Intertek-PSI
37483 Interchange Drive
Farmington Hills, MI 48335

Tel (248) 957-9911
Fax (248) 957-9909
www@psiusa.com
intertek.com/building

November 10, 2021

Mr. Chad Gornall
Associate, Construction Manager
Taco Bell of America, Inc.
1 Glen Bell Way, MD #534
Irvine, CA 92618

RE: Level I Investigation
Proposed Taco Bell
17699 23 Mile Road
Macomb Township, Michigan
Taco Bell Site No. 315390
PSI Project No. 03811269

Dear Mr. Gornall:

In accordance with the Project Agreement for Architectural/Engineering/Consultant Services dated September 28, 2021, PSI has conducted a Level I investigation for the above referenced property.

Thank you for choosing PSI as your consultant for this project. If you have any questions, or if we can be of additional service, please contact us at your earliest convenience.

Respectfully submitted,
Professional Service Industries, Inc.

Mr. Kevin F. Dubnicki, PE
Senior Geotechnical Engineer

Copy: Mr. Billy N. Mitchell – PSI, Inc. – Kennesaw, GA

PHASE II LEVEL I
INVESTIGATION

FOR

PROPOSED TACO BELL
17699 23 MILE ROAD
MACOMB TOWNSHIP, MICHIGAN
TACO BELL SITE NO. 315390

PREPARED FOR

TACO BELL OF AMERICA, INC.
1 GLEN BELL WAY, MD #534
IRVINE, CA 92618

PREPARED BY

PROFESSIONAL SERVICE INDUSTRIES, INC.
37483 INTERCHANGE DRIVE
FARMINGTON HILLS, MICHIGAN, 48335
TELEPHONE (248) 957-9911

PSI NCG PROJECT NO. 03811269

NOVEMBER 10, 2021

Larisa Nouri
Staff Engineer

Kevin F. Dubnicki, P.E.
Senior Geotechnical Engineer
MI No. 57718

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EXECUTIVE SUMMARY

PSI has completed a Level I Investigation of the proposed Taco Bell Site No. 315390 located in the Macomb Township, Michigan. The assessment was performed in general accordance with the scope and limitations of Yum! Brands, Inc.'s Guidelines for Environmental Assessments and Geotechnical Engineering Studies, dated August 2006, to comply with the Project Agreement for Architectural/Engineering/Consultant Services between PSI and Yum! Brands, Inc. dated September 28, 2021.

This summary does not contain all the information that is found in the full report. The report should be reviewed in its entirety to obtain a more complete understanding of the information provided, and to aid in any decisions made or actions taken based on this information.

1. The site is located at 17699 23 Mile Road in Macomb Township, Macomb County, Michigan. At the time of PSI's geotechnical investigation, the property consisted of vacant property with tall grasses and limited trees. It is PSI's understanding that a former residential house occupied the project site and was located towards the front of the property based on imagery obtained through Google Earth. Access to the site will be from 23 Mile Road located on the south side of the proposed building. The topography of the site was relatively flat and exhibited an elevation difference of less than 1 foot based on Google Earth Pro and visual observations

2. PSI encountered approximately 7.5 to 8 inches of dark brown sandy topsoil at the locations of Borings B-1 through B-6. Fill consisting of dark brown silty clay with sand and pieces of wood was encountered at the location of Boring B-4 (Building Corner) extending to a depth of approximately 4.0 feet below the existing ground surface. In addition, an isolated area of silty sand was encountered at the location of Boring B-2 extending to a depth of approximately 4.0 feet below the existing ground surface. The apparent fill and sand layers were not encountered at the remaining boring locations. A stratum of mottled light gray and yellowish-brown sandy clay was encountered below the topsoil at the location of Borings B-1, B-3, B-5 and B-6. The mottled brown sandy clay extended to a depth of approximately 4.0 feet below the existing ground surface. A stratum of gray silty clay with variable percentage of sand was encountered below the mottled brown sandy clay, fill and sand at all boring locations. The gray silty clay extended to depths ranging from approximately 14.0 to 19.0 feet below the existing ground surface. A stratum of gray sandy clay and clayey sand was encountered below the gray silty clay at the locations of Borings B-1 through B-6. The gray sandy clay/clayey sand extended through the final explored depths approximately 20.5 feet below the existing ground surface.

3. Groundwater or perched water was encountered at the locations of Borings B-1 through B-6 ranging in depths from approximately 4.0 to 6.5 feet below the existing ground surface. The change in color of the soil from brown to gray may indicate the long-term minimum piezometric level in the area. Based on the subsurface conditions at the boring locations performed, the long term piezometric level at this site may be located at a depth of approximately 4 feet. It should also be noted that groundwater levels at this site may be subject to seasonal fluctuations or other mechanical control. Based on the Soil Conservation Service (SCS) Soil Survey of Macomb County (Issued November 1971), seasonal high groundwater elevations may be encountered at 0 to 1 foot below the ground surface present at this site. Therefore, groundwater may be anticipated during excavations associated with the proposed foundations.

PSI recommends that the contractor verify the actual groundwater and seepage conditions at the time of the construction activities and propose his site-specific groundwater control methods for the Engineer's approval, including the disposal of discharge water (if necessary).

4. PSI understands that a shallow spread footing and grade beam system is the preferred foundation type for the proposed restaurant structure. The encountered surficial very soft to soft sandy clay soils are not considered suitable for support of the proposed structure. In addition, apparent fill was encountered at the location of Boring B-4 extending to a depth of approximately 4.0 feet below the existing ground surface. However, suitable soils appear to be present at a depth of approximately 6.0 feet below the ground surface. PSI recommends the foundation extend through the soft clays and apparent fill to bear on the very stiff gray silty clay at a depth of approximately 6.0 feet below the ground surface. PSI recommends the foundation excavations be observed full time under PSI's representatives to confirm suitable soils are present and that foundations extend through the apparent fill.

   The site is generally suitable for the planned construction of a lightly loaded structure following site preparation detailed in Section 5.8 of this report. Conventional shallow spread footings or grade beams can be placed on the native medium stiff to very stiff silty clay soils (provided they are stable at the time of construction). The footings or grade beams should be designed for a maximum allowable net bearing pressure of 2,500 psf bearing on native soils. A single isolated footing or a grade beam designed as discussed should experience a settlement of less than 1 inch. However, if a cluster of closely spaced footings is planned, PSI should be contacted to calculate the potential settlement.

Detailed analyses of subsurface conditions and pertinent design recommendations are included herein. PSI cannot be responsible for the interpretation or implementation of this report by others. PSI should be retained to perform services sufficient to determine compliance with its recommendations. If PSI is not so retained, it will not accept any responsibility for the performance of the structure.

SUMMARY OF RECOMMENDATIONS

Design Item	Recommended Parameter	Reference Page No.
Foundations:		
Allowable Bearing Pressure: Spread Footing Wall Footing	2,500 psf (Bearing at a depth of approximately 6 feet) 2,500 psf (Bearing at a depth of approximately 6 feet)	1,12,13
Foundation Type	Spread Footing	1,12,13
Bearing Materials	Native gray silty clay	1,12,13
Ultimate Passive Lateral Resistance (EFP)	1,500 pcf (Silty Clay)	13
Coefficient of Friction	0.30	13
Soil Expansion Potential	Low	14
Geologic Hazards:		
Liquefaction Potential	Low	8
Nearest Fault and Magnitude	N/A	--
Fault Type	N/A	--
Seismic Zone	1	8
Soil Profile Type	S_D	8
Near-Source Distance	N/A	--
Seismic Coefficient, N_A	1.6	8
Seismic Coefficient, N_V	2.4	8
Subsidence Potential	NA	--
Pavement:		
AASHTO SN equal to or greater than 2.10 Light Traffic	3.5” AC / 8.0” AB Concrete: 5.0” PC / 6.0” AB	15,16,17
AASHTO SN equal to or greater than 2.94 Heavy Traffic	4.5” AC/ 8.0” AB Concrete: 8.0” PC /6.0” AB	15,16,17
Slabs:		
Building Floor Slabs	On Native Sandy Clay or Engineered Fill	14
Modulus of Subgrade Reaction	100 pci	14
Existing Site Conditions:		
Existing Native Soils	Sandy Clay over Silty Clay	1,9,10
Groundwater Depth (Historical High)	Approximately 4 feet; Seasonal high between 0’ and 1‘ per SCS	1,10
Near-Surface Corrosivity	Steel – Low (per SCS) Concrete – Moderate (per SCS)	--
Estimated Cut and Fill	To be determined after excavation	5,15,16
Existing Underground Structures	Unknown	--
Existing Aboveground Structures	None	4,18,19
Is the site in a 500 or 100-year flood plain	No	--

1. INTRODUCTION

1.1 Authorization

Authorization to perform this assessment was given by Mr. Chad Gornall, Associate, Construction Manager for Taco Bell of America, Inc., on October 6, 2021 and performed in general accordance with the Project Agreement for Architectural / Engineering / Consultant Services Form between Taco Bell of America, Inc. and PSI dated April 6, 2021.

1.2 Purpose and Scope of Work

The purpose of this study was to determine the geotechnical engineering parameters of the site. All work was conducted in accordance with Yum! Brands, Inc. Guidelines for Environmental Assessments and Geotechnical Engineering Studies, dated August 2006.

The scope of the geotechnical exploration and analysis included subsurface exploration, field and laboratory testing, and an engineering analysis and evaluation of the foundation materials.

1.3 Site Location

The site is located at 17699 23 Mile Road in Macomb Township, Macomb County, Michigan. A site location map is attached as Figure No. 1.

1.4 Site Description and Conditions

At the time of PSI's geotechnical investigation, the property consisted of vacant property with tall grasses and limited trees. It is PSI's understanding that a former residential house occupied the project site and was located towards the front of the property based on imagery obtained through Google Earth. Access to the site will be from 23 Mile Road located on the south side of the proposed building. The topography of the site was relatively flat and exhibited an elevation difference of less than 1 foot based on Google Earth Pro and visual observations. A boring location plan is attached as Figure No. 2.

1.5 Previous Geotechnical Data

No previous geotechnical engineering assessment was provided.

2. PROJECT DESIGN DATA

2.1 Development Plans

Based upon the information provided, it is understood that the proposed project consists of the construction of END-20 Taco Bell restaurant building with at-grade parking for 28 vehicles. A drive-thru lane will be constructed along the west side of the proposed building. Access to the site will be from 23 Mile Road located on the south side of the proposed lot.

2.2 Structure Types

The building will be a single story, wood frame or masonry structure with a truss roof system supported on the exterior foundation only. The trusses span the transverse (short) direction of the building. At the front of the building, columns, which support beams and headers, are concealed within longitudinal exterior walls.

2.3 Foundation Loads

The maximum structural loads on longitudinal (side) bearing walls are about 1,300 pounds per linear foot (plf). Maximum column loads are approximately 20 kips. Maximum loads to the transverse (front and rear) non-bearing walls are about 300 plf (dead load only). The floor slab will carry a maximum design live load of 100 pounds per square foot (psf).

2.4 Grading and Slopes

Neither a site grading plan nor the finished floor elevation of the proposed building was provided at the time of our investigation. For the purposes of our analysis, PSI assumes that the proposed building finished floor will be constructed at or near the existing grade. Based on visual observations of the existing site topography. If any of this information is incorrect, please notify the geotechnical engineer so that he may determine if changes in the foundation recommendations are required.

2.5 Pavement

Depending on the site conditions, either of two types of pavements may be used: Flexible Asphalt Concrete (AC) surfaced pavement; or Rigid Portland Cement (PC) Concrete pavement. It is anticipated that the parking lot is divided into two areas: 1) driving lanes, 2) parking stalls. The driving lanes will be subjected to a minimum daily traffic of 1,000 cars and five 18,000 pounds single axle load from heavy trucks. The parking stalls will experience 100 cars per day. Parking stall pavements will only be used where there are portions of lots that will not receive truck traffic. The structural section design shall be based on a twenty-year design period to determine pavement thickness and subgrade preparation requirements.

Pavement structural sections are to be designed according to American Association of State Transportation and Highway Official Standards, Portland Cement Association procedures, or applicable design procedures used by local government or State Transportation Department. Repeated stopping and starting motions will be taken into account during the design.

3. SUBSURFACE INVESTIGATION

3.1 Soil Borings

A total of six (6) soil borings were performed with a truck-mounted rotary drill rig (CME-75) and All-Terrain Vehicle (ATV) mounted rotary drill rig. Conventional 2 ¼-inch hollow-stem augers were used to advance the holes.

Standard Penetration Tests were performed in accordance with ASTM designation D1586. Split spoon samples were collected in the field at the surface, at 2.5-foot intervals in the top 15 feet, and on five-foot centers thereafter. The samples were transported to our laboratory for visual classification and laboratory testing. The samples were identified according to boring number and depth, and sealed in glass jars to protect against moisture loss.

3.2 Field Testing

3.2.1 Strength Tests

During the field boring operations, Standard Penetration Tests were performed at all sample depths. A hand penetrometer was used in the laboratory on intact samples as an aid in estimating the shear strength of the soil.

3.2.2 Water Level Measurements

Water level depths were obtained during performance of the test boring operations. They are noted on the test boring logs presented in the Appendix. In relatively pervious soils, such as sandy soils, the indicated depths are usually reliable groundwater levels. In relatively impervious soils, a suitable estimate of the groundwater depth may not be possible, even after several days of observation. Seasonal variations, temperature, land-use, proximity to a river, canal, or large body of water and recent rainfall conditions may influence the depths to the groundwater. Volumes of water will largely depend on the permeability of the soils.

3.2.3 Ground Surface Elevations

Ground surface elevations at the test boring locations were not provided. Prior to final design and construction, PSI recommends the elevation of the existing ground surface at the boring locations performed by determined by a professional land surveyor registered in the State of Michigan. References to depth of the various strata encountered are from existing grade at the time of our drilling operations.

3.3 Laboratory Testing

In addition to the field investigation, a supplemental laboratory testing program was conducted to determine additional pertinent engineering characteristics of the foundation materials necessary in analyzing the behavior of the foundation systems for the proposed restaurant.

The laboratory testing program included supplementary visual classification (ASTM D2487), water content tests (ASTM D2216), partial sieve analysis (ASTM 6913), unconfined compressive strength (ASTM D2166) and Atterberg limit tests (ASTM D4318) on selected samples.

Estimates of unconfined compressive strengths were made by the use of a calibrated hand penetrometer.

All phases of the laboratory testing program were conducted in general accordance with applicable ASTM Specifications. The results of these tests are to be found on the accompanying boring logs in the Appendix.

4. FINDINGS AND INTERPRETATION

4.1 Regional and Local Geology

The general geomorphology and near-surface geology of the site is associated with Lacustrine clay and silt. The near surface geology of the site is expected to consist predominately of Lenawee silty clay loam and possible Selfridge loamy sand. The area is considered very poorly drained to somewhat poorly drained soils. These soils occur nearly level soils over Lacustrine clay and silt according to the Natural Resources Conservation Service Soil Survey of Macomb County online spatial data. The Lacustrine clay and silt is underlain by the Berea Sandstone and Bedford Shale bedrock formed during the Middle Devonian period (USGS On-line Spatial Data).

4.2 Seismicity

Macomb County, Michigan lies in the Central Stable Tectonic Region and in the Seismic Zone 1 of probable seismic activity of the Building Officials Congress of America (BOCA), National Building Code and the Uniform Building Code (UBC). This zone indicates that minor damages due to occasional earthquakes might be expected in this area.

Soil borings at the project site extended to a maximum depth of approximately 20 feet below the existing ground surface. Based on regional geologic mapping and past experience in the general project area, PSI anticipates that the subsurface conditions below the explored depth may generally consist of Lacustrine clay and silt underlain by Berea Sandstone or Bedford Shale bedrock at depths assumed to be greater than 100 feet below the existing ground surface. Based on our review of the available data, knowledge of regional geology, the Standard Penetration Test (SPT) N-values and unconfined compressive strength tests, we recommend that the seismic design for this project be based on **Site Class D**.

The 2015 IBC recommended seismic parameters for the site (which uses 2008 USGS hazard data) interpolated between the nearest four grid points from latitude 42.411650 and longitude -82.913500 and Site Class D obtained from the USGS geohazards web page (http://eqdesign.cr.usgs.gov/html/designmaps/us/application.php), are as follows (based on site class D):

Period (seconds)	2% Probability of Event in 50 years* (%g)	Site Coefficients	Max. Spectral Acceleration Parameters	Design Spectral Acceleration Parameters	
0.2 (S_s)	8.7	F_a = 1.60	S_{ms} = 0.139	S_{Ds} = 0.093	T_0 = 0.153
1.0 (S_1)	4.5	F_v = 2.40	S_{m1} = 0.107	S_{D1} = 0.071	T_s = 0.763

$S_{ms} = F_aS_s$ $S_{Ds} = 2/3*S_{ms}$ $T_0=0.2*S_{D1}/S_{Ds}$

$S_{m1} = F_vS_1$ $S_{D1} = 2/3*S_{m1}$ $T_s = S_{D1}/S_{Ds}$

The site coefficients F_a and F_v were interpolated from the 2015 IBC Tables 1613.3.3(1) and 1613.3.3(2) as a function of the site classification and the mapped spectral response acceleration at the short (S_s) and 1 second (S_1) periods.

Based on the spectral response acceleration coefficients S_{Ds} and S_{D1} above, the Seismic Design Category for this site is **Category A** and **Category B** for occupancy categories I through III, and **Category A** and **Category C** for occupancy category IV, respectively as prescribed by the 2015 IBC Tables 1613.3.5(1) and 1613.3.5(2).

4.3 **Subsurface Soil Conditions**

4.3.1 General

The types of foundation bearing materials encountered in the test borings have been visually classified. They are described in detail on the boring records. The results of the field penetration tests, strength tests, water level observations, and other laboratory tests are presented on the boring records in numerical form. Representative samples of the soils were placed in glass containers and are now stored in the laboratory for further analysis, if desired. Unless notified to the contrary, all samples will be disposed after 3 months.

The stratification of the soil as shown on the boring records represents the soil conditions at the actual boring locations. Variations may occur between, or beyond, the borings. Lines of demarcation represent the approximate boundary between the soil types, but the transition may be gradual, or not clearly defined.

It is to be noted that, whereas the test borings are drilled and sampled by experienced drillers, it is sometimes difficult to record changes in stratification within narrow limits, especially at great depths. In the absence of foreign substances, it is also difficult to distinguish between discolored soils and clean soil fill.

4.3.2 Soil Conditions

The site was explored by drilling seven (7) soil test borings. The following summarizes the approximate locations:

Boring Number	Existing Conditions	Proposed Location
B-1	Sandy Clay underlain by Silty Clay	Trash Enclosure
B-2	Sand underlain by Silty Clay	Pavement Area
B-3	Sandy Clay underlain by Silty Clay	Building Corner
B-4	Fill – Silty Clay with trace wood/organics underlain by Silty Clay	Building Corner
B-5	Sandy Clay underlain by Silty Clay	Pavement Area
B-6	Sandy Clay underlain by Silty Clay	Pavement Area

PSI encountered approximately 7.5 to 8 inches of dark brown sandy topsoil at the locations of Borings B-1 through B-6. Fill consisting of dark brown silty clay with sand and pieces of wood was encountered at the location of Boring B-4 (Building Corner) extending to a depth of approximately 4.0 feet below the existing ground surface. In addition, an isolated area of silty sand was encountered at the location of Boring B-2 extending to a depth of approximately 4.0 feet below the existing ground surface. The apparent fill and sand layers were not encountered at the remaining boring locations. A generalized soil description encountered in the borings, beginning below the topsoil, sand and fill proceeding downward, is as follows:

A stratum of mottled light gray and yellowish-brown sandy clay was encountered below the topsoil at the location of Borings B-1, B-3, B-5 and B-6. The mottled brown sandy clay extended to a depth of approximately 4.0 feet below the existing ground surface. Standard Penetration Test values ("N"-values) ranged from 3 to 7 blows per foot. The un-drained shear strength of the mottled brown sandy clay stratum ranged between 250 to 1,250 psf, thereby indicating consistencies of very soft to stiff. The natural moisture contents of the tested soil samples from the mottled brown sandy clay ranged from approximately 12 to 21 percent. The recovered soil samples visually appeared to be in a very moist to wet condition when examined in the laboratory.

A stratum of gray silty clay with variable percentage of sand was encountered below the mottled brown sandy clay, fill and sand at all boring locations. The gray silty clay extended to depths ranging from approximately 14.0 to 19.0 feet below the existing ground surface. Standard Penetration Test values ("N"-values) ranged from 3 to 12 blows per foot. The un-drained shear strength of the gray silty clay stratum ranged between 700 to 3,500 psf, thereby indicating consistencies of medium stiff to very stiff. The natural moisture contents of the tested soil samples from the gray silty clay ranged from approximately 19 to 40 percent. The recovered soil samples visually appeared to be in a wet condition when examined in the laboratory. Atterberg limit tests performed on representative samples of the silty clay stratum prepared from Borings B-3 and B-4 indicates the soil to be moderate to high in plasticity with Liquid Limit's (LL) ranging from 36 to 44 and Plastic Limit's (PL) ranging from 15 to 22.

A stratum of gray sandy clay and clayey sand was encountered below the gray silty clay at the locations of Borings B-1 through B-6. The gray sandy clay/clayey sand extended through the final explored depths approximately 20.5 feet below the existing ground surface. Standard Penetration Test values ("N"-values) ranged from 25 to greater than 50 blows per foot. The un-drained shear strength of the gray sandy clay stratum ranged between 3,250 to greater than 4,500 psf, thereby indicating consistencies of very stiff to hard. The natural moisture contents of the tested soil samples from the gray sandy clay/clayey sand typically ranged from approximately 8 to 17 percent with a higher value of 35 percent at the location of boring B-1. The recovered soil samples visually appeared to be in a very moist to wet condition when examined in the laboratory.

4.4 Groundwater Conditions

Groundwater or perched water was encountered at the locations of Borings B-1 through B-6 ranging in depths from approximately 4.0 to 6.5 feet below the existing ground surface. It should be noted that water levels in the boreholes may require additional time to stabilize depending on the permeability of the soils. Due to the project schedule and for safety reasons, the boreholes were backfilled at the end of the field exploration day. In addition, it should be noted that soils were observed to be in a moist to very moist condition in the laboratory and that groundwater levels at this site may be subject to seasonal fluctuations or other mechanical control. The change in color of the soil from brown to gray may indicate the long-term minimum piezometric level in the area. Based on the subsurface conditions at the boring locations performed, the long term piezometric level at this site may be located at a depth of approximately 4 feet.

It should also be noted that groundwater levels at this site may be subject to seasonal fluctuations or other mechanical control. Based on the Soil Conservation Service (SCS) Soil Survey of Macomb County (Issued November 1971), seasonal high groundwater elevations may be encountered at 0 to 1 foot below the ground surface present at this site. PSI recommends that the contractor verify the actual groundwater and seepage conditions at the time of the construction

activities and propose his site-specific groundwater control methods for the Engineer's approval, including the disposal of discharge water (if necessary).

5. ENGINEERING RECOMMENDATIONS

5.1 Special Conditions and Mitigating Measures

The site is generally suitable for the planned construction of a lightly loaded structure following site preparation detailed in Section 5.8 of this report.

PSI understands that a former residential home occupied the site. PSI is not aware if all foundation structures have been removed from the project site. If encountered, former foundations and floor slabs should be removed and all debris cleared from the site. Depressions resulting from the removal of these items, including any existing depressions, should be backfilled with properly compacted engineered fill or specified materials, such as lean concrete or grout, to the final design grade under supervision of a PSI geotechnical representative. Engineered fill should be placed, compacted and tested as outlined in the following paragraphs of this report.

Where the removal of localized unsuitable bearing material is performed beneath the proposed footings and the excavation is backfilled with compacted fill materials, the excavation must extend laterally beyond the perimeter of the foundation for a distance equal to one-half of the thickness of the engineered backfill placed below the footing bottom. The over excavation is necessary for proper support of lateral loads exerted through the new fill by the foundations.

5.1.1 Proposed Structure

PSI understands that a shallow spread footing and grade beam system is the preferred foundation type for the proposed restaurant structure. The encountered surficial very soft to soft sandy clay soils are not considered suitable for support of the proposed structure. In addition, apparent fill was encountered at the location of Boring B-4 extending to a depth of approximately 4.0 feet below the existing ground surface. However, suitable soils appear to be present at a depth of approximately 6.0 feet below the ground surface. PSI recommends the foundation extend through the soft clays and apparent fill to bear on the very stiff gray silty clay at a depth of approximately 6.0 feet below the ground surface. PSI recommends the foundation excavations be observed full time under PSI's representatives to confirm suitable soils are present and that foundations extend through the apparent fill.

Conventional shallow spread footings or grade beams can be placed on the native medium stiff to very stiff silty clay soils (provided they are stable at the time of construction). The footings or grade beams should be designed for a maximum allowable net bearing pressure of 2,500 psf bearing on native soils. A single isolated footing or a grade beam designed as discussed should experience a settlement of less than 1 inch. However, if a cluster of closely spaced footings is planned, PSI should be contacted to calculate the potential settlement.

Exterior footings and footings in unheated areas should be located at a minimum depth of 42 inches below the final exterior grade for proper protection against frost during normal winters. Interior footings may be supported at a shallower depth, while providing necessary clearance for pavement and utility construction, provided they are bearing on suitable, undisturbed native soils or properly placed and compacted engineered fill. A minimum depth of 24 inches is recommended for stability. If the structures are to be constructed during the winter months or if footings will likely be subjected to freezing temperatures after foundation construction, then all footings should be adequately protected from freezing.

PSI recommends that the foundation inverts be properly compacted in place under PSI representative's supervision prior to placement of formwork or cast-in-place foundation concrete to densify any soils disturbed during excavation. The compaction should continue until no additional densification is observed with additional passes. However, earthwork and construction operations taking place within a distance of approximately 2 to 3 feet or so of the prevailing groundwater can cause groundwater to be 'wicked' upward, resulting in subgrade instability. Therefore, depending on the groundwater conditions at the time of construction, it may be necessary to compact the foundation invert with a 'static' roller if vibration causes moisture to be 'wicked' upward, resulting in subgrade instability. In areas where high groundwater or perched water conditions are encountered during site grading and foundation excavation activities, the contractor should be prepared to perform site-dewatering measures to allow earthwork, subgrade preparation including undercutting and proof-rolling and fill placement as well as foundation excavation and construction, to take place under relatively dry conditions. PSI recommends that the Contractor verify the actual groundwater and seepage conditions at the time of the construction activities and propose a groundwater control method(s) for the Engineer's approval, including the disposal of discharge water. If the contractor elects to attempt earthwork operations at this site without first lowering the groundwater level or controlling the groundwater seepage, remedial measures may be necessary to re-establish stable subgrade conditions.

Depending on the conditions of the exposed soils at the time of construction, it may be necessary to place a layer of crushed stone and geotextile separator fabric such as an Amoco 2000 series or locally available equivalent such as SKAPS GT180 at the bottom of the foundation excavations to maintain the stability of the bearing surface and create a working platform on which to construct the shallow spread footing foundations or grade beams.

5.1.2 Proposed Sign Area

At the time of this investigation, the exact loads for the sign pole were not available. However, we understand that the sign foundation typically consists of a shallow spread footing or drilled pier. Boring B-4 was drilled nearest the proposed monument sign location. The sign foundation should extend through the soft silty clay and bear on the very stiff gray silty. Foundations must be placed a minimum of 3.5 feet below the existing ground surface but are anticipated to be at a minimum depth of approximately 4.0 feet below the existing ground surface. Spread footings should be designed for a maximum allowable net bearing pressure of 2,500 psf bearing on the native gray silty clay.

The horizontal loads on a shallow spread footing sign foundation will be resisted by the base friction and the passive soil resistance. For a spread footing placed at least 42 inches below the existing ground surface onto the native medium stiff sandy clay soils, the ultimate base adhesion can be taken as 1,500 psf. Where the monument sign foundation is supported over compacted granular engineered fill, the friction coefficient between the concrete footing and soil can be assumed to be 0.30. The allowable passive earth pressure can be calculated using an estimated equivalent fluid pressure (EFP) of 250 pcf for limited deflection.

The uplift resistance of a shallow foundation formed in an open excavation will be limited to the weight of the foundation and the soil above it. For design purposes, the ultimate uplift resistance should be based on effective unit weights of 120 and 150 pcf for soil and concrete, respectively. This value should then be reduced by a factor of safety of 2.0 to arrive at the allowable uplift load. For transient loads, the factor of safety is 1.5. If there is a chance of submergence, the unit weights should be taken as 60 and 90 pcf for the soil and concrete, respectively.

5.1.3 Proposed Trash Enclosure

Fill was encountered at the location of the proposed trash enclosure. The proposed trash enclosure masonry walls can be supported on conventional shallow spread footing foundations extending through the encountered fill and bear on native sandy soils. The footings or grade beams should be designed for a maximum allowable net bearing pressure of 2,000 psf. The footings should bear a minimum of 42 inches below existing grade for proper protection against frost during normal winters. PSI recommends that the foundation inverts be compacted in place prior to placement of formwork or cast-in-place foundation concrete to densify any soils disturbed during excavation as recommended above in Section 5.2.1 for the proposed building structure.

5.2 Concrete Slabs-on-Grade

PSI anticipates the floor slab will be supported by native sandy clay soils. Floor slabs utilized in conjunction with a spread footing or grade beam foundation system may consist of a soil supported slab-on-grade. PSI recommends the placement of a minimum of 4 inches of crushed stone beneath the slabs. It may also be desirable to use polyethylene sheeting between the crushed stone and the slab as a vapor barrier. PSI recommends that a vertical subgrade modulus, k value of 100 pounds per cubic inch, as determined by a 1-foot by 1-foot plate load test, be used in floor slab-on-grade design calculations.

5.3 Expansive Soils

Not encountered at this project site.

5.4 Lateral Earth Pressures

This site does not require the design of geotechnical systems for lateral earth pressures and therefore, no information is provided.

5.5 Slopes

No slopes are planned to be a part of the final design for this site and therefore no information is provided.

5.6 Excavation De-Watering

Groundwater or perched water was encountered at the locations of Borings B-1 through B-6 ranging in depths from approximately 4.0 to 6.5 feet below the existing ground surface. The change in color of the soil from brown to gray may indicate the long-term minimum piezometric level in the area. Based on the subsurface conditions at the boring locations performed, the long term piezometric level at this site may be located at a depth of approximately 4 feet. It should also be noted that groundwater levels at this site may be subject to seasonal fluctuations or other mechanical control. Based on the Soil Conservation Service (SCS) Soil Survey of Macomb County (Issued November 1971), seasonal high groundwater elevations may be encountered at 0 to 1 foot below the ground surface present at this site. Therefore, groundwater may be anticipated during excavations associated with the proposed foundations.

PSI recommends that the contractor verify the actual groundwater and seepage conditions at the time of the construction activities and propose his site-specific groundwater control methods for the Engineer's approval, including the disposal of discharge water (if necessary).

Because the foundation materials and soils exposed in the bottom of undercut excavations generally tend to soften when exposed to free water, every effort should be made to keep any excavations dry if water is encountered or if storm water runoff enters the excavations. A gravity drainage system, sump pump, or other conventional minor dewatering procedure should be sufficient for excavations shallower than about 6 feet depending on the water table at the time of construction. Sloping excavations to one corner will aid in removal of accumulated groundwater or surface runoff.

5.7 Pavement Design

In designing the proposed parking lots or roadways, the existing subgrade conditions must be considered together with the expected traffic use and loading conditions. The conditions that will influence the pavement design can be summarized as follows:

- Bearing values of the subgrade. These can be represented by a California Bearing Ratio (CBR) for the design of flexible pavements, or a Modulus of Subgrade Reaction (K) for rigid pavements.
- Vehicular traffic, in terms of the number and frequency of vehicles and their range of axle loads.
- Probable increase in vehicular use over the life of the pavement.
- The availability of suitable materials to be used in the construction of the pavement and their relative costs.

After site stripping and undercutting unsuitable/unstable soil sections (as necessary), the exposed soils should be thoroughly proof rolled/compacted with a large, heavy rubber-tired vehicle. Areas that exhibit instability or are observed to rut or deflect excessively under the moving load should be undercut, stabilized by aeration, drying (if wet) and additional compaction to attain a stable finished subgrade. The proof rolling/compacting and undercutting activities should be performed during a period of dry weather and should be performed under the supervision of the geotechnical engineer's representative. Where subgrade conditions are not improved through undercutting and replacement or where aeration, drying and compaction are considered impractical due to the underlying soil and groundwater conditions, time constraints, and/or seasonal limitations, it may be necessary to stabilize the subgrade soils with chemical additives such as hydrated lime, cement, fly ash or lime kiln dust. A contractor specializing in this type of work should be consulted in developing the mix design for this site as well as for placement and mixing of the additives on-site. PSI can assist with this process if desired. Alternatively, localized areas of subgrade instability can be stabilized in-place with a woven geotextile, geogrid and a layer of well graded crushed concrete or well graded coarse aggregate such as MDOT 4AA, 6A or 21AA. The need for the use of chemical additives, geotextile, geogrid and the thickness and gradation requirements of the crushed aggregate layer required should be determined at the time of the subgrade preparation, based on the condition of the exposed subgrade at the time of construction. The subgrade should be stabilized prior to placement of engineered fill or aggregate base course.

In addition, we recommend the upper 18 inches of the existing soils at the site be scarified and properly recompacted in place to not less than 95 percent of the maximum dry density as determined by ASTM D698 (Standard Proctor). The moisture content at the time of compaction should be within 2 percentage points of the optimum value. Any removed fill should be replaced by compacted structural fill to arrive at the desired grade.

Based on the traffic information provided and the Yum! Brands minimum pavement requirements, the pavement thickness values are shown in the following tables. The pavement section thicknesses are being provided based on our experience with similar subgrade soil conditions in the project area. The recommended pavement sections meet or exceed the Yum! Brands minimum pavement requirements in terms of AASHTO structural number analysis methodology of 2.10 for the light duty section and 2.94 for the heavy-duty pavement section. The pavement design values presented below should be considered the minimum recommended thickness. Based on the traffic information provided, the pavement thickness values are shown in the following tables.

Light Duty Flexible Pavement Options	
Asphaltic Concrete Surface Course MDOT 5E03	1.5"
Asphaltic Concrete Binder Course MDOT 4E03	2”
Dense Aggregate Base Stone MDOT 21AA	8”
Compacted Subgrade (Minimum)	12"

Heavy Duty Flexible Pavement Options	
Asphaltic Concrete Surface Course MDOT LVSP	2.0"
Asphaltic Concrete Binder Course MDOT LVSP	2.5”
Dense Aggregate Base Stone MDOT 21AA	8”
Compacted Subgrade (Minimum)	12"

The recommended light and heavy-duty rigid concrete pavement sections are provided in the following table:

Rigid Pavement	**Light**	**Heavy**
Portland Cement Concrete	5”	8”
Dense Aggregate Base Stone, MDOT 21AA	6”	6”

Compacted Subgrade (Minimum)	12”	12”

Dense Aggregate Base materials in flexible pavement areas should be placed in maximum 8-inch loose lifts and compacted to at least 100% of the Standard Proctor (ASTM D 698) maximum dry density near optimum moisture content.

The use of concrete for paving has become more prevalent in recent years due to a decrease in the material cost of concrete and to the long-term maintenance cost benefits of concrete compared to asphaltic pavements. Should concrete pavement be utilized, the concrete should be properly jointed, and should have a minimum 28-day compressive strength of 3500 psi. Expansion joints should be sealed with a polyurethane sealant so that moisture infiltration into the subgrade soils and resultant concrete deterioration at the joints is minimized.

Allowances for proper drainage and proper material selection of base materials are most important for performance of asphaltic pavements. Ruts and birdbaths in asphalt pavement allow for quick deterioration of the pavement primarily due to saturation of the underlying base and subgrade. Concrete pavement at least seven (7) inches thick is recommended for the trash dump approach due to the high wheel and impact loads that this area receives. Concrete pavement is recommended in areas, which receive continuous repetitive traffic such as drive-through or loading lanes and parking lot entrances.

5.8 **Site Grading**

Prior to site grading activities or excavation for foundation elements, PSI recommends that existing underground utilities be identified and rerouted or properly abandoned in-place. Existing underground utilities that are not re-routed or abandoned should be adequately marked and protected to minimize the potential for damage during construction activities.

Former foundations and floor slabs should be removed and all debris cleared from the site. Depressions resulting from the removal of these items, including any existing depressions, should be backfilled with properly compacted engineered fill or specified materials, such as lean concrete or grout, to the final design grade under supervision of a PSI geotechnical representative. Engineered fill should be placed, compacted and tested as outlined in the following paragraphs of this report.

Where the removal of localized unsuitable bearing material is performed beneath the proposed footings and the excavation is backfilled with properly compacted engineered fill materials, the excavation must extend laterally beyond the perimeter of the foundation for a distance equal to one-half of the thickness of the engineered backfill placed below the footing bottom. The over excavation is necessary for proper support of lateral loads exerted through the new fill by the foundations. Removal of the old fill should be performed under full time supervision of PSI’s geotechnical representative.

Based on the borings performed, fill consisting predominately of dark brown sandy clay with pieces of wood and trace organics was encountered bellow the proposed building at the location of Boring B-4 and extended to a depth of approximately of 4.0 feet below the existing ground surface.

Uncontrolled fills (defined as fill material that consist of organics and other deleterious materials or soil materials that have not been placed in a manner to produce consistent density, uniform moisture content and consistent engineering properties) and native soils with organics may experience significant volume changes, resulting in excessive foundation settlement and poor floor slab and pavement performance including faulting and cracking, when subjected to loads from foundations, floor slabs and pavements placed over them. Due to the variability of the fill soil materials, presence of deleterious materials and variability of the N-values, the engineering characteristics of the fill soils, including bearing capacity and settlement potential, are likely to be extremely variable. **Therefore, the uncontrolled fill and native soils with organics are generally not considered to be suitable for direct support of at-grade structures such as foundations, floor slabs and pavements.** PSI recommends an onsite evaluation during excavation to determine the type and severity of the apparent fill and provide further recommendations.

If the owner is willing to accept the risk in doing so, a portion of the existing fill may remain in-place below the proposed site pavements. The long-term performance of the pavement section will typically be a function of the quality of the subgrade at the time of construction, and the quality, thickness and strength of the pavement section. The most critical portion of the subgrade is the upper 2 to 3-foot section. This zone provides the primary strength needed for support of the pavement section. Therefore, the risk of poor pavement performance can be reduced (but not completely eliminated) by partial depth undercutting of the critical upper 2 to 3 foot section of the subgrade and replacement of the existing fill with clean imported engineered fill. Risk remains of poor pavement performance due to the inherent uncertainty associated with supporting the pavements over existing uncontrolled fill or discolored, organic-containing native soils, which the Owner must recognize and accept if some or the entire fill thickness is left in place.

After site stripping and undercutting unsuitable/unstable soil sections (as necessary), the exposed soils should be thoroughly proof rolled/compacted with a large, heavy rubber-tired vehicle. Areas that exhibit instability or are observed to rut or deflect excessively under the moving load should be undercut, stabilized by aeration, drying (if wet) and additional compaction to attain a stable finished subgrade. The proof rolling/compacting and undercutting activities should be performed during a period of dry weather and should be performed under the supervision of the geotechnical engineer's representative.

Where subgrade conditions are not improved through undercutting and replacement or where aeration, drying and compaction are considered impractical due to the underlying soil and groundwater conditions, time constraints, and/or seasonal limitations, it may be necessary to stabilize the subgrade soils with chemical additives such as hydrated lime, cement, fly ash or lime kiln dust. A contractor specializing in this type of work should be consulted in developing the mix design for this site as well as for placement and mixing of the additives on-site. PSI can assist with this process if desired. Alternatively, localized areas of subgrade instability can be stabilized in-place with a woven geotextile, geogrid and a layer of well graded crushed concrete or well graded coarse aggregate such as MDOT 4AA, 6A or 21AA. The need for the use of chemical additives, geotextile, geogrid and the thickness and gradation requirements of the crushed aggregate layer required should be determined at the time of the subgrade preparation, based on the condition of the exposed subgrade at the time of construction. The subgrade should be stabilized prior to placement of engineered fill or aggregate base course.

New fill supporting at-grade structures should be an environmentally clean material, free of organic matter, frozen soil, or other deleterious material. The material proposed to be used as engineered fill should be evaluated and approved for use by a PSI geotechnical engineer or his representative prior to placement in the field. Fill materials should be placed in maximum horizontal lifts of 8 inches of loose material and should be compacted within the range of ±2% of the optimum moisture content value. Moisture contents should be adjusted to the proper levels prior to placement and compaction. Adequate compaction will not be achieved if the fill is in a saturated condition. Wet soils may require drying or mixing with dry soil to facilitate compaction. If water must be added to dry soil, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying prior to compaction.

Organic soils, old fill and other deleterious materials, which are removed or uncovered during site grading and subgrade undercut operations, foundation and utility excavations at this site, must be wasted in non-load bearing areas such as landscaped areas or removed from the site as directed by the project's engineer and should not be reused as engineered fill in other areas of the site.

The excavation side slopes should be sloped or benched in accordance with OSHA requirements. The bottom of the excavation should be sloped to drain toward one end in the event rain or natural groundwater seepage occurs while the excavation is open. The bottom of the excavation should then be compacted/proofrolled using a sheep's foot vibratory compactor making a minimum of 8 passes across the excavation. The area should be checked by a geotechnical engineer and judged suitable prior to placement of new compacted engineered fill. Engineered fill should then be placed in accordance with the guidelines and procedures found in the following paragraphs.

In parking and drive areas of the site, the subgrade should be proofrolled to detect zones of loose, soft or wet soils following undercutting and before placement of engineered fill. Proofrolling consists of repeated passes over the subgrade with a loaded dump truck or loaded bucket loader. Areas, which rut or pump excessively should be further undercut and replaced with properly compacted fill. The near-surface soils are anticipated to consist predominately of fine and fine to medium grained granular soil. PSI generally does not anticipate difficulty in achieving a stable subgrade within these soils. However, to reduce the undercut depths in any isolated of subgrade instability, a geotextile fabric such as an Amoco 2000 series or locally available equivalent such as SKAPS GT180 may be used in lieu of undercutting greater than 2 feet below subgrade. The fabric would serve to reinforce the subgrade and provide a suitable working base for fill placement.

PSI recommends that all fill be compacted to a minimum of 95 percent of the soils standard Proctor maximum dry density (ASTM D698), with a moisture content within 2 percentage points of the optimum moisture. Lift thickness' should be 8 inches or less, loose measure. Fill soils should have the following characteristics:

- A liquid limit (LL) of less than 40 and a plasticity index (PI) of less than 20.
- A standard Proctor maximum dry density of at least 100 pounds per cubic foot.
- The fill soils have a maximum particle size of no more than 3 inches.

Fill placement should be monitored and tested during construction by experienced engineering technicians. Field density tests should be conducted as required to document compaction requirements with a minimum of 5 tests conducted for every lift of fill placed. Any area failing to

achieve both the required compaction and moisture requirements should be recompacted or moisture conditioned and retested.

It will be important to maintain positive site drainage during construction. Storm water runoff should be diverted around the building and parking areas. The site should be graded at all times such that water is not allowed to pond. If any surface soils become wet due to rains, they should be removed or allowed to dry prior to further site work operations and/or fill placement.

5.9 Post Investigation Services

As indicated above within sections 5.2 and 5.7.

6. REPORT LIMITATIONS

The recommendations submitted in this report are based on the available subsurface information obtained by PSI and design details furnished by Taco Bell of America, Inc. for the purpose of this project. If there are any revisions to the plans for this project, or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If PSI is not notified of such changes, PSI will not be responsible for the impact of those changes on the project.

Subsurface conditions may vary between boring locations. PSI recommends that the contract specifications include the following clause:

"The contractor will, upon becoming aware of subsurface or latent physical conditions differing from those disclosed by the original soil exploration work, promptly notify the owner verbally to permit verification of the conditions, and in writing, as to the nature of the differing conditions. No claim by the contractor for any conditions differing from those anticipated in the plans and specifications and disclosed by the soil studies will be allowed unless the contractor has so notified the owner, verbally and in writing, as required above, of such differing conditions."

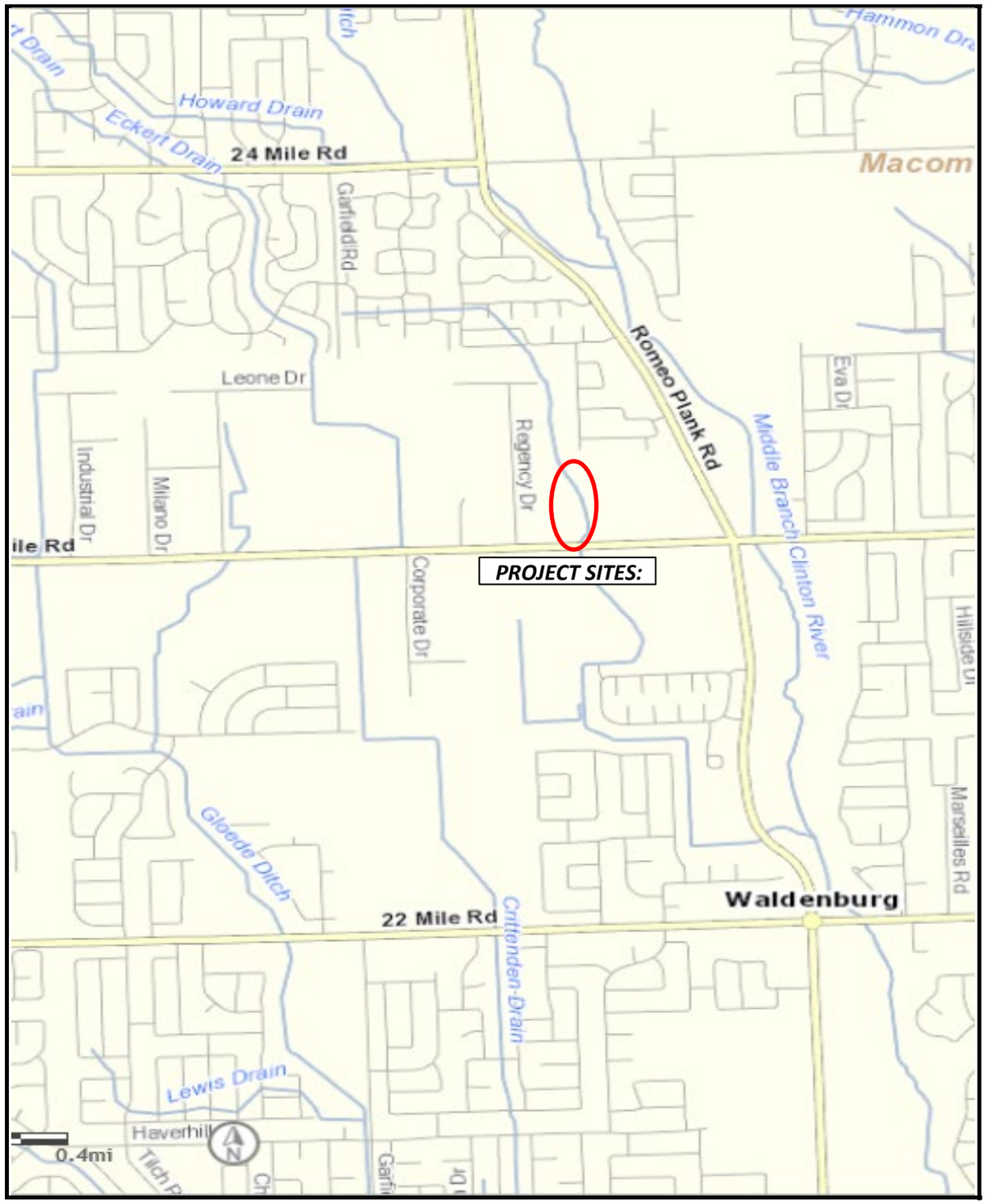
The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project. This report has been prepared for the exclusive use of the Taco Bell of America, Inc. for the specific application to the proposed Taco Bell Site #315390 to be located at 17699 23 Mile Road in Macomb Township, Macomb County, Michigan.

APPENDIX

SITE VICINITY SKETCH

SITE LOCATION MAP



N

PROJECT NAME:	PROJECT NUMBER	Figure No.
Proposed Taco Bell #315390 17699 23 Mile Road Macomb Township, Macomb County, Michigan	03811269	1
	Date: November 10, 2021	

BORING LOCATION PLAN

BORING LOCATION PLAN

N

Approximate Boring Location

PROJECT NAME:		PROJECT NUMBER	Figure No.
Proposed Taco Bell #315390 17699 23 Mile Road Macomb Township, Macomb County, Michigan	Prepared by PSI using Google Earth for use in the geotechnical exploration and report	03811269	2
		Date: November 10, 2021	intertek psi

BORING LOGS

BORING B-01

DATE STARTED:	10/13/21	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	10/13/21	**DRILLER:** A. Sasse	**LOGGED BY:** L. Nouri
COMPLETION DEPTH	20.5 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	2.25" Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	2" SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	89%
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	K. Dubnicki

REMARKS: Borehole backfilled with auger cuttings

Water

While Drilling	4 feet
Upon Completion	Dry
Delay	Cave-in @ 18.5 feet

BORING LOCATION:
See Boring Location Plan

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Approximately 8" of dark brown SANDY TOPSOIL, moist					
				1	12	SANDY CLAY - trace gravel, hair roots and organics, mottled light gray and yellowish brown, very moist, medium stiff	CL	1,2,2 N=4	21		Qp = 0.75 tsf
	5			2	18	SILTY CLAY - trace sand and gravel and hair roots, occasional yellowish brown and black silt partings, brown, very moist, medium stiff	CL	1,2,2 N=4	31		Qp = 0.75 tsf
				3	18	SILTY CLAY - trace sand and gravel, dark brown, very moist, stiff	CL	3,3,3 N=6	22		Qp = 1.75 tsf
	10			4	18	SILTY CLAY - trace sand and gravel, dark gray, wet, stiff to medium stiff		2,3,3 N=6	34		Qp = 1.25 tsf
				5	18			2,2,3 N=5	33		Qp = 1.25 tsf
	15			6	18		CL	2,2,3 N=5	30		Qp = 0.75 tsf
	20			7	12	CLAYEY SILTY SAND - fine, trace gravel, gray, wet, very dense	SC-SM	13,50/5"	35		>>◎
						End of Boring					

intertek psi

Professional Service Industries, Inc.
37483 Interchange Drive
Farmington Hills, MI 48335
Telephone: (248) 857-9911

PROJECT NO.: 03811269
PROJECT: Proposed Taco Bell #315390
LOCATION: 17699 23 Mile Road
Macomb Township
Macomb County, Michigan

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-02

DATE STARTED:	10/12/21	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	10/12/21	**DRILLER:** A. Sasse	**LOGGED BY:** L. Nouri
COMPLETION DEPTH	20.5 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	2.25" Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	2" SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	89%
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	K. Dubnicki

REMARKS: Borehole backfilled with auger cuttings

Water

While Drilling	6.5 feet
Upon Completion	Dry
Delay	Cave-in @ 13.3 feet

BORING LOCATION:
See Boring Location Plan

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Approximately 8" of dark brown SANDY TOPSOIL, moist					
				1	12	SILTY SAND - fine, trace gravel, wet, loose	SM	1,3,2 N=5	17		
	5			2	18	SILTY CLAY - trace sand and gravel, occasional yellowish brown and black silt partings, brown, wet, very stiff	CL	3,3,3 N=6	22		Qp = 2.25 tsf
				3	18	SILTY CLAY - trace sand and gravel, dark gray, wet, very stiff to stiff		3,3,3 N=6	28		Qp = 2.5 tsf
	10			4	18			3,3,3 N=6	33		Qp = 1.75 tsf
				5	18		CL	2,2,3 N=5	26		Qp = 1.25 tsf
	15			6	18			2,2,3 N=5	37		Qp = 1.0 tsf
	20			7	18	SANDY CLAY - trace gravel, gray, wet, hard	CL	4,10,17 N=27	10		Qp = 4.5 + tsf
						End of Boring					

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PROJECT:	Proposed Taco Bell #315390
LOCATION:	17699 23 Mile Road
	Macomb Township
	Macomb County, Michigan

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-03

DATE STARTED:	10/14/21	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	10/14/21	**DRILLER:** A. Sasse	**LOGGED BY:** L. Nouri
COMPLETION DEPTH	20.5 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	2.25" Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	2" SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	89%
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	K. Dubnicki

REMARKS: Borehole backfilled with auger cuttings

Water

While Drilling	4	feet
Upon Completion	10.3	feet
Delay	Cave-in @ 19.9	feet

BORING LOCATION:
See Boring Location Plan

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ Moisture × PL ◪ LL ✚ (0, 25, 50) STRENGTH, tsf Qu ▲ Qp ✳ (0, 2.0, 4.0)	Additional Remarks
	0					Approximately 7.5" of dark brown SANDY TOPSOIL, moist					
				1	16	SANDY CLAY - trace gravel, mottled light gray and yellowish brown, very moist, soft	CL	2,1,2 N=3	21		Qp = 0.5 tsf
	5			2	18	SILTY CLAY - trace sand and gravel and hair roots, occasional yellowish brown and black silt partings, brown, very moist, medium stiff	CL	2,1,2 N=3	32		DD = 96 pcf Q_u = 0.7 tsf Qp = 0.5 tsf
				3	18	SILTY CLAY - trace sand and gravel, dark brown, very moist, very stiff	CL	2,4,5 N=9	23		Qp = 2.25 tsf
	10			4	18	SILTY CLAY - trace sand and gravel, dark gray, wet, stiff to medium stiff	CL	2,3,4 N=7	32		LL = 44 PL = 22 Qp = 1.25 tsf
				5	18			2,2,2 N=4	29		Qp = 1.25 tsf
	15			6	18			2,2,2 N=4	34		DD = 95 pcf Q_u = 0.6 tsf Qp = 0.5 tsf
	20			7	14	SANDY CLAY - trace gravel, gray, wet, hard	CL	5,8,17 N=25	17		Qp = 4.0 tsf
						End of Boring					

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Telephone: (248) 857-9911

PROJECT NO.:	03811269
PROJECT:	Proposed Taco Bell #315390
LOCATION:	17699 23 Mile Road
	Macomb Township
	Macomb County, Michigan

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-04

DATE STARTED:	10/14/21	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	10/14/21	**DRILLER:** A. Sasse	**LOGGED BY:** L. Nouri
COMPLETION DEPTH	20.5 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	2.25" Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	2" SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	89%
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	K. Dubnicki

REMARKS: Borehole backfilled with auger cuttings

Water

While Drilling	6.5	feet
Upon Completion	14.9	feet
Delay	Cave-in @ 18.3	feet

BORING LOCATION:
See Boring Location Plan

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ Moisture × PL ◪ LL ✚ (0, 25, 50) STRENGTH, tsf Qu ▲ Qp ✳ (0, 2.0, 4.0)	Additional Remarks
	0					Approximately 8" of dark brown SANDY TOPSOIL, moist					
				1	11	FILL - SILTY CLAY - with sand, trace gravel, wood, hair roots and organics, dark brown, very moist		1,2,3 N=5	25		
	5			2	12	SILTY CLAY - trace sand and gravel, mottled brown, gray and yellowish brown, moist, stiff	CL	2,2,2 N=4	20		LL = 36 PL = 15 Qp = 2.0 tsf
				3	18	SILTY CLAY - trace sand and gravel, dark brown, wet, very stiff	CL	3,4,6 N=10	29		DD = 97 pcf Q_u = 3.0 tsf Qp = 3.5 tsf
	10			4	19	SILTY CLAY - trace sand and gravel, dark gray, wet, stiff to medium stiff	CL	4,4,5 N=9	28		Qp = 2.0 tsf
				5	18			2,2,3 N=5	33		Qp = 0.75 tsf
	15			6	18	CLAYEY SAND - fine to medium, with silt, trace gravel, gray, wet, loose	SC	2,3,1 N=4	12		
	20			7	18	SANDY CLAY - trace gravel, gray, wet, hard	CL	8,20,25 N=45	8		Qp = 4.5+ tsf
						End of Boring					

intertek psi

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Telephone: (248) 857-9911

PROJECT NO.:	03811269
PROJECT:	Proposed Taco Bell #315390
LOCATION:	17699 23 Mile Road
	Macomb Township
	Macomb County, Michigan

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-05

DATE STARTED:	10/14/21	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	10/14/21	**DRILLER:** A. Sasse	**LOGGED BY:** L. Nouri
COMPLETION DEPTH	20.5 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	2.25" Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	2" SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	89%
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	K. Dubnicki

REMARKS: Borehole backfilled with auger cuttings

Water

While Drilling	6.5 feet
Upon Completion	Dry
Delay	Cave-in @ 19.3 feet

BORING LOCATION:
See Boring Location Plan

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ Moisture × PL ◪ LL ✚ (0, 25, 50) STRENGTH, tsf Qu ▲ Qp ✳ (0, 2.0, 4.0)	Additional Remarks
	0					Approximately 8" of dark brown SANDY TOPSOIL, moist					
				1	8	SANDY CLAY - trace gravel, dark gray, moist, stiff	CL	4,3,4 N=7	12		Qp = 1.25 tsf
	5			2	14	SILTY CLAY - trace sand and gravel, mottled yellowish brown, brown, and gray, moist, stiff	CL	2,3,2 N=5	24		Qp = 2.0 tsf
				3	18	SILTY CLAY - trace sand and gravel, dark brown, wet, very stiff	CL	4,5,7 N=12	29		Qp = 3.5 tsf
	10			4	18	SILTY CLAY - trace sand and gravel, dark gray, wet, medium stiff	CL	3,3,4 N=7	30		Qp = 1.0 tsf
				5	18			2,2,2 N=4	19		Qp = 1.0 tsf
	15			6	16	CLAYEY SAND - fine to medium, with silt, trace gravel, gray, wet, loose	SC	2,2,5 N=7	14		
	20			7	14	SANDY CLAY - trace gravel, gray, wet, hard	CL	9,19,26 N=45	9		Qp = 4.5+ tsf
						End of Boring					

intertek psi

Professional Service Industries, Inc.
37483 Interchange Drive
Farmington Hills, MI 48335
Telephone: (248) 857-9911

PROJECT NO.:	03811269
PROJECT:	Proposed Taco Bell #315390
LOCATION:	17699 23 Mile Road
	Macomb Township
	Macomb County, Michigan

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-06

DATE STARTED:	10/14/21	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	10/14/21	**DRILLER:** A. Sasse	**LOGGED BY:** L. Nouri
COMPLETION DEPTH	20.5 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	2.25" Hollow Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	2" SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	89%
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	K. Dubnicki

REMARKS: Borehole backfilled with auger cuttings

Water

While Drilling	4	feet
Upon Completion	10.2	feet
Delay	Cave-in @ 16.8	feet

BORING LOCATION:
See Boring Location Plan

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Approximately 7.5" of dark brown SANDY TOPSOIL, moist					
				1	12	SANDY CLAY - trace gravel, mottled light gray and yellowish brown, very moist, very soft	CL	1,2,3 N=5	21		Qp < 0.25 tsf
	5			2	18	SILTY CLAY - trace sand and gravel, occasional yellowish brown and black silt partings, brown, wet, medium stiff	CL	2,3,4 N=7	28		Qp = 0.75 tsf
				3	18	SILTY CLAY - trace sand and gravel, dark gray, wet, very stiff to medium stiff		2,5,6 N=11	28		Qp = 3.25 tsf
	10			4	18			3,3,5 N=8	32		Qp = 1.5 tsf
				5	18		CL	2,3,3 N=6	40		Qp = 1.5 tsf
	15			6	18			2,3,3 N=6	33		Qp = 1.0 tsf
				7	18	SANDY CLAY - trace gravel, gray, wet, very stiff	CL	6,15,20 N=35	11		Qp = 3.25 tsf
	20					End of Boring					

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PROJECT NO.:	03811269
PROJECT:	Proposed Taco Bell #315390
LOCATION:	17699 23 Mile Road
	Macomb Township
	Macomb County, Michigan

The stratification lines represent approximate boundaries. The transition may be gradual.

LABORATORY TESTING

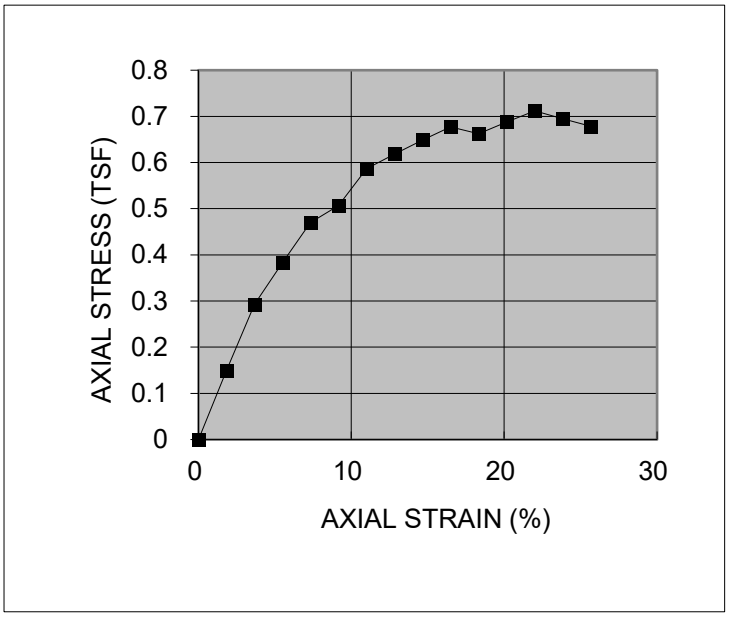
UNCONFINED COMPRESSIVE STRENGTH (ASTM D2166)

Project Name: Proposed Taco Bell #315390
Location: 17669 23 Mile Road, Macomb, MI 48042
Project No.: 03811269
Source: B-3, SS2 **Sample Depth:** 4.0'-5.5'
Description: Silty Clay (CL), brown
Qp (tsf): 0.50
Wet Weight (gm): 129.10
Date Tested: 10/22/2021
Tested By: PJ
Checked By: KD

Height:	2.729	inches	69.30	mm	
Diameter:	1.345	inches	34.15	mm	
Moisture Content:	32%		**Saturation (%):**		
Ht.-Diameter Ratio:	2.03		**Specific Gravity:**		
Dry Density:	96	pcf			

READING NUMBER	DEFORM. (in.)	LOAD DIAL READING	LOAD (lbs)	STRAIN (%)	CORRECTED AREA (in^2)	AXIAL STRESS (tsf)
0	0.000	0	0.0	0.00	1.420	0.00
1	0.050	9	3	1.83	1.447	0.15
2	0.100	23	6	3.67	1.474	0.29
3	0.150	34	8	5.50	1.503	0.38
4	0.200	41	10	7.33	1.532	0.47
5	0.250	46	11	9.16	1.563	0.51
6	0.300	54	13	11.00	1.596	0.59
7	0.350	57	14	12.83	1.629	0.62
8	0.400	62	15	14.66	1.664	0.65
9	0.450	65	16	16.49	1.701	0.68
10	0.500	68	16	18.33	1.739	0.66
11	0.550	70	17	20.16	1.779	0.69
12	0.600	73	18	21.99	1.820	0.71
13	0.650	74	18	23.82	1.864	0.70
14	0.700	75	18	25.66	1.910	0.68
15	0.750					
16	0.800					
17	0.850					
18	0.900					
19	0.950					
20	1.000					

Qu = 0.65 tsf 62.15 kPa, Strain 15.00%



Failure Sketch

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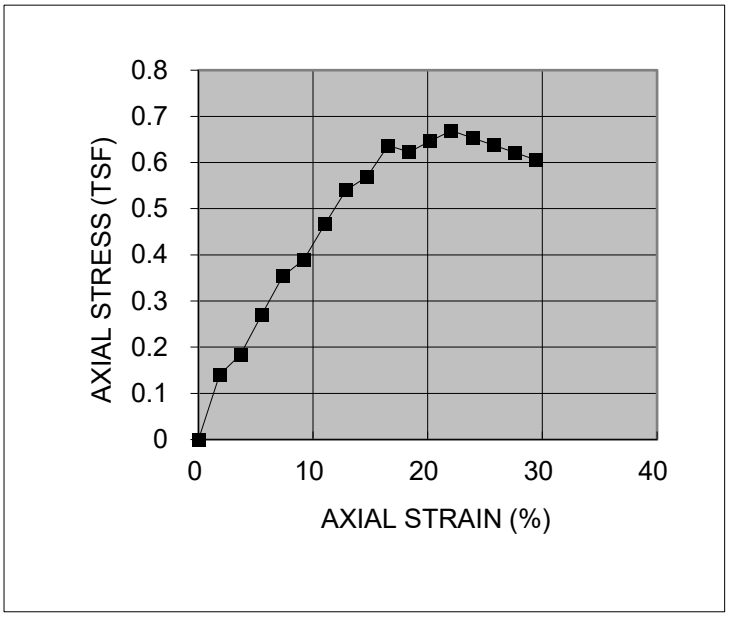
UNCONFINED COMPRESSIVE STRENGTH (ASTM D2166)

Project Name:	Proposed Taco Bell #315390						
Location:	17669 23 Mile Road, Macomb, MI 48042						
Project No.:	03811269						
Source:	B-3, SS6	**Sample Depth:**	14.0'-15.5'				
Description:	Silty Clay (CL), gray						
Qp (tsf):	0.50	**Height:**	2.721	inches	69.10	mm	
Wet Weight (gm):	136.93	**Diameter:**	1.387	inches	35.22	mm	
Date Tested:	10/22/2021	**Moisture Content:**	34%		**Saturation (%):**		
Tested By:	PJ	**Ht.-Diameter Ratio:**	1.96		**Specific Gravity:**		
Checked By:	KD	**Dry Density:**	95	pcf			

READING NUMBER	DEFORM. (in.)	LOAD DIAL READING	LOAD (lbs)	STRAIN (%)	CORRECTED AREA (in^2)	AXIAL STRESS (tsf)
0	0.000	0	0.0	0.00	1.510	0.00
1	0.050	10	3	1.84	1.538	0.14
2	0.100	17	4	3.68	1.567	0.18
3	0.150	25	6	5.51	1.598	0.27
4	0.200	33	8	7.35	1.630	0.35
5	0.250	38	9	9.19	1.663	0.39
6	0.300	46	11	11.03	1.697	0.47
7	0.350	53	13	12.87	1.733	0.54
8	0.400	59	14	14.70	1.770	0.57
9	0.450	65	16	16.54	1.809	0.64
10	0.500	68	16	18.38	1.850	0.62
11	0.550	71	17	20.22	1.892	0.65
12	0.600	73	18	22.05	1.937	0.67
13	0.650	73	18	23.89	1.984	0.65
14	0.700	74	18	25.73	2.033	0.64
15	0.750	75	18	27.57	2.085	0.62
16	0.800	75	18	29.41	2.139	0.61
17	0.850					
18	0.900					
19	0.950					
20	1.000					
Qu =	0.57 tsf		54.53 kPa,	Strain	15.00%	



Failure Sketch

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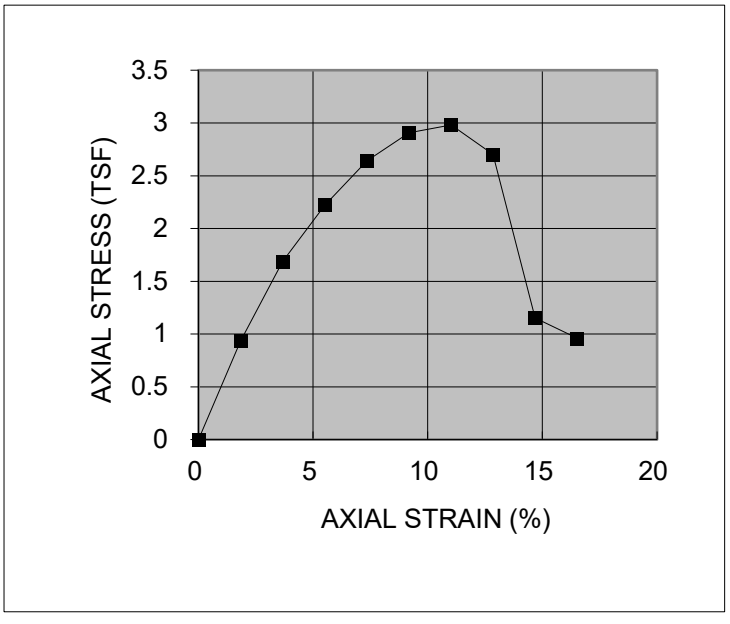
UNCONFINED COMPRESSIVE STRENGTH (ASTM D2166)

Project Name: Proposed Taco Bell #315390
Location: 17669 23 Mile Road, Macomb, MI 48042
Project No.: 03811269
Source: B-4, SS3 **Sample Depth:** 6.5'-8.0'
Description: Silty Clay (CL), brown
Qp (tsf): 3.50
Wet Weight (gm): 129.02
Date Tested: 10/22/2021
Tested By: PJ
Checked By: KD

Height:	2.724	inches	69.19	mm	
Diameter:	1.354	inches	34.39	mm	
Moisture Content:		29%	**Saturation (%):**		
Ht.-Diameter Ratio:		2.01	**Specific Gravity:**		
Dry Density:	97	pcf			

READING NUMBER	DEFORM. (in.)	LOAD DIAL READING	LOAD (lbs)	STRAIN (%)	CORRECTED AREA (in^2)	AXIAL STRESS (tsf)
0	0.000	0	0.0	0.00	1.440	0.00
1	0.050	80	19	1.84	1.467	0.93
2	0.100	138	35	3.67	1.495	1.69
3	0.150	180	47	5.51	1.524	2.22
4	0.200	211	57	7.34	1.554	2.64
5	0.250	232	64	9.18	1.585	2.91
6	0.300	241	67	11.01	1.618	2.98
7	0.350	225	62	12.85	1.652	2.70
8	0.400	110	27	14.68	1.688	1.15
9	0.450	96	23	16.52	1.725	0.96
10	0.500					
11	0.550					
12	0.600					
13	0.650					
14	0.700					
15	0.750					
16	0.800					
17	0.850					
18	0.900					
19	0.950					
20	1.000					

Qu = 2.98 tsf 285.49 kPa, Strain 11.01%



Failure Sketch

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