Foundation Investigation

Oakey Blvd. Separation
Wall St. Separation
Charleston Blvd. Separation
Gass Ave. Separation

MOORE & TABER • Engineers • Geologists
Foundation Investigation

Oakley Boulevard Separation
Wall Street Separation
Charleston Boulevard Separation
Gass Avenue Separation

I-015-1(6) Las Vegas Freeway
Control Section CL83 - F.A. #70090

State of Nevada
Department of Highways

De Leuw, Cather & Company
Engineers
#947

Moore & Taber

by H. R. Taber
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July 28, 1962
This report presents the results of foundation investigation at the sites of the four above structures and fill between Charleston Boulevard and Gass Avenue. Details of structure locations and relative grades are per DeLeuw, Cather & Co. drawings entitled "Structure Boring Locations". Anticipated structure designs are per DeLeuw, Cather & Co. drawings entitled "General Plan and Elevation"; dated August 1961-Oakey, Wall and Charleston, February 1962-Gass. In addition to the exploration completed by Moore & Taber during June 1962, the results of test borings completed during 1959 at Charleston Boulevard for a previous study have been utilized.

**Exploration:**

The subsurface materials were explored by means of rotary sampled borings. Five such borings were completed at the Oakey Blvd. site, four at Wall St., three additional at Charleston Blvd., one in the fill section between Charleston and Gass and four at Gass Avenue. Samples were taken in the borings by means of a 2-inch O.D. "standard penetration" sampler, a 2½-inch I.D. thin-wall sampler and a 2-inch diamond core-barrel. The samplers, equipped with tube liners to retain samples for laboratory testing, were advanced by means of 350-ft.lb. blows. All samples were sealed in moisture-proof containers for transportation to the laboratory. Observations of groundwater level were made in the borings at intervals after completion.

Borings were located and elevations referenced to site data supplied by De Leuw, Cather & Co. Details of the borings
are shown on the accompanying "Log of Test Borings" drawings. Drilling and sampling was performed by equipment and personnel of Moore & Taber. All exploration operations were directly supervised in the field and all borings logged by an engineering geologist - foundation engineer.

Testing:

The soils were classified to size, color, gradation, etc., by examination of the samples and continuous observation of drill cuttings. Strength and bearing characteristics of the soils were established primarily by in-situ "standard penetration" test, consisting of measuring and correlating the driving resistance of the standard penetration sampler to standard 350-ft. lb. blows. Unconfined compression tests were performed on selected samples to supplement standard penetration strength determinations. Supplemental testing for settlement characteristics was performed by standard laboratory consolidation tests.

As an aid to classification and analysis, unit weight, moisture content and plasticity determinations were made on selected samples. Portions of the samples have been retained and are filed for reference. The results of testing are shown on the accompanying "Log of Test Borings" drawings and attached Figures 1 and 2. Field and laboratory tests were performed by Moore & Taber facilities and personnel.

Geologic Conditions and Foundation Materials:

General

The sites are located in an area of deep alluvial deposits. The foundation materials are typical alluvium,
consisting of sand, gravel, silt and clay. Sand and silt predominate in the soil profiles due largely to location with respect to source materials. The profiles show a characteristic irregular distribution of soil types and consistency with individual soil units varying markedly in nature within small areas.

The character of the foundation materials is also affected by the nature of the soil constituents and groundwater conditions. Much of the fine soil fraction, apparently derived from glassy volcanic materials, is susceptible to thorough weathering under suitable conditions. Thus locally, appreciable portions of the fines consist of clay minerals formed in-place. The soil sequence is rich in lime, which combines with a favorable groundwater position to produce a widespread, although not entirely uniform, "caliche" cementation of near-surface soils.

The secondary soil constituent weathering and lime precipitation accentuates the primary irregular nature of the alluvium and erratic distribution of soil types, consistency and bearing capacity. The occurrences of the foundation materials in this area are, however, generalized as follows:

1) Several feet of loose or slightly compact silt or sand from ground surface to depth 3 to 6 ft.

2) Dense gravelly silt or lime-cemented silt from 3 to 6 ft. depth to depths of 8 to 35 ft.

3) Below the dense and/or cemented materials, interbedded slightly compact silt or sand, soft to stiff clay and dense
or cemented silt-gravelly silt.

**Oakley Boulevard Separation**

The foundation materials at this site consist of loose sand to approximate elev. 2045; compact to very dense silt and cemented silt from elev. 2045 to about elev. 2033 and inter-bedded dense or cemented sand-gravel-silt and stiff to very stiff sandy clay-clayey silt below elev. 2033. Within this lowermost unit a 2 ft. layer of soft clayey silt and very loose clayey sand was encountered at elev. 2030. Highest groundwater level was measured at elev. 2037.

**Wall Street Separation**

The foundation materials at this site consist of loose sand and silt to approximate elev. 2040 and compact to very dense and cemented silt from elev. 2040 to 2031. In Borings 1, 2 and 3, the materials below elev. 2031 are alldense and cemented excepting a 1 foot layer of loose clayey sand which occurs at elev. 2031 in Boring-3. In Boring-4, however, loose sand extends from elev. 2031 to 2026; underlain by compact sand and very stiff clayey silt to elev. 2014; very soft clayey silt from elev. 2014 to elev. 2009 and dense sand and silt below elev. 2009. Groundwater level was measured at elev. 2032.

**Charleston Boulevard Separation**

The foundation materials at this site are extremely variable in consistency and distribution. In general they consist of loose and slightly compact silt and sand from ground surface to elev. 2037; compact to dense and cemented silt, sand and gravel from elev. 2037 to elev. 2027 and slightly compact
sand and gravel and/or very dense silt and very stiff clayey silt below elev. 2027. In Boring-2, a five foot layer of soft clayey silt was encountered at elev. 2022. Groundwater level was measured at elev. 2027 (c.f. elev. 2032, 1959).

**Gass Avenue Separation**

The foundation materials at this site consist of slightly compact silt and stiff clayey silt from ground surface to elev. 2040; dense to very dense and cemented silt and gravelly silt with thin beds of stiff clayey silt from elev. 2040 to elev. 2032 and predominantly dense and cemented silt and hard and cemented silty sandy clay below elev. 2032 to elev. 2005. Below elev. 2005 in Boring-2, interbedded soft-stiff and cemented clayey silt was encountered. Groundwater level was measured at elev. 2032.

**Roadway Fill—Charleston to Gass**

The boring located between Charleston and Gass to correlate subsurface materials between structure borings encountered compact and slightly compact silt and sand from ground surface to elev. 2035 and dense-cemented clayey sand below elev. 2035.

**Foundation Recommendations:**

**General**

Conditions are satisfactory for support of interior bents on footing foundations at moderate loads. The proposed continuous footing is well adapted to soil conditions. Soil pressures are based upon adequate factors of safety against base failure and detrimental differential settlement under combined loading for the proposed continuous design. No
groundwater is anticipated in foundation excavations.

Steel H-piles with design loads of 45 tons/pile are suitable for the support of the proposed open abutments. All such piles should have full design bearing at final penetration as indicated by the Engineering News formula.

Foundation conditions are excellent for stability of approach fills. Settlement of near surface soils under fill loading will be minor and take place rapidly with fill construction. Some settlement may occur in deep lying soft soil layers. However, excepting the Wall Street site, it is not anticipated that any precautions are necessary to control settlement from this source.

The results of the roadway boring between Charleston and Gass indicate that the fill foundation materials in this interval are similar to those at structure sites and are adequate to support the fill loading.

**Oakley Boulevard Separation**

Footings to support interior bents may be assigned soil pressures of 2 tons per sq.ft. at elev. 2045. Steel piles are estimated to penetrate to average tip elev. 2043 at the southerly abutments; 2039 at the northerly abutments, with minimum acceptable penetration to elev. 2044; anticipated maximum penetration to elev. 2027.

**Wall Street Separation**

Footings to support interior bents may be assigned soil pressures 2 tons per sq.ft. at elev. 2039. Steel piles are estimated to penetrate to average tip elevation 2035 at the southerly abutments; 2032 at the northerly abutments, with
Minimum acceptable penetration to elev. 2036; anticipated maximum penetration to elev. 2022.

The northerly approach fill will cause some settlement of the loose materials at elev. 2030 possibly extending into the area of the adjacent interior footing. To minimize possibility of settlement from this source, it is recommended that this fill be in place at least 30 days before construction of adjacent bents.

Charleston Boulevard Separation

Footings to support interior bents may be assigned soil pressures of 1.5 tons per sq. ft. at elev. 2036. As an alternative to these relatively deep footings, steel-pile support is feasible. Such piles driven to 45 ton design bearing from footing grade at 2040 are estimated to penetrate to average tip elev. 2028; minimum acceptable penetration to elev. 2034, maximum anticipated to elev. 2017.

Steel-piles to support the abutments are estimated to penetrate to average elev. 2030 at the southerly abutments; 2032 at the northerly abutments, with minimum acceptable penetration to elev. 2034; maximum anticipated penetration to elev. 2022.

Gass Avenue Separation

Footings to support interior bents may be assigned soil pressures of 2 tons per sq. ft. at elev. 2039. Steel piles are estimated to penetrate to average tip elev. 2033 at the southerly abutments; elev. 2030 at the northerly abutments with minimum acceptable penetration to elev. 2036; maximum anticipated penetration to elev. 2022.
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<th>Natural Moisture (%)</th>
<th>Plastic Limit</th>
<th>Liquid Limit</th>
<th>Plasticity Index</th>
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CONSOLIDATION TEST - PRESSURE CURVES

Project  LAS VEGAS FREEWAY  -  No. 3276
Client  STATE OF NEVADA - DEPT. OF HIGHWAYS   -  DE LEUV, CATHEY & CO. - ENGINEERS
Bore/Sample No.  4/1 (6AXS)  3% (WALL)  Depth - Eff. 5 FT. 12 FT. Respectively  Date  JULY 1962

Sample height (inches)

Pressure Tons/sq.ft.

Coefficient of consolidation

Pressure Tons/sq.ft.

C_v (10^-4 cm^2/sec)