

Memorandum

To: MR. MICHAEL KEEVER
Office of Structure Design
Bridge Design Branch South
Design Section 15

Date: July 16, 2001

File: 11-SD-15-KP 25.6
11-232600

Attention: Ms. Traci Holden



Mira Mesa Blvd. UC (Widen)
Bridge No. 57-0597

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services - MS 5

Subject: Final Foundation Recommendations

A foundation study for the proposed widening of the Mira Mesa Blvd. UC, Bridge No. 57-0597, was completed in June 2001. The study consisted of a field investigation and the review of "As-Built" data. The field investigation consisted of a site review and the drilling of three mud rotary sample borings. The "As-Built" review included the evaluation of "As-Built" Log of Test Borings (LOTB) from January, 1964; December 1972, and January, 1984 and "As-Built" drawings of the structure. All elevations referred to below and shown on the current LOTB sheets are based on the NAVD of 1988. The elevations shown on the "As-Built" LOTB sheets are based on the NGVD of 1929.

Project and Site Description

The existing Mira Mesa Blvd. UC bridge carries State Route 15 over Mira Mesa Blvd. in northern San Diego, California. Mira Mesa Blvd crosses beneath Route 15 in a cut section under the structure. The freeway is also elevated above original ground by approximately 4m of fill. The site location is an area of gently sloping hills that have been leveled as cut and fill for urban development. The proposed improvements are part of the Interstate Route 15 widening at the structure location and include widening both the north and southbound exterior lanes.

Geologic Data

Previous work describes roadway fill over two similar geologic units, both consisting of dense granular materials. The recent foundation investigation encountered approximately 4.8m of dense gravelly fill overlying dense to very dense silty, sandy and clayey gravels interbedded with very dense gravelly and silty sands. Gravels in the fill and native formations include fresh and very hard cobbles consisting of dacite, granite and quartzite. Groundwater was not encountered in any of the borings which extended a maximum depth of 34.5m to elevation 135.4m

Seismic Data and Liquefaction

According to the Office of Geotechnical Earthquake Engineering (OGEE) Final Seismic Design Recommendations memorandum dated May 30, 2001, the controlling fault for the site is the Newport - Inglewood- Rose Canyon Fault (NIE, style strike slip). This fault is located approximately 14 km west of the site, and may generate a maximum credible earthquake of

moment magnitude $M_w=7$. The Memo indicates that the horizontal peak bedrock acceleration at the site is estimated to be 0.3 g, and the horizontal peak ground acceleration is approximately 0.35g. Based on the available information, the potential for soil liquefaction appears remote and there is no potential for lateral spreading.

Foundation Recommendations

The following recommendations are for the proposed widening of the Mira Mesa Blvd UC, Bridge 57-0597 as shown on the General Plan dated May 23, 2001. Cast-in-Drilled-Hole (CIDH) 600mm diameter piles may be used at the Abutment 1 and Abutment 3 support locations. Spread footings may be used for support at Bent 2. The recommended specified pile tip elevations (SPTE) and specific pile types are shown below in Table 1. All SPTE are such that the calculated ultimate geotechnical capacities of the piles will equal or exceed the required nominal resistance in compression as shown below in Table 1. Recommended soil bearing pressures are provided in Table 2.

Table 1
Pile Data Table

Location	Pile Type	Design Loading	Nominal Resistance		Cut-Off Elevation	Design Tip Elevations	Specified Pile Tip Elevations
			Compression	Tension			
Abut 1 Rt.	600mm CIDH	600 kN	1200 kN	0	NA	147.8m (1)	147.8m
Abut 1 Lt.	600mm CIDH	600 kN	1200 kN	0	NA	146.0m (1)	146.0m
Abut 3 Rt.	600mm CIDH	600 kN	1200 kN	0	NA	147.8 m (1)	147.8m
Abut 3 Lt.	600mm CIDH	600 kN	1200 kN	0	NA	146.0m (1)	146.0m

Note: Design tip elevation controlled by: (1) compression
Elevations based on NAVD 1988

Table No. 2
Bent 2 Spread Footing Data

Support Location	Bottom of footing Elevation	Minimum Footing Width	Recommended Soil Bearing Pressures	
			ASD ¹	LFD ²
			Gross Allowable Soil Bearing Pressure (q_{all})	Ultimate Soil Bearing Pressure (q_{ult})
Bent 2	149.8m	4.2 m	N/A	1450 kPa (15.0 tsf)

Notes: 1) Allowable Stress Design. (ASD). The Maximum Contact Pressure, (q_{max}), is not to exceed the recommended Gross Allowable Soil Bearing Pressure, (q_{all}). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed 3 times the recommended Gross Allowable Soil Bearing Pressure, (q_{all}).
2) Load Factor Design. (LFD). The Maximum Contact Pressure, (q_{max}), divided by the Strength Reduction Factor, (ϕ), is not to exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}).

General Notes

- 1) Should there be any reduction in the spread footing dimensions, or increase in the bottom of footing elevation, the Structure Foundations South Section must be notified to reevaluate the recommended gross allowable soil bearing pressures to be used for design.
- 2) All support locations are to be plotted in plan view on the LOTBs as stated in "Memo to Designers" 4-2. The plotting of support locations should be made prior to requesting a final foundation review.

Construction Considerations

- 1) The LOTB indicate the occurrence of very dense granular materials and fresh, hard cobbles within the CIDH construction zone soil profile. Provisions should be made for hard rock drilling through cobbles and very dense soils.
- 2) The CIDH piles shall be constructed in accordance with Section 49-4, Cast-In-Place Concrete Piles, of the Standard Specifications, July, 1999
- 3) The calculated geotechnical capacity of the CIDH piles is based on a combination of skin friction and end-bearing. To develop the required end bearing, the bottoms of the drilled holes shall be free of slough, cavings or loose soil. All drilled holes are to be cleaned out and inspected prior to placement of reinforcing cage or placing the concrete. Drilled holes are to be reinspected prior to concrete placement to determine if during placement of the reinforcement cage, the wall of the drilled hole was disturbed, causing loose material to fall into the bottom of the hole. If loose material is detected at the bottom of the drilled holes, the contractor is to remove the reinforcement cage and re-clean the bottom of the holes by an approved method.
- 4) There is a potential for the granular soils to cave during the construction of the CIDH piles; therefore, temporary casing may be required.
- 5) Due to the end-bearing requirements, if the drilled hole for the CIDH piles is drilled beyond the specified tip elevation, the reinforcement shall be extended accordingly.
- 6) When the footing excavation (s) has been completed to the required elevation, the footing excavation is to be inspected and approved by a representative of the Office of Geotechnical Design, South, Structure Foundation Branch, South, prior to placing any steel, forms or concrete into the footing excavation. Spread footings are to be constructed on undisturbed native materials. Footing concrete shall be placed neat against undisturbed soil at the bottom of the footing excavation. If the soils at the bottom of the excavation are disturbed or loosened, they shall excavated and removed until undisturbed native soil is exposed.
- 7) Groundwater seepage has been observed under Abutments 1 and 3, and in shallow test holes bored in the traveled surface at the bridge. As the potential for water seepage during pile construction cannot be ruled out, 600mm diameter piles are required, at a minimum. Wet construction techniques may be required.
- 8) The design of the proposed widening should incorporate a closure pour to allow for any settlement and movement of the widening to occur prior to joining with the existing structure.

The recommendations contained in this report are based on specific project information regarding the proposed structure locations, loading conditions and foundation dimensions provided by Office of Structure Design. If any conceptual changes are made during final project design, or if there are any questions regarding the above recommendations, please contact Mark A. Richards at (916) 227-7193 (CALNET 498-7193) or Mark DeSalvatore (916) 227-7056 (CALNET 498-7056), of the Office of Geotechnical Design - South, Structure Foundation South Branch.

Report by: Date: 7/16/01

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- c: R.E. Pending File
- DBarlow - Specs & Estimates
- TRuckman - Specs & Estimates
- OAlcantara - Proj Mgmt
- District 11 Materials and Investigations Engr
- Larry Carr - District 11 Proj Mgr
- LHuynh - Structure PCE
- Geology Bridge File (LA)
- Geology Bridge File (Sac)
- RGES.30

