GEOTECHNOLOGY

A Universal Engineering Sciences Company

GEOTECHNICAL SERVICES
BURGER KING PAVEMENT DESIGN
FRANKFORT, KENTUCKY

Prepared for:

AMPLER BURGERS, LLC
RALEIGH, NORTH CAROLINA

Prepared by:

GEOTECHNOLOGY, LLC
ERLANGER, KENTUCKY

Date:

DECEMBER 10, 2021

Geotechnology Project No.:

J040181.01

SAFETY
QUALITY
INTEGRITY
PARTNERSHIP
OPPORTUNITY
RESPONSIVENESS

GEOTECHNOLOGY
A Universal Engineering Sciences Company

December 10, 2021

Mr. Dan Peyton
Ampler Burgers, LLC
4700 Falls of Neuse Road
Suite 400
Raleigh, North Carolina 27609

Re: Geotechnical Services
Burger King Pavement Design
Frankfort, Kentucky
Geotechnology Project No. J040181.01

Dear Mr. Peyton:

Presented in this report are the results of our geotechnical pavement design services completed for the proposed Burger King project on Versailles Road in Frankfort, Kentucky. Our services were performed in general accordance with our Proposal-Agreement P040181.01, which was dated November 23, 2021, and signed for authorization on November 24, 2021. The scope of our services was to provide pavement thickness design for the proposed parking lot and drive-thru.

1.0 PROJECT INFORMATION

We understand that a Burger King restaurant will be constructed on one of the lots in the commercial development located at 1335 Versailles Road, Frankfort, Kentucky. A site plan, titled "Preliminary Site Plan", which was prepared by Charles William Pope & Associates, dated October 7, 2021, was provided to us electronically on November 23, 2021. The plan indicates that the approximately 1-acre site will be developed with a 2,832 square-foot building, and parking and drive areas. The parking lot and drives will be asphalt pavement, and the double-lane drive-thru will be concrete pavement. Traffic information was not available at the time of this report.

We are familiar with this site, as Geotechnology completed geotechnical services at the site under Project No. J029879.01. Our report for this site, titled "Geotechnical Data Report, Rzeszutko and DaCosse Property, 1335 Versailles Road, Frankfort, Kentucky", was issued on July 18, 2017.

2.0 PAVEMENT DESIGN AND CONSTRUCTION

2.1 Pavement Subgrade

Based on the results of the 2017 Geotechnical Data Report, we have assumed that the pavement subgrade exposed in cuts or in areas of proposed fill, will be comprised of highly plastic clay soils. We recommend using a California Bearing Ratio (CBR) of 2.0 for pavement designs in that soil type.

Proposed pavement subgrades should be proofrolled with a loaded tandem-axle dump truck weighing at least 40,000 pounds under the review of the Project Geotechnical Engineer, or representative thereof. Soft or yielding soils observed during the proofroll should be undercut to stiff, non-yielding soils; however, the depth of undercut below subgrade may be limited to 3 feet in light-duty traffic areas and 4 feet in heavy-duty traffic areas. The undercut should be backfilled with new compacted clayey fill. The fill should be compacted to at least 95% standard Proctor maximum dry density (ASTM D698), at moisture contents within 2% of optimum. The top 8 inches of the subgrade should be compacted to 98% standard Proctor maximum dry density at the same moisture range stated above. We recommend that the Contract Documents include an item for undercutting unsuitable soils and replacing them with new compacted and tested fill on a “per cubic yard of compacted replacement fill” basis.

In lieu of undercutting soft or yielding soils to the maximum undercut depths specified above (i.e., 3 feet for light-duty traffic and 4 feet for heavy-duty traffic), the subgrade may be stabilized using a biaxial or triaxial geogrid (e.g., Tensar BX-1200 or TriAx TX160 or equivalent) and at least 12 inches of compacted crushed stone, in addition to the required aggregate base of the pavement section, if selected. We recommend that the thickness of undercut and compacted crushed stone be field-evaluated based on the conditions encountered during construction and using a test section. This alternative should also be considered if weather, other site conditions, or the project schedule make earthwork activities with clayey soils impractical. Chemical modification of the yielding soils with Lime Kiln Dust (LKD) could also be considered.

In areas not previously compacted as discussed above, or if the subgrade is exposed to wetting, drying or otherwise disturbed and deteriorated since compaction, we recommend that immediately prior to the placement of pavement or aggregate base, where provided, that the top 8 inches of clayey subgrade be scarified and recompacted per the requirements presented above.

If the selected pavement section includes an aggregate base, we recommend that caution be exercised so that the proposed aggregate base does not become saturated during or after construction. Water trapped in the aggregate base is capable of freezing, causing it to expand within the voids it occupies. Consequently, ice lenses may form and potentially heave the pavement. Furthermore, the thawing process can soften underlying cohesive subgrades, which reduces the pavement support provided by the subgrade, giving rise to “pumping” of the pavements under loads. Preferably, the aggregate base should be a free-draining material with provisions for draining the base through a system of underdrains.

Surface drainage should be directed away from the edges of proposed or existing pavements so that water does not pond next to pavements or flow onto pavements from unpaved areas. Such ponding or flow can cause deterioration of pavement subgrades and premature failure of pavements. If drainage ditches are used to intercept surface water before it reaches the pavements, the ditches should have an invert at least 6 inches below the pavement subgrade, and have a sufficient longitudinal gradient to rapidly drain the ditches and prevent ponding of water. In those areas where exterior grades do not fully slope away from the edges of the

proposed pavement, we recommend that edge drains be installed along the perimeter of the pavement.

2.2 Asphalt Pavement

We have completed the asphalt pavement design using the 2012 version of the Windows Pavement Analysis Software (WinPAS12) produced by the American Concrete Pavement Association (ACPA), which is based on the 1993 AASHTO Guide for Design of Pavement Structures published by the American Association of State Highway and Transportation Officials (AASHTO).

Table 1. Assumed AASHTO Flexible Pavement Design Parameters.

Assumed AASHTO Flexible Pavement Design Parameters.		
Pavement Type	Light-Duty	Heavy-Duty
Reliability	90%	90%
Standard Deviation	0.45	0.45
CBR	2.0	2.0
Soil Resilient Modulus	3,000 psi	3,000 psi
Estimated Equivalent Single Axle Loads (ESAL) over the Design Life of the Facility	15,000	100,000
Drainage Coefficient	1.0	1.0
Initial Serviceability	4.2	4.2
Terminal Serviceability	2.25	2.25

Based on the above input parameters and the Plantmix Asphalt Institute of Kentucky (PAIKY) Parking Lot Design Guide, we are providing the following alternate (alt.) minimum pavement sections for both light-duty and heavy-duty flexible sections.

Table 2. Flexible Pavement Minimum Thickness Recommendations.

Flexible Pavement Minimum Thickness Recommendations*					
Layer Type*	Structural Coefficient	Light-Duty Pavement Layer Thicknesses (in.)		Heavy-Duty Pavement Layer Thicknesses (in.)	
		Alt. 1	Alt. 2	Alt. 1	Alt. 2
Asphalt Surface Course	0.44	1.5	1.5	1.25	1.25
Asphalt Base Course	0.40	3.0	5.0	4.75	7.0
Dense Graded Aggregate	0.14	6.0	--	6.0	--

*The materials should meet the requirements set forth in the applicable sections of the Standard Specifications for Road and Bridge Construction, latest edition, published by the Kentucky Transportation Cabinet (KYTC).

2.3 Concrete Pavement

The design of the concrete pavement considered the methods included in Appendix A of the American Concrete Institute (ACI) Guide for the Design and Construction of Concrete Parking Lots, ACI 330R-08.

For light duty rigid sections, we recommend 4.5 inches of non-reinforced Portland cement concrete atop 6 inches of aggregate base. For heavy duty rigid sections, we recommend 6 inches of non-reinforced Portland cement concrete atop 6 inches of aggregate base. The Portland cement concrete for both light and heavy duty should have the following properties:

- 28-day compressive strength (f_c') of 4,000 psi;
- crushed limestone aggregate with a nominal maximum size of 1 inch;
- slump of 4 inches or less; and
- 6 percent air content.

3.0 RECOMMENDED ADDITIONAL SERVICES

We recommend that Geotechnology be retained to provide construction observation services as a continuation of the design process to confirm the recommendations in this report and to revise them accordingly to accommodate differing subsurface conditions. Construction observation is intended to enhance compliance with project plans and specifications. It is not insurance, nor does it constitute a warranty or guarantee of any type. Regardless of construction observation, contractors, suppliers, and others are solely responsible for the quality of their work and for adhering to plans and specifications.

4.0 LIMITATIONS

This report has been prepared on behalf of, and for the exclusive use of, Ampler Burgers, LLC for specific application to the named project as described herein. If this report is provided to other parties, it should be provided in its entirety with all supplementary information. In addition, Ampler Burgers, LLC should make it clear that the information is provided for factual data only, and not as a warranty of subsurface conditions presented in this report.

Geotechnology has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions. The recommendations and conclusions contained in this report are professional opinions. The report is not a bidding document and should not be used for that purpose.

Our scope did not include: any services to investigate or detect the presence of mold or any other biological contaminants (such as spores, fungus, bacteria, viruses, and the by-products of such organisms) on and around the site; or any services, designed or intended, to prevent or lower the risk of the occurrence of an infestation of mold or other biological contaminants.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the subsurface exploration. The field exploration methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Consequently, subsurface conditions may vary gradually, abruptly, and/or nonlinearly between sample locations and/or intervals.

The conclusions or recommendations presented in this report should not be used without Geotechnology's review and assessment if the nature, design, or location of the facilities is changed, if there is a substantial lapse in time between the submittal of this report and the start of work at the site, or if there is a substantial interruption or delay during work at the site. If changes are contemplated or delays occur, Geotechnology must be allowed to review them to assess their impact on the findings, conclusions, and/or design recommendations given in this report. Geotechnology will not be responsible for any claims, damages, or liability associated with any other party's interpretations of the subsurface data or engineering analyses in this report.

A copy of "Important Information about This Geotechnical-Engineering Report" that is published by the Geotechnical Business Council (GBC) of the Geoprofessional Business Association (GBA) is included in the appendix for your review. The publication discusses some other limitations, as well as ways to manage risk associated with subsurface conditions.

5.0 CLOSING

We appreciate the opportunity to provide the geotechnical services for this project. If you have any questions regarding this report, or if we may be of any additional service to you, please do not hesitate to contact us.

Respectfully submitted,
GEOTECHNOLOGY, LLC

Andrew C. Casto, PE
Senior Project Manager

Michelle E. Casto, PE
Senior Engineer

ACC/MEC:acc

Copies submitted: Ampler Burgers, LLC (email)
Charles William Pope & Associates (email)

Appendix attached

APPENDIX

Important Information about This

Geotechnical-Engineering Report

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

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

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

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