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December 19, 2018

Glendale Unified School District
349 West Magnolia Avenue
Glendale, California 91204

MTG$_L$ Project No.: 1047D35
MTG$_L$ Log No.: 18-3747
MTG$_L$ Branch: Anaheim
DSA File No.: 19-41
DSA Application No.: 03-119567
LEA No.: 44

Attention: Mr. Dan Holmquist, Facilities Project Manager

Subject: **Report Update**
Verdugo Woodlands Elementary School Pedestrian Bridge
1751 North Verdugo Road
Glendale, Los Angeles County, California

Reference: MTG$_L$, Inc., "New Pedestrian Bridge Design Recommendations, Verdugo Woodlands Elementary School, 1751 North Verdugo Road, Glendale, CA", dated October 1, 2017, Project No. 1047D35, Log No. 17-1391

Introduction

In accordance with the request of NAC Architecture, MTG$_L$, Inc. has prepared this report to provide an Update to the referenced Geotechnical Investigation dated October 1, 2017 prepared for the subject site. As discussed in the referenced Geotechnical Investigation dated October 1 2017, plans were (and currently are) to construct a new pedestrian walkway bridge across the existing Verdugo Wash Drainage Channel to join the playground area and main campus of Verdugo Woodlands Elementary School located at 1751 North Verdugo Road, in the City of Glendale, Los Angeles County, California.

Project Review

The referenced report dated October 1, 2017 was prepared and signed by Isaac B. Chun, G. E. 2649, who was the DSA-approved Engineering Manager for the Anaheim office of MTG$_L$, Inc. at the time. Mr. Chun is no longer an employee of MTG$_L$, Inc. Bruce A. Hick, G. E. 2284, the signee for this report, is the new DSA-approved Engineering Manager for the Anaheim office of MTG$_L$, Inc. Mr. Hick will be acting as the responsible Geotechnical Engineer (GE) for this project.

Based upon information supplied by the project structural engineer, estimated loads for the new bridge are on the order of 100 kips for dead loads and 100 kips for liver loads. Lateral loads are anticipated on the foundation system due to seismic and wind loads.

Based upon consultations with project parties, the proposed new bridge is to be supported by 36-inch diameter drilled pier (cast-in-drilled-hole (CIDH)) foundations. Based upon preliminary design criteria, the minimum depth of embedment of the piles is 50 feet below the existing ground surface. Due to agency requirements (United States Army Corps of Engineers and Los Angeles County Flood Control), the upper 16 feet of the subgrade soils cannot be used for support of the CIDH foundations in order to prevent surcharging the flood channel walls. Casing will be installed to separate the pier concrete from the adjacent supporting soils.

Review and Conclusions

Based upon review of the referenced Geotechnical Investigation dated October 1, 2017, and current development plans, it is MTGL, Inc.'s opinion that the findings, conclusions, and recommendations contained within the referenced Geotechnical Investigation remain valid and should be followed and implemented during future project design and construction, except as amended in this report.

Recommendations

Foundation Design Parameters

Based upon review of the referenced Report dated October 1, 2017, the proposed pedestrian bridge may be founded on CIDH pier foundations. Seismic design parameters presented in the "Seismic Design Parameters" Table of the report (page 3) remain applicable for the design of the drilled pier foundations.

The piers should be a minimum of 36 inches in diameter and be embedded a minimum of 50 feet below the existing ground surface. As previously discussed, the upper 16 feet of the subgrade soils cannot be used for support of the CIDH foundations in order to prevent surcharging the flood channel walls. Casing should be installed to separate the pier concrete from the adjacent supporting soils. Allowable axial pile capacities were presented in the "Allowable Axial Pile Capacities" Table of the report (page 4). Interpolation may be provided for 36-inch diameter piers. As stated in the report, no end-bearing capacity is recommended.

Uplift capacity of the pier foundation may be considered equal to 60 percent of the allowable axial capacity between the pier and the surrounding soils (limited to below 16 feet from the existing ground surface), plus the weight of the pier foundation.

The allowable bearing capacity and the allowable resistance of the horizontal forces may be increased by 1/3 for wind, seismic, or other short-term loading.

Per the request of the project structural engineer, lateral capacity of a 36-inch diameter pile was conducted using the computerized "L-Pile" program. A maximum pile deflection of 0.25 inches was used in the analysis. The bending moment and shear forces for both "fixed head" and "free head" pile head conditions were prepared. It is incumbent upon the project structural engineer to determine which pile head condition is applicable. The lateral capacity analysis results are attached to this report.

Provided the piers are spaced a minimum of three diameters apart (measured from the butt), there is no reduction for pier group interaction. All piers shall be adequately reinforced and tied into pile caps as recommended by the structural engineer.

The indicated pier capacities are based upon the strength of the soils. The structural capacity of the pier itself should be verified by the structural engineer. Pier foundation reinforcement should be in accordance with applicable sections of the governing building code and/or requirements of the structural engineer.

Maximum settlement of pier foundations designed and constructed in accordance with the recommendations presented in this report are estimated to be on the order of ½ inch. Differential settlement between similarly loaded and adjacent foundations are expected to be a maximum of approximately ¼ inch across 40 feet, provided footings are founded on similar materials, and designed and constructed in accordance with the recommendations of this report. Settlement of all foundations is expected to occur rapidly and should be essentially complete shortly after initial application of the loads.

Soil Corrosion Potential and Type of Pier Concrete

Laboratory test results included in the referenced Report indicate that the subsurface soils have "negligible" soluble sulfate contents, low chloride contents, and a "low" corrosion potential to buried ferrous metal. Consequently, Type II/V cement with a maximum water-cement ratio of 0.50 and minimum compressive strength of 3,500 psi should be used for concrete in contact with onsite soils.

Construction Considerations

The site is suitable for drilling for CIDH pier foundations. Based upon review of the referenced Report, groundwater was encountered at a depth of approximately 40 feet below the existing ground surface. In addition, clean sands with gravel were encountered at various depths below the existing ground surface. The contractor should anticipate the need of appropriate measures (such as slurry, polymer or steel casing) to prevent caving, if it occurs, during drilling, reinforcement placement, and concrete placement.

The adequacy of CIDH piers will depend heavily on construction methods and procedures. Large zones of disturbance around CIDH piers can lead to lower skin friction due to excessive stress relief around the length of the piers. The piers should be constructed by qualified

contractors experienced in this type of construction and be monitored on a full-time basis during construction by the geotechnical consultant. Piers should be constructed within two (2) percent of plumb.

All piers should have concrete placed on the day of drilling: no pier hole should be kept open overnight. The concrete for the CIDH piers should be placed using a down-hole tremie to limit the concrete from striking the sides of the drilled shafts. Once concrete pumping has begun, a minimum head of five (5) feet of concrete above the bottom of the tremie should be maintained throughout the concrete placement. If steel casing is used, the casing must be removed slowly with the minimum concrete head maintained to prevent caving and necking of the pier. The pier concrete mix used must be capable of disseminating around the reinforcing bars and in contact with the soils without arching during extraction of the casing.

Closure

This report is intended to be made a part of, and incorporated with, the referenced report dated October 1, 2017. All other findings, conclusions, and recommendations contained within the referenced report, except as amended in this report, remain valid and should be implemented during design and construction.

MTG$_L$, Inc. appreciates this opportunity to be of continued service to you on this project. Should you have any questions regarding the information contained herein, please contact us at your earliest convenience.

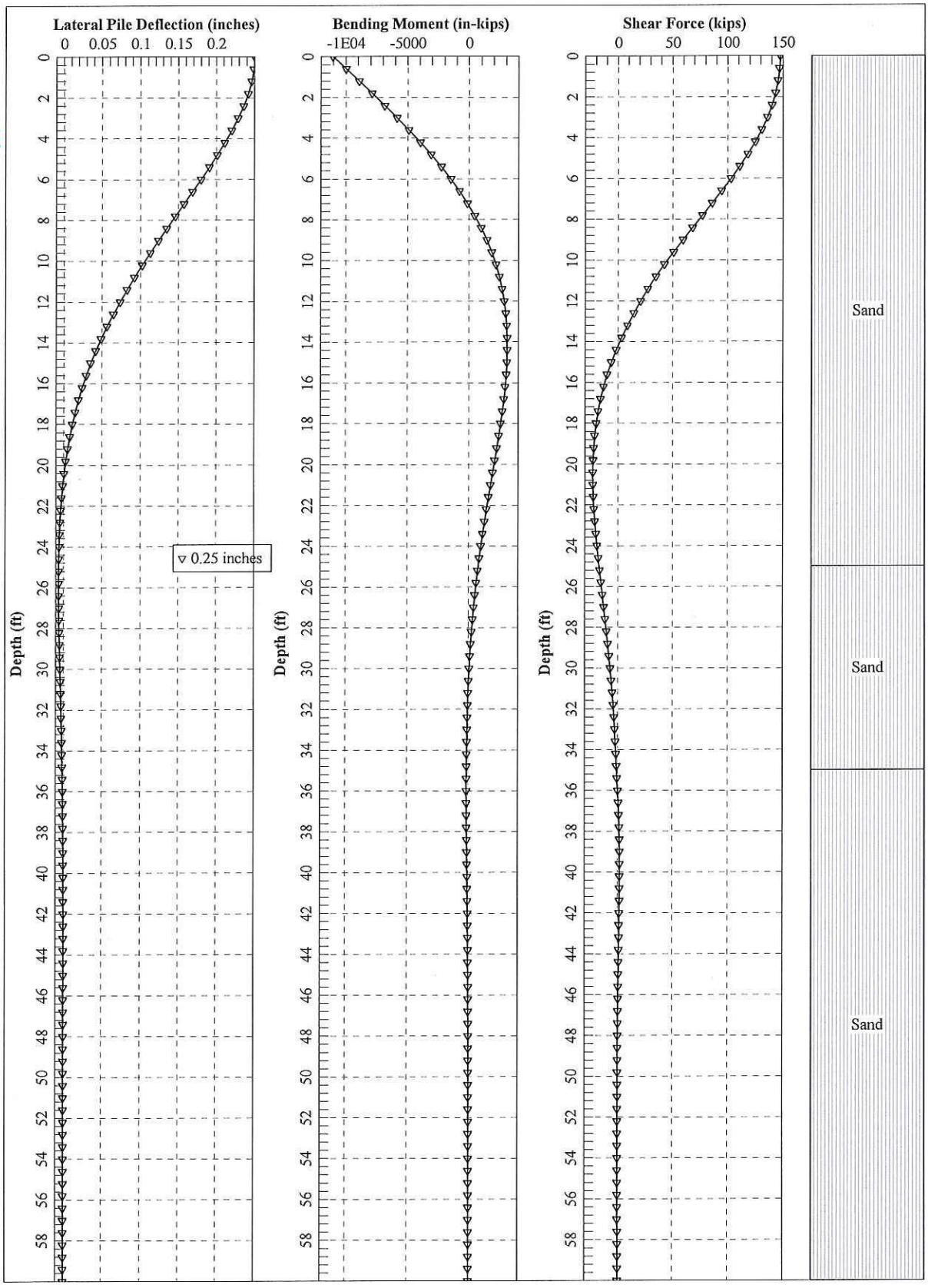
Respectfully Submitted,
MTG$_L$, Inc.

Bruce A. Hick, P.E., G.E.
Vice President | Engineering Manager

Attachments: "L"-Pile Analysis

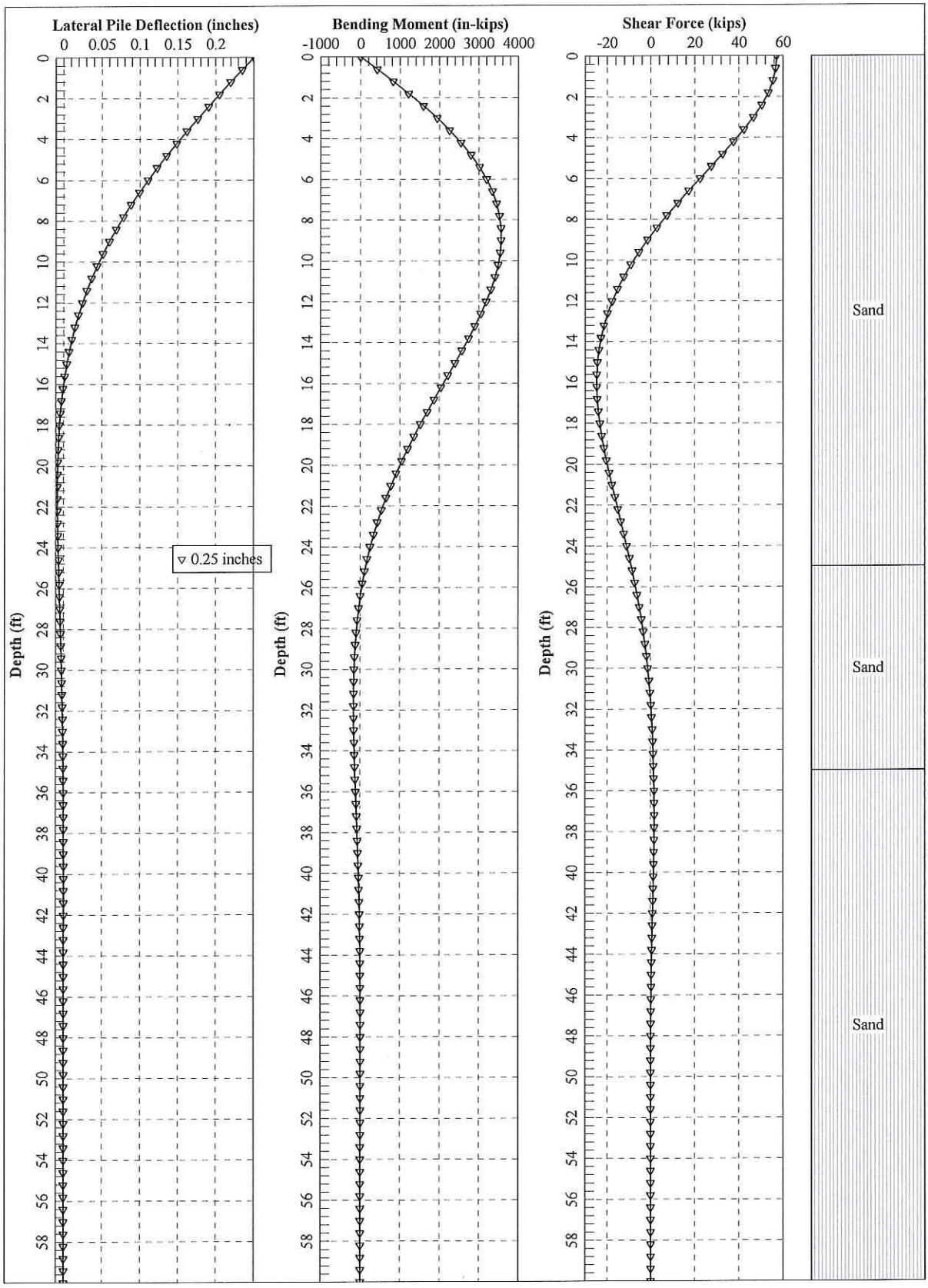
FIXED HEAD - UNFACTORED LATERAL CAPACITIES

16 FEET BELOW GROUND SURFACE



FREE HEAD - UNFACTORED LATERAL CAPACITIES

16 FEET BELOW GROUND SURFACE



Lateral Pile Capacity - 36 inches Diameter

Pile Location	Pile Head Condition	Pile Head Deflection (in)	Single Lateral Load per pile (kips)	M_{max} (kips-in)	Depth to M_{max} (ft)	Minimum Pile Embedment Depth $(ft)^2$
Abutment, Borings B-1, Boring B-2	Fixed Head	0.25	150	11,000	0	50
	Free Head	0.25	57	3,500	9	50

NOTES: 1. Lateral capacities are unfactored. A minimum FS=2 should be used for ASD.
2. Depth "0" on charts and herein is at 16 feet below ground surface (bottom channel)