GEOLABS, INC.

Geotechnical Engineering and Drilling Services

May 3, 2024
W.O. 7328-20(A)

Mr. Conrad Higashionna
Engineering Concepts, Inc.
1150 South King Street, Suite 700
Honolulu, HI 96814

AMENDMENT TO GEOTECHNICAL REPORT
TRAFFIC SIGNAL MODERNIZATION PROJECT
H-1 EXIT 26A & KOKO HEAD AVENUE INTERSECTION
HONOLULU, OAHU, HAWAII

Dear **Mr. Higashionna:**

This amendment to our report entitled "Geotechnical Engineering Exploration, Traffic Signal Modernization Project, H-1 Exit 26A & Koko Head Avenue Intersection, Honolulu, Oahu, Hawaii," dated April 16, 2024, provides Traffic Signal Type I pole foundation recommendations as well as recommendations for the installation of traffic signal pull box.

TRAFFIC SIGNAL POLE TYPE I FOUNDATIONS

Our field exploration generally encountered a surface asphaltic concrete layer approximately 9 inches thick underlain by fill material consisting of stiff sandy silt to a depth of approximately 4 feet. The fill layer was underlain by 1.5 feet thick saprolite layer consisting of dense silty sand, followed by medium hard to hard basalt rock formation extending to the maximum depth explored of about 26.5 feet below the existing ground surface. We did not encounter groundwater in the drilled boring at the time of our field exploration.

Based on the information provided, we understand that new Traffic Signal Type I poles will be about 10 feet in height. Based on the loading demands provided and anticipated subsurface soil conditions, we recommend supporting the new traffic signal poles on single cast-in-place drilled shaft foundations. We understand that foundation recommendations for 24-inch diameter drilled shafts are desired.

We recommend the following drilled shaft diameter and length for the proposed traffic signal pole foundations.

STANDARD TYPE I TRAFFIC SIGNAL POLES DRILLED SHAFT FOUNDATIONS FOR LEVEL GROUND CONDITIONS		
Pole Height (feet)	**Drilled Shaft Diameter** (inches)	**Drilled Shaft Length** (feet)
10	24	8

TRAFFIC SIGNAL PULL BOX FOUNDATIONS

We understand that the traffic signal box will be embedded below the existing ground surface. Based on the encountered subsurface conditions, an allowable bearing pressure of up to 3,000 pounds per square foot (psf) may be utilized for the design of the traffic signal pull box structures bearing on the near-surface fill and saprolite at the project site. To provide uniform bearing support for the new pull box structure, we recommend providing a minimum 6-inch-thick layer of No. 3 Fine gravel (ASTM C33, No. 67 gradation) below the bottom of the pull box structures. We anticipate the traffic signal pull box will be a pre-cast concrete structure.

Foundation subgrades should be recompacted to a firm and unyielding surface prior to the placement of the No. 3 Fine gravel. Soft and/or loose materials encountered at the bottom of the excavations should be over-excavated to expose the underlying firm materials. The over-excavation should be backfilled with select granular fill materials compacted to a minimum of 90 percent relative compaction.

LATERAL EARTH PRESSURES

The lateral earth pressures acting on the proposed pull box structure will depend on the type of backfill used, the extent of backfill, and the compactive effort on the backfill material around the structure. We recommend designing the new pull box structure to resist the following lateral earth pressures (at-rest condition) from the adjacent soils.

LATERAL EARTH PRESSURES FOR PULL BOX STRUCTURE		
Subsoil Conditions	**At-Rest** (pcf)	**Passive** (pcf)
Level Backfill	59	400

The values provided above assume that the excavated on-site soils will be used to backfill behind and/or around the structure. The backfill behind and/or around the utility structures should be compacted to between 90 and 95 percent relative compaction per ASTM D1557. Over-compaction of the structure backfill should be avoided.

Surcharge stresses due to areal surcharges, traffic loads, line loads, and point loads within a horizontal distance equal to the depth of the structure should be considered in the design. For uniform surcharge stresses imposed on the loaded side of the pull box structure, a rectangular distribution with a uniform pressure equal to 50 percent of the vertical surcharge pressure acting over the entire depth of the structure may be used in the design. Additional analyses during the design may be needed to evaluate the surcharge effects of point loads and line loads.

Lateral loads acting on the structures may be resisted by friction developed between the bottom of the foundation and the supporting subgrade soils and passive earth pressure developed against the embedded near-vertical faces of the foundation system. A coefficient of friction of 0.4 may be used between the base of the structure and the granular bedding material to resist lateral loads. Based on our field exploration data and laboratory test results, the recommended passive earth pressure shown in the above table may be used in the design.

BACKFILLING PULL BOX STRUCTURE

The traffic signal pull box structure excavation will need to be properly backfilled to reduce the potential for subsidence at the ground surface. The excavated on-site soils or imported fill materials that are free of vegetation, deleterious materials, and clay lumps and rock fragments greater than 3 inches in maximum dimension may be used as backfill up to the finished subgrades.

Pull box structure backfills should be moisture-conditioned to above the optimum moisture content, placed in level lifts not exceeding 8 inches in loose thickness, and compacted to at least 90 percent relative compaction. If the pull box structure is located below pavement areas, the upper 3 feet of the structure backfill below the pavement grade should be compacted to at least 95 percent relative compaction. Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density as determined by ASTM D1557. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

CLOSURE

We appreciate the opportunity to provide geotechnical engineering services to you on this project. If you have questions or need additional information, please contact our office.

Respectfully submitted,

GEOLABS, INC.

By _____
Gerald Y. Seki P.E.
Vice President

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