Terracon

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November 6, 2024

Mobile Loaves and Fishes
9301 Hog Eye Rd #950
Austin, Texas 78734

Attn: Ms. Sarah Satterlee
P: (512)551 5456
E: sara.satterlee@mlf.org

RE: Geotechnical Engineering
Supplemental Letter No. 6 Revision 1– Bathhouses
Community First-Phase 3
NWC Hog Eye Road & N. Imperial Drive
Austin, Texas
Terracon Project No. 96215048

Dear Ms. Satterlee:

As requested by Ms. Sarah Satterlee, this letter provides supplemental pad preparation options for the planned bathhouses. Updated slab-on-grade foundation design parameters can be provided at a later date once a pad preparation option is chosen for the bathhouses. This letter also provides deep foundation design parameters to be considered as an optional foundation type (with structurally suspended slab over void forms) for the planned bathhouse building.

Geotechnical recommendations for the project were originally provided in Terracon Report No. 96215048 dated May 10, 2021 (referred to as "Report" herein). Geotechnical recommendations not provided in this letter should follow the recommendations provided in the Report.

Floor Slabs Subgrade Preparation

We are presenting the following options to reduce the potential for foundation movements associated with volumetric changes of the underlying clayey soils due to moisture variation.

A select fill pad combined with a moisture conditioned clay subgrade may be implemented in order to reduce post-construction shrink/swell to approximately 2, 3 and 4 inches. The table below provides preparation options depending on the PVR that can be tolerated by the Owner/Users and the amount of select fill desired below the bottom of the floor slabs.

Preparation Option [1]	Select Fill Thickness, feet	Moisture Conditioned Clay Thickness (below select fill), feet	Total Building Pad Thickness, feet	Estimated PVR (inches)
BH3-1	3.0	0.5 [2]	3.5	4
BH3-2	5.0	0.5 [2]	5.5	3
BH3-3	7.0	0.5 [2]	7.5	2
BH3-4	2.0 [3]	3.0	5.0	4
BH3-5	3.0	4.0	7.0	3
BH3-6	5.0	5.0	10.0	2

1. As an example, if option BH3-3 (denoted to indicate Bathhouses, Phase 3, Option 3) is selected, we recommend that the on-site clay soils be removed to a depth of 7.5 feet below the bottom of the slab. At least 0.5 feet of the excavated soils should be moisture conditioned as outlined in the Report. The moisture conditioned clay should not be allowed to dry out prior to subsequent lift placements. For option BH3-3, select fill should be placed as outlined in the Report to provide a select fill pad of 7.0 feet below the bathhouses' floor slabs.
2. Moisture conditioned thickness for options BH3-1 to BH3-3 should be no less than 6 inches.
3. We do not recommend reducing select fill to less than two feet.

Considerations Related to Design and Performance

Long-term performance and maintenance risks increase when structures are designed for movements higher than 1 inch. Shrink-swell movements in clay soils do not occur uniformly across individual building footprints nor overall sites. Some of the increased performance and maintenance risks associated with PVR's higher than 1 inch are as follows:

- Increased frequency and magnitude of interior and exterior slab cracking
- Uneven/sloping floor slabs and adjacent flatwork
- Cracking in sheetrock walls
- Movements in and around door/window frames, leading to improper opening/closing and/or gaps around the frames
- Leaks in domestic water/wastewater utility lines, roof drains, etc., as well as movements/distress to other underground utilities
- Roof sags or separations, which can result in roof leaks
- Other building envelope leaks, which can affect HVAC system performance
- Differential movements and cracking between prepared slab areas and adjacent flatwork and pavements.

The Client and Design/Construction Team should consider the above items when deciding on design changes. In addition, the Architect, Structural Engineer, Civil

Engineer, and others may desire to comment on items pertaining to their disciplines that could be affected by the higher design movement levels.

Drilled Pier Design Parameters

As an alternative to a grade-supported slab system and to negate the requirement for building pad preparation, the bathhouse buildings could be supported on drilled and underreamed piers with suspended slabs over void boxes or crawl spaces. Design parameters are provided below in the following **Drilled and Underreamed Pier Design Summary** table. The values presented for allowable side friction and end bearing include a factor of safety.

Drilled and Underreamed Pier Design Summary [1]

Item		Design Parameter
Bearing Stratum		Stratum 2 Fat Clay [2]
Minimum Embedment below Lowest Slab FFE		20 feet
Minimum Pier Shaft Diameter		18 inches
Minimum Pier Spacing [3]		3 underream diameters center to center
Allowable End Bearing Pressure	Net dead plus sustained live load [4]	5,000 psf
	Net total load [4]	8,000 psf
Allowable Side Friction		600 psf [5,6]
Ratio of Underream Diameter to Shaft Diameter [7]		2:1 to 3:1
Estimated Uplift Force [8,9,10]		95*D for unprepared/natural subgrade areas
Minimum Percentage of Steel [8,9,10]		½ percent
Uplift Resistance [11]		Foundation Weight (~150 pcf) & Soil Unit Weight (~120 pcf)
Approximate Total Settlement [12,13]		1-inch
Estimated Differential Settlement [12,13]		½ to ¾ of total

1. Design values are dependent upon the method of installation and quality control parameters.
2. See Subsurface Profile in the Report in **Geotechnical Characterization** for more details on stratigraphy.
3. Drilled piers should have a minimum (center-to-center) spacing of three underream diameters. Closer spacing may require a reduction in axial load capacity. Axial capacity reduction can be determined by comparing the allowable axial capacity determined from the sum of individual piers in a group versus

Drilled and Underreamed Pier Design Summary [1]

Item	Design Parameter

the capacity calculated using the perimeter and base of the pier group acting as a unit. The lesser of the two capacities should be used in design.

4. Whichever condition yields a larger bearing area.
5. Applicable for compressive loading only. Reduce to 2/3 of values shown for uplift loading. The effective weight of the shaft can be added to uplift load resistance to the extent permitted by IBC. Permanently cased pier sections, if any, may not be accounted towards the side friction capacity.
6. Side friction should be neglected in the upper 10 feet of the pier and in the lower portion of the pier equal to one underream diameter above the bottom of the pier.
7. In addition to having an adequate bearing area to support compressive loads, the diameter of the underream should be large enough to overcome uplift forces on the pier without causing a local failure to the overlying soils.
8. The amount of reinforcing steel required can be computed by assuming the dead load of the structure surcharges the pier, the above estimated force acts vertically on the shaft, and the minimum pier length/embedment is sufficient in withstanding the soil-related uplift on the pier itself. The amount of required steel, as calculated by the structural engineer, should extend the entire pier length and in no case should the percentage of steel be less than 0.5 percent.
9. Uplift force (in kips) is used to calculate pier reinforcing steel. The term "D" is the pier diameter in feet. The equation for uplift force does not include a factor of safety. Piers should be adequately reinforced as designed by the Structural Engineer for both tension and shear to sufficient depths.
10. The recommended minimum embedment depth of the piers should be sufficient in withstanding soil-related uplift forces. Please note the uplift force equation given above is intended for calculating the required reinforcing steel and is not intended for calculating pier embedment to overcome soil-related uplift forces. Additional reinforcing steel may be needed to resist external structural uplift forces, such as wind.
11. Structural uplift loads on the drilled-and-underreamed piers may be resisted by the dead weight of the piers and the supported structure, plus the weight of a soil wedge above the underream. The soil wedge may be assumed to extend upward from the bottom of the underream at a slope of 4 vertical to 1 horizontal.
12. Provided proper construction practices are followed.
13. Will result from variances in the subsurface conditions, loading conditions, and construction procedures, such as cleanliness of the bearing area or flowing water in the shaft.

Drilled Pier Construction Considerations

The drilling contractor should be experienced in the subsurface conditions observed at the site, the construction techniques to be employed, and the excavations should be performed with equipment capable of providing a clean bearing surface. The drilled pier foundation system should be installed in general accordance with the procedures presented in "Standard Specification for the Construction of Drilled Piers", ACI Publication No. 336.1-01.

Subsurface water was not encountered in the borings during the drilling activities in 2021. However, subsurface water levels are influenced by seasonal and climatic conditions, which result in fluctuations in subsurface water elevations. Additionally, it is

common for water to be present after periods of significant rainfall. If groundwater is present during construction, casing could be needed to reduce the potential for excavation sidewall collapse.

The drilling contractor should remove all soft and disturbed soils from the base of the drilled pier prior to placing concrete.

Underreaming is expected to be feasible where the shafts extend at least 20 feet below FFE. Provided the concrete is placed immediately after the underream is completed and carefully while the temporary casing is being removed, we expect risk of cave-in of the underream is minimal. If difficulties are encountered during construction of the underreams at the proposed bearing depth of a pier, it may be necessary to extend the excavation to a depth where the underream can be properly completed. Alternatively, the piers could be extended deeper and be redesigned as straight-sided piers into the Stratum 3 fat clays at depths of 25 feet or greater.

Care should be taken to not disturb the sides and bottom of the excavation during construction. The bottom of the shaft excavation should be free of loose material and water before concrete placement. Concrete should be placed as soon as possible after the foundation excavation is completed, to reduce potential disturbance of the bearing surface.

The drilled shaft installation process should be performed under the observation of the Geotechnical Engineer. The Geotechnical Engineer should document the shaft installation process including soil and groundwater conditions observed, consistency with expected conditions, and details of the installed pier.

Grade Beams between Drilled Piers

Grade beams should be designed to span across the drilled pier foundations without subgrade support and the piers should be designed to handle the additional loads. The beams should be underlain by minimum 12-inch-thick carton void forms and the slabs should also be underlain by minimum 12-inch-thick carton void forms (or larger crawl spaces).

Terracon

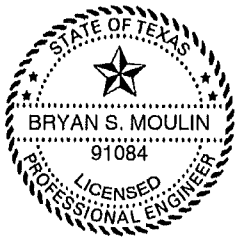
Closure

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this letter, please contact us.

Sincerely,

Terracon Consultants, Inc.
TBPE Firm Registration No. F-3272

Diana C. Vargas-Suaza, P.E.
Senior Project Manager



Bryan S. Moulin, P.E.
Senior Principal, Geotechnical Services

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April 18, 2024

Mobile Loaves and Fishes
9301 Hog Eye Rd #950
Austin, Texas 78724

Attn: Ms. Sarah Satterlee
P: (512)551 5456
E: sara.satterlee@mlf.org

RE: Geotechnical Engineering
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Community First-Phase 3
NWC Hog Eye Road & N. Imperial Drive
Austin, Texas
Terracon Project No. 96215048

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Sincerely,

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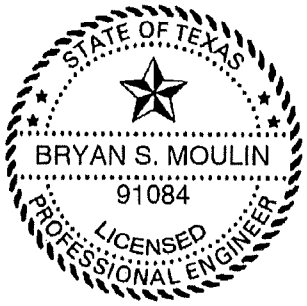
Diana C. Vargas-Suaza, P.E.
Senior Project Manager



Bryan S. Moulin, P.E. 04/18/2024
Senior Principal, Geotechnical Services