Geotechnical Engineering Report

Proposed Dollar General
US Highway 75 and West Pleasant Avenue
Warren, Minnesota
June 9, 2014
Terracon Project No. M5145023

Prepared For:
Overland Properties, LLC
West Plains, Missouri

Prepared By:
Terracon Consultants, Inc.
Grand Forks, North Dakota

June 9, 2014

Overland Properties, LLC
1598 Imperial Center #2001
West Plains, MO 65775-1855

Attn: Mr. Rusty Doss

Re: Geotechnical Engineering Report
Proposed Dollar General
US Highway 75 and West Pleasant Avenue
Warren, Minnesota
Terracon Project No. M5145023

Dear Mr. Doss:

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 DG140040 dated March 31, 2014.

This 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.

Corey D. Lindeman, EI
Field Engineer

William R. Olson, PE
Geotechnical Engineer

Theodore J. Engelstad, PE
Senior Principal

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.
Print Name: WILLIAM R. OLSON
Signature:
Date: 6/9/14 License #46391

Copies to: Addressee (1 via e-mail, 3 via mail)

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EXECUTIVE SUMMARY

A geotechnical exploration has been performed for the Proposed Dollar General located at US Highway 75 and West Pleasant Avenue in Warren, Minnesota. Terracon's geotechnical scope of work included the advancement of nine (9) soil test borings to depths of approximately 11 to 21 feet below existing site grades.

Based upon geotechnical conditions encountered in the borings and our current understanding of the proposed development the following geotechnical considerations were identified:

- The test borings encountered existing uncontrolled fill and organic topsoil to depths ranging from 1 to 3 feet. We recommend excavating the uncontrolled fill and topsoil from within the building area and replacement with a controlled engineered fill.

- The proposed building may be supported on shallow spread foundations bearing on natural, undisturbed soils or on engineered fill after removal of the existing fill and topsoil and the existing building(s).

- Due to the high plasticity and relatively impermeable nature of the soils encountered within our borings, water level data is limited. Based on sample moisture conditions, we estimate the groundwater level to be between 10 and 12 feet below the existing ground surface. We anticipate groundwater seepage in open excavations would be controlled by sump pumping, if encountered.

- Fat clays were observed in the upper portion of our borings. These soils have the potential for volumetric changes due to changes in moisture conditions, and tend to swell when wet and shrink when dry. Care should be taken to avoid moisture condition changes during excavation. Open excavations where fat clays are exposed should be protected from open air and precipitation to minimize changes in moisture.

- The natural soils encountered at the site are susceptible to disturbance from construction traffic. Care should be taken to prevent disturbance of the natural soils.

Close monitoring of the construction operations discussed herein will be critical in achieving the design subgrade support. We therefore recommend that Terracon be retained to monitor this portion of the work.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that 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.

GEOTECHNICAL ENGINEERING REPORT
PROPOSED DOLLAR GENERAL
US HIGHWAY 75 AND WEST PLEASANT AVENUE
WARREN, MINNESOTA
Terracon Project No. M5145023
June 9, 2014

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services performed for the Proposed Dollar General to be located at US Highway 75 and West Pleasant Avenue in Warren, Minnesota. Our geotechnical engineering scope of work for this project included the advancement of nine (9) soil test borings to depths ranging from approximately 11 to 21 feet below existing site grades. Boring Logs along with a site location plan and boring location plan are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to the proposed building:

- subsurface soil conditions
- groundwater conditions
- earthwork
- foundation design and construction
- floor slab design and construction
- pavement design and construction

2.0 PROJECT INFORMATION

2.1 Project Description

ITEM	DESCRIPTION
Site layout	See Exhibit A-2, Exploration Plan
Building	Approximate 9,100-square foot, single story building with parking areas to the south and east of the building.
Building construction	The structure will be of steel frame construction supported on a reinforced concrete foundation system, concrete slab-on-grade floors.
Finished floor elevation	Less than 2 feet above grade (assumed)

ITEM	DESCRIPTION
Maximum loads, assumed	Building: Column Load – 20 to 50 kips Continuous Load-Bearing Wall Loads – less than 3 klf Maximum Uniform Floor Slab Load – less than 100 psf
Maximum allowable settlement	Columns: 1-inch Walls: ½ inch over 50 feet
Grading	We have assumed cut/fill of 2 feet or less.
Traffic loading, Assumed	NAPA Traffic Class: Automobile Parking Areas: Class I Truck traffic and main drives Class II

2.2 Site Location and Description

ITEM	DESCRIPTION
Location	US Highway 75 and West Pleasant Avenue in Warren, Minnesota.(See Exhibit A-1, Site Location Map)
Existing Improvements	Two (2) buildings are located on the southwest side of the site.
Current ground cover	Grasses/weeds/sparse trees/aggregate
Existing topography	Relatively level; maximum 1 foot variance between borings.

3.0 SUBSURFACE CONDITIONS

3.1 Typical Subsurface Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Initially, uncontrolled fill and organic topsoil was encountered in our test borings. The uncontrolled fill consisted of clayey sands and poorly-graded sands with silt. The topsoil was black in color and contained organic material. These soils were found to extend to depths ranging from 1 to 3 feet below the existing grade.

Lean clays and fat clays were the predominant soils identified within our borings. These cohesive soils were of various shades of olive-brown to grayish-brown in color. In boring B-4, stratum consisting of grayish-brown silt was observed. Field consistencies for cohesive soils ranged from very soft to stiff, and very loose for non-cohesive soils.

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.

3.2 Groundwater

The boreholes were observed while drilling and after completion for the presence and level of groundwater. Groundwater was not observed in the borings while drilling, or for the short duration that the borings were allowed to remain open. However, this does not necessarily mean they were terminated above groundwater. Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole in these materials.

Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type. Based on the sample moisture conditions, we estimate the groundwater level to be 10 to 12 feet below the existing ground surface during field activities.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. In addition, perched water can develop over low permeability soil or rock strata. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Our borings encountered uncontrolled fill and topsoil extending to depths of approximately 1 to 3 feet below the existing ground surface. These soils are not suitable for support of the proposed foundations and floor slabs. We recommend the uncontrolled fill and topsoil be excavated from within the building area and replaced with a controlled engineered fill. The building could then be supported on standard spread foundations bearing on the 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 data presented herein, 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

In preparation for building construction, we recommend the existing building(s) and all uncontrolled fill and topsoil be removed from within the building footprint. Our borings indicate excavation for the building will extend 1 to 3 feet below the existing ground surface. During this process, we recommend that MTL/Terracon be retained to observe the exposed soil and to evaluate whether additional subgrade excavation is required.

The soils encountered in the borings will be sensitive to disturbance from construction activity. Construction activity should be monitored, and should be curtailed if the construction activity is causing subgrade disturbance. A Terracon representative can help with monitoring and developing recommendations to aid in limiting subgrade disturbance.

4.2.2 Materials Types

Engineered fill should consist of approved materials, free of organic material, debris and particles larger than about 3 inches. The maximum particle size criteria may be relaxed by the geotechnical engineer of record depending on construction techniques, material gradation, allowable lift thickness and observations during fill placement. Soils for use as engineered fill material should conform to the following specifications:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
Inorganic On-Site Soils	CL, CH	Exterior Foundation Backfill
Granular Soils	SP-SM, SP-SC, SW-SM, SW-SC (P200<12%)	All locations and elevations

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation.

4.2.3 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 698)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction	
		Minimum	Maximum
Acceptable soil or approved imported fill soils:			
Beneath foundations and slabs:	95	-2%	+3%
Beneath pavements:	95	-2%	+3%
12 inches directly below pavements:	98	-2%	+3%
	Per the Modified Proctor Test (ASTM D 1557)		
Aggregate base (beneath slabs)	95	-3%	+3%
Aggregate base (beneath pavements)	98	-3%	+3%

1. Engineered fill materials should be placed in horizontal, loose lifts not exceeding 9 inches in thickness and should be thoroughly compacted. Where light compaction equipment is used, as is customary within a few feet of retaining walls and in utility trenches, the lift thickness may need to be reduced to achieve the desired degree of compaction. Soils removed which will be used as engineered fill should be protected to aid in preventing an increase in moisture content due to rain.
2. We recommend that engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
3. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without pumping when proofrolled.

4.2.4 Grading and Drainage

Adequate positive drainage should be provided during construction and maintained throughout the life of the development to prevent an increase in moisture content of the foundation, pavement and backfill materials. Surface water drainage should be controlled to prevent undermining of fill slopes and structures during and after construction.

Gutters and downspouts that drain water a minimum of 10 feet beyond the footprint of the proposed structures are recommended. This can be accomplished through the use of splash-blocks, downspout extensions, and flexible pipes that are designed to attach to the end of the downspout. Flexible pipe should only be used if it is daylighted in such a manner that it gravitydrains collected water. Splash-blocks should also be considered below hose bibs and water spigots.

It is recommended that all exposed earth slopes be seeded to provide protection against erosion as soon as possible after completion. Seeded slopes should be protected until the vegetation is established. Sprinkler systems should not be installed behind or in front of walls without the approval of the civil engineer and wall designer.

4.2.5 Construction Considerations

The natural soils encountered at this site are susceptible to disturbance from construction traffic, especially when wet and saturated. We recommend construction traffic not be allowed to travel on bearing soils. Excavating should be performed by a backhoe with a smooth cutting surface. If any of the natural soils become disturbed during construction, they should be excavated to an undisturbed level and replaced with engineered fill or concrete. Fat clays encountered at the site have a potential for shrinking when dry and swelling when wet. Exposed clays should be protected from moisture changes to avoid the potential for volumetric changes.

We estimate a groundwater level on the order of 10 to 12 feet below the existing grade at the time of our field activities. We anticipate groundwater seepage in open excavations would be controllable by sump pumping, if encountered.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction and observed by Terracon.

Surface water should not be allowed to pond on the site and soak into the soil during construction. Construction staging should provide drainage of surface water and precipitation away from the building and pavement areas. Any water that collects over or adjacent to construction areas should be promptly removed, along with any softened or disturbed soils. Surface water control in the form of sloping surfaces, drainage ditches and trenches, and sump pits and pumps will be important to avoid ponding and associated delays due to precipitation and seepage.

All excavations should be sloped or braced as required by OSHA regulations to provide stability and safe working conditions. Temporary excavations will probably be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current Occupational Health and Safety Administration (OSHA) Excavation and Trench Safety Standards.

Construction site safety is the sole responsibility of the contractor who controls the means, methods and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean that Terracon is assuming any responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

4.3 Foundations

In our opinion, the proposed building can be supported by a shallow spread footing foundation system bearing on natural, undisturbed inorganic soils or engineered fill after removal of the existing fill and topsoil. Design recommendations for shallow foundations for the proposed structure are presented in the following paragraphs.

4.3.1 Design Recommendations

DESCRIPTION	Column	Wall
Net allowable bearing pressure [1]	1,500 psf	1,200 psf
Minimum dimensions	24 inches	18 inches
Minimum embedment below finished grade for frost protection [2]	60 inches	60 inches
Approximate total settlement [3]	<1 inch	<1 inch
Estimated differential settlement [3]	<¾ inch between columns	<¾ inch over 40 feet
Ultimate coefficient of sliding friction	0.35	

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Assumes any unsuitable fill or soft soils, if encountered, will be undercut and replaced with engineered fill.
2. And to reduce the effects of seasonal moisture variations in the subgrade soils. For perimeter footing and footings beneath unheated areas. The above settlement estimates were estimated based on the information in the Project Information section of this report.
3. The foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of compacted fill, and the quality of the earthwork operations.

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. Interior footings should bear a minimum of

12 inches below finished grade. Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings.

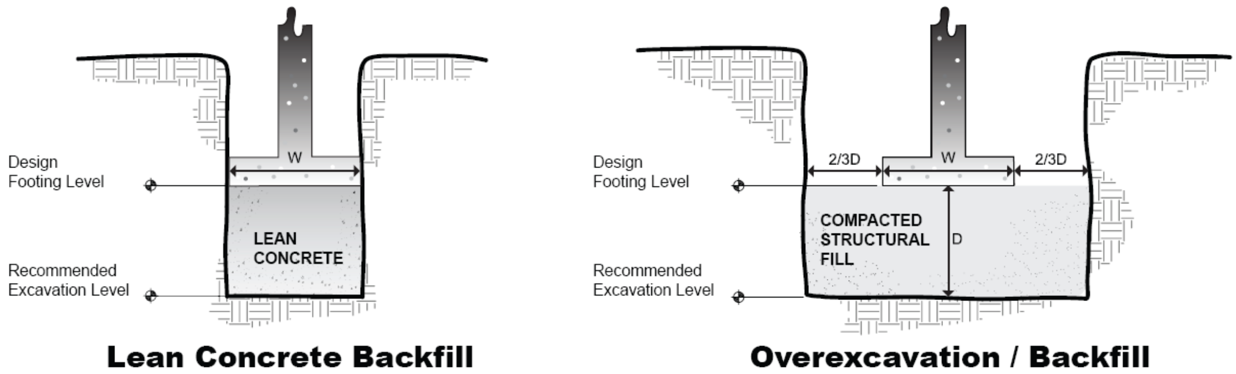
Footings, foundations, and masonry walls should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. The use of joints at openings or other discontinuities in masonry walls is recommended.

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

4.3.2 Construction Considerations

The base of all foundation excavations should be free of water and loose soil and rock prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soils at bearing level become excessively dry, disturbed or saturated, or frozen, the affected soil should be removed prior to placing concrete. Place a lean concrete mud-mat over the bearing soils if the excavations must remain open over night or for an extended period of time. It is recommended that the geotechnical engineer be retained to observe and test the soil foundation bearing materials.

If unsuitable bearing soils are encountered in footing excavations, the excavations should be extended deeper to suitable soils and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The footings could also bear on properly compacted backfill extending down to the suitable soils. Overexcavation for compacted backfill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. The overexcavation should then be backfilled up to the footing base elevation with well-graded granular material placed in lifts of 9 inches or less in loose thickness and compacted to at least 95 percent of the material's maximum standard Proctor dry density (ASTM D-698). The overexcavation and backfill procedure is described in the figure below.



NOTE: Excavations in sketches shown vertical for convenience. Excavations should be sloped as necessary for safety.

4.4 Seismic Considerations

Code Used	Site Classification
2006 International Building Code (IBC) [1]	E [2]

1. In general accordance with the *2006 International Building Code,* Table 1613.5.2.
2. The 2006 International Buildin*g Code (IBC) requires a site soil* profile determination extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100 foot soil profile determination. Borings for the building extended to a maximum depth of approximately 20 feet and this seismic site class definition considers that medium dense silty sand continues below the maximum depth of the subsurface exploration. Additional exploration to deeper depths could be performed 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 12 inches of approved on-site or imported soils placed and compacted in accordance with Earthwork section of this report.
Subbase	6-inch compacted layer of free draining, granular subbase material
Modulus of subgrade reaction	100 pounds per square inch per in (psi/in) for point loading conditions. The modulus was obtained based on our experience with similar subgrade conditions, and estimates obtained from reviewed design charts.

Continued from Page 9

1. Floor slabs should be structurally independent of any building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation. Narrower, turned-down slab-on-grade foundations may be utilized at the approval of the structural engineer. The slabs should be appropriately reinforced to support the proposed loads.
2. We recommend subgrades be maintained at the proper moisture condition until floor slabs and pavements are constructed. If the subgrade should become desiccated prior to construction of floor slabs and pavements, the affected material should be removed or the materials scarified, moistened, and recompacted. Upon completion of grading operations in the building areas, care should be taken to maintain the recommended subgrade moisture content and density prior to construction of the building floor slabs.
3. The floor slab design should include a capillary break, comprised of free-draining, compacted, granular material, at least 6 inches thick.

A subgrade prepared and tested as recommended in this report should provide adequate support for lightly loaded floor slabs.

Where appropriate, saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or any cracks in pavement areas that develop should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

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

On most project sites, the site grading is generally accomplished early in the construction phase. However as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall, etc. As a result, the floor slab subgrade may not be suitable for placement of base rock and concrete and corrective action may be required.

4.6 Pavements

In our opinion, use of the existing uncontrolled fill and topsoil for support of the proposed pavement is not feasible. The natural subgrade soils, encountered beneath the fill and topsoil, are highly susceptible to movement from frost heaving. Therefore, the completed lot will experience frost heaving over the winter months and a subsequent loss of strength during spring thaw. The pavement will be subject to movement and cracking due to the extreme temperatures that will occur.

4.6.1 Subgrade Preparation

We recommend excavating the topsoil and existing fill from the proposed pavement areas. Based on the soil conditions encountered at our boring locations, we estimate excavation depths of 1 to 3 feet would be needed. We recommend the exposed soils be scarified to a depth of 12 inches and recompacted to a minimum of 98 percent of the maximum dry density as determined by ASTM D698. The moisture content at the time of compaction should range from 0 to 4 percent below the optimum.

If needed, engineered fill consisting of inorganic lean clays or a pit run sand could be used to obtain the desired subgrade elevation. The engineered fill should be placed and compacted as recommended in section **4.2 Earthwork**.

4.6.2 Design Considerations

Traffic patterns and anticipated loading conditions were not available at the time that this report was prepared. However, we anticipate that traffic loads will be produced primarily by automobile traffic and occasional delivery trucks and weekly trash removal trucks. The thickness of pavements subjected to heavy truck traffic, if needed, should be determined using expected traffic volumes, vehicle types, and vehicle loads and should be in accordance with local, city or county ordinances.

Based on typical engineered fill consisting of sand, we have used a subgrade CBR of 5, for our analysis. Because the engineered fill material is unavailable at this time, we recommend CBR tests be performed at the time of construction to verify the suitability of the soil used for pavement construction.

Pavement thickness can be determined using AASHTO, Asphalt Institute and/or other methods if specific wheel loads, axle configurations, frequencies, and desired pavement life are provided. Terracon can provide thickness recommendations for pavements subjected to loads other than personal vehicle and occasional delivery and trash removal truck traffic if this information is provided.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to parking lots and drives should slope down from pavement edges at a minimum 2%;
- The subgrade and the pavement surface should have a minimum ¼ inch per foot slope to promote proper surface drainage;

- Install pavement drainage surrounding areas anticipated for frequent wetting (e.g., garden centers, wash racks);
- Install joint sealant and seal cracks immediately;
- Seal all landscaped areas in, or adjacent to pavements to reduce moisture migration to subgrade soils;
- Place compacted, low permeability backfill against the exterior side of curb and gutter; and,
- Place curb, gutter and/or sidewalk directly on low permeability subgrade soils rather than on unbound granular base course materials.

4.6.3 Estimated Minimum Pavement Thickness

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

Asphalt Pavement

Material	Automobiles Only Thickness (inches)	Combined Automobiles and Trucks Thickness (inches)	MNDOT
Subgrade	Upper 12 inches of existing soil or engineered fill	Upper 12 inches of existing soil or engineered fill	98% of Standard Proctor MMD, -4 to 0% OMC
Aggregate Base	10	12	MNDOT 3138 Class 5
Asphalt Binder Course	2	3	MNDOT 2360 SPNWB230B
Asphalt Surface Course	2	2	MNDOT 2360 SPWEB230B

The graded aggregate base should be compacted to a minimum of 95 percent of the material's modified Proctor (ASTM D-1557) maximum dry density. Where base course thickness exceeds 6 inches, the material should be placed and compacted in two or more lifts of equal thickness.

The listed pavement component thicknesses should be used as a guide for pavement systems at the site for the traffic classifications stated herein. These recommendations assume a 20-year pavement design life. If pavement frequencies or loads will be different than that specified Terracon should be contacted and allowed to review these pavement sections.

We recommend a Portland cement concrete (PCC) pavement be utilized in entrance and exit sections, dumpster pads, loading dock areas, or other areas where extensive wheel maneuvering are expected. The dumpster pad should be large enough to support the wheels of the truck which will bear the load of the dumpster. We recommend a minimum of 7 inches of PCC underlain by 12 inches of aggregate base coarse. Although not required for structural support, the base course layer is recommended to help reduce potentials for slab curl, shrinkage cracking, and subgrade "pumping" through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

Portland cement concrete should be designed with proper air-entrainment and have a minimum compressive strength of 4,000 psi after 28 days of laboratory curing, a maximum water cement ratio of 0.45, and a target air content of 6%. Adequate reinforcement and number of longitudinal and transverse control joints should be placed in the rigid pavement in accordance with ACI requirements. The joints should be sealed as soon as possible (in accordance with sealant manufacturer's instructions) to minimize infiltration of water into the soil.

4.6.4 Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section.

4.6.5 Pavement Maintenance

The pavement sections provided in this report represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore preventive maintenance should be planned and provided for through an on-going pavement management program. Preventive maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventive maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

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.

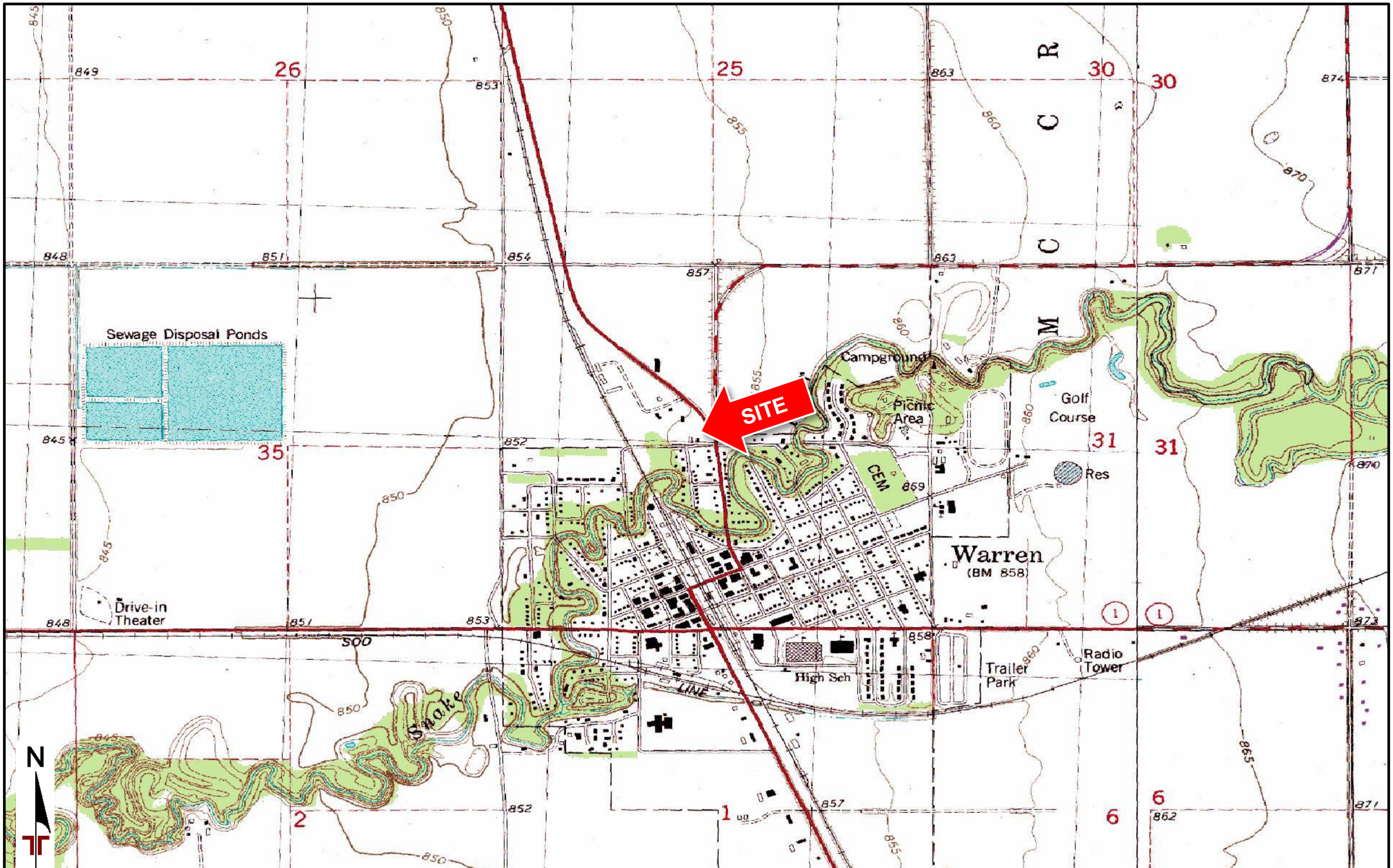
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the 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, 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.

APPENDIX A

FIELD EXPLORATION



TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY QUADRANGLES INCLUDE: WARREN, MN (1/1/1982) and ROAN, MN (1/1/1985).

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

Project Manager: WRO	Project No. M5145023
Drawn by: CDL	Scale: 1:24,000
Checked by: WRO	File Name:
Approved by: WRO	Date: 6/5/2014

Terracon
1555 N. 42nd St., Unit B
Grand Forks, ND

SITE LOCATION

Proposed Dollar General Store
US Highway 75 and West Pleasant Avenue
Warren, Minnesota

Exhibit
A-1

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

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

Project Manager:	WRO	Project No.	M5145023
Drawn by:	CDL	Scale:	AS SHOWN
Checked by:	WRO	File Name:	
Approved by:	WRO	Date:	6/5/2014

Terracon
1555 N. 42nd St., Unit B
Grand Forks, ND

EXPLORATION PLAN

Proposed Dollar General Store
US Highway 75 and West Pleasant Avenue
Warren, Minnesota

Exhibit
A-2

Field Exploration Description

Nine (9) soil test borings were performed at the site on May 8, 2014. The borings were advanced at the approximate locations indicated on Exhibit A-2. The boring locations were laid out in the field by a MTL/Terracon representative using a site plan provided by the client and utilizing hand-held GPS equipment. The ground surface elevations indicated on the boring logs were measured in the field using a surveyor's level and a grade rod. The elevations are referenced to the finished floor elevation of the existing east building on the site. This was assumed to be at elevation 100.0. The locations and elevation of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were drilled with a track-mounted rotary drill rig using 3 ¼ hollow stem to advance the boreholes. Samples of the soil encountered in the borings were obtained using split barrel sampling. In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). This value is used to estimate the in situ relative density of cohesionless soils and consistency of cohesive soils.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings performed at this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count (N) value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions.

A field log of each boring was prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

BORING LOG NO. B-1

PROJECT: Proposed Dollar General

CLIENT: Overland Properties West Plains, Missouri

SITE: US Highway 75 and West Pleasant Avenue Warren, Minnesota

LOCATION See Exhibit A-2

Latitude: 48.20295° Longitude: -96.77295°

Surface Elev.: 99 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0	**TOPSOIL (OL)**, black	98			X	0.7	1-1-2 N=3						
4.0	**LEAN CLAY (CL)**, grayish brown, soft	95			X	1.5	1-1-2 N=3	2000 (HP)		32			
9.0	**FAT CLAY (CH)**, grayish brown, medium stiff, with lenses of silt	90	5		X	1.4	2-3-4 N=7	4500 (HP)		28			
					X	1.5	2-2-3 N=5	3000 (HP)		31			
19.0	**FAT CLAY (CH)**, olive brown mottled, very stiff	80	10		X	1.7	2-2-3 N=5	4000 (HP)		41			
					X	1.8	2-2-3 N=5	3000 (HP)		50			
			15		X	1.4	2-2-4 N=6	3000 (HP)		55			
21.0	**FAT CLAY (CH)**, dark grayish brown, very stiff	78	20		X	1.7	2-2-2 N=4	2000 (HP)		60			
	Boring Terminated at 21 Feet												

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

Hammer Type: Automatic

Advancement Method:
3 ¼" 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

Not measureable before HSA removal

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

Boring Started: 5/8/2014	Boring Completed: 5/8/2014
Drill Rig: Diedrich D90	Driller: CAS
Project No.: M5145023	Exhibit: A-4

BORING LOG NO. B-2

PROJECT: **Proposed Dollar General**

CLIENT: **Overland Properties**
West Plains, Missouri

SITE: **US Highway 75 and West Pleasant Avenue**
Warren, Minnesota

LOCATION See Exhibit A-2

Latitude: 48.20297° Longitude: -96.7727°

Surface Elev.: 99 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	RECOVERY (Ft.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0	**TOPSOIL (OL)**, black	98	0.6	1-1-1 N=2						
2.0	**LEAN CLAY (CL)**, grayish brown, soft	97								
4.0	**LEAN CLAY WITH SAND (CL)**, dark grayish brown, stiff	95	1.4	3-5-3 N=8	1000 (HP)		24			
	FAT CLAY (CH), olive brown, very stiff					1210	29	95	54-25-29	
			1.4	2-3-5 N=8	5000 (HP)		29			
							23			
			1.5	2-3-4 N=7	2800 (HP)		53			
19.0		80	1.7	2-2-4 N=6	3000 (HP)		54			
21.0	**FAT CLAY (CH)**, dark grayish brown, very stiff	78	2	2-2-4 N=6	3000 (HP)		56			
	Boring Terminated at 21 Feet									

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

Hammer Type: Automatic

Advancement Method:
3 ¼" 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

Not measureable before HSA removal

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

Boring Started: 5/8/2014	Boring Completed: 5/8/2014
Drill Rig: Diedrich D90	Driller: CAS
Project No.: M5145023	Exhibit: A-5

BORING LOG NO. B-3

PROJECT: Proposed Dollar General

CLIENT: Overland Properties
West Plains, Missouri

SITE: US Highway 75 and West Pleasant Avenue
Warren, Minnesota

LOCATION See Exhibit A-2

Latitude: 48.20278° Longitude: -96.7728°

Surface Elev.: 99 (Ft.)

DEPTH	Description	ELEVATION (Ft.)
1.0	**TOPSOIL (OL)**, black	98
3.0	**FILL - LEAN CLAY (CL)**, brown and dark grayish brown	96
14.0	**FAT CLAY (CH)**, olive brown, medium stiff to stiff to very stiff, with lenses and laminations of silt, 2 inch silt layer at 13'	85
21.0	**FAT CLAY (CH)**, dark grayish brown, medium stiff	78
	Boring Terminated at 21 Feet	

RECOVERY (Ft.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.4	2-1-2 N=3						
0.7	1-1-1 N=2						
0.9	2-2-4 N=6	3500 (HP)		28			
			4460	28	96		
1.4	3-4-6 N=10	5500 (HP)		32			
1.4	3-8-13 N=21	2800 (HP)		32			
1.7	2-2-4 N=6	4000 (HP)		38			
				61	64	106-37-69	

DEPTH (Ft.): 5, 10, 15, 20

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

Hammer Type: Automatic

Advancement Method:
3 ¼" 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

Not measureable before HSA removal

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

Boring Started: 5/8/2014	Boring Completed: 5/8/2014
Drill Rig: Diedrich D90	Driller: CAS
Project No.: M5145023	Exhibit: A-6

BORING LOG NO. B-4

PROJECT: Proposed Dollar General

CLIENT: Overland Properties
West Plains, Missouri

SITE: US Highway 75 and West Pleasant Avenue
Warren, Minnesota

LOCATION See Exhibit A-2

Latitude: 48.20263° Longitude: -96.77257°

Surface Elev.: 99.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)
1.0	**TOPSOIL (OL)**, black	98.5
4.0	**LEAN CLAY (CL)**, brown and grayish brown, medium stiff, with lenses of silt and fine sand	95.5
7.0	**SILT (ML)**, grayish brown, very loose	92.5
9.0	**LEAN CLAY WITH SAND (CL)**, grayish brown, very soft	90.5
14.5	**FAT CLAY (CH)**, olive brown, medium stiff, with lenses of silt, 2 inch layer of silt at 12'	85
15.0	**SANDY SILT (ML)**, light olive brown	84.5
19.0	**FAT CLAY (CH)**, olive brown, stiff, with lenses of silt	80.5
21.0	**FAT CLAY (CH)**, dark grayish brown, medium stiff	78.5
	Boring Terminated at 21 Feet	

RECOVERY (Ft.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3	1-2-2 N=4						
		2000 (HP)		30			
0.9	2-1-2 N=3	1000 (HP)		23			
0.7	2-1-2 N=3	1000 (HP)		24			
1.5	2-2-4 N=6	4000 (HP)		28			
1.5	5-7-4 N=11			19			
		3500 (HP)		52			
1.7	2-2-3 N=5	3000 (HP)		57			

DEPTH (Ft.): 5, 10, 15, 20

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

Hammer Type: Automatic

Advancement Method:
3 ¼" 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

Not measureable before HSA removal

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

Boring Started: 5/8/2014	Boring Completed: 5/8/2014
Drill Rig: Diedrich D90	Driller: CAS
Project No.: M5145023	Exhibit: A-7

BORING LOG NO. B-5

PROJECT: Proposed Dollar General

CLIENT: Overland Properties
West Plains, Missouri

SITE: US Highway 75 and West Pleasant Avenue
Warren, Minnesota

LOCATION See Exhibit A-2

Latitude: 48.20264° Longitude: -96.77284°

Surface Elev.: 100 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - CLAYEY SAND , brown, with a trace of gravel					0.6	2-3-3 N=6						
2.0		98											
	TOPSOIL (OL), black					0.5							
3.0		97											
	FAT CLAY (CH), grayish brown, stiff		5			1.2	3-5-5 N=10	7000 (HP)		16			
7.0		93											
	FAT CLAY (CH), olive brown, stiff, with lenses of silt					1.3	3-5-6 N=11	6000 (HP)		27			
			10			1.3	3-2-4 N=6	4000 (HP)		32			
								2000 (HP)		26			
14.0		86											
	FAT CLAY (CH), dark grayish brown, soft		15			1.7	2-2-2 N=4	4000 (HP)		56			
			20			1.8	1-2-2 N=4	2000 (HP)		63			
21.0		79											
	Boring Terminated at 21 Feet												

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

Hammer Type: Automatic

Advancement Method:
3 ¼" 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

Not measureable before HSA removal

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

Boring Started: 5/8/2014	Boring Completed: 5/8/2014
Drill Rig: Diedrich D90	Driller: CAS
Project No.: M5145023	Exhibit: A-8

BORING LOG NO. B-6

PROJECT: Proposed Dollar General

**CLIENT: Overland Properties
West Plains, Missouri**

**SITE: US Highway 75 and West Pleasant Avenue
Warren, Minnesota**

LOCATION See Exhibit A-2

Latitude: 48.20248° Longitude: -96.7726°

Surface Elev.: 100 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	**FILL - POORLY GRADED SAND WITH SILT**, brown, with a trace of gravel	98				0.3	6-5-1 N=6						
4.0	**LEAN CLAY WITH SAND (CL)**, grayish brown, stiff	96				1.5	2-4-10 N=14	2000 (HP)		18			
7.0	**LEAN CLAY (CL)**, dark grayish brown, very stiff	93	5			1.5	3-5-12 N=17	1000 (HP)		24			
	FAT CLAY (CH), light olive brown, stiff to medium stiff, with lenses of silt					1.4	3-5-6 N=11	5000 (HP)		30			
11.0		89	10			1.6	2-3-4 N=7	2000 (HP)		30			

Boring Terminated at 11 Feet

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

Hammer Type: Automatic

Advancement Method:
3 ¼" 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

Not measureable before HSA removal

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

Boring Started: 5/8/2014	Boring Completed: 5/8/2014
Drill Rig: Diedrich D90	Driller: CAS
Project No.: M5145023	Exhibit: A-9

BORING LOG NO. B-7

PROJECT: Proposed Dollar General

CLIENT: Overland Properties West Plains, Missouri

SITE: US Highway 75 and West Pleasant Avenue Warren, Minnesota

LOCATION See Exhibit A-2

Latitude: 48.20255° Longitude: -96.77242°

Surface Elev.: 99.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.5	**TOPSOIL (OL)**, black	98				0.3	7-9-5 N=14						
4.0	**LEAN CLAY (CL)**, grayish brown, soft	95.5				1	1-1-1 N=2						
7.0	**FAT CLAY (CH)**, olive brown, soft	92.5	5			1.2	1-1-2 N=3	1500 (HP)		27			
	FAT CLAY (CH), olive brown, medium stiff, with lenses of silt					1	2-3-4 N=7	3500 (HP)		30			
11.0		88.5	10			1.6	2-3-4 N=7	3000 (HP)		31			

Boring Terminated at 11 Feet

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

Hammer Type: Automatic

Advancement Method:
3 ¼" 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

Not measureable before HSA removal

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

Boring Started: 5/8/2014

Boring Completed: 5/8/2014

Drill Rig: Diedrich D90

Driller: CAS

Project No.: M5145023

Exhibit: A-10

BORING LOG NO. B-8

PROJECT: Proposed Dollar General

CLIENT: Overland Properties West Plains, Missouri

SITE: US Highway 75 and West Pleasant Avenue Warren, Minnesota

LOCATION See Exhibit A-2

Latitude: 48.20274° Longitude: -96.77246°

Surface Elev.: 99.5 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0	**TOPSOIL (OL)**, black	98.5			X	1	1-1-7 N=8						
4.0	**LEAN CLAY (CL)**, grayish brown to dark grayish brown, stiff	95.5			X	1.4	6-5-3 N=8			31			
7.0	**FAT CLAY (CH)**, olive brown, soft	92.5	5		X	0.9	2-1-3 N=4	1500 (HP)		27			
	FAT CLAY (CH), olive brown, stiff, with lenses of silt				X	1.7	3-3-5 N=8	6000 (HP)		26			
11.0		88.5	10		X	1.7	3-3-5 N=8	4500 (HP)		33			

Boring Terminated at 11 Feet

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

Hammer Type: Automatic

Advancement Method:
3 ¼" 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

Not measureable before HSA removal

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

Boring Started: 5/8/2014	Boring Completed: 5/8/2014
Drill Rig: Diedrich D90	Driller: CAS
Project No.: M5145023	Exhibit: A-11

BORING LOG NO. B-9

PROJECT: Proposed Dollar General

CLIENT: Overland Properties West Plains, Missouri

SITE: US Highway 75 and West Pleasant Avenue Warren, Minnesota

LOCATION See Exhibit A-2

Latitude: 48.20293° Longitude: -96.77251°

Surface Elev.: 99 (Ft.)

GRAPHIC LOG	DEPTH / MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Ft.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	TOPSOIL (OL), black					13	1-1-2 N=3						
	1.0	98											
	FAT CLAY WITH SAND (CH), grayish brown, soft							1000 (HP)		27			
	4.0	95											
	FAT CLAY (CH), olive brown mottled, medium stiff		5			1.1	2-2-3 N=5	3500 (HP)		28			
	7.0	92											
	FAT CLAY (CH), olive brown, stiff, with lenses of silt							4500 (HP)		27			
			10			1.2	3-3-7 N=10	3000 (HP)		35			
	11.0	88											
	Boring Terminated at 11 Feet												

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

Hammer Type: Automatic

Advancement Method:
3 ¼" 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

Not measureable before HSA removal

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

Boring Started: 5/8/2014	Boring Completed: 5/8/2014
Drill Rig: Diedrich D90	Driller: CAS
Project No.: M5145023	Exhibit: A-12

APPENDIX B
SUPPORTING INFORMATION

Laboratory Testing

As part of the testing program, all samples were examined in the laboratory by experienced personnel and classified in accordance with the attached General Notes and the Unified Soil Classification System (see Appendix C) based on the texture and plasticity of the soils. The group symbol for the Unified Soil Classification System is shown in the appropriate column on the boring logs and a brief description of the classification system is included with this report in the Appendix.

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.

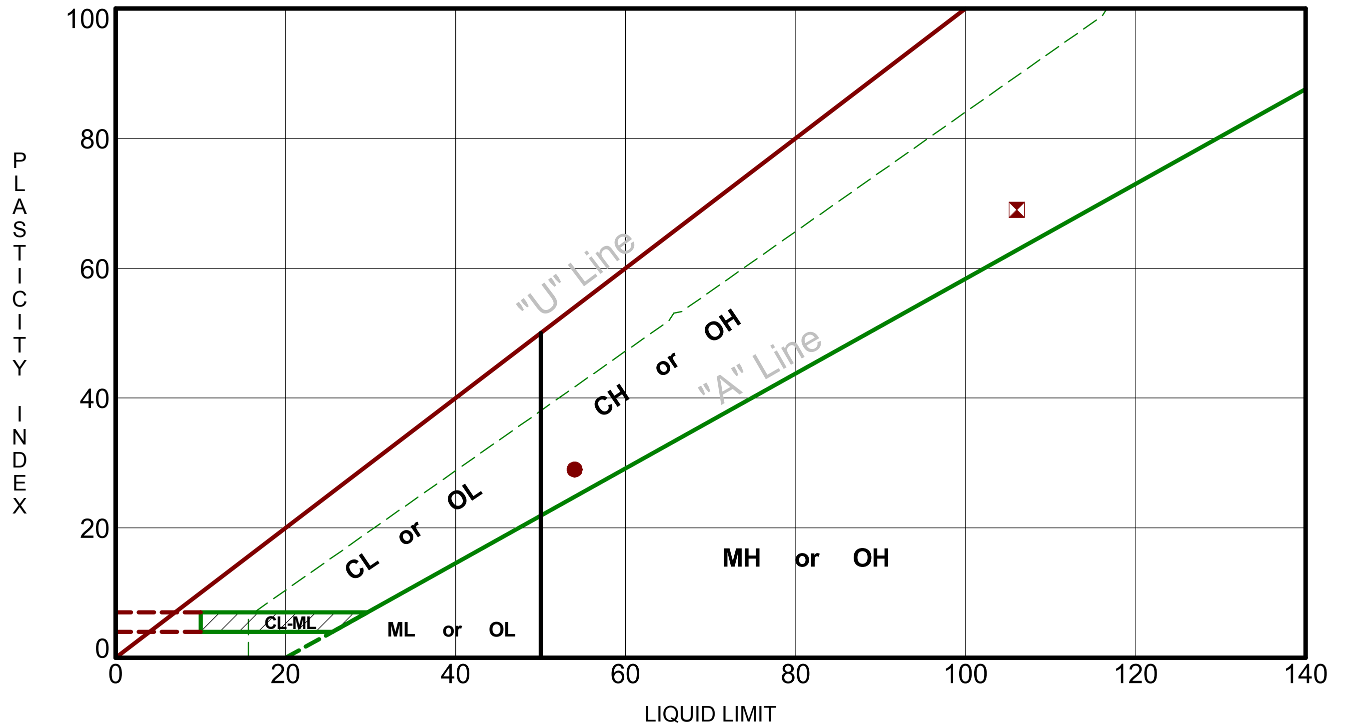
Laboratory tests were conducted on selected soil samples and the test results are presented in this appendix. The laboratory test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance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

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

- In-situ Water Content
- Atterberg Limits
- Hand Penetrometer
- Dry Density
- Unconfined Compressive Strength

ATTERBERG LIMITS RESULTS

ASTM D4318



	Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
●	B-2	4.5	54	25	29		CH	FAT CLAY (CH)
⧗	B-3	19.5	106	37	69		CH	FAT CLAY (CH)

PROJECT: Proposed Dollar General

SITE: US Highway 75 and West Pleasant Avenue
Warren, Minnesota

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

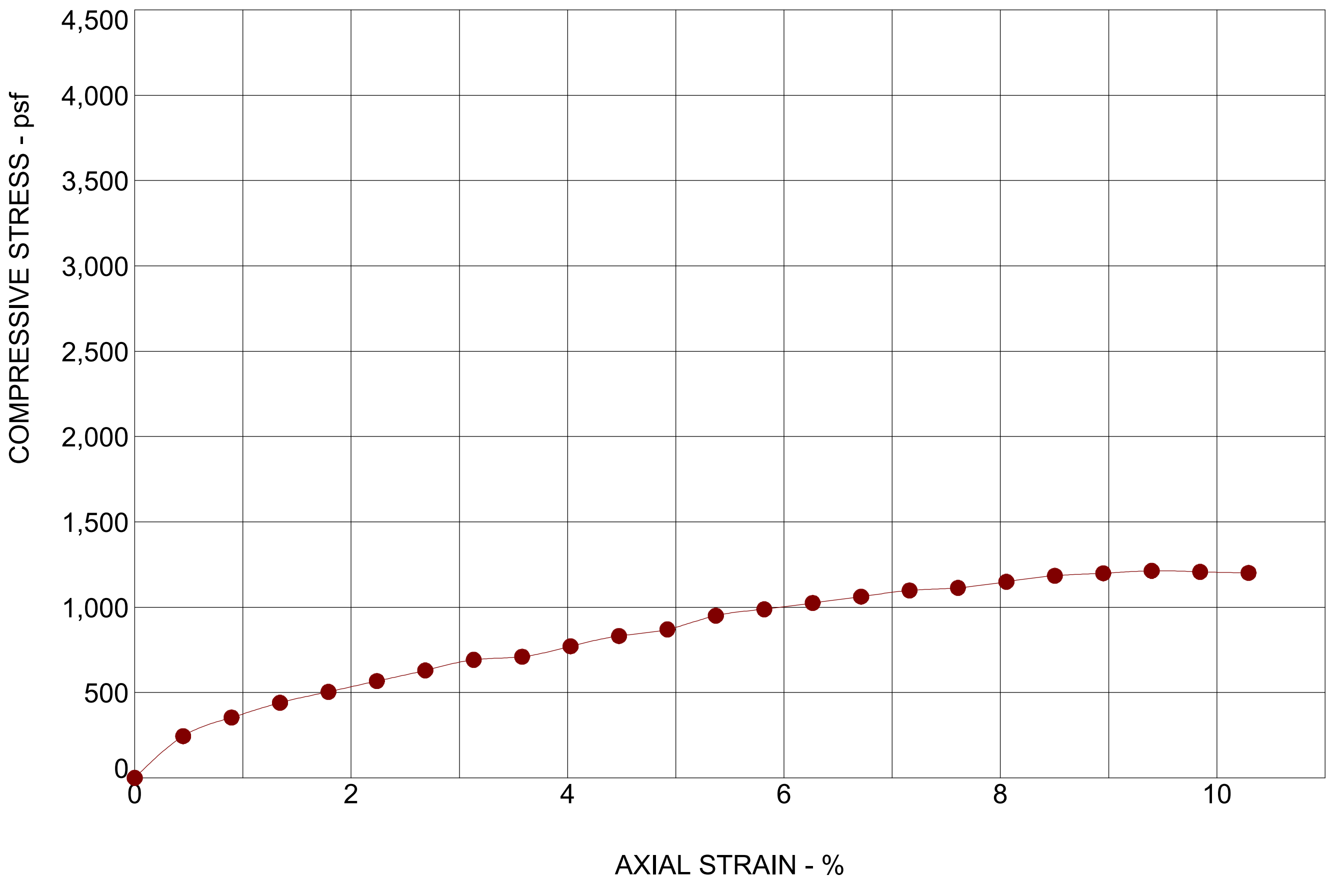
PROJECT NUMBER: M5145023

CLIENT: Overland Properties
West Plains, Missouri

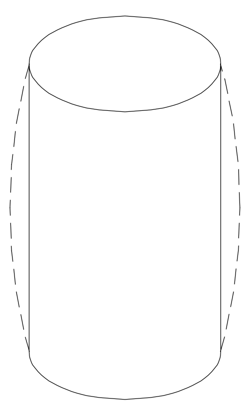
EXHIBIT: B-2

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE MODE	SPECIMEN TEST DATA		
	Moisture Content:	%	29
	Dry Density:	pcf	95
	Diameter:	in.	2.87
	Height:	in.	5.59
	Height / Diameter Ratio:		1.95
	Calculated Saturation:	%	98.27
	Calculated Void Ratio:		0.78
	Assumed Specific Gravity:		2.7
	Failure Strain:	%	9.40
	Unconfined Compressive Strength	(psf)	1213
	Undrained Shear Strength:	(psf)	607
	Strain Rate:	in/min	0.1500
	Remarks:		



Failure Mode: Bulge (dashed)

SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: B-2 @ 4.5 Feet			
DESCRIPTION: FAT CLAY (CH)	LL	PL	PI	Percent < #200 Sieve
	54	25	29	

PROJECT: Proposed Dollar General

SITE: US Highway 75 and West Pleasant Avenue
Warren, Minnesota

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

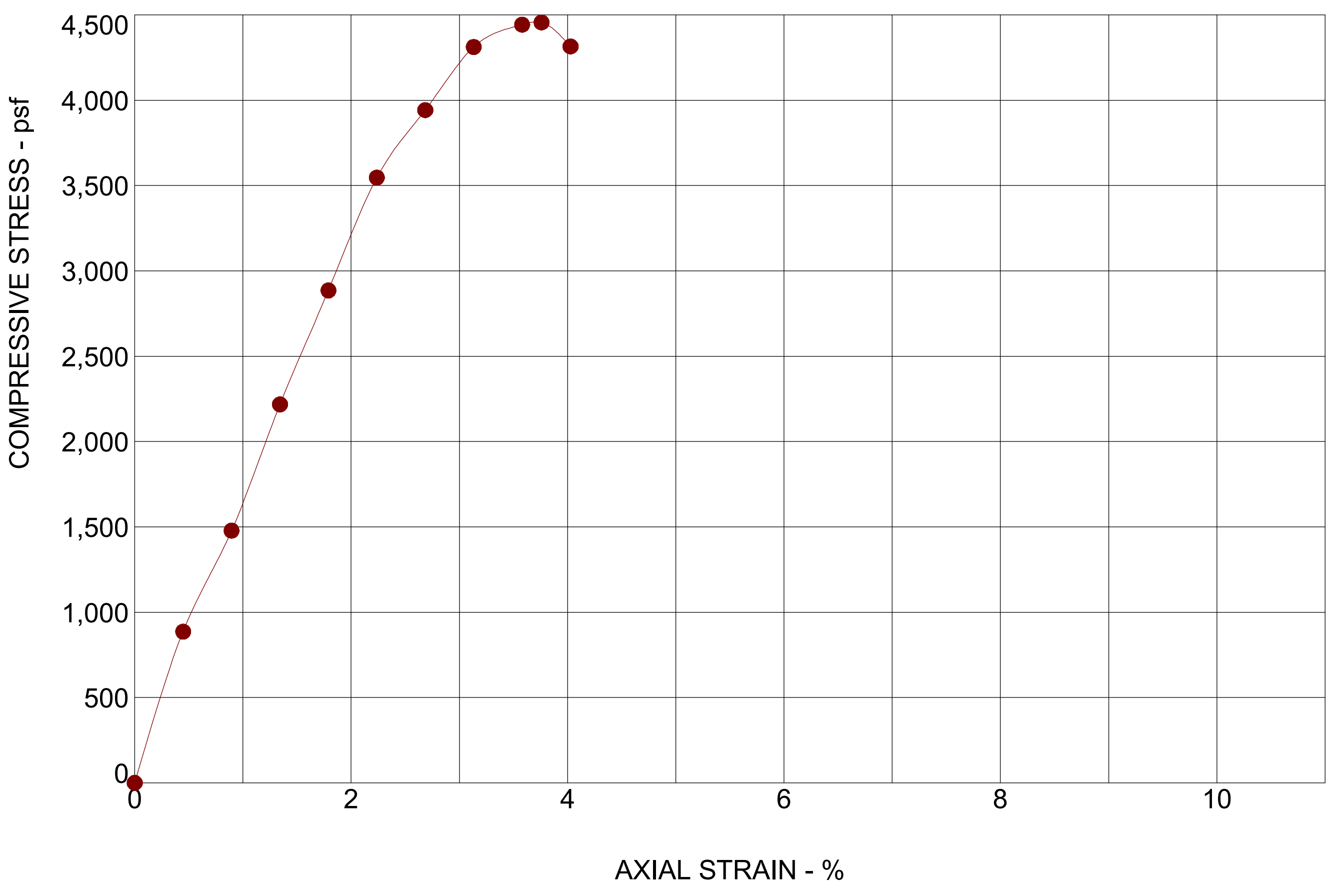
PROJECT NUMBER: M5145023

CLIENT: Overland Properties
West Plains, Missouri

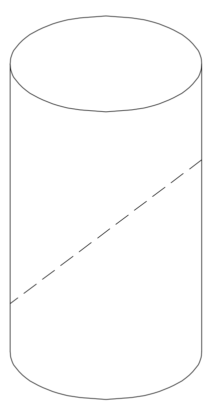
EXHIBIT: B-3

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE MODE	SPECIMEN TEST DATA		
	Moisture Content:	%	28
	Dry Density:	pcf	96
	Diameter:	in.	2.87
	Height:	in.	5.59
	Height / Diameter Ratio:		1.95
	Calculated Saturation:	%	99.40
	Calculated Void Ratio:		0.75
	Assumed Specific Gravity:		2.7
	Failure Strain:	%	3.76
	Unconfined Compressive Strength	(psf)	4456
	Undrained Shear Strength:	(psf)	2228
	Strain Rate:	in/min	0.1500
Failure Mode: Shear (dashed)	Remarks:		



SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: B-3 @ 7 Feet			
DESCRIPTION: FAT CLAY (CH)	LL	PL	PI	Percent < #200 Sieve

PROJECT: Proposed Dollar General

SITE: US Highway 75 and West Pleasant Avenue
Warren, Minnesota

Terracon
1555 N. 42nd St., Unit B
Grand Forks, North Dakota

PROJECT NUMBER: M5145023

CLIENT: Overland Properties
West Plains, Missouri

EXHIBIT: B-4

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING	Shelby Tube; Split Spoon	WATER LEVEL	Water Initially Encountered Water Level After a Specified Period of Time Water Level After a Specified Period of Time 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 (DCP) Dynamic Cone Penetrometer (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		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.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (psf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
		Hard	> 8,000	> 30

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	Soil Classification: 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 $\geq$ 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.

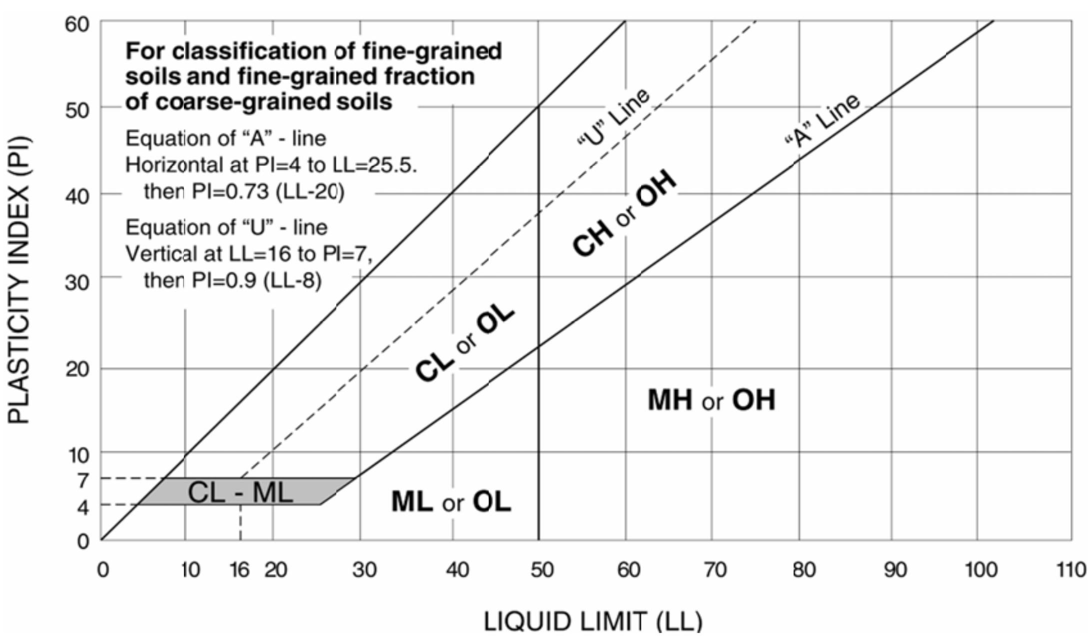
[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[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.



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A Terracon Company