Exhibit 14 - Geotechnical Study

GEOTECHNICAL INVESTIGATION
FOR
EVANGELINE PARISH, WARD I
INDUSTRIAL PARK VERIFICATION
VILLE PLATTE, LOUISIANA
REPORT NO. 02-11-016

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APPENDIX

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Introduction:

This report transmits the findings of a geotechnical investigation performed for the above-referenced project. The purpose of this investigation was to define and evaluate the general subsurface conditions in the immediate vicinity of a proposed new industrial complex. Specifically, the study was planned to determine the following:

- Subsurface stratigraphy within the limits of our exploratory borings.
- Classification, strength, and compressibility characteristics of the foundation strata.
- Suitable foundation systems and allowable soil bearing pressures.

The purpose of this report is to provide the owner, structural engineer, architect, civil engineer, and other design team professionals with recommendations for the design and construction of the proposed project. This report should not be used by the contractor in lieu of project plans and specifications.

Project Authorization:

Formal authorization to perform the work was provided by Mr. Ronald Landreneau, Parish Engineer for the Evangeline Parish Police Jury (client), by accepting our March 4, 2010 written proposal. Authorization to proceed was provided on November 2, 2010. Field procedures were conducted between February 8 and 15, 2011. The delay between the project authorization and the field investigation was due to a combination of boring placement and inclement weather. To accomplish the intended purposes, a three-phase study program was conducted which included:

- a field investigation consisting of five exploratory test borings with samples obtained at selected intervals;
- a lab testing program designed to evaluate the expansive and strength characteristics of the subsurface soils; and,
- an engineering analysis of the field and laboratory test data for preliminary foundation design recommendations.

No additional analysis was requested. A brief description of the field and laboratory test procedures are provided in the Appendix.

Project Description:

The project will be the development of an industrial park site for the Evangeline Parish Police Jury. We understand that the industrial park could consist of a number of structures varying from one (1) story to four (4) stories in height. Preliminary structural information is not available. The proposed buildings should consist of either steel or wood framing and may be supported on either shallow foundations, or on drilled shafts bearing at depths sufficient to resist the anticipated loadings. The pavements will most likely consist of light duty pavements for passenger cars and pickup trucks and heavy duty pavements for tractor-trailer trucks.

For the purpose of this report, we have assumed that column loads could be between 25 and 150 kips, and that maximum continuous wall loads will be between one (1) and four (4) kips per linear foot. Maximum uniform and isolated concentrated floor loads are expected to be 125 psf and five (5) kips, respectively. Grade changes are expected to be nominal with no more than two (2) to three (3) feet of cut or fill.

Information pertaining to anticipated traffic loads and volumes was not available. For the purposes of this report, we assume that the industrial traffic could consist of up to 500 repetitions of light passenger cars and pick-up trucks, 50 medium-sized delivery trucks and vans, and up to 50 heavy tractor-trailer trucks per day.

If any of this information should change significantly or be in error, it should be brought to our attention so that we may review recommendations made in this report.

Site and Subsurface Conditions:

The project site is situated within a tract of land located northwest of the intersection of Industrial Road and Industrial Park Road in Evangeline Parish, Ville Platte, Louisiana. Maxie Rae Boulevard is oriented east-to-west through the southern portion of the site. The site was noted to be relatively level with estimated maximum elevation differences of no more than one (1) to two (2) feet. The site was vegetated with weeds and grass at the time of drilling. A pile of construction debris was noted south of Maxi Rae Boulevard. An overhead power line was oriented north-to-south through the approximate center of the site. The drilling rig experienced moderate difficulty moving about the site. Heavy equipment was required to access Borings B-3 through B-5.

Subsurface Stratigraphy:

In accordance with your request, subsurface conditions at the anticipated building sites were explored by drilling a total of five (5) borings to a depth of approximately 50 feet. The borings were located in the field by the drilling crew by measuring approximate distances from existing features as shown on the Plan of Borings included in the Appendix of this report.

The stratification of the soils encountered during field drilling operations is presented on the boring logs in the Appendix. The stratification of the subsurface materials shown on the boring logs represents the subsurface conditions encountered at the actual boring locations and variations may occur across the site. The lines of demarcation represent the approximate boundary between the soil types, but the actual transition may be gradual. The following subsurface descriptions are of a generalized nature to highlight the major stratification features. The boring logs should be reviewed for more detailed information.

In order of increasing depth, the borings generally encountered the following soil strata beneath the surface: silty lean clay (CL), fat clay (CH), lean to fat clay (CL/CH), silt (ML), and silty sand (SM).

Groundwater Conditions:

Seepage was observed at depths of 14.5 to 19 feet during advancement of the test borings. Groundwater was measured at depths of 14 to 25 feet below existing ground surface upon completion of the borings. The subsurface water regime is subject to change with variations in climatic conditions. Future construction activities may also alter the surface and/or subsurface drainage patterns of this site. Therefore, groundwater conditions should be explored at the

start of construction by others. If there is a noticeable variance from the observations reported herein, then GeoConsultants should be notified immediately to review the effect, if any, such data may have on the design recommendations. It is not possible to predict future ground water conditions based upon short-term observations.

Foundation Recommendations:

The soil parameters presented below are based on single borings placed at irregular intervals across the site. The deviations between the boring locations indicate variable subsurface conditions across the site and should not be assumed as representative of the individual borings. Thus, the findings presented herein should be considered preliminary in nature and should be confirmed through further investigation prior to development of the subject parcel. Prior to developing any section of the tract, a specific subsurface investigation should be obtained and tailored to the individual project. This report should not be used in lieu of a final geotechnical investigation addressing site specific needs for the intended projects.

Based on the size and type of anticipated structures, as well as the findings from this investigation, a system of shallow footings with an on-grade floor slab, in conjunction with the recommended subgrade preparation is believed to be the most practical and economical means of support. However, heavier building loads could result in the use of deep foundations. Recommendations for both foundation types are discusses separately below.

Potential Vertical Rise (PVR) values were estimated to vary between less than one (1) inch and 1.75 inches for this site. One (1) inch of PVR is generally accepted as the maximum allowable value for design and construction in the geographical area. The surficial soils encountered by the borings are considered to be moderately to highly expansive.

Shallow Foundations:

To remediate variable soil conditions in the surficial zone, provide a consistent subgrade for slab support, and reduce the potential for active soils to affect the foundations where active clays are present at the surface, GeoConsultants recommends that a uniform layer of density-approved select fill be provided beneath the floor slabs. The select fill for the building pads should extend at least five (5) feet beyond the perimeter of the buildings. The table below indicates the estimated undercut and select fill pad thickness to limit the PVR to a value of one (1) inch or less for the individual building pads in the vicinity of the boring locations.

Boring No.	Estimated PVR (inches)	Estimated Thickness of Select Fill Pad (feet)
1	< 1	1
2	< 1	1
3	1.25	2
4	< 1	1
5	1.75	2

The fill should be used to elevate the building pads so that positive drainage is provided away from the buildings. Where feasible, elevating the building pads with fill is generally desirable because this aids in providing positive drainage away from the floor slabs and foundations and helps prevent water from collecting in the filled areas.

Shallow foundations may utilize individual or continuous footings bearing within the upper five (5) feet of the surficial zone. The provision of at least one (1) to two (2) feet of select fill should be anticipated to be necessary to provide a suitable subgrade for the structures. Typical

bearing capacity values for shallow spread footings may vary from between approximately 1,500 psf to 2,500 psf for soils with consistencies of medium dense or medium stiff. Strip footings for continuous wall loads may be estimated between 1,150 and 2,000 pounds per linear foot.

Fill areas may be required to provide a level building pad for the proposed structures. These fill areas should be composed of density controlled select fill (compacted to 95% Standard Proctor ASTM D-698). These constructed fills, even though placed in a density controlled and monitored manner, can be expected to settle between 1% and 2% throughout the fill thickness. This contribution to settlement can be significant on sites with constructed fill depths exceeding three (3) or four (4) feet, and should be accounted for in the design of the building. Usually the most effective means to minimize deleterious effects of this settlement is to simply provide a relatively constant fill thickness, or accommodate a gradual transition from cut to fill.

Construction of select fill as specified herein beneath the building should result in the development of a modulus of subgrade reaction (k_s) to range between 125 and 150 pounds per cubic inch based upon empirical equations that estimate the results of a plate load test. For warehouse slabs exposed to fork lift loads, the subgrade modulus may be increased to between 250 and 300 pci by placing eight (8) inches of crushed limestone base or equal below the slab.

Deep Foundations:

We understand that deep foundations may be considered for use at this site, if required due to special equipment or building loads. The table below presents preliminary estimates for drilled, cast-in-place concrete shafts. These values are based on the average conditions encountered within the borings. Therefore, prior to developing any structure within this tract of land, we strongly recommend a specific site investigation to determine the actual soil parameters for deep foundations.

Shafts should be founded at a minimum estimated depth of 30 feet and should not extend below a depth of 50 feet below the existing ground surface. The table below presents the estimated allowable single shaft capacities for an 18 inch diameter shaft founded at depths between 30 and 50 feet below present ground surface.

Diameter of Shaft (inches)	Depth of Shaft (feet)	Allowable Single Shaft Capacity (kips)	
		Compressive	Uplift
18	30	50	40
	35	65	50
	40	75	60
	45	85	70
	50	95	80

The factor of safety for these calculations is estimated to be 2.0. Shafts should have a minimum diameter of 18 inches even if the actual bearing pressure is less than the design value. Groundwater will most likely be encountered in the drilled shafts. Casing for installing drilled shafts is always a possible necessity when dealing with the unknowns inherent with subsurface conditions. It is prudent for contract documents to include this option.

Drilled Shaft Considerations

Due to the presence of a shallow groundwater table with a hydrostatic head, consideration should be given to installing the drilled shafts using a slurry method which maintains a constant slurry level equal to or slightly above the hydrostatic water level. If the shafts can be sealed from water intrusion using casing, the slurry option may be eliminated.

It is recommended that the design and construction of drilled piers should generally follow methods outlined in the manual titled Drilled Shafts: Construction Procedures and Design Methods (Publication No: FHWA-IF-99-025, August 1999).

We emphasize that close engineering supervision is essential during installation of the drilled pier foundations in order to assure that construction is performed in accordance with the plans and specifications. Also, to insure proper construction of the drilled piers at this site, close coordination between the drilling and concreting operations is considered to be of great importance. Detailed inspection of drilled shaft construction should be made to verify that the shafts are vertical and founded in the proper bearing stratum and to verify that all loose materials have been removed prior to concrete placement.

Pavements:

Information for this pavement analysis is inferred from the building borings. Our scope of services did not include extensive sampling and CBR testing of existing subgrade or potential sources of imported base material for the specific purpose of a detailed pavement analysis. Instead, we have assumed pavement related design parameters that are considered to be typical for the area soil types. It has been assumed that the constructed pavement subgrade will consist of well compacted soils. Based on experience, it is anticipated that the compacted native subgrade will yield a California Bearing Ratios (CBR) of between 3.0 and 5.0.

The satisfactory performance of pavements for parking and drive areas depends upon several factors including (1) the characteristics of the supporting soil; (2) the magnitude and frequency of wheel load applications; (3) quality of construction materials; (4) the contractor's placement and workmanship abilities, (5) good drainage, and (6) the desired period of design life.

The general pavement design information presented in this report is based on subsurface conditions inferred by the test borings, information published by The Asphalt Institute, the Portland Cement Association, and past experience in the locale. The published information was utilized in conjunction with the available field and laboratory test data to develop general pavement designs based on the AASHTO structural numbering system.

Pavements to be utilized by light vehicular traffic may be either flexible or rigid pavement sections supported on well-compacted subgrade or select fill. However, Portland cement concrete pavements should be utilized where large loads (i.e. waste disposal containers, etc.) are located. Both flexible and rigid pavement sections have been designed using general engineering design criteria referenced above.

Subgrade:

It is paramount to the satisfactory performance of pavements that the subgrade be stable under loads and compacted prior to deployment of flexible base or concrete. All pavement subgrade should be proof rolled prior to beginning placement of pavement section materials. Stable subgrade is especially critical to the successful performance of flexible pavement sections. The surficial soils within the proposed paving limits should be tested to determine the average plasticity index (PI) value. If the average PI of the subgrade is above a value of 20, the upper eight (8) inches of subgrade should be either removed and replaced with select fill, or treated with lime to reduce the PI to an acceptable limit.

Subgrade may be, or become, wet and unstable under paving areas, depending on several factors, including construction season, groundwater fluctuations, contractor's maintenance of positive drainage, routing of equipment, weather, and scheduling constraints. Flexible base

and concrete should be placed only on subgrade that has passed both stability and compaction requirements. Also, it is prudent for contract documents to accommodate over-excavation and replacement as needed or, more typically, to anticipate such remedial activity through the change order process. In any event, the owner should be advised that this risk is inherent in practically every construction project that involves site work.

Lime Treatment:

A review of the boring logs indicates that the subgrade below some areas of the pavements could consist of highly plastic clays. Normally, these materials are considered to have poor support characteristics for pavements unless they are chemically treated to improve their engineering properties. Generally, soils with a PI value greater than 20 should be either removed to a depth of eight (8) inches and replaced with density approved select fill, or lime-treated as discussed below.

Clayey soils with excessive plasticity are subject to loss in support value with increases in moisture, as well as volumetric changes (shrinking and swelling) accompanying moisture changes. They chemically react with hydrated lime, becoming more stable. Clayey soils should be free of organics and other deleterious materials. Lime treatment should be performed in accordance with the applicable provisions of Section 304 of the *Louisiana Standard Specifications for Roads and Bridges,* 2006 Edition.

The lime-treated clay soil should have a maximum liquid limit value of 40 and a maximum plasticity index of 22 based on a dry method of sample preparation per ASTM D 421. If the above values cannot be obtained, the optimum lime content should be determined using a pH meter as outlined in ASTM C 977. A minimum of five (5) percent lime by dry weight of soil should be used even if a lesser percentage appears feasible based on the test data. In addition, consideration should be given to the potential for non-uniformity of soils, spillage, and other losses such as dusting when selecting the percentage lime required for treatment.

If dusting of dry hydrated lime is anticipated to be problematic, whether due to loss of lime or due to local air emissions restrictions, the lime may be slurried with water and applied, if soil conditions are dry. In wet weather, pelletized quick lime may be used, if appropriate worker safety precautions are followed. The use of quick lime will reduce the amount of lime required by about 20% on a weight basis, as compared to hydrated lime.

The lime-treated clay should be compacted at a moisture content not less than optimum, nor more than four (4) percent above the optimum as defined by ASTM D 698 (Standard Proctor). Compaction should be at least 95 percent of the maximum dry density defined by this standard. The required moisture content and density of the compacted material should be maintained until construction is complete.

Cement Treatment:

A bulk sample of the silty lean clay subgrade was submitted to the laboratory to determine its suitability for use for cement treatment. The results of those tests indicate that the subgrade soils at this site are not suitable for use in cement treatment. A copy of the Determination of Usable Materials for Cement Treatment is included in the Appendix of this report.

Traffic and Design Data:

Commercial pavement sections presented herein are based upon minimum material thickness as recommended by the Asphalt Institute and the Portland Cement Association. These sections are not based upon anticipated traffic loads as these were not available at the time this

report was prepared. As previously discussed, we assume that the industrial traffic could consist of up to 500 repetitions of light passenger cars and pick-up trucks, 50 medium-sized delivery trucks and vans, and up to 50 heavy tractor-trailer trucks per day.

Asphaltic Pavement Materials:

Surface or wearing course asphaltic concrete should consist of Item 501, Type 3. Surface course asphalt should be compacted to a minimum of 95 percent of the density of the laboratory molded specimen, or a minimum of 92% of the maximum theoretical density. The placement temperature and compacted thickness of Hot Mix Asphaltic Concrete (HMAC) should be determined during placement. Samples for extraction and gradation analysis should be obtained at the rate of at least one sample for each day's operation, for each pavement course, with at least one sample for each 600 tons.

Granular base should be compacted to 95 percent of the maximum density defined by the Modified Proctor (ASTM D-1557). Cohesive (clay) subgrade soils should be compacted to a minimum of 95% of maximum density defined by the Standard Proctor (ASTM D-698). Non-cohesive (sand) subgrade soils should be compacted to 100% of maximum density defined by the Standard Proctor (ASTM D-698).

Portland Cement Concrete:

Concrete compressive strength should be a minimum of 3,000 psi at 28 days. The concrete should be designed with 5 percent (± 1 percent) entrained air to improve workability and durability. Subgrade (and subbase, if specified) should be compacted to a minimum of 95% of the maximum density defined by the Standard Proctor (ASTM D-698). The design of steel reinforcement, if advised by the structural engineer, should be in accordance with local or accepted codes. (Although reinforcement is not normally required by design, it is customary to provide minimum reinforcement of 6 x 6 x No. 6 welded wire flat mesh or No. 3 deformed steel bars spaced on 18-inch centers each way.)

Proper finishing of concrete pavement requires appropriate construction joints to reduce the potential for cracking. Construction joints ("weakened planes") should be designed in accordance with current Portland Cement Association guidelines. It is recommended that such "weakened plane" joints be spaced no more than 15' c-c, or as specified by the structural engineer. Depth of such joints should be 1/3 of the pavement thickness. These joints should be cut as soon as the concrete will support the machinery. Joints should be sealed to reduce the potential for water infiltration into pavement joints and subsequent infiltration into the supporting soils.

Recommended Pavement Sections:

The table below presents a summary of both rigid and flexible pavement sections for standard and heavy duty applications. It should be noted that the pavement sections as presented below are minimums. If it is desired to reduce potential cracking, greater thickness of select fill and/or greater pavement section thickness could be utilized. In addition, long term pavement performance requires good drainage and performance of periodic maintenance activities. Refer to the text for qualification of the designs and further discussion and limitations.

MINIMUM PAVEMENT RECOMMENDATIONS *		
Pavement Type	**Light Duty (Parking Lot Entries & Drives)**	**Heavy Duty (Truck Entries & Drives)**
Portland Cement Concrete	6.0" Portland Cement Concrete 8.0" Lime Treated Subgrade or Density Controlled Select Fill	7.0" Portland Cement Concrete 8.0" Lime Treated Subgrade or Density Controlled Select Fill
Asphalt Over Crushed Stone Base	3.0" Item 501 Type 3 Surface 8.0" Item 1003.03 (b) Base 8.0" Lime Treated Subgrade or Density Controlled Select Fill	4.0" Item 501 Type 3 Surface 14.0" Item 1003.03 (b) Base 8.0" Lime Treated Subgrade or Density Controlled Select Fill
*Materials shall meet general requirements of the Louisiana DOTD Standard Specifications for Construction of Roads & Bridges, and specific requirements listed herein.		

The pavement section for the parking stalls may consist of either five (5) inches of Portland cement concrete, or two (2) inches of HMAC over six (6) inches of compacted stone base. Concrete thickness at trash receptacles should be a minimum of seven (7) inches. All paving recommendations are based on stable subgrade. Subgrade areas which are unstable should be over-excavated and replaced, or otherwise rendered stable prior to proceeding with base material placement.

Limitations:

The exploration and analysis of the site conditions reported herein are considered preliminary in detail and scope and are not intended to form a basis for foundation design. The information submitted is based on the available soil information only and not on design details for the intended projects.

The findings, recommendations or professional advice contained herein have been made after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology. No other warranties are implied or expressed.

The scope of services did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors, or unusual or suspicious items or conditions are strictly for the information of the client. Prior to purchase or development of this site, an environmental assessment is advisable.

The scope of services did not include a geologic investigation to address any faults, large scale subsidence, or other macro geologic features not specifically addressed in this report or the agreement between GeoConsultants and the client.

After plans are more complete, it is recommended that the soils and foundation engineer be retained to provided a subsurface investigation tailored to meet the specific needs of the project.

This report has been prepared for the exclusive use of our client for the general application for the referenced project. GeoConsultants cannot be responsible for interpretations, opinions, or recommendations made by others based on the data contained in this report.

This report was prepared for general purposes only and should not be considered sufficient for purposes of preparing accurate plans for construction. Contractors reviewing this report are advised that the discussions and recommendations contained herein were provided exclusively to and for use by the project owner.