imported soils are considered acceptable for the project, provided some movement can be tolerated.

Pavement Sections: Standard Duty parking areas – 3" AC over 6" ABC or 5" PCC; Heavy Duty truck drives and drive lanes – 4-½" AC over 6" ABC or 5-½" PCC.

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 construction.

**GEOTECHNICAL ENGINEERING REPORT
PROPOSED CIRCLE K RETAIL STORE
SWC OF NM HWY 516 AND CR 350
FLORA VISTA, NEW MEXICO**

**Terracon Project No. 69135013
JANUARY 31, 2014**

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services performed for the proposed Circle K Retail Store to be located southwest of NM Hwy 516 and CR 350 in Flora Vista, New Mexico. The report addresses the following:

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

Our geotechnical engineering scope of work for this project included the advancement of six (6) test borings to a depth of approximately 6-½ to 21-½ 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.

A limited asbestos survey has been conducted and will be submitted under separate cover (Terracon Project No. 66137030). We assume that the Phase I Environmental Assessment has been performed by others.

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	Development will consist of the construction of a one-story, slab-on-grade building on the order of about 4,480 square feet in plan area. Additional development will consist of the construction of fuel dispensing pumps, fuel island canopy, underground storage tanks, trash enclosure, asphalt and/or Portland cement concrete paved parking areas, exterior flatwork, and the installation of utilities.
Building construction	Load-bearing metal or wood-framed, plywood roof deck, and concrete floor slab-on-grade construction
Proposed foundation	Spread/continuous footings
Finished floor elevation	Within 1 to 2 feet of existing site grade (assumed)
Maximum loads	Columns: 12 kips (reported) Walls: 1.8 kips per lineal foot (reported) Slabs: 100 psf max (reported)
Maximum settlement	Total: 1 inch over 20 years Differential: ½ inch over 50 lineal feet
Grading	Maximum cut and fills on the order of about 1 to 2 feet (assumed)
Retaining walls	Not applicable
Below Grade Areas	Underground storage tanks assumed to be on the order of about 12 to 16 feet in depth.
Traffic loading	Standard Duty: 36,500 ESALs over a 20-Year design period Heavy Duty: 73,000 ESALs over a 20-Year design period
Off-site Improvements	None

2.2 Site Location and Description

ITEM	DESCRIPTION
Location	The site is located southwest of NM Hwy 516 and CR 350 in Flora Vista, New Mexico.
Existing site features (site interior)	Existing one-story single-family residence with two associated site buildings. The site is enclosed in by various types of fencing. Several large deciduous trees are also present on the site.
Surrounding developments	North: NM Hwy 516 East: CR 350 West: Vacant parcel with multiple small storage sheds. South: Vacant parcel with small storage sheds.
Current ground cover	Existing building footprints, gravel surfacing, concrete slabs, exposed earth, trees, brush, and vegetation.
Existing topography	The site is relatively level.

3.0 SUBSURFACE CONDITIONS

3.1 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/bedrock 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	2 to 3	Sandy lean clay.**	NA
Stratum 2	6-½ to 21-½ (termination depth)	Sand with varying amounts of clay, silt, and gravel.	Loose to Medium Dense

*Gravel fills encountered at the ground surface in Boring B-02 and B-06 to about 1 to 1-½ feet below ground surface.

**Encountered in Boring Nos. B-01 and B-03.

The sand soils were non-plastic to medium in plasticity. We anticipate clay soils to be low to medium in plasticity.

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 potential at in-situ moisture contents. The near surface soils have a moderate to high tendency for compression when wetted under light foundation loads. Due to the granular nature and low moisture content of some of the subsurface soils, some disturbance is likely reflected in the test results. It is our opinion that the shallow subsurface soils will likely exhibit low to moderate consolidation/compression. When water is added to samples of laboratory compacted near-surface soils, we anticipate that the compacted soils will exhibit low compressive and non-to low expansive potential when subjected to light loading conditions such as those imposed by floor slabs.

Laboratory test results indicate that on-site soils have a resistivity of about 1,455 ohm-centimeters, a soluble sulfate of 132 mg/kg, chlorides of 50 mg/kg, and pH value 7.9.

3.2 Groundwater

Groundwater was not observed at the time of field exploration, nor when checked upon completion. 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.

4.0 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. Potentially compressible and expansive soils which show a tendency for movement when elevated in moisture content will require particular attention in the design and construction.

An existing buildings, slabs, structures, and large trees currently occupy the site. These features will need to be razed or removed prior to new construction. In addition, existing below ground utilities within and adjacent to the site were observed and should be considered in the design and development of the project.

Based on the geotechnical subsurface exploration, the laboratory test results, and our engineering analyses, the proposed building structure, fuel dispensing islands and canopies, trash enclosure walls, and monument sign can be supported on a spread footing foundation system bearing on a zone of engineered fill. A slab-on-grade floor system supported on a zone of engineered fill can be used, provided some movement can be tolerated. On-site soils are suitable for use as engineered fill.

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.

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 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 slabs, various fencing, vegetation and other deleterious materials from the proposed structure and new pavement areas. A significant topsoil zone was not observed in the borings. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction.

Demolition of the existing structures/elements 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.

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 the proposed building structure.

Evidence of underground facilities and utilities (septic tank/leach field) was observed during the site reconnaissance. Therefore, such features will likely be encountered during construction. If the septic tank and water well are not being used as part of this project, these structures should be removed and/or abandoned per County requirements.

If loose 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

Excavations into the on-site soils are expected to be accomplished with conventional earthwork equipment.

Based on the results from the soil borings, we do not anticipate groundwater control measures will be necessary in excavations up to about 21-½ feet below existing site grades. However, depending upon depth of excavation and seasonal conditions, groundwater may be encountered in excavations on the site. Pumping from sumps may be utilized to control water within excavations.

On-site soils may pump or become unstable at elevated moisture contents. Workability may be improved by scarifying and drying, this condition is likely as excavations approach groundwater conditions. Overexcavation of wet zones and replacement with granular materials may be necessary. Lightweight excavation equipment may be required 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 Fuel Storage Tank Excavation and Installation

We understand underground fuel storage tanks will be constructed on site. We recommend that the tank excavation and installation, including associated lines, be performed in accordance with local, state and federal guidelines, including OSHA requirements. Construction and installation of the tanks including bedding materials for the tanks should follow manufacturer's specifications.

4.2.4 Subgrade Preparation

Engineered fill should extend below proposed building, car wash, fuel dispenser islands/canopies, trash enclosure walls, and monument sign.

A minimum of three (3) feet of engineered fill is recommended below all building footings. The subgrade soils should be removed to a minimum depth of two (2) feet and a minimum of two (2) feet horizontally beyond the edge of footings. If engineered fill is placed beneath the entire building footprints, it should extend horizontally a minimum distance of 5 feet beyond the outside edge of perimeter footings.

A minimum of two (2) feet of engineered fill is recommended below the fuel dispenser islands/canopies, trash enclosure walls, and monument sign footings. The subgrade soils should be removed to a minimum depth of two (2) feet and a minimum of one (1) feet horizontally beyond the edge of footings.

A minimum of two (2) 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 or unstable 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 soft soils should be removed and replaced as engineered fill. 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.

4.2.5 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.

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
- foundation backfill
- pavements

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

<u>Gradation</u>	<u>Percent Finer by Weight (ASTM C 136)</u>
6"	100
3"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	50 (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.

Some blending of the clay with on-site or imported sand soils will be required to meet the specifications in this report. 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 10 inches loose thickness.

4.2.6 Compaction Requirements

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

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

4.2.7 Grading and Drainage

All grades must provide effective drainage away from the buildings during and after construction. Water permitted to pond next to the building 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 five (5) percent away from the building for at least five (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.

4.2.8 Corrosion Potential

Laboratory test results indicate that on-site soils have a resistivity of about 1,455 ohm-centimeters, a soluble sulfate of 132 mg/kg, chlorides of 50 mg/kg, and pH value 7.9. These values should be used to determine potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Criteria published by the Cast Iron Pipe Research Institute indicates that the near surface subgrade soils generally have a slight to moderate corrosive potential to cause corrosion to buried ferrous materials. Review of data published by the National Association of Corrosion Engineers indicates that the resistivity places the soils in the moderately corrosive category. If there is concern regarding pipe corrosion, the use of PVC or poly-wrap should be considered.

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 building structure, fuel dispenser islands/canopies, trash enclosure walls, and monument sign can be supported by a shallow, spread footing foundation system bearing on engineered fill. Design recommendations for foundations for the proposed structures and related structural elements are presented in the following paragraphs.

4.3.1 Design Recommendations

DESCRIPTION	VALUE
Foundation Type	Conventional Shallow Spread Footings
Structures	One (1)-story, at-grade buildings, trash enclosure walls, and monument sign
Bearing Material	<u>Building:</u> Minimum three (3) feet of engineered fill below footings <u>Fuel Dispenser Islands/Canopies, Trash Enclosure Walls and Monument Sign:</u> Minimum two (2) feet of engineered fill below footings
Allowable Bearing Pressure	<u>Building and Car Wash:</u> 2,500 psf <u>Fuel Dispenser Islands/Canopies, Trash Enclosure and Monument Sign:</u> 2,000 psf
Minimum Dimensions	Columns: 36 inches Walls: 16 inches
Minimum Embedment Depth Below Finished Grade	Exterior - 24 inches Interior - 12 inches
Total Estimated Movement	1 inch

DESCRIPTION	VALUE
Estimated Differential Settlement	½ inch in 40 feet under walls and columns

To resist uplift loads on the fuel dispensing canopy, we recommend the foundations be embedded at a minimum depth of 3 feet below existing site grades; however, the actual depth should be determined by a structural engineer. The uplift forces should be resisted by the weight of the structure, its foundation and the soil placed over the foundation. Additional resistance to uplift forces can be provided by either increasing the size of the footings or their depth below final grade. In either case, the resistance is increased by the addition of the soil weight over the foundations. It is expected that the footings will be constructed such that the axial loads act at the centroid of the footing, producing a compressive soil reaction everywhere beneath the base of the foundation. Tension between the concrete and the soil should not be used in design. For uplift consideration, the total weight of the concrete mass (at 145 pcf) divided by an appropriate factor of safety could be used. The unit weight of soil above the footing can be taken as 120 pcf for design purposes when compacted as indicated in the Earthwork section of this report.

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 pressures apply 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.

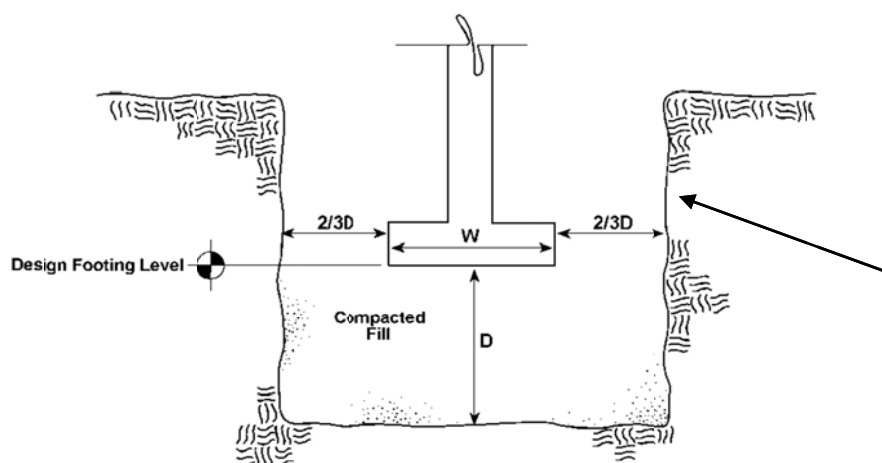
4.3.2 Construction Considerations

Engineered fill should extend below proposed building, fuel dispenser islands/canopies, trash enclosure walls, and monument sign.

A minimum of three (3) feet of engineered fill is recommended below all building and car wash footings. The subgrade soils should be removed to a minimum depth of three (3) feet and a minimum of two (2) feet horizontally beyond the edge of footings. If engineered fill is placed beneath the entire building footprints, it should extend horizontally a minimum distance of 5 feet beyond the outside edge of perimeter footings.

A minimum of two (2) feet of engineered fill is recommended below the fuel dispenser islands/canopies, trash enclosure walls, and monument sign footings. The subgrade soils should be removed to a minimum depth of two (2) feet and a minimum of one (1) feet horizontally beyond the edge of footings.

Areas of loose or unstable 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 soft soils should be removed and replaced as engineered fill. The overexcavation and backfill procedure is described in the figure below.



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4.4 Seismic Considerations

DESCRIPTION	VALUE
2009 International Building Code Site Classification (IBC) ¹	D ²
Site Latitude	N 36.801461°
Site Longitude	W 108.086358 °
S _{Ms} Spectral Acceleration for a Short Period	0.271g
S _{M1} Spectral Acceleration for a 1-Second Period	0.128g
S _{Ds} Spectral Acceleration for a Short Period	0.181g
S _{D1} Spectral Acceleration for a 1-Second Period	0.085g

DESCRIPTION	VALUE
F _a Site Coefficient for a Short Period	1.6
F _v Site Coefficient for a 1-Second Period	2.4

¹ Note: In general accordance with the 2009 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 2009 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. Borings extended to a maximum depth of 21-½ 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 would be required to confirm the conditions below the current depth of exploration.

4.5 Floor Slab

4.5.1 Design Recommendations

DESCRIPTION	VALUE
Interior floor system	Slab-on-grade concrete.
Floor slab support	Minimum two (2) feet of engineered fill placed and compacted in accordance with Earthwork section of this report.
Subbase	Compacted subgrade/engineered fill
Modulus of subgrade reaction	125 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 compacted fills composed of on-site sand soils or approved imported soils is considered acceptable for the project. Some blending of the clay with on-site or imported sand soils will be required to meet the specifications in this report. Some movement of a slab-on-grade floor system is possible should the subgrade materials become elevated in moisture content due to the compression and expansion potential of the near surface soils. Additional slab movements could occur if water infiltrates the subgrade; 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. If engineered fill is placed beneath the entire building footprints, it should extend horizontally a minimum distance of 5 feet beyond the outside edge of perimeter footings.

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.

Positive separations and/or isolation joints should be provided between slabs and all foundations, columns or utility lines to allow independent movement. Interior trench backfill placed beneath slabs should be compacted in accordance with recommendations outlined in the Earthwork section of this report. Other design and construction considerations, as outlined in the ACI Design Manual, Section 302.1R are recommended.

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

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 floor system should be supported on a zone of engineered fill a minimum two (2) feet in thickness. The engineered fill and subgrade soils should be placed 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 sand soils	35 psf/ft
	On-site clays	50 psf/ft
Passive Case	On-site or imported sand soils	400 psf/ft
	On-site clays	300 psf/ft
At-Rest Case	On-site or imported sand soils	55 psf/ft
	On-site clays	70 psf/ft
Coefficient of Base Friction	On-site or imported sand soils	0.35 ¹

¹Note: 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

The design approach used to populate the table outlined 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. If traffic loading conditions vary from those used to determine the provided pavement thicknesses, we ask to be given the opportunity to review, and modify if necessary, our pavement section recommendations.

The design of pavement thickness was based on the following:

- Traffic Class II for the light duty traffic areas include a maximum of 36,500 design EALs (assumed)
- Traffic Class III for the heavy duty traffic areas include a maximum 73,000 design EALs (assumed)
- A soil characterization of “medium” to “good” based on the clay and silty sand soils encountered at the site
- A design life of 20 years

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

Traffic Area	Alternative	Recommended New Pavement Section Thickness (inches)*			
		Asphalt Concrete Surface	Portland Cement Concrete	Aggregate Base Course	Total
Light Duty - Parking Areas	A	3	---	6	9
	B	4-½	---	---	4-½
	C	---	5*	---	5*
Heavy Duty - Main Drives & Truck Access	A	4-½	---	6	10-½
	B	6	---	---	6

Traffic Area	Alternative	Recommended New Pavement Section Thickness (inches)*			
		Asphalt Concrete Surface	Portland Cement Concrete	Aggregate Base Course	Total
Areas	C	---	5-½	---	5-½

*Minimum per ACI.

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.

The Portland cement concrete mix should have a minimum 28-day compressive strength of 4,000 psi and include fiber mesh.

4.7.2 Construction Considerations

Loose subgrade soils were encountered at the site. Subgrade soils 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 pavement construction.

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 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.

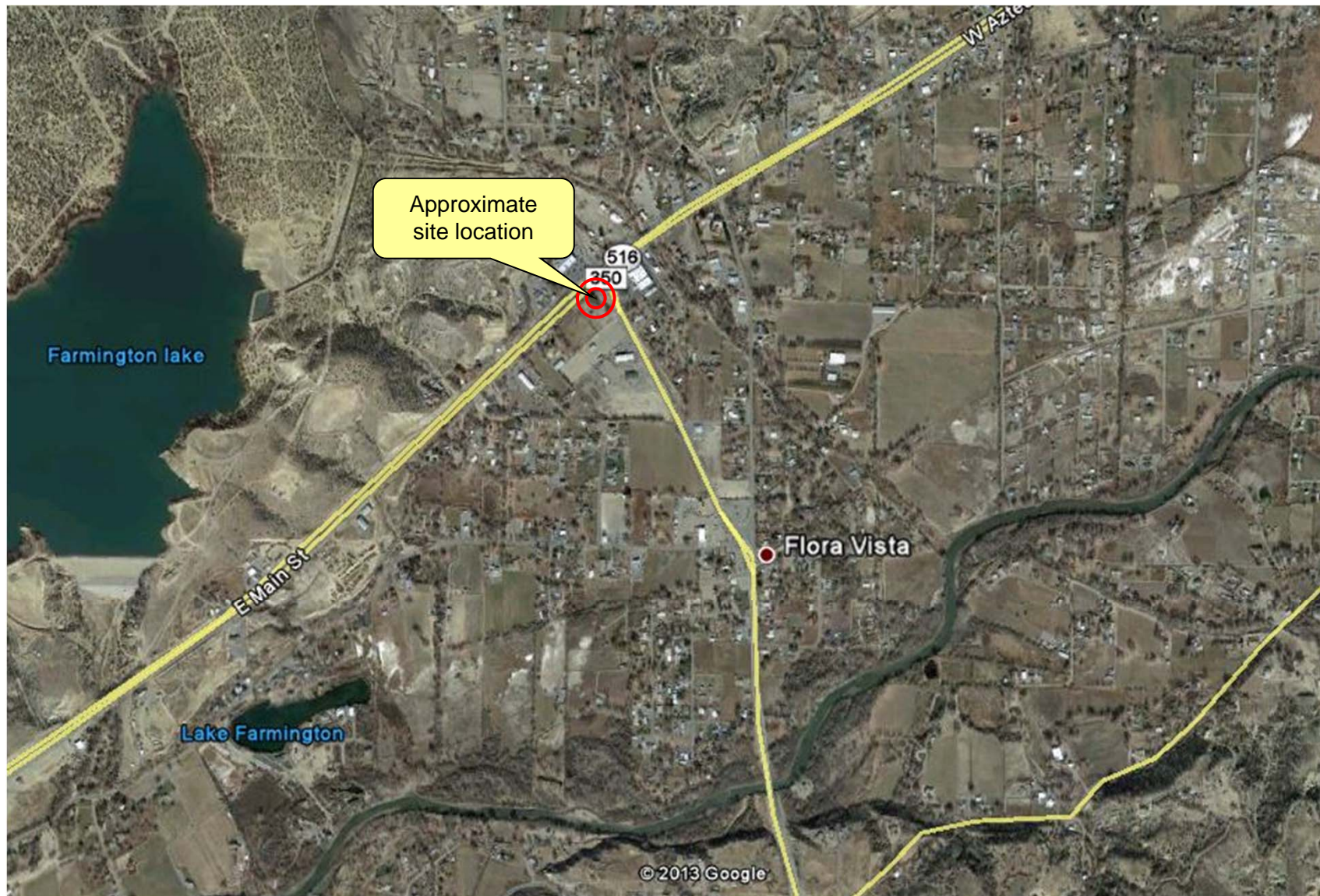
5.0 GENERAL COMMENTS

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 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 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, and 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 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.



SOURCE: Google Earth. Accessed 1/15/14.



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager:	ZCS	Project No.	69135013
Drawn by:	WHS	Scale:	N.T.S.
Checked by:	MEA	File Name:	69135013A-1
Approved by:	MEA	Date:	1/30/2014

Terracon
Consulting Engineers & Scientists

#4A CR 3499 Flora Vista, New Mexico 87415
PH. (505) 334-3400 FAX. (505) 334-9703

SITE LOCATION MAP

CIRCLE K RETAIL STORE
S.W.C. OF NM HWY 516 AND C.R. 350
FLORA VISTA, NEW MEXICO

Exhibit

A-1

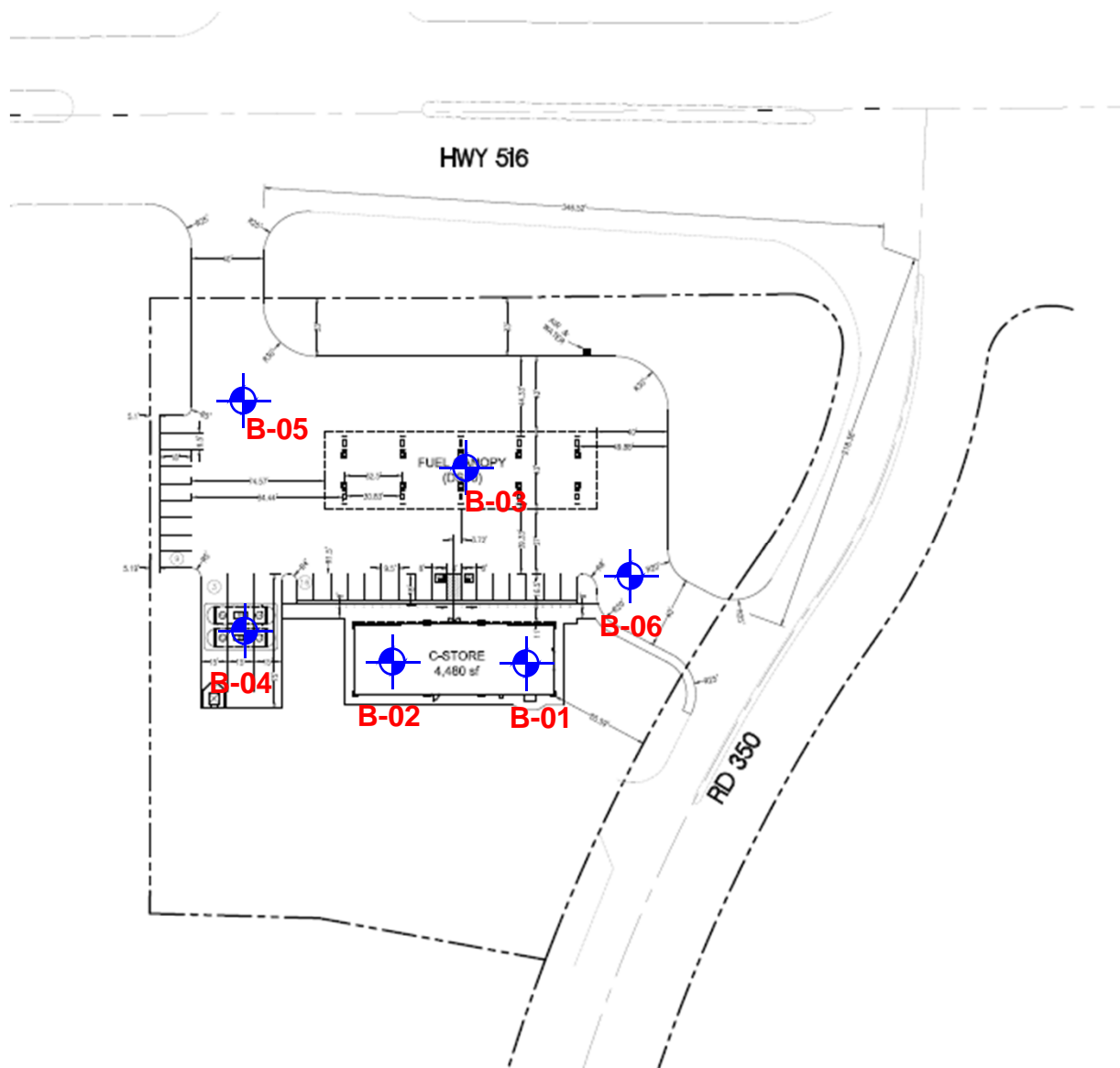


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT
INTENDED FOR CONSTRUCTION PURPOSES

SOURCE: GreebergFarrow, Site Plan, dated 10/9/13.

Project Manager:	ZCS
Drawn by:	WHS
Checked by:	ZCS
Approved by:	ZCS
Project No.	69135013
Scale:	N.T.S
File Name:	69135013A-2
Date:	1/30/2014

Terracon
Consulting Engineers & Scientists

#4A CR 3499 Flora Vista, New Mexico 87415
PH. (505) 334-2900 FAX. (505) 334-9703

BORING LOCATION PLAN

CIRCLE K RETAIL STORE
S.W.C. OF NM HWY 516 AND C.R. 350
FLORA VISTA, NEW MEXICO

FIG No.

A-2

APPENDIX A
FIELD EXPLORATION

BORING LOG NO. B-03

Page 1 of 1

PROJECT: Flora Vista Circle K

CLIENT: Cirle K
Tempe, Arizona

SITE: Hwy 516 and CR 350
Flora Vista, New Mexico

GRAPHIC LOG	LOCATION +/- 15 feet from actual location Latitude: 36.80168° Longitude: 108.08643°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
									LL-PL-PI	
DEPTH										
	SANDY LEAN CLAY (CL) , brown									
2.0										
	SILTY SAND (SM) , light brown, medium dense									
		5		X	8	7-10-9 N=19	13			
		10		X	10	8-9-10 N=19	8			
		15		X	12	11-11-10 N=21	2			
16.5										
	Boring Terminated at 16.5 Feet									

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

Hammer Type: Automatic

Advancement Method:
8-inch Hollow Stem Auger

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:

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

WATER LEVEL OBSERVATIONS

Groundwater was not observed

Terracon
#4A CR 3499
Flora Vista, New Mexico

Boring Started: 1/9/2014

Boring Completed: 1/9/2014

Drill Rig: CME-75

Driller: Kyvek

Project No.: 69135013

Exhibit: A-6

BORING LOG NO. B-04

Page 1 of 1

PROJECT: Flora Vista Circle K

CLIENT: Cirle K
Tempe, Arizona

SITE: Hwy 516 and CR 350
Flora Vista, New Mexico

GRAPHIC LOG	LOCATION +/- 15 feet from actual location Latitude: 36.80126° Longitude: 108.08632°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
									LL-PL-PI	
DEPTH										
	SILTY SAND (SM) , light brown, medium dense									
		5		X	6	11-12-12 N=24	6			
				X	6	10-7-8 N=15	7			
	clay lense									
		10		XX	12	9-8	4	98	NP	17
		15		X	12	6-7-8 N=15	5			
17.0										
	WELL GRADED SAND (SW) , light brown, loose to medium dense									
		20		X		10-11-9 N=20	3			
21.5										
	Boring Terminated at 21.5 Feet									

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

Hammer Type: Automatic

Advancement Method:
8-inch Hollow Stem Auger

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:

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

WATER LEVEL OBSERVATIONS

Groundwater was not observed

Terracon
#4A CR 3499
Flora Vista, New Mexico

Boring Started: 1/9/2014

Boring Completed: 1/9/2014

Drill Rig: CME-75

Driller: Kyvek

Project No.: 69135013

Exhibit: A-7


BORING LOG NO. B-05

Page 1 of 1

PROJECT: Flora Vista Circle K

CLIENT: Cirle K
Tempe, Arizona

SITE: Hwy 516 and CR 350
Flora Vista, New Mexico

GRAPHIC LOG	LOCATION +/- 15 feet from actual location Latitude: 36.8015° Longitude: 108.08612°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH								LL-PL-PI	
	POORLY GRADED SAND WITH CLAY (SP-SC) , light brown, medium dense	5		X	4	9-10-11 N=21	2		44-23-21	10
	6.5			X	4	8-10-10 N=20	6			
Boring Terminated at 6.5 Feet										

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

Hammer Type: Automatic

Advancement Method:
8-inch Hollow Stem Auger

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:

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

WATER LEVEL OBSERVATIONS

Groundwater was not observed

Terracon
#4A CR 3499
Flora Vista, New Mexico

Boring Started: 1/9/2014

Boring Completed: 1/9/2014

Drill Rig: CME-75

Driller: Kyvek

Project No.: 69135013

Exhibit: A-8

BORING LOG NO. B-06

Page 1 of 1

PROJECT: Flora Vista Circle K

CLIENT: Cirle K
Tempe, Arizona

SITE: Hwy 516 and CR 350
Flora Vista, New Mexico

GRAPHIC LOG	LOCATION +/- 15 feet from actual location Latitude: 36.80146° Longitude: 108.08692°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH								LL-PL-PI	
	FILL - SILTY GRAVEL WITH SAND (GM) , light brown	5		X	12	9-7-8 N=15	10			
	1.5									
	SILTY SAND (SM) , light brown, medium dense									
	6.5			X	3	10-8-8 N=16	9			
	Boring Terminated at 6.5 Feet									

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

Hammer Type: Automatic

Advancement Method:
8-inch Hollow Stem Auger

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:

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

WATER LEVEL OBSERVATIONS

Groundwater was not observed

Terracon
#4A CR 3499
Flora Vista, New Mexico

Boring Started: 1/9/2014

Boring Completed: 1/9/2014

Drill Rig: CME-75












Driller: Kyvek

Project No.: 69135013

Exhibit: A-9

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING			WATER LEVEL		Water Initially Encountered	FIELD TESTS	(HP) Hand Penetrometer
					Water Level After a Specified Period of Time		(T) Torvane
					Water Level After a Specified Period of Time		(b/f) Standard Penetration Test (blows per foot)
							(PID) Photo-Ionization Detector
	Auger	Split Spoon					(OVA) Organic Vapor Analyzer

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.

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				BEDROCK		
	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.	Ring Sampler Blows/Ft.	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)
	Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3	< 30	< 20	Weathered
	Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4	30 - 49	20 - 29	Firm
	Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9	50 - 89	30 - 49	Medium Hard
	Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18	90 - 119	50 - 79	Hard
	Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42	> 119	>79	Very Hard
				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 ≥ 4 and 1 ≤ Cc ≤ 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 ≥ 6 and 1 ≤ Cc ≤ 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

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

^F If soil contains $\geq 15\%$ 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 $\geq 15\%$ 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 $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

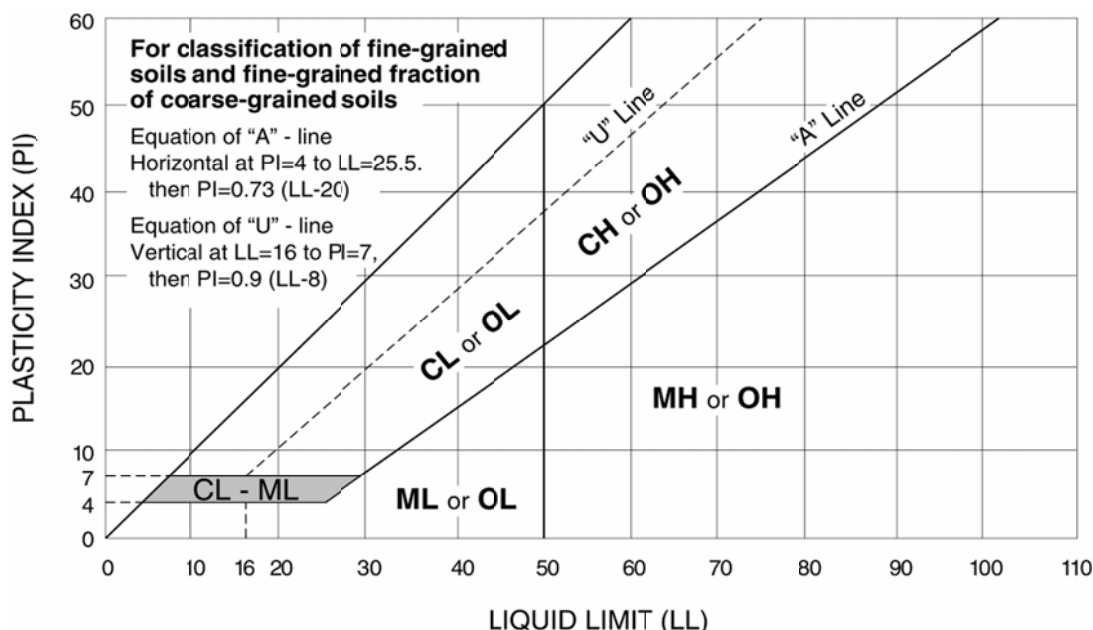
^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ 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.



Field Exploration Description

A total of six (6) test borings were drilled at the site on January 9, 2014. The borings were drilled to depths of approximately 5 to 21-½ 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 and B-02	Main Store Building	16-½
B-03	Fuel Dispensing Islands/Canopies	16-½
B-04	Underground Storage Tanks	21-½
B-05 and B-06	Pavement Areas	6-½

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 measuring from existing property lines and structures. The latitude and longitude of each boring location were recorded with a hand held GPS unit. 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.

Borings were backfilled with soil cuttings upon completion of drilling.

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.

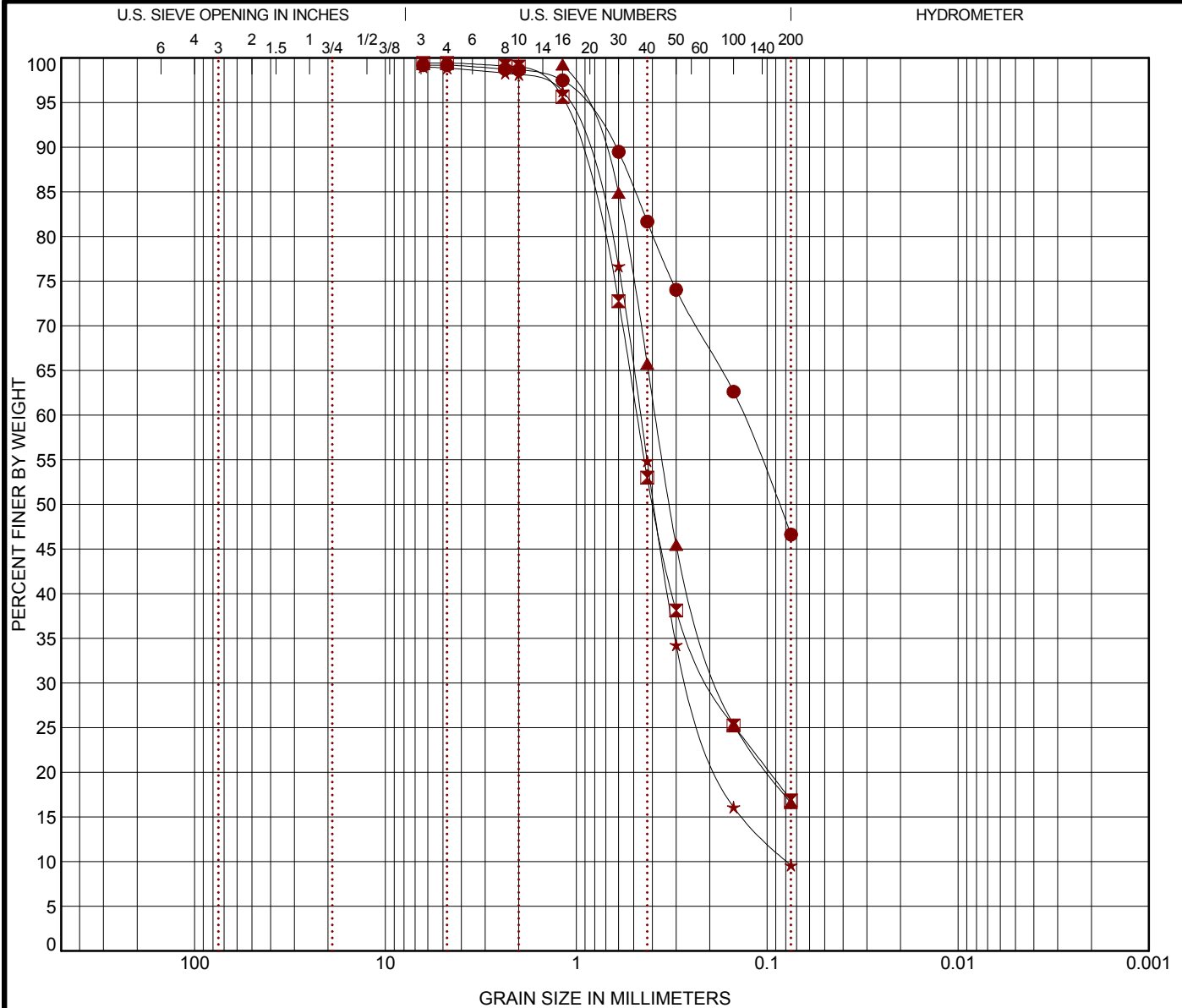
Laboratory tests were conducted on selected soil samples and the test results are presented in this appendix. The laboratory test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance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

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

- | | |
|-----------------------------|-------------------------|
| ■ Compression/Consolidation | ■ In-situ Water Content |
| ■ Sieve Analysis | ■ In-situ Dry Density |
| ■ Atterberg Limits | ■ Soluble Sulfates |
| ■ pH | ■ Resistivity |
| ■ Chlorides | |

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	SILTY SAND(SM)				NP	NP	NP		
☒	B-02	5.0	SILTY SAND(SM)				NP	NP	NP		
▲	B-04	10.0	SILTY SAND(SM)				NP	NP	NP		
★	B-05	2.5	POORLY GRADED SAND with CLAY(SP-SC)				44	23	21	1.80	5.88
Boring ID		Depth	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Gravel	%Sand	%Silt	%Clay	
●	B-01	2.5	6.35	0.134			0.0	52.6	46.6		
☒	B-02	5.0	6.35	0.48	0.194		0.0	82.6	16.9		
▲	B-04	10.0	1.18	0.385	0.176		0.0	82.7	16.6		
★	B-05	2.5	6.35	0.461	0.255	0.078	0.1	89.3	9.6		

PROJECT: Flora Vista Circle K

SITE: Hwy 516 and CR 350
Flora Vista, New Mexico

Terracon
#4A CR 3499
Flora Vista, New Mexico

PROJECT NUMBER: 69135013

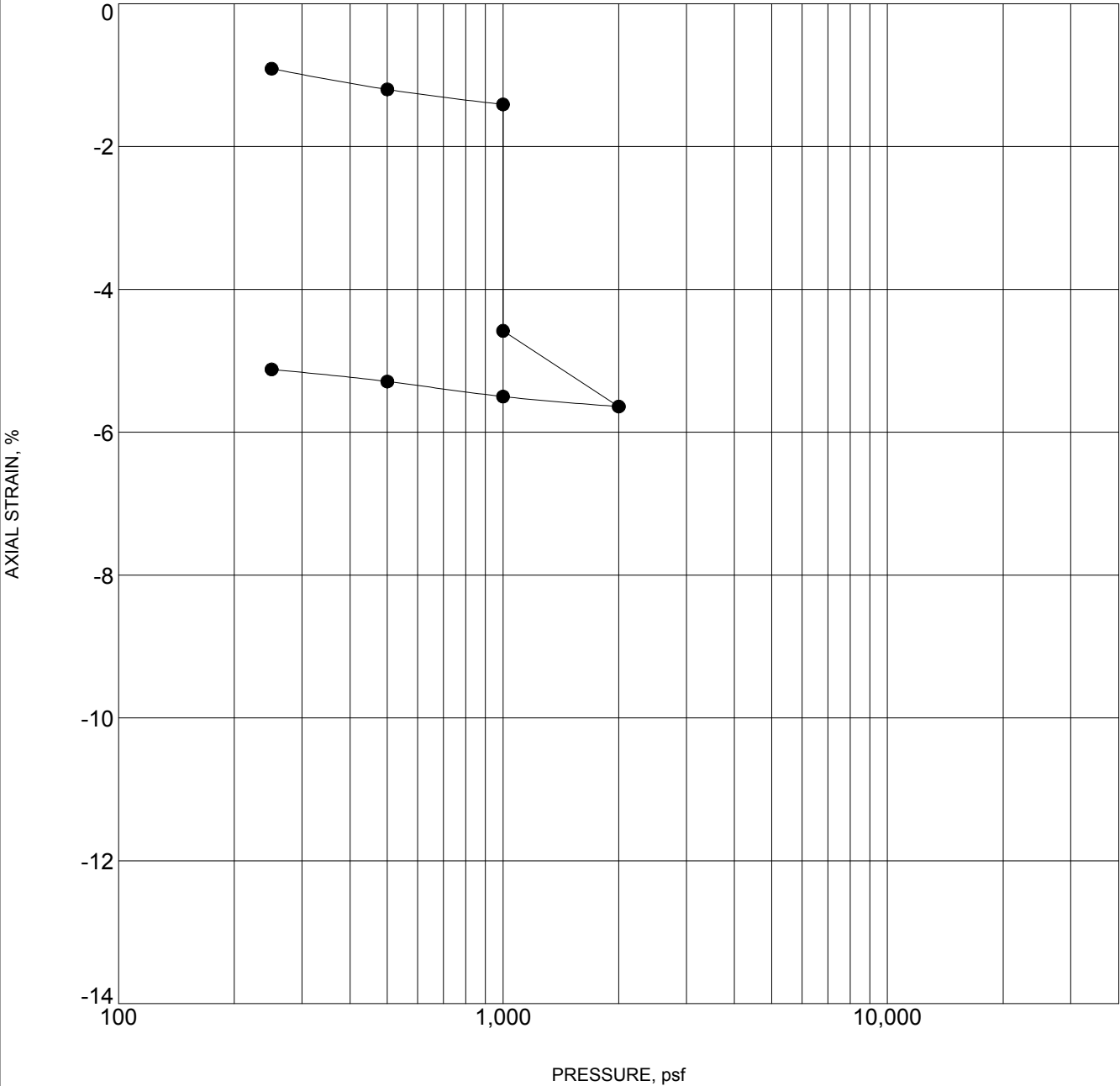
CLIENT: Circle K
Tempe, Arizona

EXHIBIT: B-2

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 69135013 GINT.GPJ TERRACON2012.GDT 1/29/14

SWELL CONSOLIDATION TEST

ASTM D4546



Specimen Identification			Classification	γ_d , pcf	WC, %
●	B-02	5.0 ft	SILTY SAND(SM)	93	5

NOTES: Sample likley disturbed

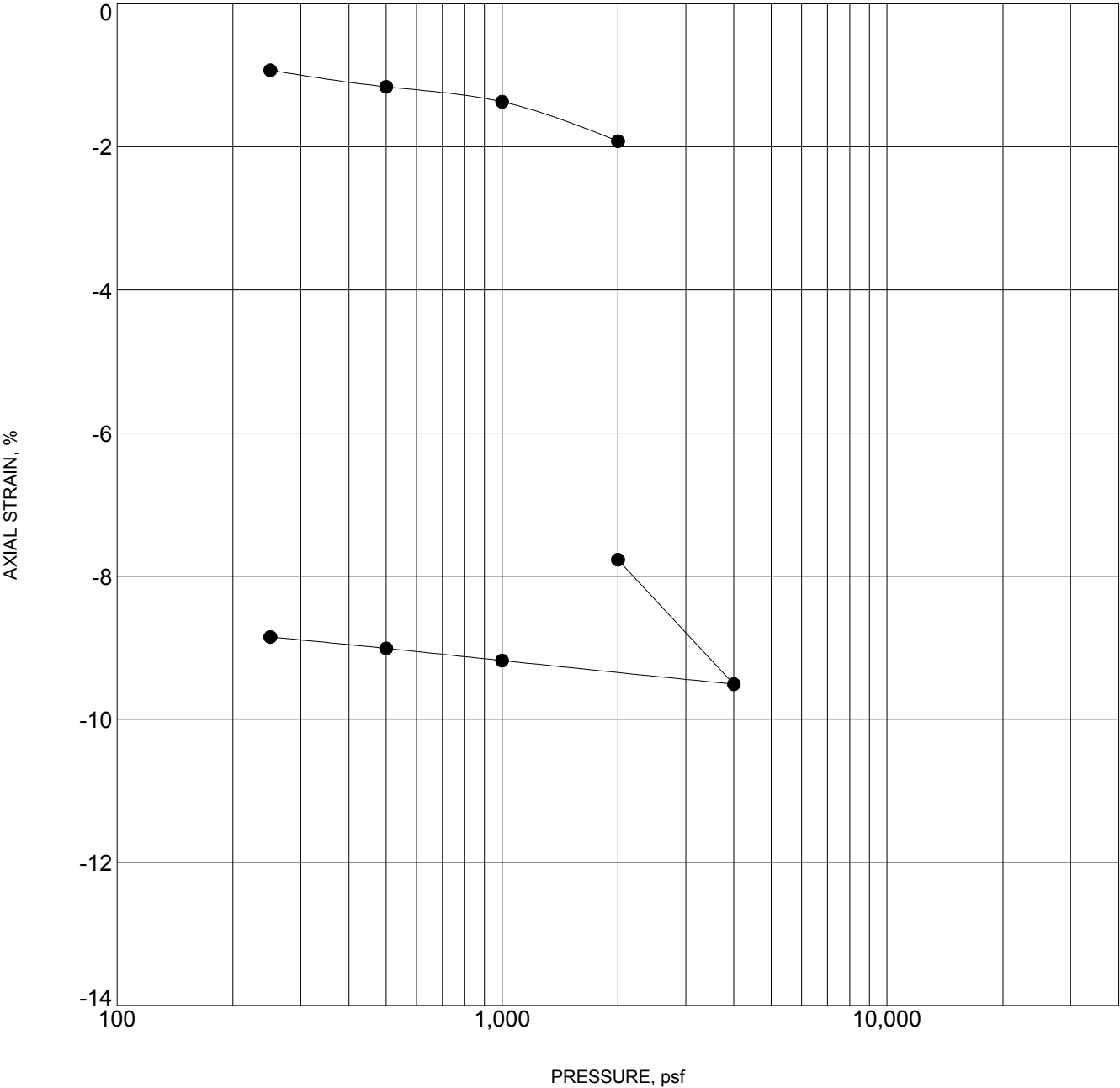
LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CONSOL_STRAIN-USCS 69135013 GINT.GPJ TERRACON2012.GDT 1/29/14

PROJECT: Flora Vista Circle K	<div>Terracon</div> <div>#4A CR 3499 Flora Vista, New Mexico</div>	PROJECT NUMBER: 69135013
SITE: Hwy 516 and CR 350 Flora Vista, New Mexico		CLIENT: Cirle K Tempe, Arizona
		EXHIBIT: B-3

SWELL CONSOLIDATION TEST

ASTM D4546

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CONSOL_STRAIN-USCS 69135013 GINT.GPJ TERRACON2012.GDT 1/29/14



Specimen Identification			Classification	γ_d , pcf	WC, %
●	B-04	10.0 ft	SILTY SAND(SM)	98	4

NOTES: Sample likley disturbed

PROJECT: Flora Vista Circle K	<div>Terracon</div> <div>#4A CR 3499 Flora Vista, New Mexico</div>	PROJECT NUMBER: 69135013
SITE: Hwy 516 and CR 350 Flora Vista, New Mexico		CLIENT: Cirle K Tempe, Arizona
		EXHIBIT: B-4

CHEMICAL LABORATORY TEST REPORT

Project Number: 69135014

Service Date: 01/20/14

Report Date: 01/20/14

Task:

Terracon

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Client

Circle K
1130 West Warner Road, Building B
Tempe, AZ 85294

Project

Flora Vista Circle K

Sample Submitted By: Terracon (69)
Analyzed By: Kurt D. Ergun

Date Received: 1/17/2014 **Lab No.:** 14-0017

Results of Resistivity Analysis

<i>Sample Number</i>	1
<i>Sample Location</i>	B-3
<i>Sample Depth (ft.)</i>	2.5
pH Analysis, AWWA 4500 H	7.88
Water Soluble Sulfate (SO ₄), AWWA 4500 E (mg/kg)	132
Chlorides, AWWA 3500 Cl B, (mg/kg)	50
Resistivity, ASTM G-57, (ohm-cm)	1455

Services:

Terracon Rep:

Reported To:

Contractor:

Reviewed By:



Kurt D. Ergun
Chemist

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.