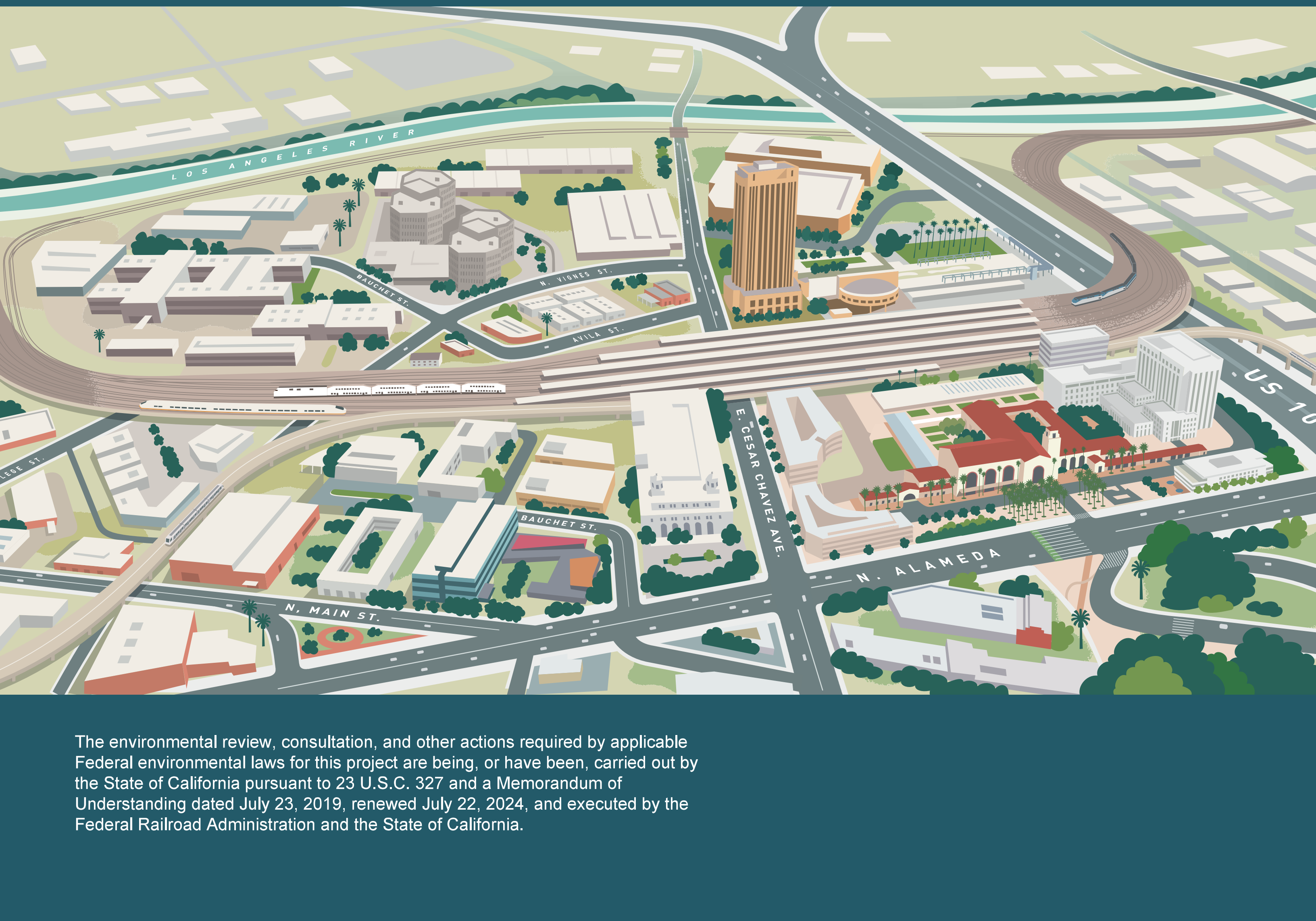
Los Angeles County
Metropolitan Transportation Authority

Link Union Station

Final Preliminary Geotechnical Report

January 2026



The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 23, 2019, renewed July 22, 2024, and executed by the Federal Railroad Administration and the State of California.

Metro

CALIFORNIA
High-Speed Rail Authority

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FIGURES

APPENDICES

ACRONYMS

ADA	Americans with Disabilities Act
af	artificial fill
AOBB	Amtrak Office and Baggage Building
Authority	California High-Speed Rail Authority
bgs	below ground surface
BNSF	BNSF Railway
CBC	California Building Code
Caltrans	California Department of Transportation
CDMG	California Division of Mines and Geology
CGS	California Geological Survey
CIDH	cast-in-drilled-hole
CPT	cone penetrometer test
CP	Control Point
EIS	Environmental Impact Statement
FRA	Federal Railroad Administration
FTIP	Federal Transportation Improvement Program
HSB	Historic Station Building
HSR	High-Speed Rail
Kips	pounds-force
LAUS	Los Angeles Union Station
LOTB	log of test boring
Metro	Los Angeles County Metropolitan Transportation Authority
MOU	Memorandum of Understanding
MSL	mean sea level
NEPA	National Environmental Policy Act
P-S	compressional wave (P) – shear wave (S)
ppm	parts per million
Project	Link Union Station Project
PTC	Positive Train Control
ROW	right-of-way
RTP	regional transportation plans
SCAG	Southern California Association of Governments
SCRIP	Southern California Regional Interconnector Project
SCRTD	Southern California Rapid Transit District
SCS	Sustainable Communities Strategy
US-101	United States Highway 101
USGS	United States Geological Survey
VCE	Vertical Circulation Elements

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ES.0 Executive Summary

This report presents the results of the review of existing data for the Link Union Station Project (Project or proposed action) in Los Angeles, California. The purpose of the study was to review existing data at the site and provide preliminary geotechnical recommendations for the design and construction of the Project. The executive summary briefly summarizes the results of the review, findings, recommendations, and conclusions.

- The subsurface soils generally consisted of fill ranging from a few feet generally, to up to 30 feet in the station platform area. This fill is generally considered uncertified and may require special design considerations. Beneath the fill is a layer of alluvial soil consisting of sands, gravels, and cobbles over bedrock.
- The soils within the Project study area have a moderate to severe corrosion potential to buried metal structures, and the potential for sulfate attack on concrete is considered low.
- Groundwater is relatively shallow, at depths ranging from about 14 to 48 feet.
- No active or potentially active faults are known to cross the site, and the site is not located within a currently delineated State of California Alquist-Priolo Earthquake Fault Zone. Accordingly, the risk of surface rupture due to faulting is considered low. However, the Project study area may be subjected to strong ground shaking during its lifetime. The closest mapped fault is the Elysian Park (Upper) Fault located approximately 0.8 mile from the site.
- The California Geological Survey (CGS; CGS 1999) has identified the Project study area within an area designated as potentially liquefiable. Potential for liquefaction may exist within the Project footprint and would be addressed after future field investigations.
- The probability of other geologic hazards, such as tsunami, seiches, deep seated landslides, or ground subsidence affecting the Project study area, is considered low.
- The proposed structures are likely to be lightly loaded structures or uninhabited structures that may be able to be founded on spread footings. However, heavy loads of major structures would likely require deep foundations including driven or drilled piles. Special consideration must be given to nearby structures, subsurface conditions, and loading in determining foundation types.
- Wet method or casing may be required for drilling, with relatively clean cohesionless soils and groundwater expected at relatively shallow depths. Encountering cobbles and possibly boulders should be expected, as well as possibly contaminated soils and groundwater.
- Future geotechnical exploration is recommended to better characterize the subsurface conditions and anticipated issues that would affect the proposed improvements. In general, additional explorations should be performed at the existing platform area within Los Angeles Union Station (LAUS), along the proposed United States Highway

101 (US-101) Viaduct structure and where lead tracks would provide entrance/exit to LAUS. Refer to Section 8.0 for details.

- Exploratory borings intended for the design of foundations and/or subterranean structures should extend to a minimum depth of 100 feet or into bedrock, whichever is shallower. The spacing of exploratory borings depend on the type of structure and proposed improvements. In general, a minimum of one exploratory boring per bridge support is recommended. Standard penetration test blow counts (N-values) should be obtained from these borings. Geotechnical laboratory testing of recovered soil samples should be performed, as necessary, to obtain engineering design parameters of the subsurface materials. Additionally, shear wave velocity measurements should be considered during future geotechnical exploration. Downhole compressional and shear waves (P-S) suspension logging is the preferable method for obtaining seismic design data at the Project study area due to the accurate measurement of the shear wave velocity value and site-specific conditions.
- Prior to conducting future geotechnical explorations, a geotechnical field work plan is recommended to be prepared to describe the scope of subsequent geotechnical investigation. Future geotechnical explorations should consider existing data, preliminary findings, and the recommendations, as described in Section 8.0.
- During final design, a final geotechnical report would be prepared, incorporating new findings and updated design recommendations, which would address soil-bearing capacity, earth pressures, seismic design parameters, foundation selection, and recommendations to reduce adverse conditions.

Based on this report, the Project is feasible from a geotechnical standpoint, provided the recommendations presented in this preliminary geotechnical report are incorporated into the Project design and construction.

1.0 Introduction

The Los Angeles County Metropolitan Transportation Authority (Metro), as the owner of Los Angeles Union Station (LAUS), is proposing the infrastructure improvements associated with the Link Union Station (Link US) Project (Project or proposed action) to address existing capacity constraints at LAUS. For the purposes of the National Environmental Policy Act (NEPA), Metro is serving as the local Project sponsor and joint lead agency.

Pursuant to 23 United States Code (USC) Section 327 and a memorandum of understanding (MOU) between the Federal Railroad Administration (FRA) and the State of California, effective July 23, 2019, under a program known as NEPA Assignment, the California High-Speed Rail Authority (CHSRA) is responsible for the federal review and approval of environmental documents for projects on the high-speed rail (HSR) system and other passenger rail projects that directly connect to the HSR system, including the Link US Project. For the purposes of the Environmental Impact Statement (EIS) being prepared, CHSRA is serving as the federal lead agency with NEPA responsibilities pursuant to the requirements of the NEPA Assignment MOU. CHSRA and Metro are preparing the EIS in compliance with NEPA (42 USC Section 4321 et seq.), the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500–1508), FRA's Procedures for Considering Environmental Impacts (FRA's Environmental Procedures) (*Federal Register* [FR] 64(101), 28545-28556, May 26, 1999), 23 USC Section 139, and the NEPA Assignment MOU.[1, 2]

Pursuant to the MOU requirements between FRA and the State of California, FRA's Environmental Procedures are being used to determine environmental effects of the No Action Alternative and the Build Alternative.

Below is an overview of the purpose and need, the Project study area, the No Action Alternative, and the major components associated with the on-site infrastructure improvements proposed at and within the vicinity of LAUS that are associated with the Build Alternative considered in the EIS.

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1 While this environmental document was being prepared, FRA adopted new NEPA compliance regulations (23 CFR 771). Those regulations only apply to actions initiated after November 28, 2018. See 23 CFR 771.109(a)(4). Because this environmental document was initiated prior to that date, it remains subject to FRA's Environmental Procedures rather than the Part 771 regulations.

2 The CEQ issued new regulations, effective April 20, 2022, updating the NEPA implementing procedures at 40 CFR Parts 1500–1508. However, because this environmental document was initiated prior to the effective date, it is not subject to the new regulations and CHSRA is relying on the regulations as they existed on the date of the initial Notice of Intent, May 31, 2016. Therefore, all citations to CEQ regulations in this environmental document refer to the 1978 regulations and the 1986 amendment, 51 *Federal Register* 15618 (April 25, 1986).

1.1 Purpose

The purpose of the proposed action is to increase the regional and intercity rail service capacity of LAUS and to improve schedule reliability at LAUS through the implementation of a run-through tracks configuration and elimination of the current stub end tracks configuration while preserving current levels of freight rail operations, accommodating the planned HSR system in Southern California, increasing the passenger/pedestrian capacity and enhancing the safety of LAUS through the implementation of a new passenger concourse, meeting the multi-modal transportation demands at LAUS.

1.2 Need

The need for the proposed action is generated by the forecasted increase in regional population and employment; implementation of federal, state, and regional transportation plans (RTP) that provide for increased operational frequency for regional and intercity trains; and introduction of the planned HSR system in Southern California. Localized operational, safety, and accessibility upgrades in and around LAUS will be required to meet existing demand and future growth.

1.3 Project Location and Study Area

The Build Alternative consists of infrastructure improvements in Downtown Los Angeles in the vicinity of LAUS (Figure 1-1). LAUS is located at 800 Alameda Street in the City of Los Angeles, California. LAUS is bounded by United States Highway 101 (US-101) to the south, Alameda Street to the west, Cesar Chavez Avenue to the north, and Vignes Street to the east. The northern Project limit is at North Main Street (Mile Post 1.18) and the southern Project limit is in the vicinity of Control Point (CP) Olympic, south of Interstate 10 and Olympic Boulevard (Mile Post 142.70).

Figure 1-2 depicts the Project study area, which is generally used to characterize the affected environment, unless otherwise specified, and provide a geographic context for the existing and proposed infrastructure improvements at and within the vicinity of LAUS. The Project study area includes three main segments (Segment 1: Throat Segment, Segment 2: Concourse Segment, and Segment 3: Run-Through Segment). The existing conditions within each segment are summarized north to south below:

- **Segment 1: Throat Segment –** This segment, known as the LAUS throat, includes CP Chavez and the area north of the platforms at the LAUS rail yard, from North Main Street at the north to Cesar Chavez Avenue at the south. In the throat segment, all arriving and departing trains are required to traverse through a complex network of lead tracks, switches, and crossovers. Five lead tracks provide access into and out of the rail yard, except for one location near the Vignes Street Bridge, where it reduces to four lead tracks. Currently, special track work consisting of multiple turnouts and double-slip switches are used in the throat to direct trains into and out of the appropriate assigned terminal platform tracks. The Garden Tracks (stub-end tracks where private train cars are currently stored) are also located just north of the platforms. Land uses in the vicinity of the throat segment are residential, industrial, and institutional.

- **Segment 2: Concourse Segment –** This segment is between Cesar Chavez Avenue and US-101 and includes LAUS, the rail yard, the East Portal Building, the baggage handling building with associated parking areas and access roads, the ticketing/waiting halls, and the 28-foot-wide pedestrian passageway with connecting ramps and stairways below the rail yard. Land uses in the vicinity of the concourse segment are residential, commercial, and public.
- **Segment 3: Run-Through Segment –** This segment is south of LAUS and extends east to west from Alameda Street to the west bank of the Los Angeles River and north to south from Keller Yard to CP Olympic. This segment includes US-101, the Commercial Street/Ducommun Street corridor, Metro Red and Purple Lines Maintenance Yard (Division 20 Rail Yard), BNSF Railway (BNSF) West Bank Yard, Keller Yard, the main line tracks on the west bank of the Los Angeles River from Keller Yard to CP Olympic, and the Amtrak lead track connecting the main line tracks with Amtrak's Los Angeles Maintenance Facility in the vicinity of 8th Street. Land uses in the vicinity of the run-through segment are primarily industrial and manufacturing.

The Project study area has a dense street network ranging from major highways to local city streets. The roadways within the Project study area include the El Monte Busway, US-101, Bolero Lane, Leroy Street, Bloom Street, Cesar Chavez Avenue, Commercial Street, Ducommun Street, Jackson Street, East Temple Street, Banning Street, First Street, Alameda Street, Garey Street, Vignes Street, Main Street, Aliso Street, Avila Street, Bauchet Street, and Center Street.

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Figure 1-1. Project Location and Regional Vicinity

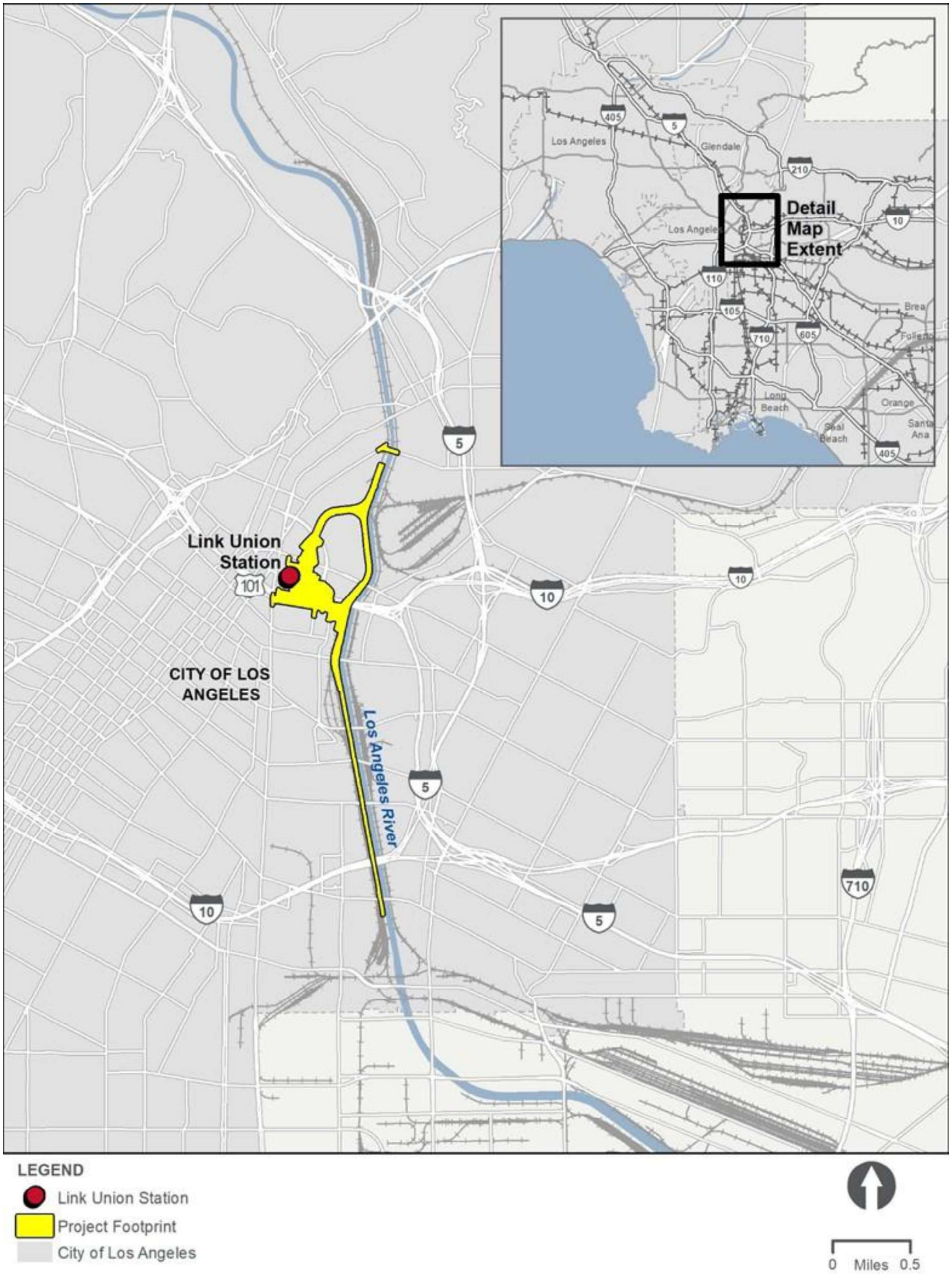

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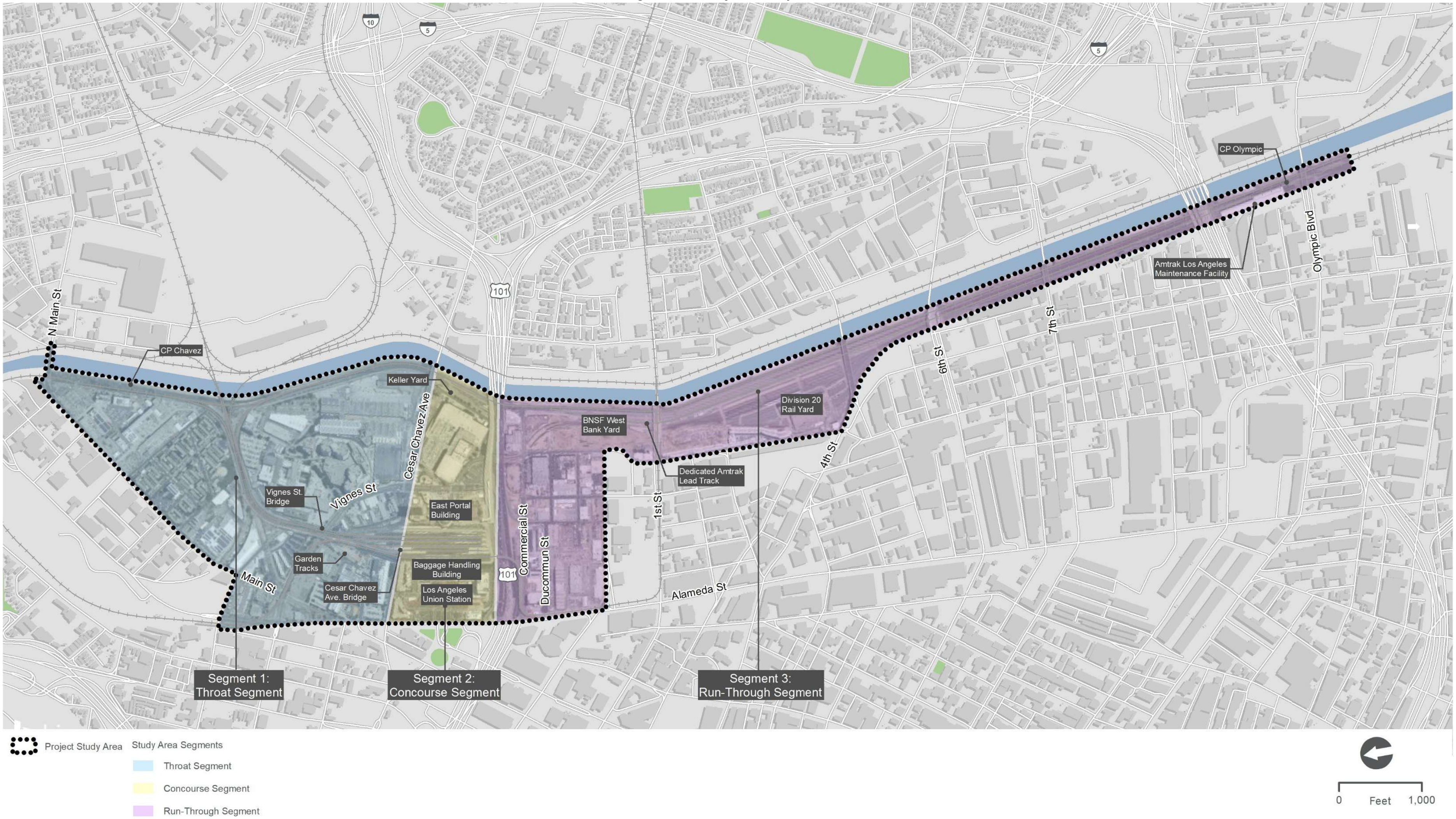
Figure 1-2. Project Study Area



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1.4 Project Alternatives

The EIS includes an evaluation of the No Action Alternative and one build alternative (Build Alternative). The Build Alternative would include, but not be limited to, new lead tracks north of LAUS (Segment 1: Throat Segment), an elevated throat and rail yard with concourse-related improvements at LAUS (Segment 2: Concourse Segment), and 10 run-through tracks south of LAUS (Segment 3: Run-Through Segment).

1.4.1 No Action Alternative

NEPA (40 CFR 1502.14(d)) requires federal agencies to include an analysis of "the alternative of no action." For NEPA purposes, the No Action Alternative is the baseline against which the effects of implementing the Build Alternative is evaluated against to determine the extent of environmental and community effects. For the No Action Alternative, the baseline year is 2016, and the horizon year is 2040.

The No Action Alternative represents the future conditions that would occur if the proposed infrastructure improvements and the operational capacity enhancements at LAUS were not implemented. The No Action Alternative reflects the foreseeable effects of growth planned for the area in conjunction with other existing, planned, and reasonably foreseeable projects and infrastructure improvements in the Los Angeles area, as identified in planning documents prepared by Southern California Association of Governments (SCAG), Metro, and/or Metrolink, including the 2023 Federal Transportation Improvement Program (FTIP) (SCAG 2023), *Final 2008 Regional Comprehensive Plan* (SCAG 2008), and the 2020 RTP/Sustainable Communities Strategy (SCS): Connect SoCal (SCAG 2020).

Conditions in the Project study area would remain similar to the existing condition, as described below:

- **Segment 1: Throat Segment –** Trains would continue to operate on five lead tracks that do not currently accommodate the planned HSR system. The tracks north of LAUS would remain at the current elevation, and the Vignes Street Bridge and Cesar Chavez Avenue Bridge would remain in place.
- **Segment 2: Concourse Segment –** LAUS would not be transformed from a stub-end tracks station into a run-through tracks station, and the 28-foot-wide pedestrian passageway would be retained in its current configuration. No modifications to the existing passenger circulation routes or addition of vertical circulation elements (escalators and elevators) at LAUS would occur.
- **Segment 3: Run-Through Segment –** Commercial Street would remain in its existing configuration, and implementation of active transportation improvements would likely be implemented along Center Street in concert with the *Connect US Action Plan* (Metro 2015). No modifications to the BNSF West Bank Yard would occur.

1.4.2 Build Alternative

The key components associated with the Build Alternative are summarized north to south below:

- **Segment 1: Throat Segment (lead tracks and throat track reconstruction) –** The Build Alternative includes subgrade and structural improvements in Segment 1 of the Project study area (throat segment) to increase the elevation of the tracks leading to the rail yard. The Build Alternative includes the addition of one new lead track in the throat segment for a total of six lead tracks to facilitate enhanced operations for regional/intercity rail trains (Metrolink/Amtrak) and operations for HSR trains within a shared track alignment. Regional/intercity and HSR trains would share the two western lead tracks in the throat segment. The existing railroad bridges in the throat segment at Vignes Street and Cesar Chavez Avenue would also be reconstructed. North of CP Chavez on the west bank of the Los Angeles River, the Build Alternative also includes safety improvements at the Main Street public at-grade railroad crossing (medians, restriping, signals, and pedestrian and vehicular gate systems) to facilitate future implementation of a quiet zone by the City of Los Angeles.
- **Segment 2: Concourse Segment (elevated rail yard and expanded passageway) –** The Build Alternative includes an elevated rail yard and expansion of the existing 28-foot-wide pedestrian passageway in Segment 2 of the Project study area (concourse segment). The rail yard would be elevated approximately 15 feet. New passenger platforms would be constructed on the elevated rail yard with associated vertical circulation elements (stairs, escalators, and elevators) to enhance safety elements and improve Americans with Disabilities Act (ADA) accessibility. Platform 1, serving the Gold Line, would be lengthened, and elevated to optimize east to west passenger circulation. The pedestrian passageway would be expanded at the current grade to a 140-foot width to accommodate a substantial increase in passenger capacity with new functionally modern passenger amenities while providing points of safety to meet applicable California Building Code (CBC) and National Fire Protection Association (NFPA) 130 Standards for Fixed Guideway Transit Systems. The expanded passageway and associated concourse improvements would facilitate enhanced passenger circulation and provide space for ancillary support functions (back-of-house uses, baggage handling, etc.), transit-serving retail, and office/commercial uses while creating an opportunity for an outdoor, community-oriented space with new plazas east and west of the elevated rail yard (East and West Plazas). Amtrak ticketing and baggage check-in services would be enhanced, and new baggage carousels would be constructed in a centralized location under the rail yard. A canopy would be constructed over the West Plaza up to 70 feet in height, and two design options are considered for canopies that would extend over the rail yard (Section 1.4.3).
- **Segment 3: Run-Through Segment (10 run-through tracks) –** The Build Alternative includes 10 new run-through tracks south of LAUS in Segment 3 of the Project study area (run-through segment). The Build Alternative includes common rail infrastructure from LAUS to the west bank of the Los Angeles River (vicinity of First Street

Bridge) to support run-through tracks for both regional/intercity rail trains and HSR trains. At the BNSF West Bank Yard, dedicated lead tracks for Amtrak trains and BNSF trains, in combination with implementation of common rail infrastructure would result in permanent loss of freight rail storage track capacity at the north end of BNSF West Bank Yard (5,500 track feet).

The Build Alternative would also require modifications to US-101 and local streets (including potential street closures and geometric modifications); improvements to railroad signal, positive train control (PTC), and communications systems; modifications to the Gold Line light rail platform and tracks; modifications to the main line tracks on the west bank of the Los Angeles River; modifications to the Amtrak lead track; addition of access roadways to the railroad right-of-way (ROW); land acquisitions; addition of utilities; utility relocations, replacements, and abandonments; and addition of drainage facilities/water quality improvements.

1.4.3 Rail Yard Canopy Design Options

Two design options for canopies over the elevated platforms in the rail yard are considered in conjunction with the concourse-related improvements as part of the Build Alternative.

- **Rail Yard Canopy Design Option 1 (individual canopies) –** This design option would include replacing the existing historic butterfly canopies with individual canopies above each platform. New individual canopies would extend up to 25 feet above each platform and would be similar in form to the existing butterfly canopies but sized to fit the widened and lengthened platforms. Platform lengths would vary between 450 and 1,445 feet. Platforms would be up to 30 feet wide.
- **Rail Yard Canopy Design Option 2 (grand canopy) –** This design option would include replacing the existing historic butterfly canopies with a large grand canopy that would extend up to 75 feet above the elevated rail yard platforms. The grand canopy would be up to 1,500 feet long and wide enough to provide cover over all elevated platforms in the rail yard.

1.5 Project Implementation Approach

The implementation of infrastructure improvements would generally occur in two main phases that are evaluated as scenario years in the EIS: the interim condition and the full build-out condition. The infrastructure improvements for each of these scenarios are described below.

1.5.1 Interim Condition (Phase A)

The interim condition (also referred to as Phase A) is when the run-through track infrastructure south of LAUS and the associated signal modifications, property acquisitions, and civil/structural improvements to facilitate new run-through service would be implemented. The interim condition does not include new lead tracks north of LAUS, or the elevated rail yard and new concourse-related improvements at LAUS. The interim condition aligns with a construction completion date as early as 2026.

A summary of the proposed activities associated with the interim condition is provided below.

- Acquire properties south of LAUS within the Project footprint.
- Relocate utilities north and south of LAUS.
- Acquire a portion of the BNSF West Bank Yard (majority north of First Street) and remove 5,500 feet of existing storage tracks at BNSF West Bank Yard.
- Construct special track work and modify signal/communication infrastructure north of LAUS.
- Construct a run-through track ramp on the southern extent of Platform 4 at LAUS.
- Construct a common viaduct/deck over US-101.
- Construct a common embankment from Vignes Street to Center Street south of LAUS.
- Construct common Center Street Bridge south of LAUS.
- Construct common embankment or new common bridge from Center Street to Amtrak Bridge south of LAUS.
- Construct common Amtrak Bridge south of LAUS.
- Construct Division 20 access road.
- Construct common rail embankment on the west bank of the Los Angeles River (from Amtrak Bridge to First Street Bridge).
- Construct new dedicated lead tracks for BNSF freight trains and Amtrak trains.
- Construct two run-through tracks from Platform 4 at LAUS to the main line tracks along the west bank of the Los Angeles River.

Some embankments and/or bridges south of LAUS could be constructed in a phased manner.

1.5.2 Full Build-Out Condition (Phase B)

The full build-out condition (also referred to as Phase B) is when new lead tracks and the elevated throat north of LAUS, along with the elevated rail yard and concourse-related improvements at LAUS would be implemented. The full build-out condition aligns with a construction completion date as early as 2031.

A summary of the proposed activities associated with the full build-out condition is provided below.

- Construct new compatible lead tracks and reconstruct throat north of LAUS.
- Construct new bridges over Vignes Street and Cesar Chavez Avenue north of LAUS.

- Construct elevated rail yard, concourse-related improvements, and East/West Plazas at LAUS.
- Construct remaining run-through tracks for regional/intercity rail operations on previously constructed structures south of LAUS.

The full build-out condition includes the common rail infrastructure for the planned HSR system that would be located throughout the Link US Project limits, including improvements at LAUS. Operation of HSR trains would occur on two lead tracks north of LAUS, Platforms 2 and 3 and associated Tracks 3 through 6 at LAUS, and on HSR run-through tracks supported by common rail bridges and embankments south of LAUS. Operation of the planned HSR system is or will be considered in CHSRA's environmental documentation for the Burbank to Los Angeles and Los Angeles to Anaheim Project Sections.

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2.0 Report Purpose

The purpose of this report is to:

- Document existing geologic, geotechnical, and seismic conditions, including subsurface soils, groundwater, seismicity, corrosion potential, subsidence, and environmental concerns relevant to the Project.
- Facilitate the understanding of the existing geologic and geotechnical information at the Project site that would be used for the preliminary design of the proposed improvements and during the planning of future geotechnical exploratory investigations. During the planning of future geotechnical investigations, the existing available data and findings presented in this report would be taken into consideration to allocate resources where geotechnical information is missing and/or augment subsurface geotechnical information in other areas within the Project limits.
- Identify constructability conditions relevant to proposed improvements. The early identification of these conditions would provide the opportunity to consider alternatives during the planning, design, and construction phases.
- Provide preliminary recommendations for foundation selection, summarize key constructability-related subsurface conditions affecting the Project, and provide recommendations for future geotechnical investigations.

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3.0 Methodology

The methodology used in this report included the following tasks:

- ***Literature Review –*** Public agencies were contacted to obtain relevant geotechnical and geology reports for the Project site. Documents reviewed were obtained from the City of Los Angeles Department of Public Works, City of Los Angeles Department of Building and Safety, Caltrans, and Metro. The reviewed documents include published geologic maps; planning documents and hazard maps; as-built log of test borings (LOTB); and previous geotechnical and environmental reports for LAUS, Metro Red Line Tunnel, East Side Underpass Light Rail Transit (Gold Line Eastside Extension), and nearby developments. This review provided the basis for the evaluation of site conditions and geologic and geotechnical conditions present within the Project study area.
- ***Site Conditions –*** The existing site conditions present where infrastructure improvements are proposed were described. A site reconnaissance was performed to visually identify existing facilities, evaluate the accessibility to the site for future explorations, confirm desk study findings, and identify potential issues that could affect the proposed improvements.
- ***Geologic and Geotechnical Conditions –*** Relevant geologic and geotechnical data were compiled in this report, along with the findings of the performed study for the proposed action. Topics covered included faulting and seismicity, seismic hazards, subsurface soil conditions, groundwater, and environmental-related issues.
- ***Geotechnical Considerations –*** Discussion and conclusions were provided regarding foundation selection, constructability conditions, and summary of finite element analysis results for the proposed improvements.
- ***Recommendations –*** Recommendations for additional geotechnical investigations were provided to better characterize the subsurface conditions where infrastructure improvements are proposed and to confirm the preliminary findings of this report.
- ***Next Steps –*** Discussion was provided for subsequent actions to follow this report.
- ***References –*** A list of references used in the preparation of this report was provided.

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4.0 Literature Review

Various documents were reviewed pertaining to the Project study area. Documents reviewed include published geologic maps; planning documents and hazard maps; LOTBs; and previous geotechnical and environmental reports for LAUS, Metro Red Line Tunnel, East Side Underpass Light Rail Transit (Gold Line Eastside Extension), and nearby developments (Exhibit 4-1 in Appendix A). A list of maps, reports, and documents reviewed is presented below.

Published geologic and hazard maps include the following:

- State of California - Special Studies Zones – Los Angeles Quadrangle, Official Map. (California Division of Mines and Geology [CDMG] 1977).
- State of California Seismic Hazard Zones – *Los Angeles 7.5 Minute Quadrangle* (CGS 1999).
- Los Angeles County Tsunami Inundation Maps (CGS 2009).
- Geologic Compilation of Quaternary Surficial Deposits in Southern California, Los Angeles 30'x 60' Quadrangle (CGS 2012).
- Quaternary Fault and Fold Database for the United States (United States Geological Survey [USGS] and CGS 2006).

Geotechnical information reviewed includes geotechnical reports for LAUS, as well as nearby developments, and as-built plan sheets (Appendix B) presenting LOTBs for nearby Caltrans structures. Pertinent LOTBs are provided in Appendix C, alphabetically by reference name. The complete list of documents reviewed is presented in Section 10.0. The following is a list of the most relevant geotechnical reports and documents considered in this report:

- *Final Environmental Impact Report/EIS, Run-Through Tracks Project* (Caltrans and FRA 2005).
- *Final Geotechnical Summary Report, SR-710 Tunnel Technical Study, Los Angeles County, California* (Caltrans 2010).
- *Geotechnical Investigation Report Volume I, Southern California Rapid Transit District [SCRTD], Metro Rail Project* (Metro 1981).
- *Geotechnical Report: Metro Rail Project-Design Unit A135, LOTBs SCRTD* (Metro 1983).
- *Union Station Area Aquifer Pump Tests Metro Rail Project* (Metro 1986).
- *Temporary Tunnel Excavation Support by Chemical Grouting*. Grouting Soil Improvement and Geosynthetics Proceedings, GT Div. ASCE (Gularte et al. 1992).
- *Geotechnical Engineering and Groundwater Study, Proposed Two Level Subterranean Parking Garage and Four Story Office* (Catellus Urban Development Corporation 1998).

- *Report of Phase I Environmental Site Assessment, Alameda District Plan* (Cordoba Corporation 1994).
- *Metro Rail Project, Main Yard and Shops Yard Leads* (Metro 1988).
- *The Phase I Subsurface Investigation at the Metro Rail A-130 Corridor* (Metro 1987a).
- *The Phase III Subsurface Investigation at the Metro Rail A-130 Corridor* (Metro 1987b).
- *The Phase IV Subsurface Investigation at the Metro Rail A-130 Corridor* (Metro 1987c).
- *Geotechnical Investigation, Proposed West Campus Infrastructure Project, Los Angeles, California, LOTBs* (Catellus Urban Development Corporation 2003).
- *Phase I Environmental Site Assessment and Limited Phase II Testing Selected Portions of the LAUS Property* (TPG Capital, L.P. 2011).

Technical memoranda addressing specific design considerations, including preliminary seismic design parameters for proposed improvements, the potential lowering of the intersection grade at Commercial Street and Center Street, and potential effects on the Metro Red Line Tunnel due to the proposed aerial structures, were also reviewed. The documents reviewed include the following:

- *Preliminary Draft Report for Seismic Design Parameters, Southern California Regional Interconnector Project (SCRIP)* (Metro 2015b).
- *Draft Technical Memorandum Static and Seismic Performance of Red Line Tunnel, SCRIP* (Metro 2016a).
- *Draft Technical Memorandum Impact of Lateral Pile Loading on Red Line Tunnel, SCRIP Project–Geotechnical Fatal Flaw Study* (Metro 2016b).

Pertinent findings and information contained within these maps, memoranda, and reports are discussed within the body of this study.

5.0 Site Conditions

5.1 Existing Facilities

LAUS is located in the northeastern portion of Downtown Los Angeles, on the property bounded by Alameda Street, Cesar Chavez Avenue, Vignes Street, and US-101 (Exhibit 5-1, Appendix A). In general, surface conditions across the Project study area are considered improved, consisting of commercial/industrial and residential developments.

A field reconnaissance was conducted August 15, 2014, of the Project footprint area and April 20, 2016, within the LAUS area to evaluate existing facilities and activities. The Project is located within a mixed industrial-commercial use area. Metro owns most of LAUS, including train platforms, rail tracks, and some nearby facilities. Other owners include the City and County of Los Angeles and private corporations. Specific site locations that were explored during these field visits included the Historic Station Building (HSB), Amtrak Office and Baggage Building (AOBB), LAUS train platforms, Gateway Station Building, Metro Red Line, Cesar Chavez Avenue Undercrossing (Bridge Number [No.] 53C-131), and the facilities in the vicinity of Commercial and Center Streets. The site overlies two major tunnels: one constructed for pedestrian access and the other for the Metro Red Line. A detailed description of the Metro Red Line Tunnel is provided in Section 5.1.1. The pedestrian tunnel is about 28 feet wide and traverses one floor level below the surface tracks and platforms connecting the AOBB and Gateway Station Building with the boarding platforms (Caltrans and FRA 2005).

The HSB is east of Alameda Street and adjacent to the Metropolitan Water District Building. It incorporates retail businesses, a waiting area for passengers, and ticket booths within its central portion. Driveways, an enclosed garden, and a subterranean parking garage are located within the HSB area. The eastern portion of the HSB constitutes the AOBB, used by Amtrak for luggage handling and storage area. Important features to consider for future geotechnical exploration activities include the underground tunnel for the Metro Red Line subway located north of the HSB and the connecting pedestrian tunnel underneath the LAUS train platforms to the AOBB area.

The LAUS train platforms, located on the central portion of LAUS, consist of 6 reinforced concrete platforms with access to 12 rail lines serving Metrolink and Amtrak trains. There is an additional platform located adjacent to the AOBB parking lot area that is in use by the Metro Gold Line. All the Amtrak/Metrolink platforms are accessed through the underground pedestrian tunnel via stairs and access ramps located on both sides of the pedestrian tunnel. The Gold Line platform is accessed via stairs or by an elevator located adjacent to the underground pedestrian tunnel. The surficial materials encountered on the rail tracks consist predominantly of ballast rock, and the areas surrounding the platforms are either concrete or paved surfaces.

The Gateway Station Building is located on the eastern portion of LAUS, adjacent to the train platforms and north of US-101. This building serves as the eastern entrance for the Metro subway lines, Metro buses, and Amtrak/Metrolink.

Commercial Street, located south of LAUS and parallel to US-101, was explored to identify potential issues with the proposed aerial structures on August 14, 2014. During this site visit, personnel performed a reconnaissance of the street starting at Hewitt Street on the west end and terminating at the east end of Commercial Street near the Metro's ROW and railroad tracks. In addition, the intersection of Commercial Street and Central Street was visually explored to evaluate the potential lowering of the intersection grade. Observed land uses within the area consist of existing commercial and industrial establishments. The pavement condition ranges from poor to fair in most of the observed areas. Access to the Metro's ROW parallel to the Los Angeles River was not available on foot at the time of this visit, but future geotechnical exploration of these premises is considered accessible with the required entry permits.

Other facilities near the proposed infrastructure improvements include commercial buildings, parking lots, residential buildings, a Metro bus station, mechanic shops, major freeways and local streets, the Metro Gold Line Bridge, and underground utilities. Existing utility research in this area indicates existing storm drain, steam, air, petroleum products, fiber optic, sewer, electric, water, natural gas, and various other lines within LAUS and the surrounding area.

A summary of existing facilities and foundation information is provided in Table 5-1.

5.1.1 Los Angeles County Metropolitan Transportation Authority Red Line Tunnel

The Metro Red Line Tunnel is a twin cast-in-place concrete tunnel that runs in a northwest-to-southeast direction through LAUS. Each tunnel is nearly 20 feet in diameter with a nominal 12-inch thick concrete lining and located approximately 28 feet apart center-to-center. Within LAUS, this structure runs beneath the station's platforms and pedestrian tunnel. Southeast of LAUS, the Metro Red Line Tunnel begins at grade level, described as the east portal, and runs beneath the intersection of Commercial Street and Center Street, some private lots, and US-101. The construction of the tunnel segment located within LAUS was performed using the cut-and-cover method, and the excavations were supported by the implementation of tiebacks (pre-stressed soil anchors). After construction of the tunnel concrete box structure at LAUS, the tiebacks were abandoned in place (Metro 1988). The tunnel segment located southeast of LAUS was bored using a conventional tunnel boring machine. Horizontal and vertical grouting techniques were implemented for soil stabilization for the segments that run beneath the intersection of Commercial Street and Center Street and beneath US-101. The chemical grouting was applied around the Metro Red Line Tunnel, forming a binocular-shaped underground structure (Metro 2016a). The Metro Red Line Tunnel invert elevation ranges from about 265 feet mean sea level (MSL) near the east portal entrance and slopes down as the it advances northwest with an average invert elevation of about 237 feet MSL beneath US-101 and LAUS. Photographs taken during the construction of the Metro Red Line Tunnel are presented on Exhibits 5-2 and 5-3 in Appendix A.

During the construction of the tunnel segment between the intersection of Commercial Street and Center Street and US-101, a fire incident was reported July 13, 1990. Based on the reviewed documents, the fire was initiated by a spark from the cutting torch used during the installation of high-density polyethylene membrane. During this fire, approximately 730 feet of tunnel lagging used for support was destroyed causing the collapse of this tunnel segment that, at the time of the fire, was ungrouted (Gularte et al. 1992).

Table 5-1. As-Built Information – Existing Structures

Structure	Approximate Foundation Elevation (feet MSL)	Foundation Type	Number of Piles	Average Tip Elevation (feet MSL)	Approximate Pile Length (feet)	Pile Construction Technique
Los Angeles River Bridge and Overhead at Aliso Street (Bridge No. 53-0405) – Initial Construction (Approximately 1954)						
Abutment/Pier 1A, 2A, 1B-17B, 19D, and 20D	270	16-inch diameter CIDH	Hundreds	255	15	Drilled in place
West and East Arch Abutments, Piers 24D and 25D, Abutment 1 – Pier 25	236 at Arch abuts, 267 at Piers	Spread Footing	—	—	—	—
Pier 26 – Abutment 28	255	7-gauge fluted 16-inch diameter cast-in-steel-shell	Hundreds	230	20 - 38	Driven
Los Angeles Street Overcrossings (Bridge No. 53-0629) – Initial Construction (Approximately 1949)						
All	259	Spread footing	—	—	—	—
Alameda Street Overcrossing (Bridge No. 53-0782) – Initial Construction (Approximately 1952)						
All	240	Spread footing	—	—	—	—
Eastside Underpass [Gold Line] (Bridge No. 53-2975)– Initial Construction (Approximately 2004)						
Abutment 1	288	4-foot diameter CIDH	6	210	78	Drilled in place
Bent 2 and Bents 6–9	262	8-foot diameter CIDH	1 each	190	72	

Table 5-1. As-Built Information – Existing Structures

Structure	Approximate Foundation Elevation (feet MSL)	Foundation Type	Number of Piles	Average Tip Elevation (feet MSL)	Approximate Pile Length (feet)	Pile Construction Technique
Bents 3–5	267	10-foot diameter CIDH	1 each	194	73	
Abutment 10	269	3-foot diameter CIDH	5	215	54	

Source: Caltrans n.d., 1949, 1954, and 2004
Notes:
No.=number; MSL=mean sea level, CIDH=cast-in-drilled-hole

6.0 Geologic and Geotechnical Conditions

6.1 Geologic Setting

The Project study area is located within the Los Angeles Basin near the boundary of the Transverse Ranges Province and the northern Peninsular Ranges Geomorphic Province. The mountain ranges include the Santa Monica and San Gabriel Mountains located northwest of the Project study area and the Palos Verdes Hills toward the southwest. The Transverse Ranges are characterized by an east to west trending complex group of mountain ranges and valleys. The Transverse Ranges are comprised predominantly of sedimentary rocks, Mesozoic granitic rocks, and ancient Precambrian rocks of all types. The northern Peninsular Ranges are characterized by a series of northwest to southwest trending mountains and faults. These mountain ranges are composed of metamorphosed sedimentary and volcanic rocks of Jurassic age that have been intruded by mid-Cretaceous plutonic rocks of the Southern California batholith and rimmed by Cenozoic sedimentary rocks (Gastil and Krummenacher 1981; Schoellhamer et al. 1981).

The Project footprint area is located west of the Los Angeles River on a gently sloping alluvial surface. Topography within the Project footprint area slopes downward from north to south with ground elevations ranging from about 295 to 274 feet above MSL. Based on the review of the Geologic Compilation of Quaternary Surficial Deposits in Southern California (CGS 2012), the Project footprint area is underlain by Holocene-age and Pleistocene alluvium deposits consisting of silty sands, sands and silts with varying amounts of gravel and cobbles (Exhibit 6-1 in Appendix A). Beneath the alluvium layers, Miocene Puente marine sedimentary formations are present within the Project footprint area (Bilodeau et al. 2007). Although not shown on the published map, artificial fill (af) is anticipated within the Project footprint area related to the construction of the existing structures and improvements.

6.2 Faulting and Seismicity

The review of available literature indicates there are no known active or potentially active faults that have been mapped within the Project study area and the Project study area is not located within an Alquist-Priolo Earthquake Fault Zone (see Exhibits 6-2 and 6-3 in Appendix A). The principal seismic hazard that could affect the site is ground shaking resulting from an earthquake occurring along one of several major active or potentially active faults in Southern California. Based on the review of the Caltrans Acceleration Response Spectrum Online (Caltrans 2016b), the USGS and CGS (USGS and CGS 2006) Quaternary Fault and Fold Database, and the Alquist-Priolo Special Studies Zone Map for Los Angeles Quadrangle (CDMG 1977), the closest active faults that could affect the site, approximate distances, fault lengths, and magnitudes are presented in Table 6-1.

Table 6-1. Nearby Faults

Fault Name	Distance from Site (Mile)[a]	Moment Magnitude[b]
Elysian Park (Upper)[c]	0.8	6.6
Hollywood	4.3	6.6
Puente Hills (Los Angeles)[c]	4.5	6.9
Raymond	4.6	6.7
Santa Monica	4.6	7.0
Verdugo	6.8	6.8
Newport Inglewood	8.4	7.2
Sierra Madre	11.0	7.2
Elsinore	11.6	6.9
Malibu Coast	16.7	6.6
Palos Verdes	17.7	7.2
San Gabriel	18.2	7.3
THUMS – Huntington Beach	19.6	6.6
Northridge Hills	19.3	6.4

Note:
[a] *Distance from site is approximate and measured from LAUS (USGS and CGS 2006)*
[b] *Caltrans 2016b*
[c] *Blind thrust fault: Mapped by Caltrans Acceleration Response Spectrum Online but not mapped by USGS and CGS (Caltrans 2016b; USGS and CGS 2006)*

6.3 Seismic Design Criteria

To mitigate the effects of ground shaking produced by regional seismic events, seismic design should be performed in accordance with the applicable building codes. Seismic design criteria and recommendations relevant to the proposed improvements are included in a preliminary technical memorandum prepared by Earth Mechanics, Inc. (Metro 2015b).

6.4 Seismic Hazards

6.4.1 Fault Rupture

Based on available literature and reports, no active faults are known to traverse the Project study area and the Project study area is not located within a currently designated Alquist-Priolo Earthquake Fault Zone. The nearest special study zone as mapped by CDMG is approximately 5.5 miles from the Project location (CDMG 1977) (Exhibit 6-3 in Appendix A).

6.4.2 Seismic Ground Shaking

The Project is located within an active seismic region and is expected to experience ground shaking from an earthquake occurring along several major active or potentially active faults in Southern California (Section 6.2 for details). Consequently, the implementation of the proposed improvements may increase the number of people exposed to effects associated with seismically induced ground shaking. The seismic ground shaking hazard is considered moderate to high.

6.4.3 Liquefaction and Seismically Induced Settlement

Liquefaction is the loss of soil strength or stiffness due to a buildup of pore-water pressure during ground shaking. Liquefaction is associated primarily with loose (low-density), saturated, fine- to medium-grained, cohesionless soils. Effects of liquefaction can include sand boils, excessive displacements, bearing capacity failures, and lateral spreading. Seismically induced settlement consists of dry dynamic settlement (above groundwater) and liquefaction-induced settlement (below groundwater). This settlement occurs primarily within loose to moderately dense sandy soil due to reduction in volume during and shortly after an earthquake event.

Based on the review of the Seismic Hazard Zones map for the *Los Angeles 7.5-Minute Quadrangle* (CGS 1999), the Project study area is located within an area designated as potentially liquefiable (Exhibit 6-3 in Appendix A).

A review of existing borings from nearby projects and borings performed by others at LAUS and surrounding areas, the groundwater level ranges between depths of approximately 14 to 48 feet below ground surface (bgs) (corresponding groundwater elevations range from about 222 to 256 feet MSL). Historical groundwater depths as shallow as 13.5 feet below ground were reported (Catellus Urban Development Corporation 1998, 2003), but more recent measurements indicated a steady groundwater level decline (Section 6.6 for discussion). The soils encountered below groundwater are generally alluvial deposits consisting of medium dense to very dense sandy silts, silty sands, and sands with gravel that are not considered susceptible to liquefaction. However, there is evidence of thin interbedded loose materials within the upper 30 feet of the Project study area. These layers would need to be evaluated during future subsurface exploration to confirm their liquefaction potential for the site. In general, and from a preliminary standpoint, based on the available geotechnical data and groundwater assumptions (see Section 6.6), the potential for liquefaction and seismically induced settlement to occur within the Project study area is considered low.

6.4.4 Lateral Spreading

Lateral spreading is a type of landslide motion generally characterized by progressive cracking and ground motion near a slope face. Lateral spreading is generally associated with liquefiable soils, which allow the slope face and surrounding area to flow during or shortly after earthquake ground motions. Conditions favorable for lateral spreading are frequently found along streams and waterfronts or in loosely placed, saturated, sandy fill (Rauch 1997). The Los Angeles River is located southeast of LAUS; it is a channelized concrete channel. Based on the proposed improvements, as well as the known soil conditions, the potential for lateral spreading within the Project study area is considered low. The liquefaction potential should be further evaluated during the design phase of the Project, using site-specific information collected from future exploratory borings.

6.4.5 Seiches and Tsunamis

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Tsunamis are waves generated in large bodies of water by fault displacement or major ground movement. Based on the absence of enclosed bodies of water near the Project study area and the CGS Tsunami Inundation Map (CGS 2009), seiche and tsunami risks at the Project study area are considered negligible.

6.5 Subsurface Earth Materials

The review of existing geotechnical data, geologic maps, reports, and other pertinent information indicates the Project study area is underlain by varying amounts of artificial fill and young alluvium deposits ranging from loose to medium dense materials, such as silty sands/sandy silts, silt, and sands with varying amounts of gravel and cobbles. The artificial fill varies in composition but is generally known to contain construction debris, as well as imported natural earth materials. The compaction of this layer is uncertain and, therefore, this layer of fill is categorized as "uncertified fill." Generally, in Los Angeles County, uncertified fill may not be used to support loads from structures, and the removal and recompaction of this layer should be anticipated for construction. In the review of existing data, the artificial fill layer varies from about 5 to 15 feet in thickness but may extend to depths as great as about 30 feet bgs in some locations. Within the concourse area, the artificial fill ranges from about 20 to 30 feet bgs. The young alluvium encountered within the Project study area consists primarily of coarse-grained deposits ranging in consistency from loose to very dense silty sands, clayey sands, and sands with varying amounts of gravel and cobbles. Interbedded fine-grained deposits consisting of soft to stiff sandy silts, silt, and clay were also observed within the young alluvium in the LAUS area (Metro 1983). Generally, the thickness of the young alluvium within the Project study area ranges from about a few feet to up to 85 feet.

The fill and younger alluvium deposits are underlain by the Puente Formation. The Puente Formation (bedrock) consists predominantly of interbedded siltstone and sandstone with thinly bedded claystone. The degree of weathering of the bedrock decreases with increasing depth. The upper several feet of the bedrock is weakly cemented and susceptible to softening or slaking in the presence of water; however, deeper beds are strongly cemented. Near the platforms/tracks and the concourse passenger areas, bedrock was generally encountered at approximately elevation 200 feet MSL, which is about 95 feet below existing grade (Metro 1983). On the southeast side of LAUS and east of the intersection of Commercial Street and Central Street, bedrock is generally estimated at depths ranging from about 75 to 85 feet bgs. However, the borings performed for the Gold Line Eastside Extension Project located near the intersection of Alameda Street and Commercial Street encountered bedrock at depths ranging from 49 to 75 feet bgs or corresponding elevations ranging from 226 to 218 feet MSL. Other areas in the vicinity of the Project study area encountered bedrock at relatively shallow depths ranging from about 18 to 30 feet bgs or corresponding elevations ranging from 245 to 257 feet MSL in the southwestern portion of LAUS as described in the geotechnical exploratory borings (Catellus Urban Development Corporation 2003). Other data reviewed included borings located on Cesar Chavez Avenue, Keller Street, and Lyon Street, which did not encounter bedrock within their exploration depths (up to about 50 feet bgs).

In general, the Puente Formation is of low to moderate strength with locally hard, cemented, and interbedded concretions. Limited unconfined compressive strength tests performed for the Metro Red Line Tunnel indicates unconfined compressive strengths ranging from about 10 to 175 pounds per square inch, with an average value of about 80 pounds per square inch (Metro 1983). Based on the review of the report performed by others (Caltrans 2010), the unconfined compressive strength of the Puente Formation varies from about 50 to 750 pounds per square inch (Caltrans 2010). The strength of cemented layers and concretions vary from 4,000 to 15,400 pounds per square inch (Caltrans 2010). Cross sections utilizing selected boring logs obtained from the previous reports were prepared for LAUS and Commercial Street (Exhibits 6-4 and 6-5 in Appendix A).

6.6 Groundwater

Based on the review of previous reports and available data, the groundwater levels within the Project footprint area range between approximately 14 and 48 feet bgs (corresponding groundwater table elevations range from about 222 to 256 feet MSL). Historical groundwater depths as shallow as 13.5 feet below ground were reported (Catellus Urban Development Corporation 1998, 2003), but more recent measurements indicate a steady groundwater level decline. The groundwater quality at the Project study area is not specifically known, but the groundwater may contain inorganic constituents, as well as organic contaminants from solvent and petroleum hydrocarbon pollution associated with industrial activities in the area (Caltrans and FRA 2005). Underground facilities, as well as temporary excavations during construction, should anticipate encountering groundwater if greater than about 10 to 15 feet bgs. See Section 6.12 regarding potential groundwater contamination. For a preliminary evaluation, a design groundwater level of 35 feet bgs was considered in areas north of US-101 (from the station platform area northward) and 25 feet bgs elsewhere.

6.7 Collapsible and Expansive Soils

Collapsible soils are soils that undergo settlement upon wetting, even without the application of additional loads. Typical collapsible soils are low in plasticity and have relatively low moisture contents and densities. These soils are distributed throughout the southwestern United States, specifically in areas of young alluvial fans, debris flow sediments, and loess (wind-blown sediment) deposits. Expansive soils are generally plastic clays that can undergo a substantial increase in volume with increase in moisture content and a substantial decrease in volume with a decrease in moisture content. Expansive soils can cause uplift pressures that can lead to structural damage. Based on the review of available geotechnical reports (Section 4.0), collapsible soils and expansive soils have not been identified at the Project study area. Therefore, the soils at the Project study area have low collapse and expansion potential.

6.8 Corrosion Potential

Existing available data indicates soils located within LAUS exhibited sulfate concentrations ranging from 152 to 475 parts per million (ppm) and chloride concentrations ranging from 3,000 ppm to 4,600 ppm (Metro 1981). Caltrans Corrosion Guidelines (Caltrans, 2021) define a corrosive soil as a material in which any of the following conditions exist: a chloride content greater than 500 ppm; soluble sulfate content greater than 1,500 ppm; or a pH of 5.5 or less. Based on these guidelines established by Caltrans and existing data from previous reports, the soils within the Project study area have a moderate to severe corrosion potential to buried metal structures, and the potential for sulfate attack on concrete is considered low. However, future studies should further assess corrosion potential.

A geotechnical report prepared for the Metro Red Line Tunnel (Metro 1986) described severe corrosion to groundwater monitoring instrumentation and pump equipment exposed to the groundwater in the LAUS area. During this investigation, soils within LAUS were treated with hydrogen peroxide to reduce hydrogen sulfide content in the groundwater. The hydrogen peroxide treatment was successful in the reduction of hydrogen sulfide in the groundwater within LAUS (Metro 1986). The subsurface soils within the Project study area would be evaluated in the future, planned investigations for the potential for corrosion to concrete and ferrous metals to confirm previous findings.

6.9 Subsidence and Settlement

Ground subsidence is a process characterized by downward displacement of surficial materials caused by natural phenomena, such as removal of underground fluids, natural consolidation, or dissolution of underground minerals, or by man-made phenomena, such as underground mining or tunneling. The Project study area is located north of the Union Station Oil Field. The LAUS Run-Through Tracks Project Environmental Impact Report/EIS (Caltrans and FRA 2005) indicates the potential for subsidence due to the extraction of oil in the surrounding area near LAUS is considered low. It is anticipated that the proposed improvements would impose higher loads on the existing soils than presently exist; therefore, settlement, both long-term and immediate, is anticipated to occur in low density, loose deposits of silts, clays and sands for those improvements proposed to rely upon the upper zones for support using shallow foundations. The review of existing soil boring logs indicates thin, interbedded loose deposits within the upper 30 feet of the artificial fill should be anticipated. Significant settlement was generally not a controlling issue in the reports reviewed. Proper compaction and/or the removal of fill soils should be considered for proposed improvements. Another alternative to consider is use of deep foundations which extend through the artificial fill soils and bear in firm strata.

6.10 Flooding

The Flood Insurance Rate Map 06037C1636F (Federal Emergency Management Agency 2015) depicted that the Project footprint area is located within Zone "X" (unshaded), an area designated to be outside the 500-year floodplain and protected by levee from 100-year floodplain. The potential for flooding for the proposed action is considered low.

6.11 Mineral Resources

The Project footprint area is underlain by man-made fill and alluvium materials, such as sand and gravel, which could be considered mineral resources and used as construction aggregates. However, the mining of such materials within an urbanized environment is not practical. Therefore, no significant effect on mineral resources would be attributed to the construction of the proposed action.

6.12 Environmental Concerns

Several environmental reports were reviewed regarding subsurface conditions. Due to the long history and varied uses of this area of Los Angeles, the Project study area is expected to have variable potential for contamination. The J. Byer Group reported encountering methane and hydrogen sulfide in their test wells near LAUS (Catellus Urban Development Corporation 1998). In one sample at Test Well No. CMW2, located west of the HSB, combustible gas readings were high enough to reach the lower explosive limit. Similar combustible gas conditions were encountered at the site when performing pump tests as reported by others (Metro 1986). Additionally, previous problems had been encountered at the site when performing a pump test related to entrained gases in the water (possibly methane), which may have been released by the underlying Puente Formation (Metro 1986). Groundwater contaminated with gas or other volatile organic compounds may be encountered during groundwater pumping on site. Other detailed recommendations for dewatering can be found in the J. Byer Group report (Catellus Urban Development Corporation 1998).

In addition, the area located south of Jackson Street and west of the Los Angeles River is mapped as an abandoned oil field (Union Station Oil Field); consequently, bedrock could contain hydrocarbon odor and stains (DOC 2023).

A boring performed near the Los Angeles River (Boring CEG-2) indicates the presence of natural oil, which was encountered at a depth of about 37 feet bgs (Metro 1981).

Soil and groundwater contamination at LAUS was found primarily in the eastern, northern, and southern portions of the property. The contaminants found in soil samples at LAUS included carbon disulfide, petroleum hydrocarbons, benzene, toluene, xylenes and potentially methylene choline in the upper 30 feet bgs. Twenty-eight volatile organic compounds were reported in groundwater samples, which include acetone, dicloroethane, dichloroethylene, tetrachloroethylene, toluene, methylene chloride, carbon disulfide, and various others (Cordoba Corporation 1994). Further studies (TPG Capital, L. P. 2011) suggest the highest concentrations of volatile organic compounds exist on the off-site portion of the Gateway Area, near the intersection of Vignes Street and Cesar Chavez Avenue, whereas the yard tracks are contaminated with petroleum hydrocarbons, lead, and semi-volatile organic compound from historic rail operations. Similar types of contaminants are expected to be found near LAUS, including the southern parts of the 1st Street Viaduct Bridge, Keller Street, Ramirez Street, Commercial Street, Center Street, and various other streets.

Soil and groundwater environmental investigations for the construction of the Metro Red Line Tunnel segment between the intersection of Commercial Street and Center Street and US-101 revealed low levels to nondetectable levels of soil and groundwater contaminants (Metro 1987a, 1987b, and 1987c).

Numerous on- and off-site contamination sources are known to exist or have existed at the site. Some of these sources and their contaminants are described in previous environmental documents (Cordoba Corporation 1994; TPG Capital, L.P. 2011). In general, the site is affected by volatile organic compounds from various sources, and nearby rail operation areas are affected by petroleum hydrocarbons, lead, and semi-volatile organic compound. The report prepared for the site determined that these areas affected by rail operations are generally limited to the upper 10 feet of materials below existing site grade (TPG Capital, L.P. 2011).

6.13 Methane Gas

Based on the review of the Methane and Methane Buffer Zone Map (City of Los Angeles 2004), portions of the Project study area are located within an area designated as Methane Zone. The areas within the Project limits affected by this designation are located south of US-101. Therefore, there is the potential for methane and other volatile gases to exist within the Project footprint area.

7.0 Geotechnical Considerations

7.1 Foundation Type

Based on the review of previous reports, anticipated loading characteristics of the proposed improvements and the soil stratigraphy within the Project study area, a combination of shallow foundations and deep (pile) foundations would likely be suitable to support proposed improvements. Reviewed reports indicate allowable bearing pressures for spread footings of between 3,000 and 4,000 pounds per square foot. Where conventional spread foundations are considered, proper treatment (removal and recompaction) of the uncertified artificial fill is required. Similarly, if loading capacity is required for pile foundations (especially for lateral loading), the uncertified fill should be removed and recompacted to meet or exceed the minimum compaction criteria for the proposed improvements, or these foundations are designed to not rely on these uncertified fill soils for lateral resistance.

The foundation type selection should account for the presence of adverse conditions, such as a shallow groundwater table, presence of dense to very dense granular materials and cobbles, caving of loose granular soils, the highly urbanized area surrounding the Project study area, potential soil corrosion, and potential for encountering contaminated soils. Heavy column and wall loads would be best supported by a deep foundation system. Feasible deep foundation types include steel piles driven to refusal into bedrock and cast-in-drilled-hole (CIDH) piles. Foundation types, such as CIDH piles and driven steel piles, would provide suitable support for the proposed structures with the proper design and construction methods. During the construction of pile foundations, difficult driving and/or drilling can be expected due to the presence of dense to very dense deposits, cobbles and bedrock at shallow depths within the Project footprint area. CIDH piles were the prevailing recommended foundation type among the more recent documents reviewed. Where axial load demands are high, utilizing methods such as base grouting of CIDH piles should be considered to increase compressive capacity.

However, the relatively shallow depth to the Puente Formation bedrock may make driven piles a feasible alternative. Consideration should be given to underground utilities; nearby structures; and existing tunnels, which may be sensitive to ground vibrations, corrosion of pile steel, and noise impacts if driven piles are to be considered.

7.2 Constructability Considerations

Some known constructability-related subsurface conditions exist at the Project study area. The intent of the planned future exploration is to better delineate these and other conditions near proposed improvements. Anticipated subsurface conditions at the Project footprint area that might affect the proposed improvements are summarized below:

- Presence of groundwater ranging from depths of about 14 to 48 feet bgs (corresponding groundwater table elevations range from about 222 to 256 feet MSL) is anticipated at LAUS.

- Environmental concerns exist, given the presence of contaminated soils and groundwater at LAUS.
- Corrosion potential of soils at LAUS is considered high.
- The effect of proposed improvements to the existing Metro Red Line Tunnel within LAUS and off-site areas must be considered (near the intersection of Commercial Street and Center Street).
- Difficult driving or drilling conditions for piles could be encountered at the site due to gravel and cobble layers and bedrock.
- Abandoned tiebacks (pre-stressed soil anchors) installed during the construction of the Metro Red Line Tunnel within LAUS could pose obstructions to deep foundations and other proposed improvements.

7.3 Finite Element Analysis Results

A finite element analysis was performed by Earth Mechanics, Inc. to evaluate the effect on the existing Metro Red Line Tunnel due to the potential street grade modification at the intersection of Commercial and Center Streets, which includes the lowering of the roadway by approximately 7 feet below existing grade. Based on the preliminary results provided in the technical memorandum by Earth Mechanics, Inc. (Metro 2016a), the lowering of Commercial Street and Center Street would not affect the structural integrity of the existing Metro Red Line Tunnel. In addition, Earth Mechanics, Inc. did not identify any fatal flaws when evaluating the tunnel performance under static and seismic conditions due to the proposed lowered grade (Metro 2016a).

Another analysis was performed (Metro 2016b) to evaluate the effect of lateral pile loading on the Metro Red Line Tunnel near the intersection of Commercial Street and Center Street due to the proposed aerial bridge structure. The two-dimensional finite element analysis considered a 10-foot diameter CIDH pile located at approximately 20 feet apart from the Metro Red Line Tunnel. Since lateral pile demands were not available, Earth Mechanics, Inc. provided a range of possible pile response using incremental lateral displacements for both fixed and free pile head conditions. Based on the analysis, the pile top shear force required to displace the pile 1 inch is approximately 1,700 pounds-force (kips) and 3,500 kips for the free-head and fixed-head conditions, respectively (Metro 2016b). These results are considered preliminary, and further analysis would be required when more detailed design information becomes available.

8.0 Recommendations

Future geotechnical exploration is recommended to better characterize the subsurface conditions and anticipate issues that would affect the proposed improvements. In general, additional explorations should be performed at the existing platform area within LAUS, along the proposed US-101 Viaduct structure and where lead tracks would provide entrance/exit to LAUS. Special consideration should be given to the existing Metro Red Line Tunnel to identify any potential impacts that the proposed improvements might have on this underground structure. The subsurface soils and groundwater contain moderate to high levels of contamination, and the presence of combustible gases, including methane, may affect the drilling and sampling at the Project study area (Section 6.12).

Based on the existing Project study area conditions and the expected shallow depth to groundwater, a combination of hollow stem auger and mud rotary drilling methods may be used. Coring of bedrock, if encountered, should be considered to obtain bedrock design information. Subsurface materials contain varying amounts of gravel and range from medium dense to very dense, but these soils can be drilled and sampled to the required depths using conventional drilling technology. Exploratory borings intended for the design of foundations and/or subterranean structure should extend to a minimum depth of 100 feet or into bedrock, whichever is shallower. The spacing of exploratory borings depends of the type of structure and proposed improvements. In general, a minimum of one exploratory boring per bridge support is recommended. Standard penetration test blow counts (N-values) should be obtained from these borings. Geotechnical laboratory testing of recovered soil samples should be performed, as necessary, to obtain engineering design parameters of the subsurface materials.

Cone penetrometer tests (CPT) equipped with one or more geophone sensors and pushed to refusal should be considered in addition to the conventional borings, in particular at the platform areas and the proposed US-101 Viaduct structure. Per foot of exploration, CPTs are more cost-effective than soil borings, and they also provide more precise subsurface data useful for soil characterization, liquefaction analysis, seismic analysis, and pile capacity design. The state of the practice for CPTs has improved over the years and some CPTs can now be pushed through denser or coarse-grained alluvium than in the past but may still encounter relatively shallow refusal in very dense soil layers or bedrock. CPTs could be mobilized first and exploratory borings using a combination of hollow stem auger and mud rotary drilling methods could then be drilled to augment data where the CPTs could not reach sufficient depths. Seismic design parameters (shear wave velocity) can be obtained by using seismic CPTs, seismic refraction, and/or downhole P-S suspension logging. Due to the presence of dense granular materials, seismic CPTs might encounter shallow refusal, consequently limiting its capabilities to gather useful data for seismic analysis. Downhole P-S suspension logging is the preferable method for obtaining seismic design data at the Project study area due to the accurate measurement of the shear wave velocity value and site-specific conditions. The downhole P-S suspension logging can be performed in any exploratory boring planned for the Project. Noninvasive methods, such as seismic refraction, can also be considered to obtain seismic design data for the proposed improvements.

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9.0 Next Steps

The findings presented in this report were based solely on the review of published geologic maps and geologic sources, planning documents, and previous geotechnical reports for LAUS and nearby developments. The findings presented in this report are considered preliminary and would need to be reevaluated during the Project's final design phase. Additional geotechnical investigations should be performed to provide site-specific design information for the proposed improvements and incorporate any modifications to the design of the Project. The recommended next steps are as follows:

- Delineate potential areas requiring further investigation by taking into consideration the findings presented in this report and the location of the proposed improvements.
- Plan and prepare a detailed geotechnical field work plan for proposed geotechnical investigation, which would be prepared by incorporating the preliminary findings of this report and the recommendations, as described in Section 8.0.
- Conduct additional geotechnical exploratory investigations to obtain additional subsurface soil information to be used to confirm preliminary findings and in the refinement of recommendations, which would reduce the risk of encountering unexpected subsurface conditions during the Project's design phase.
- Provide mitigation alternatives for the identified constructability-related subsurface conditions affecting the Project, as described in Section 7.2.
- During final design, prepare a final geotechnical report, incorporating new findings; refined Project alternatives; and updated design recommendations, which would address soil bearing capacity, earth pressures, seismic design parameters, foundation selection, and recommendations to reduce adverse conditions.

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10.0 References

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Appendix A: Exhibits

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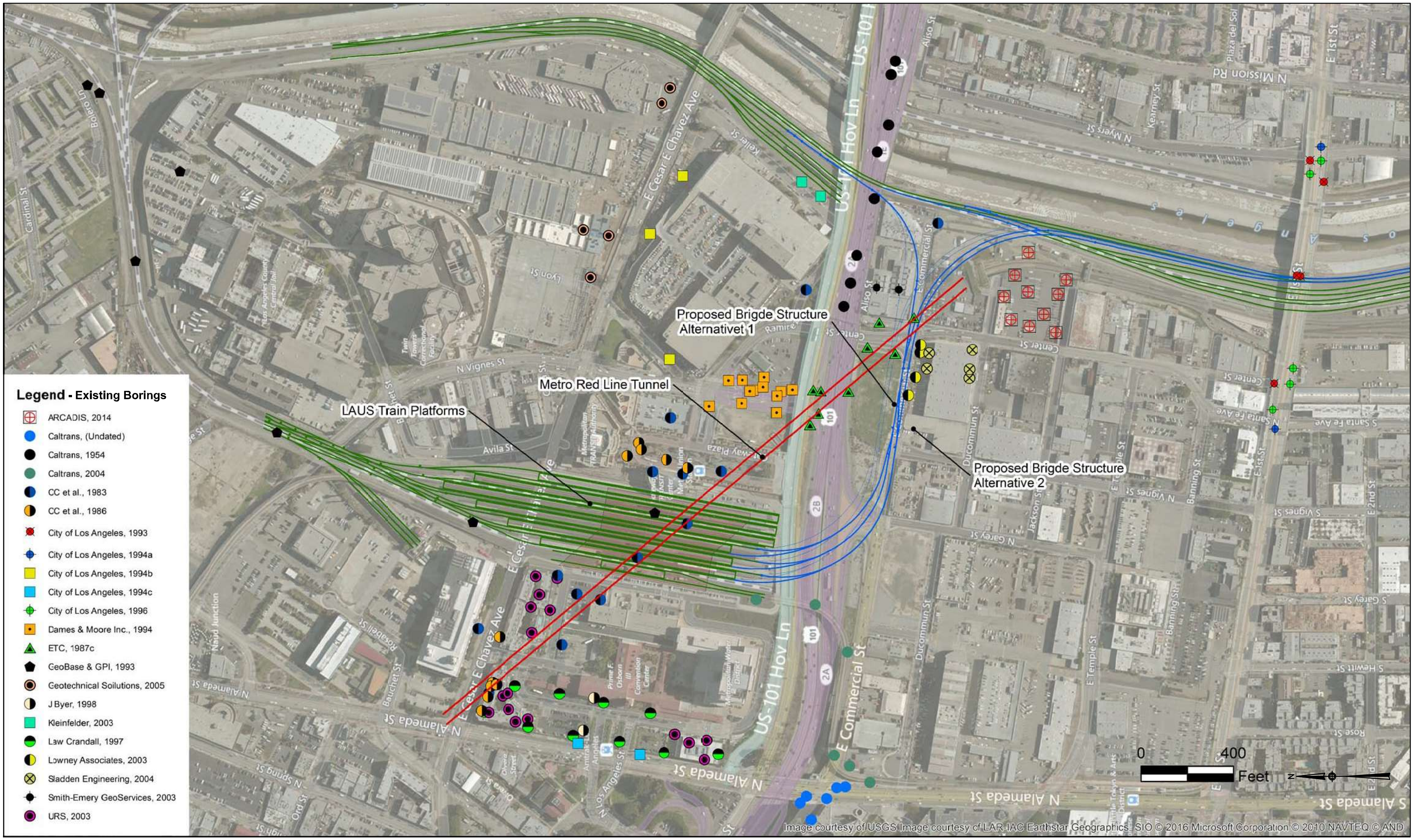

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LINK UNION STATION
EXISTING DATA - EXHIBIT 4-1

SCALE: AS SHOWN
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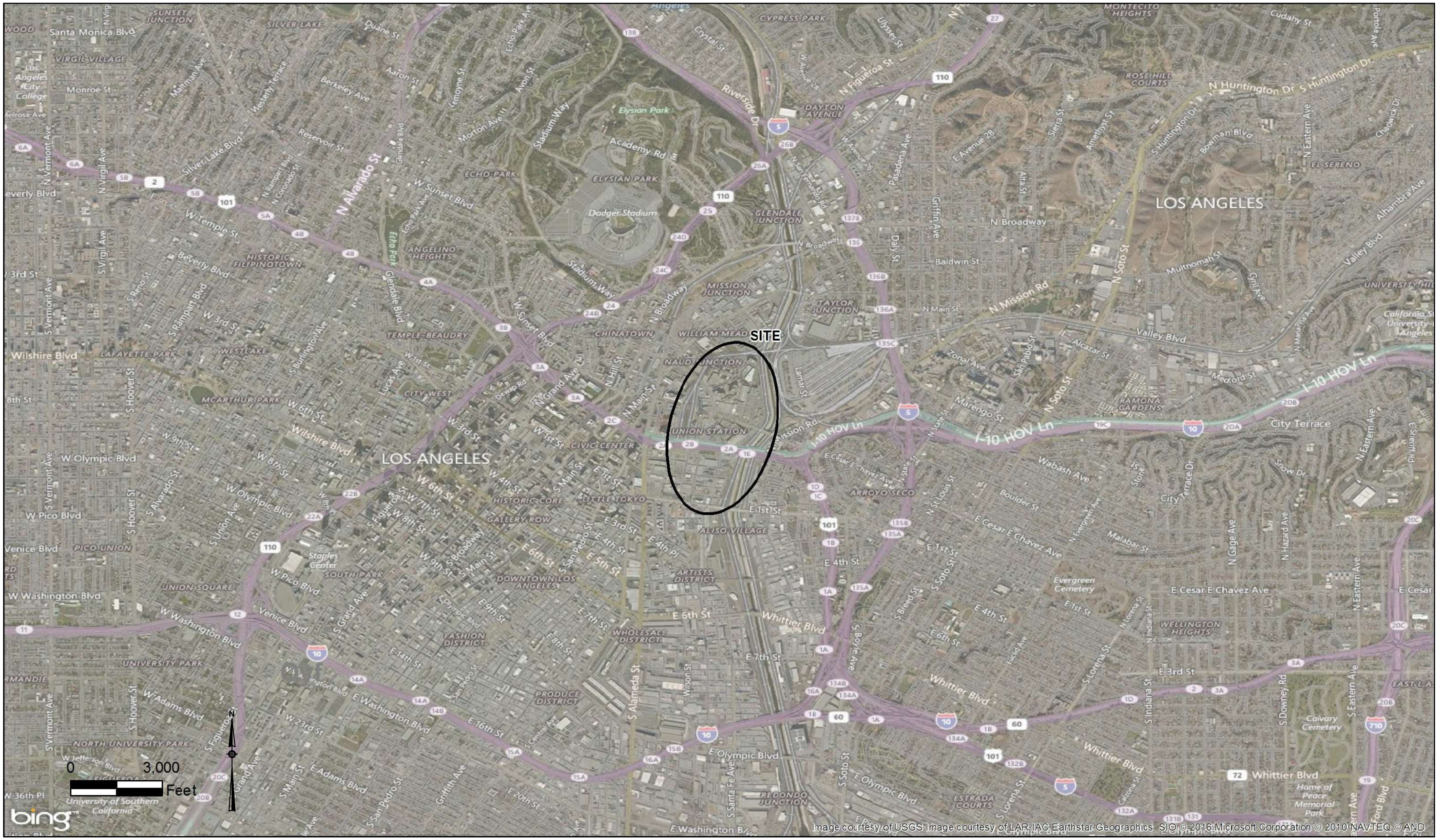

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LINK UNION STATION
SITE LOCATION MAP - EXHIBIT 5-1

SCALE: AS SHOWN
DATE: 06-12-2016

Photo No. 1. False tunnel sets at the South Tunnel Portal of YR Tunnel (south of LAUS) with tunnel shield and mucking machine in the background. Photo taken: 01/30/90. Source: SCRTD, 1990a.

Photo No. 2. False tunnel sets and the jacking frame and struts for pushing the shield off of at the South Tunnel Portal (south of LAUS). Photo taken: 01/30/90. Source: SCRTD, 1990a.

Photo No. 3. Mezzanine floor slab in place with column reinforcement steel protruding. The reinforcement for lift No. 4 of mezzanine floor is being placed in the foreground. Photo Taken: 01/30/90. Source: SCRTD, 1990a.

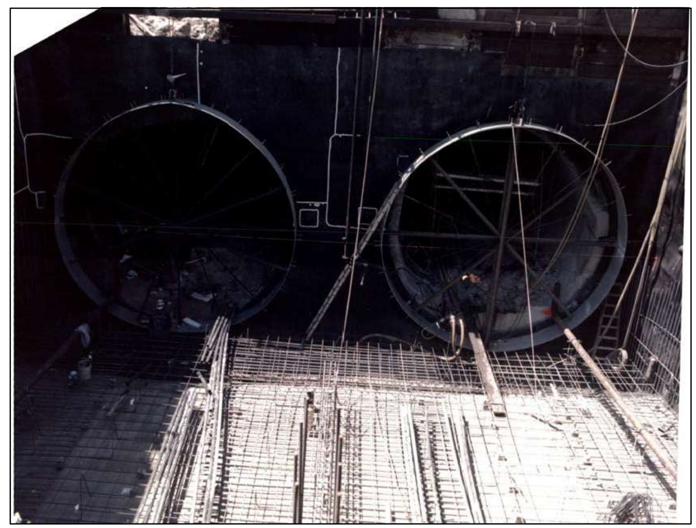


Photo No. 4. Reinforcement steel being placed in the closing slab of box structure at the south tunnel portals. Photo taken: 07/30/90. Source: SCRTD, 1990a.

HDR	Metro	**LINK UNION STATION** PHOTOGRAPHS - EXHIBIT 5-2	**SCALE: AS SHOWN** **DATE: 06-12-2016**

NEG NO 8 ROLL NO
PICT NO 2
SCRTD - M.O.S. 1
PROJECT Main Yard and Shops - Yard Leads
CONTRACT NO A-130
DATE 1-18-90
TAKEN BY D. EDGAR
LOCATION STA. YR 98+00 - TRACTION POWER SUBSTATION.
COMMENT PICTURE SHOWS 2' BOULDER IN CUT, ENCOUNTERED BY HAYWOOD-BAKER.

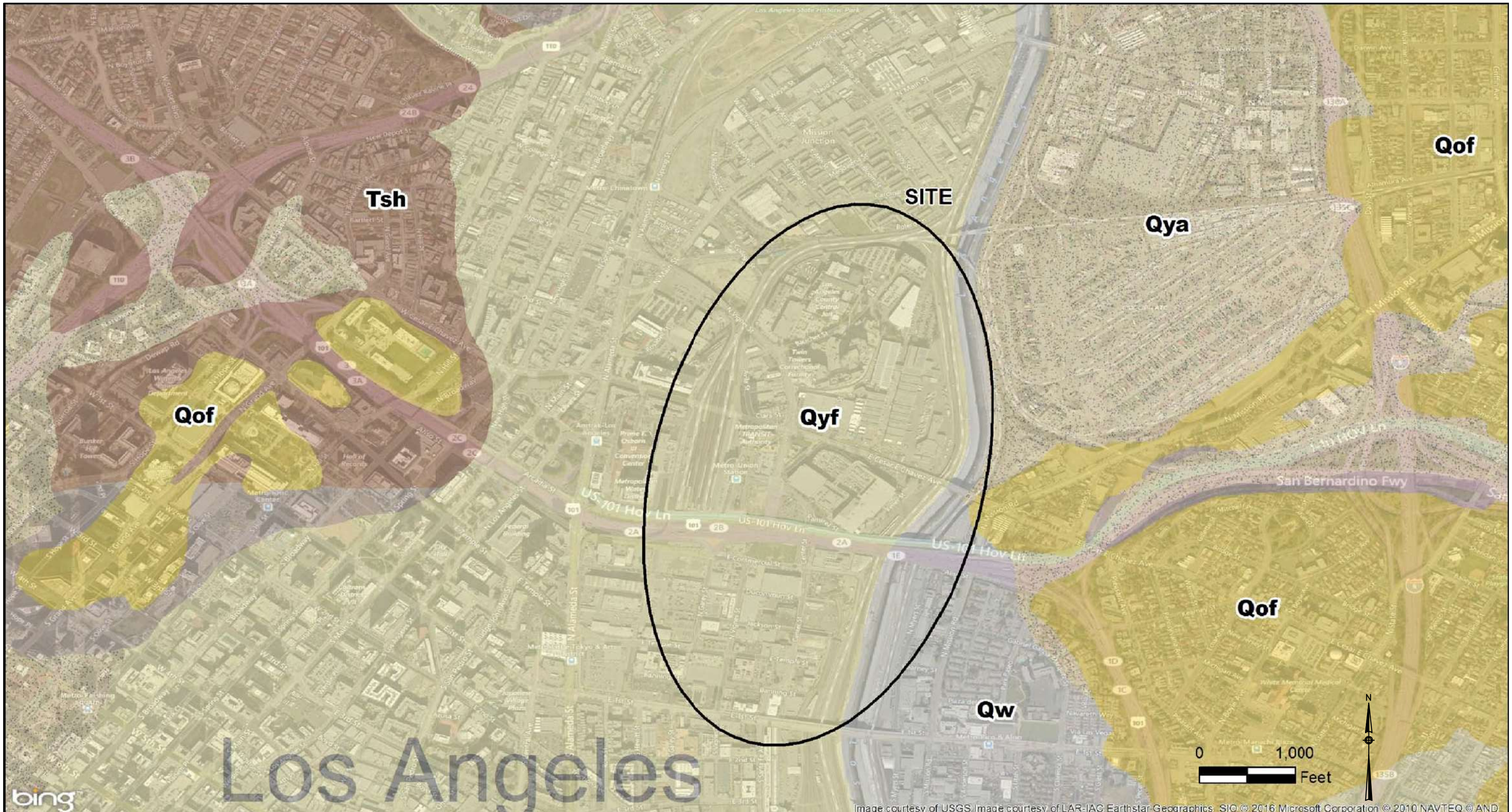
NEG NO 6 ROLL NO
PICT NO 7
SCRTD - M.O.S. 1
PROJECT Main Yard and Shops - Yard Leads
CONTRACT NO A-130
DATE 1-18-90
TAKEN BY D. EDGAR
LOCATION STA. YR 98+00 - POWER SUBSTATION.
COMMENT SENIOR INSPECTOR McLUCKIE HOLDING MEA SHOWING 4' BOULDER.

Photo No. 5. Boulders encountered at the Main Yard and Shops (currently LAUS). Photo taken: 01/18/90. Source: SCRTD, 1990b.

Photo No. 6. Interface between the box structure (LAUS area) on the YL side at Sta. 89+7 and the YL Tunnel (south of LAUS). Photo taken: 03/04/90. Source: SCRTD, 1990a.

Photo No. 7. Sub-ballast placed on the base of slab in the "U" wall structure area, East Portal Entrance (south of LAUS). Looking north towards LAUS. Photo taken: 07/30/90. Source: SCRTD, 1990a.

HDR	Metro	LINK UNION STATION PHOTOGRAPHS - EXHIBIT 5-3	SCALE: AS SHOWN DATE: 06-12-2016



Qyf	**Young Alluvial Fan Deposits** - unconsolidated to slightly consolidated, undissected to slightly dissected boulder, cobble, gravel, sand, and silt deposits issued from a confined valley or canyon
Qof	**Old Alluvial Fan Deposits** - slightly to moderately consolidated, moderately dissected boulder, cobble, gravel, sand, and silt deposits issued from a confined valley or canyon
Qya	**Young Alluvial Valley Deposits** - unconsolidated to slightly consolidated, undissected to slightly dissected clay, silt, sand, and gravel along stream valleys and alluvial flats of larger rivers
Qw	**Alluvial Wash Deposits** - unconsolidated sandy and gravelly sediment deposited in recently active channels of streams and rivers; may contain loose to moderately loose sand and silty sand

Reference: CGS, 2012

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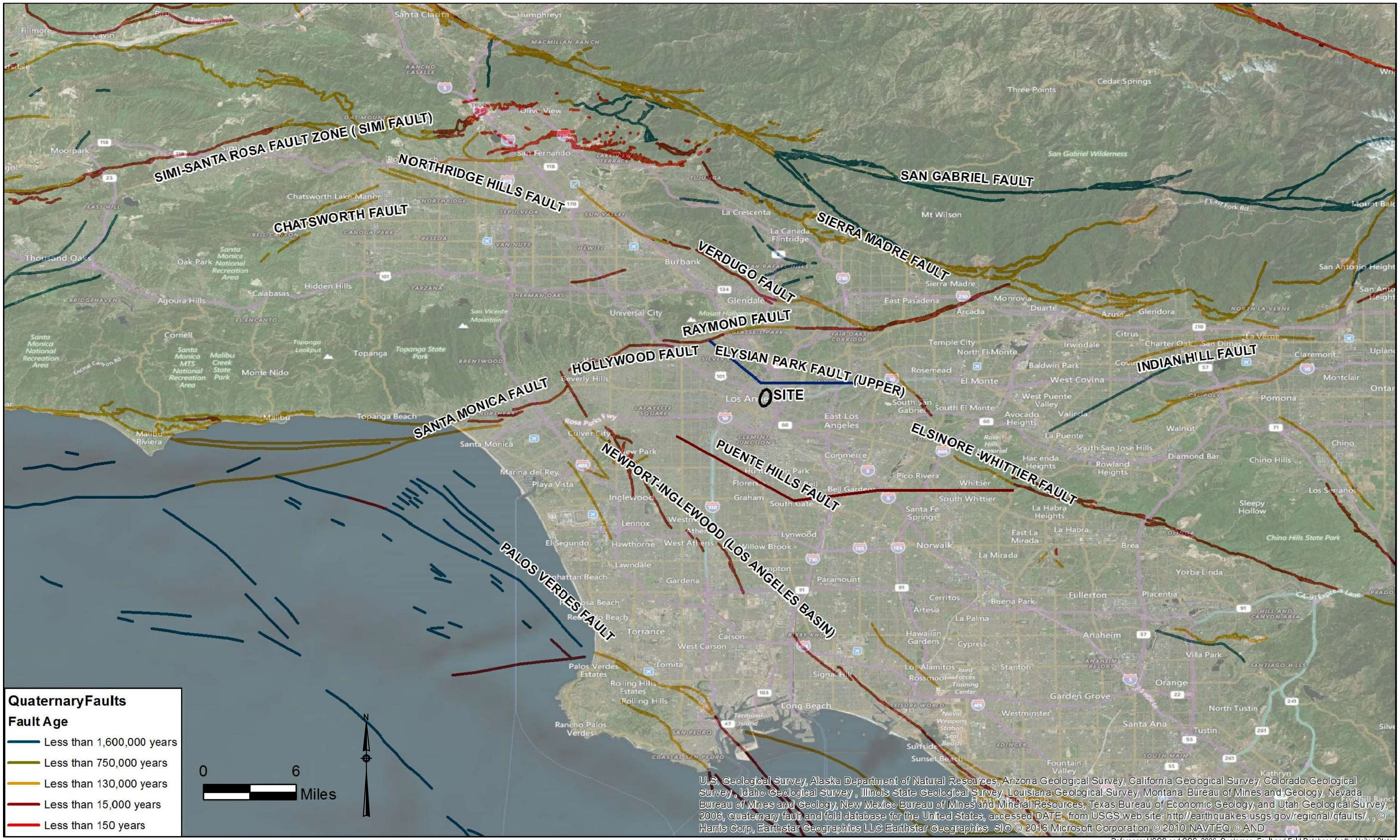
LINK UNION STATION

GEOLOGIC MAP - EXHIBIT 6-1

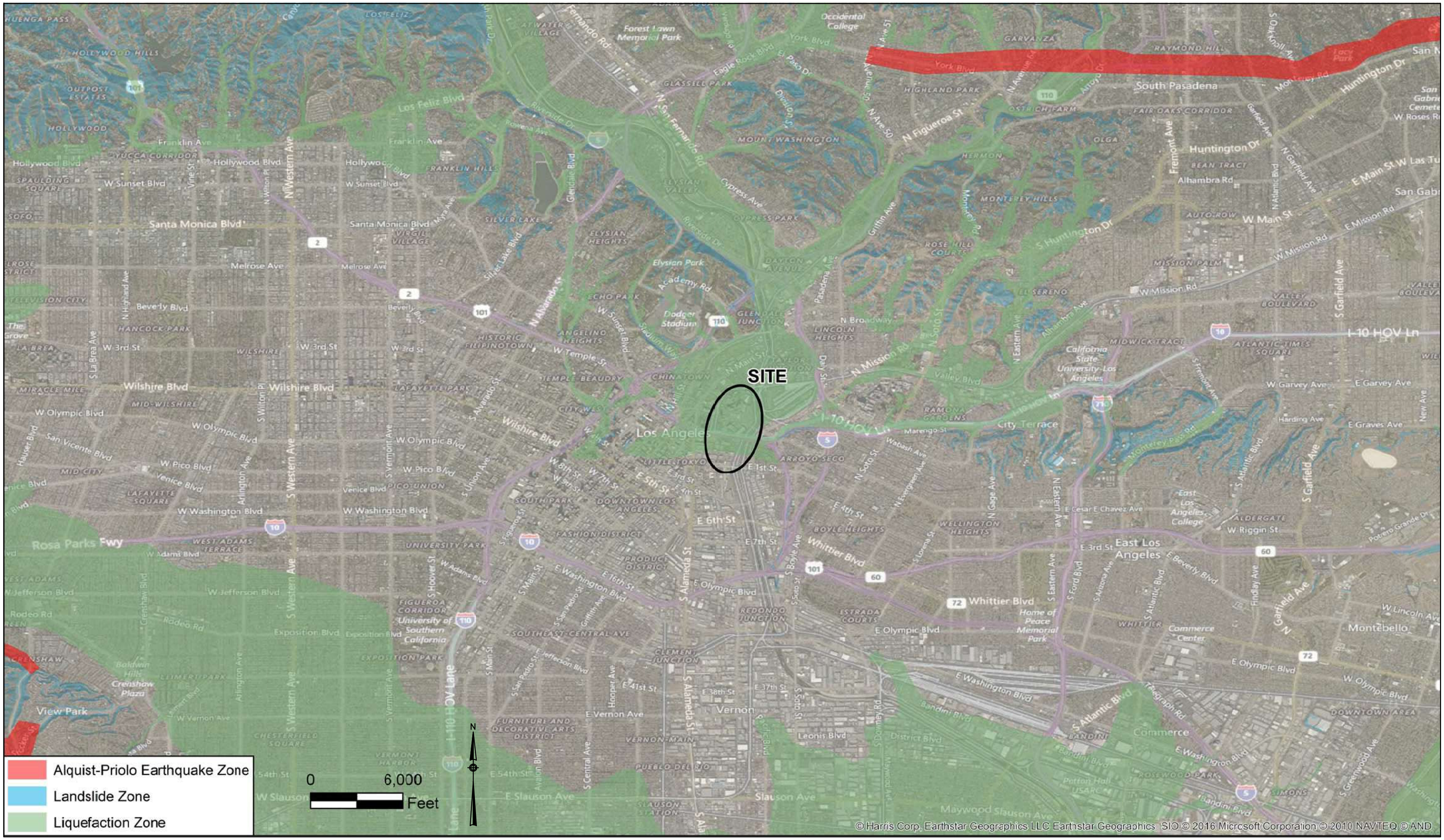
SCALE: AS SHOWN

DATE: 06-12-2016



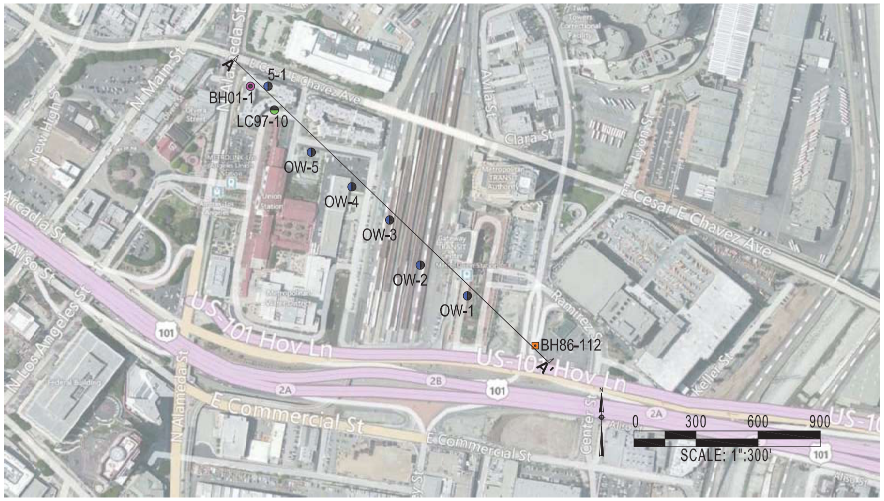
Reference: USGS and CGS, 2006, Quaternary Fault and Fold Database for the United States

HDR	Metro	LINK UNION STATION FAULT MAP - EXHIBIT 6-2	SCALE: AS SHOWN DATE: 06-12-2016



References: CDMG, 1977 & CGS, 1999

HDR | Metro | LINK UNION STATION
HAZARD MAP - EXHIBIT 6-3 | SCALE: AS SHOWN
DATE: 06-12-2016



PLAN VIEW

EXPLANATION

Geotechnical Investigations

- CC et al, 1983
- Dames & Moore Inc., 1994
- Law Crandall, 1997
- URS, 2003

Source for Boring Information: HDR, 2014b, Preliminary Geotechnical Memoradum-Existing Data

Geologic Units

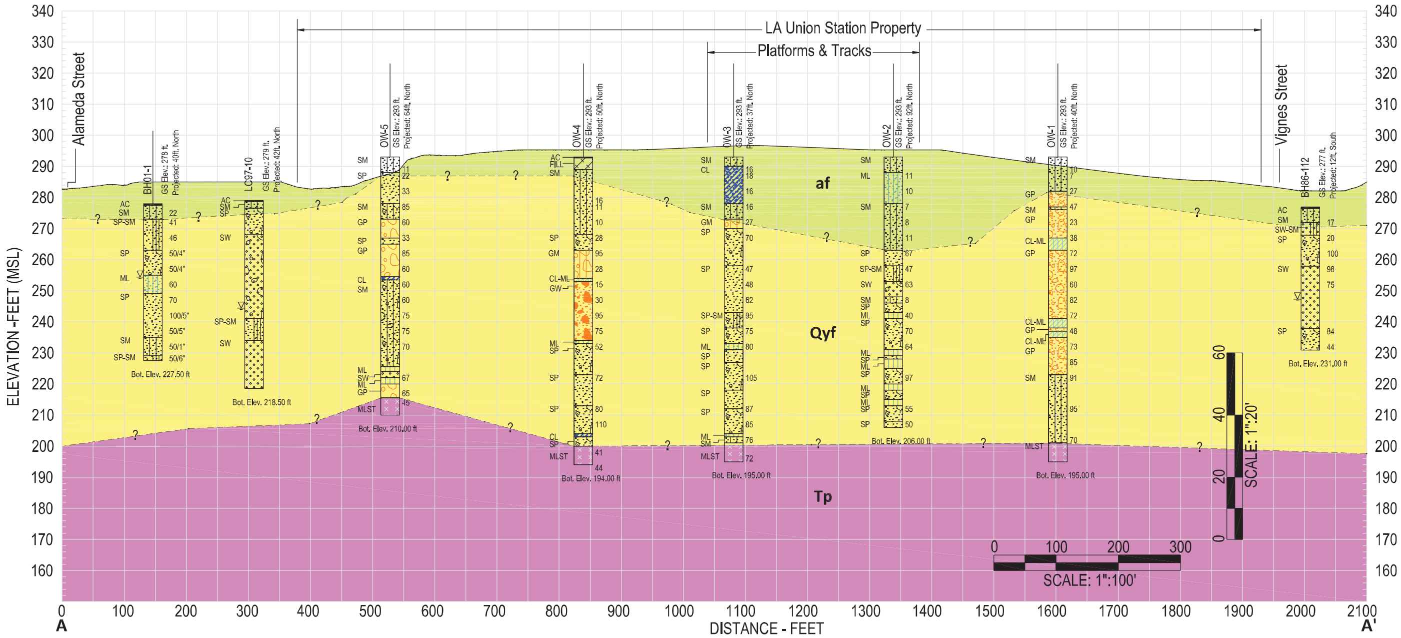
- **af** — Artificial Fill: Silty Sand and Clayey Sand; may contain Gravel and/or Cobbles
- **Qyf** — Alluvium: Sand, Silty Sand, Silt, and Clay; may contain Gravel and/or Cobbles
- **Tp** — Puente Formation: Siltstone, Claystone, and Siltstone/Sandstone

Group Symbol & Name

Symbol	Name	Symbol	Name
SW	Well-Graded SAND	CL	Lean CLAY
SW	Well-Graded SAND with GRAVEL	ML	Sandy SILT
SP-SM	Poorly-Graded SAND with SILT	GM	Silty GRAVEL
SP-SM	Poorly-Graded SAND with SILT and GRAVEL	GP	Poorly-Graded GRAVEL
SW-SM	Well-Graded SAND with SILT	GP	Poorly-Graded GRAVEL with SAND
SC	Clayey SAND with GRAVEL	GP-GM	Poorly-Graded GRAVEL with SILT
SM	Silty SAND	GW	Well-Graded GRAVEL with SAND
SM	Silty SAND with GRAVEL	CBBL	Cobbles
SP	Poorly-Graded SAND	ROCK	Bedrock
SP	Poorly-Graded SAND with GRAVEL	CLST	Claystone
PCC	Concrete	MLST	Siltstone
CL-ML	Silty CLAY	AC	Asphalt
CL	Sandy Lean CLAY	FILL	Fill

A14-001
GS Elev.: xx ft.
Projected: xx ft.
Group Symbol—SM
Soil Type
52—Blows / ft.
Groundwater Level
Material Change

Note: Abbreviation for soil group is based on ASTM D2487-11, Unified Soil Classification

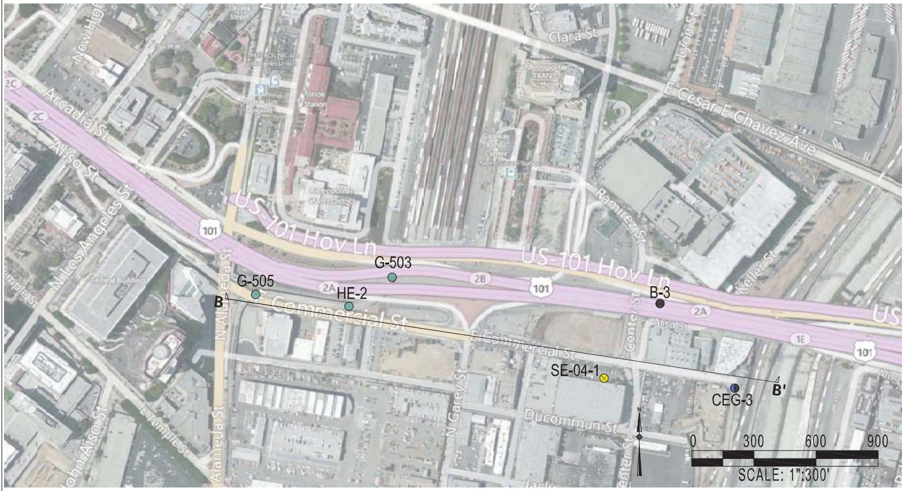


PROFILE VIEW

HDR | Metro

LINK UNION STATION
GEOLOGIC PROFILE - EXHIBIT 6-4

SCALE: AS SHOWN
DATE: 06-12-2016



PLAN VIEW

EXPLANATION

Geotechnical Investigations

- Caltrans, 1954
- Caltrans, 2004
- Converse Consultants, 1983
- Sladden Engineering, 2004

Geologic Units

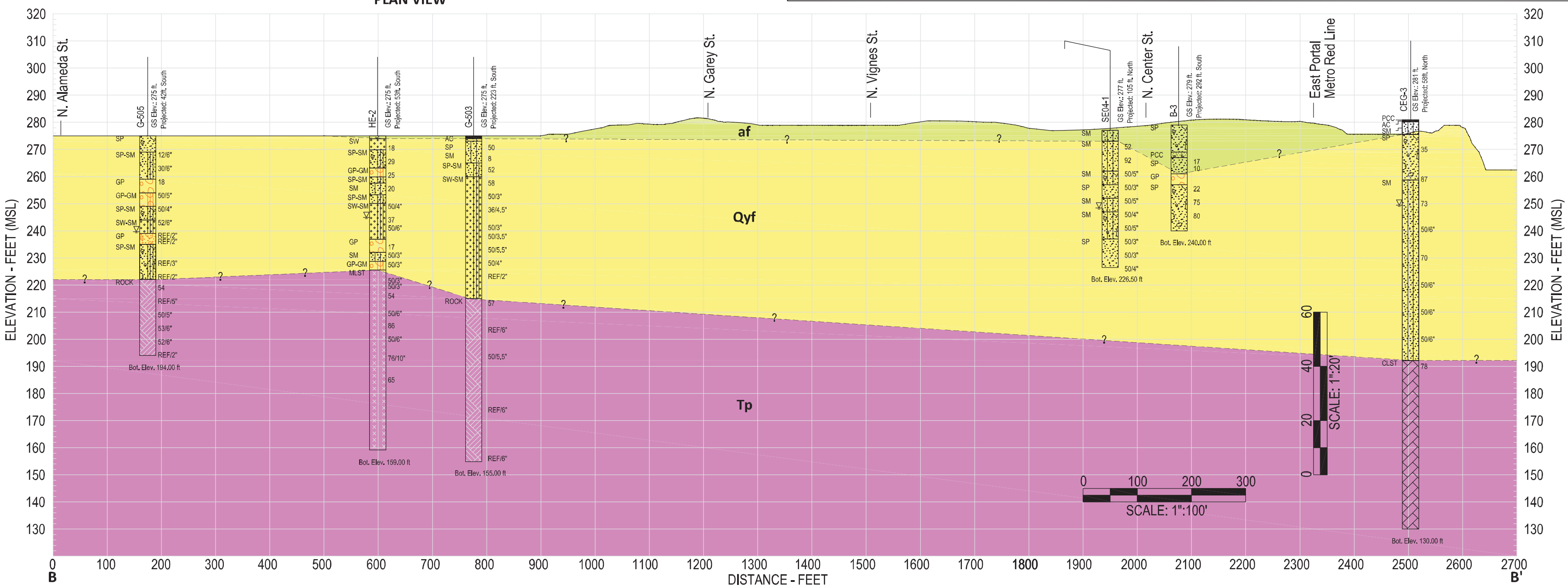
- **af** — Artificial Fill: Silty Sand and Clayey Sand; may contain Gravel and/or Cobbles
- **Qyf** — Alluvium: Sand, Silty Sand, Silt and Clay; may contain Gravel and/or Cobbles
- **Tp** — Puente Formation: Siltstone, Claystone, and Siltstone/Sandstone

Group Symbol & Name

Symbol	Name	Symbol	Name
SW	Well-Graded SAND	CL	Lean CLAY
SW	Well-Graded SAND with GRAVEL	ML	Sandy SILT
SP-SM	Poorly-Graded SAND with SILT	GM	Silty GRAVEL
SP-SM	Poorly-Graded SAND with SILT and GRAVEL	GP	Poorly-Graded GRAVEL
SW-SM	Well-Graded SAND with SILT	GP	Poorly-Graded GRAVEL with SAND
SC	Clayey SAND with GRAVEL	GP-GM	Poorly-Graded GRAVEL with SILT
SM	Silty SAND	GW	Well-Graded GRAVEL with SAND
SM	Silty SAND with GRAVEL	CBBL	Cobbles
SP	Poorly-Graded SAND	ROCK	Bedrock
SP	Poorly-Graded SAND with GRAVEL	CLST	Claystone
PCC	Concrete	MLST	Siltstone
CL-ML	Silty CLAY	AC	Asphalt
CL	Sandy Lean CLAY	FILL	Fill

A14-001 GS Elev.: xx ft. Projected: xx ft.
Group Symbol—SM; Soil Type; 52—Blows / ft.; Groundwater Level; Material Change

Note: Abbreviation for soil group is based on ASTM D2487-11, Unified Soil Classification



PROFILE VIEW

LINK UNION STATION
GEOLOGIC PROFILE - EXHIBIT 6-5

SCALE: AS SHOWN
DATE: 06-12-2016

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Appendix B:
As-Built Plans

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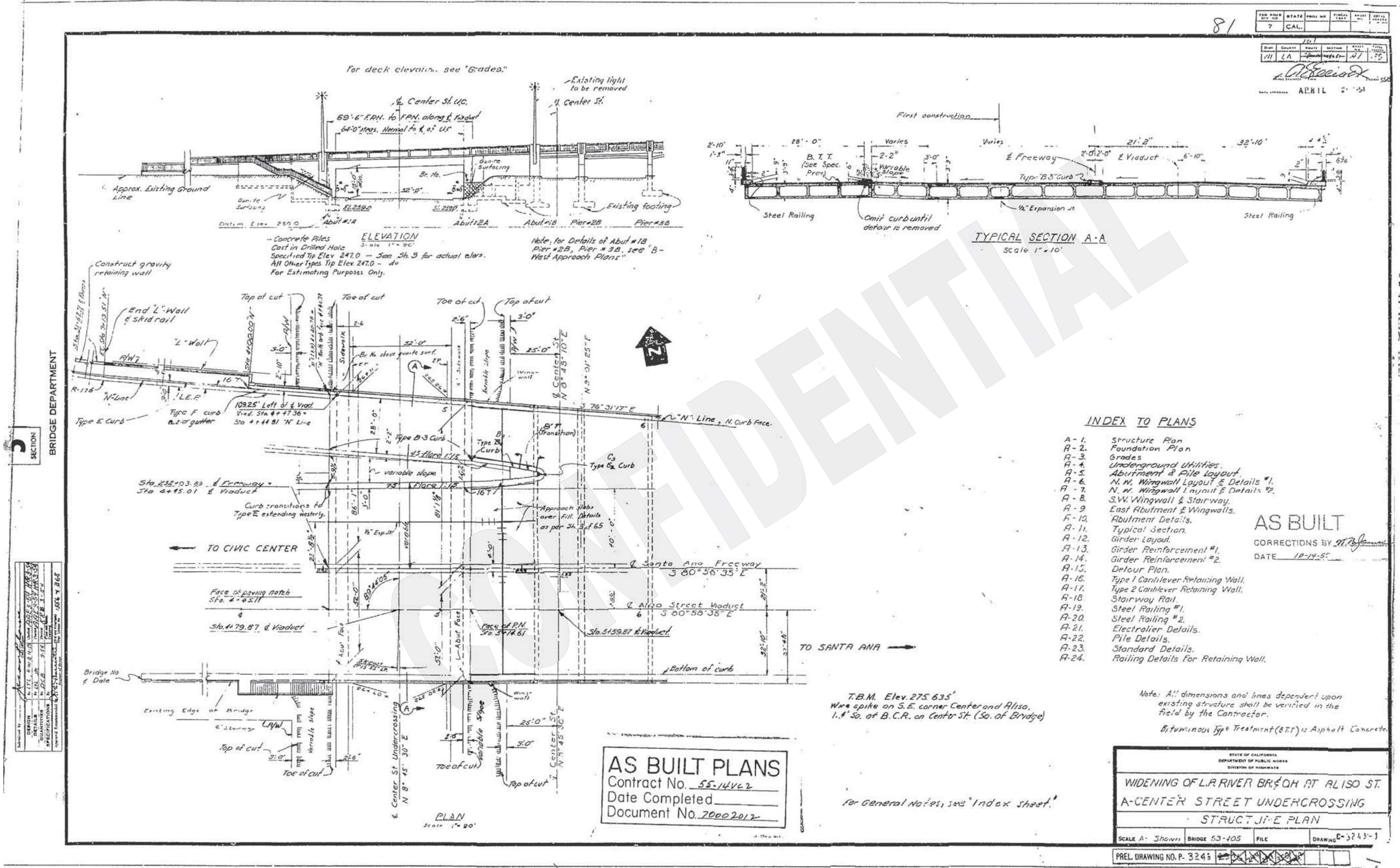
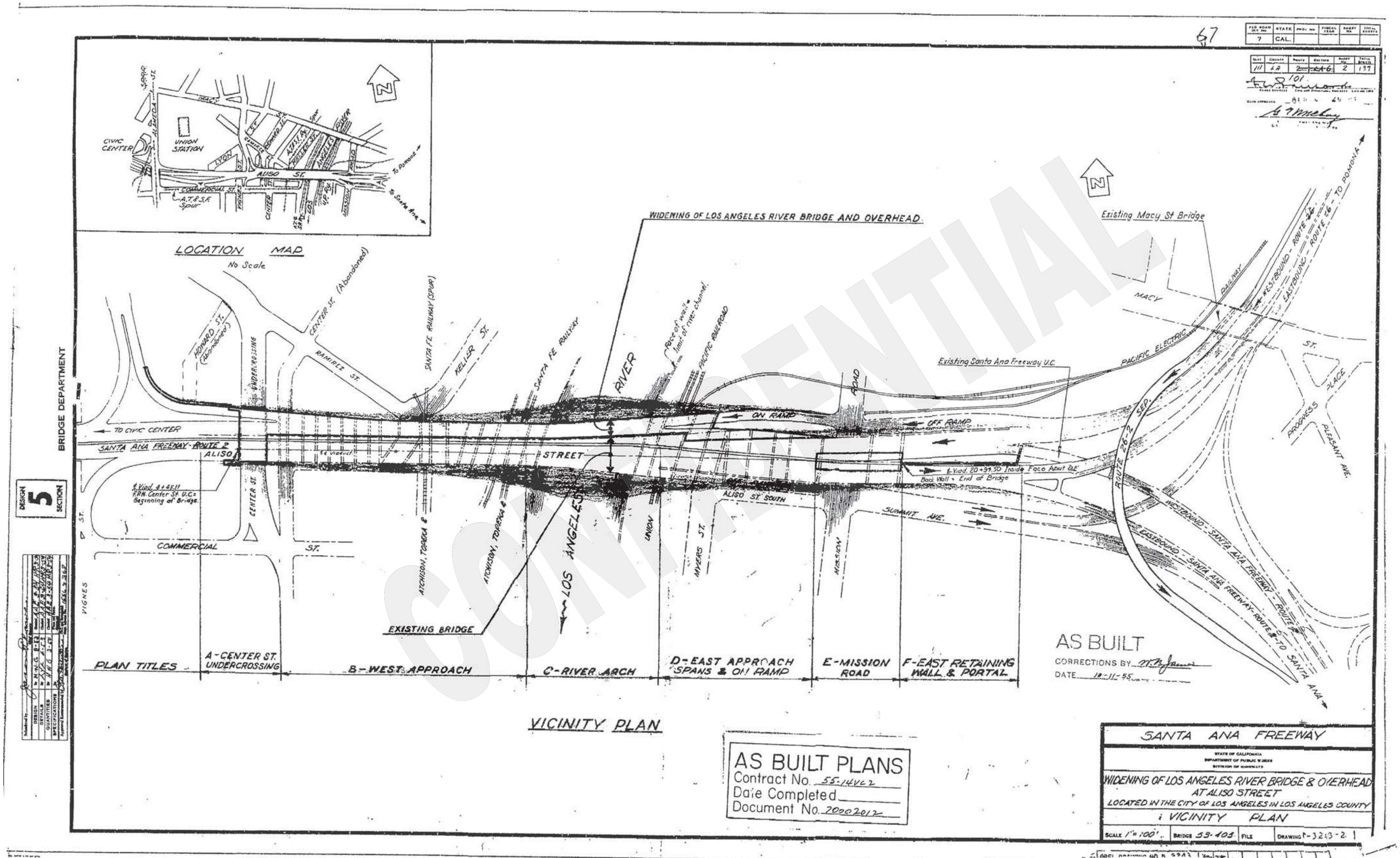
As-Built Plans

Los Angeles River Bridge & OH at Aliso Street, Bridge No. 53-0405



I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE ________ SIGNATURE ________ TITLE ________



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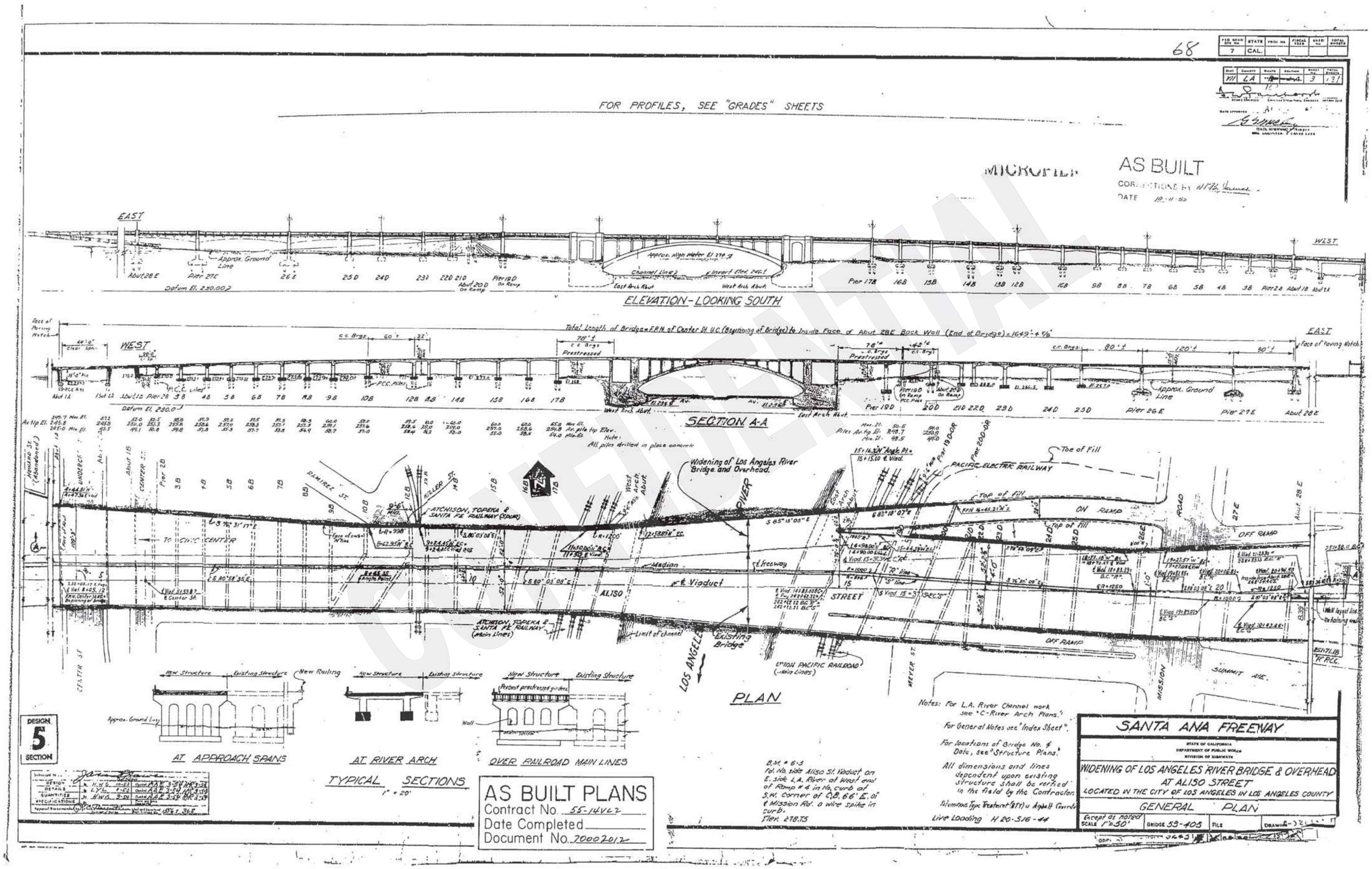
DATE ______ SIGNATURE ______ TITLE ______



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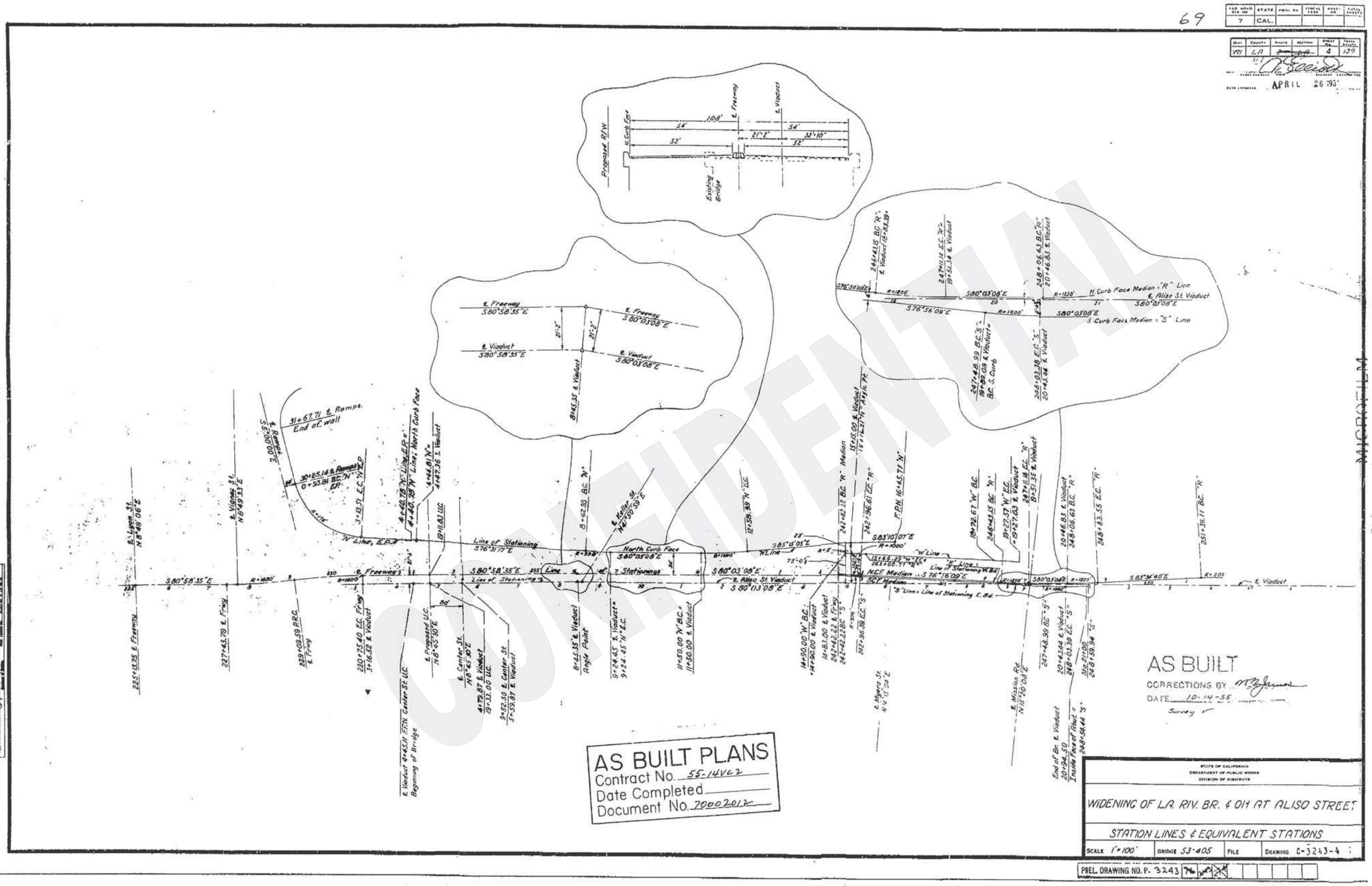
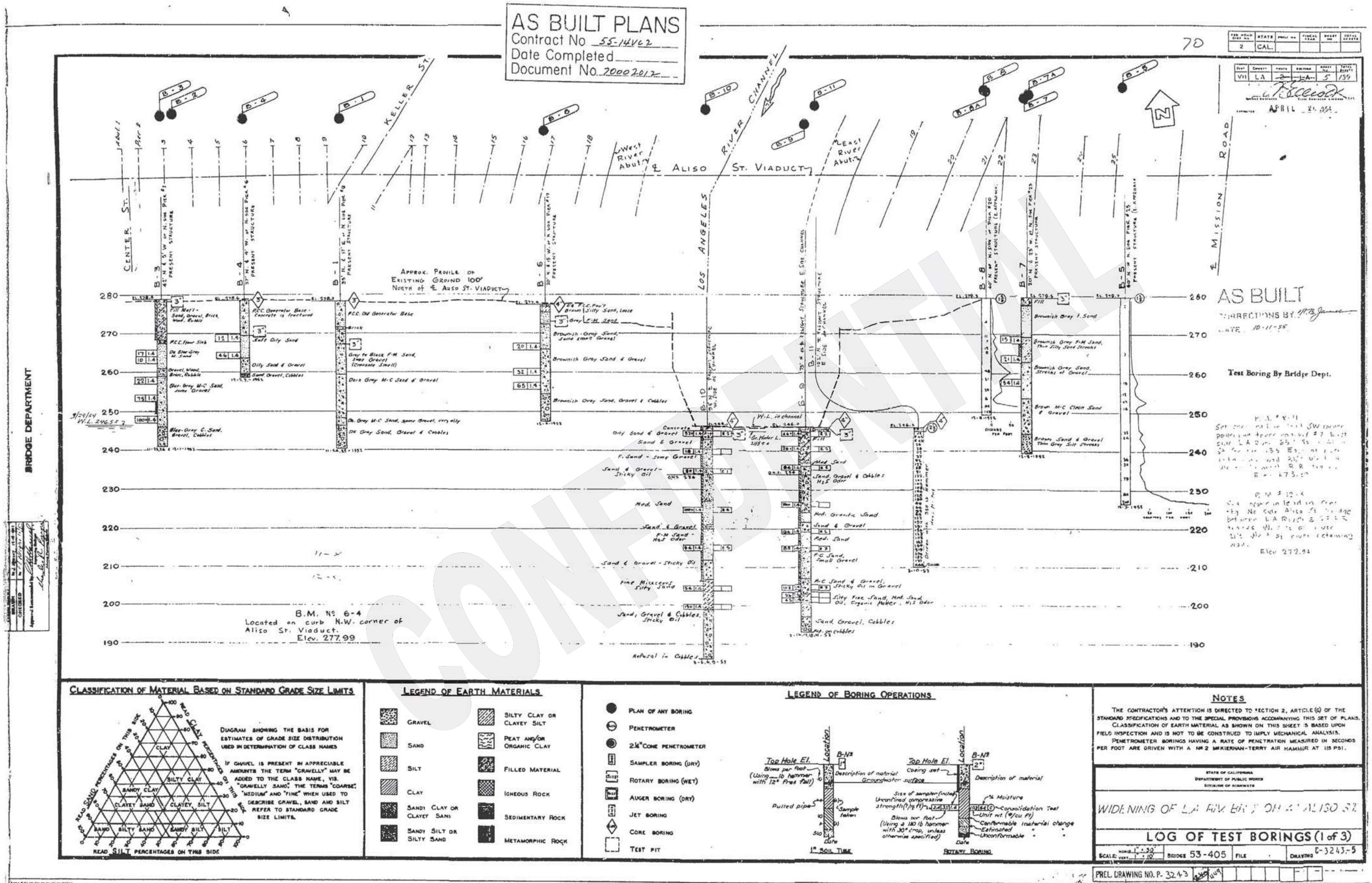
DATE ________ SIGNATURE



I HEREBY CERTIFY THAT THIS IS A TRUE & ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA, PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE________ SIGNATURE________ TITLE________



AS BUILT PLANS
Contract No 55-14V62
Date Completed
Document No. 70002012
70
CENTER ST.
KELLER ST.
LOS ANGELES RIVER CHANNEL
℄ ALISO ST. VIADUCT
West River Abut.
East River Abut.
℄ MISSION ROAD
APPROX. PROFILE OF EXISTING GROUND 100' NORTH OF ℄ ALISO ST. VIADUCT
AS BUILT
Test Boring By Bridge Dept.
B.M. No 6-4
Located on curb N.W. corner of Aliso St. Viaduct.
Elev. 277.99
BRIDGE DEPARTMENT
CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS
DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIS. "GRAVELLY SAND". THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE GRAVEL, SAND AND SILT REFER TO STANDARD GRADE SIZE LIMITS.
READ SAND PERCENTAGES ON THIS SIDE
READ CLAY PERCENTAGES ON THIS SIDE
READ SILT PERCENTAGES ON THIS SIDE
LEGEND OF EARTH MATERIALS
GRAVEL
SAND
SILT
CLAY
SANDY CLAY OR CLAYEY SAND
SANDY SILT OR SILTY SAND
SILTY CLAY OR CLAYEY SILT
PEAT AND/OR ORGANIC CLAY
FILLED MATERIAL
IGNEOUS ROCK
SEDIMENTARY ROCK
METAMORPHIC ROCK
LEGEND OF BORING OPERATIONS
PLAN OF ANY BORING
PENETROMETER
2¼" CONE PENETROMETER
SAMPLER BORING (DRY)
ROTARY BORING (WET)
AUGER BORING (DRY)
JET BORING
CORE BORING
TEST PIT
1" SOIL TUBE
ROTARY BORING
NOTES
THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 2, ARTICLE (G) OF THE STANDARD SPECIFICATIONS AND TO THE SPECIAL PROVISIONS ACCOMPANYING THIS SET OF PLANS. CLASSIFICATION OF EARTH MATERIAL AS SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS. PENETROMETER BORINGS HAVING A RATE OF PENETRATION MEASURED IN SECONDS PER FOOT ARE DRIVEN WITH A No 2 McKIERNAN-TERRY AIR HAMMER AT 115 PSI.
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
WIDENING OF L.A. RIV. BR. ON ALISO ST.
LOG OF TEST BORINGS (1 of 3)
BRIDGE 53-405
DRAWING C-3243-5
PREL. DRAWING NO. P-3243

71

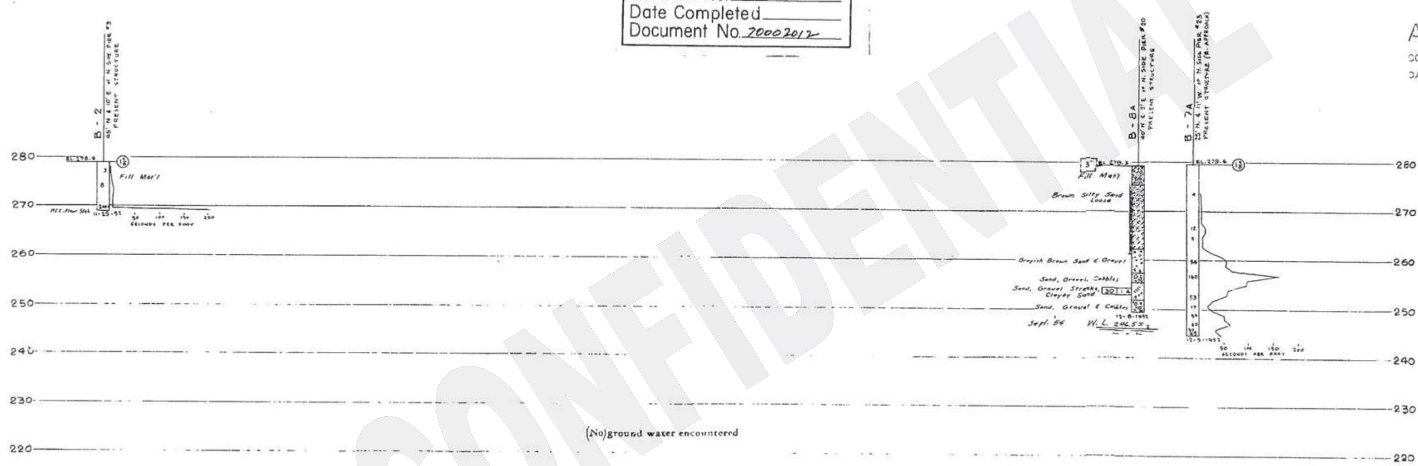
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
2	CAL.				

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VII	LA			6	39

APRIL 26, 1954

AS BUILT PLANS
Contract No. 55-14VC2
Date Completed
Document No. 20002012

AS BUILT
CORRECTIONS BY
DATE 10-11-55



Test Boring By Bridge Dept.

(No)ground water encountered

BRIDGE DEPARTMENT

Classification of Material Based on Standard Grade Size Limits

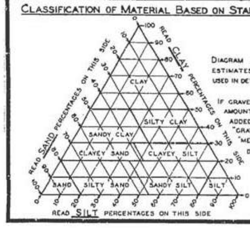


Diagram showing the basis for estimates of grade size distribution used in determination of class names

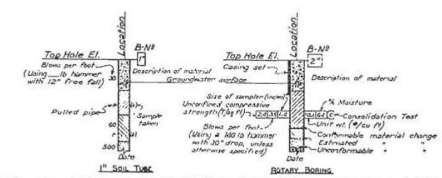
If gravel is present in appreciable amounts the term "gravelly" may be added to the class name, viz. "gravelly sand". The terms "coarse", "medium" and "fine" when used to describe gravel, sand and silt refer to standard grade size limits.

Legend of Earth Materials

- Gravel
- Sand
- Silt
- Clay
- Sandy Clay or Clayey Sand
- Sandy Silt or Silty Sand
- Silty Clay or Clayey Silt
- Peat and/or Organic Clay
- Filled Material
- Igneous Rock
- Sedimentary Rock
- Metamorphic Rock

Legend of Boring Operations

- Plan of any boring
- Penetrometer
- 2¼" Cone penetrometer
- Sampler boring (dry)
- Rotary boring (wet)
- Auger boring (dry)
- Jet boring
- Core boring
- Test pit



Notes

The contractor's attention is directed to Section 2, Article (c) of the Standard Specifications and to the Special Provisions accompanying this set of plans.
Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.
Penetrometer borings having a rate of penetration measured in seconds per foot are driven with a No 2 McKiernan-Terry air hammer at 115 psi.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

WIDENING OF L.A. RIV. BR. & OH AT ALISO ST.

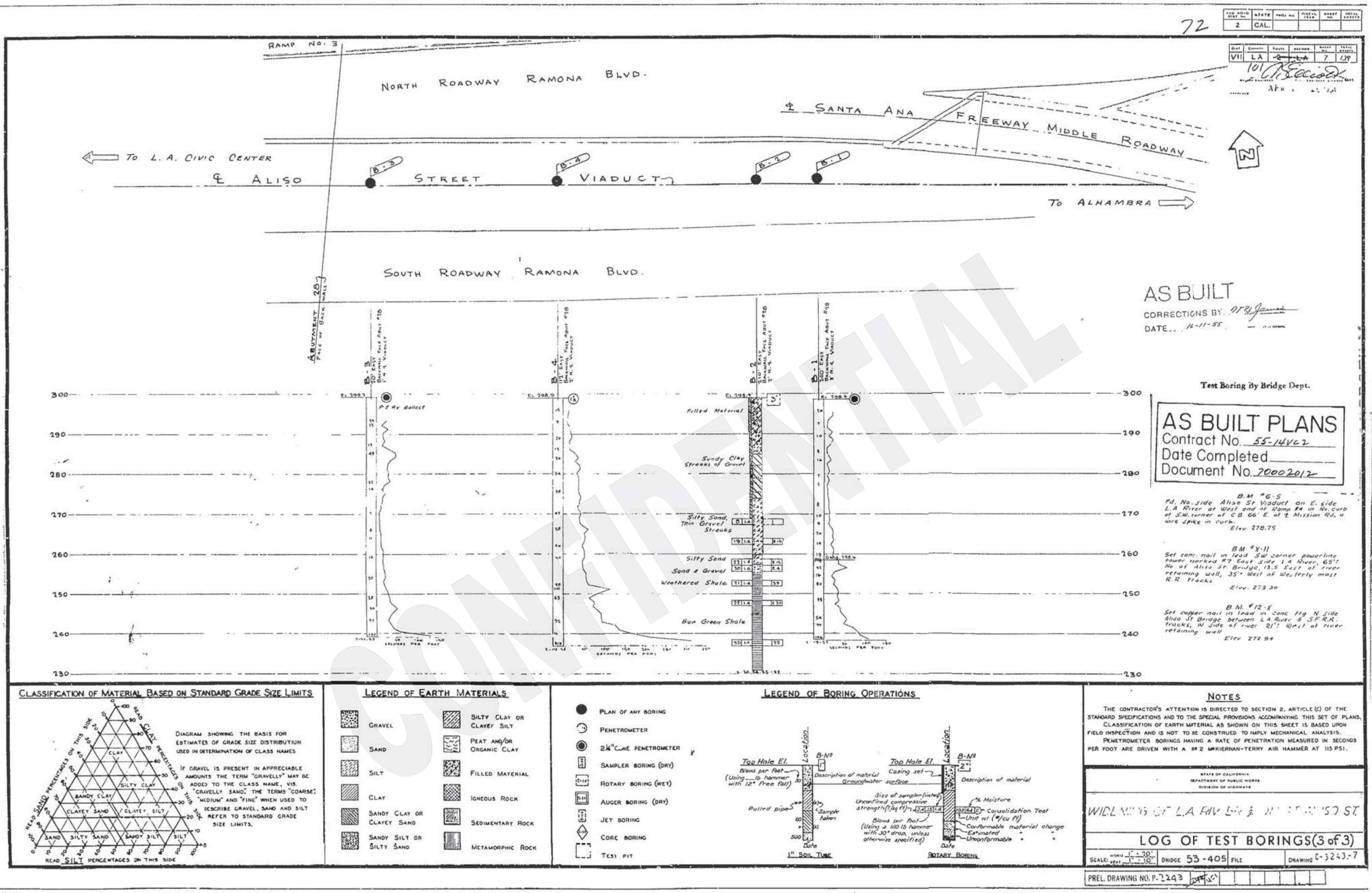
LOG OF TEST BORINGS (2 of 3)

SCALE: Horiz. 1" = 50', Vert. 1" = 10' | BRIDGE 53-405 | FILE | DRAWING C-3243-6

PREL. DRAWING NO. P 3243

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE ______ SIGNATURE ______ TITLE ______

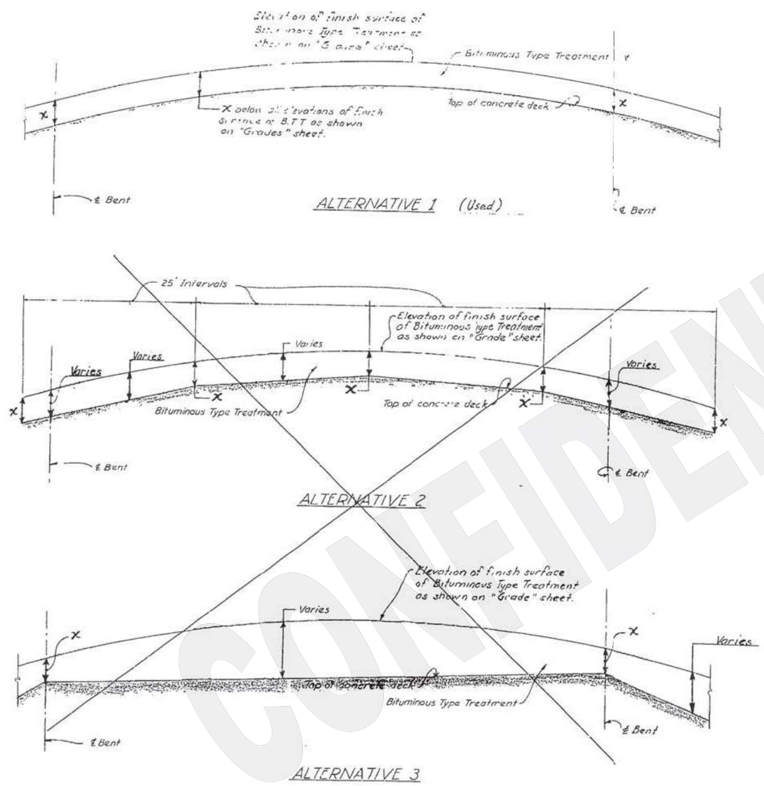


BRIDGE DEPARTMENT

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE ______ SIGNATURE ______ TITLE ______

73



LONGITUDINAL SECTION

Note: $x = 0.25'$ except x = difference between "Grade" elevation and top of concrete elevation shown at the following locations:
A - Center Street Undercrossing.
D - East Approach Spans ℄ On Ramp, prestressed girder span only.
E - Mission Road.

Contractor may use any or a combination of alternatives shown.

Other alternatives may be used upon approval by the Engineer.

Bituminous Type Treatment (B.T.T.) is asphalt concrete.

AS BUILT
CORRECTIONS BY [signature]
DATE 10-11-55

AS BUILT PLANS
Contract No. 55-14vc2
Date Completed
Document No. 20002012

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

WIDENING OF L.A. RIVER BR. & OH. AT ALISO ST.

ELEVATIONS - TOP OF CONCRETE DECK

SCALE NO SCALE | BRIDGE 53-405 | FILE | DRAWING C-3243-8

PREL. DRAWING NO. P-3243

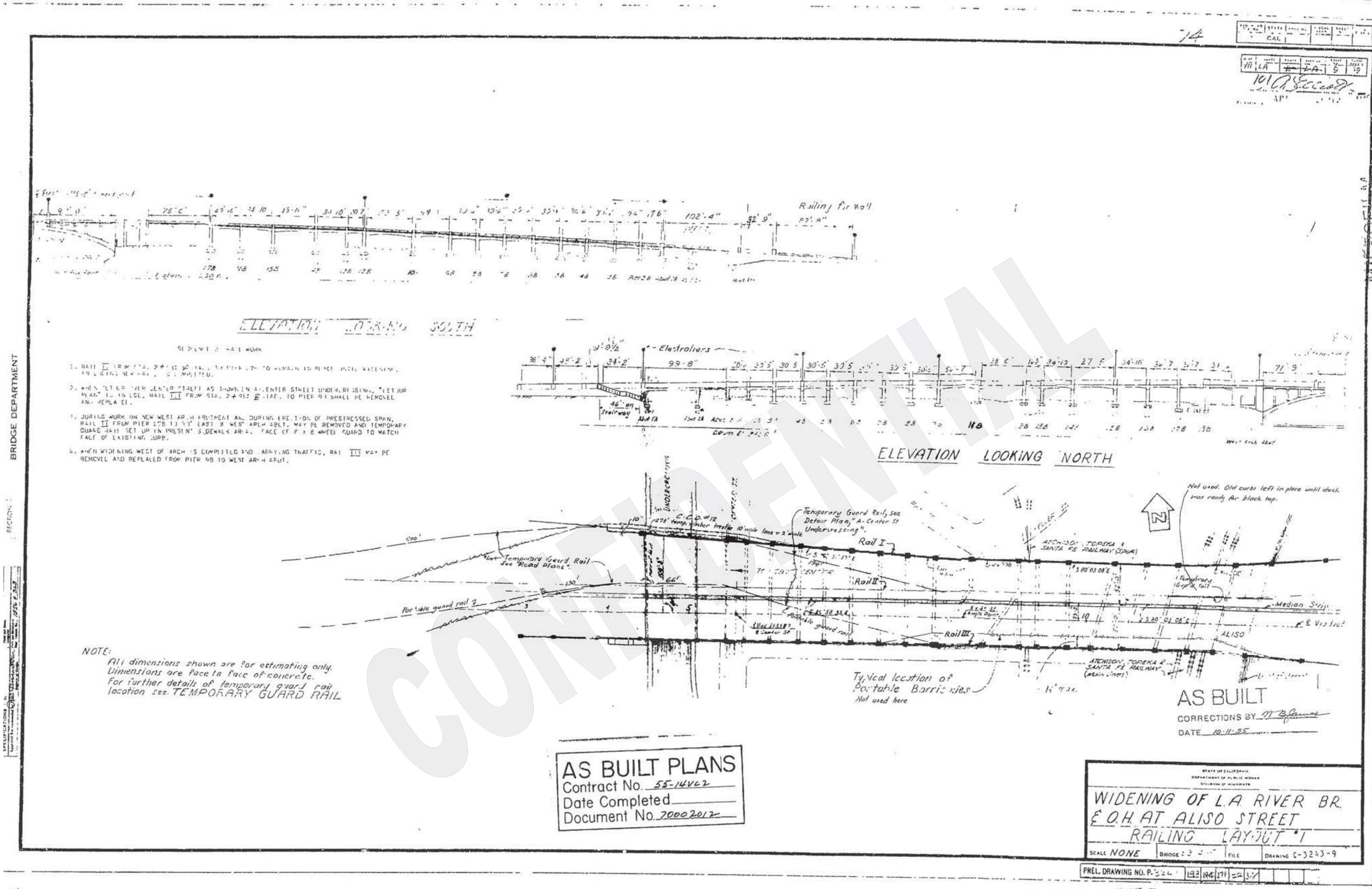
DIST	STATE		SHEET NO.	TOTAL SHEETS
7	CAL.		8	39

APRIL

BRIDGE DEPARTMENT

SECTION C

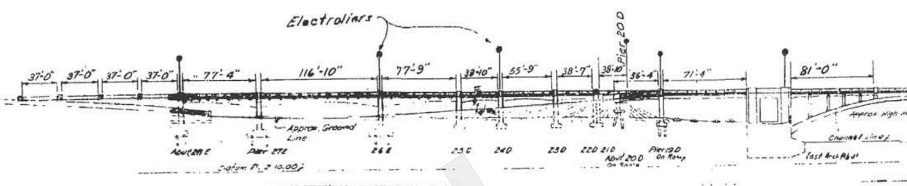
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.
DATE ______ SIGNATURE ______ TITLE ______



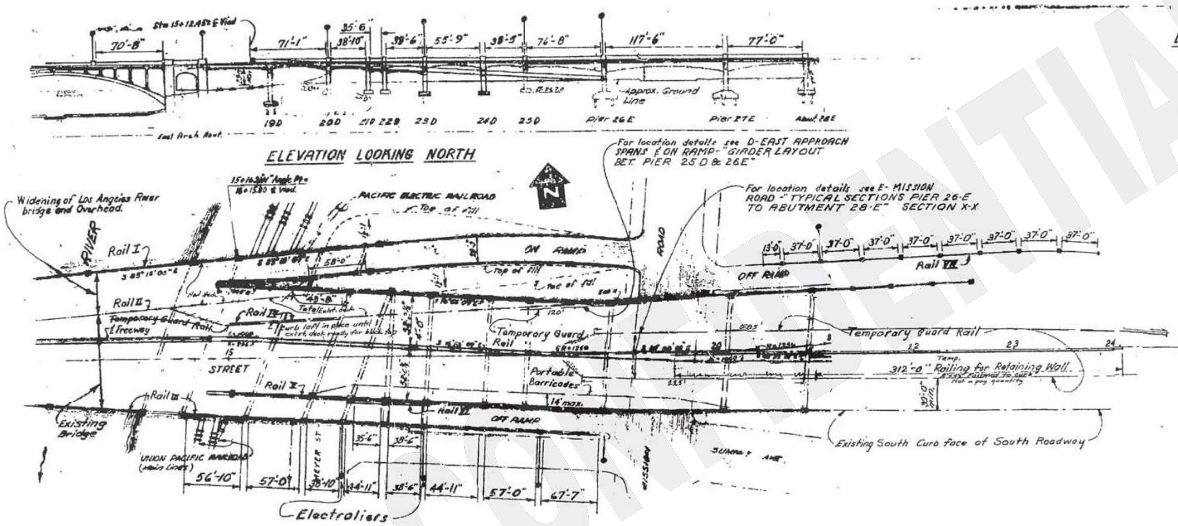
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DA IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE ________ SIGNATURE ________ TITLE ________

75



ELEVATION LOOKING SOUTH



SEQUENCE OF RAIL WORK

1. RAIL II ON ARCH TO REMAIN IN PLACE UNTIL ARCH WIDENING IS COMPLETED.
2. WHEN WORK IS BEING DONE ON EAST ARCH ABUT. AND THE WEST PORTION OF SECTION D, TEMPORARY GUARD RAIL WILL BE PLACED FROM PIER 20D TO STA. 15+05.17± ℄ VIAD. AND THENCE TO WEST END OF EAST ARCH ABUT. AS SHOWN.
3. ~~RAIL~~ Curb only IV FROM PIER 20D TO PIER 25D TO REMAIN IN PLACE UNTIL ADJACENT WIDENING, INCLUDING NEW RAIL, IS COMPLETED. CLOSE GAPS LEFT BY REMOVAL OF POSTS AT PIERS WITH TEMPORARY RAIL.
4. RAIL IV FROM PIER 26E TO STA 22+12± ℄ VIAD. TO REMAIN IN PLACE UNTIL WORK NEAR ℄ VIADUCT FROM PIER 26E TO TUNNEL PORTAL IS COMPLETED.
5. RAIL III ON ARCH TO REMAIN IN PLACE UNTIL ARCH WIDENING IS COMPLETED AND CARRYING TRAFFIC.
6. RAIL III FROM EAST ARCH ABUT. TO END OF OFF RAMP MAY BE REMOVED AND REPLACED AT ANY TIME.
7. RAIL VI ON OFF RAMP MAY NOT BE REMOVED AND REPLACED WHILE WORK IS BEING DONE ON ADJACENT PORTION OF RAIL III.
8. RAIL V TO REMAIN IN PLACE UNTIL WIDENING IS COMPLETED AND CARRYING TRAFFIC.
9. RAIL VII MAY BE REMOVED AND REPLACED AT ANY TIME.

AS BUILT
CORRECTIONS BY [signature]
DATE 10-11-55

AS BUILT PLANS
Contract No. 55-14VC2
Date Completed
Document No. 20002017

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

WIDENING OF L.A. RIVER BR. & O.H. AT ALISO STREET
RAILING LAYOUT #2

SCALE NONE | BRIDGE 53-405 | DRAWING C-3243-10

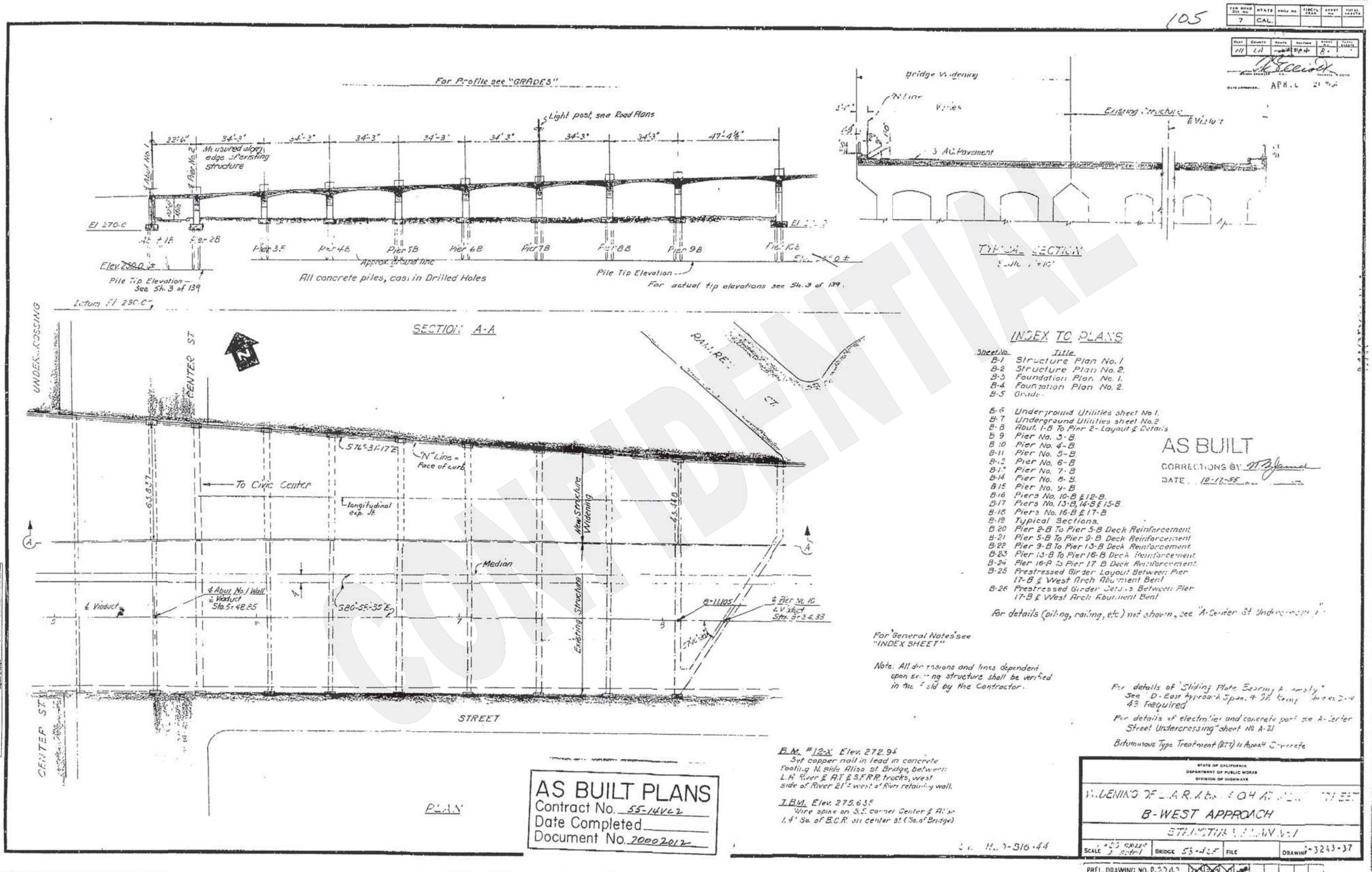
PREL. DRAWING NO. P-3243

DIST.	COUNTY	ROUTE	SHEET	TOTAL
VII	LA	101	10	139

BRIDGE DEPARTMENT

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.
DATE ____ SIGNATURE ____ TITLE ____

MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF PUBLIC WORKS - MICROFILM



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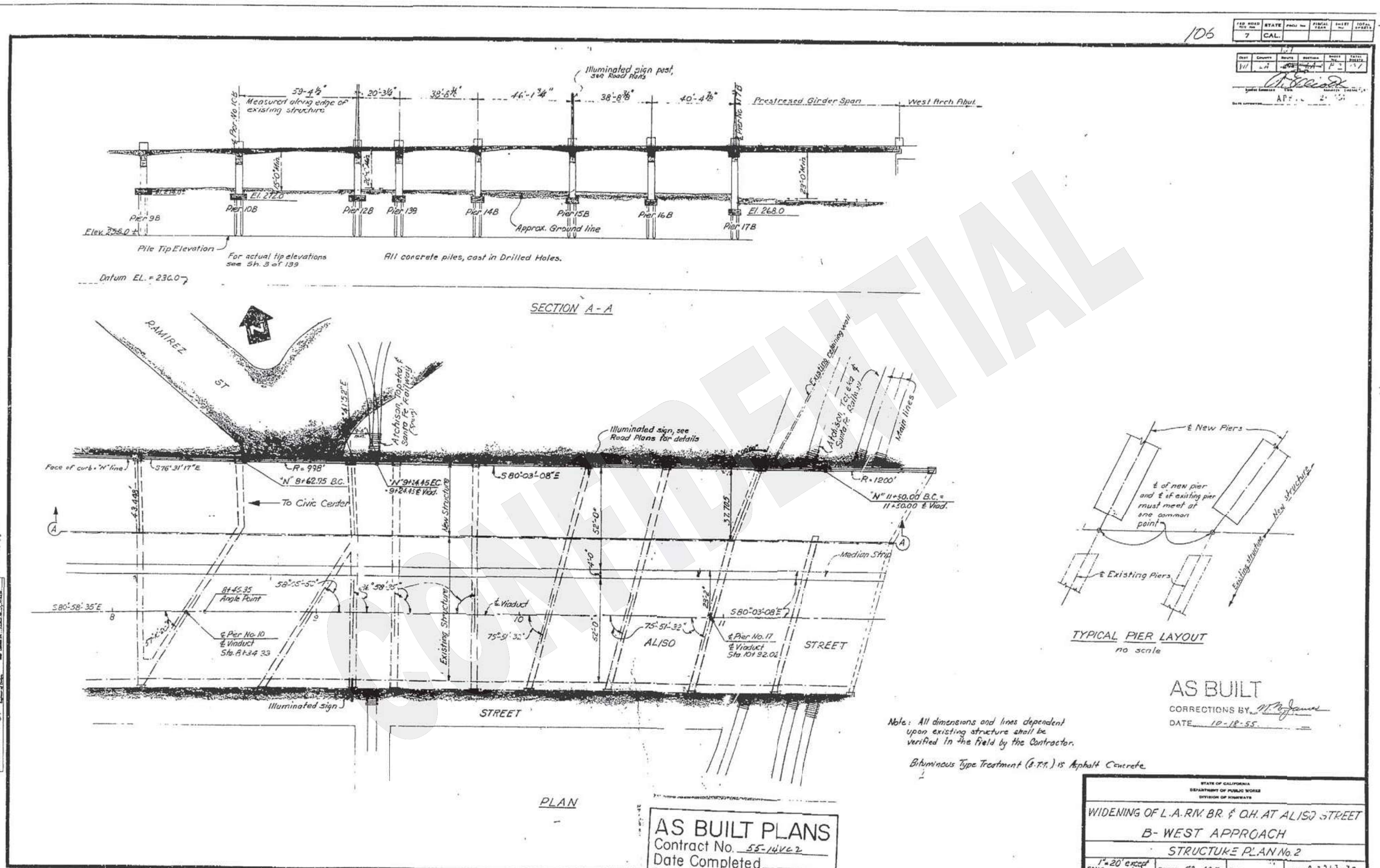
DATE ________ SIGNATURE ________ TITLE ________



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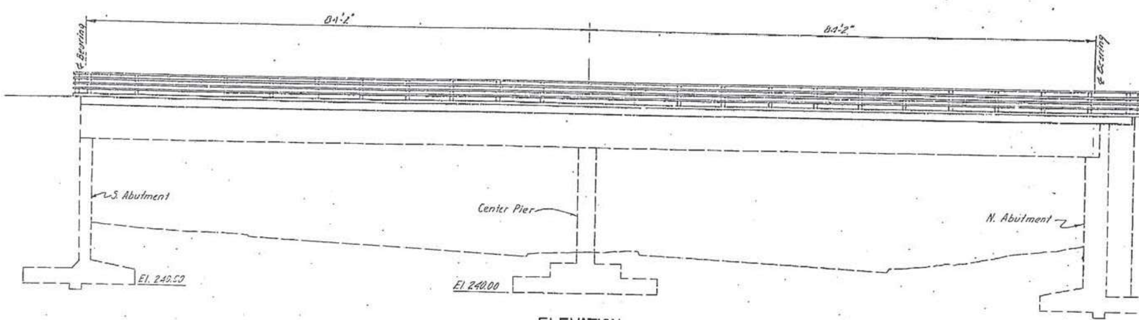
DATE________ SIGNATURE________ TITLE________

As-Built Plans

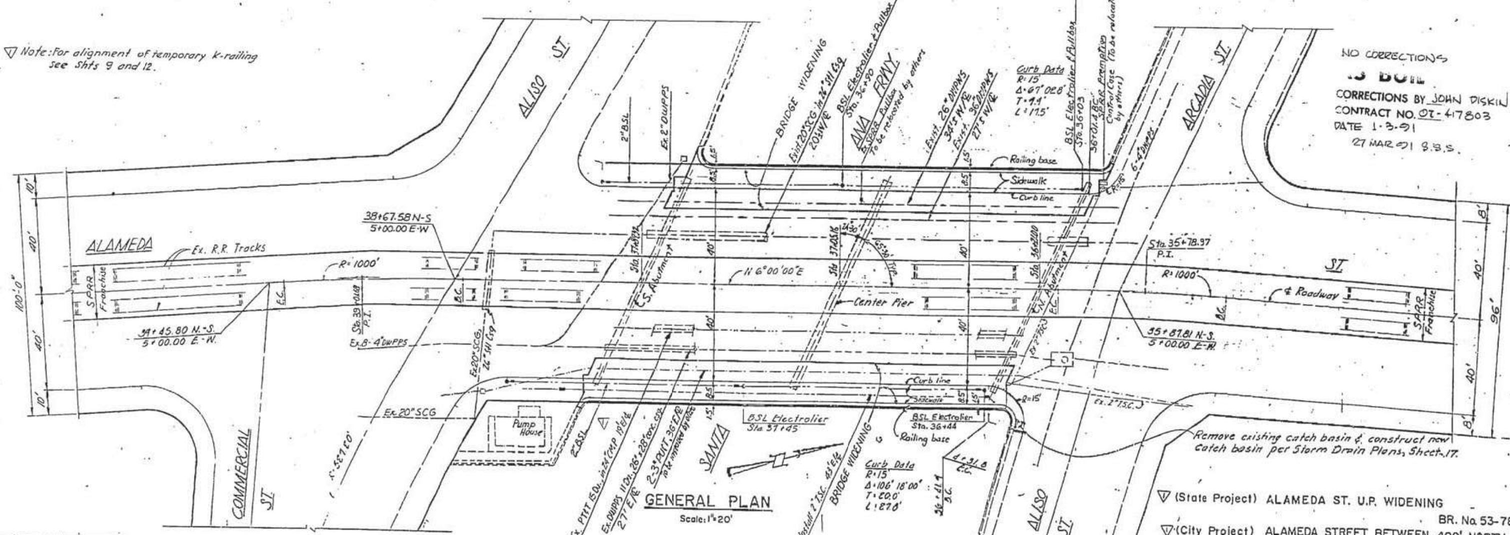
Alameda Street Underpass, Bridge No. 53-0782

▽ THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL



ELEVATION
Scale: 1/8"=1'-0"

▽ Note: For alignment of temporary k-railing see Shts 9 and 12.



GENERAL PLAN
Scale: 1"=20'

NO CORRECTIONS
AS BUILT
CORRECTIONS BY JOHN DISKIN
CONTRACT NO. 07-417803
DATE 1-3-91
27 MAR 91 S.S.S.

Dist.	County	Route	Post Miles Total Project	Sheet No.	Total Sheets
07	L.A.	101/10		209	296

PROJECT ENGINEER — Wm. C. Chang, REGISTERED CIVIL ENGINEER NO. 25537

DATE APPROVED September 16, 1985

		DATE
DESIGNED	S. Kreibel, D. Yoshimoto	5-75 / 10-80
DRAWN	J. Moran	5-75
CHECKED	A. Yoshimura	10/80
SUPERVISED	R. Hartig, S. Kinjo	5-75 / 10-81
PROJ. ENGR.		

PLAN & ELEVATION

NO.	REVISION DESCRIPTION	DIV./DIST. ENGR.	DATE
▽	Revised for State Contract and added State project title.		3-83

CITY OF LOS ANGELES
DONALD C. TILLMAN, CITY ENGINEER
DATE June 25, 1982
DIVISION/DISTRICT ENGINEER

▽ (State Project) ALAMEDA ST. U.P. WIDENING
BR. No. 53-782

▽ (City Project) ALAMEDA STREET BETWEEN 400' NORTH OF ARCADIA STREET AND TEMPLE STREET
W.O. 61584

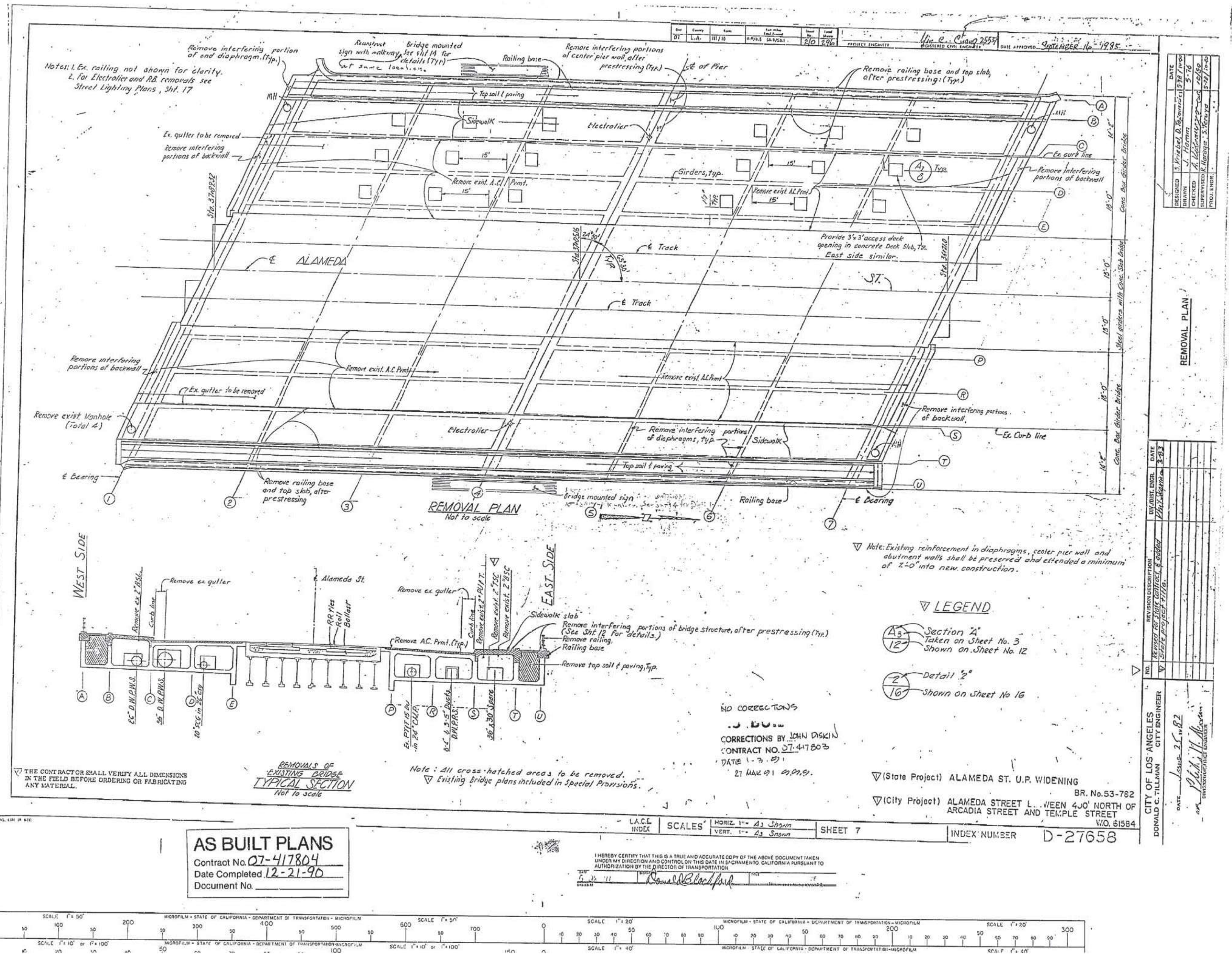
L.A.C.E. INDEX | SCALES | HORIZ. 1"= As Shown | VERT. 1"= As Shown | SHEET 6 | INDEX NUMBER D-27658

FINAL ORIGINAL

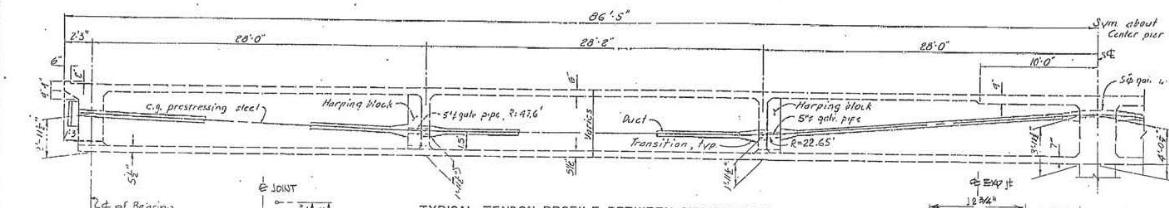
AS BUILT PLANS
Contract No. 07-417804
Date Completed 12-21-90
Document No.

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION

MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - MICROFILM

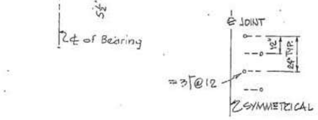

Notes: 1. Ex. railing not shown for clarity.
2. For Electrolier and P.B. removals see Street Lighting Plans, Sht. 17
Remove interfering portion of end diaphragm. (Typ.)
Reconstruct sign with walkway
Bridge mounted see sht 14 for details (Typ)
Railing base
Remove interfering portions of center pier wall, after prestressing (Typ.)
℄ of Pier
Remove railing base and top slab, after prestressing: (Typ.)
Top soil & paving
Sidewalk
Electrolier
Ex. gutter to be removed
Remove interfering portions of backwall
Remove exist. A.C. Pvmt.
Girders, typ.
Ex. curb line
Provide 3'x3' access deck opening in concrete Deck Slab, Typ. East side similar.
℄ ALAMEDA
℄ Track
Remove exist. Manhole (Total 4)
Remove interfering portions of diaphragms, typ.
Ex. Curb line
℄ Bearing
Remove railing base and top slab, after prestressing
Bridge mounted sign
REMOVAL PLAN
Not to scale
Cont. Box Girder Bridge
Steel girders with Conc. Slab Bridge
WEST SIDE
EAST SIDE
Remove ex. gutter
Curb line
Alameda St.
RR ties
Rail
Ballast
Remove AC. Pvmt. (Typ.)
Sidewalk slab
Remove interfering portions of bridge structure, after prestressing (Typ.) (See Sht. 12 for details.)
Remove railing.
Railing base
Remove top soil & paving, Typ.
REMOVALS OF EXISTING BRIDGE
TYPICAL SECTION
Not to scale
Note: All cross-hatched areas to be removed.
▽ Existing bridge plans included in Special Provisions.
▽ Note: Existing reinforcement in diaphragms, center pier wall and abutment walls shall be preserved and extended a minimum of 2'-0" into new construction.
▽ LEGEND
Section "A" Taken on Sheet No. 3 Shown on Sheet No. 12
Detail "2" Shown on Sheet No 16
▽ THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.
NO CORRECTIONS
CORRECTIONS BY JOHN DISKIN
CONTRACT NO. 07-417803
DATE 1-3-91
21 MAR 91
▽ (State Project) ALAMEDA ST. U.P. WIDENING
BR. No. 53-782
▽ (City Project) ALAMEDA STREET BETWEEN 400' NORTH OF ARCADIA STREET AND TEMPLE STREET
W.O. 61584
REMOVAL PLAN
CITY OF LOS ANGELES
DONALD C. TILLMAN CITY ENGINEER
DATE June 25 1982
SCALES HORIZ. 1" = As Shown VERT. 1" = As Shown
SHEET 7
INDEX NUMBER D-27658
AS BUILT PLANS
Contract No. 07-417804
Date Completed 12-21-90
Document No.
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION
MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - MICROFILM

▽ THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.



TYPICAL TENDON PROFILE BETWEEN GIRDERS B&E AND BETWEEN GIRDERS P&T

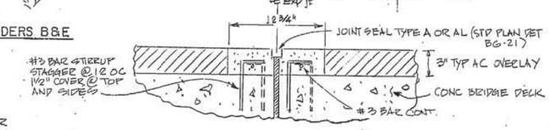
Scale: $\frac{1}{4}$" = 1'-0"



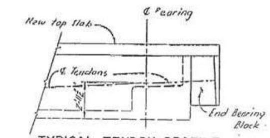
PART PLAN

CONSTRUCTION NOTES

1. SAW CUT 3" AC OVER LAY.
2. CHIP OUT AC
3. SET DOWELS (4" EMBEDMENT) REBAR
4. MIX AND PLACE RAPID SET CONCRETE WITH 60% 3/8" MAX AGGREGATE
5. SAW, CHIP, AND INSTALL JOINT SEAL, TYPE A
6. WHERE 1/2 OF PAVEMENT EXPANSION DAM IS EXISTING, BUILD AS DETAILED FOR OPPOSITE 1/2 OF EXP DAM.

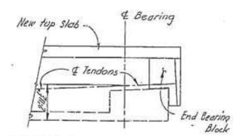


EXPANSION DAM CCO #82 6/12/89



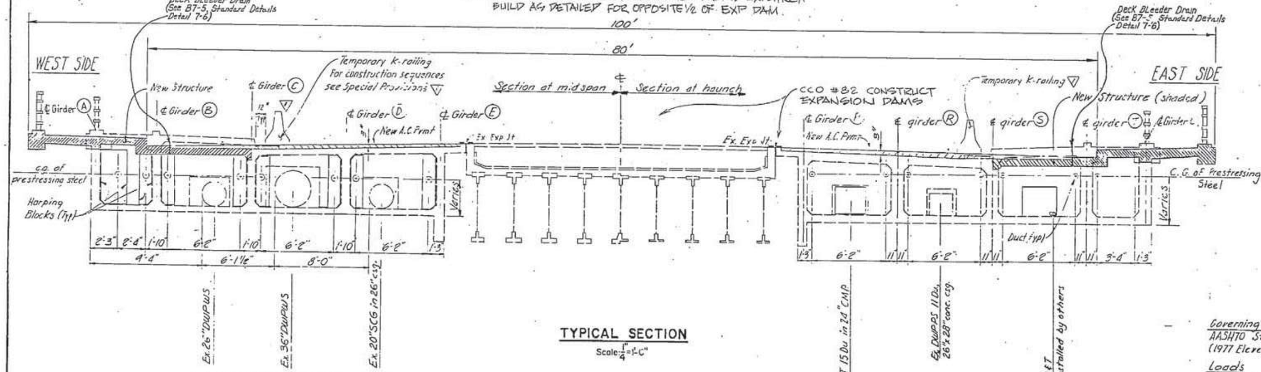
TYPICAL TENDON PROFILE BETWEEN GIRDERS T&U

Scale: $\frac{1}{4}$" = 1'-0"



TYPICAL TENDON PROFILE BETWEEN GIRDERS A&B

Scale: $\frac{1}{4}$" = 1'-0"



TYPICAL SECTION

Scale: $\frac{1}{4}$" = 1'-0"

▽ PRESTRESSING NOTES

The following applies to each of the two bridge sections. Each section contains five (5) girders.

1. Pjack = 4010 kips total at jacking end, $A_s = \frac{P_{jack}}{.75 f_s'}$ Total number of girders = 5
2. Design is based on u = 0.25 and k = 0.0002. Pjack specified at the jacking end includes friction loss, anchorage loss, creep and elastic shortening (total 56.24 ksi)
3. Tendons to be jacked to .75 f's and anchored at a minimum equivalent anchor set = 0.625 inches.
4. Contractor shall submit elongation and jacking calculations based on initial stress of .933 times jacking stress at non-stressing end.
5. The design is based on one end prestressing. Half of the prestressing steel in the member shall be stressed from one end and the other half from the opposite end. In the event the Contractor wishes to stress tendons simultaneously from both ends, he shall submit to the Engineer, for approval, details and supporting calculations prepared by a registered Civil or Structural Engineer by the State of California.
6. Distribution of prestressing force: Unless otherwise noted, the prestressing force shall be distributed with an approximately equal amount in each tendon and shall be placed symmetrically about the cross section.
7. Stressing sequence: No more than ½ of the prestressing force in any girder may be stressed before an equal force is stressed in the adjacent girders. At no time during the stressing operations will more than ⅙ of the total prestressing force be applied eccentrically about the center of gravity of the section.
8. The Contractor shall install the C4 x 5.4 steel girder web braces at locations designated on the plans prior to prestressing. They shall remain in place. The Contractor shall submit shop drawings showing the connection details of the web braces to the existing girders, to take compression and/or tension, for the Engineer's approval.
9. Harping Shall Be Grouted into Place a Minimum of 14 days Before Prestressing.

▽ Note: All reinforced concrete shall be normal Class A concrete except the new deck, sidewalk and railing base which shall be lightweight concrete. End bearing and harping blocks shall be 5000 psi concrete.

AS BUILT

CORRECTIONS BY JOHN DISKIN
CONTRACT NO. 07-417803
DATE 1-3-91
27 MAR 91

▽ DESIGN DATA

Governing Code

AASHTO Standard Specifications For Highway Bridges (1977 Eleventh Edition) including AASHTO Interim Specifications (1982)

Loads

Live load	HS20-44 (MS18)
Lateral earth pressure	36 pcf EFP plus 2 ft. surcharge

Stresses

Lightweight concrete	$F_c' = 3250$ psi at 28 days; $F_c = 1300$ psi
Concrete not in prestressed area	$F_c' = 3250$ psi; $F_c = 1300$ psi
Concrete bearing & harping blocks	$F_c' = 5000$ psi at 28 days; $F_c = 2,000$ psi
Reinforcing steel	$F_s = 24,000$ psi
Prestressed steel wire	$F_s' = 270,000$ psi
Temporary stress before loss due to creep and shrinkage	$0.70 f_s' = 189,000$ psi

▽ (State Project) ALAMEDA ST. U.P. WIDENING

BR. No. 53-782

▽ (City Project) ALAMEDA STREET BETWEEN 400' NORTH OF ARCADIA STREET AND TEMPLE STREET

W.O. 61584

SCALES	HORIZ. 1" = As Shown; VERT. 1" = As Shown	SHEET 9	INDEX NUMBER D-27658

FINAL ORIGINAL

NO.	REVISION DESCRIPTION	DIV./DIST. ENGR.	DATE
▽	Revised for State contract & added State title project	Phil [illegible]	3-83

CITY OF LOS ANGELES
DONALD C. TILLMAN, CITY ENGINEER
DATE June 25 1982

PRESTRESSING STEEL DETAILS

DESIGNED	Sharif D. Toronzides	5-74
DRAWN	[illegible]	5-74
CHECKED	[illegible]	5-74
SUPERVISED	P. Boroza, S. Kelaye	4-74

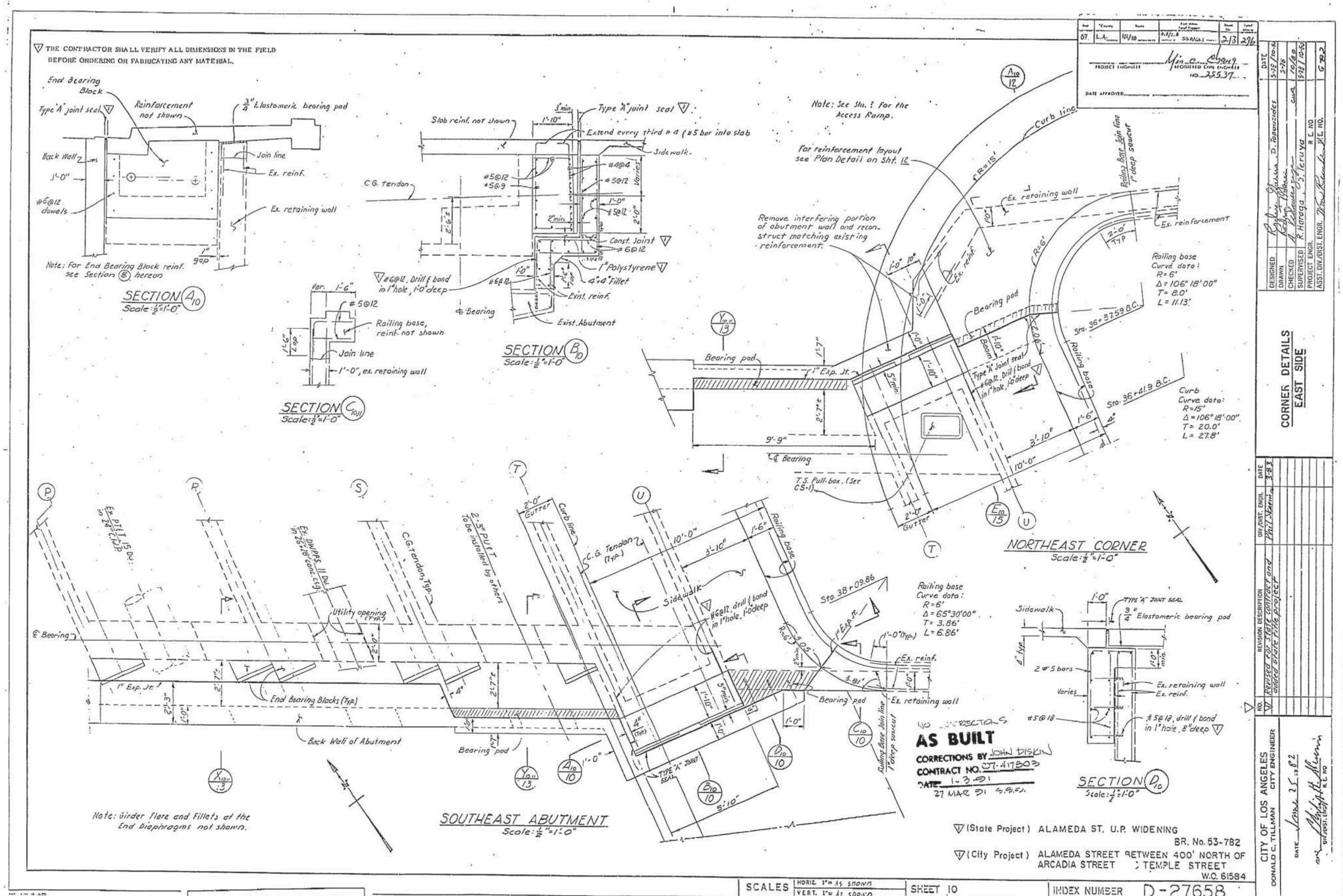
07 | LA | 101/5 | 0.9/38, 5.1/5.1 | 2 | 296 | Alvin C. Clark | 25537 | REGISTERED CIVIL ENGINEER | DATE APPROVED September 16, 1985

AS BUILT PLANS

Contract No. 07-417804
Date Completed 12-21-90
Document No.

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

5-3-91 Donald Blackford



AS BUILT PLANS
Contract No. 07-417804
Date Completed 12-21-90
Document No.

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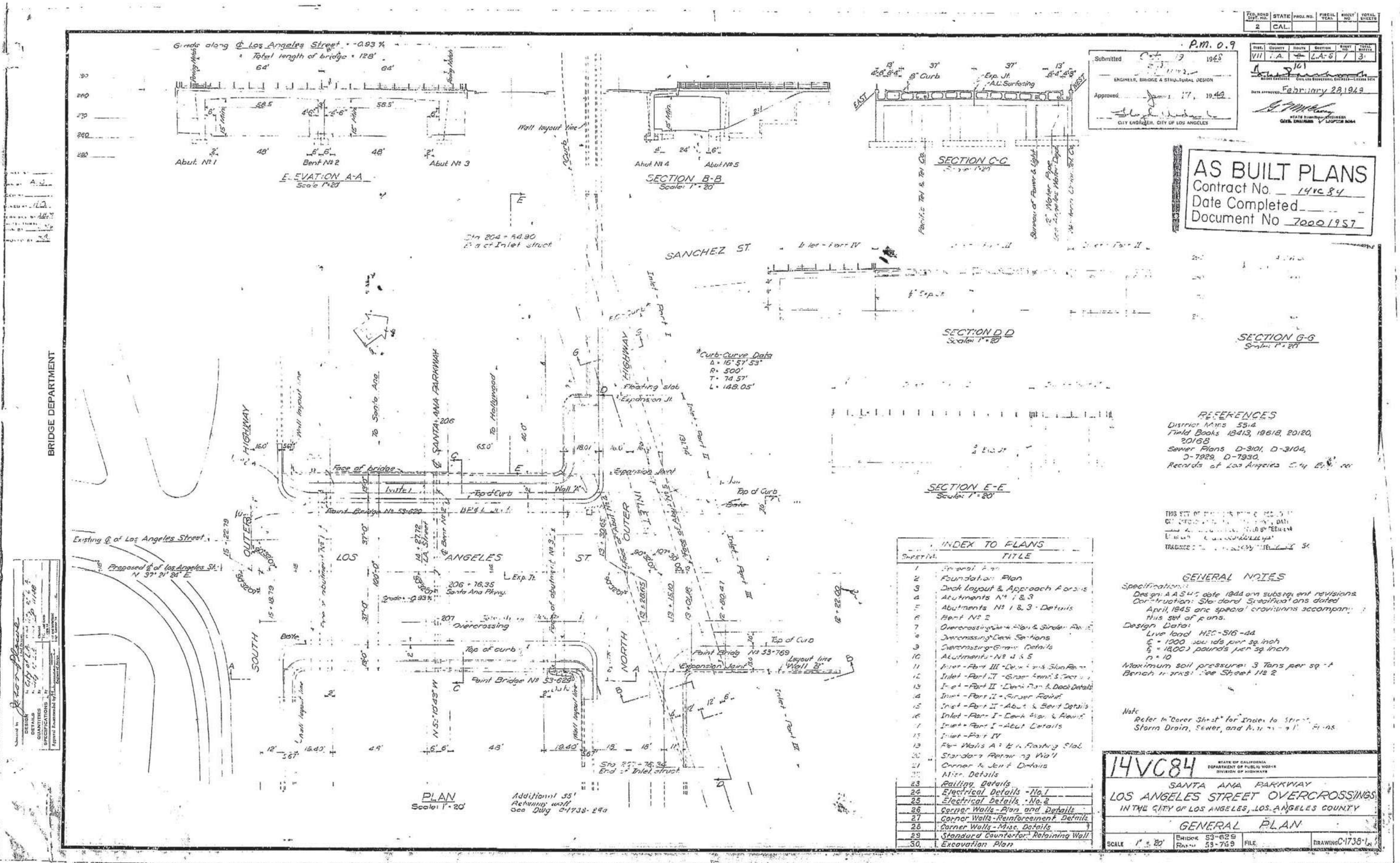
MICROFILM • STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION • MICROFILM

As-Built Plans

Los Angeles Street Overcrossing, Bridge No. 53-0629



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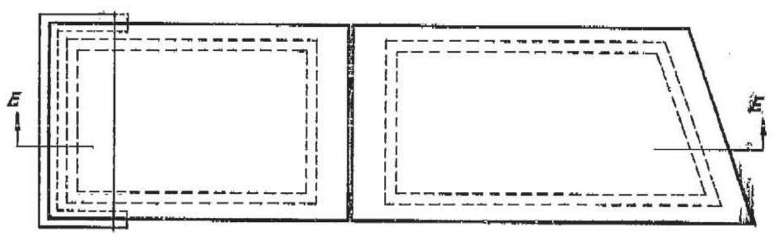
DATE 3/17/71 SIGNATURE [signature] TITLE

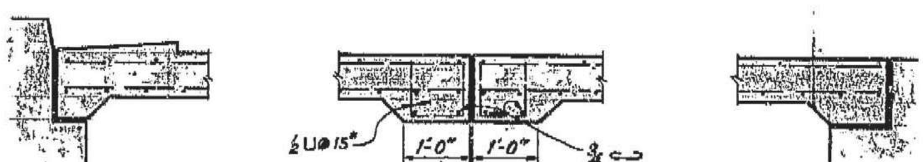
DIST.	COUNTY	ROUTE	SECTION
VII	L.A.	2	L.A

BRIDGE ENGINEER LICENSE 1414

DATE APPROVED Apr. 29, 1949



FLOATING SLAB
Scale: 3/8" = 1'-0"



SECTION E-E
Scale: 3/4" = 1'-0"

Note:
Refer to contract Plans, Sheet No. 19, for remaining details.

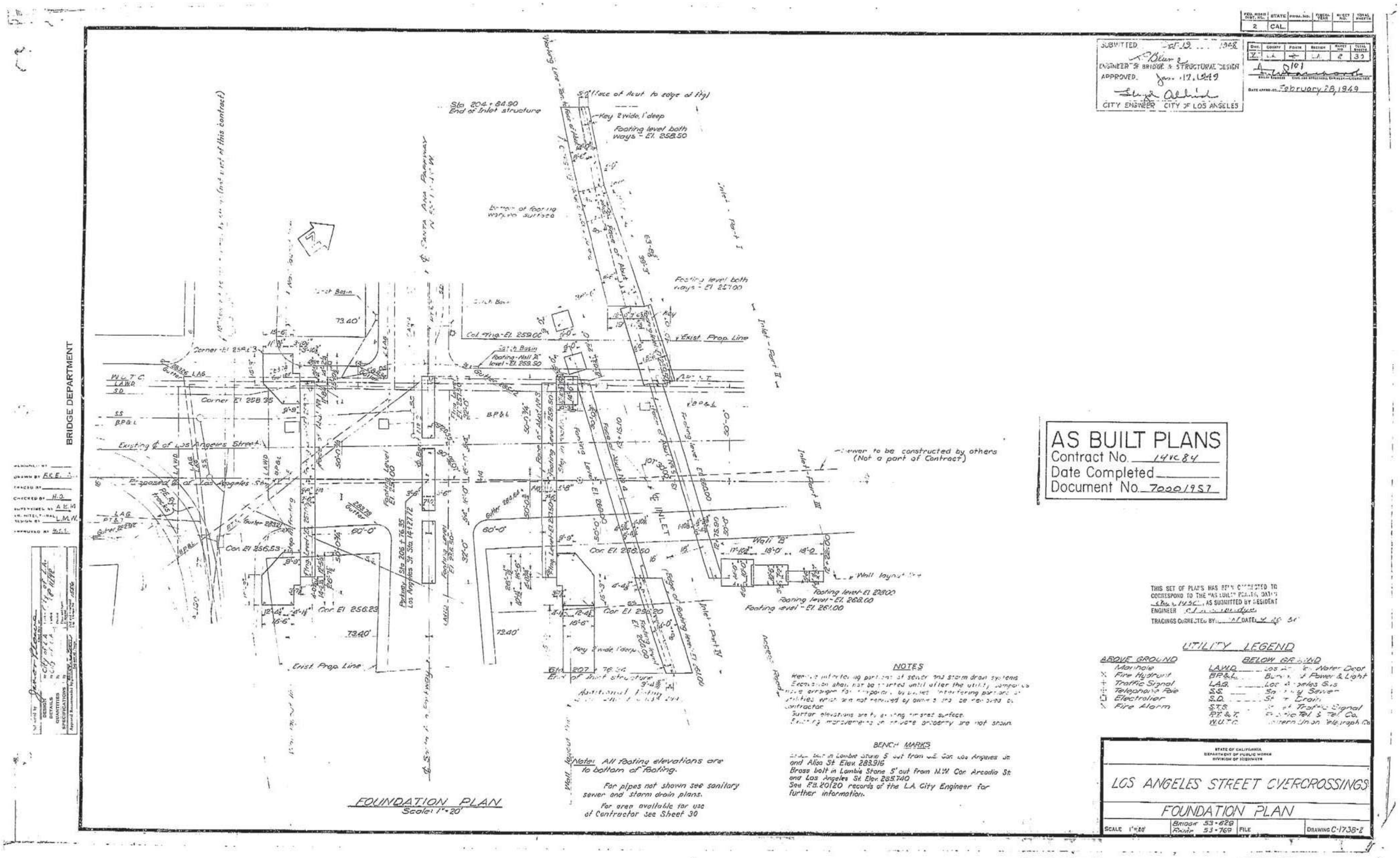
DRAWN BY WWS DATE 4-49
CHECKED BY CP 4-49
APPROVED

SUPPLEMENTARY DRAWING

LOS ANGELES ST. OVERXING	
FLOATING SLAB REVISION	
SCALE: As Shown	FILE NO. 40-7-362
BRIDGE NO. 53-629	SC-1738-1 DRWG. NO.

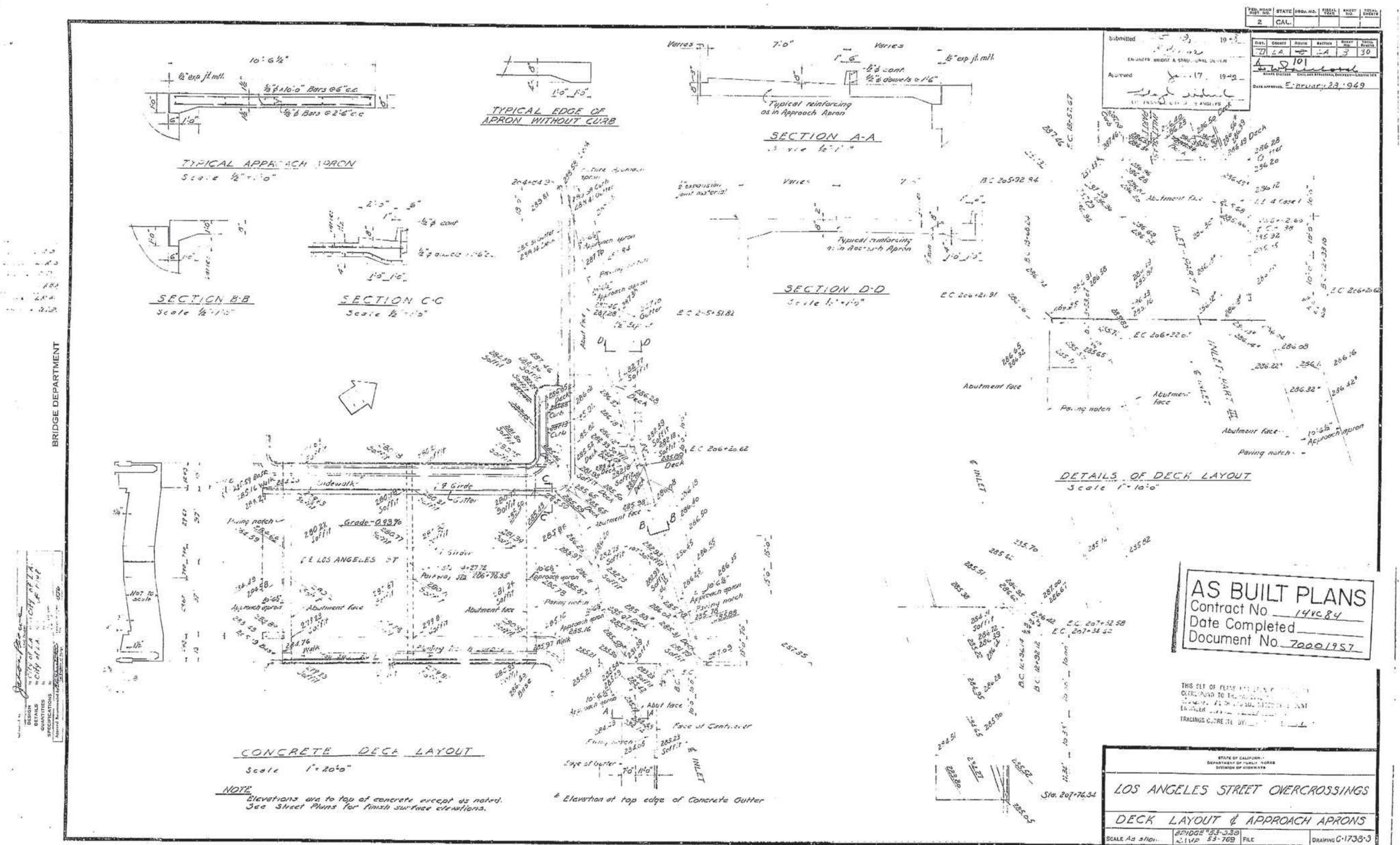
1840

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
BRIDGE DEPARTMENT



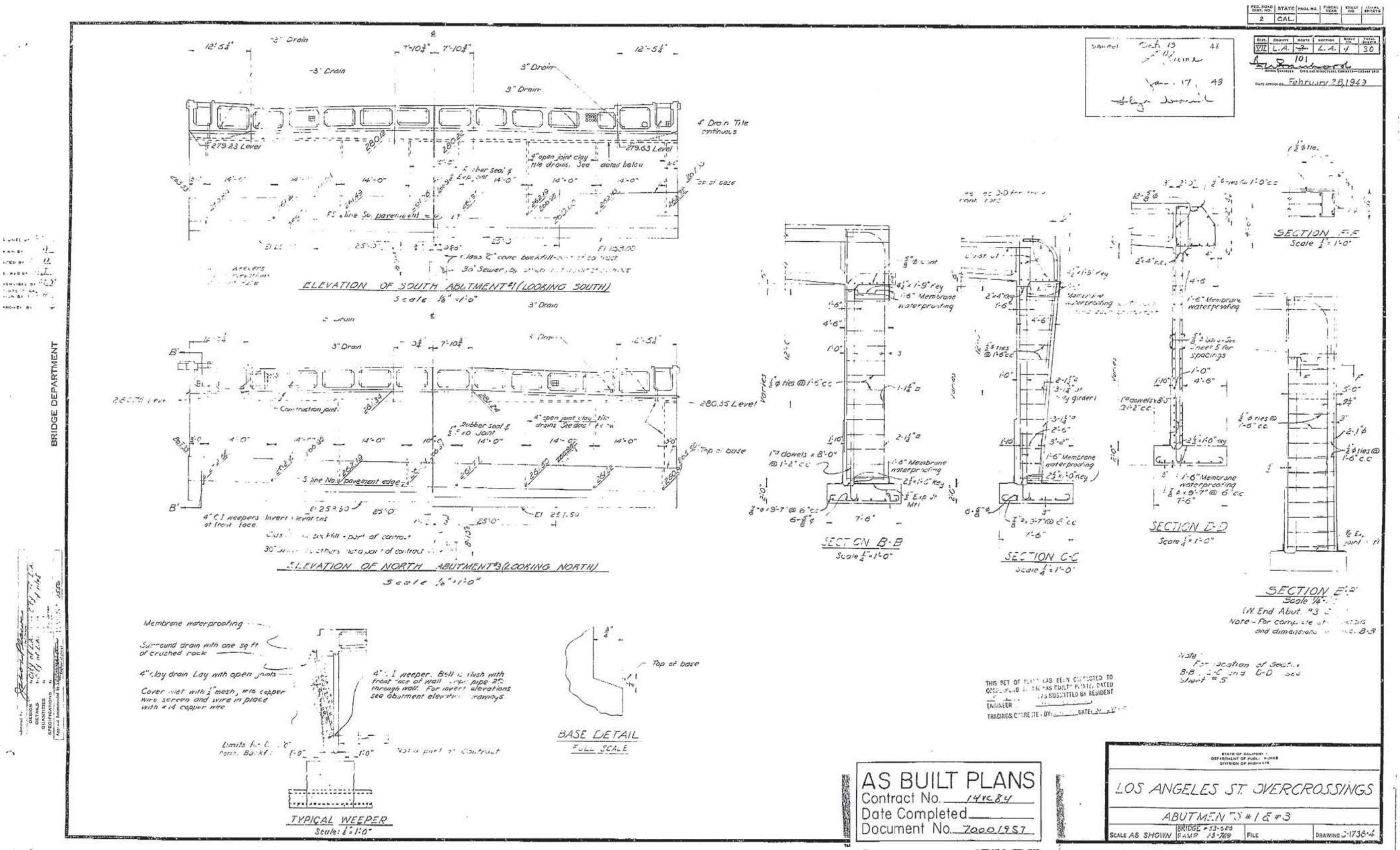
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 5/17/01 SIGNATURE [signature] TITLE H.T.T.



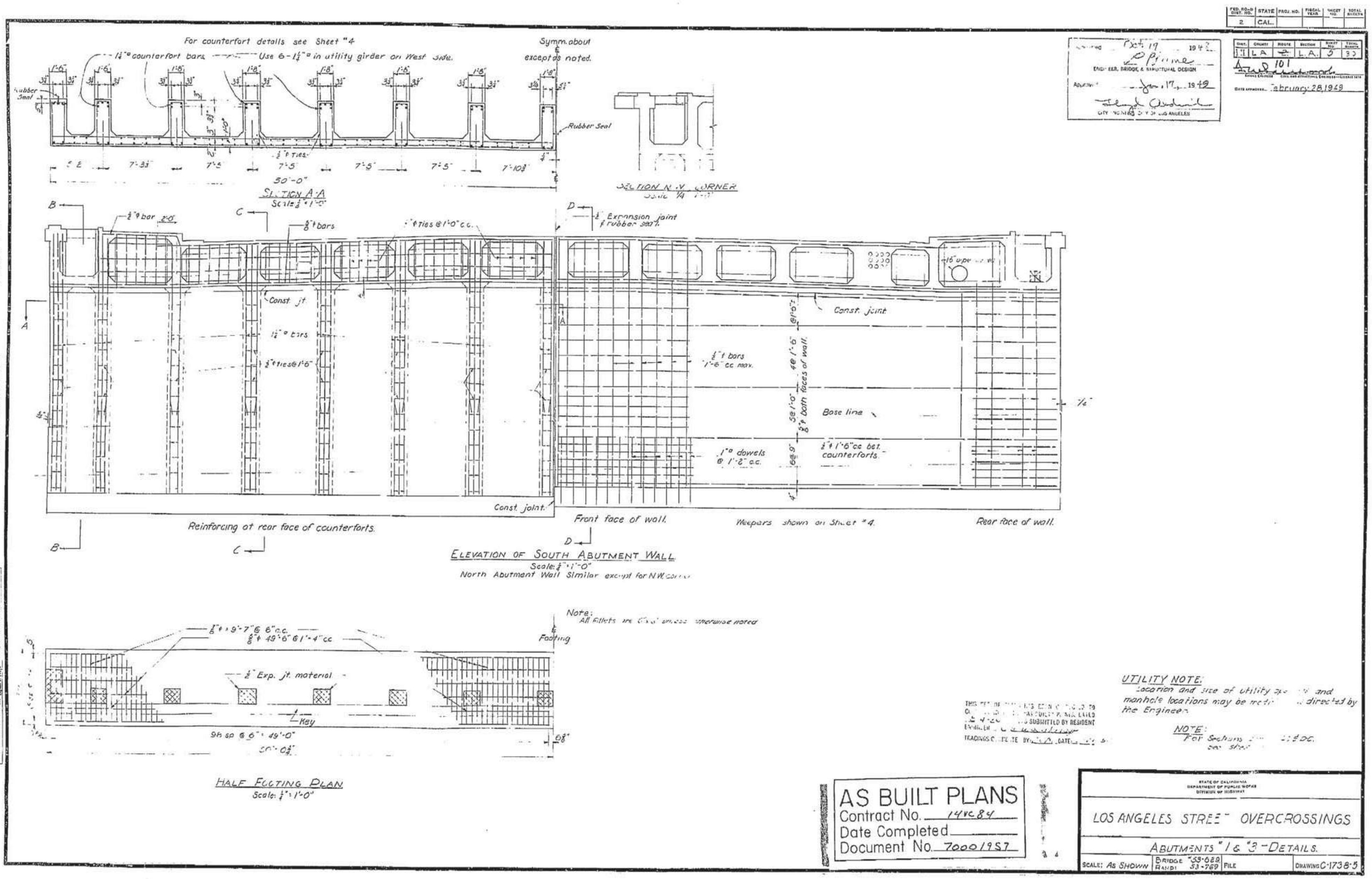
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 8/1/01 SIGNATURE [signature] TITLE [illegible]



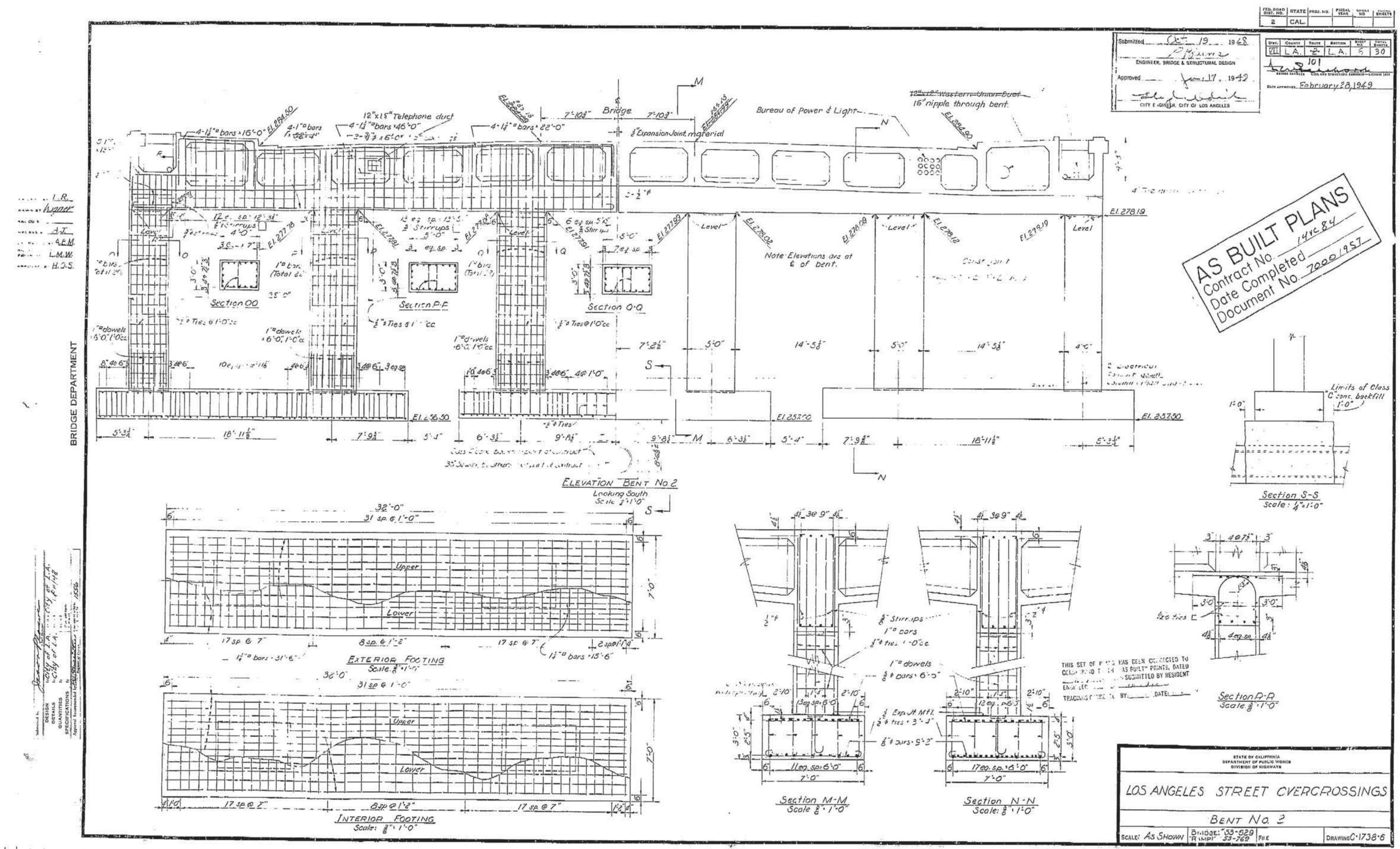
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 9/1/61 SIGNATURE [illegible] TITLE [illegible]



I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 8/15/71 SIGNATURE [signature] TITLE [illegible]

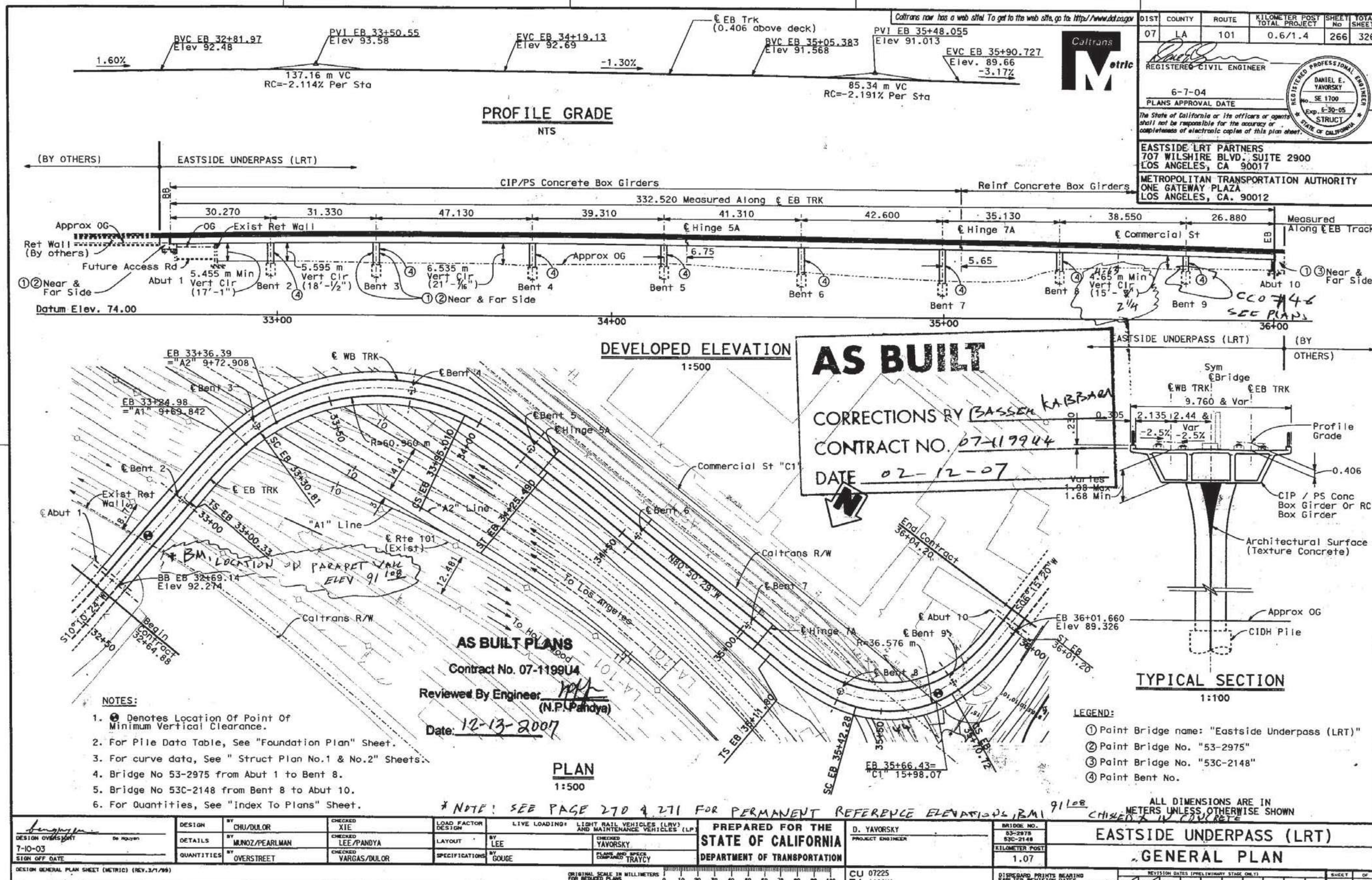


I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 3/17/71 SIGNATURE [illegible] TITLE [illegible]

As-Built Plans

Eastside LRT Project Bridge over HWY 101, Bridge No. 53-2975



NOTES:

1. ● Denotes Location Of Point Of Minimum Vertical Clearance.
2. For Pile Data Table, See "Foundation Plan" Sheet.
3. For curve data, See " Struct Plan No.1 & No.2" Sheets.
4. Bridge No 53-2975 from Abut 1 to Bent 8.
5. Bridge No 53C-2148 from Bent 8 to Abut 10.
6. For Quantities, See "Index To Plans" Sheet.

LEGEND:

① Point Bridge name: "Eastside Underpass (LRT)"
② Point Bridge No. "53-2975"
③ Point Bridge No. "53C-2148"
④ Point Bent No.

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

* NOTE: SEE PAGE 270 & 271 FOR PERMANENT REFERENCE ELEVATIONS, BM1 91.08 CHISELED IN CONCRETE

EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017

METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	101	0.6/1.4	266	326

REGISTERED CIVIL ENGINEER
6-7-04
PLANS APPROVAL DATE

EASTSIDE UNDERPASS (LRT)
GENERAL PLAN

BRIDGE NO. 53-2975 53C-2148
KILOMETER POST 1.07
CU 07225
EA 1199U1
SHEET 1 OF 61

Submitted 8/5/08

INDEX TO BRIDGE PLANS

GENERAL NOTES
LOAD FACTOR DESIGN

DESIGN:

CALTRANS BRIDGE DESIGN SPECIFICATIONS (LFD VERSION APRIL 2000) (1996 AASHTO WITH INTERIM REVISIONS BY CALTRANS) AND LACMTA DESIGN CRITERIA

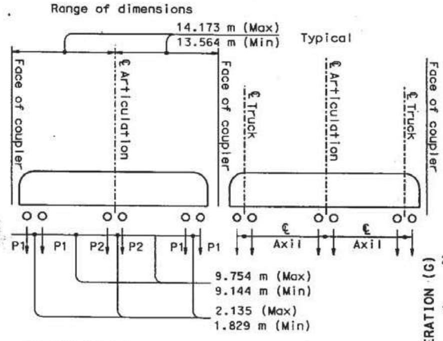
ADDITIONAL DEAD LOADS (AD):

RAIL & PLINTHS, DUCTBANK/WALKWAY, OCS POLES

LIVE LOADING (LL):

LIGHT RAIL VEHICLES (LRV) & MAINTENANCE VEHICLE (LP) (SEE LOADING DIAGRAMS)

LIGHT RAIL VEHICLE (LRV)



ESTIMATED LOADING DISTRIBUTION (kN)

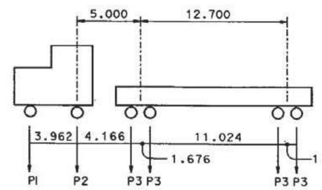
	DISTR. TO CENTER TRUCK	P1	P2	TOTAL
UNLOADED	24%	82.83	52.31	435.93
	31%	75.20	67.57	435.93
FULLY LOADED	24%	108.98	82.29	600.51
	31%	101.42	96.97	600.51

MAX SPEED OF LIGHT RAIL VEHICLE = 25 km/h

LIGHT RAIL VEHICLE FOR SEISMIC:

THE MASS OF ONE 3-CAR TRAIN IS INCLUDED WITH THE DEADLOAD MASS OF THE STRUCTURE. NO OTHER ASPECT OF LIVE LOAD IS INCLUDED IN GROUP VII LOADING

LIGHT RAIL MAINTENANCE VEHICLE (LP)



LOADING (kN)

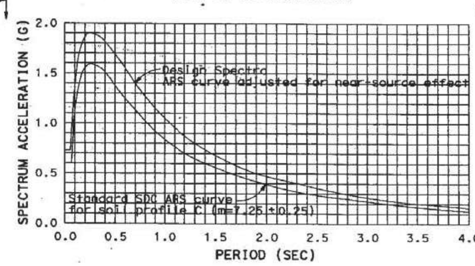
	LOADED
P1	133.45
P2	200.17
P3	82.29

LIGHT RAIL VEHICLE (LRV) IMPACT:

VERTICLE = 30% OF LL, HORIZ = 10% OF LL
(NO IMPACT FOR LP LOADING)

SEISMIC LOADING (EQ):

MODIFIED SDC ARS CURVE FOR SOIL PROFILE C (M= 7.25 ± 0.25)
(PEAK ROCK ACCELERATION = 0.6g WITH 20% INCREASE IN SPECTRA ACCELERATION MODIFIED AS SHOWN BELOW)



REINFORCED CONCRETE:

SUPERSTRUCTURE	SUBSTRUCTURE
Fy = 420 MPa	Fy = 420 MPa
F'c= 35 MPa	F'c= 25 & 28 MPa

TRANSVERSE DECK SLABS
(WORKING STRESS DESIGN)
Fy = 138 MPa
F'c= 8.3 MPa
N = 10

PRESTRESSED CONCRETE:

SEE "PRESTRESSING NOTES" IN "GIRDER LAYOUT NO. 1" SHEET

No As-Built Changes

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	101	0.6/1.4	267	326

REGISTERED CIVIL ENGINEER
6-7-04
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
DANIEL E. TAVORSKY
No. SE 1700
Exp. 6-30-05
STRUCT
STATE OF CALIFORNIA

EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017

METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012

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Caltrans Metric

ADDITIONAL ABBREVIATIONS

CS	CIRCULAR CURVE TO SPIRAL
EB	EASTBOUND
NIC	NOT IN THIS CONTRACT (BY OTHERS)
OCS	OVERHEAD CONTACT SYSTEM
SC	SPIRAL TO CIRCULAR CURVE
ST	SPIRAL TO TANGENT OR SHORT TANGENT
T/R	TOP OF RAIL
TRK	TRACK
TS	TANGENT TO SPIRAL
WB	WESTBOUND

AS BUILT PLANS

Contract No. 07-1199U4

Reviewed By Engineer (N.P. Pandya)

Date: 12-13-2007

QUANTITIES

CONTAMINATED MATERIAL HANDLING	LUMP	SUM
STRUCTURE EXCAVATION (BRIDGE)	243	m^3
STRUCTURE EXCAVATION (TYPE Y) (AERIALLY DEPOSITED LEAD)	44	m^3
STRUCTURE BACKFILL (BRIDGE)	370	m^3
1.2 m CAST-IN-DRILLED-HOLE CONCRETE PILING	142	m
2.4 m CAST-IN-DRILLED-HOLE CONCRETE PILING	109	m
3.0 m CAST-IN-DRILLED-HOLE CONCRETE PILING	67	m
900 mm CAST-IN-DRILLED-HOLE CONCRETE PILING	83	m
PRESTRESSING CAST-IN-PLACE CONCRETE	LUMP	SUM
STRUCTURAL CONCRETE, BRIDGE FOOTING	191	m^3
STRUCTURAL CONCRETE, BRIDGE	2 360	m^3
FLUTED RIB TEXTURE	36	m^2
JOINT SEAL (MR≤30 mm)	10	m
JOINT SEAL ASSEMBLY (MR 70 mm)	10	m
JOINT SEAL ASSEMBLY (MR 90 mm)	10	m
JOINT SEAL ASSEMBLY (MR 101 mm - 160 mm)	10	m
BAR REINFORCING STEEL (BRIDGE)	982 000	kg
BAR REINFORCING STEEL (EPOXY COATED) (BRIDGE)	6 200	kg
MISCELLANEOUS METAL (RESTRAINER - CABLE TYPE)	1 334	kg
MISCELLANEOUS METAL (BRIDGE)	18 400	kg
METAL RAILING	667	m
PTFE BEARING	4	EA

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DESIGN OVERSIGHT Bo Nguyen
7-10-03
SIGN OFF DATE
DESIGN DETAIL SHEET (METRIC) REV. 3/1/98)

	BY	CHECKED
DESIGN	CHU	XIE
DETAILS	NGUYEN/PEARLMAN	LEE/PANDYA
QUANTITIES	OVERSTREET	VARGAS/DULOR

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DAN YAVORSKY
PROJECT ENGINEER

CU 07225
EA 1199U1

BRIDGE NO. 53-2975 53C-2148
KILOMETER POST 1.07

EASTSIDE UNDERPASS (LRT)
INDEX TO PLANS

DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES (PRELIMINARY STAGE ONLY)
SHEET 2 OF 61

FILE => aa1tp0002.dgn

USERNAME => trreno DATE PLOTTED => $DATE$ TIME PLOTTED => $TIME$

2

MARK	DATE	DESCRIPTION	BY	CH'D
3				
2				
1	12/25/05	Revised per RFI-198.02	VN	NP
		REVISIONS		

REGISTERED PROFESSIONAL ENGINEER
ZAFER MUDAR
No. C64151
EXPIRES: 12/31/08
CIVIL
STATE OF CALIFORNIA
2.5.2007

AS BUILT PLANS
Contract No. 07-1199U4
Reviewed By Engineer (N.P. Pandya)
Date: 12-13-2007

AS BUILT CCO # 57

CORRECTIONS BY BASSEM SABBARA
CONTRACT NO. 07-119944
DATE 02-12-07

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
7	LA	101	0.6/1.4	268R	326

REGISTERED CIVIL ENGINEER
PLANS APPROVAL DATE
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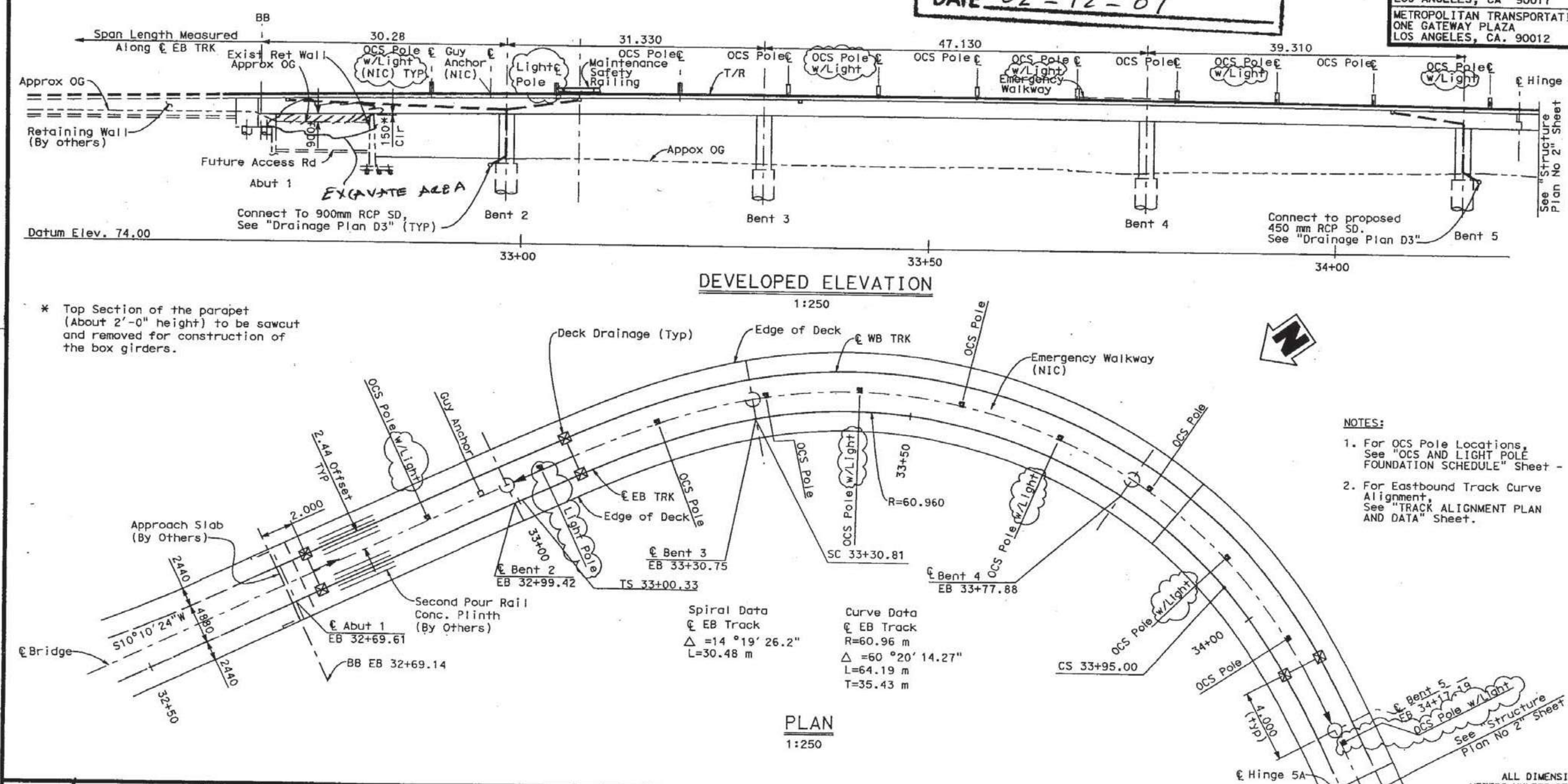
REGISTERED PROFESSIONAL ENGINEER
DANIEL E. YAVORSKY
No. SE 1700
Exp. 6-30-05
STRUCT
STATE OF CALIFORNIA

EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017

METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012



* Top Section of the parapet (About 2'-0" height) to be sawcut and removed for construction of the box girders.

NOTES:

1. For OCS Pole Locations, See "OCS AND LIGHT POLE FOUNDATION SCHEDULE" Sheet - 50
2. For Eastbound Track Curve Alignment, See "TRACK ALIGNMENT PLAN AND DATA" Sheet.

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DESIGN OVERSIGHT BE NGUYEN 7-10-03
SIGN OFF DATE
DESIGN DETAIL SHEET (METRIC) (REV. 3/1/98)

	BY	CHECKED
DESIGN	YANG/DULOR	XIE
DETAILS	MUNOZ/PEARLMAN	LEE/PANDYA
QUANTITIES	OVERSTREET	VARGAS/DULOR

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DAN YAVORSKY
PROJECT ENGINEER

CU 07225
EA 1199U1
FILE => oaspl0003.dan

BRIDGE NO. 53-2975 53C-2148
KILOMETER POST 1.07

DISREGARD PRINTS BEARING EARLIER REVISION DATES

EASTSIDE UNDERPASS (LRT)
STRUCTURE PLAN No. 1

SHEET 3 OF 61

(3)

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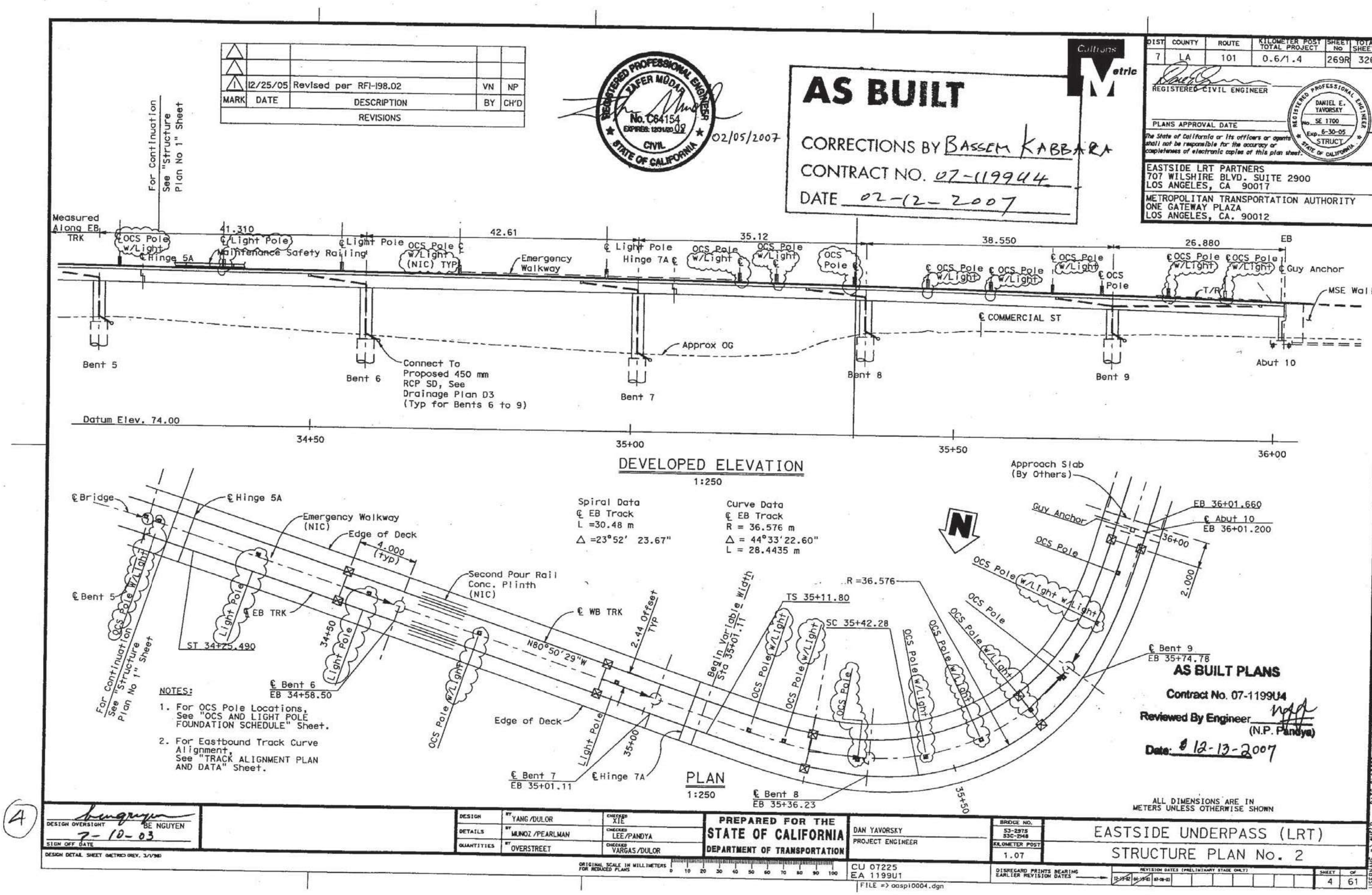
TIME PLOTTED => $TIME$



AS BUILT
CORRECTIONS BY BASSEM KABBARA
CONTRACT NO. 07-119944
DATE 02-12-2007
02/05/2007
REGISTERED PROFESSIONAL ENGINEER ZAFER MUDAR No. C64154 EXPIRES: 12/31/08 CIVIL STATE OF CALIFORNIA
12/25/05 Revised per RFI-198.02 VN NP
MARK DATE DESCRIPTION BY CH'D
REVISIONS
DIST 7 COUNTY LA ROUTE 101 KILOMETER POST TOTAL PROJECT 0.6/1.4 SHEET No 269R TOTAL SHEETS 326
REGISTERED CIVIL ENGINEER
PLANS APPROVAL DATE
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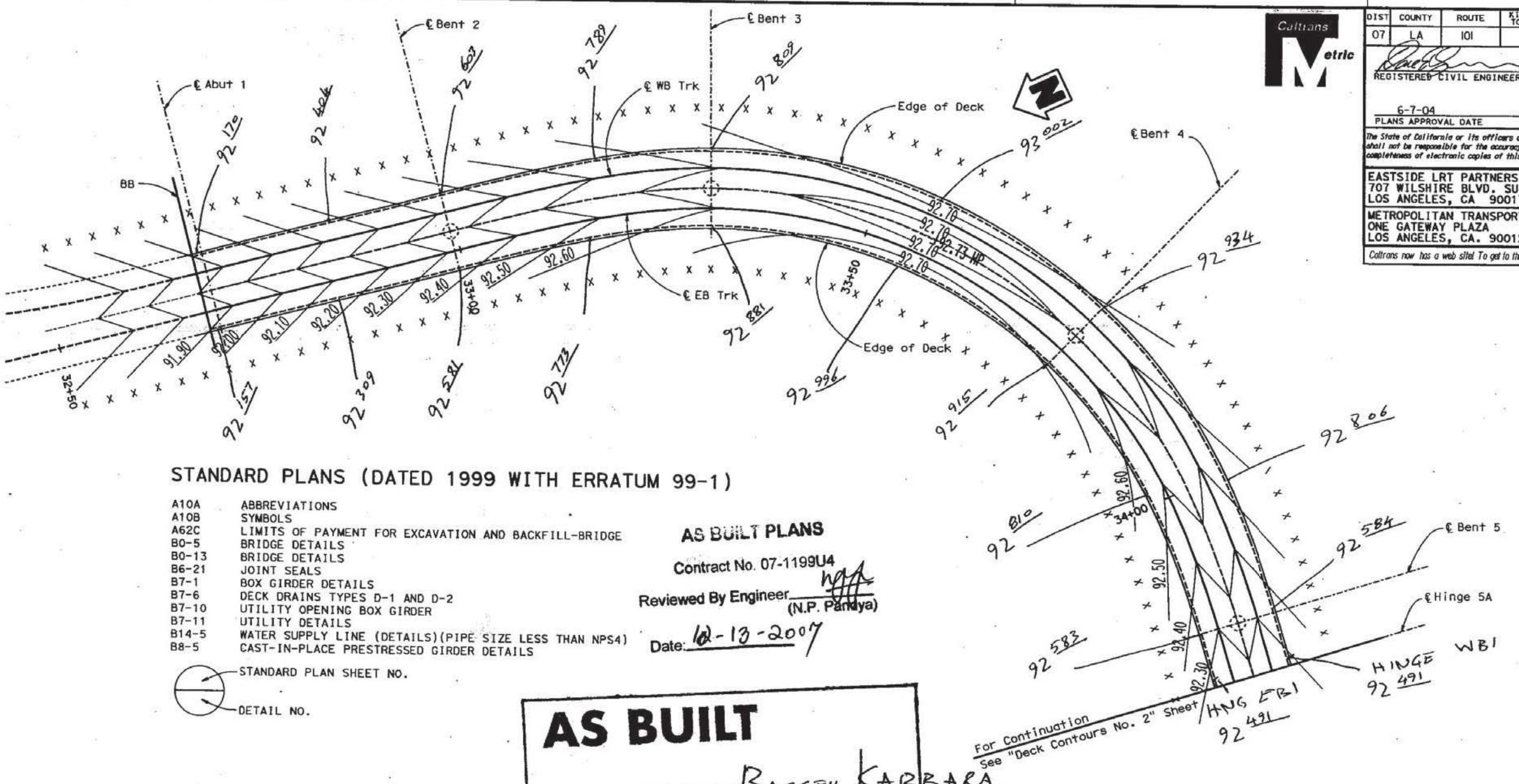
REGISTERED PROFESSIONAL ENGINEER DANIEL E. YAVORSKY No. SE 1700 Exp. 6-30-05 STRUCT STATE OF CALIFORNIA
EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017
METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012
Caltrans Metric
For Continuation See "Structure Plan No 1" Sheet
Measured Along EB TRK
41.310
42.61
35.12
38.550
26.880
EB
OCS Pole w/Light
Light Pole
Hinge 5A
Maintenance Safety Railing
OCS Pole w/Light (NIC) TYP
Emergency Walkway
Light Pole
Hinge 7A
OCS Pole
Guy Anchor
MSE Wall
T/R
COMMERCIAL ST
Approx OG
Bent 5
Bent 6
Bent 7
Bent 8
Bent 9
Abut 10
Connect To Proposed 450 mm RCP SD, See Drainage Plan D3 (Typ for Bents 6 to 9)
Datum Elev. 74.00
34+50
35+00
35+50
36+00
DEVELOPED ELEVATION
1:250
Bridge
Emergency Walkway (NIC)
Edge of Deck
4.000 (typ)
Second Pour Rail Conc. Plinth (NIC)
EB TRK
WB TRK
ST 34+25.490
N80°50'29"W
2.44 Offset TYP
Bent 6 EB 34+58.50
Bent 7 EB 35+01.11
Hinge 7A
Bent 8 EB 35+36.23
Bent 9 EB 35+74.78
Begin Variable Width Sta 35+01.11
TS 35+11.80
SC 35+42.28
R =36.576
Spiral Data
EB Track
L =30.48 m
Δ =23°52' 23.67"
Curve Data
EB Track
R = 36.576 m
Δ = 44°33'22.60"
L = 28.4435 m
Approach Slab (By Others)
EB 36+01.660
Abut 10
EB 36+01.200
2.000
N
PLAN
1:250
NOTES:
1. For OCS Pole Locations, See "OCS AND LIGHT POLE FOUNDATION SCHEDULE" Sheet.
2. For Eastbound Track Curve Alignment, See "TRACK ALIGNMENT PLAN AND DATA" Sheet.
AS BUILT PLANS
Contract No. 07-1199U4
Reviewed By Engineer (N.P. Pandya)
Date: 12-13-2007
ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN
DESIGN OVERSIGHT BE NGUYEN
SIGN OFF DATE 7-10-03
DESIGN YANG/DULOR CHECKED XIE
DETAILS MUNOZ/PEARLMAN CHECKED LEE/PANDYA
QUANTITIES OVERSTREET CHECKED VARGAS/DULOR
PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
DAN YAVORSKY PROJECT ENGINEER
BRIDGE NO. 53-2975 53C-2148
KILOMETER POST 1.07
EASTSIDE UNDERPASS (LRT)
STRUCTURE PLAN No. 2
CU 07225
EA 1199U1
FILE => oaspl0004.dgn
SHEET 4 OF 61
4



STANDARD PLANS (DATED 1999 WITH ERRATUM 99-1)

A10A	ABBREVIATIONS
A10B	SYMBOLS
A62C	LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL-BRIDGE
B0-5	BRIDGE DETAILS
B0-13	BRIDGE DETAILS
B6-21	JOINT SEALS
B7-1	BOX GIRDER DETAILS
B7-6	DECK DRAINS TYPES D-1 AND D-2
B7-10	UTILITY OPENING BOX GIRDER
B7-11	UTILITY DETAILS
B14-5	WATER SUPPLY LINE (DETAILS)(PIPE SIZE LESS THAN NPS4)
B8-5	CAST-IN-PLACE PRESTRESSED GIRDER DETAILS

STANDARD PLAN SHEET NO.
DETAIL NO.

AS BUILT PLANS
Contract No. 07-1199U4
Reviewed By Engineer ngp (N.P. Pandya)
Date: 12-13-2007

AS BUILT

CORRECTIONS BY BASSEM KABBARA
CONTRACT NO. 07-119944
DATE 02-12-2007

Notes:

1. X- indicates 3.0 m interval measured along ℄ EB track
2. Contours shown at 0.1 m elevation interval
3. Contour shown do not include camber.

No As-Built Change

PLAN
1:250

LOCATION & ELEVATION OF COPPER NAILS ON BRIDGE CURBS.

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	101	0.6/1.4	270	326

REGISTERED CIVIL ENGINEER
6-7-04
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
DANIEL E. YAVORSKY
No. SE 1700
Exp. 6-30-05
STRUCT
STATE OF CALIFORNIA

EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017

METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012

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Be Nguyen
DESIGN OVERSIGHT
7-10-03
SIGN OFF DATE
DESIGN DETAIL SHEET (METRIC) (REV. 3/1/99)

DESIGN	BY CHU	CHECKED XIE
DETAILS	BY NGUYEN/PEARLMAN	CHECKED LEE/PANDYA
QUANTITIES	BY OVERSTREET	CHECKED VARGAS/DULOR

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DAN YAVORSKY
PROJECT ENGINEER

BRIDGE NO. 53-2875 53C-2146
KILOMETER POST 1.07

EASTSIDE UNDERPASS (LRT)
DECK CONTOURS No. 1

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 07225
EA 1199U1
FILE => abdkc0005.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 5 OF 61

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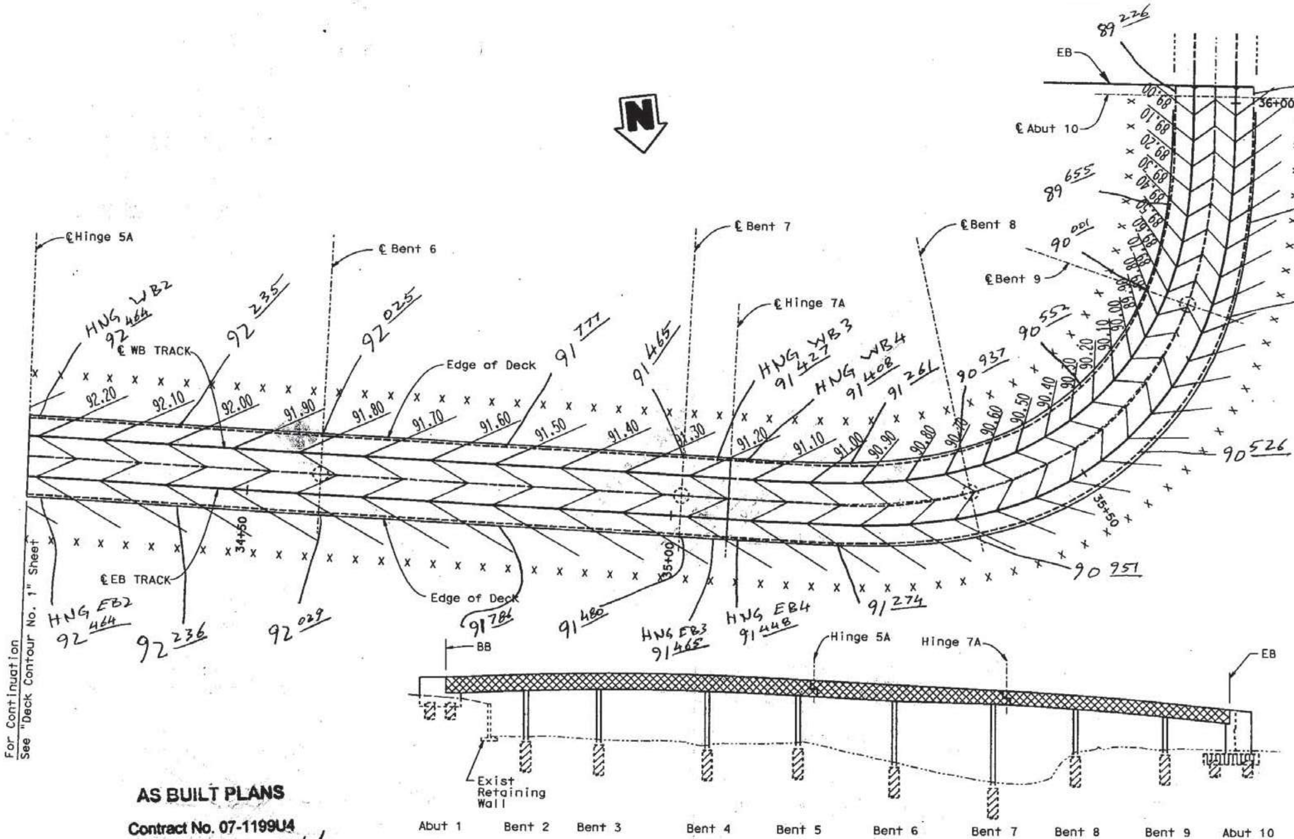

AS BUILT

CORRECTIONS BY Bassem Kabbara

CONTRACT NO. 07-119944

DATE 07-12-2007

AS BUILT PLANS

Contract No. 07-1199U4

Reviewed By Engineer (N.P. Pandya)

Date: 12-13-2007

CONCRETE STRENGTH AND TYPE LIMITS

No Scale

- STRUCTURE CONCRETE, BRIDGE (F'c= 28 MPa @28 DAYS)
- STRUCTURE CONCRETE, BRIDGE (F'c= 35 MPa @28 DAYS)
- CAST-IN-DRILL HOLE CONCRETE PILE, BRIDGE (F'c= 28 MPa @ 28 DAYS)
- STRUCTURAL CONCRETE FOOTING, (F'c= 25 MPa @28 DAYS)

No As-Built Changes

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	101	0.6/1.4	271	326

REGISTERED CIVIL ENGINEER

6-7-04

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER — DANIEL E. YAVORSKY — No. SE 1700 — Exp. 6-30-05 — STRUCT — STATE OF CALIFORNIA

EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017

METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012

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Caltrans Metric

DESIGN OVERSIGHT — Be Nguyen — 7-10-03 — SIGN OFF DATE

DESIGN DETAIL SHEET (METRIC) REV. 3/1/96

	BY	CHECKED
DESIGN	CHU	XIE
DETAILS	NGUYEN/PEARLMAN	LEE/PANOYA
QUANTITIES	OVERSTREET	VARGAS/DUCOR

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DAN YAVORSKY — PROJECT ENGINEER

CU 07225
EA 1199U1

FILE => abdkc0006.dgn

BRIDGE NO. 53-2975 53C-2545 — KILOMETER POST 1.07

EASTSIDE UNDERPASS (LRT)

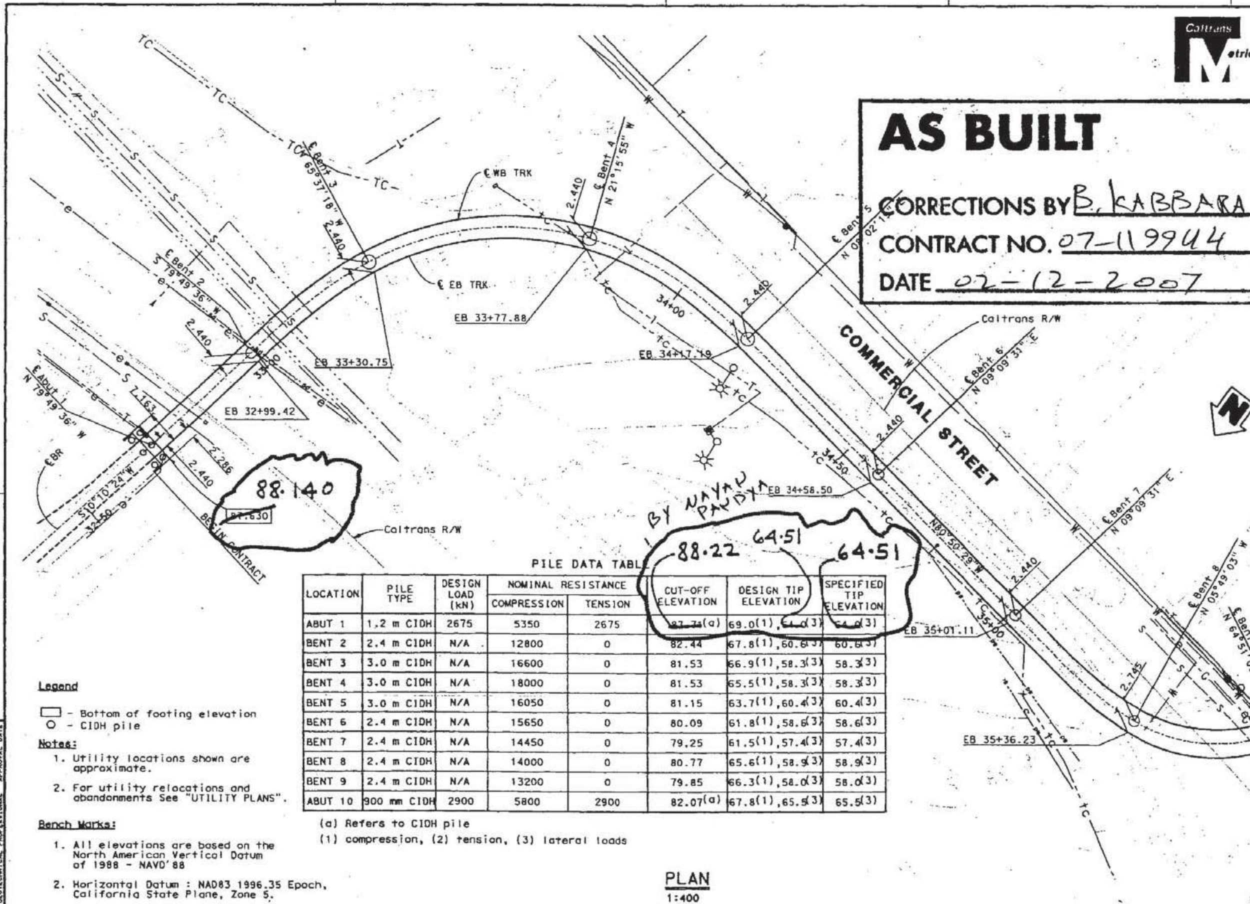
DECK CONTOURS No. 2

DISREGARD PRINTS BEARING EARLIER REVISION DATES — REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 6 OF 61

USERNAME => trmorlok DATE PLOTTED => $DATE$ TIME PLOTTED => $TIME$

(6)



AS BUILT

CORRECTIONS BY B. KABBARA
CONTRACT NO. 07-119944
DATE 02-12-2007

AS BUILT PLANS
Contract No. 07-1199U4
Reviewed By Engineer (N.P. Pandya)
Date: 12-13-2007

PILE DATA TABLE

LOCATION	PILE TYPE	DESIGN LOAD (kN)	NOMINAL RESISTANCE COMPRESSION	NOMINAL RESISTANCE TENSION	CUT-OFF ELEVATION	DESIGN TIP ELEVATION	SPECIFIED TIP ELEVATION
ABUT 1	1.2 m CIDH	2675	5350	2675	~~87.71~~(a) 88.22	69.0(1), ~~64.0~~(3) 64.51	~~64.0~~(3) 64.51
BENT 2	2.4 m CIDH	N/A	12800	0	82.44	67.8(1), 60.6(3)	60.6(3)
BENT 3	3.0 m CIDH	N/A	16600	0	81.53	66.9(1), 58.3(3)	58.3(3)
BENT 4	3.0 m CIDH	N/A	18000	0	81.53	65.5(1), 58.3(3)	58.3(3)
BENT 5	3.0 m CIDH	N/A	16050	0	81.15	63.7(1), 60.4(3)	60.4(3)
BENT 6	2.4 m CIDH	N/A	15650	0	80.09	61.8(1), 58.6(3)	58.6(3)
BENT 7	2.4 m CIDH	N/A	14450	0	79.25	61.5(1), 57.4(3)	57.4(3)
BENT 8	2.4 m CIDH	N/A	14000	0	80.77	65.6(1), 58.9(3)	58.9(3)
BENT 9	2.4 m CIDH	N/A	13200	0	79.85	66.3(1), 58.0(3)	58.0(3)
ABUT 10	900 mm CIDH	2900	5800	2900	82.07(a)	67.8(1), 65.5(3)	65.5(3)

(a) Refers to CIDH pile
(1) compression, (2) tension, (3) lateral loads

Legend

▭ - Bottom of footing elevation
○ - CIDH pile

Notes:

1. Utility locations shown are approximate.
2. For utility relocations and abandonments See "UTILITY PLANS".

Bench Marks:

1. All elevations are based on the North American Vertical Datum of 1988 - NAVD'88
2. Horizontal Datum : NAD83 1996.35 Epoch, California State Plane, Zone 5.

PLAN
1:400

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL
07	LA	101	0.6/1.4	272	326

REGISTERED CIVIL ENGINEER
6-7-04
PLANS APPROVAL DATE
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EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017

METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012

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Caltrans Metric

DESIGN OVERSIGHT 7-10-03 SIGN OFF DATE
SCALE: | VERT. DATUM | HORZ. DATUM
PHOTOGRAMMETRY AS OF: | ALIGNMENT TIES
SURVEYED | DRAFTED
FIELD CHECKED | CHECKED
DESIGN CHU/DULOR | CHECKED XIE
DETAILS NGUYEN/PEARLMAN | CHECKED LEE/PANDYA
QUANTITIES OVERSTREET | CHECKED VARGAS/DULOR

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DAN YAVORSKY
PROJECT ENGINEER

BRIDGE NO. 53-2979 53C-2146
KILOMETER POST 1.07

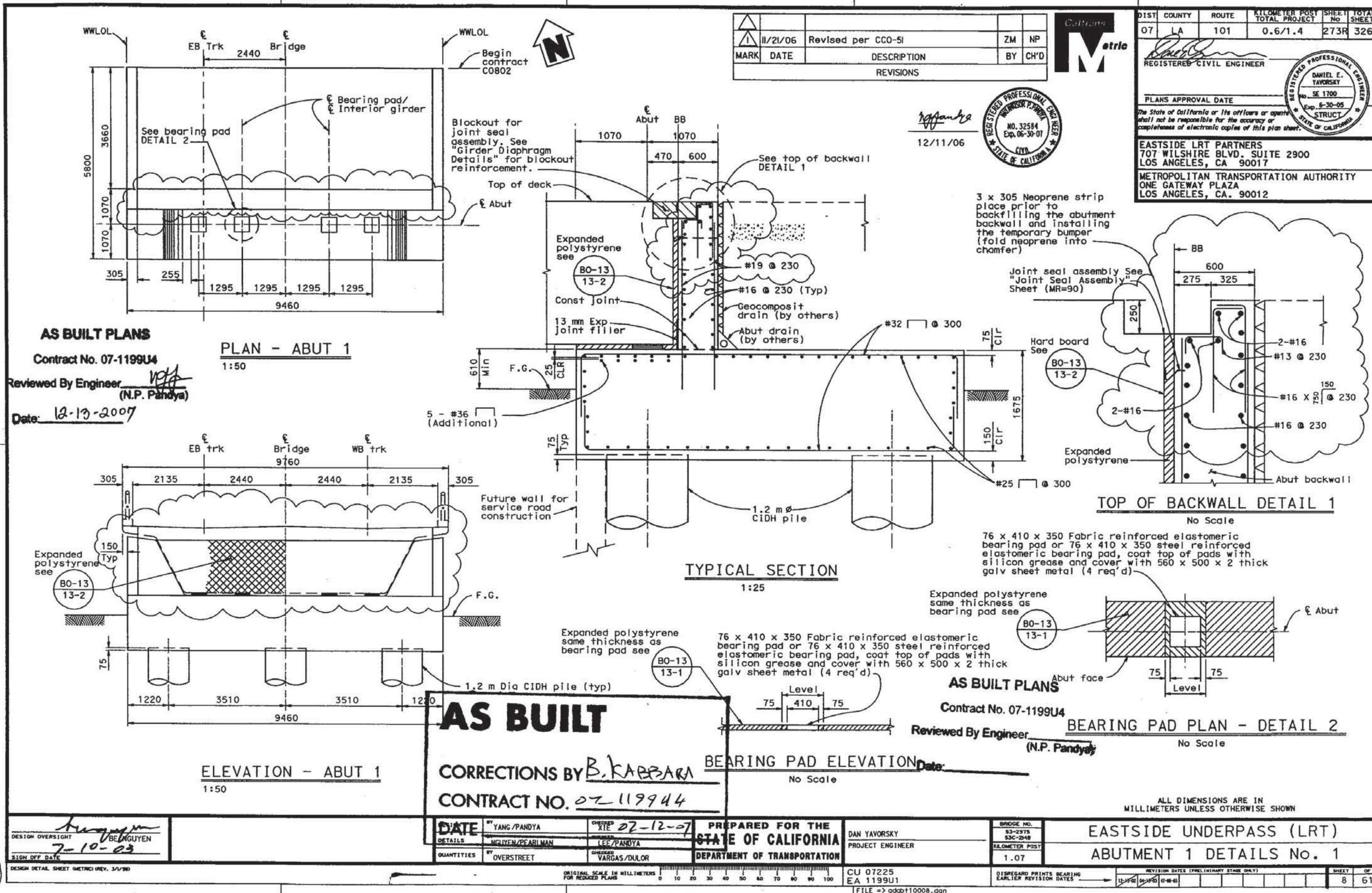
EASTSIDE UNDERPASS (LRT)
FOUNDATION PLAN

CU 07225
EA 1199U1
FILE => acfnp0007.dgn

SHEET 7 OF 61

FOUNDATION PLAN SHEET (METRIC) (REV. 3/1/99)
ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS
GEOTECHNICAL PROFESSIONAL APPROVAL DATE
USERNAME => trmorlok DATE PLOTTED => 09-JUN-2004 TIME PLOTTED => 11:15

(1)



PLAN - ABUT 1
1:50
ELEVATION - ABUT 1
1:50
TYPICAL SECTION
1:25
TOP OF BACKWALL DETAIL 1
No Scale
BEARING PAD ELEVATION
No Scale
BEARING PAD PLAN - DETAIL 2
No Scale
WWLOL
EB Trk
Bridge
Begin contract C0802
Bearing pad/ Interior girder
See bearing pad DETAIL 2
Blockout for joint seal assembly. See "Girder Diaphragm Details" for blockout reinforcement.
Top of deck
Abut
Expanded polystyrene see
BO-13 13-2
Const joint
13 mm Exp joint filler
See top of backwall DETAIL 1
#19 @ 230
#16 @ 230 (Typ)
Geocomposit drain (by others)
Abut drain (by others)
#32 @ 300
#25 @ 300
5 - #36 (Additional)
F.G.
1.2 m ø CIDH pile
Future wall for service road construction
1.2 m Dia CIDH pile (typ)
3 x 305 Neoprene strip place prior to backfilling the abutment backwall and installing the temporary bumper (fold neoprene into chamfer)
Joint seal assembly See "Joint Seal Assembly" Sheet (MR=90)
Hard board See
2-#16
#13 @ 230
#16 X 150/75 @ 230
#16 @ 230
Expanded polystyrene
Abut backwall
76 x 410 x 350 Fabric reinforced elastomeric bearing pad or 76 x 410 x 350 steel reinforced elastomeric bearing pad, coat top of pads with silicon grease and cover with 560 x 500 x 2 thick galv sheet metal (4 req'd)
Expanded polystyrene same thickness as bearing pad see
BO-13 13-1
Abut face
Level
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
AS BUILT PLANS
Contract No. 07-1199U4
Reviewed By Engineer (N.P. Pandya)
Date: 12-13-2007
AS BUILT
CORRECTIONS BY B. KABBARA
CONTRACT NO. 07-1199U4
11/21/06 Revised per CCO-51 ZM NP
MARK DATE DESCRIPTION BY CH'D
REVISIONS
12/11/06
DIST 07 COUNTY LA ROUTE 101 KILOMETER POST TOTAL PROJECT 0.6/1.4 SHEET No 273R TOTAL SHEETS 326
REGISTERED CIVIL ENGINEER
PLANS APPROVAL DATE
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EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017
METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012
DESIGN OVERSIGHT BE NGUYEN
SIGN OFF DATE 7-10-03
DATE 02-12-07
DETAILS YANG/PANDYA NGUYEN/PEARLMAN
QUANTITIES OVERSTREET
CHECKED XIE LEE/PANDYA VARGAS/DULOR
PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
DAN YAVORSKY PROJECT ENGINEER
BRIDGE NO. 53-2375 53C-2348
KILOMETER POST 1.07
EASTSIDE UNDERPASS (LRT)
ABUTMENT 1 DETAILS No. 1
SHEET 8 OF 61
CU 07225
EA 1199U1
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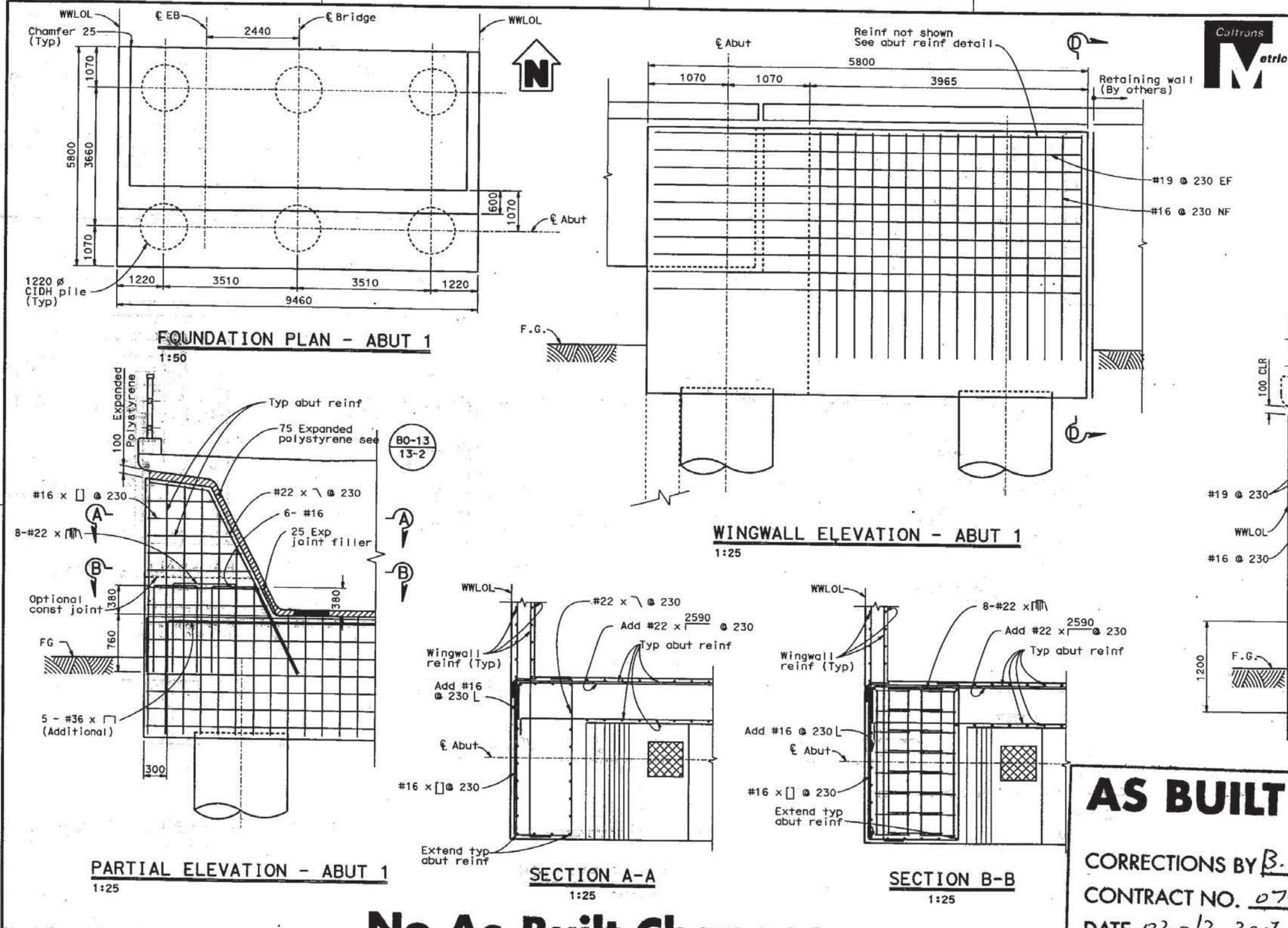

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	101	0.6/1.4	274	326

REGISTERED CIVIL ENGINEER

6-07-04
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER DANIEL E. YAVORSKY No. SE 1700 Exp. 6-30-05 STRUCT STATE OF CALIFORNIA

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LOS ANGELES, CA 90017

METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012

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AS BUILT

CORRECTIONS BY B. KABBARA
CONTRACT NO. 07-1199U4
DATE 02-12-2007

AS BUILT PLANS
Contract No. 07-1199U4
Reviewed By Engineer (N.P. Pandya)
Date: 12-13-2007

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

No As-Built Changes

DESIGN OVERSIGHT Be Nguyen
7-10-03
SIGN OFF DATE
DESIGN DETAIL SHEET (METRIC) REV. 3/1/98

DESIGN: LANG/PANDYA | XIE
DETAILS: NGUYEN/PEARLMAN | CHECKED LEE/PANDYA
QUANTITIES: OVERSTREET | CHECKED VARGAS/DULOR

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

DAN YAVORSKY
PROJECT ENGINEER

CU 07225
EA 1199U1
FILE => odabt1009.dgn

BRIDGE NO. 53-2975 53C-2491
KILOMETER POST 1.07

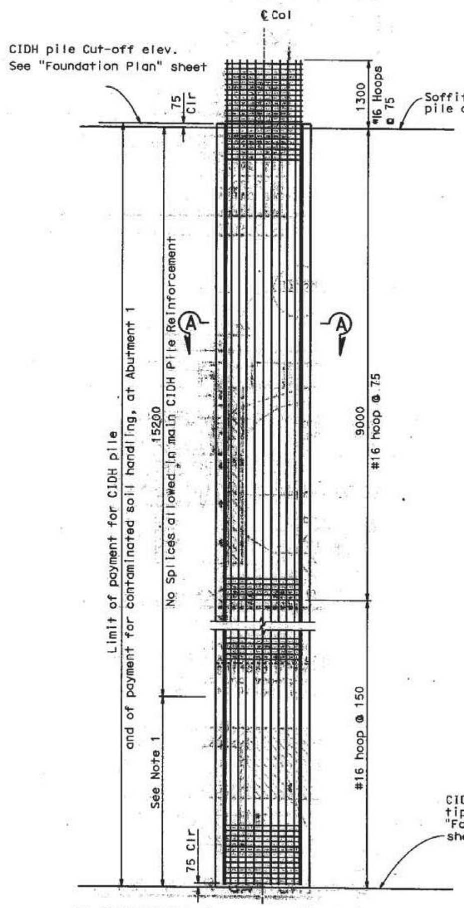
EASTSIDE UNDERPASS (LRT)
ABUTMENT 1 DETAILS No. 2

DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 9 OF 61

9

Contract No. 07-1199U4
Reviewed By Engineer (N.P. Pandya)
Date: 12-13-2007

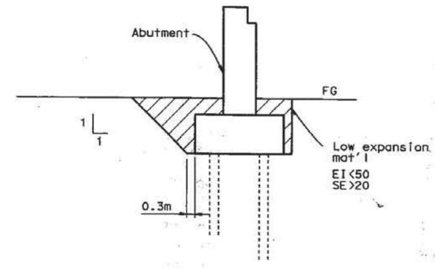


ELEVATION (1.2 M Ø CIDH PILE)

1:40

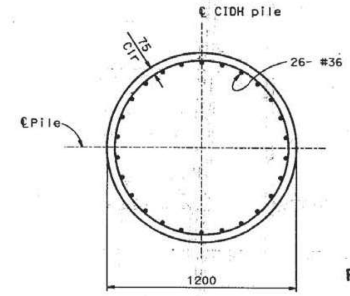
Notes:

1. Only staggered "Ultimate" butt splices are allowed in main CIDH pile reinforcement in this zone.
2. All hoops are "Ultimate" butt spliced continuous.



EXPANSIVE SOIL EXCLUSION ZONE

No Scale



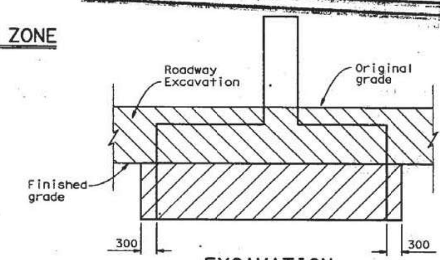
SECTION A-A

No Scale

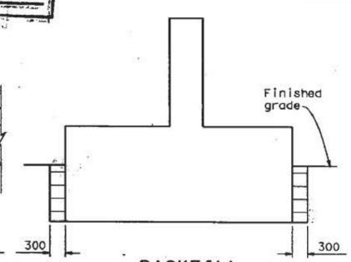
Structure excavation (bridge)

Structure backfill (bridge)

For additional details see A62C



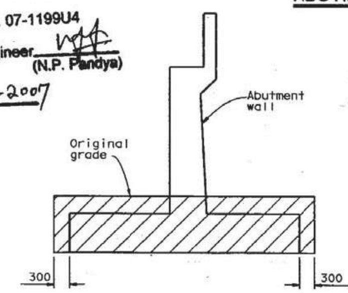
EXCAVATION



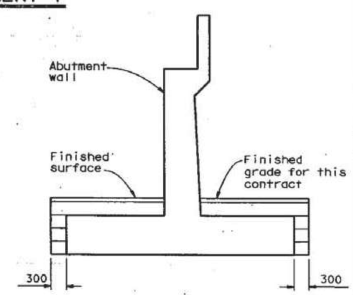
BACKFILL

ABUTMENT 1

AS BUILT PLANS
Contract No. 07-1199U4
Reviewed By Engineer (N.P. Pandya)
Date: 12-13-2007



EXCAVATION



BACKFILL

ABUTMENT 10

LIMITS OF PAYMENT FOR STRUCTURE EXCAVATION & BACKFILL

No Scale

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

AS BUILT
CORRECTIONS BY Bassem Kabbara
CONTRACT NO. 07-1199U4
DATE 11/15/07

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
07	LA	101	0.6/1.4	275	326

REGISTERED CIVIL ENGINEER
6-07-04
PLANS APPROVAL DATE
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REGISTERED PROFESSIONAL ENGINEER DANIEL E. YAVORSKY No. SE 1700 Exp. 6-30-05 STRUCT STATE OF CALIFORNIA

EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
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DESIGN OVERSIGHT Bo nguyen
7-10-03
SIGN OFF DATE
DESIGN DETAIL SHEET (METRIC) (REV. 3/1/95)

DESIGN	BY YANG/PANDYA	CHECKED XIE
DETAILS	BY NGUYEN/PEARLMAN	CHECKED LEE/PANDYA
QUANTITIES	BY OVERSTREET	CHECKED VARGAS/DULOR

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DAN YAVORSKY
PROJECT ENGINEER

BRIDGE NO. 53-2975 53C-2148
KILOMETER POST 1.07

EASTSIDE UNDERPASS (LRT)
ABUTMENT 1 DETAILS No.3

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 07225
EA 1199U1
FILE => adabt1010.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES (PRELIMINARY STAGE ONLY)
SHEET 10 OF 61

USERNAME => trphils DATE PLOTTED => $DATE$ TIME PLOTTED => $TIME$

10

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Appendix C:
Existing Geotechnical Boring Logs

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Existing Geotechnical Boring Logs

ARCADIS, 2014

SOIL DESCRIPTION

Soil descriptions on the exploration logs are based on visual observations and laboratory testing on selected samples.

MOISTURE

Dry	Little perceptible moisture
Damp	Below optimum moisture for compaction
Moist	Likely near optimum moisture content
Wet	Likely wet of optimum moisture content
Saturated	Probably below water table or in perched groundwater

SAMPLE TYPE SYMBOLS

MCS 2.0 = Modified California (ID 1.9 inch with liner)

CT = Cuttings

CR = Core Run

ST = Shelby Tube

TEST SYMBOLS

MC	Moisture Content
GS	Grain Size
AL	Atterberg Limits
SG	Specific Gravity
DT	Density Test
OG	Organic Content
CN	Consolidation
UU	Unconsolidated Undrained Triaxial
CU	Consolidated Undrained Triaxial
UC	Unconfined Compression
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer in tons/ft^2
CT	Corrosivity Test
PID	Photoionization Detector Reading
CA	Chemical Analysis

KEY TO EXPLORATION LOGS

ARCADIS

Date Start/Finish: 8/19/14 **Drilling Company:** Jet Drilling **Driller's Name:** Gary Buss **Drilling Method:** Hollow Stem Auger **Rig Type:** CME 75 **Sampling Method:** CA Modified Split Spoon	**Northing:** NA **Easting:** NA **Casing Elevation:** NA **Borehole Depth:** 50 ft **Borehole Diameter:** 8" **Surface Elevation:** NA **Descriptions By:** Brent Anderson	**Well/Boring ID: B-01** **Client:** Los Angeles Metropolitan Transportation Authority **Location:** MTA Metro 410 Center Street Los Angeles, California

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
0									Gravel and asphalt debris.
					0.0		SW		WELL GRADED SAND Fill (20, 80, 0, 0), olive brown (2.5Y 4/3), dry, subangular, with little fine- to coarse-grained gravel.
5	B-01-5	MCS 2.0	1.5	4 5 12	0.0	GS, MC, DT	SW		WELL GRADED SAND (18, 84, 2, 0), brown (10YR 4/3), dry, medium- to coarse-grained, subangular to angular.
10	B-01-10	MCS 2.0	1.5	11 18 15	0.0	DS	SW		WELL GRADED SAND (0, 95, 5, 0), brown (10YR 4/3), dry, medium-grained, subangular.
15	B-01-15	MCS 2.0	1.5	12 23 32	0.0	GS, MC, DT	SW		WELL GRADED SAND WITH GRAVEL (14, 82, 4, 0), light brownish gray (10YR 6/2), dry, medium- to very coarse-grained, angular.

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

▽ = First Encountered Water ○ = Static Water

Water Level Data

Date		Depth	Elev.
8/19/14	▽	30 ft bgs	NA ft amsl
NA	○	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-01**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 50 ft

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
20	B-01-20	MCS 2.0	1.5	17, 45, 50	0.0		SW		WELL GRADED SAND (20, 80, 0, 0), dark yellowish brown (10YR 4/4), dry, medium- to very coarse-grained, angular.
25	B-01-26	MCS 2.0	1.5	25, 28, 30		GS, MC, DT	SW		WELL GRADED SAND (16, 78, 6, 0), dark yellowish brown (10YR 4/4), dry, medium- to coarse-grained, subangular.
30	B-01-30	MCS 2.0	1.5	41, 32, 23	3.2	GS, MC, DT	GP		Poorly Graded GRAVEL, pulverized.
35	B-01-35	MCS 2.0	0.8	50, 50		GS, MC, DT	GP		Same as above.

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(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/19/14	▽	30 ft bgs	NA ft amsl
NA	○	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-01**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 50 ft

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
40	B-01-40	MCS 2.0	0.8	45 50	9.8		GP		Poorly Graded GRAVEL WITH SAND (55, 45, 0, 0), dark gray (10YR 4/1), wet, coarse gravel with medium- to very coarse-grained sand.
45	B-01-45	MCS 2.0	0.8	27 50	0.0		SP		POORLY GRADED SAND (25, 75, 0, 0), dark grayish brown (2.5Y 4/2), wet, medium- to coarse-grained, subangular, with some fine to coarse gravel, some larger rock fragments.
50	B-01-50	MCS 2.0	0.8	28 50	0.0		SP		POORLY GRADED SAND (0, 100, 0, 0), dark gray (2.5Y 4/1), wet, coarse-grained, subangular to angular, compacted.
									Bottom of boring at 50 ft bgs.
55									

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Remarks:

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(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/19/14	First Encountered	30 ft bgs	NA ft amsl
NA	Static	NA btoc	NA ft amsl

Date Start/Finish: 8/26/14 **Drilling Company:** Jet Drilling **Driller's Name:** Gary Buss **Drilling Method:** Mud Rotary **Rig Type:** CME 75 **Sampling Method:** CA Modified Split Spoon	**Northing:** NA **Easting:** NA **Casing Elevation:** NA **Borehole Depth:** 50 ft **Borehole Diameter:** 8.25" **Surface Elevation:** NA **Descriptions By:** Ali Zafarani	**Well/Boring ID: B-02** **Client:** Los Angeles Metropolitan Transportation Authority **Location:** MTA Metro 410 Center Street Los Angeles, California

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
0									4" Asphalt at surface.
									3' Concrete slab.
5									
	B-02-9	MCS 2.0	1.0	7 12 20	0.0	GS, MC	SW		WELL GRADED SAND (11, 82, 7, 0), pale brown (10YR 6/3), dry, fine- to coarse-grained, subrounded, fine to medium gravel.
10									
	B-02-14	MCS 2.0	0.9	20 34 38	0.0		SW		Same as above.
15									
				12			SW		WELL GRADED SAND (8, 86, 6, 0), brown (10YR 5/3), dry, fine- to coarse-grained, subrounded, trace gravel.

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Remarks:
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(5, 95, 0, 0) = %(gravel, sand, silt, clay)

▽ = First Encountered Water ○ = Static Water

Water Level Data

Date		Depth	Elev.
8/26/14	▽	NA ft bgs	NA ft amsl
NA	○	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-02**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 50 ft

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
	B-02-19	MCS 2.0	0.9	22 28	0.0	GS, MC	SW		
20									
	B-02-23	MCS 2.0	0.9	27 50-5"	0.0		GP		POORLY GRADED GRAVEL (66, 32, 2, 0), dark yellowish brown (10YR 4/4), dry, fine- to coarse-grained, fine gravel.
25									
	B-02-28	MCS 2.0	0.5	36 50-5"	0.0	GS, MC	GP		Same as above.
30									
	B-02-33	MCS 2.0	0.7	40 50-5"	1.7		SW		WELL GRADED SAND (5, 95, 0, 0), very dark gray (10YR 3/1), wet, fine- to coarse-grained, subangular, trace fine to medium gravel.
35									

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Remarks:
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(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/26/14	First Encountered	NA ft bgs	NA ft amsl
NA	Static	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-02**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 50 ft

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
	B-02-39	MCS 2.0	1.3	45 48 50-2"	0.0		SW		Same as above.
40									
	B-02-43	MCS 2.0	0.3	50 50-3"			SW		WELL GRADED SAND (30, 70, 0, 0), very dark gray (10YR 3/1), wet, fine- to coarse-grained, subrounded, trace medium gravel and crushed rock.
45									
	B-02-49	MCS 2.0	1.2	50 45 45	0.0		SP		POORLY GRADED SAND (0, 98, 2, 0), very dark gray (10YR 3/1), wet, fine- to medium-grained, subrounded, trace silt.
50									Bottom of boring at 50 ft bgs.
55									

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(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/26/14	First Encountered	NA ft bgs	NA ft amsl
NA	Static	NA btoc	NA ft amsl

Date Start/Finish: 8/20/14 **Drilling Company:** Jet Drilling **Driller's Name:** Gary Buss **Drilling Method:** Hollow Stem Auger **Rig Type:** CME 75 **Sampling Method:** CA Modified Split Spoon	**Northing:** NA **Easting:** NA **Casing Elevation:** NA **Borehole Depth:** 5 ft **Borehole Diameter:** 8" **Surface Elevation:** NA **Descriptions By:** Brent Anderson	**Well/Boring ID: B-03** **Client:** Los Angeles Metropolitan Transportation Authority **Location:** MTA Metro 410 Center Street Los Angeles, California

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
0					0.0		SP		POORLY GRADED SAND (0, 85, 15, 0), dry, fine grained, rounded.
					0.0		SP		POORLY GRADED SAND (0, 100, 0, 0), slightly moist, fine to medium grained, subangular.
5									Boring terminated @ 5 ft bgs due to unknown obstruction.
10									
15									

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water

= Static Water

Water Level Data

Date	Depth	Elev.
NA	NA ft bgs	NA ft amsl
NA	NA btoc	NA ft amsl

Date Start/Finish: 8/22/14 **Drilling Company:** Jet Drilling **Driller's Name:** Gary Buss **Drilling Method:** Hollow Stem Auger **Rig Type:** CME 75 **Sampling Method:** CA Modified Split Spoon	**Northing:** NA **Easting:** NA **Casing Elevation:** NA **Borehole Depth:** 20 ft **Borehole Diameter:** 8" **Surface Elevation:** NA **Descriptions By:** Brent Anderson	**Well/Boring ID: B-04** **Client:** Los Angeles Metropolitan Transportation Authority **Location:** MTA Metro 410 Center Street Los Angeles, California

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
0									Decomposed brick mixed with fill, sand and trace fine gravel, metal debris.
5									Unknown fill objects impeading auger rods, concrete structure.
10									
15									
									Approximately 1' of concrete.

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
NA	First Encountered Water	NA ft bgs	NA ft amsl
NA	Static Water	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-04**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 20 ft

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
20									Boring terminated @ ~20' bgs due to broken auger.
25									
30									
35									

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
NA		NA ft bgs	NA ft amsl
NA		NA btoc	NA ft amsl

Project: LO492301.0000 Template: G:\Projects\LogPlot\Logs\LO490000\LO492301\0000\ldfx and dat temp...\boring_well HSA 2007 analytical USCS WL_25 ft per p
Data File: B-02.dat Date: 10/23/2014 Created/Edited by: Geoff Bishop

Date Start/Finish: 8/22/14 - 8/25/14 **Drilling Company:** Jet Drilling **Driller's Name:** Gary Buss **Drilling Method:** Mud Rotary **Rig Type:** CME 75 **Sampling Method:** CA Modified Split Spoon	**Northing:** NA **Easting:** NA **Casing Elevation:** NA **Borehole Depth:** 49 ft **Borehole Diameter:** 8" **Surface Elevation:** NA **Descriptions By:** Brent Anderson (8/22) James Gonzales (8/25)	**Well/Boring ID: B-05** **Client:** Los Angeles Metropolitan Transportation Authority **Location:** MTA Metro 410 Center Street Los Angeles, California

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
0									
5	B-05-5	MCS 2.0	1.5		0.0	CT	SP		POORLY GRADED SAND Fill (5, 95, 0, 0), brown (10YR 4/3), dry, medium dense, fine-grained, subrounded.
									Concrete slab.
10	B-05-10	MCS 2.0	1.2	5 6 10	0.0		SW		WELL GRADED SAND (25, 75, 0, 0), very dark gray (7.5YR 3/1), fine- to coarse-grained, subangular, organic matter present.
15									
				16					WELL GRADED SAND (2, 89, 9, 0), very dark brown (10YR 2/2), medium- to coarse-grained, subrounded to

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

Drilled to 17.5 ft bgs on 8/22/14.

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/25/14	First Encountered Water	NA ft bgs	NA ft amsl
NA	Static Water	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-05**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 49 ft

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
	B-05-19	MCS 2.0	1.5	38 23	0.0	GS	SW		subangular, trace fine subangular gravel, trace silt.
20									
	B-05-24	MCS 2.0	1.5	22 31 50	0.0	GS	SW		WELL GRADED SAND (0, 90, 8, 2), very dark brown (10YR 2/2), medium- to coarse-grained, subrounded to subangular, trace fine subangular gravel, trace silt.
25									
	B-05-28	MCS 2.0	0.4	50-5"	0.0		SW		WELL GRADED SAND (20, 80, 0, 0), very dark grayish brown (10YR 3/2), medium- to coarse-grained, subrounded, fine to medium gravel.
30									
	B-05-33	MCS 2.0	0.75	50 50-3"	0.0		SW		Same as above.
35									

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Remarks:

amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

Drilled to 17.5 ft bgs on 8/22/14.

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/25/14	First Encountered	NA ft bgs	NA ft amsl
NA	Static	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-05**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 49 ft

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
	B-05-38	MCS 2.0	0.9	40 50-5"	0.0		SW		WELL GRADED SAND (35, 65, 0, 0), very dark gray (10YR 3/1), medium- to coarse-grained, subrounded, fine to medium gravel, rounded.
40									
	B-05-43	MCS 2.0	1.5	20 37 48			SW		WELL GRADED SAND (20, 79, 1, 0), very dark gray (10YR 3/1), subrounded, fine to coarse gravel, subangular, trace silt.
45									
	B-05-48	MCS 2.0	1.5	28 44 49			SW		Same as above.
									Bottom of boring at 49 ft bgs.
50									
55									

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Remarks:

amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

Drilled to 17.5 ft bgs on 8/22/14.

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/25/14	First Encountered	NA ft bgs	NA ft amsl
NA	Static	NA btoc	NA ft amsl

Date Start/Finish: 8/25/14 **Drilling Company:** Jet Drilling **Driller's Name:** Gary Buss **Drilling Method:** Mud Rotary **Rig Type:** CME 75 **Sampling Method:** CA Modified Split Spoon	**Northing:** NA **Easting:** NA **Casing Elevation:** NA **Borehole Depth:** 49 ft **Borehole Diameter:** 8.25" **Surface Elevation:** NA **Descriptions By:** Ali Zafarani	**Well/Boring ID: B-06** **Client:** Los Angeles Metropolitan Transportation Authority **Location:** MTA Metro 410 Center Street Los Angeles, California

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
0									4" Asphalt at surface.
							SW		Aggregate Base Fill.
5									6" Concrete slab.
	B-06-9	MCS 2.0	1.5	16 17 21	0.0		SW		WELL GRADED SAND (5, 95, 0, 0), brown (7.5YR 4/3), moist, fine- to coarse-grained, subrounded, fine to medium gravel, trace silt.
10									
	B-06-13	MCS 2.0	0.45	50-5"	0.0		SW		WELL GRADED SAND (5, 95, 0, 0), very dark gray (10YR 3/1), moist, medium- to coarse-grained, subangular, trace fine gravel, trace pulverized cobbles.
15									
				17			SW		WELL GRADED SAND (24, 72, 4, 0), very dark grayish brown (10YR 3/2), dry, fine- to coarse-grained, subrounded, fine

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(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/25/14	First Encountered	NA ft bgs	NA ft amsl
NA	Static	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-06**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 49 ft

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
	B-06-19	MCS 2.0	1.35	19 20	0.0	GS, MC	SW		gravel.
20									
	B-06-23	MCS 2.0	0.75	28 50-3"			SW		Same as above.
25									
	B-06-29	MCS 2.0	1.2	38 35 42	0.0	GS, MC	SW		WELL GRADED SAND (2, 92, 6, 0), very dark gray (10YR 3/1), moist, fine- to coarse-grained, subangular, trace gravel.
30									
	B-06-34	MCS 2.0	1.2	30 39 43	0.0		SW		Same as above.
35									

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water = Static Water

Water Level Data

Date		Depth	Elev.
8/25/14	▽	NA ft bgs	NA ft amsl
NA	○	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-06**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 49 ft

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
		MCS 2.0	0.0						No Recovery.
40									
	B-06-43	MCS 2.0	0.45	50-5"	0.0		SW		WELL GRADED SAND (5, 95, 0, 0), black (10YR 2/1), wet, fine- to coarse-grained, subrounded, trace fine gravel.
45									
	B-06-48	MCS 2.0	1.35	40 42 50	2.1		SW		WELL GRADED SAND (5, 95, 0, 0), black (10YR 2/1), wet, fine- to coarse-grained, subrounded, trace medium gravel.
									Bottom of boring at 49 ft bgs.
50									
55									

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Remarks:
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(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/25/14		NA ft bgs	NA ft amsl
NA		NA btoc	NA ft amsl

Date Start/Finish: 8/21/14 **Drilling Company:** Jet Drilling **Driller's Name:** Gary Buss **Drilling Method:** Hollow Stem Auger **Rig Type:** CME 75 **Sampling Method:** CA Modified Split Spoon	**Northing:** NA **Easting:** NA **Casing Elevation:** NA **Borehole Depth:** 50 ft bgs **Borehole Diameter:** 8" **Surface Elevation:** NA **Descriptions By:** Brent Anderson	**Well/Boring ID: B-07** **Client:** Los Angeles Metropolitan Transportation Authority **Location:** MTA Metro 410 Center Street Los Angeles, California

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
0							SW		SAND Fill and asphalt debris.
5	B-07-5	MCS 2.0	0.5		0.0		SW		WELL GRADED SAND (5, 95, 0, 0), dark reddish brown (5YR 3/2), dry, fine- to very coarse-grained, subangular.
10	B-07-10	MCS 2.0	0.25	50-3"		GS, MC	SW		WELL GRADED SAND (12, 79, 9, 0), dark reddish brown (5YR 3/2), dry, fine- to very coarse-grained, subangular, poor recovery.
15	B-07-15	MCS 2.0	1.5	11 17 20	0.0	GS, MC	SW		WELL GRADED SAND (29, 66, 5, 0), brown (10YR 5/3), dry, fine- to coarse-grained, angular.

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water = Static Water

Water Level Data

Date		Depth	Elev.
8/21/14	First Encountered	28 ft bgs	NA ft amsl
NA	Static	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-07**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 50 ft bgs

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
20	B-07-20	MCS 2.0	1.5	25 28 35	0.0	GS, MC	SW		WELL GRADED SAND (7, 88, 5, 0), dark reddish brown (5YR 3/2), dry, fine- to coarse-grained, subrounded.
25	B-07-25	MCS 2.0	0.9	27 50-5"	0.0		SW		WELL GRADED SAND (20, 80, 0, 0), dark reddish brown (5YR 3/3), dry, fine- to very coarse-grained, angular, some fine to coarse gravel, trace crushed rock, mica.
30	B-07-30	MCS 2.0	1.5	28 47 40		GS, MC	GP		POORLY GRADED GRAVEL (53, 41, 6, 0), very dark gray (10YR 3/1), wet, medium- to coarse-grained, subrounded, fine to medium gravel.
35	B-07-30	MCS 2.0	0.4	50-5"			GP		Same as above, saturated.

Remarks:

amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/21/14	First Encountered Water	28 ft bgs	NA ft amsl
NA	Static Water	NA btoc	NA ft amsl

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Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-07**

Site Location:
MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 50 ft bgs

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
40	B-07-40	MCS 2.0	0.7	44 50-2"	0.0		SW		WELL GRADED SAND WITH GRAVEL (40, 60, 0, 0), very dark gray (10YR 3/1), wet, fine- to coarse-grained, subangular, fine to coarse gravel.
45	B-07-45	MCS 2.0	1.5	20 33 50	0.0		SP		POORLY GRADED SAND (0, 100, 0, 0), dark gray (10YR 4/1), wet, fine-grained, subangular.
50	B-07-50	MCS 2.0	1.5	14 20 20			SW		WELL GRADED SAND (5, 95, 0, 0), dark gray (10YR 4/1), wet, fine- to medium-grained, subangular.
55									Bottom of boring at 50 ft bgs.

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/21/14	First Encountered Water	28 ft bgs	NA ft amsl
NA	Static Water	NA btoc	NA ft amsl

Date Start/Finish: 8/21/14 **Drilling Company:** Jet Drilling **Driller's Name:** Gary Buss **Drilling Method:** Hollow Stem Auger **Rig Type:** CME 75 **Sampling Method:** CA Modified Split Spoon	**Northing:** NA **Easting:** NA **Casing Elevation:** NA **Borehole Depth:** 44 ft bgs **Borehole Diameter:** 8" **Surface Elevation:** NA **Descriptions By:** Brent Anderson	**Well/Boring ID: B-08** **Client:** Los Angeles Metropolitan Transportation Authority **Location:** MTA Metro 410 Center Street Los Angeles, California

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
0									
5	B-08-5	MCS 2.0	0.5		0.0		SP		POORLY GRADED SAND Fill (5, 95, 0, 0), brown (10YR 4/3), dry, fine-grained, subrounded.
10	B-08-10	MCS 2.0	1.5	9 14 20	0.0	GS, MC	SW		WELL GRADED SAND (30, 66, 4, 0), reddish gray (5YR 5/2), dry, fine- to coarse-grained, rounded, little fine gravel.
15	B-08-15	MCS 2.0	1.5	20 23 40	0.0		SW		Same as above, micaceous.

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/21/14	First Encountered	30 ft bgs	NA ft amsl
NA	Static	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-08**

Site Location:
MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 44 ft bgs

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
20	B-08-20	MCS 2.0	1.5	26 32 40	0.0	GS, MC	SW		WELL GRADED SAND (43, 52, 5, 0, reddish brown (5YR 4/3), dry, medium- to coarse-grained, fine subrounded gravel.
25	B-08-25	MCS 2.0	0.9	43 50-5"		GS, MC	SW		Crushed micaceous rock.
30	B-08-30	MCS 2.0	0.25	50-3"	0.0		SW		WELL GRADED SAND (10, 90, 0, 0), very dark grayish brown (10YR 3/2), moist, fine- to coarse-grained, subrounded.
35	B-08-35	MCS 2.0	0.4	50-5"			SW		WELL GRADED SAND (30, 70, 0, 0), very dark gray (10YR 3/1), wet, medium- to coarse-grained, subrounded.

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

▽ = First Encountered Water ○ = Static Water

Water Level Data

Date		Depth	Elev.
8/21/14	▽	30 ft bgs	NA ft amsl
NA	○	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-08**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 44 ft bgs

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
40	B-08-40	MCS 2.0	1.5	20 25 50-3"	0.0		SP		POORLY GRADED SAND (15, 85, 0, 0), very dark gray (10YR 3/1), wet, medium- to coarse-grained, subrounded.
45									Bottom of boring at 44 ft bgs due to refusal.
50									
55									

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

▽ = First Encountered Water ○ = Static Water

Water Level Data

Date		Depth	Elev.
8/21/14	▽	30 ft bgs	NA ft amsl
NA	○	NA btoc	NA ft amsl

Date Start/Finish: 8/14/14 - 8/20/14 **Drilling Company:** Jet Drilling **Driller's Name:** Gary Buss **Drilling Method:** Hollow Stem Auger **Rig Type:** CME 75 **Sampling Method:** CA Modified Split Spoon	**Northing:** NA **Easting:** NA **Casing Elevation:** NA **Borehole Depth:** 45 ft bgs **Borehole Diameter:** 8" **Surface Elevation:** NA **Descriptions By:** Brent Anderson	**Well/Boring ID: B-09** **Client:** Los Angeles Metropolitan Transportation Authority **Location:** MTA Metro 410 Center Street Los Angeles, California

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
0							SP		POORLY GRADED SAND Fill (0, 90, 10, 0), dark yellowish brown (10YR 3/4), dry, fine- to medium-grained, subrounded.
5	B-09-5	MCS 2.0	0.5		0.0	GS, MC	SP		POORLY GRADED SAND (6, 93, 1, 0), dark yellowish brown (10YR 3/4), dry, fine- to medium-grained, subangular to angular.
10	B-09-10	MCS 2.0	1.5	9 12 25	0.0	DS	SP		Same as above, increased silt (0, 90, 10, 0).
15	B-09-15	MCS 2.0	1.5	16 28 24	0.0	GS, MC	SW		WELL GRADED SAND (17, 79, 4, 0), brown (10YR 5/3), dry, fine- to coarse-grained, subangular, trace fine gravel.

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water = Static Water

Water Level Data

Date		Depth	Elev.
8/20/14	First Encountered	35 ft bgs	NA ft amsl
NA	Static	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-09**

Site Location:
MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 45 ft bgs

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
20	B-09-20	MCS 2.0	1.5	27 18 27	0.0		SW		Same as above.
25	B-09-25	MCS 2.0	1.5	20 25 33	0.0	GS, MC	SW		WELL GRADED SAND (4, 92, 4, 0), brown (10YR 5/3), dry, fine- to coarse-grained, subangular.
30	B-09-30	MCS 2.0	1.5	20 30 36	0.0		SP		POORLY GRADED SAND (5, 95, 0, 0), yellowish brown (10YR 5/6), moist, medium- to coarse-grained, subrounded.
35	B-09-35	MCS 2.0	1.5	41 50 50	0.0	GS, MC	SP		POORLY GRADED SAND (20, 73, 7, 0), yellowish brown (10YR 5/6), wet, medium- to coarse-grained, subrounded.

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date	Depth	Elev.
8/20/14	35 ft bgs	NA ft amsl
NA	NA btoc	NA ft amsl

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-09**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 45 ft bgs

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
40	B-09-40	MCS 2.0	0.75	50 50-3"	0.0		SW		WELL GRADED SAND (10, 90, 0, 0), very dark gray (10YR 3/1), wet, fine- to coarse-grained, subrounded, trace fine and coarse gravel.
45	B-09-45	MCS 2.0	1.25	20 20 50-3"	0.0		SW		Same as above, increased gravel (25, 75, 0, 0).
									Bottom of boring at 45 ft bgs due to sheared rod.
50									
55									

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Remarks:

amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water = Static Water

Water Level Data

Date		Depth	Elev.
8/20/14	∇	35 ft bgs	NA ft amsl
NA	○	NA btoc	NA ft amsl

Date Start/Finish: 8/29/14

Drilling Company: Jet Drilling

Driller's Name: Gary Buss

Drilling Method: Hollow Stem Auger

Rig Type: CME 75

Sampling Method: CA Modified Split Spoon

Northing: NA
Easting: NA
Casing Elevation: NA

Borehole Depth: 50 ft bgs
Borehole Diameter: 8"
Surface Elevation: NA
Descriptions By: Brent Anderson

Well/Boring ID: **B-10**

Client: Los Angeles Metropolitan Transportation Authority

Location: MTA Metro
410 Center Street
Los Angeles, California

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
0									
5	B-10-5	MCS 2.0	0.5		0.0	MC, DS	SP		POORLY GRADED SAND WITH GRAVEL (50, 50, 0, 0), dark yellowish brown (10YR 4/4), dry, medium-grained sand, fine to coarse gravel.
10	B-10-10	MCS 2.0	1.5	24 32 32	0.0	GS, MC	GP		POORLY GRADED GRAVEL (54, 39, 7, 0), pale brown (10YR 6/3), dry, fine- to medium-grained, subrounded.
15	B-10-15	MCS 2.0	1.5	20 28 34	0.0		GP		Same as above, increasing grain size.

Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water = Static Water

Water Level Data

Date		Depth	Elev.
8/29/14	First Encountered Water	31 ft bgs	NA ft amsl
NA	Static Water	NA btoc	NA ft amsl

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Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-10**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 50 ft bgs

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
20	B-10-20	MCS 2.0	1.5	25 28 44	0.0	GS, MC	GP		POORLY GRADED GRAVEL (58, 38, 4, 0), light brownish gray (2.5Y 6/2), dry, medium- to very coarse-grained, subrounded.
25	B-10-25	MCS 2.0	1.5	33 45 30	0.0		SW		WELL GRADED SAND (15, 85, 0, 0), light yellowish brown (2.5Y 6/3), slightly moist, fine- to very coarse-grained, subangular.
30	B-10-29	MCS 2.0	1.5	30 36 40	0.0	GS, MC	SP		POORLY GRADED SAND (20, 73, 7, 0), dark gray (7.5YR 4/1), wet, medium-grained, subrounded.
35	B-10-35	MCS 2.0	1.5	20 25 38	0.0	GS, MC	SP		POORLY GRADED SAND (32, 60, 8, 0), dark gray (7.5YR 4/1), wet, medium-grained, subrounded. 30% fine to coarse gravel.

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Remarks:
amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/29/14	▽	31 ft bgs	NA ft amsl
NA	○	NA btoc	NA ft amsl

Project: LO492301.0000 Template: G:\Projects\LogPlot\Logs\LO490000\LO492301\0000\ldfx and dat temp...\boring_well HSA 2007 analytical USCS WL_25 ft per p
Data File: B-10.dat Date: 10/23/2014 Created/Edited by: Geoff Bishop

Client: Los Angeles Metropolitan Transportation Authority

Well/Boring ID: **B-10**

Site Location:

MTA Metro
410 Center Street
Los Angeles, California

Borehole Depth: 50 ft bgs

DEPTH	Sample ID	Sample Type	Recovery (feet)	Blow Counts	PID (ppm)	Lab Tests	USCS Code	Geologic Column	Stratigraphic Description
40	B-10-40	MCS 2.0	0.75	38 50-3"	0.0		SP		POORLY GRADED SAND (0, 100, 0, 0), dark gray (7.5YR 4/1), wet, medium-grained, subrounded.
45	B-10-45	MCS 2.0	0.8	50 50-4"	0.0		SP		Same as above, 5% medium gravel.
50	B-10-50	MCS 2.0	0.9	50 50-5"	0.0		SP		Same as above, slight increase in grain size.
									Bottom of boring at 50 ft bgs.
55									

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Infrastructure · Water · Environment · Buildings

Remarks:

amsl = above mean sea level; bgs = below ground surface; Dia. = diameter; ft/' = feet, NA = not applicable/available; ppm = parts per million

(5, 95, 0, 0) = %(gravel, sand, silt, clay)

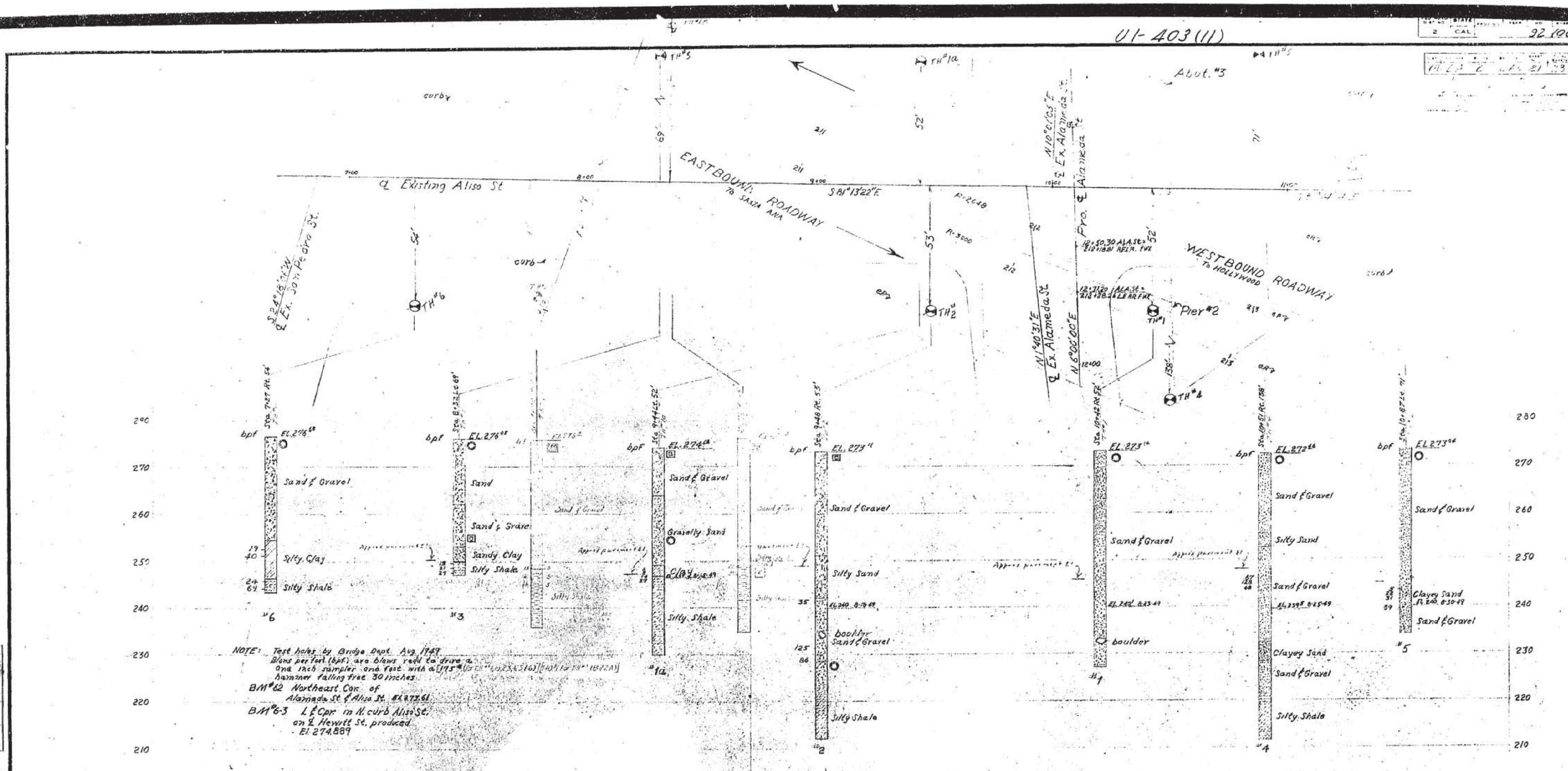
= First Encountered Water   = Static Water

Water Level Data

Date		Depth	Elev.
8/29/14	First Encountered	31 ft bgs	NA ft amsl
NA	Static	NA btoc	NA ft amsl

Existing Geotechnical Boring Logs

Caltrans (Undated)



CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

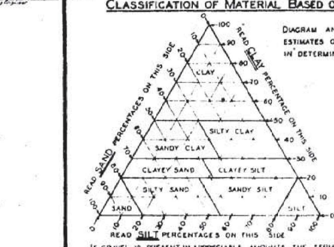


DIAGRAM AND TABLE SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES.

GROUPING USED IN TRIANGULAR CLASSIFICATION			
CLASS NAME	PERCENTAGE OF SIZES PRESENT		
	SAND	SILT	CLAY
SAND	80-100	0-20	0-20
SILTY SAND	45-80	0-55	0-20
SANDY SILT	0-45	35-80	0-20
SILT	0-20	80-100	0-20
CLAYEY SAND	38-80	0-42	20-30
CLAYEY SILT	0-38	32-80	20-30
SANDY CLAY	30-70	0-40	30-50
SILTY CLAY	0-30	20-70	30-50
CLAY	0-50	0-50	50-100

IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIS "GRAVELLY SAND". THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE GRAVEL, SAND AND SILT REFER TO STANDARD GRADE SIZE LIMITS

LEGEND OF BORING OPERATIONS

- PLAN OF ANY BORING
- 1" SAMPLER BORING
- ROTARY WASH BORING
- 1" CLOSED SAMPLER DRIVEN
- CORE BORING
- 2½" PENETROMETER DRIVEN
- 2" SAMPLER BORING
- 2" TO 5" AUGER BORING
- 6" TO 20" AUGER BORING
- CASING DRIVEN
- JET BORING
- (S) SAMPLE TAKEN

THE APPROPRIATE BORING SYMBOLS DESIGNATING THE METHOD OF OPERATION ARE SHOWN AT THE UPPER RIGHT-HAND CORNER OF THE RESPECTIVE BORING. WHERE TOOL CHANGES WERE MADE DURING THE BORING OPERATION SYMBOLS ARE SHOWN AT THE POINT OF CHANGE.

LEGEND OF EARTH MATERIALS

- GRAVEL—G
- SAND—S
- SILT—SI
- CLAY—C
- SILTY SAND—SI S
- CLAYEY SAND—C S
- SANDY SILT—S SI
- CLAYEY SILT—C SI
- SANDY CLAY—SC
- SILTY CLAY—SI C
- PEAT and/or ORGANIC CLAY—O
- SANDSTONE—SS
- SHALE—SH
- BROKEN ROCK (FRAGMENTS)—BR
- ROCK—R

ABBREVIATIONS

EL. 69.4	ELEVATION OF GROUND AT TEST HOLE
bpf	BLOWS PER FOOT—(SEE NOTE ABOVE)
P	PULLED PIPE
M	MOISTURE AS % DRY WEIGHT
EL 64.3 6-12-49	ELEVATION OF GROUND WATER AND DATE

NOTES

THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 2, ARTICLE (c) OF THE STANDARD SPECIFICATIONS AND TO THE SPECIAL PROVISIONS ACCOMPANYING THIS SET OF PLANS.

CLASSIFICATION OF EARTH MATERIAL AS SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS.

ALAMEDA ST. UNDERPASS

LOG OF TEST BORINGS

SCALE HOR. 1" = 20' VERT. 1" = 10'

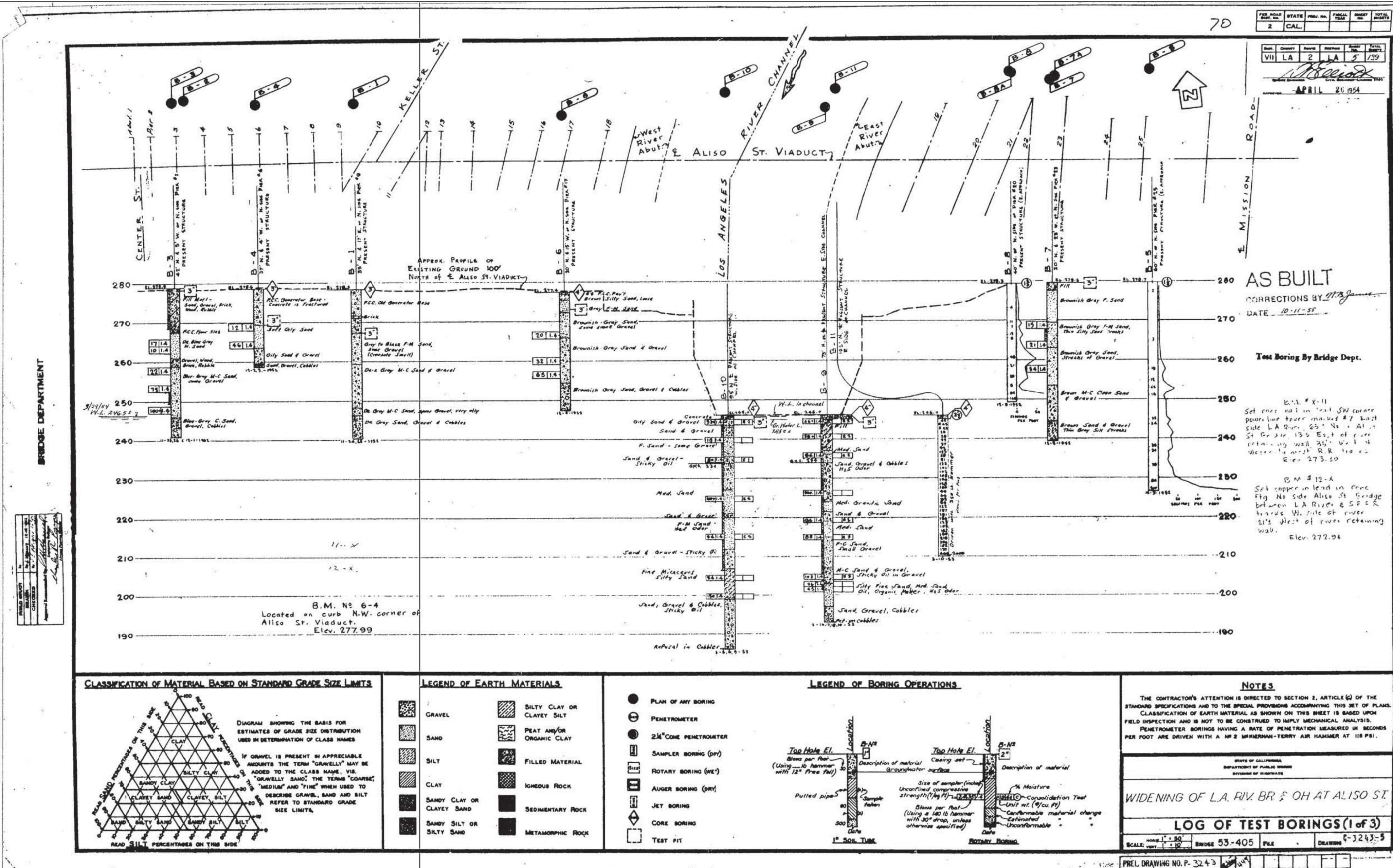
BRIDGE NO. 53-782

FILE NO.

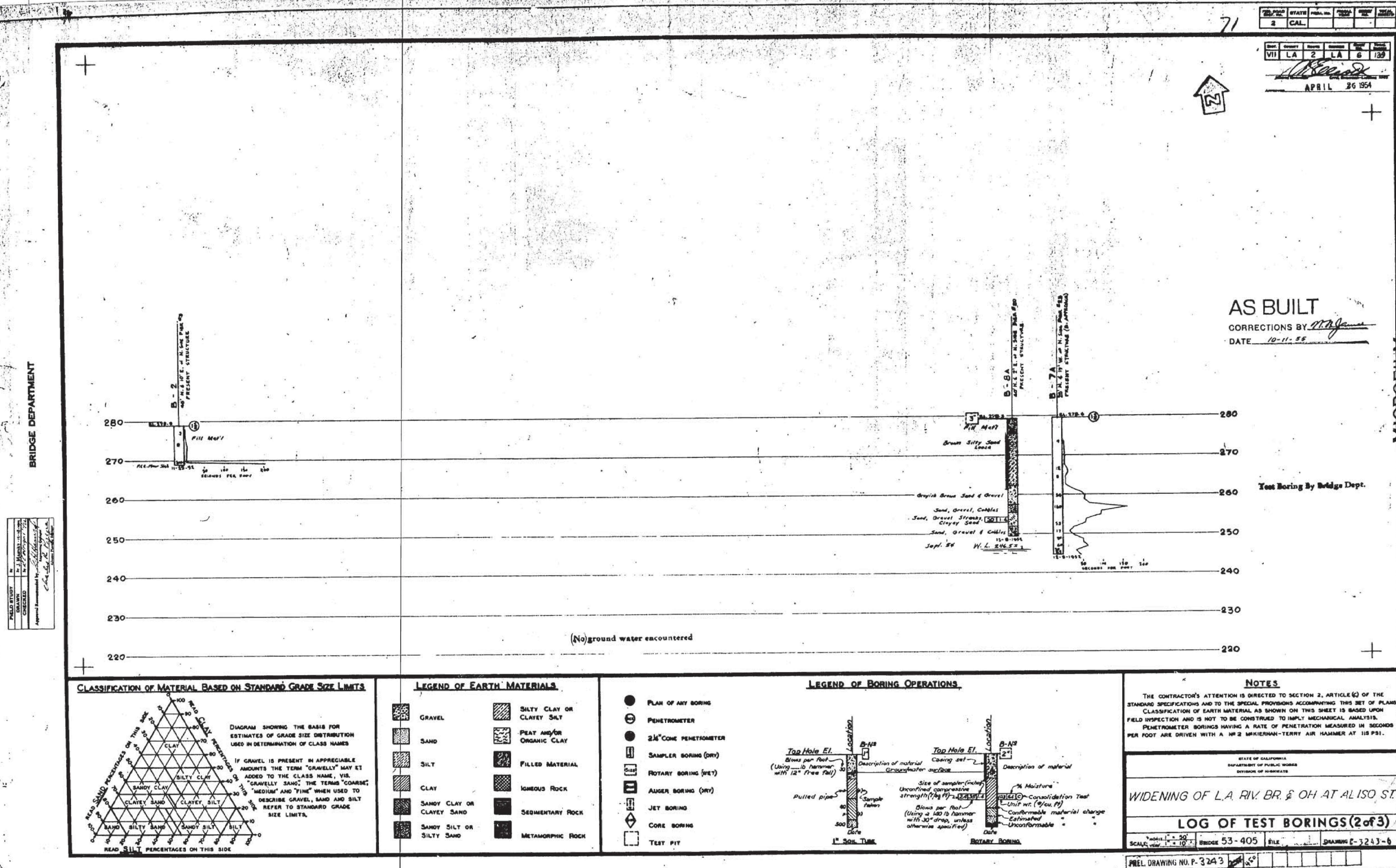
DRAWING NO.

Existing Geotechnical Boring Logs

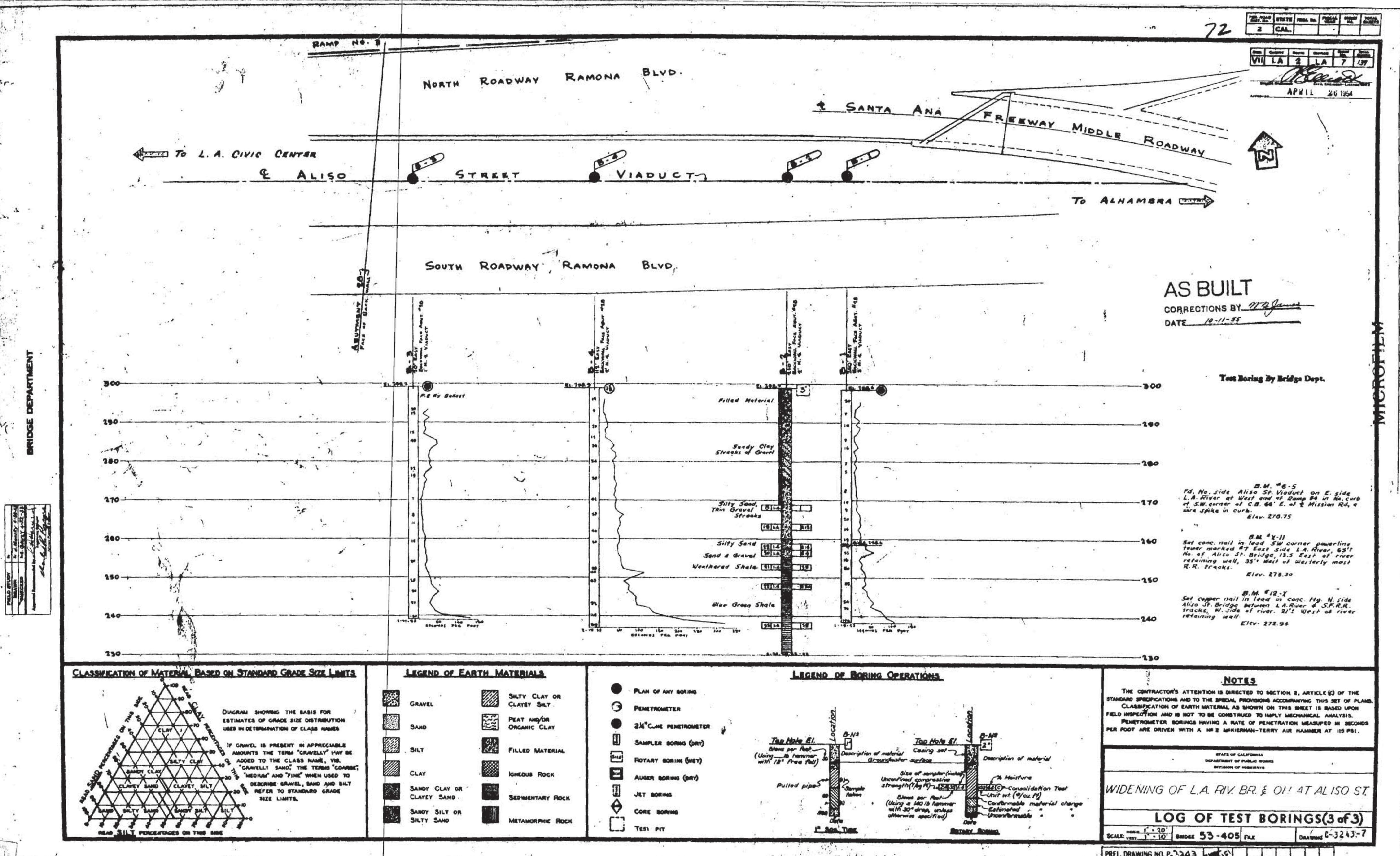
Caltrans, 1954



AS BUILT
CORRECTIONS BY
DATE 10-11-55
Test Boring By Bridge Dept.
B.M. Nº 6-4
Located on curb N.W. corner of Aliso St. Viaduct.
Elev. 277.99
B.M. # 12-K
Set copper in lead in Conc. Ftg. No Side Aliso St. Bridge between L.A. River & S.F.E.R. tracks W. side of river 21½' West of river retaining wall.
Elev. 272.94
APRIL 26 1954
CENTER ST.
KELLER ST.
LOS ANGELES RIVER CHANNEL
℄ ALISO ST. VIADUCT
℄ MISSION ROAD
West River Abut.
East River Abut.
Approx. Profile of Existing Ground 100' North of ℄ Aliso St. Viaduct
B-3
B-4
B-1
B-6
B-10
B-9
B-11
B-8
B-7
B-5
CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS
DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIS. "GRAVELLY SAND". THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE GRAVEL, SAND AND SILT REFER TO STANDARD GRADE SIZE LIMITS.
READ CLAY PERCENTAGES ON THIS SIDE
READ SAND PERCENTAGES ON THIS SIDE
READ SILT PERCENTAGES ON THIS SIDE
LEGEND OF EARTH MATERIALS
GRAVEL
SAND
SILT
CLAY
SANDY CLAY OR CLAYEY SAND
SANDY SILT OR SILTY SAND
SILTY CLAY OR CLAYEY SILT
PEAT AND/OR ORGANIC CLAY
FILLED MATERIAL
IGNEOUS ROCK
SEDIMENTARY ROCK
METAMORPHIC ROCK
LEGEND OF BORING OPERATIONS
PLAN OF ANY BORING
PENETROMETER
2½" CONE PENETROMETER
SAMPLER BORING (DRY)
ROTARY BORING (WET)
AUGER BORING (DRY)
JET BORING
CORE BORING
TEST PIT
1" SOIL TUBE
ROTARY BORING
NOTES
THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 2, ARTICLE (c) OF THE STANDARD SPECIFICATIONS AND TO THE SPECIAL PROVISIONS ACCOMPANYING THIS SET OF PLANS. CLASSIFICATION OF EARTH MATERIAL AS SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS.
PENETROMETER BORINGS HAVING A RATE OF PENETRATION MEASURED IN SECONDS PER FOOT ARE DRIVEN WITH A Nº 2 MCKIERNAN-TERRY AIR HAMMER AT 115 PSI.
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
WIDENING OF L.A. RIV. BR. & OH AT ALISO ST.
LOG OF TEST BORINGS (1 of 3)
BRIDGE 53-405
C-3243-5
PREL. DRAWING NO. P-3243
BRIDGE DEPARTMENT
MICROFILM



2 CAL.
71
VII LA 2 LA 6 139
APRIL 26 1954
AS BUILT
CORRECTIONS BY
DATE 10-11-55
Test Boring By Bridge Dept.
B-2
PRESENT STRUCTURE
Fill Mat'l
SECONDS PER FOOT
B-8A
PRESENT STRUCTURE
Fill Mat'l
Brown Silty Sand Loose
Grayish Brown Sand & Gravel
Sand, Gravel, Cobbles
Sand, Gravel Streaks, Clayey Sand
Sand, Gravel & Cobbles
Sept. 54
W. L. 246.5
B-7A
PRESENT STRUCTURE (B-APPROACH)
SECONDS PER FOOT
280
270
260
250
240
230
220
(No) ground water encountered
CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS
READ CLAY PERCENTAGES ON THIS SIDE
READ SAND PERCENTAGES ON THIS SIDE
READ SILT PERCENTAGES ON THIS SIDE
CLAY
SILTY CLAY
SANDY CLAY
CLAYEY SAND
CLAYEY SILT
SAND
SILTY SAND
SANDY SILT
SILT
DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIS. "GRAVELLY SAND". THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE GRAVEL, SAND AND SILT REFER TO STANDARD GRADE SIZE LIMITS.
LEGEND OF EARTH MATERIALS
GRAVEL
SAND
SILT
CLAY
SANDY CLAY OR CLAYEY SAND
SANDY SILT OR SILTY SAND
SILTY CLAY OR CLAYEY SILT
PEAT AND/OR ORGANIC CLAY
FILLED MATERIAL
IGNEOUS ROCK
SEDIMENTARY ROCK
METAMORPHIC ROCK
LEGEND OF BORING OPERATIONS
PLAN OF ANY BORING
PENETROMETER
2½" CONE PENETROMETER
SAMPLER BORING (DRY)
ROTARY BORING (WET)
AUGER BORING (DRY)
JET BORING
CORE BORING
TEST PIT
Top Hole El.
Location
B-No
Blows per foot (Using __ lb hammer with 12" free fall)
Description of material
Groundwater surface
Pulled pipe
Sample taken
Date
1" SOIL TUBE
Casing set
Size of sampler (inches)
Unconfined compressive strength (T/sq ft)
Blows per foot (Using a 140 lb hammer with 30" drop, unless otherwise specified)
% Moisture
Consolidation Test
Unit wt. (#/cu. ft)
Conformable material change
Estimated
Unconformable
ROTARY BORING
NOTES
THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 2, ARTICLE (c) OF THE STANDARD SPECIFICATIONS AND TO THE SPECIAL PROVISIONS ACCOMPANYING THIS SET OF PLANS.
CLASSIFICATION OF EARTH MATERIAL AS SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS.
PENETROMETER BORINGS HAVING A RATE OF PENETRATION MEASURED IN SECONDS PER FOOT ARE DRIVEN WITH A No 2 McKIERNAN-TERRY AIR HAMMER AT 115 PSI.
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
WIDENING OF L.A. RIV. BR. & OH AT ALISO ST.
LOG OF TEST BORINGS (2 of 3)
BRIDGE 53-405
DRAWING E-3243-6
PREL. DRAWING NO. P-3243
FIELD STUDY
DRAWN
CHECKED
BRIDGE DEPARTMENT
MICROFILM



72
RAMP NO. 3
NORTH ROADWAY RAMONA BLVD.
SANTA ANA FREEWAY MIDDLE ROADWAY
TO L. A. CIVIC CENTER
℄ ALISO STREET VIADUCT
TO ALHAMBRA
SOUTH ROADWAY RAMONA BLVD.
ABUTMENT 20 FACE OF BACK WALL
B-3
B-4
B-2
B-1
APRIL 26 1954
AS BUILT
CORRECTIONS BY
DATE 10-11-55
Test Boring By Bridge Dept.
Filled Material
Sandy Clay Streaks of Gravel
Silty Sand, Thin Gravel Streaks
Silty Sand
Sand & Gravel
Weathered Shale
Blue Green Shale
B.M. #6-5
Fd. No. side Aliso St. Viaduct on E. side L.A. River at West end of Ramp #4 in No. curb at S.W. corner of C.B. 66' E. of ℄ Mission Rd., a wire spike in curb.
Elev. 278.75
B.M. #Y-11
Set conc. nail in lead SW corner powerline tower marked #7 East side L.A. River, 65'± No. of Aliso St. Bridge, 13.5' East of river retaining wall, 35' West of westerly most R.R. tracks.
Elev. 273.30
B.M. #12-Y
Set copper nail in lead in conc. ftg. N. side Aliso St. Bridge between L.A. River & S.P.R.R. tracks, W. side of river. 21'± West of river retaining wall.
Elev. 272.94
MICROFILM
BRIDGE DEPARTMENT
CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS
DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND". THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE GRAVEL, SAND AND SILT REFER TO STANDARD GRADE SIZE LIMITS.
READ SAND PERCENTAGES ON THIS SIDE
READ CLAY PERCENTAGES ON THIS SIDE
READ SILT PERCENTAGES ON THIS SIDE
LEGEND OF EARTH MATERIALS
GRAVEL
SAND
SILT
CLAY
SANDY CLAY OR CLAYEY SAND
SANDY SILT OR SILTY SAND
SILTY CLAY OR CLAYEY SILT
PEAT AND/OR ORGANIC CLAY
FILLED MATERIAL
IGNEOUS ROCK
SEDIMENTARY ROCK
METAMORPHIC ROCK
LEGEND OF BORING OPERATIONS
PLAN OF ANY BORING
PENETROMETER
2½" CONE PENETROMETER
SAMPLER BORING (DRY)
ROTARY BORING (WET)
AUGER BORING (DRY)
JET BORING
CORE BORING
TEST PIT
1" SOIL TUBE
ROTARY BORING
NOTES
THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 2, ARTICLE (c) OF THE STANDARD SPECIFICATIONS AND TO THE SPECIAL PROVISIONS ACCOMPANYING THIS SET OF PLANS.
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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
WIDENING OF L.A. RIV. BR. & OH AT ALISO ST.
LOG OF TEST BORINGS (3 of 3)
SCALE: HORIZ. 1" = 20' VERT. 1" = 10'
BRIDGE 53-405
DRAWING C-3243-7
PREL. DRAWING NO. P-3243

Existing Geotechnical Boring Logs

Caltrans, 2004

Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	101	0.6/1.4	322	326

GEOTECHNICAL PROFESSIONAL 12/13/02

6-7-04
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER Kui Bhushan No. G.E. 144 Exp. 12/31/05 GEOTECHNICAL STATE OF CALIFORNIA

Caltrans Metric

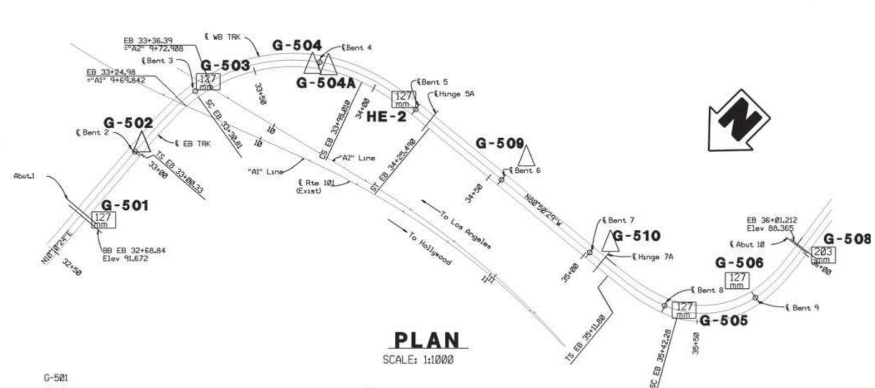
METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012

EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017

BENCHMARK
ESE-252 CALTRANS SR 98-146
FD CALTRANS BRASS DISC IN EAST SIDEWALK OF ALAMEDA ST. O/C AND ROUTE 101

NORTHING: 561498.646
EASTING: 1978051.044
ELEVATION: 83.920 m

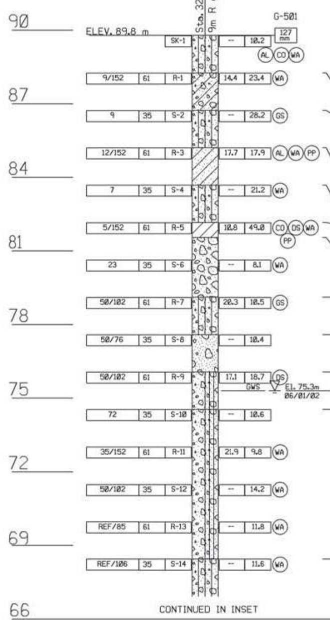
Horizontal Datum: NAD83 1996.35 EPOCH, California State Plane Zone 5.
Vertical Datum: NAVD 88



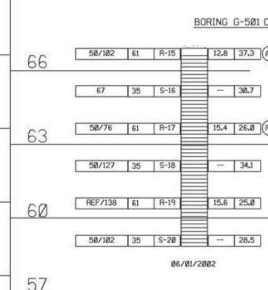
PLAN
SCALE: 1:1000

DRIVE SAMPLER AND HAMMER DATA (ALL BORINGS)

TYPE OF SAMPLER	OUTSIDE DIAMETER (mm)	INSIDE DIAMETER (mm)	TYPE OF HAMMER	WEIGHT OF HAMMER (kN)	HEIGHT OF DROP (mm)
California Ring	76.2	61.5	Automatic	0.623	762
TYPE OF SAMPLER	50.8	34.9	Automatic	0.623	762



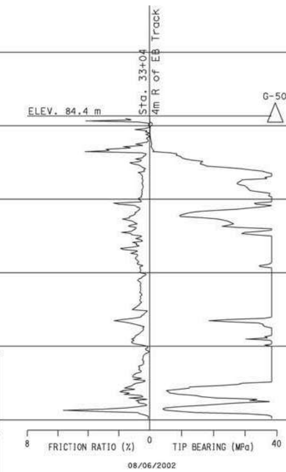
FILL:
Silty SAND w/Gravel (SM), dark brown, moist, fine to medium gravel, trace clay, slight plasticity
LL = 22, PI = 3
Clayey SAND to Sandy CLAY w/Gravel (SC/CL), medium dense to stiff, orange and brown, moist to wet
Silty SAND w/Gravel (SM), loose, dark olive and brown, moist to wet, with pieces of brick
@ El. 84.4 m, drilling fluid was lost instantly. The borehole had to be terminated and moved. The first 4.6 m of the new hole was drilled through.
Sandy CLAY (CL), stiff, moist to wet, olive
LL = 33, PI = 14
PP Su= 84 to 132 kPa
Silty SAND w/Gravel (SM), loose, dark olive, wet
Lean CLAY (CL), stiff, olive brown, moist
PP Su= 60 kPa
ALLUVIUM (Qal):
Poorly Graded GRAVEL w/Sand (GP), medium dense, gray and brown, moist
Silty SAND w/Gravel (SM), very dense, light olive, moist, fine to coarse grained sand with fine to coarse gravel
Poorly Graded SAND (SP), very dense, gray, moist, fine to coarse sand, with gravel
Poorly Graded SAND w/Silt & Gravel (SP-SM), gray, moist to wet, fine to coarse sand with medium size gravel
- soil odor observed
Poorly Graded SAND and GRAVEL w/Silt (SP-SM / GP-GM), very dense, gray, wet, fine to medium size gravel
- no odor observed
Silty SAND w/Gravel (SM), very dense, gray, wet, medium size gravel

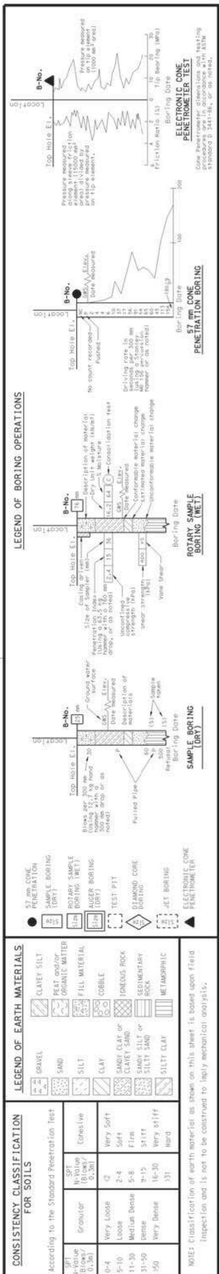


BEDROCK, PUENTE FORMATION (Tp):
Elastic SILT (MH), hard, dark olive, moist

PP Su >215 kPa

Bottom of boring at El. 58.9 m
Groundwater encountered at El. 75.3 m
Borehole backfilled with grout, cold asphalt patched.





PROFILE
VERTICAL SCALE: 1:100
HORIZONTAL SCALE: NONE

PLATE 1

All dimensions and elevations are in meters except as noted

DESIGN OVERSIGHT Be Nguyen	DRAWN BY	K. FERNANDES	N. NGHIEM FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	D. YAVORSKY PROJECT ENGINEER	BRIDGE NO. 53-2975 53C-2148	EASTSIDE LRT PROJECT BRIDGE OVER HWY 101
SIGN OFF DATE	CHECKED BY	C. SCHEYHING	DATE:			KILOMETER POST 1.07	LOG OF TEST BORINGS SHEET 1 OF 5

GEOTECHNICAL LOG OF TEST BORINGS SHEET (METRIC) (REV 2/1/00)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS

CU 07225
EA 1199U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

SHEET 57 OF 61

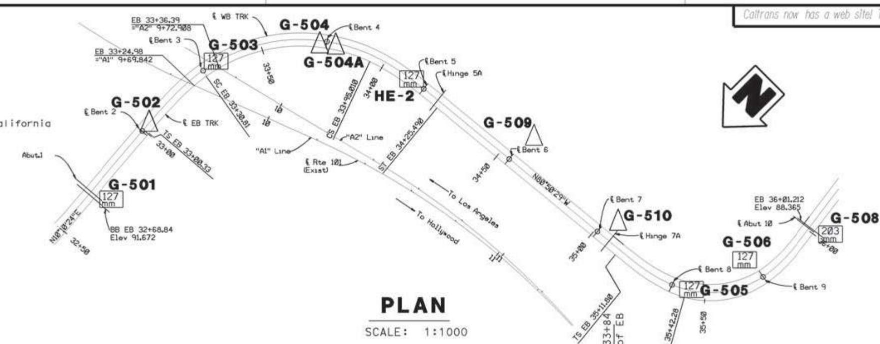
FILE => a11tb1057.dgn

USERNAME => trpierce DATE PLOTTED => 09-JUN-2004 TIME PLOTTED => 11:37

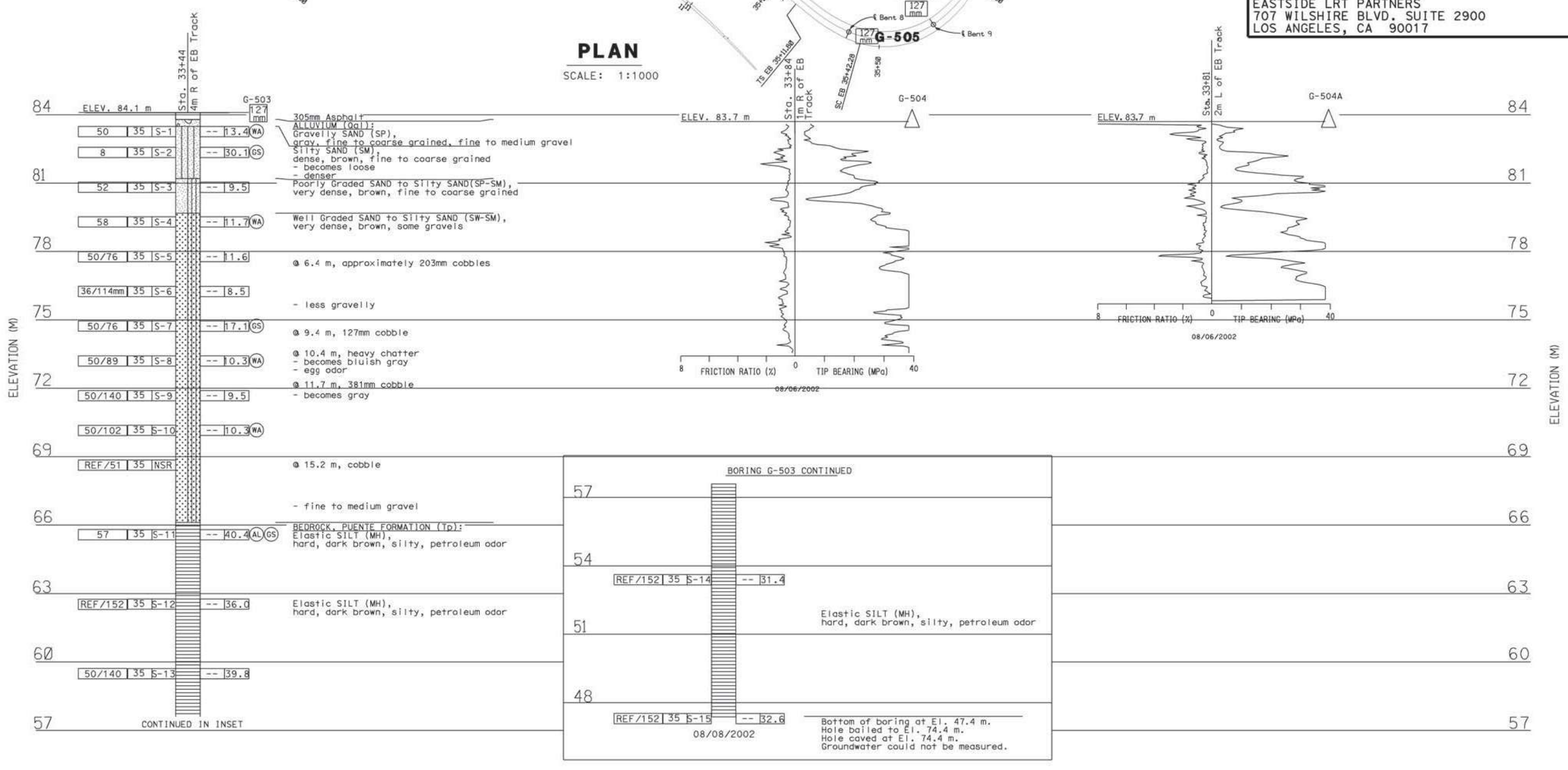
BENCHMARK
ESE-252 CALTRANS SR 98-146
FD CALTRANS BRASS DISC IN EAST
SIDEWALK OF ALAMEDA ST. O/C AND
ROUTE 101

NORTHING: 561498.646
EASTING: 1978051.044
ELEVATION: 83.920 m

Horizontal Datum: NAD83 1996.35 EPOCH, California
State Plane Zone 5.
Vertical Datum: NAVD 88



PLAN
SCALE: 1:1000



PROFILE
VERTICAL SCALE: 1:100
HORIZONTAL SCALE: NONE

PLATE 2
All dimensions and elevations are in meters except as noted

Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	101	0.6/1.4	323	326

Kui Bhushan 12/13/02
GEOTECHNICAL PROFESSIONAL

6-7-04
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER Kui Bhushan No. G.E. 144 Exp. 12/31/05 GEOTECHNICAL STATE OF CALIFORNIA

Caltrans Metric

METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012

EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS

CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration Test

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DESIGN OVERSIGHT Be Nguyen	DRAWN BY	K. FERNANDES	N. NGHIEM FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	D. YAVORSKY PROJECT ENGINEER	BRIDGE NO. 53-2975 53C-2148	EASTSIDE LRT PROJECT BRIDGE OVER HWY 101
7-10-03 SIGN OFF DATE	CHECKED BY	C. SCHEYHING	DATE:			KILOMETER POST 1.07	LOG OF TEST BORINGS SHEET 2 OF 5

GEOTECHNICAL LOG OF TEST BORINGS SHEET (METRIC) (REV 2/1/00)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 07225
EA 1199U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

SHEET 58 OF 61

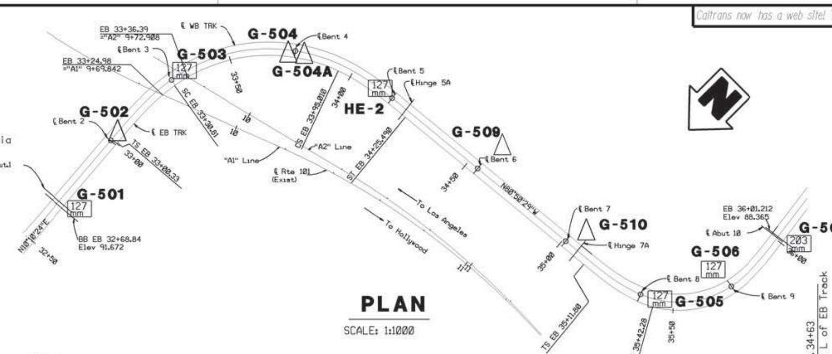
FILE => a11tb1058.dgn

USERNAME => trpierce DATE PLOTTED => 09-JUN-2004 TIME PLOTTED => 11:38

BENCHMARK
ESE-252 CALTRANS SR 98-146
FD CALTRANS BRASS DISC IN EAST
SIDEWALK OF ALAMEDA ST. O/C AND
ROUTE 101

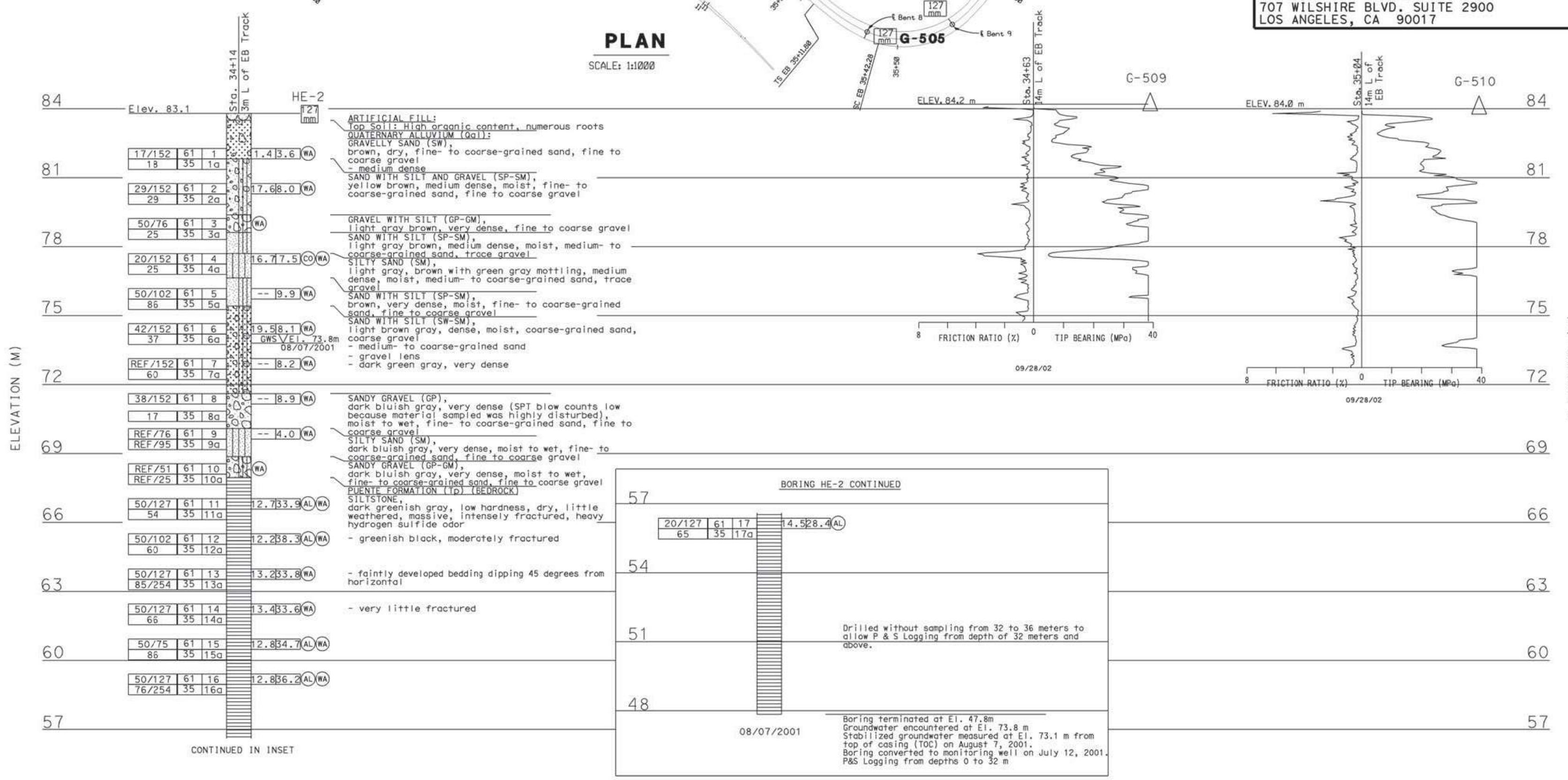
NORTHING: 561498.646
EASTING: 1978051.044
ELEVATION: 83.920 m

Horizontal Datum: NAD83 1996.35 EPOCH, California State Plabe Zone 5.
Vertical Datum: NAVD 88



PLAN

SCALE: 1:1000



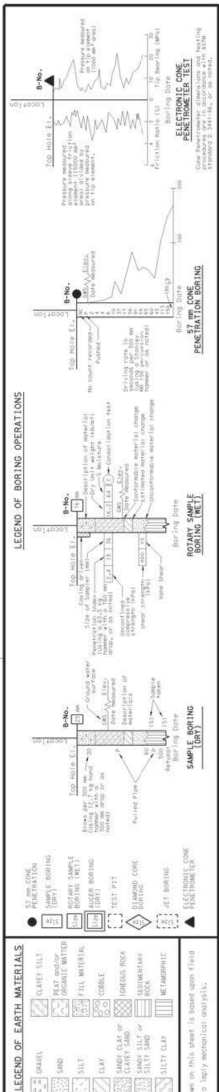
Blows	Sampler	Sample No.	Moisture %	Dry density / Test	Test
17/152	61	1	1.4	3.6	WA
18	35	1a			
29/152	61	2	17.6	8.0	WA
29	35	2a			
50/76	61	3			WA
25	35	3a			
20/152	61	4	16.7	7.5	CO, WA
25	35	4a			
50/102	61	5	--	9.9	WA
86	35	5a			
42/152	61	6	19.5	8.1	WA
37	35	6a			
REF/152	61	7	--	8.2	WA
60	35	7a			
38/152	61	8	--	8.9	WA
17	35	8a			
REF/76	61	9	--	4.0	WA
REF/95	35	9a			
REF/51	61	10			WA
REF/25	35	10a			
50/127	61	11	12.7	33.9	AL, WA
54	35	11a			
50/102	61	12	12.2	38.3	AL, WA
60	35	12a			
50/127	61	13	13.2	33.8	WA
85/254	35	13a			
50/127	61	14	13.4	33.6	WA
66	35	14a			
50/75	61	15	12.8	34.7	AL, WA
86	35	15a			
50/127	61	16	12.8	36.2	AL, WA
76/254	35	16a			
20/127	61	17	14.5	28.4	AL
65	35	17a			

PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: NONE

PLATE 3

All dimensions and elevations are in meters except as noted



CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test

SPT N-Value (Blows/0.3m)	Granular	Cohesive
0-4 / <2	Very Loose	Very Soft
5-10 / 2-4	Loose	Soft
11-30 / 5-8	Medium Dense	Firm
31-50 / 9-15	Dense	Stiff
>50 / 16-30	Very Dense	Very stiff
>31		Hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	101	0.6/1.4	324	326

Kui Bhushan 12/13/02
GEOTECHNICAL PROFESSIONAL

6-7-04
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Kui Bhushan No. G.E. 144 Exp. 12/31/05 GEOTECHNICAL STATE OF CALIFORNIA

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Caltrans Metric

METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012

EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017

DESIGN OVERSIGHT	Be Nguyen	DRAWN BY	K. FERNANDES	N. NGHIEM FIELD INVESTIGATION BY:
7-10-03 SIGN OFF DATE		CHECKED BY	C. SCHEYHING	DATE:

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

D. YAVORSKY
PROJECT ENGINEER

BRIDGE NO. 53-2975 53C-2148
KILOMETER POST 1.07

EASTSIDE LRT PROJECT BRIDGE OVER HWY 101
LOG OF TEST BORINGS SHEET 3 OF 5

CU 07225
EA 1199U1

GEOTECHNICAL LOG OF TEST BORINGS SHEET (METRIC) (REV 2/1/00)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

DISREGARD PRINTS BEARING EARLIER REVISION DATES

SHEET 59 OF 61

FILE => a11tb3059.dgn

USERNAME => trpierce DATE PLOTTED => 09-JUN-2004 TIME PLOTTED => 11:38

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DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	101	0.6/1.4	325	326

GEOTECHNICAL PROFESSIONAL 12/13/02

6-7-04

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Kui Bhushan No. G.E. 144 Exp. 12/31/05 GEOTECHNICAL STATE OF CALIFORNIA

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METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012

EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017

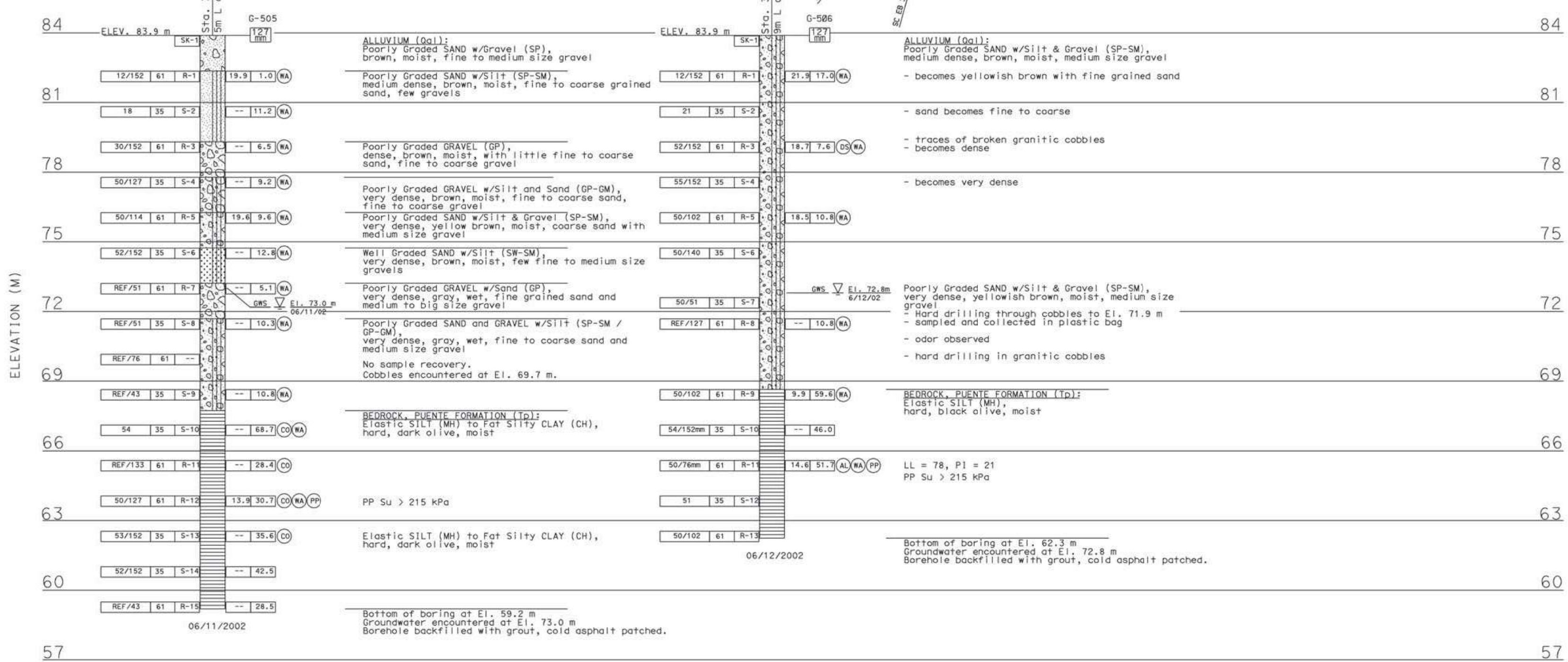
BENCHMARK
ESE-252 CALTRANS SR 98-146
FD CALTRANS BRASS DISC IN EAST SIDEWALK OF ALAMEDA ST. O/C AND ROUTE 101

NORTHING: 561498.646
EASTING: 1978051.044
ELEVATION: 83.920 m

Horizontal Datum: NAD83 1996.35 EPOCH, California State Plabe Zone 5.
Vertical Datum: NAVD 88

PLAN

SCALE: 1:1000



G-505 (Sta. 35+46, 5m L of EB Track, ELEV. 83.9 m)

Blows	Size	Sample			Tests
		SK-1			
12/152	61	R-1	19.9	1.0	WA
18	35	S-2	--	11.2	WA
30/152	61	R-3	--	6.5	WA
50/127	35	S-4	--	9.2	WA
50/114	61	R-5	19.6	9.6	WA
52/152	35	S-6	--	12.8	WA
REF/51	61	R-7	--	5.1	WA
REF/51	35	S-8	--	10.3	WA
REF/76	61	--			
REF/43	35	S-9	--	10.8	WA
54	35	S-10	--	68.7	CO WA
REF/133	61	R-11	--	28.4	CO
50/127	61	R-12	13.9	30.7	CO WA PP
53/152	35	S-13	--	35.6	CO
52/152	35	S-14	--	42.5	
REF/43	61	R-15	--	28.5	

G-506 (Sta. 35+67, 5m L of EB Track, ELEV. 83.9 m)

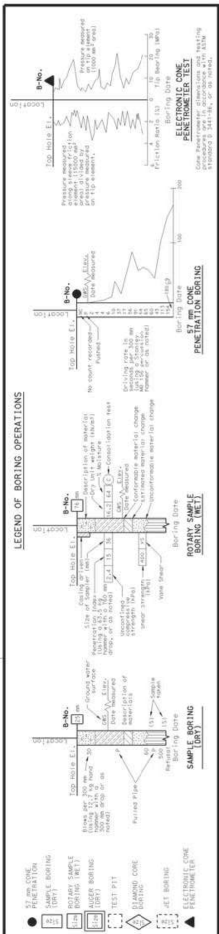
Blows	Size	Sample			Tests
		SK-1			
12/152	61	R-1	21.9	17.0	WA
21	35	S-2			
52/152	61	R-3	18.7	7.6	DS WA
55/152	35	S-4			
50/102	61	R-5	18.5	10.8	WA
50/140	35	S-6			
50/51	35	S-7			
REF/127	61	R-8	--	10.8	WA
50/102	61	R-9	9.9	59.6	WA
54/152mm	35	S-10	--	46.0	
50/76mm	61	R-11	14.6	51.7	AL WA PP
51	35	S-12			
50/102	61	R-13			

PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: NONE

PLATE 4

All dimensions and elevations are in meters except as noted



CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test

Granular	SPT N-Value (Blows/0.3m)	Cohesive	SPT N-Value (Blows/0.3m)
Very Loose	0-4	Very Soft	<2
Loose	5-10	Soft	2-4
Medium Dense	11-30	Firm	5-8
Dense	31-50	Stiff	9-15
Very Dense	>50	Very stiff	16-30
		Hard	>31

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DESIGN OVERSIGHT	Be Nguyen	DRAWN BY	K. FERNANDES	N. NGHIEM FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	D. YAVORSKY PROJECT ENGINEER	BRIDGE NO. 53-2975 53C-2148	EASTSIDE LRT PROJECT BRIDGE OVER HWY 101
7-10-03 SIGN OFF DATE		CHECKED BY	C. SCHEYHING	DATE:			KILOMETER POST 1.07	LOG OF TEST BORINGS SHEET 4 OF 5

GEOTECHNICAL LOG OF TEST BORINGS SHEET (METRIC) (REV 2/1/00)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 07
EA 1035F1

FILE => a11tb4060.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET	OF
60	61

USERNAME => trpierce DATE PLOTTED => 09-JUN-2004 TIME PLOTTED => 11:38

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DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
07	LA	101	0.6/1.4	326	326

GEOTECHNICAL PROFESSIONAL 12/13/02

6-7-04
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER Kul Bhushan No. G.E. 144 Exp. 12/31/05 GEOTECHNICAL STATE OF CALIFORNIA

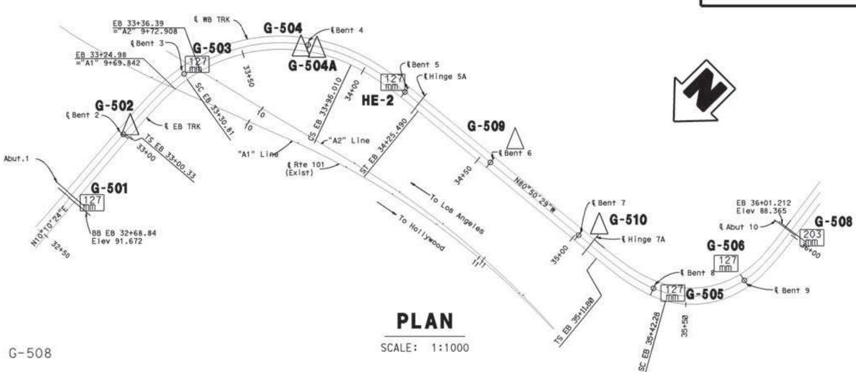
METROPOLITAN TRANSPORTATION AUTHORITY
ONE GATEWAY PLAZA
LOS ANGELES, CA. 90012

EASTSIDE LRT PARTNERS
707 WILSHIRE BLVD. SUITE 2900
LOS ANGELES, CA 90017

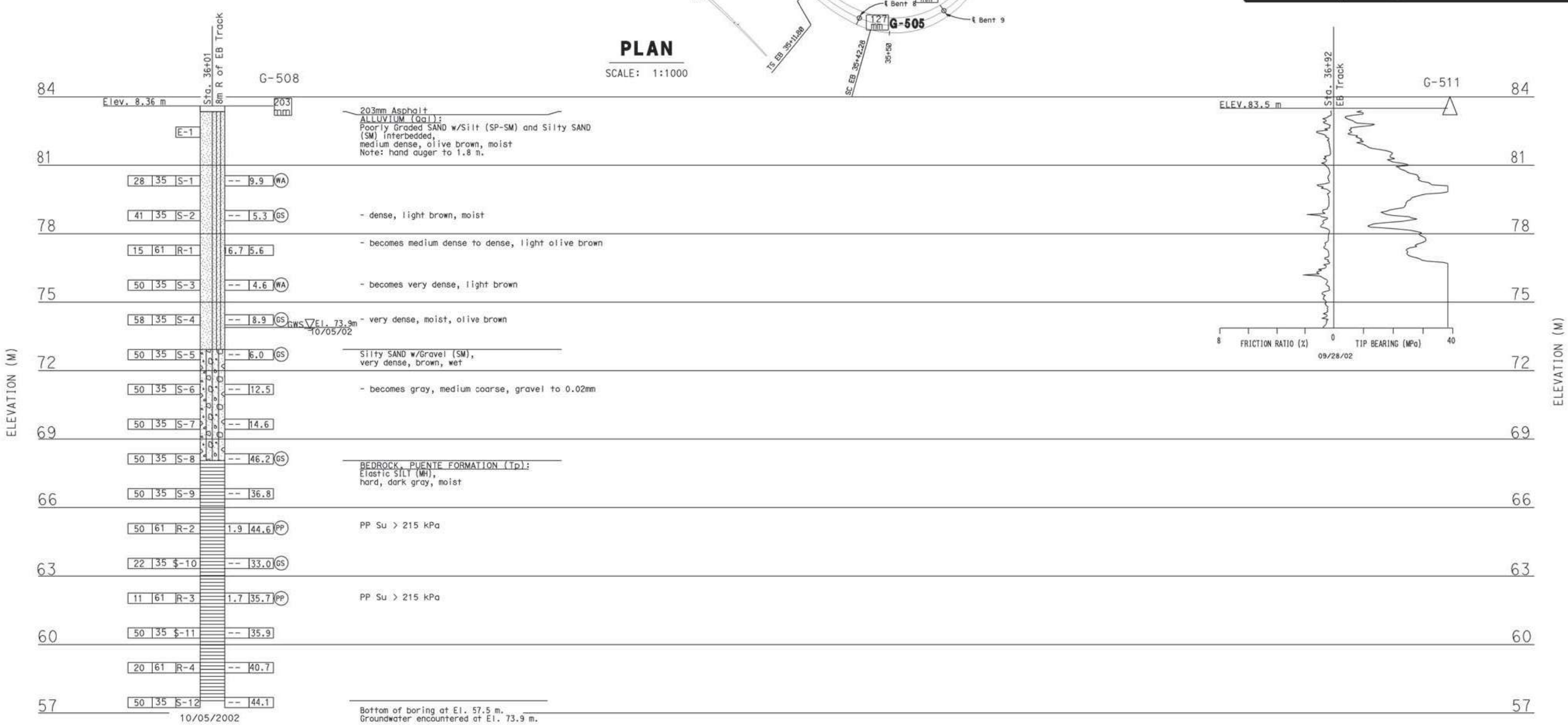
BENCHMARK
ESE-252 CALTRANS SR 98-146
FD CALTRANS BRASS DISC IN EAST SIDEWALK OF ALAMEDA ST. O/C AND ROUTE 101

NORTHING: 561498.646
EASTING: 1978051.044
ELEVATION: 83.920 m

Horizontal Datum: NAD83 1996.35 EPOCH, California State Plabe Zone 5.
Vertical Datum: NAVD 88



PLAN
SCALE: 1:1000



PROFILE
VERTICAL SCALE: 1:100
HORIZONTAL SCALE: NONE

PLATE 5

All dimensions and elevations are in meters except as noted

LEGEND OF BORING OPERATIONS

SAMPLE BORING (DRY) — ROTARY SAMPLE BORING (WET) — 57 mm CONE PENETRATION BORING — ELECTRONIC CONE PENETROMETER TEST

57 mm CONE PENETRATION; SAMPLE BORING (DRY); ROTARY SAMPLE BORING (WET); AUGER BORING (DRY); TEST PIT; DIAMOND CORE BORING; JET BORING; ELECTRONIC CONE PENETROMETER

LEGEND OF EARTH MATERIALS

GRAVEL; SAND; SILT; CLAY; SANDY CLAY or CLAYEY SAND; SANDY SILT or SILTY SAND; SILTY CLAY; CLAYEY SILT; PEAT and/or ORGANIC MATTER; FILL MATERIAL; COBBLE; IGNEOUS ROCK; SEDIMENTARY ROCK; METAMORPHIC

CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test

Granular	SPT N-Value (Blows/0.3m)	Cohesive
Very Loose	0-4	Very Soft
Loose	5-10	Soft
Medium Dense	11-30	Firm
Dense	31-50	Stiff
Very Dense	>50	Very Stiff
	16-30	
	>31	Hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DESIGN OVERSIGHT Be Nguyen	DRAWN BY	K. FERNANDES	N. NGHIEM FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	D. YAVORSKY PROJECT ENGINEER	BRIDGE NO. 53-2975 53C-2148	EASTSIDE LRT PROJECT BRIDGE OVER HWY 101
7-10-03 SIGN OFF DATE	CHECKED BY	C. SCHEYHING	DATE:			KILOMETER POST 1.07	LOG OF TEST BORINGS SHEET 5 OF 5

GEOTECHNICAL LOG OF TEST BORINGS SHEET (METRIC) (REV 2/1/00)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 07225
EA 1199U1
FILE => a11tb5061.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 61 OF 61

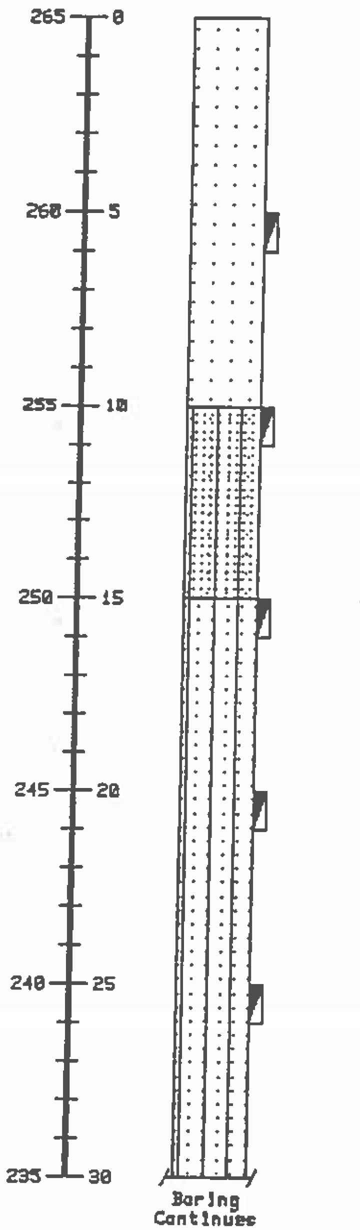
USERNAME => trpierce DATE PLOTTED => 09-JUN-2004 TIME PLOTTED => 11:38

Existing Geotechnical Boring Logs
City of Los Angeles, 1993

LOG OF TEST BORING

PROJECT: 140-4046 DATE: Nov. 18, 1992
BORING NO.: 1 ELEV.: 265'
BORING LOCATION: 124' W/O N. Myers St. & 76' S/O SCF E. 1st St.
DRILL RIG TYPE: CME-75 HT using 8" diameter hollow stem augers
DRILLER: Cooksey LOGGER: C. Kunesh ENGINEER: Yew/Adams
DEPTH TO STANDING WATER: none DEPTH TO WATER SEEPAGE: none

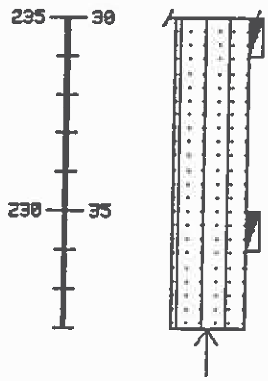
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND BLOWS/INCHES



USCS	Field Description	Standard Pen. Readings 1st 6" / 2nd 6" / 3rd 6"
SP	Brown poorly graded sand with gravel. Trace of silt. Moist and dense.	
		8 / 6 / 9
SW-SM	Light brown to tan, well graded sand with silt, granitic gravel and cobbles. Dry to moist and dense.	6 / 9 / 10
SP-SM	Light brown to tan poorly graded sand with silt and gravel. Gravel content ranges from 8% to 42% . Moist and dense to very dense.	10 / 14 / 19
		19 / 39 / 18
		28 / 30 / 24

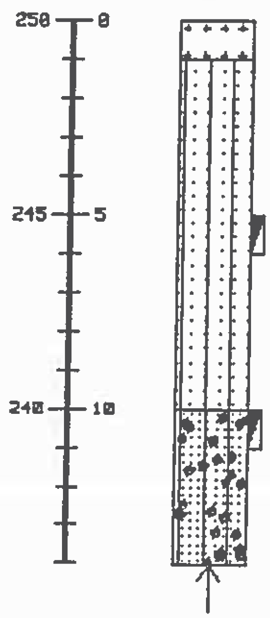
LOG OF TEST BORING

PROJECT: 140-4046 DATE: Nov. 18, 1992
BORING NO.: 1 ELEV.: 265'
BORING LOCATION: 124' W/O N. Myers St. & 76' S/O SCF E. 1st St.
DRILL RIG TYPE: CME-75 HT using 8" diameter hollow stem augers
DRILLER: Cooksey LOGGER: C. Kunesh ENGINEER: Yew/Adams
DEPTH TO STANDING WATER: none DEPTH TO WATER SEEPAGE: none

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND BLOWS/INCHES	USCS	Field Description	Standard Pen. Readings 1st 6" / 2nd 6" / 3rd 6"
235 — 30		SP-SM	Light brown to tan poorly graded sand with silt and gravel. Gravel content is 41 %. Moist and dense to very dense.	13 / 31 / 44
230 — 35				50 @ 5"/ - / -
			No Water	

_OG OF TEST BOR_NG

PROJECT: 140-4046 DATE: Nov. 13, 1992
BORING NO.: 2 ELEV.: 250'
BORING LOCATION: W/S L.A. River channel, below 1st St. Bridge
DRILL RIG TYPE: CME-75 HT using 8" diameter hollow stem augers
DRILLER: Cooksey LOGGER: C. Kunesh ENGINEER: Yew/Adams
DEPTH TO STANDING WATER: none DEPTH TO WATER SEEPAGE: none



ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND BLOWS/INCHES	USCS	Field Description	Standard Pen. Readings 1st 6" / 2nd 6" / 3rd 6"
			12" PCC.	
		SP-SM	Brown to rusty brown poorly graded sand with silt and gravel. Gravel content is 29%. Moist and dense. Encountered granitic cobbles from 4' to 10'.	10 / 20 / 31
		GW-GM	Brown to rusty brown well graded gravel with silt, sand and granitic cobbles. Sand content is 31% . Moist and dense.	25 / 27 / 27
			No Water	

LOG OF TEST BORING

PROJECT: 140-4046 DATE: Nov. 17, 1992

BORING NO.: 2A ELEV.: 250'

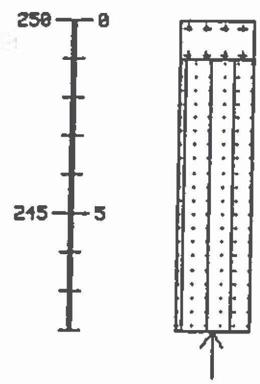
BORING LOCATION: W/S River channel, below 1st St. Bridge, 17' N/O T.H. 2

DRILL RIG TYPE: CME-75 HT using 8" diameter hollow stem augers

DRILLER: Cooksey LOGGER: C. Kunesh ENGINEER: Yew/Adams

DEPTH TO STANDING WATER: none DEPTH TO WATER SEEPAGE: none

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND BLOWS/INCHES	USCS	Field Description	Standard Pen. Readings 1st 6" / 2nd 6" / 3rd 6"
250 — 0			12" PCC.	
		SP-SM	Brown to rusty brown poorly graded sand with silt and gravel. Gravel content is about 29% . Moist and dense. Encountered cobbles from 4' to 8'.	
245 — 5				
			No Water	



Existing Geotechnical Boring Logs
City of Los Angeles, 1994a

Legend:

Symbol:	Description:
	Poorly graded sand with gravel. Trace of silt.
	Well graded sand with silt, granitic gravel and cobbles.
	Poorly graded sand with silt and gravel.
	Well graded gravel with silt, sand and granitic cobbles.
	Representative sample (disturbed)
	Depth to perched water

Symbol:	Description:
	PCC.
	Water at depth indicated during drilling
	Rig refusal or end of boring

Notes:

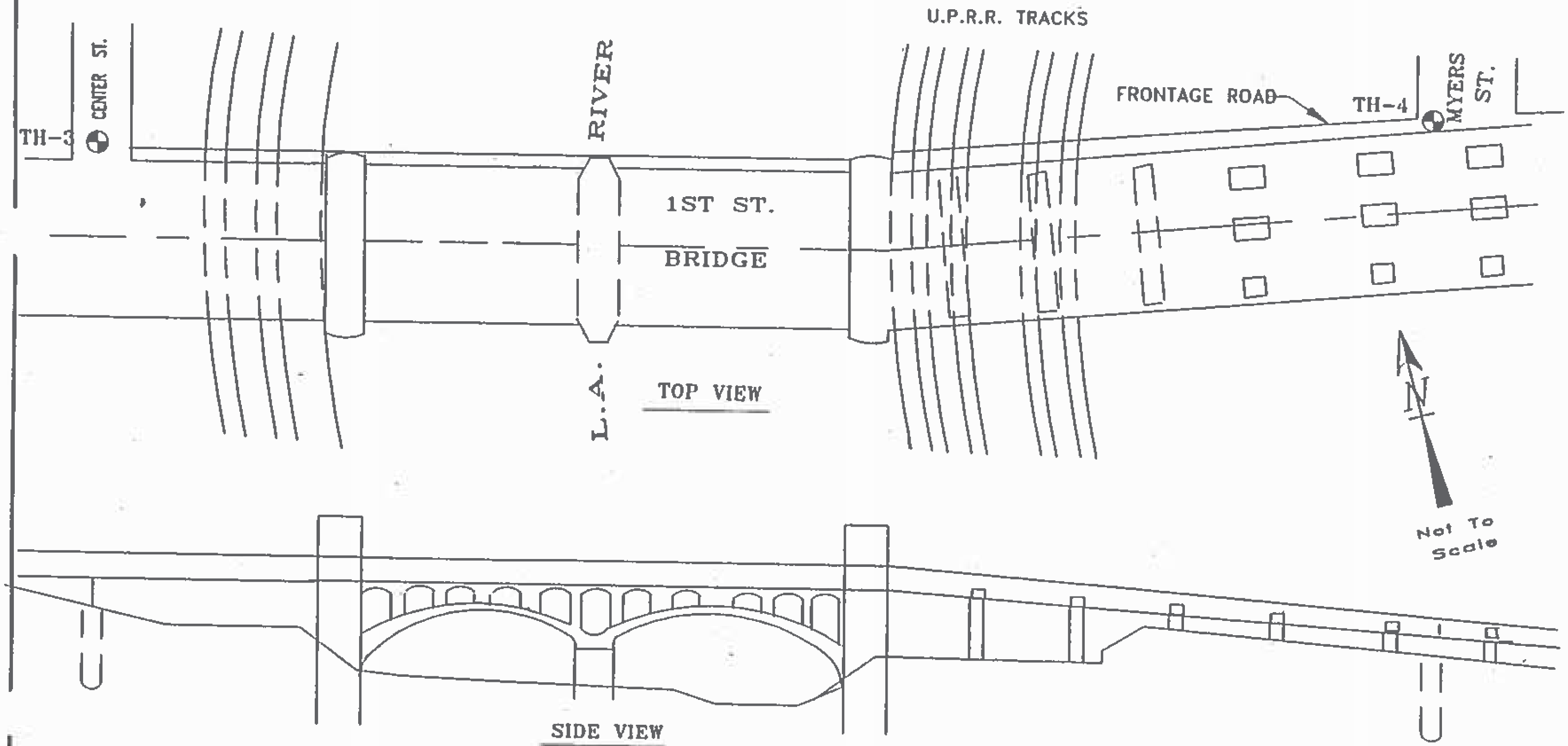
1. Exploratory borings were drilled on November 13, 17, & 18, 1992 with a CME-75 HT drill rig using 8" diameter hollow stem augers.

2. Free water was not encountered during the drilling of this project.

3. The boring locations and elevations were provided by Geotechnical Services.

4. Abbreviations used on logs: HT = high torque
   - N/O = north of
   - S/O = south of
   - E/O = east of
   - W/O = west of
   - NCF = north curb face
   - SCF = south curb face
   - ECF = east curb face
   - WCF = west curb face
   - C/L = center line
   - BCR = begin curb return
   - PL = property line
   - ELEV. = elevation
   - OVA = organic vapor analyzer
   - LEL = lower explosive limit
   - AC = asphalt concrete
   - PCC = Portland cement concrete

5. A maximum blow count value of 75 per 6 inch increment was used for the Standard Penetration Test.



Project Title : 1ST STREET VIADUCT OVER L.A. RIVER-SUPPLEMENTAL

CITY OF LOS ANGELES
DEPARTMENT OF GENERAL SERVICES
STANDARDS DIVISION

TEST BORING LOCATIONS

Lab No. 140- 4046 Ref. No. 06573
Date: 3-19-93
CADD BY R.B.

LOG OF TEST BORING

LAB. NO.: 140- 4046 **PROJECT:** FIRST STREET VIADUCT OVER L.A. RIVER-SUPPLEMENTAL

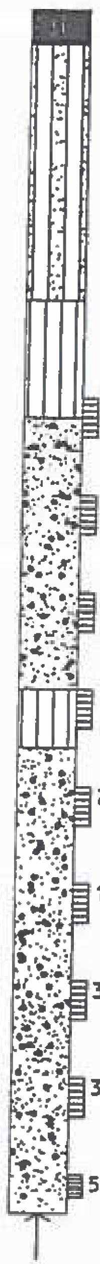
BORING NO.: 3 **ELEVATION:** 265' **DRILLING DATE:** January 21, 1993

BORING LOCATION: 25' N/O NCF 1st St. frontage road & 46' W/O ECF Center St.

DRILL RIG TYPE: CME-75HT using 8" diameter hollow stem augers

DEPTH TO STANDING WATER: none **DEPTH TO WATER SEEPAGE:** none

DRILLER: Cooksey **LOGGER:** C. Kunesh **ENGINEER:** B. Adams



ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/INCHES	USCS	Field Description	Moisture %	Density Pcf
265 / 0			10" AC pavement in good condition.		
		SM	Brown silty sand. Few gravels and red brick fragments. Fill material to 2.5'. Moist. Color changes to light brown at 2.5'.		
260 / 5					
		ML	Brown silt. Little amount of clay. Moist and firm.		
255 / 10	14/12			6.3	107
		SW	Gray well graded sand. Few granitic gravel. Moist and dense. Moisture decreasing with depth.		
	20/12			3.7	116
250 / 15	26/12		Encountered a 1' lense of poorly graded gravel with sand at 15'.	2.5	120
	10/12	ML	Brown-gray silt. Little to some fine sand. Moist and firm.	16.1	98
		SW	Gray-brown well graded sand with silt and gravels. Gravel is granitic. Moist and dense.		
245 / 20	23/12			2.6	119
	15/12		Encountered a 1' poorly graded sand lense at 22'.	7.6	101
240 / 25	30/12			3.2	118
	37/12			3.1	115
235 / 30	50/7			2.1	126
			No Water		
230 / 35					

LOG OF TEST BORING

LAB. NO.: 140- 4046 **PROJECT:** FIRST STREET VIADUCT OVER L.A. RIVER-SUPPLEMENTAL

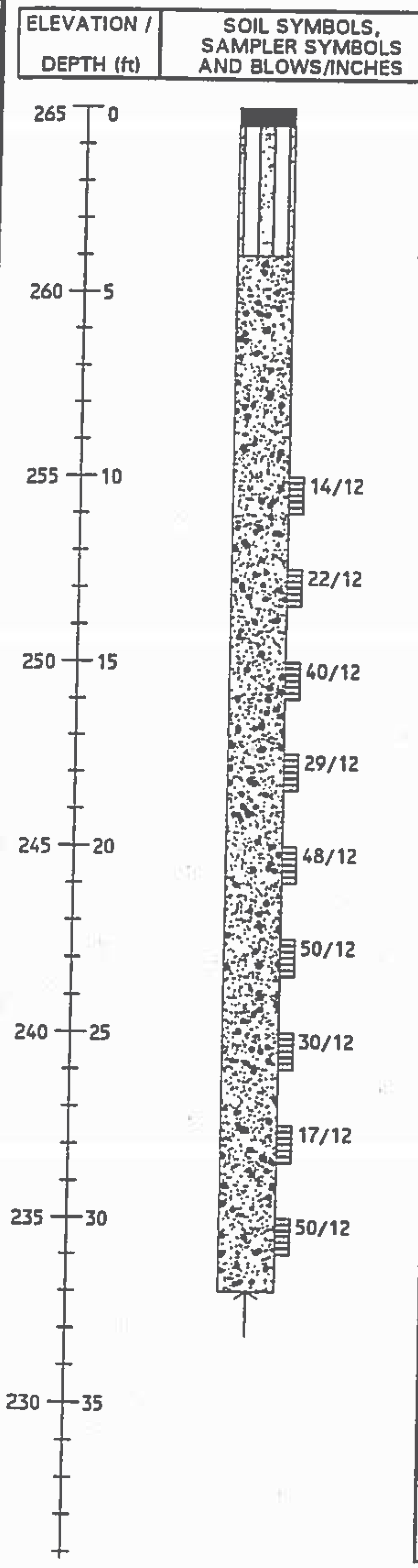
BORING NO.: 4 **ELEVATION:** 265' **DRILLING DATE:** January 22, 1993

BORING LOCATION: 7' W/O C/L N. Myers St. & approx. C/L 1st St. frontage Road

DRILL RIG TYPE: CME-75 using 8" diameter hollow stem augers

DEPTH TO STANDING WATER: none **DEPTH TO WATER SEEPAGE:** none

DRILLER: Cooksey **LOGGER:** C. Kunesh **ENGINEER:** Zadoorian



Blows/Inches	USCS	Field Description	Moisture %	Density Pcf
		6" AC pavement in good condition.		
	SM	Brown silty sand. Few gravels and red brick fragments. Fill material. Moist.		
	SW/SP	Brown well to poorly graded sand. Trace of silt. Few granitic gravel. Silt content decreasing with depth. Moist and dense to very dense.		
14/12			2.9	127
22/12		Encountered 1' lense of well graded gravel with sand at 12.5'.	1.9	123
40/12			2.8	125
29/12			2.5	118
48/12			3.0	127
50/12			1.7	135
30/12			2.4	112
17/12			2.9	124
50/12			2.1	132

No Water

Existing Geotechnical Boring Logs
City of Los Angeles, 1994b

LOG OF TEST BORING 9402300H2

LAB. NO.: 140- 4340 **PROJECT:** PIPER TECHNICAL CENTER

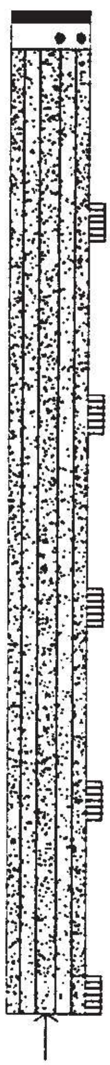
BORING NO.: H-2 **ELEVATION:** 280' **DRILLING DATE:** 07-14-94 (CONTAMINATION)

BORING LOCATION: 188' S/o and 13' W/o Northwest corner of building #1 (Police garage)

DRILL RIG TYPE: CME-55 using 8" diameter hollow stem augers.

DEPTH TO STANDING WATER: none **DEPTH TO WATER SEEPAGE:** none

DRILLER: Myles **LOGGER:** Redlin **ENGINEER:** Burnett



ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/INCHES	OVA (PPM)	USCS	Field Description
280 — 0				4" AC pavement in fair condition.
				Sand/gravel base.
				FILL MATERIAL To 15'. Light brown poorly graded sand with some silt and a little gravel. Moist and loose to dense. Encountered 2' silty lense at 15'. Encountered coarse gravel and small cobbles at 20'. Encountered silty sand at 25'. No petrochemical odor.
275 — 5	5/12	0		
270 — 10	3/12	0		
265 — 15	10/12	0		
260 — 20	14/12	0		
255 — 25	20/12	0		
26				--- No water ---
250 — 30				
245 — 35				

LOG OF TEST BORING

940230 H12

LAB. NO.: 140- 4340 PROJECT: PIPER TECHNICAL CENTER

BORING NO.: H-9A ELEVATION: 280' DRILLING DATE: 08-31-94 (CONTAMINATION)

BORING LOCATION: 56' S/o and 32' W/o NW corner of column QR at Space 120' Building #2

DRILL RIG TYPE: CME-55 using 8" diameter hollow stem augers.

DEPTH TO STANDING WATER: none DEPTH TO WATER SEEPAGE: none

DRILLER: L. Cooksey LOGGER: J. Kunesh ENGINEER: Burnett

ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/INCHES	OVA (PPM)	USCS	Field Description
280 / 0				4" AC pavement in good condition.
				Crushed aggregate base with some sand.
				FILL MATERIAL. Grayish-brown silty sand with some gravel. Slight petrochemical odor from 8' depth. No sampling at 5' and 10' depths per engineer present. Concrete fragments present from 11' to 13' depth. Granite cobble lodged in split spoon sampler at 16' depth. Petrochemical odor decreasing with depth. Moist and dense.
265 / 15	40/12	7		
			SP	Brown poorly graded sand with some granitic gravel and cobbles. Sand color becoming lighter with depth. Trace of petrochemical odor present. Moist and dense.
260 / 20	16/12	8		
21				--- No water ---

Depth scale: 280 / 0, 275 / 5, 270 / 10, 265 / 15, 260 / 20, 255 / 25, 250 / 30, 245 / 35

LOG OF TEST BORING 940230H21

LAB. NO.: 140- 4340 **PROJECT:** PIPER TECHNICAL CENTER

BORING NO.: H-18 **ELEVATION:** 280' **DRILLING DATE:** 08-25-94 (CONTAMINATION)

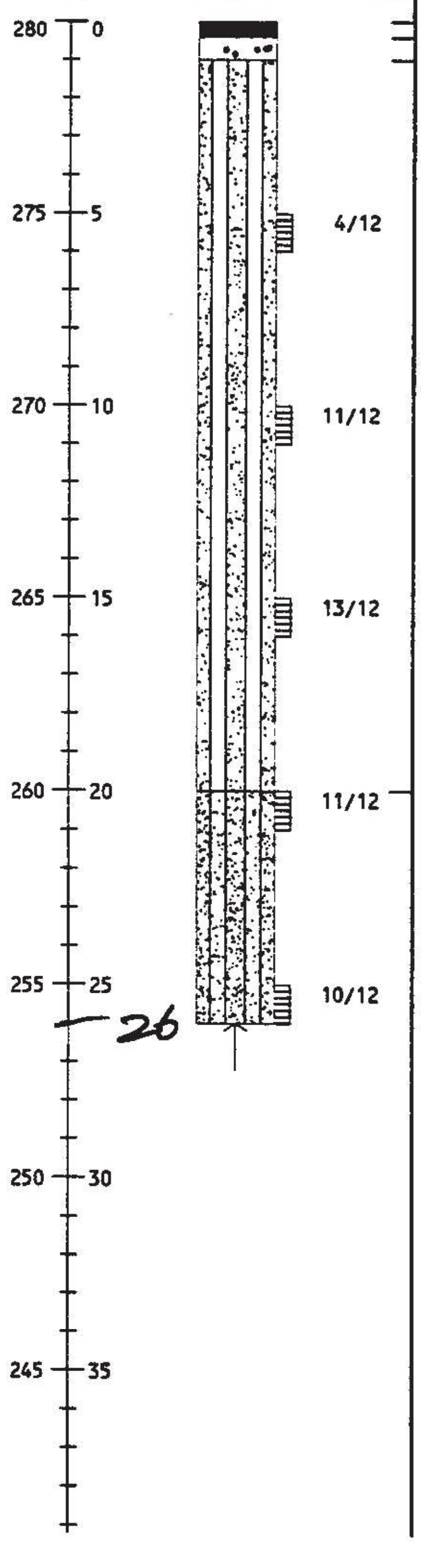
BORING LOCATION: 61' W/o and 11' N/o Diesel Pump at back of building #1 Space 150

DRILL RIG TYPE: CME-75 using 8" diameter hollow stem augers.

DEPTH TO STANDING WATER: none **DEPTH TO WATER SEEPAGE:** none

DRILLER: L. Cooksey **LOGGER:** Redlin **ENGINEER:** Burnett

ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/INCHES	OVA (PPM)	USCS	Field Description
280 – 0				5" AC pavement in fair condition.
				Sand/gravel base.
				FILL MATERIAL. Gray/brown silty sand with some clay binders, gravel and a few red brick fragments. Moist and fairly loose. Slight petrochemical odor at 10'.
275 – 5	4/12			
270 – 10	11/12			
265 – 15	13/12			
260 – 20	11/12		SP-SM	Light brown/tan poorly graded sand. Moist and fairly loose. No petrochemical odor. Encountered some gravel at 25'. Sand is becoming coarser with depth.
255 – 25	10/12			
– 26				--- No water ---
250 – 30				
245 – 35				



CITY OF LOS ANGELES - STANDARDS DIVISION

Existing Geotechnical Boring Logs
City of Los Angeles, 1994c

94110001A

LOG OF TEST BORING

LAB. NO.: 140- 4413 **PROJECT:** ALAMEDA SEWER REHABILITATION AT LOS ANGELES ST.

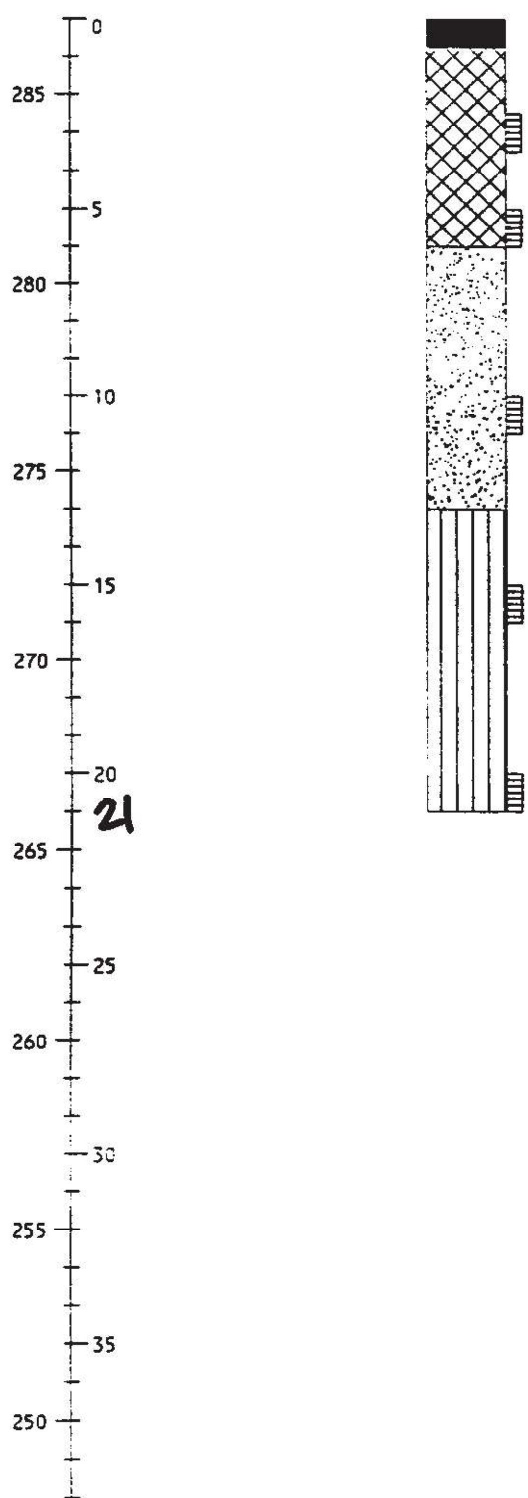
BORING NO.: B-1A **ELEVATION:** 287' **DRILLING DATE:** 12-28-94

BORING LOCATION: 3.5' W/o ECF Alameda St. and 92' S/o SCF Union Station Parking Ent.

DRILL RIG TYPE: CME-75 using 8" diameter hollow stem augers.

DEPTH TO STANDING WATER: None **DEPTH TO WATER SEEPAGE:** None

DRILLER: Adams **LOGGER:** A. Gharai **ENGINEER:** None Present



SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/INCHES	USCS	Field Description	Moist. %	Dens. Pcf
		9" AC pavement in good condition.		
7/12		FILL MATERIAL. Light brown poorly graded sand with some silt and gravel. Concrete slurry present from 4.5' to 6' depth.	3.1	122
43/12			7.2	116
	SP	POSSIBLE FILL MATERIAL from existing sewer line. Light brown sand with some granitic gravel and traces of silt. Moist and loose.		
6/12			3.7	111
	ML	Light green silt with clay. Moist and firm. Density increasing with depth.		
18/12			28.0	96
28/12			23.1	104

No water.

CITY OF LOS ANGELES - STANDARDS DIVISION

941100002

LOG OF TEST BORING

LAB. NO.: 140- 4413 **PROJECT:** ALAMEDA SEWER REHABILITATION AT LOS ANGELES ST.

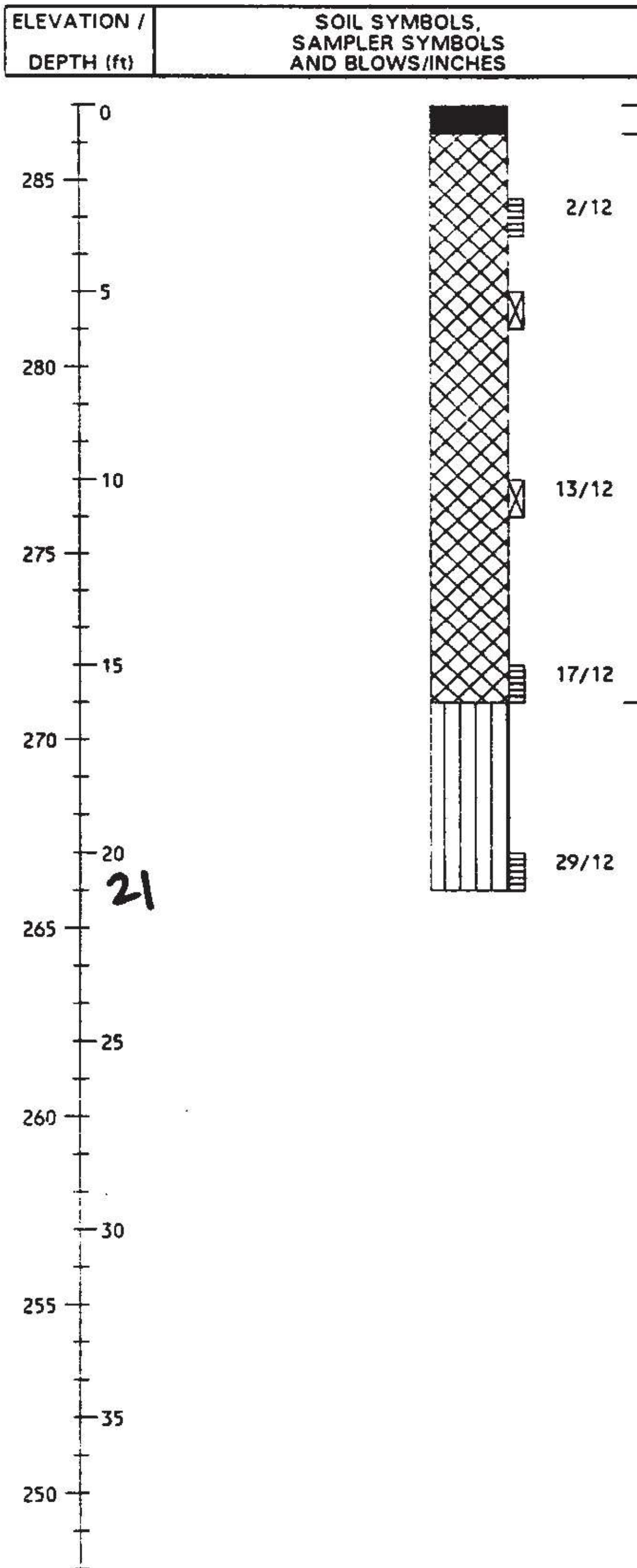
BORING NO.: B-2 **ELEVATION:** 287' **DRILLING DATE:** 12-28-94

BORING LOCATION: 3.5' W/o ECF Alameda St. and 24' S/o SCF Union Station Parking Exit

DRILL RIG TYPE: CME-75 using 8" diameter hollow stem augers.

DEPTH TO STANDING WATER: None **DEPTH TO WATER SEEPAGE:** None

DRILLER: Adams **LOGGER:** A. Gharai **ENGINEER:** None Present

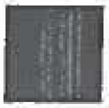
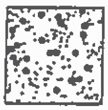
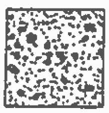


USCS	Field Description	Moist. %	Dens. Pcf
	9" AC pavement in good condition.		
	FILL MATERIAL. Light brown silty sand with some gravel. Wood fragments (plywood) present at 3' depth. PVC pipe and concrete slurry present at 5' depth. Concrete fragments, sand and cobbles present from 10' to 15' depth. Moist.	10.2	100
		27.8	96
ML	Light green/brown silt with sand and clay. Moist and firm. Moisture increasing with depth.		
		32.9	91
	--- No water. ---		

CITY OF LOS ANGELES - STANDARDS DIVISION

Existing Geotechnical Boring Logs
City of Los Angeles, 1996

KEY TO SYMBOLS

Symbol	Description
STRATA	
	AC pavement
	Silty sand.
	Fine to very fine sandy silt.
	Well graded sands. Few granitic gravel.
	Well to poorly graded sand. Trace of silt.
MISCELLANEOUS	
	End of Boring
SAMPLERS	
	Split spoon sampler

KEY TO SYMBOLS

Notes:

1. Exploratory borings were drilled on January 21, 1993 with a CME-75 HT drill rig and on January 22, 1993 with a CME-75 drill rig using 8" diameter hollow stem augers.

2. Free water was not encountered during the drilling of this project.

3. The boring locations and elevations were provided by Geotechnical Services.

4. Test Holes No. 1 & 2 were drilled on November 17th & 18th, 1992.

5. Abbreviations used on logs:

N/O = north of	NCF = north curb face	NE = northeast
S/O = south of	SCF = south curb face	NW = northwest
E/O = east of	ECF = east curb face	SE = southeast
W/O = west of	WCF = west curb face	SW = southwest
C/L = center line	PL = property line	
AC = asphalt concrete	PCC = Portland cement concrete	
OVA = organic vapor analyzer	LEL = lower explosive limit	
HT = high torque		

LAB NO.: 140- 4046

LOG OF TEST BORING

LAB. NO.: 140- 4536 **PROJECT:** 1ST STREET VIADUCT OVER L.A. RIVER-SEISMIC RETROFIT

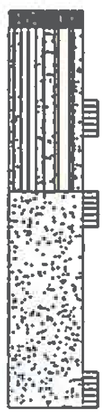
BORING NO.: H-2 **ELEVATION:** 270' **DRILLING DATE:** 02-15-96 (CONTAMINATION)

BORING LOCATION: 5' N/o SCF 1st St. (N/s Frontage Rd.) and 48' E/o ECF Santa Fe Ave.

DRILL RIG TYPE: CME-75 using 6" diameter conventional flight augers.

DEPTH TO STANDING WATER: None **DEPTH TO WATER SEEPAGE:** None

DRILLER: Ramirez **LOGGER:** Redlin **ENGINEER:** Burnett



ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/INCHES	OVA (PPM)	USCS	Field Description
70 / 0				6" AC pavement in poor condition.
	5/12	0	SM-ML	Light brown silty sand/sandy silt with some clay binders. Sand is fine in texture. Moist and firm. No petrochemical odor.
65 / 5	6/12	0	SP	Light tan sand with a little silt and gravel. Moist and dense. Sand is becoming coarser in texture with depth. Gravel content is increasing with depth. No petrochemical odor.
60 / 10	15/12	0		
55 / 15				--- No free water. ---
50 / 20				
45 / 25				
40 / 30				
35 / 35				

OG OF TEST BORING

LAB. NO.: 140- 4536 **PROJECT:** 1ST STREET VIADUCT OVER L.A. RIVER-SEISMIC RETROFIT

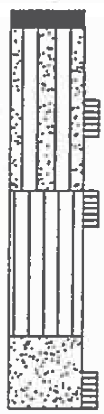
BORING NO.: H-1 **ELEVATION:** 270' **DRILLING DATE:** 02-15-96 (CONTAMINATION)

BORING LOCATION: 11' E/o WCF Center St. and 53' S/o SCF 1st St. (N/s Frontage Rd.) under bridge

DRILL RIG TYPE: CME-75 using 6" diameter conventional flight augers.

DEPTH TO STANDING WATER: None **DEPTH TO WATER SEEPAGE:** None

DRILLER: Ramirez **LOGGER:** Redlin **ENGINEER:** Burnett



ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/INCHES	OVA (PPM)	USCS	Field Description
270 / 0				6" AC pavement in poor condition.
	7/12	0	SM	FILL MATERIAL. Light brown silty sand with some clay binders and a trace of gravel. Sand is fine in texture. Moist and firm. Encountered some red brick fragments at 2.5' depth.
265 / 5	9/12	0	ML	Light brown sandy silt with some clay binders. Moist and firm. No petrochemical odor.
260 / 10	12/12	0	SP	Light tan sand with some gravel. Moist and dense. No petrochemical odor.

No free water.

Used break down mast under bridge.

Depth scale: 270 / 0; 265 / 5; 260 / 10; 255 / 15; 250 / 20; 245 / 25; 240 / 30; 235 / 35

LOG OF TEST BORING

LAB. NO.: 140- 4536 **PROJECT:** 1ST STREET VIADUCT OVER L.A. RIVER-SEISMIC RETROFIT
BORING NO.: H-5 **ELEVATION:** 275' **DRILLING DATE:** 02-15-96 (CONTAMINATION)
BORING LOCATION: 45' W/o ECF Myers St. and 53' S/o SCF 1st St. (N/s Frontage Rd.)- under bridge
DRILL RIG TYPE: CME-75 using 6" diameter conventional flight augers.
DEPTH TO STANDING WATER: None **DEPTH TO WATER SEEPAGE:** None
DRILLER: Ramirez **LOGGER:** Redlin **ENGINEER:** Burnett

ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/INCHES	OVA (PPM)	USCS	Field Description
275 / 0				6" AC pavement in poor condition.
			SP	Light brown/tan poorly graded sand. Sand is fine in texture. Moist and dense. Sand is becoming coarser in texture with depth. No petrochemical odor.
	10/12	0		
270 / 5	12/12	0		
265 / 10	17/12	0		Encountered gravel and small cobbles at 10' depth.

				No free water.

				Used break down mast under bridge.
260 / 15				
255 / 20				
250 / 25				
245 / 30				
240 / 35				

OG OF TEST BORING

AB. NO.: 140- 4536 PROJECT: 1ST STREET VIADUCT OVER L.A. RIVER-SEISMIC RETROFIT

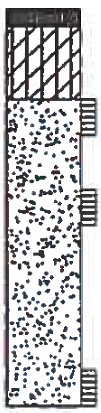
ORING NO.: H-4 ELEVATION: 275' DRILLING DATE: 02-15-96 (CONTAMINATION)

ORING LOCATION: 28' S/o SCF 1st St. (N/s Frontage Rd.) and 104' W/o ECF Myers St.- under bridge

RILL RIG TYPE: CME-75 using 6" diameter conventional flight augers.

EPTH TO STANDING WATER: None DEPTH TO WATER SEEPAGE: None

RILLER: Ramirez LOGGER: Redlin ENGINEER: Burnett



EVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/INCHES	OVA (PPM)	USCS	Field Description
75 / 0				6" AC pavement in poor condition.
			CL-ML	POSSIBLE FILL MATERIAL (due to presense of disturbed soil matrix) Light brown silty clay/clayey silt with some sand and gravel pockets. Moist and firm. No petrochemical odor.
	9/12	0	SP	Light brown/tan sand with some gravel. Moist and dense. Gravel content is increasing with depth. No petrochemical odor.
70 / 5	10/12	0		
65 / 10	17/12	0		Encountered small cobbles at 10' depth.
				--- No free water. --- Used break down mast under bridge.
60 / 15				
55 / 20				
50 / 25				
45 / 30				
40 / 35				

.OG OF TEST BORINC

LAB. NO.: 140- 4536 **PROJECT:** 1ST STREET VIADUCT OVER L.A. RIVER-SEISMIC RETROFIT

BORING NO.: H-3 **ELEVATION:** 271' **DRILLING DATE:** 02-15-96 (CONTAMINATION)

BORING LOCATION: 59' E/o ECF Center St. and 54' S/o SCF 1st St. (N/s Frontage Rd.) under bridge

DRILL RIG TYPE: CME-75 using 6" diameter conventional flight augers.

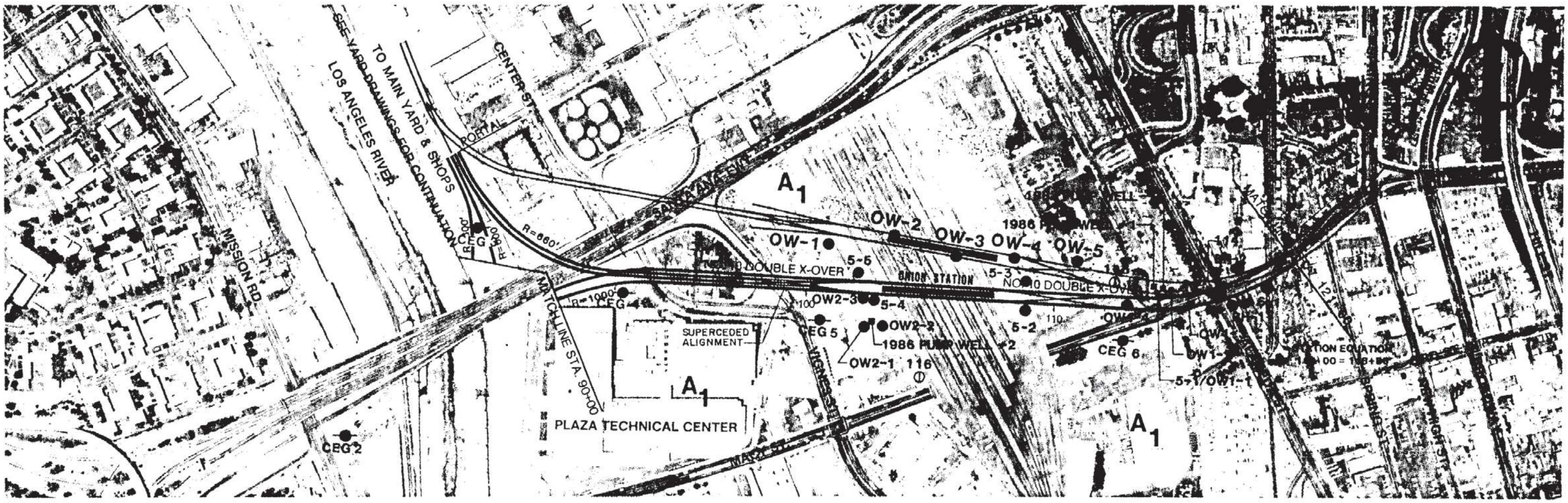
DEPTH TO STANDING WATER: None **DEPTH TO WATER SEEPAGE:** None

DRILLER: Ramirez **LOGGER:** Redlin **ENGINEER:** Burnett

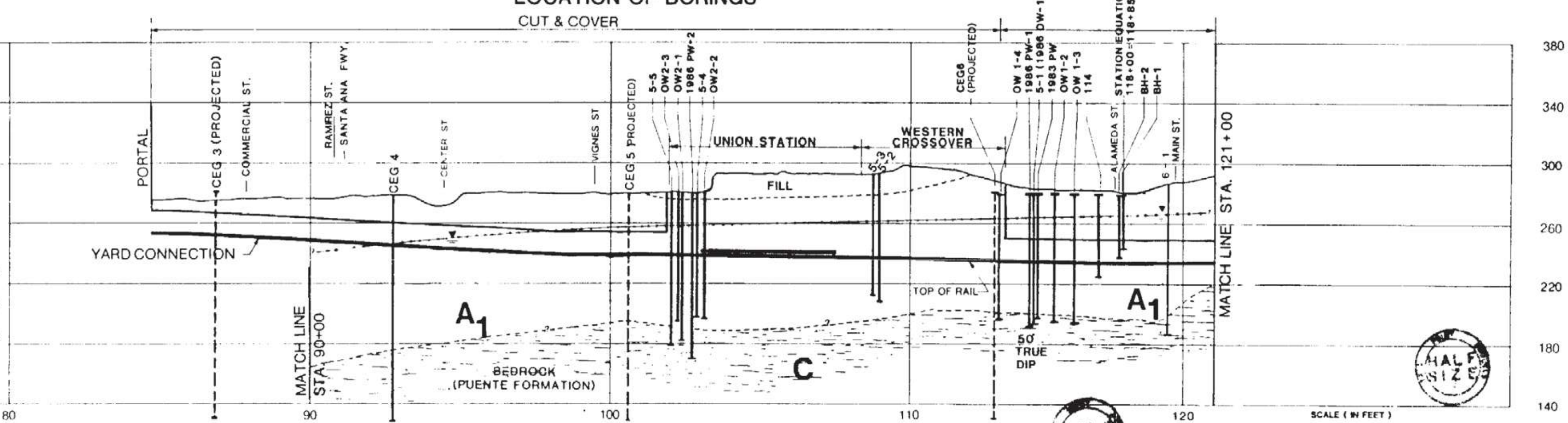
ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/INCHES	OVA (PPM)	USCS	Field Description
0				6" AC pavement in poor condition.
270			SP-SM	POSSIBLE FILL MATERIAL (due to low blow count and location near bridge footing) Light brown poorly graded sand with some silt and gravel. Moist and loose.
	4/12	0		
5	3/12	0		
265				Encountered some small cobbles at 7' depth.
10	6/12	0		
260				--- No free water. --- Used break down mast under bridge.
15				
255				
20				
250				
25				
245				
30				
240				
35				
235				

Existing Geotechnical Boring Logs

Converse Consultants/Earth Sciences Associates Geo/Resource Consultants, 1983 and 1986



LOCATION OF BORINGS



NOTES:

1.) FOR EXPLANATION OF GEOLOGIC SYMBOLS SEE DRAWING NO. K-002

2.) THIS DRAWING WAS PREPARED AS AN AID IN DEVELOPING DESIGN RECOMMENDATIONS. SUBSURFACE INFORMATION PRESENTED ON THIS DRAWING IS BASED ON INTERPOLATION AND EXTRAPOLATION OF SUBSURFACE DATA BETWEEN AND BEYOND BORING LOCATIONS. ACTUAL CONDITIONS ENCOUNTERED DURING CONSTRUCTION MAY BE DIFFERENT

GEOLOGIC SECTION THROUGH SUPERCEDED ALIGNMENT

THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U. S. DEPARTMENT OF TRANSPORTATION, URBAN MASS TRANSPORTATION ADMINISTRATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA

REV	DATE	BY	SUB	APP	DESCRIPTION
0	8/3/87	JAR	WJA		INITIAL ISSUE

DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE 2-13-87

N/A

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
RTD

CCI/ESA/GRC
General Geotechnical Consultants
Submitted [signature] Date 12-31-85

DMJM/PBQD/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS
APPROVED [signature]

LA CBD TO NORTH HOLLYWOOD
UNION STATION

LOCATION OF BORINGS AND
GEOLOGIC SECTION

CONTRACT NO. A136
DRAWING NO. K-001 REV 0
SCALE AS SHOWN
SHEET NO. 47

GEOLOGIC EXPLANATION

GEOLOGIC UNITS

QUATERNARY — HOLOCENE

- A_1 YOUNG ALLUVIUM (Granular): Includes clean sands, silty sands, gravelly sands, sandy gravels, and locally contains cobbles and boulders. Primarily dense, but ranges from loose to very dense.
- A_2 YOUNG ALLUVIUM (Fine-grained) : Includes clays, clayey silts, sandy silts, sandy clays, clayey sands. Primarily stiff, but ranges from firm to hard.

QUATERNARY — PLEISTOCENE

- A_3 OLD ALLUVIUM (Granular): Includes clean sands, silty sands, gravelly sands, and sandy gravels. Primarily dense, but ranges from medium dense to very dense.
- A_4 OLD ALLUVIUM (Fine-grained): Includes clays, clayey silts, sandy silts, sandy clays, and clayey sands. Primarily stiff, but ranges from firm to hard
- SP SAN PEDRO FORMATION: Predominantly clean, cohesionless, fine to medium-grained sands, but includes layers of silts, silty sands, and fine gravels. Primarily dense, but ranges from medium dense to very dense. Locally impregnated with oil or tar.

TERTIARY — PLIOCENE, MIOCENE

- C FERNANDO AND PUENTE FORMATIONS: Claystone, siltstone, and sandstone; thinly to thickly bedded. Primarily low hardness, weak to moderately strong. Locally contains very hard, thin cemented beds and cemented nodules. Locally contains gas and oil.

SYMBOLS

- ? Geologic contact: approximately located, queried where inferred.
- ? Fault: approximately located; queried where inferrred; arrows indicate probable movement; attitude in profile is an apparent dip and is not corrected for scale distortion.
- 40 Dip of bedding: from unoriented core samples; bedding attitudes may not be correctly oriented to the plane of the profile, but represent dips to illustrate regional geologic trends; number gives true dip in degrees, as encountered in boring.
- ? Perched water level: approximately located; queried where inferred.
- ? Permanent water level: approximately located, queried where inferred.
- Boring - CEG (1981)
- Boring - CCI/ESA/GRC (1983, 1984 & 1985)
- Boring - Woodward - Clyde (1977)
- Boring - Kaiser Engineers (1962)

  } See appropriate Woodward - Clyde and Kaiser report(s).
- Boring - Other (USGS 1977 and various foundation studies)
- Boring - Nuclear Regulatory Commision (1980)

  } Borings not drilled for Metro Rail Project. Logs not available in Metro Rail Transit Consultants' office

NOTES

1) The geologic sections are based on interpolation between borings and were prepared as an aid in developing design recommendations. Actual conditions encountered during construction may be different. Geologic sections are plotted for AR (Outbound) track.
2) Track alignment plan and profiles are approximate.
3) Borings projected more than 200' to the profile line were considered in some of the interpretation of subsurface conditions. However, final interpretation is based on numerous factors and may not reflect the boring logs as presented on Drawings No. K-001.
4) Displacements shown along faults are graphic representations. Actual vertical offsets are unknown.
5) Additional information on observation wells (OW) and pump wells (PW) , located in the Union Station vicinity, is presented in the report titled "Union Station Area Aquifer Pump Test", dated November 11, 1986.
6) CONTRACTOR SHOULD BE AWARE OF THE PRESENCE OF COBBLES AND BOULDERS AT LOWER DEPTHS IN THE BORINGS, ABOVE THE PUENTE FORMATION

REVISIONS

1) Added supplemental borings to plan and geologic section.
2) The following data was added to boring logs

Boring 5-1 : Drill Rig - Failing 1500
Boring 5-2 : Drill Rig - Failing 1500
Boring 5-3 : Drill Rig - Failing 1500
Boring 5-4 : Drill Rig - Failing 1500
Boring 5-5 : Drill Rig - Failing 1500

HALF SIZE

REV	DATE	BY	SUB	APP	DESCRIPTION
0	8/31/87	JAR	WJA		INITIAL ISSUE

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DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE 2-13-87

N/A

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
RTD

CCI/ESA/GRC
General Geotechnical Consultants
SUBMITTED Howard A. Spellman 8-13-87

DMJM/PBQD/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS
APPROVED Edward Schaeffer

LA CBD TO NORTH HOLLYWOOD
UNION STATION

EXPLANATIONS, NOTES AND REVISIONS

CONTRACT NO A136
DRAWING NO K-002
REV 0
SCALE NONE
SHEET NO 48

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHEN AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

Converse Consultants, Inc.
Earth Sciences Associates
Geo/Resource Consultants

BORING LOG 5-1

Proj: DESIGN UNIT A135 Date Drilled 2-4-83 Ground Elev. 279.1'
Drill Rig ______ Logged By B. Inghram Total Depth 85.0
Hole Diameter 4 3/4" Hammer Weight & Fall 320 lbs. @ 36"

Depth	USCS	Material Classification	Sample	Blows/ft	Sample Type	Remarks
0		0.0-0.4 ASPHALT PAVEMENT			RD	
	SM	0.4-2.0 FILL SILTY SAND: mottled brown, moist, dense	1-1		DR	
2	SM, ML	ALLUVIUM 2.0-4.0 SILTY SAND/SANDY SILT: red-brown moist, medium dense, fine sand with silt, slightly porous				
4	SM	4.0-8.0 SILTY SAND: gray brown, moist, medium dense, fine sand with silt and trace gravel to 1"	1-2		DR RD	
8	SW	8.0-70.0 GRAVELLY SAND				
10				100	SS RD	Refusal at 5"
20						Sheet 1 of 4

Project DESIGN UNIT A135 Date Drilled 2-4-83 Hole No. 5-1

Depth	USCS	Material Classification	Sample	Blows/ft	Sample Type	Remarks
20	SW	8.0-70.0 GRAVELLY SAND (continued)			DR RD	NO RECOVERY
30			1-3		DR RD	POOR RECOVERY
34		Intermittent lenses of increased gravel content				
40			1-4		DR RD	Sulphur odor in sample Poor Recovery
44						Sheet 2 of 4

Project DESIGN UNIT A135 Date Drilled 2-4-83 Hole No. 5-1

Depth	USCS	Material Classification	Sample	Blows/ft	Sample Type	Remarks
44	SW	8.0-70.0 GRAVELLY SAND (continued)	1-5		RD CCI DR RD	Sulphur odor Poor Sample Recovery
50					CCI DR RD	No Recovery
56			1-6		CCI DR RD	Slight Sulphur Odor Poor Sample Recovery
66			1-7		CCI DR RD	Sulphur Odor Poor Recovery
68						Sheet 3 of 4

Project DESIGN UNIT A135 Date Drilled 2-4-83 Hole No. 5-1

Depth	USCS	Material Classification	Sample	Blows/ft	Sample Type	Remarks
68	SW	8.0-70.0 GRAVELLY SAND (continued)			RD	
70	B	70.0-79.5 BOULDERS				
74						No Recovery
76						Refusal
80		BEDROCK 79.5-85.0 SANDY CLAYSTONE AND CLAYEY SANDSTONE: olive-gray, moist; fresh, thinly laminated, friable strength, friable to low hardness. Tends to fracture along laminations	1-8		DR RD	
84			1-9		DR	
85		END OF BORING 85.0 FT				Piezometer set to 85.0' perforated interval: 45'-85'
92						Sheet 4 of 4

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Converse Consultants, Inc.
Earth Sciences Associates
Geo/Resource Consultants

BORING LOG 5-2

Proj: DESIGN UNIT A135 Date Drilled 2-3-83 Ground Elev. 292.2'
Drill Rig ______ Logged By B. Inghram Total Depth 85.0'
Hole Diameter 4 3/4" Hammer Weight & Fall 320 lbs. @ 36"

Depth	USCS	Material Classification	Sample	Blows/ft	Sample Type	Remarks
0		0.0-0.4 Concrete Slab; 0.4-0.8 Base Course			RD	
2	ML & CL	0.8-14.0 FILL CLAYEY SILT AND SILTY CLAY: mottled brown and green-gray, moist, stiff with trace gravel and fine sand	2-1		DR RD	
10		becoming hard		8 / 11 / 24 / RD	SS	
13		13.0 Rock or Concrete		100	SS	SPT REFUSAL AT 0"
14	SM	14.0-19.0 ALLUVIUM SILTY SAND: gray-brown, moist, medium dense, fine to very fine sand with silt				
16				6 / 7 / 14 / RD	SS	
19	SW	19.0-72.0 GRAVELLY SAND				
20						Sheet 1 of 4

Project DESIGN UNIT A135 Date Drilled 2-3-83 Hole No. 5-2

Depth	USCS	Material Classification	Sample	Blows/ft	Sample Type	Remarks
20	SW	19.0-72.0 GRAVELLY SAND (continued) gray, dense, medium to coarse sand, gravel to 2"	2-2		DR RD	Disturbed Sample
30				70 / 100 / RD	SS	Refusal at 9"
38		Increasing content of fine and very fine sand				
40					DR RD	No sample recovery
44						Sheet 2 of 4

Project DESIGN UNIT A135 Date Drilled 2-3-83 Hole No. 5-2

Depth	USCS	Material Classification	Sample	Blows/ft	Sample Type	Remarks
44	SW	19.0-72.0 GRAVELLY SAND (continued) color change observed to dark gray			RD	
46			2-3		DR RD	Slight sulphur odor poor sample recovery
56					DR RD	no sample recovery
61					DR RD	no sample recovery
67				100	SS RD	Refusal at 5"
68						Sheet 3 of 4

Project DESIGN UNIT A135 Date Drilled 2-3-83 Hole No. 5-2

Depth	USCS	Material Classification	Sample	Blows/ft	Sample Type	Remarks
68	SW	19.0-72.0 GRAVELLY SAND (continued) decreasing gravel content			RD	
70			2-4		DR RD	slight sulphur odor
72	SP	72.0-83.0 SAND: dark gray; very dense; medium sand with trace gravel to 2"				
76				100	SS RD	sulphur odor refusal at 5"
80		fine to very fine sand; thin lenses of silty sand	2-5		DR RD	sulphur odor
83		83.0-84.0 BOULDERS				
84		END OF BORING 84.0 FT				
92						Sheet 4 of 4

HALF SIZE

REV	DATE	BY	SUB	APP	DESCRIPTION

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REV	DATE	BY	SUB	APP	DESCRIPTION
0	1/31/89	JAR	WJA		INITIAL ISSUE

DESIGNED BY
DRAWN BY DKM/JAP
CHECKED BY J.A. Doolittle
IN CHARGE K.M. Prael
DATE 30 NOV. 84

N/A

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
RTD

CCI/ESA/GRC
General Geotechnical Consultants
SUBMITTED K.M. Prael

DMJM/PEQD/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS
APPROVED [signature]

LA CBD TO NORTH HOLLYWOOD
UNION STATION
BORING LOGS 5-1 & 5-2

CONTRACT NO A136
DRAWING NO K-003 REV 0
SCALE NO SCALE
SHEET NO 49

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

Converse Consultants, Inc.
Earth Sciences Associates
Geo/Resource Consultants

BORING LOG 5-3

Proj. DESIGN UNIT A135 | Date Drilled 2-2-83 | Ground Elev 292.8'
Drill Rig ___ | Logged By B. Inghram | Total Depth 80.0'
Hole Diameter 4 3/4" | Hammer Weight & Fall 320#, 36"

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows	Type	REMARKS
0		0.0-0.8 ASPHALT PAVEMENT			RD	
	GW	FILL 0.8-4.6 GRAVEL: gravel to 2-1/2", subangular to subrounded			DW	no sample recovery
					RD	
	ML	4.6-14.0 CLAYEY SILT: green gray, moist, stiff, with variable sand content	3-1		DW	
					RD	
10		very stiff to hard		15 25 45	SS	
					RD	
14	SM	ALLUVIUM 14.0-19.0 SILTY SAND: gray brown, moist, dense, fine to very fine sand with silt			SS	
					RD	
19	SW	19.0-74.0 GRAVELLY SAND				

Sheet 1 of 4

Project DESIGN UNIT A135 | Date Drilled 2-2-83 | Hole No. 5-3

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows	Type	REMARKS
20	SW	19.0-74.0 GRAVELLY SAND continued brown, very dense, medium to coarse sand and gravel to 3", subangular to subrounded			DR	no sample recovery
					RD	
						24-28' intermittent drill rig chatter
24		sand and gravel strata				
30					DR	poor sample recovery
					RD	
40					DR	sulphur odor
					RD	drill rig chatter at 41'

Sheet 2 of 4

Project DESIGN UNIT A135 | Date Drilled 2-2-84 | Hole No. 5-3

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows	Type	REMARKS
44	SW	19.0-74.0 GRAVELLY SAND continued			RD	
50			3-2		DR	sulphur odor in sample
					RD	
52		sand and gravel strata				53' intermittent drill rig chatter to 58'
60					DR	slight sulphur odor in sample
					RD	poor recovery

Sheet 3 of 4

Project DESIGN UNIT A135 | Date Drilled 2-2-83 | Hole No. 5-3

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows	Type	REMARKS
68	SW	19.0-74.0 GRAVELLY SAND continued			RD	
70			3-3		DR	slight sulphur odor in sample
					RD	
74	SP	74.0-80.0 SAND: dark gray, medium dense to dense, fine to very fine, micaceous silty sand lenses				
79			3-4		DR	sulphur odor in sample
80		End of Boring 80.0'				

Sheet 4 of 4

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Converse Consultants, Inc.
Earth Sciences Associates
Geo/Resource Consultants

BORING LOG 5-4

Proj. DESIGN UNIT A135 | Date Drilled 1-31-83 | Ground Elev 280.6'
Drill Rig ___ | Logged By B. Inghram | Total Depth 80.0'
Hole Diameter 4 3/4" | Hammer Weight & Fall 320#, 36"

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows	Type	REMARKS
0		0.0-0.3 ASPHALT PAVEMENT			RD	
	ML	FILL 0.3-3.5 SANDY SILT: dark brown, moist, stiff, with fine to medium sand, trace gravel and brick chunks	4-1		DR	
					RD	
		3.5-4.0 CONCRETE BLOCK				
4	SM	ALLUVIUM 4.0-7.0 SILTY SAND: gray brown, moist, dense, fine to very fine sand with silt	1-1	18 21 24	SS	
					RD	
7	SP	7.0-18.0 SAND: gray, moist, dense, clean fine sand				
10			4-2		DR	
					RD	
15			1-2	5 4 11	SS	
					RD	
18	SW	18.0-28.0 GRAVELLY SAND: brown/gray/white, moist, medium to coarse sand with gravel to 2", subrounded to subangular grains				

Sheet 1 of 4

Project DESIGN UNIT A135 | Date Drilled 1-31-83 | Hole No. 5-4

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows	Type	REMARKS
20	SW	18.0-28.0 GRAVELLY SAND continued	4-3		DR	
					RD	
25				100	SS	Refusal at 5"
					RD	
28	SP CL	28.0-41.0 SAND/SILTY CLAY: gray, moist, very dense clean sand, interbeds of dark gray, stiff, moist silty clay				
30			4-4		DR	
					RD	
35			1-3	67 55 83	SS	
					RD	
40						no sample recovery
41	SW	41.0-68.0 GRAVELLY SAND: dark gray, very dense, subrounded grains, fine to coarse sand with gravel to 1", micaceous				

Sheet 2 of 4

Project DESIGN UNIT A135 | Date Drilled 1-31-83 | Hole No. 5-4

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows	Type	REMARKS
44	SW	41.0-68.0 GRAVELLY SAND continued			RD	
45				25 70 100	SS	Refusal at 17"
					RD	
50		50.5' clay interbeds	4-5		DR	sulphurous odor in sample
					RD	
55				100	SS	sulphurous odor refusal at 3"
					RD	
60			4-6		DR	sulphur/hydrothermal odor
					RD	
65				105 50	SS	sulphur odor refusal at 7"
					RD	

Sheet 3 of 4

Project DESIGN UNIT A135 | Date Drilled 1-31-83 | Hole No. 5-4

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows	Type	REMARKS
68	SP	68.0-75.0 SAND: gray, dense, micaceous, fine to very fine sand			RD	
70			4-7		DR	sulphur/hydrothermal odor in sample
					RD	
75	SW	75.0-80.0 GRAVELLY SAND: gravel to 1-1/2", gray, dense to very dense				
79			4-8		DR	
80		End of Boring 80.0'				

Sheet 4 of 4

HALF SIZE

REV	DATE	BY	SUB	APP	DESCRIPTION
0	8/31/84	JAR	WJA		INITIAL ISSUE

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DESIGNED BY ___
DRAWN BY DKM/JAP
CHECKED BY J.A. Doolittle
IN CHARGE K.M. Pride
DATE 30 Nov. 84

N/A

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
RTD

CCI/ESA/GRC
General Geotechnical Consultants
SUBMITTED K.M. Pride

DMJM/PBQD/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS
APPROVED [signature]

LA CBD TO NORTH HOLLYWOOD
UNION STATION
BORING LOGS 5-3 & 5-4

CONTRACT NO A136
DRAWING NO K-004 | REV 0
SCALE NO SCALE
SHEET NO 50

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

Converse Consultants, Inc.
Earth Sciences Associates
Geo/Resource Consultants

BORING LOG 5-5

Proj: DESIGN UNIT A-135 — Date Drilled: 2/1/83 — Ground Elev: 280.8'
Drill Rig: — Logged By: B. Ingbram — Total Depth: 100.0
Hole Diameter: 4 3/4" — Hammer Weight & Fall: 320 lb, 30"

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS/6"	DRIVE METHOD	REMARKS
0		0.0-0.3 Asphalt Pavement			RD	
	ML/SM	0.3-5.5 FILL - SANDY SILT & SILTY SAND. Mottled and intermixed, moist, stiff/medium dense w/brick debris		16 / 25 / 57	SS / RD	
	SM	ALLUVIUM. 5.5-11.0 SILTY SAND. Gray-brown, moist, medium dense, fine to very fine sand with silt	S-1		DR / RD	
	SP	11.0-14.0 SAND. Gray-brown, moist, medium dense to dense, poorly graded fine sand with trace silt		10 / 17 / 25	SS / RD	
	SW	14.0-62.0 GRAVELLY SAND. brown, dense, medium to coarse sand with gravel to 2", subangular to subrounded grains	S-2		DR / RD	
20						Sheet 1 of 5

Project: DESIGN UNIT A-135 — Date Drilled: 2/1/83 — Hole No: 5-5

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS/6"	DRIVE METHOD	REMARKS
20	SW	14.0-62.0 GRAVELLY SAND (Cont'd)		1/5"	RD	refusal at 5"
		25.5-26.0 lens of fine sand	S-3		DR / RD	
		30.0 color change to dark gray		75 / 1/2"	SS / RD	slight gas odor. refusal at 9"
			S-4		DR / RD	slight gas odor
			J-1		SS / RD	refusal at 15"
44						Sheet 2 of 5

Project: DESIGN UNIT A-135 — Date Drilled: 2/1/83 — Hole No: 5-5

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS/6"	DRIVE METHOD	REMARKS
44		14.0-62.0 GRAVELLY SAND (Cont'd)			RD	
					DR / RD	sulphur odor. poor sample recovery
		decreasing gravel content				
			S-5		DR / RD	slight sulphur odor
	SP	62.0-78.0 SAND. dark gray, dense, fine to very fine sand, micaceous				
68						Sheet 3 of 5

Project: DESIGN UNIT A-135 — Date Drilled: 2/1/83 — Hole No: 5-5

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS/6"	DRIVE METHOD	REMARKS
68	SP	62.0-78.0 SAND (Cont'd)			RD	
			S-6		DR / RD	sulphur odor
		78.0-90.0 BOULDERS			DR / RD	no sample recovery
			J-2		RD	
90		BEDROCK. 90.0-100.0 CLAYSTONE (see next page)				
92						Sheet 4 of 5

Project: DESIGN UNIT A-135 — Date Drilled: 2/1/83 — Hole No: 5-5

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS/6"	DRIVE METHOD	REMARKS
92		90.0-100.0 CLAYSTONE (Cont'd). olive-gray color, moist; plastic to friable strength, soft to friable hardness, thinly laminated with silty claystone and sandstone blebs, tends to fracture along laminations	S-7		RD / DR	
100		End of Boring 100.0 ft.				piezometer set to 100', perforated in lowest 40'
116						Sheet 5 of 5

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

Converse Consultants, Inc.
Earth Sciences Associates
Geo/Resource Consultants

BORING LOG 6A

Proj: DESIGN UNIT A135 — Date Drilled: 2-10-83 — Ground Elev: 290.0'
Drill Rig: BUCKET AUGER — Logged By: D. Gillette — Total Depth: 55.0'
Hole Diameter: 36" — Hammer Weight & Fall: NA

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS/6"	DRIVE METHOD	REMARKS
0	SP	ALLUVIUM. 0.0-22.0 SAND AND GRAVEL, light brown, medium to coarse sand with silt, little gravel to 1 1/2", subrounded, trace cobbles and boulders, moist, medium dense				0.0-15.0 belling and caving
		12.0-13.0 clay with trace gravel				
		15.5-16.0 clay				
		19.0-19.5 gravel lens				
20		W.L. 19.8'				Sheet 1 of 3

Project: DESIGN UNIT A135 — Date Drilled: 2-10-83 — Hole No: 6A

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS/6"	DRIVE METHOD	REMARKS
20	SP	0.0-22.0 SAND AND GRAVEL continued				
22	SM	22.0-55.0 SILTY SAND, olive gray, fine sand, slightly micaceous, moist to very moist, medium dense				water seeps at 22.0'
		28.0 dark greenish gray				
44						Sheet 2 of 3

Project: DESIGN UNIT A135 — Date Drilled: 2-10-83 — Hole No: 6A

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS/6"	DRIVE METHOD	REMARKS
44	SM	22.0-55.0 SILTY SAND continued				
55		END OF BORING 55.0'				Special Hole Closure: 2-14-83 Hole filled to 25' with pea gravel. 2-15-83 Hole pumped to 25' and slurry placed to -1'. 2-16-83 Placed concrete cap to surface
68						Sheet 3 of 3

HALF SIZE

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REV	DATE	BY	SUB	APP	DESCRIPTION
0	8/3/84	JAR	WJA		INITIAL ISSUE

DESIGNED BY:
DRAWN BY: DKM/JAP
CHECKED BY: J.A. Doolittle
IN-CHARGE: K.M. Pride
DATE: 30 Nov 84

N/A

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
RTD

CCI/ESA/GRC
General Geotechnical Consultants
SUBMITTED: K.M. Pride

DMJM/PBQD/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS
APPROVED: Howard J. Kaloff

LA CBD TO NORTH HOLLYWOOD
UNION STATION
BORING LOGS 5-5 & 6A

CONTRACT NO: A136
DRAWING NO: K-005 — REV: 0
SCALE: NO SCALE
SHEET NO: 51

LOG OF BORING NO. OW-1

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

MOISTURE (%)	DRY DENSITY (PCF)	OVA READING (PPM)	PENETRATION RESISTANCE BLOWS/FOOT	SAMPLE NO.	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					0		
		0	10	1		Silty SAND (SM) gray, slightly moist	
		0	7	2	5		
		0	27	3	10	Sandy GRAVEL (GP)	
		0	47	4	15	Silty SAND (SM)	
		0	23	5	20	Sandy GRAVEL (GP), some cobbles	
		0	38	6	25	No recovery Silty CLAY (CL) grayish brown, some cobbles	
13.70	118.2	0	72	7	30	Sandy GRAVEL (GP) gray	
		0	97	8	35		
		0	60	9	40	Sandy GRAVEL (GP) gray	
9.90	112.4	2	82	10	45		
		1	72	11	50		
						Silty CLAY (CL) gray	
			48	12	55	Sandy GRAVEL (GP) gray, cobbles Silty CLAY (CL) greenish gray	
						Gravelly SAND (SP)	
12.70	123.3	12	73	13	60	Silty SAND (SW-SM) traces of gravel, H2S odor	
			85	14	65	no recovery	
5.30	111.5	9	91	15	70	Silty SAND (SM) gray, some gravel, H2S odor	
					75		

ND:Not detected

DATE DRILLED: 11-17-88
EQUIPMENT USED: 6" Rotary Wash
GROUNDWATER ELEVATION: NOT MEASURED

GEOFON Incorporated | PROJECT NO.: METRO A-135

LOG OF BORING NO. OW-1

MOISTURE (%)	DRY DENSITY (PCF)	OVA READING (PPM)	PENETRATION RESISTANCE BLOWS/FOOT	SAMPLE NO.	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
		10	95	16	80	Silty Sand (SM)	
					85		
		10	70	17	90	Increasing gravel, poorly graded sand SILTSTONE unsaturated	
					95		
		0		18		H2S odor	
						Total depth drilled, 98 feet	

ND:Not detected

DATE DRILLED: 11-17-88
EQUIPMENT USED: 6" Rotary Wash
GROUNDWATER ELEVATION: NOT MEASURED

GEOFON Incorporated | PROJECT NO.: METRO A-135

LOG OF BORING NO. OW-1

LOG OF BORING NO. OW-2

MOISTURE (%)	DRY DENSITY (PCF)	OVA READING (PPM)	PENETRATION RESISTANCE BLOWS/FOOT	SAMPLE NO.	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					0	Silty SAND (SM) brown, some clay, loose and dry	
			11	1A	5	Clayey SILT (ML) dark brown with black mottling some fine sand, firm and dry	
			10	1	10	Trace of gravel	
16.60	116.9		7	2	15	Silty SAND (SM) gray, some gravel, loose and dry, piece of brick	
			8	3	20	Silty SAND (SM) light brown, very fine to fine sand, loose and dry, traces of mica	
16.40	105.9		11	4	25	Silty SAND (SM) medium to coarse, some gravel to 1", grayish-brown, loose and dry, pieces of brick	
			67	5	30	SAND (SP) light brown, some gravel to 1/2", dense and dry	
12.00	102.6		47	6	35	Silty SAND (SP-SM) light brown, dry, dense	
7.50	124.6		63	7	40	SAND (SW) medium to coarse, some gravel to 1 1/2", gray, trace of silt, dense and dry	
21.80	95.3		8	8	45	Silty SAND (SM) gray, very fine to fine sand, loose and dry Gravelly SAND (SP)	
17.60	106.6		40	9	50	Gravelly SAND (SP) gray, medium to coarse Sandy SILT (ML) gray, sand is fine to very fine, stiff and dry Gravelly SAND (SP)	
7.70			70	10	55	Silty SAND-Gravelly SAND (SM-SW) gray, gravel to 1", dense and dry Increasing gravel size and percentage	
			64	11	60	Gravelly SAND (SP) gray, medium to coarse, dense to very dense and dry Sandy SILT (ML) Gravelly SAND (SP) Sandy SILT (ML)	
					65		
			97	12	70	Gravelly SAND (SP) gray, very dense and dry, H2S odor	
						Sandy SILT (ML)	
					75	Gravelly SAND (SP)	
						Sandy SILT (ML)	
						Gravelly SAND (SP)	

ND:Not detected

DATE DRILLED: 11-16-88
EQUIPMENT USED: 6" Rotary Wash
GROUNDWATER ELEVATION: NOT MEASURED

GEOFON Incorporated | PROJECT NO.: METRO A-135

LOG OF BORING NO. OW-2

MOISTURE (%)	DRY DENSITY (PCF)	OVA READING (PPM)	PENETRATION RESISTANCE BLOWS/FOOT	SAMPLE NO.	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
			55	13	80	Gravelly SAND (SP) gray, gravel to 1", dense and dry, H2S odor	
			50	14	85	SAND (SP) medium to coarse, trace of gravel, dense and dry, H2S odor	
						Total depth drilled, 86.5 feet	

ND:Not detected

DATE DRILLED: 11-16-88
EQUIPMENT USED: 6" Rotary Wash
GROUNDWATER ELEVATION: NOT MEASURED

GEOFON Incorporated | PROJECT NO.: METRO A-135

LOG OF BORING NO. OW-2

THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U. S. DEPARTMENT OF TRANSPORTATION, URBAN MASS TRANSPORTATION ADMINISTRATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA

REV	DATE	BY	SUB	APP	DESCRIPTION
0	10/6/89	JAR	WJA		INITIAL ISSUE

DESIGNED BY | DRAWN BY | CHECKED BY | IN CHARGE | DATE 02OCT89

N/A

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
RTD

METRO RAIL TRANSIT CONSULTANTS
DMJM/PBQD/KE/HWA
GENERAL CONSULTANTS
SUBMITTED
APPROVED

LA CBD TO NORTH HOLLYWOOD
UNION STATION

BORING LOGS OW-1 & OW-2

CONTRACT NO A136
DRAWING NO K-006 REV 0
SCALE NO SCALE
SHEET NO 52

LOG OF BORING NO. OW-3

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

MOISTURE (%)	DRY DENSITY (PCF)	OVA READING (PPM)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE NO.	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					0	Silty SAND (SM) brown, trace of clay Cobble	
		0	16	1			
		0	18	2	5	Sandy CLAY (CL) brown with black mottling, some silt and gravel to 1", firm and dry	
		0	16	3	10	Increasing gravel Bricks and wood	
		0	16	4	15	Silty SAND (SM) dark brown, very fine to fine micaceous sand, firm and dry, traces of some gravels	
15.80	106.9	0	27	5	20	Silty GRAVEL (GM) some fine to medium sand, brown, medium dense and dry	
		0	70	6	25	Gravelly SAND (SP) light brown, gravel to 1 1/2", very dense and dry	
					30	No recovery	
2.60	128.4	0	47	7	35	SAND (SP) fine to medium, light brown, trace of gravel, dense and dry	
		0	48	8	40	SAND (SP) fine to medium, some coarse with a trace of gravel, gray, dense and dry	
8.90	120.9	0.1	62	9	45		
17.50	100.4	0	95	10	50	Increasing gravel Silty SAND-Gravelly SAND (SM-SP) gray, medium to coarse sand with gravel to 1 1/2", very dense and dry Increasing gravel	
		0.4	75	11	55	Gravelly SAND (SP) gray, medium to coarse sand with gravel to 1 1/2", very dense and dry Decreasing gravel size and percentage	
		1.5	80	12	60	Gravelly SAND (SP) gray, medium to coarse with gravel to 3/4", very dense and dry, H2S odor Sandy SILT (ML) SAND (SP)	
					65		
		15	105	13	70	Gravelly SAND (SP) gray, medium to coarse sand with gravel to 3/4", very dense and dry, H2S odor	
					75	SAND (SP) medium to coarse with some gravel, very dense and wet, H2S odor	

ND: Not detected

DATE DRILLED: 11-21-88
EQUIPMENT USED: 8" Rotary Wash
GROUNDWATER ELEVATION: NOT MEASURED

GEOFON Incorporated — PROJECT NO.: METRO A-135

LOG OF BORING NO. OW-3

LOG OF BORING NO. OW-3 (continued)

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

MOISTURE (%)	DRY DENSITY (PCF)	OVA READING (PPM)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE NO.	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
12.10	123.1	200	87	14	80	SAND (SP) medium to coarse with some gravel, very dense and wet, H2S odor	
		30	85	15	85	Gravelly SAND (SP) gray, medium to coarse sand with gravel to 1", very dense and wet, H2S odor	
		290	76	16	90	Sandy SILT (ML) Silty SAND (SM) fine to medium sand with a trace of gravel, very dense and wet, H2S odor, very stiff SILTSTONE and thinly bedded SANDSTONE greenish-gray, H2S odor	
					95		
		380	72	17		SILTSTONE-CLAYSTONE greenish gray, thin sand layers, very stiff, H2S odor	

Total depth drilled, 98 feet

ND: Not detected

DATE DRILLED: 11-21-88
EQUIPMENT USED: 8" Rotary Wash
GROUNDWATER ELEVATION: NOT MEASURED

GEOFON Incorporated — PROJECT NO.: METRO A-135

LOG OF BORING NO. OW-3

LOG OF BORING NO. OW-4

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

MOISTURE (%)	DRY DENSITY (PCF)	OVA READING (PPM)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE NO.	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					0	ASPHALT FILL	
					5	Silty SAND (SM) dark gray, slightly moist, trace of gravel no recovery	
			16	1	10	Silty SAND (SM) light brown, slightly moist, some gravel.	
			11	2	15	Silty SAND (SM) dark gray, slightly moist, some bricks and wood	
			10	3	20		
			28	4	25	Gravelly SAND (SP) gray, slightly moist	
6.70	132.3		95	5	30	Silty GRAVEL-Sandy GRAVEL (GM-GW) gray, medium moist	
			28	6	35		
7.80	101.1		15	7	40	Silty CLAY (CL) dark gray Sandy GRAVEL (GW) gray	
			30	8	45		
			95	9	50	Sandy GRAVEL (GW) gray, slightly moist.	
			75	10	55		
			52	11	60	Sandy SILT (ML) Gravelly SAND (SP) gray, fine to medium sand, some silt	
					65		
			72	12	70	Gravelly SAND (SP) gray, some silt, traces of clay, Occasional gravel to 1/2".	
					75		

ND: Not detected

DATE DRILLED: 11-14-88
EQUIPMENT USED: 6" Rotary Wash
GROUNDWATER ELEVATION: NOT MEASURED

GEOFON Incorporated — PROJECT NO.: METRO A-135

LOG OF BORING NO. OW-4

LOG OF BORING NO. OW-4 (continued)

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

MOISTURE (%)	DRY DENSITY (PCF)	OVA READING (PPM)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE NO.	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
			80	13	80	Gravelly SAND (SP) gray.	
			110	14	85	no recovery Increasing gravel size and percentage	
			125	15	90	Clayey SILT (ML) Gravelly SAND (SP) gray, medium to coarse, slightly moist, very dense	
			41	16	95	SILTSTONE and thinly bedded SANDSTONE greenish-gray, very fine sand, dense and dry, H2S odor.	
			44	17		Bedding planes at approximately 30 degrees	

Total depth drilled, 99 feet

ND: Not detected

DATE DRILLED: 11-14-88
EQUIPMENT USED: 6" Rotary Wash
GROUNDWATER ELEVATION: NOT MEASURED

GEOFON Incorporated — PROJECT NO.: METRO A-135

LOG OF BORING NO. OW-4

HALF SIZE

REV	DATE	BY	SUB.	APP.	DESCRIPTION
0	10/2/89	JAR	WJA		INITIAL ISSUE

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DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE 02OCT89

N/A

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
RTD

METRO RAIL TRANSIT CONSULTANTS
DMJM/PBQD/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS
SUBMITTED
APPROVED

LA CBD TO NORTH HOLLYWOOD
UNION STATION

BORING LOGS OW-3 & OW-4

CONTRACT NO A136
DRAWING NO K-007 REV 0
SCALE NO SCALE
SHEET NO 53

LOG OF BORING NO. OW-5

MOISTURE (%)	DRY DENSITY (PCF)	OVA READING (PPM)	PENETRATION RESISTANCE BLOWS/FOOT	SAMPLE NO.	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					0	THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED	
		0	11	1	5	Silty SAND (SM) dark brown, some gravel, slightly moist	
		0	22	2		Sand (SP) light brown, slightly moist.	
		0	33	3	10	SAND (SP) fine, light brown, slightly moist, medium dense	
		0	85	4	15	Silty SAND (SM) brown, trace of gravel	
7.10	100.8	0	60	5	20	Sandy GRAVEL (GP) gray, some gravel to 3/4", dense and dry.	
		0	33	6	25	No recovery SAND (SP)	
						Silty SAND (SM)	
7.60	109.6	0	85	7	30	Sandy GRAVEL (GP)	
		0	60	8	35	No recovery, Granodiorite cobble	
						Silty CLAY (CL) H2S odor Silty SAND (SM)	
		0	60	9	40	No recovery	
						Gravel, strong H2S odor	
		0	60	10	45	Silty SAND (SM) gray, medium to coarse sand with gravel to 1 1/2", very dense and dry, slight H2S odor	
		0	75	11	50	Silty SAND (SM) gray, very dense and dry, some gravel to 3/8"	
		0	75	12	55	No recovery	
		0	70	13	60	No recovery	
					65	No recovery	
						Clayey SILT (ML)	
					70	Gravelly SAND (SW)	
		0	67	14		No recovery Sandy SILT (ML) green, very dense	
		0	65	15	75	Sandy GRAVEL (GP) gray, granodiorite cobbles, no recovery	
		0	45	16		SILTSTONE with thinly bedded SANDSTONE greenish gray, no recovery	

ND:Not detected

DATE DRILLED: 12-21-88
EQUIPMENT USED: 6" Rotary Wash
GROUNDWATER ELEVATION: NOT MEASURED

GEOFON Incorporated — PROJECT NO.: METRO A-135

LOG OF BORING NO. OW-5

LOG OF BORING NO. OW-5 (continued)

MOISTURE (%)	DRY DENSITY (PCF)	OVA READING (PPM)	PENETRATION RESISTANCE BLOWS/FOOT	SAMPLE NO.	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
						THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
					80	SILTSTONE with thinly bedded SANDSTONE	
						Total depth drilled, 83 feet	

ND:Not detected

DATE DRILLED: 12-21-88
EQUIPMENT USED: 6" Rotary Wash
GROUNDWATER ELEVATION: NOT MEASURED

GEOFON Incorporated — PROJECT NO.: METRO A-135

LOG OF BORING NO. OW-5

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIALS IS LARGER THAN # 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN # 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.
		GRAVEL WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURE, NON PLASTIC FINES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN # 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.
			SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES.
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN # 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT IS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY.
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.
	SILTS AND CLAYS	LIQUID LIMIT IS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, PLASTIC SILTS.
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.
	HIGHLY ORGANIC SOILS		PT	PEAT AND OTHER HIGHLY ORGANIC SOILS.

CLASSIFICATION CRITERIA BASED ON FIELD TESTS

PENETRATION RESISTANCE (PR)

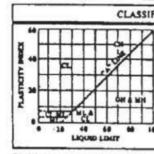
SANDS AND GRAVELS	
RELATIVE DENSITY	BLOWS/FOOT*
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

CLAYS AND SILTS		
CONSISTENCY	BLOWS/FOOT*	STRENGTH**
VERY SOFT	0 - 2	0 - ¼
SOFT	2 - 4	¼ - ½
FIRM	4 - 8	½ - 1
STIFF	8 - 15	1 - 2
VERY STIFF	15 - 30	2 - 4
HARD	OVER 30	OVER 4

* NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1 3/8 INCH I.D.) SPLIT BARREL SAMPLER (ASTM-1586 STANDARD PENETRATION TEST)

** UNCONFINED COMPRESSIVE STRENGTH IN TONS/SQ. FT. READ FROM POCKET PENETROMETER

CLASSIFICATION CRITERIA BASED ON LAB TESTS



GW AND SW – $C_u = \frac{D_{60}}{D_{10}}$ GREATER THAN 4 FOR GW AND 6 FOR SW; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ BETWEEN 1 AND 3

GP AND SP – CLEAN GRAVEL OR SAND NOT MEETING REQUIREMENT FOR GW AND SW

GM AND SM – ATTERBERG LIMIT BELOW "A" LINE OR P.I. LESS THAN 4
GC AND SC – ATTERBERG LIMIT ABOVE "A" LINE P.I. GREATER THAN 7

FINES (SILT OR CLAY)	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	COARSE GRAVEL	COBBLES	BOULDERS
SIEVE SIZES 200	40	10	4	3/4"	3"	12"	

CLASSIFICATION OF EARTH MATERIALS IS BASED ON FIELD INSPECTION AND SHOULD NOT BE CONSTRUED TO IMPLY LABORATORY ANALYSIS UNLESS SO STATED.

GEOFON

REV	DATE	BY	SUB	APP	DESCRIPTION

THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U. S. DEPARTMENT OF TRANSPORTATION, URBAN MASS TRANSPORTATION ADMINISTRATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA

REV	DATE	BY	SUB	APP	DESCRIPTION
0	10/2/89	JAR	WJA		INITIAL ISSUE

DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE 02OCT89

N/A

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
RTD

METRO RAIL TRANSIT CONSULTANTS
DMJM PBQD KE/HWA

SUBMITTED

DMJM/PBQD/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS

APPROVED

LA CBD TO NORTH HOLLYWOOD
UNION STATION

BORING LOG 5 & CLASSIFICATION CRITERIA

CONTRACT NO A136
DRAWING NO K-008 REV 0
SCALE NO SCALE
SHEET NO 54

THE BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THE LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

Converse Consultants, Inc.
Earth Sciences Associates
Geo/Resource Consultants

BORING LOG 5

Proj: DESIGN UNIT A135 Date Drilled 1-2-80/1-4-80 Ground Elev. 280'
Drill Rig Failing 1500 Logged By Stephen M. Testa Total Depth 150.0'
Hole Diameter 6 7/8, 4 7/8 Hammer Weight & Fall 140 lb @ 30"

Depth	USCS	Material Classification	Sample	Blows/6"	Drill Mode	Remarks
0		0.0-0.3 ASPHALT			RD	
	GP	ALLUVIUM 0.3-52.0 SANDY GRAVEL: primarily gravel up to 6" with medium to coarse sand; poorly graded				moderate to heavy rig chatter from 3.0

Sheet 1 of 7

Project DESIGN UNIT A135 Date Drilled 1-2-80 Hole No. 5

Depth	USCS	Material Classification	Sample	Blows/6"	Drill Mode	Remarks
20	GP	0.3-52.0 SANDY GRAVEL: (continued)			RD	moderate to heavy rig chatter from 3.0

Sheet 2 of 7

Project DESIGN UNIT A135 Date Drilled 1-2-80 Hole No. 5

Depth	USCS	Material Classification	Sample	Blows/6"	Drill Mode	Remarks
44	GP	0.3-52.0 SANDY GRAVEL: (continued)			RD	heavy rig shaking to 52.0
52	SP	52.0-55.0 GRAVELLY SAND: medium dark gray; medium to coarse sand with gravel up to 1 inch; sewer odor	1-1	47 50	SS	0.5-1.5 recovery refusal at 10"
					RD	rig shaking from 55.0 to 60.0
55	GP	55.0-84.2 SANDY GRAVEL:				
60				80 50	SS	no recovery refusal at 8"
					RD	heavy rig shaking from 60.6 to 66.0
66		medium dark gray; very fine sand moist	1-2	8 20 50	SS	0.3/1.5 recovery refusal at 16"
					RD	

Sheet 3 of 7

Project DESIGN UNIT A135 Date Drilled 1-2-81/1-3-81 Hole No. 5

Depth	USCS	Material Classification	Sample	Blows/6"	Drill Mode	Remarks
68	GP	55.0-84.2 SANDY GRAVEL: (continued)			RD	
70				50 50	DR	no recovery refusal at 7"
					RD	moderate to heavy rig shaking from 70.6 to 84.2
76						heavy rig shaking at 75.0
80						heavy rig shaking at 80.0
84		BEDROCK 84.2-150.0 CLAYSTONE: primarily olive gray claystone with alternating very thin to thin lamina of dusky yellowish brown silty claystone fossiliferous PHYSICAL CONDITION: soft to friable hardness; plastic to friable strength; fresh; tends to fracture along bedding plane	Box 1		PB	1-2-81 1-3-81 1.0/1.0 recovery 1.5/2.5 recovery 1.6/2.5 recovery

Sheet 4 of 7

Project DESIGN UNIT A135 Date Drilled 1-3-80 Hole No. 5

Depth	USCS	Material Classification	Sample	Blows/6"	Drill Mode	Remarks
92		84.2-150.0 CLAYSTONE: (continued) primarily claystone from 93.5 to 100.4	Box 1			pocket penetrometer >4.5 tsf 2-9-81 2.2/2.5 recovery
94						1.9/2.5 recovery
96		thin sandstone lamina at 96.8; 97.1'				2.0/2.5 recovery
98			Box 2			pocket penetrometer >4.5 tsf 2-9-81 1.9/2.5 recovery
101		alternating very thin to medium lamina of claystone; sandstone and silty claystone				1.9/2.5 recovery
104						1.5/2.5 recovery
108						pocket penetrometer >4.5 tsf 2-9-81 2.5/2.5 recovery
110			Box 3			2.5/2.5 recovery
112						1.9/2.5 recovery
116						2.5/2.5 recovery

Sheet 5 of 7

Project DESIGN UNIT A135 Date Drilled 1-3-80 Hole No. 5

Depth	USCS	Material Classification	Sample	Blows/6"	Drill Mode	Remarks
116		84.2-150.0 CLAYSTONE: (continued) primarily claystone with alternating very thin to medium lamina of sandstone; micaceous; fossiliferous claystone	Box 3		PB	2.5/2.5 recovery
120		dip of bedding planes variable (10-46°); folding apparent				1.7/2.5 recovery
122						1.9/2.5 recovery
125		folding apparent from 125-126.0	Box 4			1.9/2.5 recovery
128		alternating lamina of sandstone; claystone and silty claystone; dark yellowish brown				1.7/2.5 recovery
130						pocket penetrometer >4.5 tsf 1.8/2.5 recovery
132		132' clay filled fracture with offsets				1.3/2.5 recovery
135						1.4/2.8 recovery
138		PHYSICAL CONDITIONS: soft to friable hardness; plastic to friable strength; fresh; tends to fracture along bedding plane; friable sandstone lamina	Box 5			2.0/2.7 recovery

Sheet 6 of 7

Project DESIGN UNIT A135 Date Drilled 1-3-81 Hole No. 5

Depth	USCS	Material Classification	Sample	Blows/6"	Drill Mode	Remarks
140		84.2-150.0 CLAYSTONE: (continued) very thin to medium alternating lamina of claystone; sandstone and silty claystone; variable thickness of lamina; primary claystone to 142.3; very fine sandstone from 142.3-142.8; 143.1-145.3				pocket penetrometer in sand lens 3.5 1.9/2.8 recovery
142						1.5/2.7 recovery
145			Box 5			
146		PHYSICAL CONDITION: soft to friable hardness; plastic to friable strength; fresh; tends to fracture along bedding plane; notably sandstone lamina				1.8/2.0 recovery
148						2.0/2.7 recovery
150	BH	TERMINATED HOLE AT 150.0'				12-3-81 12-4-81 Installed 100.0' Piezometer

Sheet 7 of 7

RECORD DRAWING

REV.	DATE	BY	SUB.	APP.	DESCRIPTION

THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U. S. DEPARTMENT OF TRANSPORTATION, URBAN MASS TRANSPORTATION ADMINISTRATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA

REV.	DATE	BY	SUB.	APP.	DESCRIPTION
2	5-3-91	RCV	9/20		NO REVISIONS INDICATED ON CM'S AS BUILT MARK UPS RECEIVED 5-3-91
1	6-4-85	CM			REVISED PER CR5-208

DESIGNED BY
DRAWN BY DKM/JAP
CHECKED BY J.A. Apolitto
IN CHARGE K.M. Hill
DATE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
RTD

CCI/ESA/GRC
General Geotechnical Consultants
SUBMITTED K.M. Hill

DMJM/PBQD/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS
APPROVED [signature]

LA CBD TO NORTH HOLLYWOOD
UNION STATION
BORING LOG 5

CONTRACT NO. A-135
DRAWING NO. K-003
SCALE NO SCALE
SHEET NO. 39

Converse Consultants, Inc.
Earth Sciences Associates
Geo/Resource Consultants

BORING LOG 4

Proj: DESIGN UNIT A135 — Date Drilled 2-9-81 — Ground Elev. 275'
Drill Rig Failing 1500 — Logged By Stephen M. Testa — Total Depth 150.0'
Hole Diameter 4 7/8" — Hammer Weight & Fall 140 lb. @ 30"

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows / 6"	Drill Mode	REMARKS
0		0.0-0.2 CONCRETE; 0.2-14.0 FILL: Primarily crushed asphalt and brick			AD	
14	SP	ALLUVIUM 14.0-21.0 GRAVELLY SAND: olive-black; fine to medium sand and gravel; wet; very dense; oil odor	S-1	18 / 30 / 50	SS / RD	1.0/1.5 Recovery

Sheet 1 of 7

Project DESIGN UNIT A 135 — Date Drilled 2-9-81 — Hole No. 4

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows / 6"	Drill Mode	REMARKS
20	SP	14.0-21.0 GRAVELLY SAND: (continued)		50 / 50	DR / SS	No Recovery; SPT at 20.5; No Recovery refusal at 5"
21	GP	21.0-101.5 SANDY GRAVEL; Numerous cobbles and boulders				moderate to heavy rod chatter from 21.0 to 30.0'
30				50	SS / RD	No Recovery refusal at 4" caving at 32'
32		gravel; subangular to subrounded; poorly graded	S-2			
40				50	SS / RD	refusal at 3"; No Recovery; difficulty getting back into hole

Sheet 2 of 7

Project DESIGN UNIT A135 — Date Drilled 2-9-81/2-10-81 — Hole No. 4

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows / 6"	Drill Mode	REMARKS
44	GP	21.0-101.5 SANDY GRAVEL: (continued) numerous cobbles and boulders			RD	moderate to heavy rig shaking continues
60		continued; numerous cobbles and boulders		50	SS / RD	No Recovery refusal at 3"; 2-9-81; 2-10-81

Sheet 3 of 7

Project DESIGN UNIT A 135 — Date Drilled 2-10-81 — Hole No. 4

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows / 6"	Drill Mode	REMARKS
66	GP	21.0-101.5 SANDY GRAVEL: (continued) primarily cobbles and boulders			RD	moderate to heavy rig shaking continues
70				50	SS	No recovery; difficulty getting back into hole; refusal at 3"
80		continued; primarily cobbles and boulders		50	SS	No recovery refusal at 4"

Sheet 4 of 7

Project DESIGN UNIT A135 — Date Drilled 2-10-81 — Hole No. 4

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows / 6"	Drill Mode	REMARKS
92	GP	21.0-101.5 SANDY GRAVEL: (continued) sand with numerous cobbles and boulders			RD	moderate to heavy rig shaking to 101.5
101.5		BEDROCK 101.5-150.0 CLAYSTONE: olive-gray; micaceous claystone; with very fine sand. PHYSICAL CONDITION: massive; soft to friable hardness; plastic to weak strength; fresh; tends to fracture along bedding planes	Box 1		PB	2.8/2.8 recovery; 2.8/2.8 recovery; 2.8/2.8 recovery
107.8		107.8'; very thin to medium banding				
112.1	70	112.1'; clay filled fracture with undeterminable offset	Box 2			2.8/2.8 recovery
115.7		115.7'; alternating claystone and very thin grayish brown fine sand lamina				2.8/2.8 recovery

Sheet 5 of 7

Project DESIGN UNIT A135 — Date Drilled 2-10-81/2-11-81 — Hole No. 4

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows / 6"	Drill Mode	REMARKS
116		101.5-150.0 CLAYSTONE: (continued) PHYSICAL CONDITION: (continued) massive; soft to friable hardness; plastic to weak strength; fresh; tends to fracture along bedding planes; primarily claystone with alternating very thin to thin sandstone lamina 119.3-119.9 intensely fractured	Box 2 / S-1			2.8/2.8 recovery
120			Box 2			2.4/2.8 recovery; 2.8/2.8 recovery; 2-10-81
124		primarily claystone with fine sandstone	Box 3			2-11-81; 2.8/2.8 recovery
128	70					2.8/2.8 recovery
132			Box 4			Pocket penetrometer >4.5 tsf; 2.8/2.8 recovery
134			S-2			2.8/2.8 recovery
136		continued	Box 4 (cont)			2.8/2.8 recovery

Sheet 6 of 7

Project DESIGN UNIT A135 — Date Drilled 2-11-81 — Hole No. 4

Depth	USCS	MATERIAL CLASSIFICATION	Sample	Blows / 6"	Drill Mode	REMARKS
140		101.5-150.0 CLAYSTONE: (continued) 140.7-141.7 cemented; very fine greenish gray sandstone	Box 4			2.8/2.8 recovery
142			Box 5			pocket penetrometer > 4.5 tsf; 1.8/2.8 recovery
144.5	10-20	144.5-145.3 grayish brown; fine to medium sand; partially saturated with oil; 145.3 mottled claystone with oil saturated fine to medium sand				petroleum sample 145-146'; 2.5/2.8 recovery; 2.7/2.7 recovery
148			S-3			
150	BH	150.0' TERMINATED HOLE; E-LOG CONDUCTED				Installed 150.0 piezometer and backfilled hole with pea gravel and bentonite plug at surface

Sheet 7 of 7

NOTES:

1. DRILL THREE PROPOSED BORINGS TO AT LEAST 5 FEET INTO BEDROCK.
2. TAKE SOIL SAMPLES AT EVERY 5-FOOT INTERVALS TO AT LEAST 60 FEET DEPTH REQUIRED AT CLOSER DEPTHS. AFTER 60 FEET TAKE SAMPLES AT EVERY 10-FOOT I VALS OR AS REQUIRED. TAKE N-VALUES (STANDARD PENETRATION TEST) WHILE SAMP USING A SPLIT SPOON OR EQUIVALENT CALIFORNIA SAMPLER.
3. DETERMINE GROUND WATER DEPTHS, DURING AND AFTER DRILLING TO LOCATE EXI GROUNDWATER LEVEL IN EACH BORING. MONITOR FOR PRESENCE OF GAS/OIL.
4. PERFORM NECESSARY LABORATORY TESTING ON RELATIVELY UNDISTURBED SOIL SAMPL DETERMINE MOISTURE/DENSITY, C AND ϕ VALUES, SETTLEMENT PARAMETERS, PERMEAB PARAMETERS AND GRAIN SIZE DISTRIBUTION. CONTRACTOR SHALL PROVIDE ADDIT SOIL TEST DATA, IF REQUIRED BY THE DISTRICT OR ITS DESIGNEE. ALL SAMPLES BE TESTED AND STORED IN A RECOGNIZED SOILS LABORATORY. SAMPLES SHA PRESERVED FOR ONE MONTH AFTER COMPLETION OF TESTINGS AND THEN THE SA SHOULD BE TRANSFERRED TO THE DISTRICT OR ITS DESIGNEE. SOIL TESTS SHA PERFORMED AS PER APPROPRIATE ASTM CRITERIA.
5. TEST WATER AND SOIL SAMPLES FOR MEASURING LEVELS OF PRIORITY POLLUTANTS. AT LEAST FIVE SOIL SAMPLES (COLLECTED IN AIRTIGHT GLASS JARS) AND TWO SAMPLES FOR FOLLOWING CHEMICAL ANALYSIS IN A STATE APPROVED LABORATORY 604, 608, 624, 625, 6020, 8020, 8040, 8080, 8240 AND 8270-APHA 209B.
6. COLLECT AND DISPOSE OF ALL SPOIL AS APPROPRIATE, MEETING CITY AND STATE H REQUIREMENTS.
7. CONTRACTOR MAY USE THESE BORINGS TO PROVIDE OBSERVATION WELLS. IN THAT BORINGS SHALL BE COVERED WITH TIMBER OR METAL PLATE FOR SITE SAFETY UNTIL ARE INSTALLED. CONTRACTOR MUST ENSURE BEFORE DRILLING SPECIFIED REQUIRE FOR INSTALLING AND DEVELOPING WELLS.
8. CHECK PRESENCE OF POLYCHLORINATED BIPHENOLS ALONG THE TRACK AREA IN THE UP TO 5 FEET OF SUBSOIL, IN THE THREE BORINGS OR NEAR BY.
9. FINAL BORING LOGS SHOULD BE PREPARED BY A GEOTECHNICAL ENGINEER. SOILS BE IDENTIFIED BY USING THE UNIFIED SOILS CLASSIFICATION SYSTEM.
10. FIELD AND LABORATORY WORK SHALL BE CARRIED OUT UNDER THE FULL SUPERVISION GEOTECHNICAL ENGINEER REGISTERED IN THE STATE OF CALIFORNIA, WHO WILL PR SEAL AND SIGNATURE ON ALL PERTINENT DOCUMENTS. FIELD AND TEST DATA SHOU MADE AVAILABLE TO THE DISTRICT OR ITS DESIGNEE IMMEDIATELY UPON COMPLE

RECORD DRAWING

REV.	DATE	BY	SUB.	APP.	DESCRIPTION
4	5-3-91	RCV	9DA		NO REVISIONS INDICATED ON CHG. AS BUILT MARK UPS RECEIVED 5-3-91
3	10-8-87	AL			REVISED PER ACR/135-3
2	8-3-87	LG			REVISED PER CR 7-507
1	8-9-85	CM			REVISED PER CK5-208

THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U. S. DEPARTMENT OF TRANSPORTATION, URBAN MASS TRANSPORTATION ADMINISTRATION, UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA

DESIGNED BY
DRAWN BY DKM/JAP
CHECKED BY J.A. Doolittle
IN CHARGE K.M. Pande
DATE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
RTD

CCI/ESA/GRC
General Geotechnical Consultants
SUBMITTED K.M. Pande

DMJM/PBQD/KE/HWA
A JOINT VENTURE
GENERAL CONSULTANTS
APPROVED

LA CBD TO NORTH HOLLYWOOD
UNION STATION
BORING LOG 4

CONTRACT NO. A-135
DRAWING NO. K-002
SCALE NO SCALE
SHEET NO. 38

B.4 SAMPLING AND LOGGING PROCEDURES

Logging and sampling were performed in the field by the geologist. The following describes sampling equipment and procedures and notations used on the lithologic logs to indicate drilling and sampling modes.

B.4.1 Sampling

In the overburden at about 10-foot intervals, the Converse ring sampler was driven using a down-hole 450-pound slip-jar hammer. The Converse sampler was followed with the standard split spoon sample (SPT) driven with a 140-pound hammer with a 30 inch stroke. Where the Puente Formation was encountered, the borings were sampled using a Pitcher-Barrel and Converse ring sampler at 20-foot intervals.

The most common cause for loss of samples or altering the sample interval was when gravels were encountered at the desired sampling depth. Standard penetration blow count information can often be misleading in this type of formation, and it is difficult to recover an undisturbed sample. Therefore at some locations borings were advanced until drill response and cutting suggested a change in formation.

The following symbols were used on the logs to indicate the type of sample and the drilling mode:

Log Symbol	Sample Type	Type of Sampler
B	Bag	-
J	Jar	Split Spoon
C	Can	Converse Ring
S	Shelby Tube	Pitcher Barrel
Box	Box	Pitcher Barrel, Core Barrel

Log Symbol	Drilling Mode
AD	Auger Drill
RD	Rotary Drill
PB	Pitcher Barrel Sampling
SS	Split Spoon
DR	Converse Drive Sample
C	Coring

B.4.2 Field Classification of Soils

All soil types were classified in the field by the site geologist using the "Unified Soil Classification System". Based on the characteristics of the soil, this system indicates the behavior of the soil as an engineering construction material.* Although particle size distribution estimates were based on volume rather than weight, the field estimates should fall within an acceptable range of accuracy.

Table A-1 shows the correlation of standard penetration information and the physical description of the consistency of clays (hand-specimen) and the compactness of sands used by the field geologists for describing the materials encountered.

TABLE A-1 Correlation of N-Values and Consistency/Compactness of Soil Obtained in the Field

N-Values (blows/foot)	Hand-Specimen (clay only)	Consistency (clay or silt)	Compactness (sand only)	N-Values (blows/foot)
0 - 2	Will squeeze between fingers when hand is closed	Very soft	Very loose	0 - 4
2 - 4	Easily molded by fingers	Soft	Loose	4 - 10
4 - 8	Molded by strong pressure of fingers	Firm	---	---
8 - 16	Dented by strong pressure of fingers	Stiff	Medium dense	10 - 30
16 - 32	Dented only slightly by finger pressure	Very stiff	Dense	30 - 50
32+	Dented only slightly by pencil point	Hard	Very dense	50+

B.4.3 Field Description of the Formations

The description of the formations is subdivided in two parts: lithology and physical condition. The lithologic description consists of:

- rock name;
- color of wet core (from GSA rock color chart);
- mineralogy, textural and structural features; and
- any other distinctive features which aid in correlating or interpreting the geology.

The physical condition describes the physical characteristics of the rock believed important for engineering design consideration. The form for the description is as follows:

Physical condition: ________________ fractured, minimum ________, maximum ___________, mostly ______________; ______________ hardness; ___________ strength; ______________ weathered.

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* For a more complete discussion of the Unified Soil Classification System, refer to Corps of Engineers, Technical Memorandum No. 3-357, March 1953, or Department of the Interior, Bureau of Reclamation, Earth Manual, 1963.

UNION STATION-SITE#1-1983

Converse Consultants

Boring Log PT-1

THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SC RTD 83-1101-11 DATE DRILLED 3/15,16,17,18/83 HOLE NO. PT-1
LOCATION 194' E/o Alameda S/o Macy At N edge of Union Sta Park Lot GROUND ELEV. 279.1
DRILLING CONTRACTOR Roscoe Moss LOGGED BY Dan Gillette DEPTH TO GROUND WATER 20.0 3/21/
TYPE OF RIG Cable Tool HOLE DIAMETER 14-15 INCH HAMMER WEIGHT AND FALL NA
SURFACE CONDITIONS Asphalt Parking Lot TOTAL DEPTH 82.5 NO. CORE BOXES NA

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0	Af	0.0-1.5 ARTIFICIAL FILL						ASPHALT PAVING TOP 3"
2	SP	1.5-60.0 SAND AND GRAVEL		PUMP TEST HOLE				
4		MODERATE REDDISH BROWN (10R 4/6); contains 50-75% SAND	NO SAMPLES REQUIRED					
6								
8					RD ↓			
10.0								
2								
4								
6								
8								
20.0								
2								
4								
6								
8								
30.0								
2								
4								
6								
8								
40.0								

SHEET 1 OF 3

PROJECT SC RTD 83-1101-11 DATE DRILLED 3/15,16,17,18/83 HOLE NO. PT-1

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
40.0	SP	1.5-60.0 SAND AND GRAVEL			RD			
2								
4								
6								
8								
50.0								
2								
4								
6								
8								
60.0		60.0-80.0 SAND AND Boulders light gray (N 7); contains 40-80% SAND AND Granitic Boulders						
2								
4								
6								
8								
70.0								
2								
4								
6								
8								
80.0	Tp	80.0-82.0 SILTSTONE AND CLAYSTONE Olive Black (5Y 2/1)						
1								
82.0		END BORING 82.5						

SHEET 2 OF 3

3/
3/
3/
5

SUMMARY BORING NO. PT-1

PROJECT 83-1101-11 SC RTD STATION HOLE YES DATE DRILLED 3/15,16,17,18/83

OVERBURDEN DEPTH (FT.) 0.0 TO 80.0.

BEDROCK DEPTH (FT.) 80.0 TO 82.5 (T.D.).

WATER PRESS. TEST No; INTERVAL(S) — TO —, — TO —.

GROUND WATER DEPTH (FT.) 20.6 DATE [illegible]; 19.7 DATE [illegible]. { Rainfall 3/17, 3/20 Use 20.0 as Mean

GAS No; DEPTH FIRST NOTICED —, DATE —.

E-LOG No.

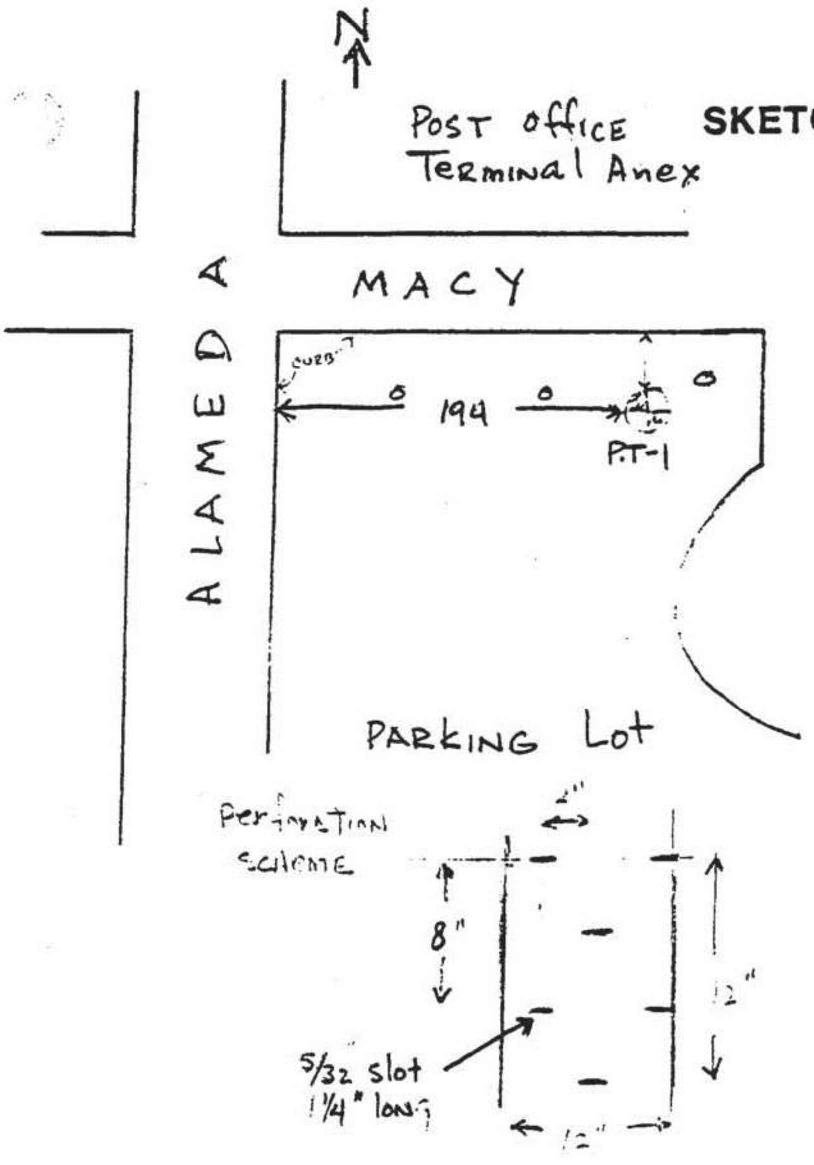
DOWN-HOLE SURVEY No.

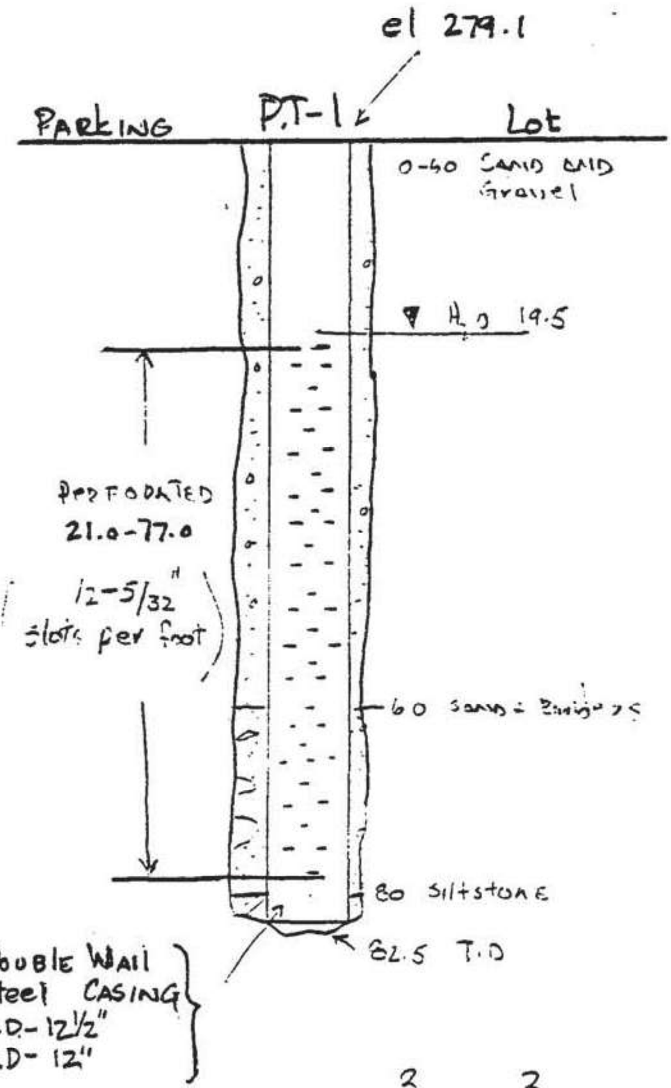
CROSS-HOLE SURVEY No.

PVC CASING (I.D.): 4" No TO ____; 3" No TO ____; 2" No TO ____.
Steel CASING - See Boring

GROUND ELEVATION REF. ____.

SKETCH





SHEET 3 OF 3

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION, BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

Converse Consultants, Inc.
Earth Sciences Associates
Geo/Resource Consultants

SITE #1

BORING LOG PUMP WELL

Proj: 83-1140-06 Date Drilled 6/18-20/86 Ground Elev. 279

Drill Rig Gus Pech 4 slope kelly Logged By MBS Total Depth 88'

Hole Diameter 24" BUCKET Hammer Weight & Fall (NO SAMPLING PERFORMED)

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
0	////	0.0-0.3 ASPHALTIC PAVEMENT	(NO SAMPLING)			0700
	ML	0.3-6.0 SANDY SILT W/ DEBRI (FILL) SILT WITH FINE SAND, SOME CLAY BINDER, MOIST, LOOSE - MEDIUM DENSE, MISC. DEBRI AND RUBBLE DECREASING WITH DEPTH, OLIVE BROWN COLOR	(0-20-80)		24" BUCKET AUGER AD	FILL RED BRICK LAYER @ 2'
6	SW	6.0-70.0 GRAVELLY SAND FINE TO COARSE SAND WITH GRAVELS, OCCASSIONAL COBBLES TO 5", CLASTS SUBROUNDED TO ROUNDED, RIVER DEPOSITS	(35-65-0)			6' ADDED DRILLING FLUID (SUPERCOL(20lbs) AND WATER MIX) BUILT SOIL BERM TO CONTAIN FLUIDS AT SURFACE
10						DRILLING FLUID IN BORING WASHING OUT MANY OF THE FINES IN EACH BUCKET
12		OCCASSIONAL DRILL RIG CHATTER FROM COBBLES AND GRAVELS				
14	SW (GW)	OCCASSIONAL COBBLES TO 14" SUBROUNDED TO ROUNDED PREDOMINANTLY GRAVELLY SAND				
16						
18						
20						

Site #1

Project 83-1140-06 **Date Drilled** 6-18-86 **Hole No.** PUMP WELL

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
20		GRAVELLY SAND WITH OCCASSIONAL COBBLES - CONTINUED	Ø		AD	
22		INTERBEDDED LENSES OF COARSE GRAVEL AND SMALL COBBLES ALTERNATING WITH LENSES OF SANDS AND GRAVELLY SANDS				H_2S ODOR
24						
26						
28		28' COBBLES WITH POSSIBLE SMALL BOULDERS, DIFFICULT DRILLING, DRILL RIG CHATTER, COBBLES TO 14"				(0900) PLACED NEW TEETH ON 24" BUCKET
30						
32		INTERBEDDED THIN LAYERS OF CLAY AND SILT, OLIVE GRAY TO GRAY, PREDOMINANTLY SAND AND GRAVELLY SANDS WITH COBBLES, AVERAGE COBBLE SIZE 3-6", OCCASSIONAL COBBLES TO 14"	(40-60-0)			
34						
36						
38						
40		OCCASSIONAL CLAYEY GRAVEL LAYERS VARIABLE THICKNESS, 1-2', OLIVE GRAY COLOR WITH H_2S ODOR				
42						
44						

Sheet 2 of 4

Project 83-1140-06 Date Drilled 6-18-86 Hole No. SITE #1 PUMP WELL

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
44	SW	GRAVELLY SANDS - CONTINUED FINE TO COARSE SAND WITH GRAVEL, OCCASSIONAL COBBLES FROM 6"-14"; SUBROUNDED TO ROUNDED.	Ø		AD ↓	(1000)
48		INTERBEDDED THIN LENSES OF CLAY AND SILTY CLAY - VARIABLE, PREDOMINANTLY GRAVELLY SANDS				
54						(1100) HYDRAULIC LEAK DEVELOPING ON DRILL RIG RING GEAR
60		GRAVELLY SANDS - CONTINUED, OCCASSIONAL SMALL COBBLES				
66						(1200)

Sheet 3 of 4

Project 83-1140-06 Date Drilled 6-18 Hole No. PUMP WELL SITE #1

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
68–70		GRAVELLY SANDS - CONTINUED INCREASING FINES			AD ↓	ADDED ±20lbs OF SUPERCOL TO DRILLING FLUID IN BORING.
70–74	SC/GC	70.0 - 74.0 GRAVELLY SAND w/ CLAY MIXTURE OF SAND AND GRAVEL WITH A CLAY / SILTY CLAY BINDER, GRAY, DENSE, H_2S ODOR IN FINER MATERIALS, OCCASSIONAL COBBLES, CLASTS SUBANGULAR TO SUBROUNDED	(35-40-25)			(1320)
74–80	GW	74.0 - 80.0 COBBLES WITH SANDY GRAVEL SUBROUNDED TO ROUNDED COBBLES TO 12", COBBLES GENERALLY 4"-8", SOME SANDY GRAVEL CONSISTING OF MEDIUM TO COARSE SANDS AND GRAVELS, RIVER DEPOSITS, H_2S ODOR GRADATIONAL CONTACT				PLACED NEW TEETH (2ND SET) ON 24" BUCKET 6-18-86 (1400) 74'- SHUTDOWN AT 1430, NEED SPECIAL BUCKETS TO REMOVE COBBLES, SECURED SITE 6-20-86 ATTEMPTED TO BREAK THROUGH ROCK IN BOTTOM OF BORING APPEARS TO BE LARGE COBBLE OR BOULDER, USING CHOPPING BUCKET AND LARGE SINGLE TOOTH WITH NO SUCCESS
80–88		80.0-88' BEDROCK CLAYSTONE / SILTSTONE PUENTE FORMATION OLIVE GRAY SILTSTONE AND CLAYSTONE, MEDIUM PLASTICITY, AQUICLUDE MATERIAL				6-21-86 USING CORING BUCKET TO ADVANCE THROUGH ROCK, HOLE REMAINED OPEN PAST TWO DAYS WITH A MINIMUM OF DRILLING FLUID EASY DRILLING (0900) THROUGH SILTSTONE/CLAYSTONE (0930)

END OF BORING 88'

USED 1 BAG SUPERCOL (50lbs) FOR BORING

INSTALLED PUMP WELL CASINGS CONSISTING OF 12" AND 2" MACHINE SLOTTED PVC CASINGS FROM APPROX 7' TO 87', 0-7' NON SLOTTED CASING, ENDS CAPPED, WELL CENTRALIZERS AT 7', 40', 87', BACKFILLED AROUND SLOTTED CASING WITH (SW) SAND CONSISTING OF IMPORTED DESIGN FILTER MIX FROM 5'-88', MONITORED BACKFILLING WITH TAPE SOUNDINGS

SITE #1
OBSERVATION WELL #1

Converse Consultants

Boring Log

THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SCRTD - UNION STATION DATE DRILLED 2/4/83 HOLE NO. 5-1 (1983)
LOCATION NORTHEAST CORNER OF PUBLIC PARKING LOT GROUND ELEV. 279.1'
DRILLING CONTRACTOR CONVERSE - LAS VEGAS LOGGED BY B. INGHRAM DEPTH TO GROUND WATER 20.3 2-8-83
TYPE OF RIG ____ HOLE DIAMETER 4¾" HAMMER WEIGHT AND FALL 320#, 36"
SURFACE CONDITIONS A.C PARKING AREA TOTAL DEPTH 85.0 NO. CORE BOXES ____

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0		0.0 - 0.4' ASPHALT PAVEMENT			RD			SET UP 7:00 AM
	SM	0.4 - 2.0 FILL - SILTY SAND						BEGIN DRILLING 7:30 AM
		MOTTLED BRN, MOIST, DENSE VARIABLE COMPOSITION	1-1 12K		CCI DR			WEATHER: CLEAR, WARM
2.0	SM/ML	YOUNG ALLUVIUM			RD			
		2.0 - 4.0 SILTY SAND / SANDY SILT						SLIGHTLY POROUS
4.0	SM	RED-BRN., MOIST, M. DENSE V. FINE SAND - 50-60% SILT - 40-50%						
		4.0 - 8.0 SILTY SAND	1-2 6K		CCI DR			
6.0		GRAY-BRN., MOIST, M. DENSE FINE SAND WITH 20% SILT AND TRACE GRAVEL TO 1"			RD			
8.0	SW	8.0 - 70.0 GRAVELLY SAND						
10.0			5" REFUSAL	100	SPT			
					RD			
12.0								
14.0								
16.0								
18.0								
20.0								

SITE #1
OBSERVATION WELL #1

PROJECT SCRTD - UNION STATION DATE DRILLED 2/4/83 HOLE NO.

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
20.0	SW	8.0 - 70.0 GRAVELLY SAND (CONTINUED)	50K		CCI DR			DELICATE SAMPLE, DIFFICULTY EXTRUDING - SAMPLE DESTROYED
					RD			
22.0								
24.0								
26.0								
28.0								
30.0			1-3 45K		CCI DR			POOR RECOVERY, DELICATE SAMPLE 3 RINGS ONLY
					RD			
32.0								
		INTERMITTENT LENSES OF INCREASED GRAVEL CONTENT						
34.0								
36.0								
38.0								
40.0			1-4 55K		CCI DR			SULPHUR ODOR IN SAMPLE
					RD			POOR RECOVERY, 2 RINGS ONLY
42.0								
44.0								

SHEET 2 OF 5

SITE #1
OBSERVATION WELL #1

PROJECT SCRTD - UNION STATION DATE DRILLED 2/4/83 HOLE NO.

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
44.0	SW	8.0 - 70.0 GRAVELLY SAND			RD			
		(CONTINUED)	1-5 57K		CCI DR			SULPHUR ODOR POOR SAMPLE RECOVERY - 2 RINGS ONLY
46.0					RD			
48.0								
50.0			80K		CCI DR			GRAVELLY SAMPLE - FELL OUT OF SAMPLER
					RD			
52.0								
54.0								SLIGHT SULPHUR ODOR
			1-6 100K	-10"	CCI DR			POOR SAMPLE RECOVERY 5 RINGS ONLY
56.0					RD			
58.0								
60.0								
62.0								
64.0								SULPHUR ODOR
			1-7 100K	-10"	CCI DR			POOR RECOVERY 4 RINGS ONLY
66.0					RD			
68.0								

SHEET 3 OF 5

SITE #1
OBSERVATION WELL #1

PROJECT SCRTD - UNION STA. DATE DRILLED 2/4/83 HOLE NO. ______

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
68.0	SW	8.0 - 70.0 GRAVELLY SAND (CONTINUED)			RD			
70.0	B	70.0 - 79.5 BOULDERS GRANITIC-TYPE CUTTINGS						
72.0								
74.0			100K REFUSAL	-0"				ATTEMPTED TO SAMPLE - COULD NOT DRIVE SAMPLER TOO HARD TO SAMPLE
76.0								
78.0								
80.0	CL/SC	PUENTE FORMATION 79.5 - 85.0 SANDY CLAYSTONE AND CLAYEY SANDSTONE	1-8 50K		CCI DR			
					RD			
82.0		OLIVE-GRAY COLOR, MOIST, FRESH, THINLY LAMINATED, BEDDING PLANES DIP ≈ 50° (SAMPLES NOT ORIENTED).						
84.0		FRIABLE STRENGTH, FRIABLE TO LOW HARDNESS. TENDS TO FRACTURE ALONG LAMINATIONS	1-9 40K		CCI DR			
		END BORING 85.0 FT PIEZOMETER SET TO 85.0' PERFORATED INTERVAL: 45'-85'						

SHEET 4 OF 5

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION, BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

Converse Consultants, Inc.
Earth Sciences Associates
Geo/Resource Consultants

SITE #1
BORING LOG O.W.-4

Proj: 83-1140-06 MRTC PUMP TEST UNION STATION AREA **Date Drilled** 3/1-3/86 **Ground Elev.** 281'

Drill Rig FAILING 1500 ROTARY WASH **Logged By** EMIR UTUSH **Total Depth** 84'

Hole Diameter 4 7/8" **Hammer Weight & Fall** 250# @ 30"

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
0		0-0.5' ASPHALTIC PAVEMENT AND BASE			C	
	ML	0.5'-5' SANDY SILT BROWN, MOIST, VERY FINE SAND AND SILT			AD	
2						
4						
	SP	5'-6' GRAVELLY SAND, BROWN				
6	GP	6'-13' SANDY GRAVEL LIGHT BROWN AND GRAY, MEDIUM TO COARSE SAND, POORLY GRADED, COBBLES TO 4", SUBROUNDED, MOIST, LOOSE TO MEDIUM DENSE, TRACE FINES			RD	INSTALLED CASING MIXED REVERT
8						
10			C-1		DR	
12					RD	
	SP	13'-15' SAND YELLOWISH BROWN, GRANITIC FRAGMENTS, MEDIUM TO COARSE, TRACE FINE GRAVEL				
14						
	GP/SP	15'-20' SAND AND GRAVEL YELLOWISH BROWN, MEDIUM TO COARSE SAND, COARSE GRAVEL AND SMALL COBBLES, SAND LENSES, TRACE SILT AND CLAY, POORLY GRADED WITH TRACE FINES	C-2		DR	
16					RD	
18						
20		▼ APPROXIMATE GROUNDWATER LEVEL: 20.0'				

Sheet 1 of 4

Project 83-1140-06 MRTC PUMP TEST Date Drilled 2/28 - 3/3/86 Hole No. SITE #1 O.W.-4

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
20	GM	20'-22' SANDY GRAVEL DARK GRAY, SILT, COARSE GRAVEL TO 3"			RD	
			C-3		DR	3/28/86
22	SM	22'-30' SILTY SAND DARK GRAY TO GREENISH GRAY, COARSE SAND			RD	3/3/86 CAVING TO 17.5' REDRILLED BORING
24						
26		COARSE GRAVEL, ANGULAR, MEDIUM SAND, LENSES OF SANDY SILT AND CLAY	C-4		DR	
28					RD	HYDROGEN SULFIDE ODOR
30	SP	30'-34' SAND GRAY, MEDIUM TO COARSE SAND, POORLY GRADED, LITTLE GRAVEL, TRACE SILT.	C-5		DR	
32					RD	
34	GP	34-35.6 SANDY GRAVEL				DRILL RIG CHATTER
36	SP	35.6-40 SAND GRAY, MEDIUM TO COARSE SAND, GRAVEL TO 1.5", TRACE SILT, H_2S ODOR	C-6		DR	
38	SP/GP				RD	DRILL RIG CHATTER
40	SP	40-45.5 SAND GRAY, MEDIUM TO COARSE SAND	X		DR	SAMPLES NOT RECOVERED
42	SM	SAND SILT LENSE WITH CLAY BINDER				
	SP		C-7		DR	
44					RD	

Sheet 2 of 4

Project 83-1140-06 MRTC PUMP TEST Date Drilled 3/3/86 Hole No. SITE #1 O.W.-4

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
44	SP	40'-45.5' SAND - CONTINUED			RD	HYDROGEN SULPHIDE ODOR - CONTINUED
46	GM/GP	45.5'-47' SANDY GRAVEL WITH SILT, SUBROUNDED GRAVEL TO 1/2", GREEN CLAYEY SILT				DRILL RIG CHATTER
48	SP	47'-49' SAND GRAY, MEDIUM TO COARSE	C-8		DR	
50	GP/SP/GP	49'-51' SANDY GRAVEL TRACE FINES OCCASSIONAL SAND LENSES			RD	DRILL RIG CHATTER
52	GM/SM	51'-52.8' SILTY SAND AND GRAVEL				
54	SW	52.8'-57' SAND GRAY, MODERATELY TO POORLY GRADED, MEDIUM TO COARSE SAND, TRACE SILT	C-9		DR	
56					RD	
	GP	57'-58' SANDY GRAVEL				DRILL RIG CHATTER
58	SW/SM	58'-60' SILTY SAND GRAY, FINE TO MEDIUM SAND MODERATELY GRADED, TRACE SILT	C-10		DR	H_2S ODOR
60	SM	60'-67.4 SILTY SAND GREENISH-GRAY VERY FINE SAND, TRACE CLAY, POORLY GRADED, DECAYING PLANT MATERIAL			RD	
62						
64			C-11		DR	
66					RD	
	GM	LENSE OF SILTY GRAVEL WITH CLAY				DRILL RIG CHATTER
68	GP	67.4-70.0 SANDY GRAVEL				

83-1140-06

Project MRTC PUMP TEST Date Drilled 3/3/86 Hole No. SITE #1 O.W.-4

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
68	GP	67.4-70' SANDY GRAVEL GRAY, COARSE, TRACE FINES			RD	
70	SW	70'-72' GRAVELLY SAND GRAY, FINE TO COARSE SAND, SOME SILT, GRAVELS TO 3", MODERATELY WELL GRADED, COBBLES	C-12		DR	SMALL COBBLE IN SAMPLER TIP
72	GP	72'-78' SANDY GRAVEL GRAY, COARSE, COBBLES AND BOULDERS, TRACE FINES			RD	DRILL RIG CHATTER
78	SM	78'-79' SANDY SILT BROWNISH GREEN, POORLY GRADED, TRANSITION ZONE				
	Tp	79'-84' BEDROCK - PUENTE FORMATION SILTSTONE / CLAYSTONE OLIVE GRAY, STIFF, TRACE VERY FINE SAND				
84		END OF BORING 84' - INSTALLED PIEZOMETER 0'-10' NON SLOTTED 2" PVC CASING 10'-79' MACHINE SLOTTED 2" CASING, 0.20" SLOTS, END CAPPED - FLUSHED CASING AND BORING WITH CLEAN WATER (± 1000 GALLONS) - BACKFILLED BORING WITH #3 MONTEREY SAND, 12-100# SACS - SEALED TOP 5' WITH CONCRETE GROUT AND BENTONITE, INSTALLED 2.5' CASING AND WELL COVER.				
92						Sheet 4 of 4

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION, BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

Converse Consultants, Inc.
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SITE #2

BORING LOG PUMP WELL

83-1140-06
MRTC PUMP TEST

Proj: UNION STATION AREA **Date Drilled** 3/3-6/86 **Ground Elev.** 279.5

Drill Rig INGERSOL RAND TH60 **Logged By** MARK SCHLUTER **Total Depth** ______

Hole Diameter 10" REAMED TO 24" **Hammer Weight & Fall** (NO SAMPLING PERFORMED)

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
0		0.0 - 9.0 FILL GRAVELLY SAND, SILT, AND SANDY SILT, TRACE AMOUNT OF DEBRI AND RUBBLE INCLUDING FRAGMENTS OF CONCRETE, BRICK, METAL	(NO SAMPLING)		AIR ROTARY	STARTED DRILLING AT (0945) 3-3-86 3/3/86 AIR-LIFTED CUTTING WITH DRILL RIG COMPRESSOR FROM 0-10' 3/3/86 (1240) STARTED REAMING BORING WITH MODIFED 24" DRILL BIT 3/4/86 (0730) DRILLED OUT HOLE WITH 12" TRI-CONE BIT TO CLEAN OUT FALLEN GRAVELS AND COBBLES FROM 24" REAMING DRILLED TO 110' WITH 12" BIT. (1100) 3/3/86 DRILLED TO 10', SET UP FOR 10" ROTARY WASH DRILLING
9-10		9.0 - 85' GRAVELLY SAND MEDIUM TO COARSE SAND, SOME GRAVELS, TRACE SILT BORING LOGGED BASED ON ROTARY WASH CUTTING, GRAVELS AND COBBLES BROKEN UP DURING DRILLING.			ROTARY WASH RD	3-3-86 ATTACHED 10" TRI-CONE BIT TO 10' LONG REAMING SECTION AND STARTED ROTARY WASH DRILLING OF PILOT HOLE. DRILLED 10" PILOT HOLE TO 100' 3-3-86 ADDED SUPERCOL GUAR GUM TO DRILLING FLUID.
16		16' - DRILL RIG CHATTER GRAVELS AND COBBLES PROGRESS SLOWED				3/3/86 (1340) AT 16" WITH 24" MODIFIED DRILL BIT
18						
20						

Sheet 1 of 5

83-1140-06
MRTC PUMP TEST

Project UNION STATION AREA Date Drilled 3/3-6/86 Hole No. PUMP WELL SITE #2

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
20		9.0 - 85' GRAVELLY SANDS — CONTINUED —	(NO SAMPLING)			3/3/86 (1030) AT 20' WITH 10" TRI-CONE BIT.
22					RD ↓	
24						
		25' - DRILL RIG CHATTER - 10" BIT COBBLES AND GRAVELS				3/3/86 (1040) AT 25' WITH 10" TRI-CONE BIT
26						
28						3/3/86 (1510) AT 28' WITH MODIFIED 24" BIT, GRAVELS AND COBBLES FALLING INTO PILOT HOLE, PULLED 24" MODIFIED BIT OUT OF HOLE AND ATTACHED 12" TRI-CONE BIT TO CLEAN OUT PILOT HOLE
30						
32						
34						
36						
38						
40						
42						
44						

Sheet 2 of 5

83-1140-06
MRTC PUMP TEST

Project UNION STATION AREA Date Drilled 3/3-6/86 Hole No. SITE #2 PUMP WELL

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
44		9.0 - 85' GRAVELLY SANDS — CONTINUED —	(NO SAMPLING)			
46					RD ↓	
48						
50						3/4/86 (1430) AT 50' WITH 24" MODIFIED DRILL BIT
52						
54						
56						
58						
60						3/5/86 (0820) AT 60', STARTED DRILLING WITH NEW 24" MODIFIED DRILL BIT, 2ND BIT USED. GRAVELS AND COBBLES FALLING INTO CLEANED OUT PILOT HOLE AS 24" BIT IS ADVANCED
62						
64						
66						
68						

Sheet 3 of 5

83-1140-06
MRTC PUMP TEST

Project UNION STATION AREA Date Drilled 3/3-6/86 Hole No. PUMP WELL SITE #2

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
68		9.0 - 85' GRAVELLY SANDS -CONTINUED-	(NO SAMPLING)			
70					RD ↓	3/4/86 (1630) AT 70' WITH MODIFIED DRILL BIT, WELDED WINGS WORN DOWN TO NUBS (1/4") PULLED RODS AND BIT TO ATTACH SECOND MODIFIED DRILL BIT ON 3/5/86 A.M. (SEE 3/5/86 AT 60')
72						
74						
76						
78						
80						3/3/86 (1145) AT 80' WITH PILOT HOLE USING 10" TRI-CONE BIT. 3/5/86 (1400) AT 80' WITH 2ND 24" MODIFIED DRILL BIT, PROGRESS SLOW, GRAVELS AND COBBLES ACCUMULATING IN PILOT BORING
82						
84						
85		85'-110' BEDROCK PUENTE FORMATION SILTSTONE / CLAYSTONE OLIVE GRAY COLOR				
86						
88						3/5/86 (1450) AT 88' WITH WORN 20" MODIFIED BIT, DRILLING MUCH EASIER IN BEDROCK, STILL SOME DRILL RIG CHATTER FROM GRAVELS AND COBBLES THAT FELL INTO PILOT BORING
90						
92						

Project 83-1140-06 MRTC PUMP TEST UNION STATION AREA Date Drilled 3/3-6/86 Hole No. PUMP WELL SITE #2

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
92		85'-110' BEDROCK PUENTE FORMATION SILTSTONE / CLAYSTONE — CONTINUED —	(NO SAMPLING)		RD ↓	
94						
96						
98						
100						-3/3/86 (1220) COMPLETED 10" PILOT HOLE TO 100', REMOVED DRILL RODS AND BIT AND STARTED REAMING 24" HOLE, USING 14.75" TRI-CONE BIT MODIFIED WITH WELDED WINGS TO 24"
102						
104						
106						
108						
110		END OF BORING 110' 4/5/86 (1500) FLUSHED BORING WITH DRILLING FLUID TO REMOVE CUTTINGS (1535)-ADDED FRESH WATER TO THIN DOWN SUPERCOL GUAR GUM DRILLING FLUID. — CONTINUED TO FLUSH BORING WITH CLEAN WATER FROM WATER TRUCK — BOTTOM OF BORING SOUNDED @ 87' WITH TAPE (SOFT BOTTOM) (1605) INSTALLED 12" AND 2" MACHINE SLOTTED CASING INTO BORING 0-7' NON SLOTTED 7'-87' MACHINE SLOTTED BACKFILLED AROUND CASING WITH FILTER MIXED SAND, REPEATEDLY SOUNDED DEPTH TO SAND DURING BACKFILL 4/6/86 (0800) STARTED "AIR-LIFT" DEVELOPMENT OF PUMP WELL				3/4/86 (1100) COMPLETED PILOT HOLE CLEAN-OUT WITH 12" BIT TO 110', PULLED OUT AND ATTACHED 24" MODIFIED BIT 3/5/86 (1500) AT 110' WITH WORN 20" MODIFIED BIT, HEAVY DRILL RIG CHATTER — GRAVELS & COBBLES ACCUMULATED IN PILOT HOLE, LAST 20' - EASIER DRILLING IN BEDROCK
112						
114						
116						

Sheet 5 of 5

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Converse Consultants, Inc.
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Geo/Resource Consultants

SITE #2

BORING LOG OW-1

Proj: 83-1140-06 MRTC PUMP TEST UNION STATION AREA — Date Drilled 2/24-25/86 — Ground Elev. 279'

Drill Rig FAILING 1500 ROTARY WASH — Logged By EMIR UTUSH — Total Depth 94'

Hole Diameter 4 7/8" — Hammer Weight & Fall 250# @ 30"

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
0	FILL (Af)	0-2' GRAVELY SAND - (FILL)			AD/C	FILL
2	FILL (Af)	2'-7' SILT - (FILL), DARK BROWN GRADING INTO OLIVE GREEN, LITTLE FINE-TO-MEDIUM GRAVEL AND SAND				PIECE OF METAL AT 3.5'
4						
6						
8	SM/ML	7-9' SANDY SILT, LIGHT OLIVE BROWN, SOME GRAVEL AND FINE SAND. GRADATIONAL FILL CONTACT.				3" SMALL COBBLE
10	SP/GP	9'-28' GRAVELLY SAND / SANDY GRAVEL ANGULAR TO SUBROUNDED GRAVEL WITH MEDIUM TO COARSE SAND. TRACE FINES	C-1		DR	
12	SP/GP	COARSE SAND AND GRAVEL			RD	SET 12.5' OF CASING ADDED ½ BAG OF JOHNSON REVERT STRONG DRILL RIG CHATTER AT 11'
14						
16	SP	MEDIUM TO COARSE SAND LENSE				DRILL RIG CHATTER STOPPED FROM 16'-17'
18	GP					
20						

Sheet 1 of 5

Project MRTC PUMP TEST 83-1140-06 Date Drilled 2-24-86 Hole No. OW-1 SITE #2

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
20	GP	SANDY GRAVEL (CONTINUED) WHITE AND GRAY COBBLES WITH COARSE SAND, TRACE SILT AND CLAY	C-2		DR	
					RD	SOFT ZONE @ 22'
22			C-3		DR	
24					RD	
26	GP/SP	GROUND WATER AT 25.7' LEVEL MEASURED @ 11:00 A.M. ON 3/3/86				VARIABLE DRILL RIG CHATTER
28	SM/ML	28'-30' FINE SAND AND SILT TRACE CLAY, SLIGHTLY DAMP, DARK GREEN, TRACE ORGANICS	C-4		DR	
					RD	
30	GP	30'-31' SANDY GRAVEL				DRILL RIG CHATTER AT 30'
32	ML AND GP	31'-36' SILT AND SANDY GRAVEL INTERBEDDED LENSES OF SILT AND SANDY GRAVEL, SILT- DARK GREEN, TRACE CLAY SANDY GRAVEL- COARSE GRAVEL AND SAND, LITTLE FINES IN SANDS, SILT SEAMS	C-5		DR	2" COBBLE FRAGMENT IN DRIVE SAMPLE
34					RD	
36	GP	36'-39.5' SANDY GRAVEL SAND AND GRAVEL WITH COBBLES AND BOULDERS				STRONG DRILL RIG CHATTER AT 36' VERY STRONG DRILL, RIG CHATTER AT -37' - BOULDER?
38			NO RECOVERY		DR	
					RD	VERY STRONG DRILL, RIG CHATTER 39.5'
40	ML	39.5'-40.5' SILT (?) SOFT ZONE				
42	GP	40.5'-43.5' SANDY GRAVEL SAND AND GRAVEL WITH COBBLES AND BOULDERS				INCREASING RESISTANCE GASTEC METER READING -NO COMBUSTIBLE GAS AT SURFACE ABOVE DRILLING FLUID
44	GP	43.5'-45.5' SANDY GRAVEL	C-7		DR	

83-1140-06 SITE #2

Project MRTC PUMP TEST Date Drilled 2-24-86 Hole No. OW-1

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
44	GP	SANDY GRAVEL - CONTINUED MOTTLED WHITE AND GRAY, CLASTS SUBANGULAR TO SUBROUNDED, TRACE SILT WITH CLAY			DR RD	STRONG DRILL RIG CHATTER AT 45'
46	SP	45.5'-49.5' GRAVELLY SAND LIGHT GRAY AND WHITE, COARSE SAND, TRACE SILT, SOME GRAVEL				
48						
50	SP	49.5'-52.5' SAND GRAY, LITTLE GRAVEL, TRACE SILT, MEDIUM TO COARSE SAND	C-8		DR RD	
52						VARIABLE DRILL RIG CHATTER AT: 52.5', 53.5', 54'
54	SP GP SP	52.5'-57.5' SAND SAND WITH INTERBEDDED SANDY GRAVEL LENSES MEDIUM TO COARSE SAND, CLASTS SUBANGULAR TO SUB-ROUNDED	C-9		DR	
56						DRILL RIG CHATTER AT 57.5' AND 60'
58	GP	57.5'-61.5' GRAVEL GRAVELS WITH SOME MEDIUM TO COARSE SAND			RD	
60		GRADATIONAL CONTACT				DRILL RIG CHATTER AT 61'
62	SM/ML	61.5'-69.5' SAND AND SILT DARK GREEN, FINE SAND AND SILT, TRACE CLAY, TRACE SMALL GRAVEL, H_2S ODOR IN SAMPLE	C-10		DR RD	LOST DRILLING FLUID CIRCULATION SMELL OF HYDROGEN SULPHIDE IN SAMPLE CAVING - BORING CAVED TO 7'
64						
66						
68						

Sheet 3 of 5

Project 83-1140-06 MRTC PUMP TEST Date Drilled 2/24-25/86 Hole No. SITE #2 OW-1

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
68	SP/ML	SAND AND SILT - CONTINUED			RD	
70	SP	69.5-71' SAND GRAY, MEDIUM COARSE, TRACE SMALL GRAVEL	C-11		DR	
72	GP	71'-76.5' SANDY GRAVEL			RD	DRILL RIG CHATTER AT 71'
74		(SP) SAND LENSE AT 74'				DECREASED DRILL RIG CHATTER AT 74' AND 75.5'
76		(SP) SAND LENSE AT 76'				
	SP	76.5'-77.5' GRAVELLY SAND				DRILL RIG CHATTER AT 77.5'
78	GP	77.5'-80.5' SANDY GRAVEL				
80		(SP) AND (GP) SAND AND GRAVEL LENSES				
82	GM/GP	80.5'-84.5' SANDY GRAVEL FINE TO COARSE SAND, SUBROUNDED FINE TO MEDIUM GRAVEL, TRACE BLUISH GRAY SILT AND CLAY	C-12		DR	2-24-86 2-25-86
84		GRADATIONAL CONTACT			RD	
86	Tp	84.5'-94.0' BEDROCK-SILTSTONE/CLAYSTONE PUENTE FORMATION, OLIVE GREEN, SOFT, MOIST, INTERBEDDED FINE SAND LAYERS				
88		VERY FINE SAND INTERBEDS THINLY BEDDED TO LAMINATED DIPPING AT APPROX. 40° STIFF TO VERY STIFF	NO RECOVERY		DR RD	
90						ADDED 1 SAC (25#) OF REVERT
92			C-14		DR	

Sheet 4 of 5

Project 83-1140-06 MRTC PUMP TEST Date Drilled 2/25/86 Hole No. OW-1 SITE #2

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
92	Tp	BEDROCK - SILTSTONE / CLAYSTONE — CONTINUED — PUENTE FORMATION			RD	
94		END OF BORING 94.0' -FLUSHED BORING - INSTALLED PIEZOMETER 0'-10' NON SLOTTED 2" CASING 10'-89' MACHINE SLOTTED 2" CASING, 0.20" SLOTS, END CAPPED BACKFILLED BORING WITH #3 MONTEREY SAND, 6-100# SACS - FLUSHED PIEZOMETER WITH FRESH WATER. - INSTALLED WELL COVER AND SEALED TOP 4.5' WITH CONCRETE GROUT AND BENTONITE.				
96						
98						
100						
102						
104						
106						
108						
110						
112						
114						
116						Sheet 5 of 5

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION, BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

Converse Consultants, Inc.
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SITE #2

BORING LOG O.W.-2

Proj: 83-1140-06 MRTC PUMP TEST UNION STATION AREA **Date Drilled** 2/25-27/86 **Ground Elev.** 280'

Drill Rig FAILING 1500 ROTARY WASH **Logged By** EMIR UTUSH **Total Depth** 84'

Hole Diameter 4 7/8" **Hammer Weight & Fall** 250# @ 30"

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
0	FILL (Af)	0-4' SAND AND GRAVEL -(FILL) WITH DARK BROWN SILT			AD/C	FILL
4	FILL (Af)	4-7' SILT -(FILL) BROWN, DRY, LOOSE; SLIGHTLY DAMP; LITTLE CLAY BINDER AT 7'				PIECES OF METAL, NAILS, GLASS AND SLAG-LIKE MATERIAL AT 4'; LARGE BENT METAL SPIKE AT 5'
7	ML	7-8' SILT - BROWN, SLIGHTLY DAMP, TRACE CLAY, SOFT				
8	SP	8-10' SAND - LIGHT BROWN, DAMP, LOOSE TO MEDIUM DENSE, LITTLE FINE GRAVEL, POORLY GRADED	C-1		DR	SET 11.5' OF CASING ADDED JOHNSON REVERT
10	GP	10-16' SANDY GRAVEL BROWN TO LIGHT GRAY. GRAVEL - COARSE, SUB-ROUNDED SAND - POORLY GRADED WITH LITTLE SILT; LARGE GRAVEL AT 13'			RD	
15			C-2		DR	POOR RECOVERY
16	SP	16'-20.5' GRAVELLY SAND LIGHT BROWN TO SPECKLED YELLOW/GREY, WET, MEDIUM DENSE, POORLY GRADED MEDIUM TO COARSE SAND, MEDIUM GRAVEL TO 3/4", TRACE SILT			RD	

Sheet 1 of 4

Project 83-1140-06 MRTC PUMP TEST Date Drilled 2/25/86 Hole No. SITE #2 O.W.-2

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
20	SP	GRAVELLY SAND				DRILL RIG CHATTER AT 20.5'
	GP GM	20.5'-24' SANDY GRAVEL LIGHT BROWN WITH GRAY AND YELLOW, MEDIUM TO COARSE GRAVEL, POORLY GRADED SAND, LITTLE SILT			RD	
22						
	ML	25' THIN CLAY SILT SEAM, SOME SAND				
	GP					
24	SM	24'-26.8' SILTY SAND BROWN, MEDIUM DENSE, WET, SOME GRAVEL, TRACE CLAY	C-3		DR	GROUNDWATER AT 25.9'
26	SP	26.8'-30.2' SAND GRAY, MEDIUM TO COARSE SAND, SOME GRAVEL, TRACE SILT, POORLY GRADED				LEVEL MEASURED @ 1158 A.M. ON 3/3/86
28						CAVING FROM 26' TO 31'
30		SLIGHT INCREASE IN SILT			RD	
	GP	30.2'-30.7' GRAVEL				INCREASED DRILL RIG CHATTER
32	GM	30.7'-37'				SMOOTH
34		SANDY GRAVEL WITH SILT, GRAY, LOOSE TO MEDIUM DENSE	C-4		DR	
	GP					DRILL RIG CHATTER AT 35'
36	GM					
		37'-45' SANDY GRAVEL				
38	GP	COARSE SAND AND GRAVEL COBBLE AND BOULDER ZONES			RD	STRONG DRILL CHATTER AT 38'
40		LENSES OF COBBLES AND BOULDERS — VARIABLE —				STRONG, DRILL CHATTER AT 41'
42						STRONG DRILL CHATTER AT 42'
44						

Sheet 2 of 4

Project 83-1140-06 MRTL PUMP TEST Date Drilled 2/25-26/86 Hole No. SITE #2 O.W.-2

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
44	GP	SANDY GRAVEL			RD	
	SP	45'-46' GRAVELLY SAND				SLIGHT H_2S ODOR
46	GP	46-51.4 GRAVEL GRAY, WITH SAND AND SOME SILT, COARSE GRAVEL TO COBBLE SIZE CLASTS, COARSE SAND	C-5		DR	
48	GP/SP					CAVING TO 44' STRONG DRILL RIG CHATTER, ADDED ADDITIONAL REVERT TO DRILLING FLUID, BOULDERS AND COBBLES BLOCKING BORING.
50		SANDY GRAVEL COARSE SAND, TRACE FINES			RD	2-25-86
52	SP	51.4'-56' GRAVELLY SAND GRAY, COARSE SAND, POORLY GRADED, LITTLE SILT H_2S ODOR IN SAMPLE				2-26-86 CAVING TO 31', BORING BLOCKED, REPOSITIONED BORING ADJACENT TO CAVED HOLE, DROVE CASING TO 32' RESUMED DRILLING ADDED REVERT TO DRILLING FLUID.
56	SP	56'-58' SAND GRAY, MEDIUM DENSE, FINE TO MEDIUM SAND, TRACE SILT H_2S ODOR IN SAMPLE	C-6		DR	
58	GP	58'-61' SANDY GRAVEL GRAY				
60						
	SM/ML	61'-70' SAND AND SILT DARK GREEN TO GRAY, LOOSE TO MEDIUM DENSE, SOME CLAY AND GRAVEL, VERY FINE SAND, TRACE ORGANICS (PLANT ROOTLETS)			RD	
62						
64						
			C-7		DR	
66					RD	
68						

Sheet 3 of 4

83-1140-06

Project MRTC PUMP TEST Date Drilled 2/26-27/86 Hole No. O.W.-2

SITE #2

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
68	ML	SAND AND SILT - CONTINUED -				
70	SP	70'-71' SAND MEDIUM COARSE, LITTLE GRAVEL			RD	
72	GP	71'-72' SANDY GRAVEL COARSE SAND AND GRAVEL, COBBLES AND BOULDERS				STRONG DRILL RIG CHATTER
74						
76			⊠		DR	NO RECOVERY
					RD	STRONG DRILL RIG CHATTER
78						LOST DRILLING FLUID CIRCULATION MIXED IN ADDITIONAL REVERT
80						CAVING UP TO 32' ADDING ADDITIONAL REVERT
81	GM/GP	81'-82' SANDY GRAVEL WITH SILT, LUMPS OF DARK GRAY/GREEN SILT WITH CLAY BINDER				
82	GP	82'-84' SANDY GRAVEL COARSE SAND AND GRAVEL, LITTLE FINES				82' LOSING FLUID ADDED TOTAL 3 SACS OF REVERT, DRILLED TO 84' AND INSTALLED 2" CASING
84		END OF BORING 84.0 (BORING CLOSE TO BEDROCK) -INSTALLED PIEZOMETER 0-12' NON SLOTTED 2" CASING 12'-81' MACHINE SLOTTED 2" CASING 0.20" SLOTS, END CAPPED -FLUSHED BORING AND CASING WITH CLEAN WATER (±400 GALLONS), CONTINUED TO FLUSH, WATER NOT RETURNING TO SURFACE - LOST TO FORMATION, PUMPED DOWN ADDITIONAL WATER AND 1 GALLON OF BLEACH (±800 GALLONS) - BACKFILLED BORING WITH #3 MONTEREY SAND, 8 - 100# SACS - INSTALLED WELL COVER AND SEALED TOP 5' WITH CONCRETE GROUT AND BETONITE,				
86						
88						
90						
92						

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION, BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

Converse Consultants, Inc.
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SITE #2

BORING LOG O.W.-3

Proj: 83-1140-06 MRTC PUMP TEST UNION STATION AREA Date Drilled 2/28 - 3/1/86 Ground Elev. 280'

Drill Rig FAILING 1500 ROTARY WASH Logged By EMIR UTUSH Total Depth 85'

Hole Diameter 4 7/8" Hammer Weight & Fall 250# @ 30"

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
0	FILL (Af)	0.0'-8' SILTY SAND BROWN, DRY, LOOSE, BROKEN BRICK FRAGMENTS, TOP 6" ASPHALT AND BASE SUBGRADE			AD	CORED THROUGH ASPHALTIC PAVEMENT FILL
8	ML	8'-11' SANDY SILT SILT WITH VERY FINE SAND, BROWN, LOOSE, TRACE CLAY, POSSIBLE FILL?	C-1		DR RD	SET CASING AND ADDED REVERT TO DRILLING FLUID
11	GP	11'-17' SANDY GRAVEL LIGHT GRAY TO LIGHT BROWN, GRANITIC CLASTS, POORLY GRADED, CLASTS SUBANGULAR TO SUBROUNDED				DRILL RIG CHATTER
17	SP	17-18.4 SAND GRAY TO LIGHT BROWN, LOOSE, WITH SILT AND GRAVEL	C-2		DR RD	DRILL RIG CHATTER AT 19'
	GP	INCREASING GRAVELS				
20	GM	18.4-23 SILTY GRAVEL				

Sheet 1 of 4

Project 83-1140-06 MRTC PUMP TEST Date Drilled 2/28/86 Hole No. SITE #2 O.W.-3

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
20	GM/SM	18.4'-23' SILTY SAND AND GRAVEL SILT WITH COARSE SAND AND GRAVEL, LUMPS OF GRAY/GREEN CLAY	C-3		RD DR	
22					RD	DRILL RIG CHATTER @ 22'
	GP	23'-26' SANDY GRAVEL SAND AND GRAVEL, POORLY GRADED, COARSE, TRACE SILT	C-4		DR	
24						
26	SP	26'-29' GRAVELLY SAND COARSE, POORLY GRADED, LITTLE SILT			RD	GROUNDWATER AT 26.8' LEVEL MEASURED AT 1050 A.M. ON 3/3/86
28						
	GP	29'-30.6' SANDY GRAVEL COARSE GRAVEL, SUBANGULAR TO SUBROUNDED				DRILL RIG CHATTER AT 29'
30	GM	30.6'-31' SILTY GRAVEL WITH TRACE CLAY				
	SP	31'-33.5' SAND GRAY, MODERATELY GRADED, MEDIUM TO COARSE SAND, SOME FINE SAND, TRACE SILT	C-5		DR	
32						
34	GM	33.5'-43.0' SANDY GRAVEL WHITE TO GRAY WITH CLAYEY SILT INCLUSIONS, SOME SILT, POORLY GRADED COARSE SAND			RD	ADDING ADDITIONAL REVERT TO THICKEN FLUID. ROCK FRAGMENTS AND GRAVELS ACCUMULATING IN BOTTOM OF BORING, ATTEMPTING TO FLUSH WITH THICKENED FLUID DRILL RIG CHATTER
36						
38						
			C-6		DR	
40		GRAY, COARSE GRAVEL TO 3", COARSE SAND WITH SILT, DENSE			RD	
42						DRILL RIG CHATTER AT 43'
44	GP	43'-47' SANDY GRAVEL SOME SILT, COARSE GRAVEL				

Project 83-1140-06 MRTC PUMP TEST Date Drilled 2/28/86 Hole No. SITE #2 O.W.-3

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
44	GP	43'-47' SANDY GRAVEL SOME SILT, COARSE GRAVEL			RD	DRILL RIG CHATTER
46						
48	GM	47'-49' SANDY GRAVEL WITH SILT, GREEN CLAYEY SILT				
50	SP/SM	49'-52' SAND GRAY, DENSE, SOME SILT AND GRAVEL, COARSE TO MEDIUM COARSE SAND, POORLY GRADED.	C-7		DR	
52	GP/SP	52'-61' SANDY GRAVEL MIXTURE OF SAND AND GRAVEL, TRACES FINES, OCCASSIONAL LENSES OF GRAVELS AND COBBLES			RD	OCCASSIONAL DRILL RIG CHATTER 54' - STRONG DRILL RIG CHATTER
54						
56						
58						VARIABLE DRILL RIG CHATTER
60						
62	SP GP	61'-64' SAND GRAY, MEDIUM COARSE SAND, SOME GRAVEL, TRACE FINES OCCASSIONAL GRAVEL/COBBLE LENSES	C-8		DR RD	LOOSE SAMPLE
64	SM/ML	64'-69' SAND AND SILT DARK GRAYISH GREEN, FINE SAND AND SILT, POORLY GRADED, TRACE ORGANICS (PLANT ROOTLETS), TRACE GRAVEL.	C-9		DR RD	
66						
68						

Sheet 3 of 4

Project 83-1140-06 MRTC PUMP TEST Date Drilled 2/28- 3/1/86 Hole No. O.W.-3 SITE #2

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
68	SM ML	64'-69' SAND AND SILT DARK GREEN TO GRAY, FINE SAND, LITTLE GRAVEL				
70	GP	69'-71' SANDY GRAVEL			RD	DRILL RIG CHATTER
72	SP	71'-74' SAND GRAY, COARSE SAND LITTLE GRAVEL				
74	GP	74'-84' GRAVEL COARSE GRAVEL TO 2", WITH MEDIUM TO COARSE SAND, TRACE SILT, GRAY COLOR	C-10		DR	DRILL RIG CHATTER
76						STARTED LOSING DRILLING FLUID TO FORMATION, MIXING IN ADDITIONAL REVERT
78					RD	2/28/86
80		SANDY GRAVEL SUBROUNDED TO WELL ROUNDED PEBBLES				3/1/86 CAVING TO 72', MIXED ADDITIONAL REVERT, BOTTOM OF BORING CAVING
82						DRILLED TO 85' AND INSTALLED CASING
84	Tp	84'-85' BEDROCK-PUENTE FORMATION OLIVE GRAY SILTSTONE/CLAYSTONE				
86–92		END OF BORING 85' -INSTALLED PIEZOMETER 0-10' NON SLOTTED 2" PVC CASING 10'-78.5' MACHINE SLOTTED 2" CASING 0.20" SLOTS, END CAPPED - FLUSHED CASING AND BORING WITH CLEAN WATER (±1800 GALLONS WITH ±650 GALLONS RETURNING) RETURN FLUID REDUCED AS BORING WAS FLUSHED. ADDED 1/2 QUART BLEACH. -BACKFILLED BORING WITH #3 MONTEREY SAND - INSTALLED WELL COVER AND CASING TOP 2.5', SEALED TOP 5' WITH CONCRETE GROUT AND BENTONITE				

SITE #2
OBSERVATION WELL #4

Converse Consultants

Boring Log 5-5 (1983)

THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME.
CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SCRTD - Union Sta. DATE DRILLED 2/1/83 HOLE NO. 5-5
LOCATION Loading Dock at Int: Vignes & Ramirez Sts GROUND ELEV. 280.8'
DRILLING CONTRACTOR Converse - Las Vegas LOGGED BY B. Ingham DEPTH TO GROUND WATER 27.9
TYPE OF RIG ____ HOLE DIAMETER 4¾" HAMMER WEIGHT AND FALL 320#, 36" (2-8-2-
SURFACE CONDITIONS A.C. Parking Area TOTAL DEPTH 100.0 NO. CORE BOXES ____

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0		0.0 - 0.3 · Asphalt Pavement			RD			Set up 2:45 PM 1/31
	ML & SM	0.3-5.5 - Fill · Sandy Silt & Silty Sand		16	S			Begin Drilling 7:15AM 2/1/83; Weather: Clear, Warm
2.0				25	P			
		Mottled & Intermixed Moist, Stiff/M. Dense w/ Brick Debris		57	T			
					RD			Drilled to 5' with 7" bit for Piezo Installation. 4¾" bit below
4.0								
			5-1 3K		CCI DR			Contact confined within sample
6.0	SM	Young Alluvium; 5.5-11.0 · Silty Sand; Gray-Brn., Moist, Med. Dense; Fine to V. Fine Sand-70%; 30% Silt			RD			
8.0								
10.0				10	S			
				12	P			
	SP	11.0 - 14.0 Sand; Gray-Brn, Moist, M. Dense to Dense; Poorly Graded Fine Sand w/ trace silt		25	T			
12.0					RD			
14.0	SW	14.0 - 62.0 Gravelly Sand; Brown, Dense; Well Graded - Med to Coarse Clean Sand - 70%, Gravel to 2" - 30%; Subangular to Subrounded Grains, Granitic Comp.						
			5-2 50K		CCI DR			Gravelly - Disturbed Sample
16.0					RD			
18.0								
20.0								

SHEET 1 OF 6

SITE #2
OBSERVATION WELL #4

PROJECT SCRTD - UNION STA. DATE DRILLED 2/1/83 HOLE NO. S-5 (1983)

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
20.0	SW	14.0-62.0 GRAVELLY SAND (CONTINUED)	5" REFUSAL	100	SPT RD			
22.0								
24.0								
		25.5-26.0 - LENSE OF FINE SAND IN SAMPLE	S-3 36K		CCT DR RD			
26.0								
28.0								
30.0		30.0 COLOR CHANGE TO DK. GRAY INCREASED MAFIC CONTENT: GRANITIC/DIORITIC COMP.	3" REFUSAL	75 100	SPT RD			SLIGHT GAS ODOR
32.0								
34.0								
			S-4 40K		CCT DR. RD			SLIGHT GAS ODOR GRAVELLY SAMPLE - ONLY 5 GOOD RINGS
36.0								
38.0								
40.0			J-1 2" REFUSAL	25 75 100	SPT RD			
42.0								
44.0								SHEET 2 OF 6

SITE #2
OBSERVATION WELL #4

PROJECT SCRTD - UNION STA. DATE DRILLED 2/1/83 HOLE NO. 5-5 (1983)

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
44.0		14.0 - 62.0 GRAVELLY SAND (CONTINUED)			RD			
46.0								
48.0								
50.0			75K		CCI DR			SULPHUR ODOR POOR SAMPLE RECOVERY - REMAINING SAMPLE DESTROYED IN HANDLING
					RD			
52.0								
54.0		GRAD. DECREASING GRAVEL CONTENT						
56.0								
58.0								
60.0			5-5 50K		CCI DR			SLIGHT SULPHUR ODOR
					RD			
62.0	SP	62.0 - 78.0 SAND DARK GRAY, DENSE POORLY GRADED UNIFORM FINE TO VERY FINE GRAINED MICACEOUS						
64.0								
66.0								
68.0								SHEET 3 OF 6

SITE #2
OBSERVATION WELL #4

PROJECT SCRTD - UNION STA. DATE DRILLED 2/1/83 HOLE NO. S-5 (1983)

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
66.0	SP	62.0-78.0 SAND (CONTINUED)			RD			
70.0			S-6 50K		CCI DR			STRONGER SULPHUR ODOR; POOR SAMPLE RECOVERY: 4½ RINGS ONLY
					RD			
72.0								
74.0								
76.0								
78.0		78.0-90.0 BOULDERS CUTTINGS: MED. TO COARSE SUBANGULAR GRAINS GRANITIC COMPOSITION						78.0 - CHANGE IN DRILLING CONDITIONS - V. HARD DRILLING, FULL WT. OF RIG (10 TON) ON BIT. TOO HARD TO SAMPLE TO 90.0'
80.0			60K REFUSAL	1"	CCI DR			NO SAMPLE RECOVERY
					RD			
82.0								
84.0								
			100K REFUSAL	0"	RD			ATTEMPTED TO SAMPLE - UNSUCCESSFUL
86.0								
			J-2 CUTTINGS					JAR SAMPLE OF CUTTINGS TAKEN
88.0								
90.0	CL	PUENTE FORMATION 90.0 - 100.0 CLAYSTONE						EASY DRILLING FROM 90.0' CLAYSTONE CUTTINGS OBTAINED
92.0		(SEE NEXT PAGE)						SHEET 4 OF 6

SITE #2
OBSERVATION WELL #1

PROJECT SCRTD - UNION STA DATE DRILLED 2/1/83 HOLE NO. 5-5 (1983)

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
92.0	CL	90.0-100.0 CLAYSTONE (CONTINUED)			RD			
94.0		OLIVE-GRAY COLOR, MOIST. PLASTIC TO FRIABLE STRENGTH, SOFT FRIABLE HARDNESS,						
96.0		THINLY LAMINATED W/ SILTY CLAYSTONE - 20%. SANDSTONE BLEBS. TENDS TO FRACTURE ALONG LAMINATIONS						
98.0								
100.0			S-7 50K		CCI DR			
		END BORING 100.0FT PIEZOMETER SET TO 100' PERFORATED IN LOWEST 40'						

SHEET 5 OF 6

SITE #2 —
OBSERVATION WELL #

SUMMARY BORING NO. 5-5 (1983)

PROJECT SCRTD STATION HOLE UNION STA. DATE DRILLED 2/1/83.

OVERBURDEN DEPTH (FT.) 0.0 TO 90.0.

BEDROCK DEPTH (FT.) 90.0 TO 100.0 (T.D.).

WATER PRESS. TEST No; INTERVAL(S) — TO —, — TO —.

GROUND WATER DEPTH (FT.) 28.0' DATE 2/3/83; 27.9 DATE 2/8/83.

GAS YES; DEPTH FIRST NOTICED 30', DATE ____. (SULPHUR ODOR)

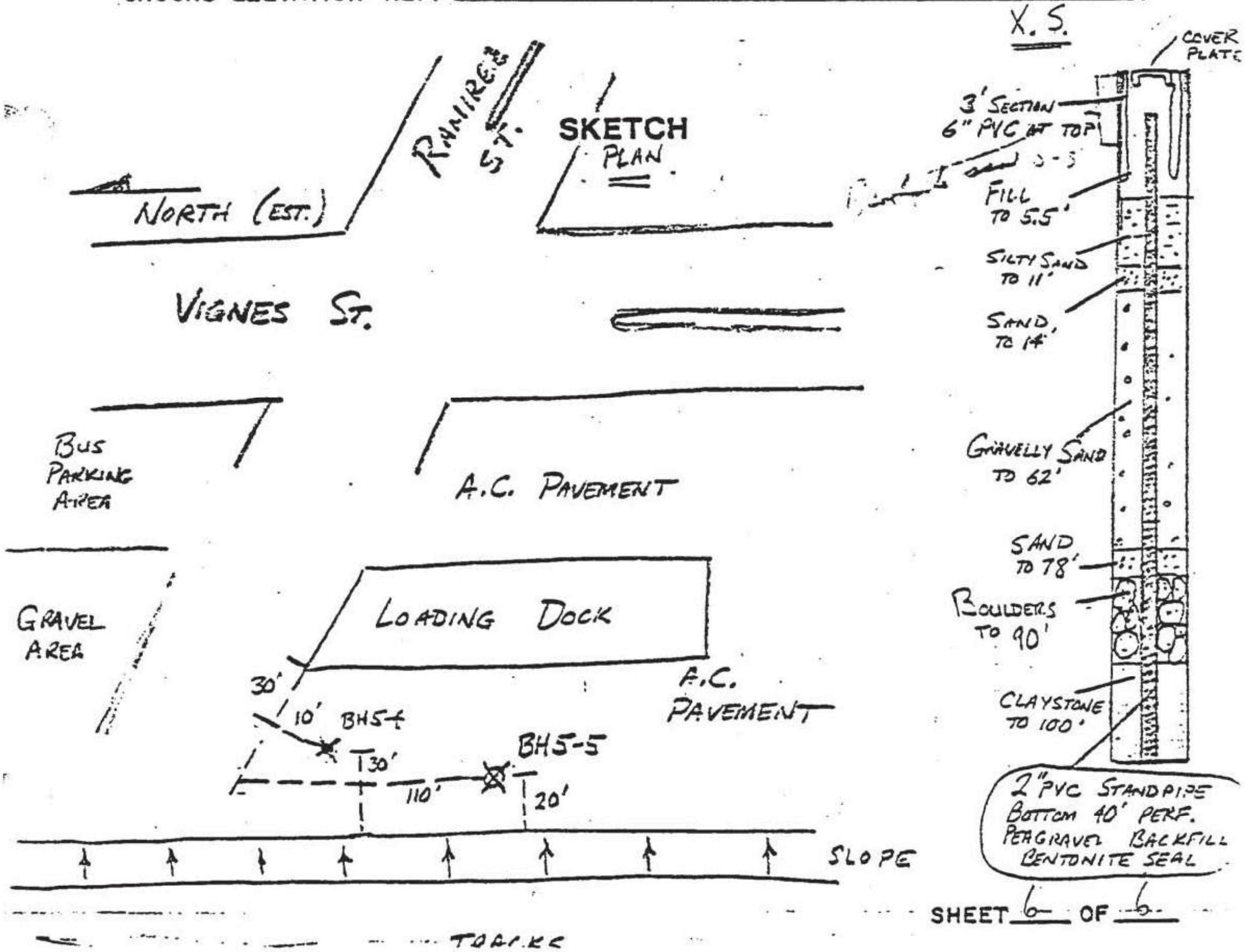
E-LOG No.

DOWN-HOLE SURVEY No.

CROSS-HOLE SURVEY No.

PVC CASING (I.D.): 4" — TO —; 3" — TO —; 2" 0.4 TO 100.0.

GROUND ELEVATION REF. ____.



1983 UNION STATION BORING LOGS

DESIGN UNIT A135

BORING LOGS FOR HOLE NUMBERS 5-2, 5-3 and 5-4

Converse Consultants, Inc.

Converse Consultants

Boring Log 5-2

THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SCRTD - UNION STATION DATE DRILLED 2/3/83 HOLE NO. 5-2
LOCATION BETWEEN TRACKS & BAGGAGE BUILDING GROUND ELEV. 292.7'
DRILLING CONTRACTOR CONVERSE-LAS VEGAS LOGGED BY B. INGHRAM DEPTH TO GROUND WATER
TYPE OF RIG HOLE DIAMETER 4¾" HAMMER WEIGHT AND FALL 320#, 36"
SURFACE CONDITIONS A.C. / CONCRETE PAVED AREA TOTAL DEPTH 85.0' NO. CORE BOXES

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0		0.0-0.4' CONCRETE SLAB 0.4-0.8' BASE COURSE			RD			SET UP 7:00 AM BEGIN DRILLING 7:30 AM WEATHER: OVERCAST, COOL
	ML & CL	0.8-14.0' FILL - CLAYEY SILT AND SILTY CLAY	2-1 8K		CS DR			
2.0		MOTTLED BRN & GREEN-GRAY, MOIST, STIFF, W/ TRACE GRAVEL AND 10% FINE SAND			RD			
4.0								
6.0								
8.0								
10.0				8 11 24	SPT			
					RD			
12.0								
		13.0' - ROCK OR CONCRETE ENCOUNTERED		100-0". REFUSAL				TRIED TO SAMPLE WITH SPT - COULD NOT DRIVE.
14.0	SM	YOUNG ALLUVIUM 14.0-19.0 SILTY SAND GRAY-BRN, MOIST, MED. DENSE FINE TO V. FINE SAND W/ 20% SILT						
16.0				6 7 14	SPT			
18.0					RD			
20.0	SW	19.0-72.0 GRAVELLY SAND (SEE NEXT PAGE)						

SHEET 1 OF 5

PROJECT SCRTD - UNION STATION DATE DRILLED 2/3/83 HOLE NO. 5-2

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
20.0	SW	17.0 - 72.0 GRAVELLY SAND (CONTINUED) GRAY, DENSE WELL GRADED - MED. TO COARSE SAND, GRAVEL TO 2"+, PERCENTAGES VARYING WITH DEPTH GRANITIC COMPOSITION	2-2 25K		CCI DR RD			DISTURBED SAMPLE - 4 RINGS ONLY
22.0								
24.0								
26.0								
28.0								
30.0			3" REFUSAL	70 100	SPT RD			RUSTY STAINED GRAINS IN SAMPLE - OXYDIZING ENVIRONMENT
32.0								
34.0								
36.0								
38.0		INCREASING CONTENT OF FINE & V. FINE GRAINED SAND						
40.0			50K		CCI DR RD			NO SAMPLE RECOVERY
42.0								
44.0								

SHEET 2 OF 5

PROJECT SCRTD - UNION STATION DATE DRILLED 2/3/83 HOLE NO. 5-2

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
44.0	SW	19.0 - 72.0 GRAVELLY SAND (CONTINUED)			RD			
			2-3 75K		CCI DR			SLIGHT SULPHUR ODOR, GRAY SAMPLE - REDUCING ENVIRONMENT
46.0		COLOR CHANGE OCCURRED - TO DK. GRAY			RD			POOR SAMPLE RECOVERY - - 4 DISTURBED RINGS ONLY
48.0								
50.0								
52.0								
54.0								
			80K		CCI DR			NO SAMPLE RECOVERY
56.0					RD			
58.0								
60.0			75K		CCI DR			NO SAMPLE RECOVERY
					RD			
62.0		GRAVEL CONTENT DECREASES W/ DEPTH						
64.0								
			J-1 5"	100 REFUSAL	SPT			
					RD			
66.0								
68.0								

SHEET 3 OF 5

PROJECT SCRTD - UNION STATION DATE DRILLED 2/3/83 HOLE NO. 5-2

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
68.0	SW	19.0-72.0 GRAVELLY SAND (CONTINUED)			RD			
70.0		DECREASING GRAVEL CONTENT	2-4 60K		CCI DR			SLIGHT SULPHUR ODOR
					RD			
72.0	SP	72.0-83.0 SAND DARK GRAY, DENSE, POORLY GRADED PREDOM. MED. GRAINED TRACE GRAVEL TO 2"						EASIER DRILLING
74.0			5"	100	SPT			SULPHUR ODOR
76.0					RD			
78.0		SAND BECOMES MORE FINE-GRAINED						
80.0		FINE TO V. FINE GRAINED	2-5 50K		CCI DR			SULPHUR ODOR DISTURBED SAMPLE ONLY 5 RINGS
		THIN LENSES OF SILTY SAND			RD			
82.0								
		83.0-84.0 BOULDERS GRANITIC-TYPE CUTTINGS	50K-0" REFUSAL		CCI			HARD DRILLING TRIED TO SAMPLE - COULD NOT DRIVE SAMPLER
84.0		END BORING 84.0 FT						

SHEET 4 OF 5

SUMMARY BORING NO. 5-2

PROJECT SCRTD STATION HOLE Union Station DATE DRILLED 2/3/83.

OVERBURDEN DEPTH (FT.) 0.0 TO 84.0 (T.D.)

BEDROCK DEPTH (FT.) — TO — ~~(T.D.)~~.

WATER PRESS. TEST No; INTERVAL(S) — TO —, — TO —.

GROUND WATER DEPTH (FT.) — DATE —; — DATE —. Rotary Wash Boring - Could not Determine

GAS Yes; DEPTH FIRST NOTICED 45', DATE 2/3/83. - Sulphur odor

E-LOG No.

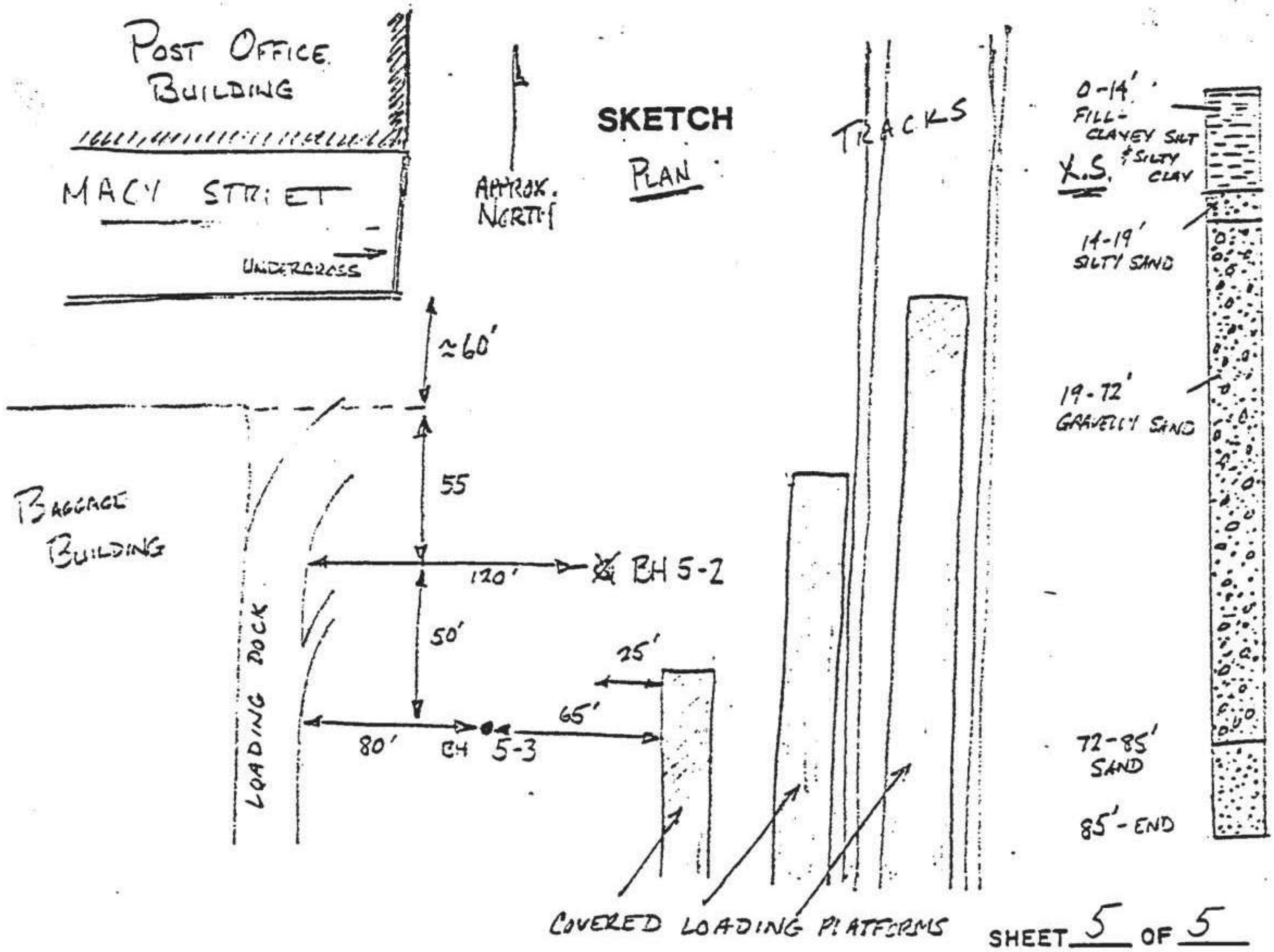
DOWN-HOLE SURVEY No.

CROSS-HOLE SURVEY No.

PVC CASING (I.D.): 4" — TO —; 3" — TO —; 2" — TO —. None

GROUND ELEVATION REF. ________.

SKETCH



SHEET 5 OF 5

Converse Consultants

Boring Log 5-3

THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SCRTD - UNION STATION DATE DRILLED 2/2/83 HOLE NO. 5-3
LOCATION BETWEEN TRACKS & BAGGAGE BLDG. GROUND ELEV. 292.8'
DRILLING CONTRACTOR CONVERSE - LAS VEGAS LOGGED BY B. INGHRAM DEPTH TO GROUND WATER ____
TYPE OF RIG ____ HOLE DIAMETER 4 3/4" HAMMER WEIGHT AND FALL 320#, 36"
SURFACE CONDITIONS A.C. PAVED AREA TOTAL DEPTH 80.0' NO. CORE BOXES ____

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0		0.0 - 0.8' ASPHALT PAVEMENT			RD			SET UP 7:00 AM BEGIN DRILLING 7:30 AM WEATHER: COOL, RAINING
	GW	0.8 - 4.6' FILL - GRAVEL WELL GRADED GRAVEL TO 2½", COMPOSITION VARIABLE SUBANGULAR TO SUBROUNDED	20K		CCI DR			
2.0					RD			NO SAMPLE RECOVERY LOST CIRCULATION OF DRILLING FLUID
4.0								
	ML	4.6 - 14.0 CLAYEY SILT GREEN-GRAY, MOIST, STIFF CONSISTENCY VARIABLE SAND CONTENT (LOCALLY 3 - 30%)	3-1 15K		CCI DR			
6.0					RD			
8.0								
10.0		TO VERY STIFF CONSISTENCY		15 25 45	SPT			
12.0					RD			
14.0	SM	YOUNG ALLUVIUM 14.0 - 19.0 SILTY SAND GRAY-BROWN, MOIST, MED. DENSE. FINE TO V. FINE SAND WITH 20% SILT		20 13 20	SPT			
16.0					RD			
18.0								
	SW	19.0 - 74.0 GRAVELLY SAND						
20.0		(SEE NEXT PAGE)						SHEET 1 OF 5

PROJECT SCRTD - UNION STA. DATE DRILLED 2/2/83 HOLE NO. 5-3

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
20.0	SW	19.0 - 74.0 GRAVELLY SAND (CONTINUED)	37K		CCI DR			NO SAMPLE RECOVERY
					RD			
22.0		BROWN, VERY DENSE, WELL GRADED - MED. TO COARSE SAND (70%), GRAVEL TO 3"+ (30%) SUBANGULAR TO SUBROUNDED GRAINS, GRANITIC COMP.						
24.0		ALTERNATING SAND & GRAVEL STRATA						24-28' INTERMITTENT RIG CHATTER
26.0								
28.0								
30.0			20K	9"	CCI DR			POOR SAMPLE RECOVERY LARGE GRAVEL - SAMPLE DESTROYED BY HANDLING
					RD			
32.0								
34.0								
36.0								
38.0								
40.0		CHANGE OF SAMPLE COLOR TO DARK GRAY	57K		CCI DR			SULPHUR ODOR LARGE GRAVEL IN SAMPLE - SAMPLE DESTROYED BY HANDLING
					RD			
42.0								RIG CHATTER AT 43.'
44.0								

PROJECT SCRTD - UNION STA. DATE DRILLED 2/2/83 HOLE NO. 5-3

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
44.0	SW	19.0-74.0 GRAVELLY SAND (CONTINUED)			RD			
46.0								
48.0								
50.0			3-2 41K		CCI DR			SULPHUR ODOR IN SAMPLE
					RD			
52.0		ALTERNATING SAND AND GRAVEL STRATA						
								53' INTERMITTENT RIG CHATTER TO 58'
54.0								
56.0								
58.0								
60.0			82K		CCI DR			SLIGHT SULPHUR ODOR IN SAMPLE
					RD			POOR RECOVERY - SAMPLE DESTROYED BY HANDLING
62.0								
64.0		LESS GRAVEL, LENSES FURTHER APART						
66.0								
68.0								

PROJECT SCRTD - UNION STA DATE DRILLED 2/2/83 HOLE NO. 5-3

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
68.0	SW	19.0 - 74.0 GRAVELLY SAND (CONTINUED)			RD			
70.0		(SAND STRATA SAMPLED)	3-3 85K		CCI DR			SLIGHT SULPHUR ODOR IN SAMPLE
					RD			
72.0								
74.0	SP	74.0-80.0 SAND						74' EASIER DRILLING
76.0		DARK GRAY, MED. DENSE TO DENSE; POORLY GRADED, UNIFORM FINE TO V. FINE GRAINED, MICACEOUS						
		SILTY SAND LENSES						
78.0								
			3-4 35K		CCI DR			SULPHUR ODOR IN SAMPLE
80.0		END BORING 80.0 FT						

SHEET 4 OF 5

SUMMARY BORING NO. 5-3

PROJECT SCRTD STATION HOLE UNION STATION DATE DRILLED 2/2/83.

OVERBURDEN DEPTH (FT.) 0.0 TO 80.0 (T.D.)

BEDROCK DEPTH (FT.) — TO — ~~(T.D.)~~.

WATER PRESS. TEST NO; INTERVAL(S) — TO —, — TO —.

GROUND WATER DEPTH (FT.) — DATE —; — DATE —. ROTARY WASH BORING - COULD NOT DETERMINE

GAS YES; DEPTH FIRST NOTICED 40', DATE 2/2/83. - SULPHUR ODOR

E-LOG NO.

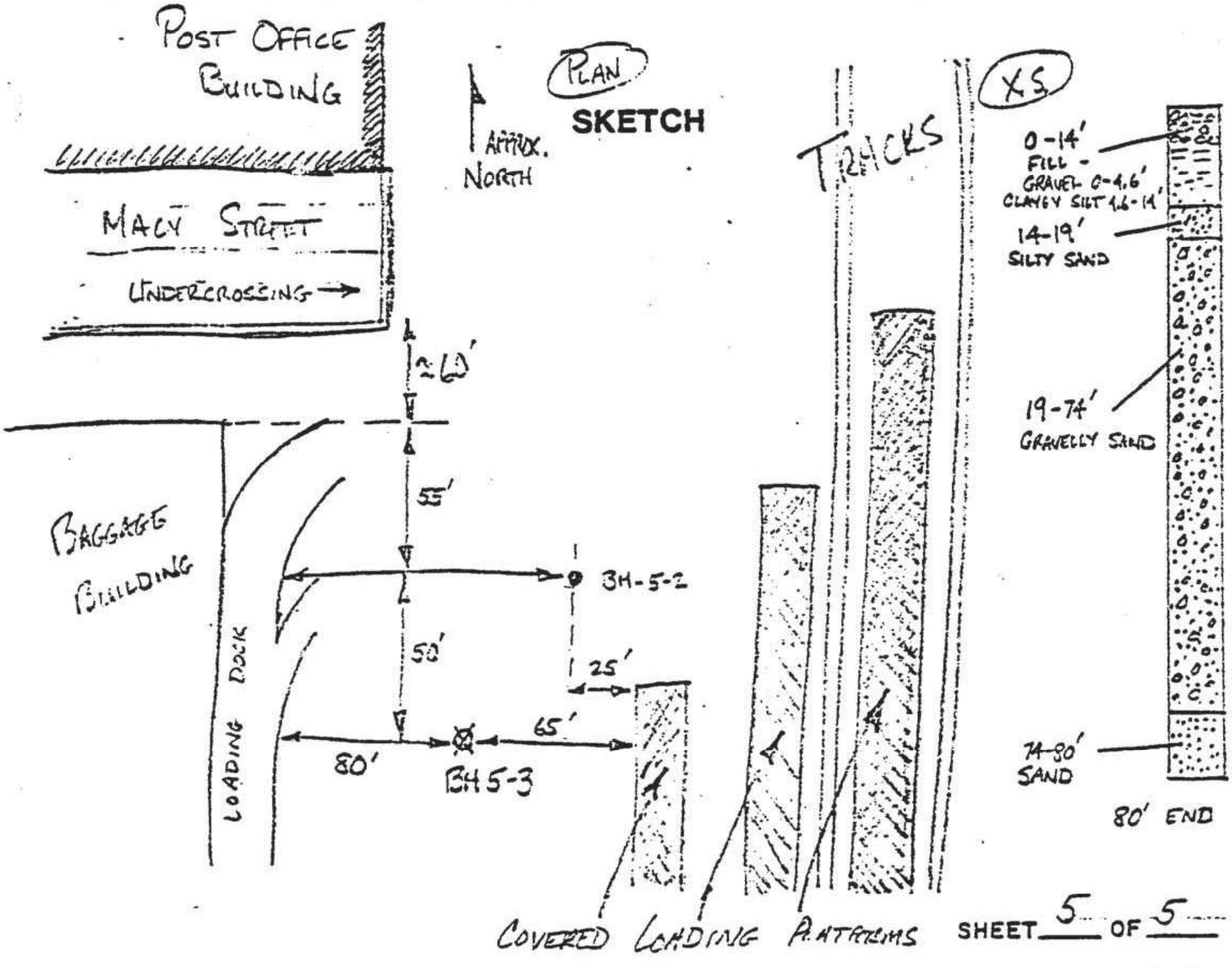
DOWN-HOLE SURVEY NO.

CROSS-HOLE SURVEY NO.

PVC CASING (I.D.): 4" — TO — NONE; 3" — TO —; 2" — TO —.

GROUND ELEVATION REF. ____.

SKETCH



SHEET 5 OF 5

Converse Consultants

Boring Log 5-4

THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SCRTD DATE DRILLED 1/31/83 HOLE NO. 5-4
LOCATION LOADING DOCK, INT. VIGNES & RAMIREZ STREETS GROUND ELEV. 25?.6'
DRILLING CONTRACTOR CONVERSE - LAS VEGAS LOGGED BY B INGHRAM DEPTH TO GROUND WATER
TYPE OF RIG HOLE DIAMETER 4 3/4" HAMMER WEIGHT AND FALL 320#, 36"
SURFACE CONDITIONS A.C. PARKING AREA TOTAL DEPTH 80.0' NO. CORE BOXES

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0		0.0 - 0.3 ASPHALT PAVEMENT			RD			BEGIN DRILLING 8:15AM WEATHER: CLEAR, WARM
	ML	0.3 - 3.5 FILL - SANDY SILT						
		DARK BRN, MOIST, STIFF SILT - 50%, FINE TO MED. SAND 40%, 10% GRAVEL & BRICK CHUNKS	4-1 16K		CCI DR			
2.0					RD			
		3.5 - 4.0 CONCRETE BLOCK						
4.0	SM	- YOUNG ALLUVIUM -						
		4.0 - 7.0 SILTY SAND						
		GRAY - BRN, MOIST, DENSE FINE TO VERY FINE - 70%, SILT - 30%	J-1	30 18 24	SPT			
6.0					RD			
	SP	7.0 - 18.0 SAND						
8.0		GRAY, MOIST, DENSE. CLEAN, UNIFORM FINE SAND						
10.0			4-2 17K		CCI DR			
					RD			
12.0		BECOMES COARSER: TO MED. GRAINED						
14.0								
			J-2	5 4 11	SPT			
16.0					RD			
18.0	SW	18.0 - 28.0 GRAVELLY SAND						
		BRN / GRAY / WHT, MOIST, DENSE MED. TO COARSE CLEAN SAND - 60%, GRAVEL TO 2" - 40%; SUBROUNDED TO SUBANGULAR GRAINS. GRANITIC / CRYSTALLINE COMPOSITION						
20.0								SHEET 1 OF 5

PROJECT SCRTD - UNION STA. DATE DRILLED 1/31/83 HOLE NO. 5-4

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
20.0	SW	18.0 - 28.0 GRAVELLY SAND (CONTINUED)	4-3 75K		CCI DR			HIGHLY DISTURBED SAMPLE DUE TO LG. GRAVEL PIECES IN SAMPLE BARREL
					RD			
22.0								
24.0								
			5" REFUSAL	100	SPT			
26.0					RD			
28.0	SP/CL	28.0-41.0' SAND / SILTY CLAY GRAY, MOIST, DENSE CLEAN SAND; INTERBEDS OF DARK GRAY, STIFF, MOIST SILTY CLAY TO 31.5'						
30.0			4-4 55K		CCI DR			
					RD			
32.0	SP	31.5' END CLAY INTERBEDS						
34.0								
			J-3	67 55 70	SPT			
36.0					RD			
38.0								
40.0			30K 0" REFUSAL					No Sample Recovery
	SW	41.0 - 68.0 GRAVELLY SAND DARK GRAY, VERY DENSE SUBROUNDED GRAINS, WELLGRADED V.FINE TO COARSE SAND - 75%, GRAVEL TO 1" - 25% HIGHLY MICACEOUS - DIORITIC COMPOSITION						
42.0								
44.0								SHEET 2 OF 5

PROJECT SCRTD - UNION STA. DATE DRILLED 1/31/83 HOLE NO. 5-4

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
44.0	SW	41.0-68.0 GRAVELLY SAND (CONTINUED)			RD			
				75	SPT			
46.0				78				
			5"-	100				
					RD			
48.0								
50.0		50.5' CLAY INTERBEDS DECREASING GRAVEL (TO ≈ 15%)	4-5 70K		CCI DR			4 RINGS ONLY
					RD			SULPHUREOUS ODOR IN SAMPLE
52.0								
54.0								
			3"- REFUSAL	100	SPT			SULPHUREOUS ODOR
56.0					RD			
58.0								
60.0			4-6 15K-9"		CCI DR			SULPHUR, MICROTHERMAL ODOR
					RD			
62.0								
64.0								
				105	SPT			SULPHUR ODOR
66.0			1"-	50				
					RD			
68.0								

SHEET 3 OF 5

PROJECT SCRTD - UNION STA. DATE DRILLED 1/31/83 HOLE NO. 5-4

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
68.0	SP	68.0 - 75.0 SAND GRAY, DENSE UNIFORM MICACEOUS FINE TO VERY FINE GRAINED			RD			
70.0			4-7 25K		CCI DR			SULPHUR/HYDROTHERMAL ODOR IN SAMPLE
					RD			
72.0								
74.0								
75.0	SW	75.0 - 80.0 GRAVELLY SAND 20% GRAVEL TO 1½" GRAY, DENSE TO V. DENSE						
76.0								
78.0								
			4-8 75K		CCI DR			STOP DRILLING 2:30 PM
80.0		END BORING 80.0 FT						

SHEET 4 OF 5

SUMMARY BORING NO. 5-4

PROJECT 83-1101-41 STATION HOLE Union Sta. DATE DRILLED 1/31/83.

OVERBURDEN DEPTH (FT.) 0.0 TO 80.0 (T.D.)

BEDROCK DEPTH (FT.) Not Encountered TO ______ ~~(T.D.)~~.

WATER PRESS. TEST No; INTERVAL(S) — TO ______, ______ TO ______.

GROUND WATER DEPTH (FT.) Rotary Wash - Could Not Determine DATE ______; ______ DATE ______.

GAS Yes; DEPTH FIRST NOTICED 50', DATE 1/31. - Sulphur odor

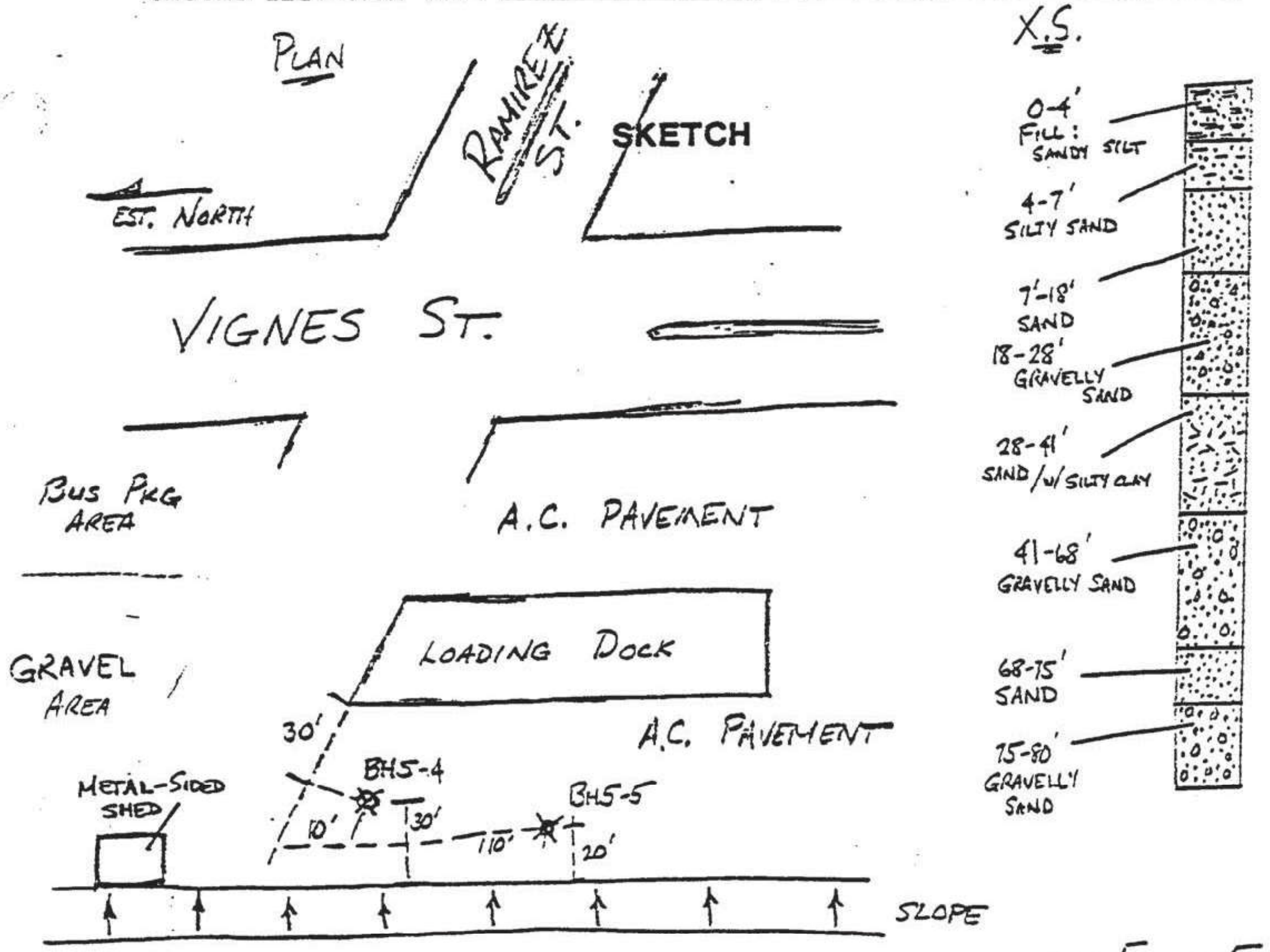
E-LOG No.

DOWN-HOLE SURVEY No.

CROSS-HOLE SURVEY No.

PVC CASING (I.D.): 4" — (None) TO ______; 3" — TO ______; 2" — TO ______.

GROUND ELEVATION REF. ______________________.



SHEET 5 OF 5

Existing Geotechnical Boring Logs

The Earth Technology Corporation, 1987c

APPENDIX C

SITE BORING LOGS

The Earth Technology Corporation

BOREHOLE LOG

Project Name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-201 Sheet 1 of 2

Borehole Location: Traffic Island off 101 Fwy		Elevation and Datum: 277.4 feet	
Drilling Agency: DRILL LINE	Driller: Gregg Deluca, John Hale	Date Started: 1-8-87	Date Finished: 1-8-87
Drilling Equipment: B-53		Completion Depth (feet): 46.5	Rock Depth: (feet)
Method of Drilling: Hollow Stem Auger - 6 Inch Dia.		Number of Samples: 6 Dist.:	Undist.: 6 Core:
Borehole Size: 8 Inch		Water Depth (ft): 29 First:	Compl.: 24 hrs.
Type of Perforation Backfill: None		Logged By: Sharon Lagas	Checked by: Barbara Fontes
Type of Seal: 5% Bentonite Cement Grout			

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks
	Dry, dark brown, silty fine to medium size grain sand with some small gravel	SM Fill					9:30	Baseline OVA reading at 2 ppm. Traffic island has been disturbed during freeway construction
5	5-6.5' Same as above with small chips of brick 7' Hit debris (possibly brick)	SM	1	1		12/26/26	10:00	OVA Readings at Baseline
10	10-11.5' Dry, dark brown, silty, fine to medium size sand	SM	1	2		18/22/32	10:08	OVA Readings at Baseline
15	15-16.5' Dry, brown to light brown silty sand with gravel	SM	-	3		14/9/7	10:13	OVA Readings at Baseline No recovery for OVA
20	20' No recovery-cobble, gravel		-	-		NOTE	10:20	OVA Readings at Baseline
25	25' No recovery - 5" chunk of concrete Groundwater encountered at approximately 29 feet		-	-		NOTE	10:30	Possibility of disturbed soil to 25 ft. OVA readings at Baseline
30								

The Earth Technology Corporation

BOREHOLE LOG

Project name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-201 Sheet 2 of 2

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks
	30-31.5' Wet, gray, fine to medium size sand	SP	70	4		16/32/37	10:37	OVA Readings at Baseline, sample has oily film and slight oily odor with sheen
35	35-36.5' Wet, gray, medium to coarse grained sand	SP	-	5		10/22/50	10:54	OVA Readings at Baseline No recovery for OVA
40	40' No recovery - cobble, gravel		-			50/6"	11:04	
45	45-46.0' Wet, dark gray, fine to medium size sand	SP	8	6		15/50	11:18	OVA Readings at Baseline
50	46.5' Hit boulder End Hole						11:25	Collected water samples
55	Note: On this and all logs that follow, there are missing blow counts at some sampling intervals. In those cases, blow counts were not recorded due to other demands on personnel time.							
60								
65								
70								

The Earth Technology Corporation

BOREHOLE LOG

Project Name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-202 Sheet 1 of 2

Borehole Location: Traffic Island off 101 FWY	Elevation and Datum: 277.3 ft
Drilling Agency: DRILL LINE; Driller: ~~Gregg Deluca~~ John Hale	Date Started: 1/8/87; Date Finished: 1/8/87
Drilling Equipment: B-53	Completion Depth (feet): 50; Rock Depth (feet):
Method of Drilling: Hollow Stem Auger - 6 Inch Dia.	Number of Samples: 8; Dist.: ; Undist.: 8; Core:
Borehole Size: 8 Inch	Water Depth (ft): 29; First: ; Compl.: ; 24 hrs.
Type of Perforation Backfill: None	Logged By: Sharon Lagas; Checked by: Barbara Fontes
Type of Seal: 5% Bentonite Cement Grout	

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks
	Dry, dark brown, silty fine to medium size sand with gravel. Hit concrete @ 1'	SM fill		-	-		1:30	Baseline OVA Reading @2 ppm
5	5-6.5' Dry, light brown, fine to medium size sand with some silt	SM	2	1		8/12/13	1:40	OVA Readings at Baseline
10	10-10.5' Dry, brown, silty, fine to medium size sand with clay	SC	1	2		8/4/16	1:45	OVA Reading at Baseline
	10.5-11.5' Dry, light brown, medium to coarse grained sand with gravel	SP						
15	15-16.5' Dry, light brown, medium to coarse sand with gravel	SP	4	3		23/40/25	1:50	OVA Readings at Baseline
	17.5' Hit cobble							
20	20-21.0' Same as above	SP	2	4		28/50	1:58	OVA Readings at Baseline, oily film on sand
	25-25.5' Dry, light brown, medium to coarse sand which grades into a brown-gray silty clay	SP/CL	6	5		14/23	2:06	OVA Readings at Baseline
25	25.5-26.0' Moist, brown-gray, medium to coarse sand Groundwater encountered at approximately 29 feet	SP						
30								

The Earth Technology Corporation

BOREHOLE LOG

Project name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-202 Sheet 2 of 2

Depth (feet)	Description	Lithology	OVA (ppm)	Number	Type	Blow Count	Drilling Rate/Time	Remarks
30	30-31.5' Wet, gray, medium to coarse grained sand	SP	16	6		13/35/50	2:15	OVA Readings at Baseline
35	35' No Recovery	-	-	-		8/16/40	2:20	
40	40-41.5' Wet, gray, medium to to coarse grained sand	SP	10	7		8/16 47	2:28	OVA Readings at Baseline
45	45' Hit boulder 45.5'-46.5' Wet, dark gray, fine to medium size sand	SP	-	8		30/50	2:42	OVA Readings at Baseline No recovery for OVA
50	50' Hammer broke, ended hole						3:15	No water sample
55								
60								
65								
70								

The Earth Technology Corporation

BOREHOLE LOG

Project Name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-203 Sheet 1 of 2

Borehole Location: Traffic Island off 101 FWY		Elevation and Datum: 276.5 ft	
Drilling Agency: DRILL LINE	Driller: Gregg Deluca John Hale	Date Started: 1/14/87	Date Finished: 1/14/87
Drilling Equipment: B-53		Completion Depth (feet) 60	Rock Depth: (feet)
Method of Drilling: Hollow Stem Auger - 6 Inch Dia.		Number of Samples: 5 Dist.:	Undist.: 5 Core:
Borehole Size: 8 Inch		Water Depth (ft): 30 First:	Compl.: 24 hrs.
Type of Perforation Backfill: None		Logged By: Sharon Lagas	Checked by: Barbara Fontes
Type of Seal: 5% Bentonite Cement Grout			

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks Slant Drilling Angle = 20°
	Dry, brown, silty fine to medium size sand - at 6" hit old brick and large boulder	SM FILL					10:00	OVA not working
5	5' Same as above with gravel and cobble - no sample collected			-		Note		No sample collected, augers grinding on gravel and cobble
	7' Broke through gravel	---						Black brown color soil
10	10-11.5' Dry, black-brown, fine to medium sand and silt with small wood fragments	SM		1		15/19/26	10:51	Soil becomes brown in color and fluffy in texture
15	15-16.5' Dry, brown, medium to coarse grained sand with gravel	SP		2		10/10/8	11:00	
20	20' No recovery			-		Note		Hammer sticking so drilling another 5 feet
25	25-25.5' Dry, light brown, medium to coarse grained sand with gravel	SP		3		Note	11:21	Only 6" of sample due to sampler falling at an angle. Samplerhitting against the auger
30	Groundwater encountered at approx. 30 feet							

The Earth Technology Corporation

BOREHOLE LOG

Project name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-203 Sheet 2 of 2

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Drilling Rate/Time	Remarks
	30-30.5' Wet, brown, coarse grained sand and gravel	SP		4		50/6"	11:30	
	32.5' Small Cobble, large gravel	GP						
35	35-35.7' Wet, gray, medium to coarse grained sand	SP		5		39/50 for 2"	11:43	Slight oily odor, only 8-10" of sample, rest was slough
	39' Small Cobble, large gravel (about 2 in.)	GP						
40	40' No recovery - Possibly cobble and gravel*			-		Note	12:00	Hammer sticking
45	45' No recovery - Possibly cobble and gravel*			-		Note	1:11	Hammer sticking-cannot sample without hammer getting stuck so continuing on to 60 feet
50	50' No recovery - Possibly cobble and gravel*			-		Note	12:17	
55	55' No recovery			-		Note		Hitting cobbles
	Wet, gray, medium to coarse grained sand with slight hydrocarbon odor coming up from augers							Appears to be predominantly slough
60	60' End hole						12:33	Collected water samples
65								
	*Augers bringing up slough from upper portion of borehole.							
70								

The Earth Technology Corporation

BOREHOLE LOG

Project Name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-204 Sheet 1 of 2

Borehole Location: Old Center St. (b/t Aliso & Comm.)		Elevation and Datum: 275.4 ft	
Drilling Agency: DRILL LINE	Driller: Gregg Deluca John Hale	Date Started: 1/12/87	Date Finished: 1/12/87
Drilling Equipment: B-53		Completion: Depth (feet) 61.5	Rock Depth: (feet)
Method of Drilling: Hollow Stem Auger - 6 Inch Dia.		Number of Samples: 6 Dist.:	Undist.: 6 Core:
Borehole Size: 8 Inch		Water Depth (ft): 30 First:	Compl.: 24 hrs.
Type of Perforation Backfill: None		Logged By:	Checked by:
Type of Seal: 5% Bentonite Cement Grout		Barbara Fontes	Sharon Lagas

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks
	Asphalt, concrete debris						7:30	Baseline OVA Reading at 4 ppm
	Dry, dark brown, silty fine to medium size sand	SM						
5	5' Same as above	SM		-				No samples collected
	8-9' Moist clayey sand	SC						
10	10-11.5' Dry, brown, silty, fine to medium size sand	SM	2	1		8/15/11	8:00	OVA Readings @ baseline
15	15-15.5' Same as above	SM	4	2		18/6"	8:10	Collected only OVA sample. Hit large object-refusal. Sampler is not penetrating
20	20-21.5' Dry, brown, medium to coarse grained sand with fragmented gravel and small cobbles	SP	4	3		39/50/49	8:17	OVA readings @ baseline
25	25-25.5' Same as above	SP	160	4		25/6"	8:25	Soil has hydrocarbon odor. OVA values recorded at 160 ppm
	Groundwater encountered at approx. 30 feet							
30								

The Earth Technology Corporation

BOREHOLE LOG

Project name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-204 Sheet 2 of 2

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks
	30-31.0' Wet, gray, coarse grained sand	SP	-	5		20/50		No OVA recovery
35	35-36.5' Same as above	SP		6		Note		
	38.5' Cobble, gravel							
40	40' No recovery - cobble, gravel			-		Note	8:59	OVA reading 2 ppm Hole has slight creosote odor (40 to 60 feet)
45	45' No recovery - cobble, gravel			-		Note		
50	50' No recovery - slough			-		Note		Augers contained approx. 4 feet of slough
55	55' No recovery			-		Note		
60	60' Wet, gray, coarse grained sand End Hole	SP	>1000	-		8/11/16	9:44 10:01	Collected water samples, not enough recovery for soil samples
65								
70								

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BOREHOLE LOG

Project Name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-205 Sheet 1 of 2

Borehole Location: Commercial and Center St., West		Elevation and Datum: 274.7 ft	
Drilling Agency: DRILL LINE	Driller: Gregg Deluca John Hale	Date Started: 1/13/87	Date Finished: 1/13/87
Drilling Equipment: B-53		Completion Depth (feet) 61.5	Rock Depth: (feet)
Method of Drilling: Hollow Stem Auger - 6 Inch Dia.		Number of Samples: 7 / Dist.:	Undist.: 7 / Core:
Borehole Size: 8 Inch		Water Depth (ft): 30 / First:	Compl.: / 24 hrs.
Type of Perforation Backfill: None		Logged By: Barbara Fontes	Checked by: Sharon Lagas
Type of Seal: 5% Bentonite Cement Grout			

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks
	Dry, brown, silty, fine to medium size sand with brick chips, possibly fill material	SM Fill					9:00	Baseline OVA reading @ 2ppm Surface soil contains shells and broken pottery. Soil type not evident in other areas
5	5' No sample collected	----		-		Note		
10	10-11.5' Dry, light brown, medium to coarse sand with gravel	SP	4	1		26/22/23	9:05	
15	15-16.0' Same as above	SP	-	2		48/50	9:10	
20	20-21.0' Dry, brown, coarse grained sand and small gravel	SP	-	3		49/50	9:20	
25	25-26.0' Same as above	SP	-	4		33/56	9:36	Decomposed granite cobble in auger (cobble > 3 in.)
30								

The Earth Technology Corporation

BOREHOLE LOG

Project name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-205 Sheet 2 of 2

Depth (feet)	Description	Lithology	OVA (ppm)	Number	Type	Blow Count	Drilling Rate/Time	Remarks
30-31.0'	Wet, grey, medium to coarse grained sand Groundwater encountered at approximately 30 feet	SP	30	5		28/50	9:48	OVA and 1 brass recovery
35-36.5'	Same as above	SP	4	6		14/37/48	9:54	
40-41.5'	Same as above	SP		7		Note	10:00	1 brass recovery, no OVA sample OVA reading @ base-line
43'	Cobble, gravel	GP						
45'	No recovery - cobble, gravel			-		Note	10:27	
50'	Wet, dark gray, fine to medium size sand, oily film and odor	SP	100	-		10/26/50	10:37	Only OVA sample recovery OVA reading @ base-line
55-56.5'	Same as above	SP	100	-		3/13/50	10:48	
60'	No recovery-sampler and "A" rods stuck in augers End Hole			-		Note	10:59	Water samples collected

The Earth Technology Corporation

BOREHOLE LOG

Project Name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-206 Sheet 1 of 1

Borehole Location: Vignes St. (C.C. Meyer's yard)		Elevation and Datum: 276.8 ft	
Drilling Agency: DRILL LINE	Driller: Gregg Deluca John Hale	Date Started: 1-9-87	Date Finished: 1-9-87
Drilling Equipment: B-53		Completion: Depth (feet) N/A	Rock Depth: (feet)
Method of Drilling: Hollow Stem Auger - 6 Inch Dia.		Number of Samples: 0 Dist.:	Undist.: Core:
Borehole Size: 8 inch		Water Depth (ft): First:	Compl.: 24 hrs.
Type of Perforation Backfill: None		Logged By: Sharon Lagas	Checked by: Barbara Fontes
Type of Seal: 5% Bentonite Cement Grout			

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks
	Dry, dark brown, silty sand with large cobbles and pieces of concrete	SM Fill					9:25	Baseline OVA reading @ 2 ppm. Hit concrete at 4 feet and could not get drill straight-abandoned hole.
5	4' concrete Borehole abandoned after two attempts						9:48	
10								
15								
20								
25								
30								

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BOREHOLE LOG

Project Name: METRO RAIL TRANSIT

Project Number: 87-600-003 Field Log of Borehole Number: BH-206A Sheet 1 of 2

Borehole Location: Vignes St. (C.C. Meyer's yard)		Elevation and Datum: 276.5 ft	
Drilling Agency: DRILL LINE	Driller: Gregg Deluca John Hale	Date Started: 1-9-87	Date Finished: 1-9-87
Drilling Equipment: B-53		Completion Depth (feet) 41.5	Rock Depth: (feet)
Method of Drilling: Hollow Stem Auger - 6 Inch Dia.		Number of Samples: 6 Dist.:	Undist.: 6 Core:
Borehole Size: 8 Inch		Water Depth (ft): 29.5 First:	Compl.: 24 hrs.
Type of Perforation Backfill: None		Logged By:	Checked by:
Type of Seal: 5% Bentonite Cement Grout		Sharon Lagas	Barbara Fontes

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks
	Dry, dark brown, sand and gravel with some silt	SP					10:00	Baseline OVA reading @ 2 to 5ppm
5	5-6' Dry, medium to coarse sand with some gravel 6-6.5' Dry, medium grained sand with silt and some clay	SP SC	3	1		10/10/10	10:10	OVA reading @ baseline
10	10' No recovery (probably fill)			-		10/15/27	10:13	OVA reading @ baseline
15	15-15.5' Dry, light brown, medium to coarse sand with gravel	SP	14	2		50/6"	10:23	OVA reading @ baseline
20	20' Dry, gravel with coarse grained sand 23' Gravel and cobble	GP GP		-		23/6"	10:30	No recovery, cobble stuck in sampler
25	25-26.5' Moist, medium to coarse grained sand with gravel Groundwater encountered at approx. 29.5 feet	SP	12	3		10/43/50	10:38	OVA reading @ baseline
30								

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BOREHOLE LOG

Project name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-206A Sheet 2 of 2

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks
30-31.5'	Wet, gray, medium to coarse grained sand	SP	8	4		3/6/10	11:20	OVA reading @ baseline
35-36.5'	Wet, gray, fine to medium size sand	SP	10	5		6/10/13	11:26	OVA reading @ baseline
40-41.5'	Same as above End Hole	SP	6	6		23/49/48	11:36	OVA reading at baseline, 10 feet of slough in hole Collected water samples

Depth scale: 35, 40, 45, 50, 55, 60, 65, 70

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BOREHOLE LOG

Project Name: METRO RAIL TRANSIT

Project Number: 87-600-0033 **Field Log of Borehole Number:** BH-207 **Sheet** 1 **of** 2

Borehole Location: 101 FWY South from Vignes		**Elevation and Datum:** 276.9 ft	
Drilling Agency: DRILL LINE	**Driller:** Gregg Deluca John Hale	**Date Started:** 1/12/87	**Date Finished:** 1/12/87
Drilling Equipment: B-53		**Completion Depth (feet)** 60	**Rock Depth: (feet)**
Method of Drilling: Hollow Stem Auger - 6 Inch Dia.		**Number of Samples:** 4 **Dist.:**	**Undist.:** 4 **Core:**
Borehole Size: 8 Inch		**Water Depth (ft):** 30 **First:**	**Compl.:** **24 hrs.**
Type of Perforation Backfill: None		**Logged By:** Barbara Fontes	**Checked by:** Sharon Lagas
Type of Seal: 5% Bentonite Cement Grout			

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Drilling Rate/Time	Remarks
	Dry, dark brown, silty, fine to medium size sand with gravel and rock/garbage debris	Fill					12:10	Baseline OVA reading @ 2 ppm
5	5-6.5' Same as above	Fill				Note		Very little pressure on augers
10	10-11.5' Moist, black-brown, silty sand, medium plasticity clay with oxidation staining	SC	2	1		3/5/8	12:28	
	12.5' Hit debris-augers crunching							
15	15-16.5' Moist to dry, medium to coarse sand	SP	4	2		31/36/33	12:35	OVA reading @ baseline
	19' Gravel and cobbles	GP						
20	20' Dry, coarse grained sand with gravel and cobbles	SP	6	-		50/6"	12:56	OVA reading @ baseline, cobble stuck in sampler No recovery for lab samples
25	25' Same as above	SP	6	-		50/6"	1:01	No recovery for lab samples
30								

The Earth Technology Corporation

BOREHOLE LOG

Project name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-207 Sheet 2 of 2

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks
	30-31.5' Wet, gray, coarse sand with some silt Groundwater encountered at approximately 30 feet	SP	12	3		4/4/ 24	1:07	
35	35-36.0' Same as above	SP	4	4		20/50	1:14	
	38' Gravel and cobble	GP						Augers vibrating
40	40' Wet, gray, medium to coarse grained sand	SP	12	-		50/6"	1:27	No recovery for lab samples
45	45' No recovery - Possibly medium to coarse grained sand			-		Note	1:30	Having problem with sand heaves going to 60'-sand locking around drill
50	50' No recovery - Possibly medium to coarse grained sand			-		Note		
55	55' No recovery - Possibly medium to coarse grained sand			-		Note		
60	60' End Hole						2:15	Collected water Samples
65								
70								

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BOREHOLE LOG

Project Name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-208 Sheet 1 of 2

Borehole Location: NE of BH-205/Adjacent to Center St.		Elevation and Datum: 270.6 ft	
Drilling Agency: DRILL LINE	Driller: Gregg Deluca ~~John Hale~~	Date Started: 1/13/87	Date Finished: 1/13/87
Drilling Equipment: B-53		Completion Depth (feet): 60	Rock Depth: (feet)
Method of Drilling: Hollow Stem Auger - 6 Inch Dia.		Number of Samples: 6 / Dist.:	Undist.: 6 / Core:
Borehole Size: 8 Inch		Water Depth (ft): 25 / First:	Compl.: / 24 hrs.
Type of Perforation Backfill: None		Logged By: Barbara Fontes	Checked by: Sharon Lagas
Type of Seal: 5% Bentonite Cement Grout			

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Samples: Drilling Rate/Time	Remarks
0	Dry, dark brown, silty fine to medium size sand	SM					12:42	Baseline OVA reading @ 2 ppm
5	5' No sample collected					Note	12:45	OVA reading @ baseline
10	10-11.5' Dry, brown, medium to coarse grained sand with gravel	SP	2	1		33/45/45	12:48	OVA reading @ baseline, large cobble in sampler
15	15-16.0' Dry, brown, fine to medium grained sand	SP	2	2		34/50	12:58	OVA reading @ baseline
20	20-21.0' Dry, brown, medium to coarse sand with gravel and broken cobble	SP	4	3		40/50	1:05	Bouncing off large cobble
25	25-26.5' Wet, gray, medium to coarse grained sand with occasional gravel. Groundwater encountered at approx. 25 feet	SP	100	4		16/19/15	1:12	Slight oily odor
30								

The Earth Technology Corporation

BOREHOLE LOG

Project name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-208 Sheet 2 of 2

Depth (feet)	Description	Lithology	OVA (ppm)	Number	Type	Blow Count	Drilling Rate/Time	Remarks
	30-31.5' Same as above-not as coarse	SP	40	5		7/7/13	1:19	
	34' Gravel and cobble	GP						Drilling very difficult
35	35' No recovery-gravel and cobble	GP		-		Note	1:28	
40	40-41.5' Wet, gray, medium grained sand	SP	2	6		7/9/34	1:43	OVA reading @ base-line, slight creosote odor
45	45' No recovery - Possibly sand			-		Note		
50	50' No recovery-6 feet of slough in augers - Possibly sand			-		Note		
55	55' No recovery - Possibly sand			-		Note		
60	60' Abandoned hole due to sampler being stuck in augers. Could not advance hole any further						2:44	Upon removal of augers, strong creosote odor. No water samples collected due to sampler being stuck
65								
70								

The Earth Technology Corporation

BOREHOLE LOG

Project Name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-209 Sheet 1 of 2

Borehole Location: East Corner Center & Commercial St.		Elevation and Datum: 273.6 ft	
Drilling Agency: DRILL LINE	Driller: Greg Deluca ~~John Hale~~	Date Started: 1/21/87	Date Finished: 1/21/87
Drilling Equipment: B-53		Completion Depth (feet) 50	Rock Depth: (feet)
Method of Drilling: Hollow Stem Auger - 6 Inch Dia.		Number of Samples: 8 / Dist.:	Undist.: 8 / Core:
Borehole Size: 8 Inch		Water Depth (ft): 30 / First:	Compl.: / 24 hrs.
Type of Perforation Backfill: None		Logged By: Sharon Lagas	Checked by: Barbara Fontes
Type of Seal: 5% Bentonite Cement Grout			

Depth (feet)	Description	Graphic Log: Lithology	OVA (ppm)	Samples: Number	Type	Blow Count	Drilling Rate/Time	Remarks
	0-6" Asphalt 6"-1.2' Brick Road 1.2'-1.6' Concrete Dry, dark brown, silty, fine to medium size sand with some gravel	Fill					9:18	Baseline OVA reading @ 6 ppm
5	5-6.5' Dry, brown-black, silty, fine to medium size sand with some gravel	SM	6	1		5/4/4	9:54	OVA reading @ base-line, only OVA sample recovery
10	10.7-11.7' Moist, black-brown, silty, fine to medium size sand with some gravel	SM	6	2		16/17	10:00	At 10' sampler hit pocket and dropped approx. 8"
15	15-16.5' Dry, brown, fine to medium sand with pea size gravel. Upper 8" stained black. Gravel increasing in size with depth. Entire sample saturated with gasoline	SP	33	3		14/41/37	10:05	OVA reading @ base-line Large cobble in bottom of sampler Oily film on sampler
20	20-20.5' Dry, brown, silty sand 20.5-21.5' Moist, gray, medium to coarse sand with pea size gravel	SM SP	6	4		20/37/43	10:20	OVA reading @ base-line Strong oily odor
25	25-26.0' Dry, brown, silty, medium to coarse sand with gravel. 27.5' Hit cobble and gravel Groundwater encountered at approx. 30 feet	SM GP	6	5		27/50	10:27	OVA reading @ base-line Strong oily odor
30								

The Earth Technology Corporation

BOREHOLE LOG

Project name: METRO RAIL TRANSIT

Project Number: 87-600-0033 Field Log of Borehole Number: BH-209 Sheet 2 of 2

Depth (feet)	Description	Graphic Log: Lithology	Graphic Log: OVA (ppm)	Samples: Number	Samples: Type	Samples: Blow Count	Drilling Rate/Time	Remarks
30-31.0'	Wet, green-gray, medium to coarse sand with some gravel	SP	24	6		36/50	10:35	OVA reading at base-line Hit void Soil has H_2S odor Oily film on sampler
35'-35.5'	Wet, gray, medium to coarse grained sand	SP	46	7		50/6"	10:44	OVA reading @ base-line
37'	Hit cobble and gravel	GP						Strong H_2S odor
39'	Broke through cobble							Slight creosote odor on sampler
40-41.5'	Wet, gray, medium to coarse grained sand with gravel	SP	12	8		6/8/16	10:59	OVA reading @ base-line Oily film on sampler
45'	No recovery - 4' slough in augers			-		Note		
50'	End hole - no recovery due to sampler sticking in augers						11:21	Water samples collected OVA reading 14 ppm at top of hole

Depth scale: 35, 40, 45, 50, 55, 60, 65, 70

Existing Geotechnical Boring Logs

GeoBase & GPI, 1993

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIALS IS LARGER THAN #200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN #4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.
			GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVEL WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURE, NON PLASTIC FINES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN #4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.
			SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES.
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN #200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY.
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.
	HIGHLY ORGANIC SOILS		PT	PEAT AND OTHER HIGHLY ORGANIC SOILS.

CLASSIFICATION CRITERIA BASED ON FIELD TESTS

PENETRATION RESISTANCE (PR)

SANDS AND GRAVELS

RELATIVE DENSITY	BLOWS/FOOT*
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

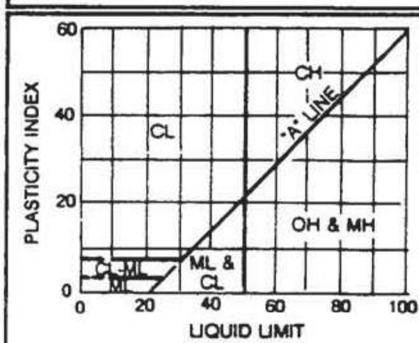
CLAYS AND SILTS

CONSISTENCY	BLOWS/FOOT*	STRENGTH**
VERY SOFT	0 - 2	0 - ¼
SOFT	2 - 4	¼ - ½
FIRM	4 - 8	½ - 1
STIFF	8 - 15	1 - 2
VERY STIFF	15 - 30	2 - 4
HARD	OVER 30	OVER 4

* NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1 ⅜ INCH I.D.) SPLIT BARREL SAMPLER (ASTM-1586 STANDARD PENETRATION TEST)

** UNCONFINED COMPRESSIVE STRENGTH IN TONS/SQ. FT. READ FROM POCKET PENETROMETER

CLASSIFICATION CRITERIA BASED ON LAB TESTS



GW AND SW-$C_c = \frac{D_{60}}{D_{10}}$ GREATER THAN 4 FOR GW AND 7 FOR SW; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ BETWEEN 1 AND 3

GP AND SP - CLEAN GRAVEL OR SAND NOT MEETING REQUIREMENT FOR GW AND SW

GW AND SM - ATTERBERG LIMIT BELOW "A" LINE OR P.I. LESS THAN 4

GC AND SC - ATTERBERG LIMIT ABOVE "A" LINE P.I. GREATER THAN 7

FINES (SILT OR CLAY)	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	COARSE GRAVEL	COBBLES	BOULDERS
SIEVE SIZES	200	40	10	4	¾"	3"	10"

CLASSIFICATION OF EARTH MATERIALS IS BASED ON FIELD INSPECTION AND SHOULD NOT BE CONSTRUED TO IMPLY LABORATORY ANALYSIS UNLESS SO STATED.

GEOBASE/GPI

KEY FOR SOIL EXPLORATION LOGS

FIGURE A-1

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
					0	FILL: MISC. CRUSHED BASE COARSE, brown, slightly moist, medium dense to dense	-290-
	2.4	95		B		CRUSHED ROCK MIXED WITH SILTY SAND (SM), brown, slightly moist, dense to very dense, 1 to 1.5 inch gravels	
	24.1			B		SILTY CLAY to CLAYEY SILT (CL-ML), mottled grey green, moist to very moist, stiff to very stiff	
	23.2			B	5		
						Refusal at 5 feet.	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 9-10-93

EQUIPMENT USED:
HAND

GROUNDWATER LEVEL:
NOT ENCOUNTERED

GEOBASE/GPI

PROJECT NO.: 1133.21
METROLINK

LOG OF BORING NO. B-1

FIGURE A-2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	FILL: SILTY GRAVEL (GM), grey, dry, loose, 3/4 to 1.5 inch gravels, trace sand	
28.2	90		B		SILTY CLAY to CLAYEY SILT (CL-ML), mottled brown green, moist, very stiff	-290-
	29.5		B			
				5	@ 5.5', black ash	
13.0			B		SILTY SAND (SM), grey, moist, medium dense to dense	-285-
					Refusal on rock at 7.5 feet.	

This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 9-10-93

EQUIPMENT USED: HAND

GROUNDWATER LEVEL: NOT ENCOUNTERED

GEOBASE/GPI

PROJECT NO.: 1133.21
METROLINK

LOG OF BORING NO. B-2

FIGURE A-3

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)		DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
					0		FILL: SILTY GRAVEL (GM), brown, slightly moist, very dense, 1" to 3" crushed rock, trace sand	294.6
	3.2	144		B				
	18.6	100		B			SILTY CLAY to CLAYEY SILT (CL-ML), light brown, stiff to very stiff, moist, trace sand	
							SILTY SAND (SM), brown, moist, medium dense, bricks, concrete, clay chunks	
	9.1			B				
							Refusal on concrete at 3.5 feet.	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 9-2-93

EQUIPMENT USED: HAND

GROUNDWATER LEVEL: NOT ENCOUNTERED

GEOBASE/GPI

PROJECT NO.: 1133.21
METROLINK

LOG OF BORING NO. B-3

FIGURE A-4

1010409200S18068

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
						This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
					0	FILL: SILTY GRAVEL (GM), brown, slightly moist, very dense, crushed gravels to 3", trace sand	
	2.7	140		B			-295-
				B		SILTY CLAY to CLAYEY SILT (CL-ML), mottled dark brown, brown, grey, stiff to very stiff, siltstone fragments	
	29.1						
	16.8			B			
						Refusal at 4.5 feet.	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 9-2-93

EQUIPMENT USED: HAND

GROUNDWATER LEVEL: NOT ENCOUNTERED

GEOBASE/GPI

PROJECT NO.: 1133.21
METROLINK

LOG OF BORING NO. B-4

FIGURE A-5

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
						This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
					0	FILL: SANDY GRAVEL (GW), brown, dry, loose, glass, trash	298
						SANDY GRAVEL (GP), grey, dry, loose, 3/8" round gravels	
						Refusal at 20 inches on asphalt concrete.	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 9-2-93

EQUIPMENT USED: HAND

GROUNDWATER LEVEL: NOT ENCOUNTERED

GEOBASE/GPI

PROJECT NO.: 1133.21
METROLINK

LOG OF BORING NO. B-5

FIGURE A-5

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	FILL:	
10.7	113		B		SILTY SAND to SAND (SM-SP), brown, slightly moist to moist, medium dense, gravels to 3 inches, concrete fragments, bricks	
3.4	99	1	D			-295-
7.7	99	3	D	5		
10.6	97	6	D		@ 7.5' - 9.0', bricks, ash	-290-
12.7	96	PUSH	D	10	SILTY SAND (SM), brown, moist, loose, slight petroleum odor	
22.9	96	3	D		NATIVE: SILTY SAND to SAND (SM-SP), green, moist, dense, gravels, strong petroleum odor	-285-
				15	Terminated at 15 feet. No caving.	

This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 9-7-93

EQUIPMENT USED: 18" BUCKET AUGER

GROUNDWATER LEVEL: NOT ENCOUNTERED

GEOBASE/GPI

PROJECT NO.: 1133.21
METROLINK

LOG OF BORING NO. B-6

FIGURE A-7

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
					0	FILL:	
	4.1	111		B		SILTY SAND (SM), brown, slightly moist to moist, loose to	-295-
	6.6	91	1	D		medium dense, glass, bricks, gravels, concrete, chunks of clay,	
	12.5	99	PUSH	D	5	@ 5', brick	
							-290-
						@ 7', refusal on concrete, moved boring 5 feet.	
	3.1		3	D		SAND (SP), grey, slightly moist, dense	
						SANDY CLAY (CL), brown, moist, stiff, bricks	
	5.8	97	6	D	10	NATIVE:	
						SAND (SW), grey, moist, dense, gravels to 3"	-285-
	3.2		5	D	15		
						Terminated at 16 feet. Slight caving and ravelling.	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 9-7-93

EQUIPMENT USED:
18" BUCKET AUGER

GROUNDWATER LEVEL:
NOT ENCOUNTERED

GEOBASE/GPI

PROJECT NO.: 1133.21
METROLINK

LOG OF BORING NO. B-7

FIGURE A-8

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	FILL:	
4.1	117		B		SILTY SAND (SM), brown, loose, moist, gravels to 2"	
3.4	92	1	D		NATIVE:	
					SAND (SW), grey, moist, very dense, gravels to 3"	-285-
2.6	119	6	D	5		
						-280-
6.2	102	10	D	10		
					Terminated at 11 feet.	
					No caving.	

This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 9-7-93

EQUIPMENT USED: 18" BUCKET AUGER

GROUNDWATER LEVEL: NOT ENCOUNTERED

GEOBASE/GPI

PROJECT NO.: 1133.21
METROLINK

LOG OF BORING NO. B-8

FIGURE A-9

Existing Geotechnical Boring Logs

Geotechnical Soilutions, 2005

Geotechnical Soilutions, Inc.

501 S. Fairfax Avenue, Suite 101
Los Angeles, California 90036
Tel: (323) 937-1097
Fax: (323) 937-1099

Logged by: SMD | Date:5/9/2005

Project No: GS5101
Client: Tetra Tech
Location: Aliso Sector D/MTA
Drilling Contractor: C&C Drilling
Equipment: 8" Hollow Stem Auger
Driving Weight: 140 lbs
Surface Elevation:
Reference:
Boring 1
Sheet 1 of 1

Depth in Feet	Drive Sample	Sample Type	Bag Sample	Blows Per 6 inches	Visual Description	Moisture Content %	Dry Unit Weight (Pcf)
0					About 4 inches asphalt, about 4 inches base.		
					Fill: Dark gray brown fine sand and gravel, pieces of concrete and brick, dry, moderately loose.		
					Fine black sand, brick pieces, slightly moist, moderately loose.		
5							
	■	CA		12	Discarded sample, abundant brick pieces.		
				17			
				30			
10							
	■	CA		6	Possible Native: Brown medium grained sand, moist, moderately dense.		
				7			
				10			
	■	CA		4	Brown medium grained sand, moist, moderately dense.		
15				6	End of boring 14 feet.		
				12	Fill to about 10 feet.		
					No groundwater.		

PLATE XVIII

10102122007 44793

Geotechnical Soilutions, Inc.	Project No: GS5101	Client: Tetra Tech Location: Aliso Sector D/MTA	
501 S. Fairfax Avenue, Suite 101 Los Angeles, California 90036 Tel: (323) 937-1097 Fax: (323) 937-1099	Drilling Contractor: C&C Drilling		
	Equipment: 8" Hollow Stem Auger		Boring 2
	Driving Weight: 140 lbs		
	Surface Elevation:		Sheet 1
Logged by: SMD Date:5/9/2005	Reference:		of 1

Depth in Feet	Drive Sample	Sample Type	Bag Sample	Blows Per 6 inches	Visual Description	Moisture Content %	Dry Unit Weight (Pcf)
0					About 6 inches asphalt, about 5 inches base.		
					Fill: Dark gray medium grained sand, lumps of brown clay,pieces of concrete, brick and asphalt, slightly moist,moderateley loose.		
					Black sand, pieces of brick and concrete, slightly moist, moderately loose.		
5							
	▓	SPT		6 6 6			
10							
	▓	CA		11 13	Possible Native: Brown sand, medium grained, scattered gravel, slightly moist, moderately loose.		
				17	End of boring 11 feet. Fill to about 10 feet No groundwater.		
15							

PLATE XIX

10102122007 44793

Geotechnical Soilutions, Inc.	**Project No:** GS5101	**Client**: Tetra Tech **Location**: Aliso Sector D/MTA	
501 S. Fairfax Avenue, Suite 101 Los Angeles, California 90036 Tel: (323) 937-1097 Fax: (323) 937-1099	**Drilling Contractor**: C&C Drilling **Equipment**: 8" Hollow Stem Auger **Driving Weight**: 140 lbs **Surface Elevation**:		Boring 3 Sheet 1
Logged by: SMD / Date:5/9/2005	**Reference:**		of 1

Depth in Feet	Drive Sample	Sample Type	Bag Sample	Blows Per 6 inches	Visual Description	Moisture Content %	Dry Unit Weight (Pcf)
0					About 6 inches asphalt, about 5 inches base. Fill: Gray-brown sand, pieces of brick and asphalt, slightly moist, moderately loose. Black sand, pieces of brick and concrete, slightly moist, moderately loose.		
5							
10		SPT		11 15 26	Black sand and clayey sand, slight odor, scattered pieces of brick, gravel, slightly moist,moderately loose.		
15		CA		26 50 6"	Possible Native: Light gray coarse sand with abundant gravel, odor, slightly moist, moderately dense.		
20		CA		100 6"	Light gray coarse sand and gravel, odor, slightly moist, moderately dense. Layers of coarse gravel/boulders.		
25		CA		20 32 33	Gray clayey silt and coarse sand, odor, moist to wet, moderately dense. End of boring at 26 feet. Water at 26 feet, possibly perched. Fill to about 15 feet.		

PLATE XX

Geotechnical Soilutions, Inc.	Project No: GS5101	Client: Tetra Tech Location: Aliso Sector D/MTA	
501 S. Fairfax Avenue, Suite 101 Los Angeles, California 90036 Tel: (323) 937-1097 Fax: (323) 937-1099	Drilling Contractor: C&C Drilling		
	Equipment: 8" Hollow Stem Auger		Boring 4
	Driving Weight: 140 lbs		
	Surface Elevation:		Sheet 1
Logged by: SMD Date:5/9/2005	Reference:		of 2

Depth in Feet	Drive Sample No.	Sample Type	Bag Sample	Blows Per 6 inches	Visual Description	Moisture Content %	Dry Unit Weight (Pcf)
0					About 8 inches asphalt, about 5 inches base.		
					Fill: Medium grained brown sand and gravel, pieces of brick and wood, slighly moist, moderately loose.		
					Mottled dark gray and light brown silty clay, slightly moist, moderately stiff.		
5							
10					Black silty clay, scattered brick fragments, odor, moist, moderately stiff.		
		CA		6			
				7			
				25			
15							
		CA		10	Possible Native: Dark gray fine sand, slightly moist, moderately dense.		
				15			
				28			
20							
		CA		27	Dark gray coarse sand and gravel, strong odor, moist, moderately dense.		
				50			
				2"			
25							
		SPT		25	Dark gray coarse sand and abundant gravel, strong odor, moist, moderately dense.		
				35			
				50			
				5"			
30				28			
				50	Dark gray medium grained sand, strong odor, moist, moderately dense.		

PLATE XXI

Geotechnical Soilutions, Inc.		Project No: GS5101	Client: Tetra Tech Location: Aliso Sector D/MTA	
501 S. Fairfax Avenue, Suite 101 Los Angeles, California 90036 Tel: (323) 937-1097 Fax: (323) 937-1099		Drilling Contractor: C&C Drilling Equipment: 8" Hollow Stem Auger Driving Weight: 140 lbs Surface Elevation:		Boring 4 Sheet 2
Logged by: SMD	Date:5/9/2005	Reference:		of 2

Depth in Feet	Drive Sample	Sample Type	Bag Sample	Blows Per 6 inches	Visual Description	Moisture Content %	Dry Unit Weight (Pcf)
30					End of boring at 31 feet. Fill to about 15 feet. No groundwater.		
35							

PLATE XXII

Geotechnical Soilutions, Inc.	Project No: GS5101	Client: Tetra Tech Location: Aliso Sector D/MTA	
501 S. Fairfax Avenue, Suite 101 Los Angeles, California 90036 Tel: (323) 937-1097 Fax: (323) 937-1099	Drilling Contractor: C&C Drilling Equipment: 8" Hollow Stem Auger Driving Weight: 140 lbs Surface Elevation:		Boring 5 Sheet 1
Logged by: SMD Date:5/9/2005	Reference:		of 1

Depth in Feet	Drive Sample	Sample Type	Bag Sample	Blows Per 6 inches	Visual Description	Moisture Content %	Dry Unit Weight (Pcf)
0					About 4 inches asphalt, about 8 inches base. Fill: Brown medium grianed sand, abundant gravel, brick pieces, slightly moist, moderately loose.		
5							
					Gray and brown silty clay, moist, moderately stiff.		
10							
		CA		10 10 15	Gray-brown silty fine sand, moist, moderately dense, slight odor.		
15							
		CA		18 38 50	Possible Native: Light brown coarse sand and gravel, moist, moderately dense.		
20							
		SPT		50 5"	Light brown silty fine sand with occasional gravel, slightly moist, dense.		
25							
		CA		40 50 5"	Gray fine to coarse sand and gravel, slight odor, slightly moist, dense. End of boring at 26 feet. Fill to about 15 feet. No groundwater.		
30							

PLATE XXIII

Existing Geotechnical Boring Logs
Kleinfelder, 2003

Date Drilled:
Drilled By:
Drilling Method:
Logged By:

Water Depth:
Date Measured:
Reference Elevation:
Datum:

Elevation (feet) Depth	Sample	Sample No.	Blow Count (Blows/ft.)	Graphic Log	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
		1	6			108	10	DS, SE
		2	12					GS
5								
	(1)	(2)	(3)	(4)	(5)	(6)	(6)	(7)
10								

NOTES ON FIELD INVESTIGATION

1. SAMPLE – Graphical representation of sample type as shown below.
   - Split Spoon – Standard Penetration Test Sample (SPT)
   - Drive Sample – California Sample (Cal)
   - Bulk Sample – Obtained by collecting cuttings in a plastic bag
   - Tube Sample – Shelby/Pitcher Tube Sample

2. SAMPLE NO. – Sample Number

3. BLOWS/FT – Number of blows required to advance sampler 1 foot (unless a lesser distance is specified). Samplers in general were driven into the soil at the bottom of the hole with a standard (140 lb) hammer dropping a standard 30 inches. Drive samples collected in bucket auger borings may be obtained by dropping non-standard weight from variable heights. When a SPT sampler is used the blow count conforms to ASTM D-1586.

   SCR/RQD – Sample Core Recovery (SCR) in percent (%) and Rock Quality Designation (RQD) in percent (%). RQD is defined as the percentage of core in each run which the spacing between natural fractures is greater than 4 inches. Mechanical breaks of the core are not considered.

4. GRAPHIC LOG – Standard symbols for soil and rock types, as shown on plate B-1b.

5. GEOTECHNICAL DESCRIPTION

   Soil – Soil classifications are based on the Unified Soil Classification System per ASTM D-2487, and designations include consistency, moisture, color and other modifiers. Field descriptions have been modified to reflect results of laboratory analyses where deemed appropriate.

   Rock – Rock classifications generally include a rock type, color, moisture, mineral constituents, degree of weathering, alteration, and the mechanical properties of the rock. Fabric, lineations, bedding spacing, foliations, and degree of cementation are also presented where appropriate.

   Description of soil origin or rock formation is placed in brackets at the beginning of the description where applicable, for example, Residual Soil.

6. DRY DENSITY, MOISTURE CONTENT: As estimated by laboratory or field testing.

7. ADDITIONAL TESTS – (Indicates sample tested for properties other than the above):

MAX – Maximum Dry Density	SG – Specific Gravity	PP – Pocket Penetrometer
GS – Grain Size Distribution	HA – Hydrometer Analysis	WA – Wash Analysis
SE – Sand Equivalent	AL – Atterberg Limits	DS – Direct Shear
EI – Expansion Index	RV – R-Value	CP – Collapse Potential
CHEM – Sulfate and Chloride Content, pH, Resistivity	CN – Consolidation	UC – Unconfined Compression
PM – Permeability	CU – Consolidation Undrained Triaxial	T – Torvane
UU – Unconsolidated Undrained Triaxial	CD – Consolidated Drained Triaxial	

8. ATTITUDES – Orientation of rock discontinuity observed in bucket auger boring or rock core, expressed in strike/dip and dip angle, respectively, preceeded by a one-letter symbol denoting nature of discontinuity as shown below.

   B: Bedding Plane J: Jointing C: Contact F: Fault S: Shear

KLEINFELDER

EXPLANATION OF LOGS

PLATE A-1a

10102102005132 41

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

PRIMARY DIVISIONS			GROUP SYMBOLS	SECONDARY DIVISIONS
COARSE-GRAINED SOILS MORE THAN HALF OF MATERIALS IS LARGER THAN #200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN #4 SIEVE	CLEAN GRAVELS (LESS THAN) 5% FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVEL WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN #4 SIEVE	CLEAN SANDS (LESS THAN) 5% FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE-GRAINED SOILS MORE THAN HALF OF MATERIALS IS SMALLER THAN #200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT IS LESS THAN 50	ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT IS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
	HIGHLY ORGANIC SOILS		PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOILS
TYPICAL FORMATIONAL MATERIALS	SANDSTONES		SS	
	SILTSTONES		SH	
	CLAYSTONES		CS	
	LIMESTONES		LS	
	SHALE		SL	

CONSISTENCY CRITERIA BASED ON FIELD TESTS

RELATIVE DENSITY: COARSE-GRAINED SOIL

RELATIVE DENSITY	SPT * (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	0 - 15
Loose	4 - 10	15 - 35
Medium Dense	10 - 30	35 - 65
Dense	30 - 50	65 - 85
Very Dense	>50	85 - 100

CONSISTENCY: FINE-GRAINED SOIL

CONSISTENCY	SPT (# blows/ft)	TORVANE UNDRAINED SHEAR STRENGTH (tsf)	POCKET ** PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)
Very Soft	<2	<0.13	<0.25
Soft	2 - 4	0.13 - 0.25	0.25 - 0.5
Medium Stiff	4 - 8	0.25 - 0.5	0.5 - 1.0
Stiff	8 - 15	0.5 - 1.0	1.0 - 2.0
Very Stiff	15 - 30	1.0 - 2.0	2.0 - 4.0
Hard	>30	>2.0	>4.0

* NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1 3/8 INCH I.D.) SPLIT BARREL SAMPLER (ASTM-1586 STANDARD PENETRATION TEST)

** UNCONFINED COMPRESSIVE STRENGTH IN TONS/SQ.FT. READ FROM POCKET PENETROMETER

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

KLEINFELDER

EXPLANATION OF LOGS

PLATE A-1b

1010210200513241

Date Drilled:	4/24/03	Water Depth:	>30.5 feet
Drilled By:	West Hazmat	Date Measured:	4/24/03
Drilling Method:	Hollow Stem Auger 6"	Elevation:	~280 feet
Logged By:	Ed Che	Reference Datum:	MSL

Elevation (feet)	Depth	Sample Type	Sample Number	Blow Counts (blows/foot)	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests	PID (ppm)
280						**Asphaltic Concrete (AC):** approximately 3 inches thick over 1 foot base approximatley				
						Artificial Fill (Af): **Sandy Clay (CL):** olive gray, moist, fine to coarse sand, brick fragments found, no ordor				
						Sandy Silt (ML): olive brown, moist, very stiff, iron oxide stains, mottled with pockets of clay, no odor				
275	5		1	35			90	20.9	DS	
						Native: **Sand (SP):** yellow brown, slightly moist, medium dense, fine grained, no odor				
270	10		2	32					WA	
265	15		3	45			110	6.8		
						-- moist, dense, fine to coarse grained, some fine gravel, 2 inch layer of gray clay, highly moist, no odor				
260			4	81						

KLEINFELDER

PROJECT NO. 29712

Proposed Shored Excavation Project
710 N. Keller Street
Los Angeles, California

LOG OF BORING B-1

PLATE A-2a

Explanation To Logs On Plate A-1

10102102005132241

Elevation (feet)	Depth	Sample Type	Sample Number	Blow Counts (blows/foot)	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION *(Continued From Previous Page)*	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests	PID (ppm)
260						-- very dense				
255	25		5	26 50/6"						
250	30		6	19 50/6"		**Gravelly Sand with Silt (SP-SM):** gray, moist, very dense, fine to medium grained, fine and coarse gravel, no odor				
						Total depth of boring: 30.5 feet No groundwater encountered Boring backfilled with bentonite grout and topped with rapid set concrete				

KLEINFELDER

PROJECT NO. 29712

Proposed Shored Excavation Project
710 N. Keller Street
Los Angeles, California

LOG OF BORING B-1

PLATE

A-2b

Explanation To Logs On Plate A-1

1010210200513241

Date Drilled:	4/24/03	Water Depth:	>31 feet
Drilled By:	West Hazmat	Date Measured:	4/24/03
Drilling Method:	Hollow Stem Auger 6"	Elevation:	~280 feet
Logged By:	Ed Che	Reference Datum:	MSL

Elevation (feet)	Depth	Sample Type	Sample Number	Blow Counts (blows/foot)	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Unit Weight (pcf)	Moisture Content (%)	Additional Tests	PID (ppm)
280						**Asphaltic Concrete (AC):** approximately 3.5 inches thick without base				
						Artificial Fill (Af): **Clayey Sand (SC):** dark olive gray, moist, fine to medium sand, brick fragments, trace fine gravel, some staining, no odor, trace coarse gravel and cobbles, concrete debris				
275	5		1	16			94	22.7	CHEM, WA	
						-- olive brown, trace wood debris and fragments of ceramics				
						Native: **Sand (SP):** yellow brown, moist, dense, fine to medium grained, some coarse gravel, no odor				
			2	39			105	6.0		
270	10								GS	
						Silty Sand (SM): olive brown, moist, very dense, fine grained, no odor				
			3	28 50/6"			87	7.4		
265	15									
						Gravelly Sand with Silt (SP-SM): gray, moist to very moist, dense, fine to coarse grained, fine and coarse gravel, occasional layers of sandy gravel, no odor				
			4	59						
260										

KLEINFELDER

PROJECT NO. 29712

Proposed Shored Excavation Project
710 N. Keller Street
Los Angeles, California

LOG OF BORING B-2

PLATE A-3a

Explanation To Logs On Plate A-1

Existing Geotechnical Boring Logs

Lowney Asssociates, 2003

EXPLORATORY BORING: LB-01

DRILL RIG: AL-ROY DRILLING CO.	PROJECT NO: 1651-15A
BORING TYPE: BUCKET AUGER	PROJECT: TOSCO CENTER STREET REMEDIATION
LOGGED BY: TKK	LOCATION: LOS ANGELES, CALIFORNIA
START DATE: 7-30-03 FINISH DATE: 7-30-03	COMPLETION DEPTH: 17.5 FT.

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Undrained Shear Strength (ksf): ○ Pocket Penetrometer; △ Torvane; ● Unconfined Compression; ▲ U-U Triaxial Compression (scale 1.0, 2.0, 3.0, 4.0)

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE
274.0	0	SURFACE ELEVATION: 274 FT. (+/-)					
	0	**5-INCHES OF ASPHALT**					
		2-INCHES OFCRUSHED AGGREGATED BASE (GW), greenish brown	GW				
		FILL: SILTY SAND (SM), trace of fine gravel and asphalt, moist, dark brown to black					33
	5	- loose, no odor	SM	1	12	102	
		AUGER REFUSAL DUE TO STEEL PIPE MOVED TO 3-FEET SOUTH OF ORIGINAL LOCATION					
		- weak petroleum odor					
	10	- weak petroleum odor, cohesive		6	11	122	
		NATIVE: SAND (SP), fine to coarse, trace of fine gravel, dense, moist, light brown, no odor	SP				
	15			14	4	127	
		AUGER REFUSAL DUE TO BOULDER (greater than 18-inches in diameter)					
		BOTTOM OF BORING AT 17½ FEET					
		NO FREE GROUNDWATER ENCOUNTERED					
	20	**BORING WAS BACKFILLED WITH CUTTINGS**					
		WEIGHT OF KELLY:					
		0 TO 24-FEET: 2,150 POUNDS					
		25 TO 44-FEET: 1,350 POUNDS					
		45 TO 65-FEET: 650 POUNDS					
	25						
	30						

GROUND WATER OBSERVATIONS:

NO FREE GROUNDWATER ENCOUNTERED

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

EXPLORATORY BORING: LB-02

DRILL RIG: AL-ROY DRILLING CO.	PROJECT NO: 1651-15A
BORING TYPE: BUCKET AUGER	PROJECT: TOSCO CENTER STREET REMEDIATION
LOGGED BY: TKK	LOCATION: LOS ANGELES, CALIFORNIA
START DATE: 7-30-03 FINISH DATE: 7-30-03	COMPLETION DEPTH: 32.0 FT.

Undrained Shear Strength (ksf): ○ Pocket Penetrometer; △ Torvane; ● Unconfined Compression; ▲ U-U Triaxial Compression (scale 1.0, 2.0, 3.0, 4.0)

SURFACE ELEVATION: 272 FT. (+/-)

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE
272.0	0	**FILL: SILTY SAND (SM),** trace of fine gravel, slightly moist to moist, brick rubble, brown	SM				
		FILL: SILT (ML), trace of sand and fine gravel, medium stiff, moist, brown, no odor	ML				
	5			3	10	104	
		FILL: SAND (SP), fine to coarse, with fine to coarse gravel and cobbles less than 12-inches in diameter, moist, light brown	SP				
		- concrete rubble greater than 24-inches in diameter					
	10	**REFUSAL DUE TO SAND CAVING, MOVED TO 5-FEET NORTH, 4-FEET WEST OF ORIGINAL LOCATION**		6	4	110	
		SAND (SP), with fine to coarse gravel and cobbles less than 12-inches in diameter, medium dense, orange brown	SP				
	15			18	3	130	
		- brown					
	20			19	7	114	
		GRAVELLY SAND (SW), fine to coarse gravel and cobbles less than 12-inches in diameter, dense, moist, orange brown with white mottling, no odor	SW				
	25	**SAND (SP),** medium to coarse, trace of gravel and cobbles less than 12-inches in diameter, dense to very dense, olive green, no odor	SP	30/10"	6	115	
	30	- fine to medium, moist to very moist		30/10"	19	105	
240.0 ∇							

Continued Next Page

GROUND WATER OBSERVATIONS:

∇: FREE GROUND WATER MEASURED DURING DRILLING AT 32.0 FEET

LA_CORP.GDT 08/15/03 Fullerton* JSR

EXPLORATORY BORING: LB-02 Cont'd

DRILL RIG: AL-ROY DRILLING CO.	PROJECT NO: 1651-15A
BORING TYPE: BUCKET AUGER	PROJECT: TOSCO CENTER STREET REMEDIATION
LOGGED BY: TKK	LOCATION: LOS ANGELES, CALIFORNIA
START DATE: 7-30-03 FINISH DATE: 7-30-03	COMPLETION DEPTH: 32.0 FT.

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ELEVATION (FT)	DEPTH (FT)	SOIL LEGEND	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	SAMPLER	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE	Undrained Shear Strength (ksf) ○ Pocket Penetrometer △ Torvane ● Unconfined Compression ▲ U-U Triaxial Compression 1.0 2.0 3.0 4.0
240.0										
	35		**BOTTOM OF BORING AT 32 FEET** **FREE GROUNDWATER ENCOUNTERED AT 32 FEET** **BORING WAS BACKFILLED WITH CUTTINGS** **BORING HALTED AT 32-FEET DUE TO REFUSAL, BOULDERS GREATER THAN 18-INCH DIAMETER, ALSO SAND CAVED DUE TO GROUNDWATER** **WEIGHT OF KELLY:** **0 TO 24-FEET: 2,150 POUNDS** **25 TO 44-FEET: 1,350 POUNDS** **45 TO 65-FEET: 650 POUNDS**							
	40									
	45									
	50									
	55									
	60									

GROUND WATER OBSERVATIONS:

∇: FREE GROUND WATER MEASURED DURING DRILLING AT 32.0 FEET

LA CORP.GDT 08/15/03 Fullerton* JSR

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

EXPLORATORY BORING: LB-03

DRILL RIG: AL-ROY DRILLING CO.
BORING TYPE: BUCKET AUGER
LOGGED BY: TKK
START DATE: 7-30-03 FINISH DATE: 7-30-03

PROJECT NO: 1651-15A
PROJECT: TOSCO CENTER STREET REMEDIATION
LOCATION: LOS ANGELES, CALIFORNIA
COMPLETION DEPTH: 24.0 FT.

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Undrained Shear Strength (ksf): ○ Pocket Penetrometer; △ Torvane; ● Unconfined Compression; ▲ U-U Triaxial Compression (scale 1.0, 2.0, 3.0, 4.0)

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE
272.0	0	SURFACE ELEVATION: 272 FT. (+/-)					
	0	**FILL: SILT (ML),** trace of fine sand and gravel, slightly moist to moist, brick rubble, brown	ML				45
		FILL: CLAYEY SAND (SC), with fine gravel, trace of asphalt, low to medium plasticity, moist, brown	SC				
	5	**FILL: SAND (SP),** medium to coarse, trace of gravel and cobbles less than 12-inches in diameter, medium dense to dense, moist, light brown to brown	SP	8	5	110	
	10	- light brown		10	3	114	
		- with gravel and cobbles less than 12-inches in diameter					
	15	**SILT (ML),** trace of fine sand, soft to medium stiff, moist, brown with iron oxide stains, no odor	ML	4	12	107	
		SILTY SAND (SM), with gravel and cobbles less than 12-inches in diameter, fine to coarse, moist, brown	SM				
	20	**SAND (SP),** fine to coarse with gravel and cobbles less than 12-inches in diameter, medium dense to dense, moist, orange brown, no odor - olive green	SP	13	6	115	

BOTTOM OF BORING AT 24 FEET
NO FREE GROUNDWATER ENCOUNTERED
BORING HOLE WAS BACKFILLED WITH CUTTINGS
BORING STOPPED AT 34 FEET DUE TO REFUSAL, BOULDER GREATER THAN 18-INCHES IN DIAMETER

WEIGHT OF KELLY:
0 TO 24-FEET: 2,150 POUNDS
25 TO 44-FEET: 1,350 POUNDS
45 TO 65-FEET: 650 POUNDS

GROUND WATER OBSERVATIONS:
NO FREE GROUNDWATER ENCOUNTERED

LA CORP.GDT 08/15/03 Fullerton* JSR

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

EXPLORATORY BORING: LB-04

DRILL RIG: AL-ROY DRILLING CO.	PROJECT NO: 1651-15A
BORING TYPE: BUCKET AUGER	PROJECT: TOSCO CENTER STREET REMEDIATION
LOGGED BY: TKK	LOCATION: LOS ANGELES, CALIFORNIA
START DATE: 7-30-03 FINISH DATE: 7-30-03	COMPLETION DEPTH: 24.0 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

Undrained Shear Strength (ksf): ○ Pocket Penetrometer; △ Torvane; ● Unconfined Compression; ▲ U-U Triaxial Compression (scale 1.0, 2.0, 3.0, 4.0)

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE
272.0	0	SURFACE ELEVATION: 272 FT. (+/-)					
	0	**FILL: SILT (ML),** with sand, trace of gravel, slightly moist to moist, brown	ML				
		- trace of sand, moist, gray brown					
	5	- trace of fine sand, soft, brown		3	10	105	
		FILL: SILTY SAND (SM), fine to coarse, moist, dark brown	SM				
		NATIVE: SAND (SP), medium to coarse, with gravel, medium dense, moist, light brown	SP	9	2	128	
	15	- disturbed soil sample was retrieved in sampler tip, only, due to gravel		9	3		
		SILT (ML), trace of fine sand and gravel, moist, gray brown	ML				
		SAND (SP), fine to coarse, with gravel and cobbles less than 12-inches in diameter, moist, light brown	SP				
	20	- medium to coarse, medium dense		9	3	125	
		- required 30 minutes to drill from 22-feet to 24-feet due to gravel and cobbles less than 12-inches in diameter					
	25	**BOTTOM OF THE BORING AT 24 FEET** **NO GROUNDWATER ENCOUNTERED** **BORING WAS BACKFILLED WITH CUTTINGS** **BORING STOPPED AT 24-FEET DUE TO REFUSAL**					
	30	**WEIGHT OF KELLY:** **0 TO 24-FEET: 2,150 POUNDS** **25 TO 44-FEET: 1,350 POUNDS** **45 TO 65-FEET: 650 POUNDS**					

GROUND WATER OBSERVATIONS:

NO FREE GROUNDWATER ENCOUNTERED

LA CORP.GDT 08/15/03 Fullerton* JSR

LOWNEYASSOCIATES

Environmental/Geotechnical/Engineering Services

PRIMARY DIVISIONS			SOIL TYPE	LEGEND	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (Less than 5% Fines)	GW		Well graded gravels, gravel-sand mixtures, little or no fines
			GP		Poorly graded gravels or gravel-sand mixtures, little or no fines
		GRAVEL WITH FINES	GM		Silty gravels, gravel-sand-silt mixtures, plastic fines
			GC		Clayey gravels, gravel-sand-clay mixtures, plastic fines
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (Less than 5% Fines)	SW		Well graded sands, gravelly sands, little or no fines
			SP		Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES	SM		Silty sands, sand-silt-mixtures, non-plastic fines
			SC		Clayey sands, sand-clay mixtures, plastic fines
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50 %		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL		Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50 %		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH		Inorganic clays of high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT		Peat and other highly organic soils

DEFINITION OF TERMS

U.S. STANDARD SIEVE SIZE — 200, 40, 10, 4

CLEAR SQUARE SIEVE OPENINGS — 3/4", 3", 12"

SILTS AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

GRAIN SIZES

TERZAGHI (N-values) SPLIT SPOON, STANDARD PENETRATION TEST (SPT)

MODIFIED CALIFORNIA SAMPLER (brass ring lined)

D & M UNDERWATER SAMPLER

PISTON SAMPLER

SAMPLERS

▽ AT TIME OF DRILLING

▼ MEASURED FOLLOWING DRILLING

GROUND WATER

SAND AND GRAVEL	BLOWS/FOOT*
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

RELATIVE DENSITY

SILTS AND CLAYS	STRENGTH+	BLOWS/FOOT*
VERY SOFT	0-1/4	0-2
SOFT	1/4-1/2	2-4
MEDIUM STIFF	1/2-1	4-8
STIFF	1-2	8-16
VERY STIFF	2-4	16-32
HARD	OVER 4	OVER 32

CONSISTENCY

*Applicable only for Standard Penetration Tests (ASTM D-1586).
+Unconfined compressive strength in tons/sq.ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

KEY TO EXPLORATORY BORING LOGS

Unified Soil Classification System (ASTM D 2487)

LOWNEYASSOCIATES
Environmental/Geotechnical/Engineering Services

FIGURE A-1

Existing Geotechnical Boring Logs
Sladden Engineering, 2004

Dynamic Builders
718 & 728 East Commercial, L.A.

Date: 2/14/2004 **Boring No. 1** **Job Number:** 444-4041

Depth, ft	Symbol	Core	Blows/6"	Description	Soil type	Unit Wt, pcf	Moisture, %	% Minus #200	Remarks
0			---	Silty Sand with Gravel: Brown	SM	---	---	---	Artificial Fill 4'
5			10/24/28	No Recovery	---	---	---	---	Native Soils
10			11/42/50	Silty Sand: Grey Brown	SM	107	3	4	
15			50-5"	Gravelly Sand: Brown	SM		2		
20			34/50-3"	Sand: Grey Brown	SM	103	3	2	
25			50-5"	Silty Sand: Grey Brown	SM		4		
30			50-4"	Gravelly Sand: Grey Petroleum Odor	SM		11		Groundwater @ 29'
35			50-5"	Gravelly Sand: Grey	SM		10		Note: The stratification lines represent the approximate boundaries between the soil types; the transition may be gradual.
40			40/50-3"	Sand: Grey	SM		11		
45			50-3"	Sand: Grey	SM		15		Total Depth = 50.5' No Bedrock
50			50-4"	Sand: Grey	SM		10		

Dynamic Builders

718 & 728 East Commercial, L.A.

Date: 2/14/2004 | Boring No. 2 | Job Number: 444-4041

Depth, ft	Symbol	Core	Blows/6"	Description	Soil type	Unit Wt, pcf	Moisture, %	% Minus #200	Remarks
0			---	Silty Sand: Brown	SM	---	---	---	Artificial Fill 5'
5			18/20/22	Silty Sand: Grey	SM	99	3	8	
									Native Soils
10			18/22/26	Silty Sand: Brown	SM	---	2	---	Disturbed Sample
15			50-5"	Gravelly Silty Sand: Brown	SM	101	3	5	
20			50-3"	Gravelly Sand: Brown	SM	102	2	6	
									Total Depth = 20.5' No Bedrock No Groundwater
25									
30									
35									
40									
45									
50									

Recovered Sample

Unrecovered Sample

Standard Penetration Sample

Note: The stratification lines represent the approximate boundaries between the soil types; the transition may be gradual.

Dynamic Builders

718 & 728 East Commercial, L.A.

Date: 2/14/2004 | **Boring No. 3** | **Job Number:** 444-4041

Depth, ft	Symbol	Core	Blows/6"	Description	Soil type	Unit Wt, pcf	Moisture, %	% Minus #200	Remarks
0			---	Silty Sand: Brown	SM	---	---	---	Artificial Fill 5'
				8" to 12" Thick Concrete @ 5'					
6			36/50-5"	Gravelly Silty Sand: Grey Brown	SM	104	3	6	Native Soils
10			10/16/23	Silty Sand: Brown	SM	98	7	5	
15			27/40/50	Gravelly Sand: Brown	SM	123	4	4	
20			39/50-3"	Gravelly Sand: Brown	SM	104	3	6	
									Total Depth = 20.5' No Bedrock No Groundwater
25									
30									
35									
40									
45									
50									

Recovered Sample

Unrecovered Sample

Standard Penetration Sample

Note: The stratification lines represent the approximate boundaries between the soil types, the transition may be gradual.

Dynamic Builders
718 & 728 East Commercial, L.A.

Date: 2/14/2004 **Boring No. 4** **Job Number:** 444-4041

Depth, ft	Symbol	Core	Blows/6"	Description	Soil type	Unit Wt, pcf	Moisture, %	% Minus #200	Remarks
0			---	Silty Sand: Brown	SM	---	---	---	Artificial Fill 19'
5		Recovered Sample	18/40/50	Gravelly Silty Sand: Dark Brown	SM	119	12	45	
10		Recovered Sample	20/31/42	Silty Sand with Gravel: Dark Grey Brown	SM	119	10	30	
15		Unrecovered Sample	50-3"	No Recovery	---	---	---	---	
20		Recovered Sample	42/50-3"	Gravelly Silty Sand: Brown	SM	107	3	6	Native Soils
25									Total Depth = 20.5' No Bedrock No Groundwater
30									
35									
40									
45									
50									

Legend:
- Recovered Sample
- Unrecovered Sample
- Standard Penetration Sample

Note: The stratification lines represent the approximate boundaries between the soil types; the transition may be gradual.

Dynamic Builders
718 & 728 East Commercial, L.A.

Date: 2/14/2004 | Boring No. 5 | Job Number: 444-4041

Depth, ft	Symbol	Core	Blows/6"	Description	Soil type	Unit Wt, pcf	Moisture, %	% Minus #200	Remarks
0			---	Silty Sand with Gravel: Grey Brown	SM	---	---	---	Artificial Fill 9'
5			7/7/7	Silty Sand with Gravel: Grey Brown	SM	96	9	31	
10			35/50-2"	Silty Sand: Grey Brown	SM	106	3	6	Native Soils
15			36/50-2"	Gravelly Sand: Brown	SM	113	2	7	
20			28/30/50	No Recovery	---	---	---	---	
									Total Depth = 20.5' No Bedrock No Groundwater

Recovered Sample

Unrecovered Sample

Standard Penetration Sample

Note: The stratification lines represent the approximate boundaries between the soil types; the transition may be gradual.

Existing Geotechnical Boring Logs
Smith-Emery GeoServices, 2003

MAJOR SUBDIVISIONS			GROUP SYMBOL	MAJOR SUBDIVISIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.
			GP	POORLY GRADED GRAVELS, OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.
	MORE THAN 50% OF COARSE FRACTION RETAINED FRACTION ON A NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES.
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES.
	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.
			SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING A NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES.
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES.
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50.	ML	INORGANIC SILTS, SANDY SILTS, AND CLAYEY SILTS OF LOW PLASTICITY.
			CL	INORGANIC CLAYS OF LOW TO MED. PLASTICITY; GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS.
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50.	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS. PLASTIC SILTS.
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.
			OH	ORGANIC CLAYS AND SILTY CLAYS OF MEDIUM TO HIGH PLASTICITY.
HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS.

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE CLASSIFICATIONS

SOIL CLASSIFICATION CHART

UNIFIED SOIL CLASSIFICATION SYSTEM

Smith-Emery GeoServices

PLATE NO.: A-1A

~~1010330208515544~~

KEY TO LOG OF BORINGS

SYMBOL	*TYPE OF TEST*
COMP	COMPACTION CHARACTERISTICS
TX	TRIAXIAL COMPRESSION TEST
DS	DIRECT SHEAR TEST
UC	UNCONFINED COMPRESSION TEST
C	CONSOLIDATION TEST
COLL	COLLAPSE TEST
EXP	PERCENT EXPANSION
EI	EXPANSION INDEX
SA	SIEVE ANALYSIS (+ #200 ONLY)
-200	% PASSING #200 SIEVE
HA	HYDROMETER ANALYSIS (- #200 ONLY)
AL	ATTERBERG LIMITS
SE	SAND EQUIVALENT
P	PERMEABILITY
R	R-VALUE
Gs	SPECIFIC GRAVITY
S	SOLUBLE SULFATES
CH	HYDROGEN ION CONTENT
RE	RESISTIVITY
CL	CHLORIDE
PTV	POCKET TORQUE VANE
PP	POCKET PENETROMETER

KEY TO SAMPLES

■ INDICATES DEPTH OF UNDISTURBED SAMPLE

▱ INDICATES DEPTH OF BULK SAMPLE

□ INDICATES DEPTH OF SAMPLING ATTEMPT WITH NO RECOVERY

◪ INDICATES DEPTH OF STANDARD PENETRATION TEST (SPT)

☒ INDICATES DEPTH OF DISTURBED SAMPLE

NOTE ON SAMPLERS:

Undisturbed samples were obtained with a "California" sampler having an O.D. of 3.0 inches and an I.D. of 2.4 inches. The SPT sampler is 2 inches O.D.; the bit has an I.D. of 1.4 inches and the split barrel has an I.D. of 1.5 inches. Unless practical refusal was encountered, the samplers were driven 18 inches into the soil using a 140 pound weight falling 30 inches. The blow count for the final 12 inches is recorded on the boring logs.

NOTES:

The descriptions on the boring logs apply only at the specific boring locations and at the time the borings were made. They are not warranted to be representative of subsurface conditions. Soil and rock descriptions are based on commonly accepted geotechnical methods of indentifi-cation and classification and are based on our professional judgment and experience. Field descriptions have been modified where appropriate to reflect laboratory test results. The stratification of soil layers is represented with approximate boundaries and the transition between soil types may be gradual.
Groundwater depths indicated on boring logs are specific to the time of drilling. The term "encountered" refers to the level at which free water was first noticed in the boring. The term "stabilized" refers to the level of the water after a lapse of at least one hour.

Smith-Emery GeoServices

PLATE NO.: A-1B

~~1010338208515544~~

SMITH-EMERY GEOSERVICES

PROJECT: Proposed Two Elevators
LOCATION: 801 E. Commercial Street, Los Angeles, California
SURFACE ELEVATION: (Not surveyed)
GROUNDWATER LEVEL: Not encountered
DATUM

FILE NO.: 33182-1
REPORT NO. G-03-5577
DATE DRILLED: 9-11-03
CORRECTED LOG BY: ABC
SHEET 1 OF 1

LOG OF BORING NO. 1 **PLATE NO.** **A-2A** SP-SM: MDD = 121.2 pcf

D (FT.)	ST	MATERIAL DESCRIPTION	USC	SYM	N'	G_d (pcf)	W %	S %	LL %	PL %	% -200	RC %	G_m (pcf)
0		5" thick reinforced concrete floor slab											
		Fill: SILTY SAND- brown, some gravel, brick fragments, loose, damp	SM		31	98.9	6.6	26.0				81.6	105.4
		(moist)			27	111.5	10.6	58.2				92.0	123.3
5													
		FINE SANDY SILT - olive brown, very loose, moist	ML		22	87.8	19.8	59.4			63.5	76.3	105.2
10		(wet)			29	85.2	33.0	92.9				74.1	113.3
		Bottom at 10 feet											

LOG OF BORING NO. 2

D (FT.)	ST	MATERIAL DESCRIPTION	USC	SYM	N'	G_d (pcf)	W %	S %	LL %	PL %	% -200	RC %	G_m (pcf)
0		3" thick concrete floor slab											
		SILTY SAND- olive brown, w/ gravel, loose to medium dense, humid	SP		28	104.0	1.7	7.6				85.8	105.8
					42	108.0	2.2	11.0			4.0	89.1	110.4
5													
					38	106.0	3.2	15.1				87.5	109.4
					45	109.0	3.3	16.9				89.9	112.6
10		Bottom at 9 feet											

ML: MDD* = 115.0 pcf
*Estimated

LEGEND:

B - Bedding
J - Joint
C - Contact
F - Fault
RS - Rupture Surface

N' - Blows per Foot (35-lb. weight)
G_d - Dry Unit Weight
W - Water Content
S - Saturation
LL - Liquid Limit
MDD - Maximum Dry Density

PL - Plastic Limit
RC - Relative Compaction
ST - Sample Type
USC - Unified Classification System
D - Depth
G_m Moist Density (pcf)

Existing Geotechnical Boring Logs

URS, 2003

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	*GRAVEL AND GRAVELLY SOILS* MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	*CLEAN GRAVELS* (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	*CLEAN SANDS* (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND - SILT MIXTURES
			SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	*SILTS AND CLAYS*	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Dual symbols are used to indicate gravels or sand with 5-12% fines and soils with fines classifying as CL-ML. Symbols separated by a slash indicate borderline soil classifications.

Sampler and Symbol Descriptions

- Dames & Moore Type-U sample
- Standard Penetration Test
- No Recovery
- Bk Bulk sample
- Disturbed Type-U Sample
- Shelby Tube Sample
- Rock Core Sample
- Approximate depth of perched water or groundwater

Note: Number of blows required to advance driven sample 12" (or length noted) is recorded.

Laboratory and Field Test Abbreviations

CBR	California Bearing Ratio test
COL	Collapse Potential test (test result in parentheses)
COMP	Compaction test
CON	Consolidation test
CORR	Corrosivity test
DSCD	Consolidated drained direct shear test (normal pressure and shear strength results shown)
EI	Expansion Index test (test result in parentheses)
LL=29	Liquid limit (Atterberg limits test)
PI=11	Plasticity Index (Atterberg limits test)
PP	Pocket Penetrometer test (test result in parentheses, tsf)
R-Value	Resistance Value test
SA	Sieve Analysis (-200 result in parentheses)
SE	Sand Equivalent test (test result in parentheses)
SWELL	Swell Load test (test result in parentheses)
TV	Torvane test (test result in parentheses, tsf)
-200	Percent passing #200 sieve (test result in parentheses)

KEY TO LOG OF BORING

PROPOSED WEST CAMPUS INFRASTRUCTURE PROJECT
UNION STATION
LOS ANGELES, CALIFORNIA

URS

FIGURE A-1

1020312200514722

Template: DMG4KEY; Prj ID: UNION3.GPJ; Printed: 10/24/03

Date(s) Drilled	10-14-02	Logged By	Jeff Pyska
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	8-inch O.D.
Drill Rig Type	B61	Hammer Data	140 lbs, 30-inch drop
Sampling Method(s)	Dames & Moore Type-U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	Groundwater encountered at 24 feet below ground surface on 10/14/2002		
Comments	None		

Boring B-1

Sheet 1 of 1

Job Number	29401632.00001
Total Depth Drilled (ft)	40.0
Approximate Ground Surface Elevation(ft)	278 feet MSL

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per 6-inch	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0		Bk-1		SM	About 2.5-inch thick Asphaltic Concrete			
						FILL Silty SAND			
			1	35		mottled brown, loose to medium dense, moist, fine to coarse, with fine gravel. Pieces of bricks in cuttings	12	101	-200(26); +4(27)
	5			11		Grades dark gray, with trace asphalt	11		
			2	4					
270			3	35/1"					
	10		4	28	SM	**ALLUVIUM** Silty SAND brown, medium dense, slightly moist, fine to coarse, with fine to coarse gravel. Gravel/rock powder in shoe	2		
	15		5	91/11"	SP-SM	SAND with silt brown, very dense, slightly moist, fine to coarse, with fine to coarse gravel	3	124	
260									
	20		6	50/5"					
	25		7	56		Grades wet	13	111	
250									
	30		8	56	SM	Silty SAND gray, very dense, wet, fine to coarse, with fine to coarse gravel			
	35		9	50/0"		Grades with coarse gravel and cobble			
240									
	40		10	50/2"					

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LOG OF BORING

PROPOSED WEST CAMPUS INFRASTRUCTURE PROJECT
UNION STATION
LOS ANGELES, CALIFORNIA

URS

FIGURE A-2

Date(s) Drilled	10-14-02	Logged By	Jeff Pyska
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	8-inch O.D.
Drill Rig Type	B61	Hammer Data	140 lbs, 30-inch drop
Sampling Method(s)	Dames & Moore Type-U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	Groundwater encountered at 40 feet below ground surface on 10/14/2002		
Comments	None		

Boring B-2

Sheet 1 of 2

Job Number	29401632.00001
Total Depth Drilled (ft)	51.5
Approximate Ground Surface Elevation(ft)	293 feet MSL

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per 6-inch	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0	⊠	BK-1			SM	About 2.5-inch thick Asphaltic Concrete			
290							**FILL** Silty SAND brown, loose to medium dense, moist, fine to coarse, with fine gravel and pieces of brick			COMP DSCD
	5		1	14		ML	Sandy SILT olive-brown, medium dense, moist, fine to coarse, with trace fine gravel and pieces of siltstone	20		-200(57); +4(7)
	10	■	2	42			Grades mottled brown and gray, with fine to coarse gravel			
280			3	50/6"			Grades very dense	10		
	15	■	4	28		SM	**ALLUVIUM** Silty SAND gray, loose to medium dense, moist, fine to coarse, with trace fine gravel			
			5	8			Grades with less silt and gravel			
						ML	Sandy SILT gray, medium dense, moist, fine			
	20	■	6	35						DSCD
							White with black crystals rock in shoe			
270			7	27		SM	Silty SAND light greenish-gray, medium dense, slightly moist, fine to coarse, with some fine to coarse gravel	4		
	25	■	8	79			Grades with some brown layers, dense			
			9	38		SP-SM	SAND with silt gray, dense, slightly moist, fine			
	30	■	10	36		SM	Silty SAND greenish-gray to gray, medium dense, slightly moist, fine to coarse, with some fine to coarse gravel	25	96	CON
260										
	35		11	50/5"			Grades greenish-gray to brown, very dense, with more sand	3		
	40						▽			

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LOG OF BORING

PROPOSED WEST CAMPUS INFRASTRUCTURE PROJECT
UNION STATION
LOS ANGELES, CALIFORNIA

URS

FIGURE A-3

LOS ANGELES, CALIFORNIA

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per 6-inch	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	40	■	12	64		SM	Silty SAND greenish-gray to brown, dense, wet, fine to coarse, with fine to coarse gravel			
250										
						SP-SM	SAND with silt gray, medium dense, moist, fine to coarse, with trace fine gravel			
	45	◩	13	28				12	112	-200(8); +4(7)
	50	■	14	45				9		
240										
	55									
	60									
230										
	65									
	70									
220										
	75									
	80									
210										
	85									
	90									

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Date(s) Drilled	10-16-02	Logged By	Jeff Pyska
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	8-inch O.D.
Drill Rig Type	B61	Hammer Data	140 lbs, 30-inch drop
Sampling Method(s)	Dames & Moore Type-U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	Groundwater encountered at 38 feet below ground surface on 10/16/2002		
Comments	None		

Boring B-3

Sheet 1 of 2

Job Number	29401632.00001
Total Depth Drilled (ft)	51.5
Approximate Ground Surface Elevation(ft)	293 feet MSL

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inch	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0	Bulk	Bk-1		SM	About 2.5-inch thick Asphaltic Concrete			
						FILL Silty SAND brown, loose to medium dense, moist, fine to coarse, with fine to coarse gravel			
290									CORR
	5		1	11	CL	Sandy CLAY mottled brown and gray, stiff, moist, fine to coarse, with trace fine gravel and some organics	19		-200(61); +4(2)
	10		2	37		Grades very stiff, with some silty sand layers, some siltstone fragments, and no organics	23	103	-200(76); +4(2)
280			3	26			26		
	15					Grades with pieces of wood and brick in cuttings			
			5	22		Grades stiff, with large gravel particle in bottom ring and nothing in shoe	26	98	
	20		6	7	SM	**ALLUVIUM** Silty SAND dark gray, loose, moist, fine, with organics			
270									
	25		8	39		Grades gray, dense, fine to coarse, with fine to coarse gravel			
			9	50/4"		Grades gray to brown, very dense, slightly moist, coarse gravel in shoe	4	120	
	30		10	50/6"					
260									
	35		11	50/4"	SP-SM	SAND with silt gray, very dense, moist, fine to coarse, with fine to coarse gravel			
						▽			
	40								

Report: URS-1FOOT; Project File: G:\GINT-ZZW\PROJECTS\UNION3.GPJ; Data Template:DMLA.GDT Printed: 10/24/03

LOG OF BORING

PROPOSED WEST CAMPUS INFRASTRUCTURE PROJECT
UNION STATION
LOS ANGELES, CALIFORNIA

URS

FIGURE A-4

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inch	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	40		12	79/11"		SP-SM	SAND with silt gray, very dense, moist, fine to coarse, with fine to coarse gravel			
250										
	45		13	50/6"				8	128	
	50		14	69/11"						
240										
	55									
	60									
230										
	65									
	70									
220										
	75									
	80									
210										
	85									
	90									

Report: URS-1FOOT, Project File: G:\GINT-ZZW\PROJECTS\UNION3.GPJ, Data Template:DMLA.GDT Printed: 10/24/03

10203122000514722

Date(s) Drilled	10-16-02	Logged By	Jeff Pyska
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	8-inch O.D.
Drill Rig Type	B61	Hammer Data	140 lbs, 30-inch drop
Sampling Method(s)	Dames & Moore Type-U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	Groundwater encountered at 39 feet below ground surface on 10/16/2002		
Comments	None		

Boring B-4

Sheet 1 of 2

Job Number	29401632.00001
Total Depth Drilled (ft)	51.5
Approximate Ground Surface Elevation(ft)	293 feet MSL

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per 6-inch	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0	⊠	Bk-1			SM	About 2.5-inch thick Asphaltic Concrete			
							FILL Silty SAND brown to reddish-brown, loose to medium dense, moist, fine to coarse, with trace fine gravel			
290										
	5	■	1	36				16	112	
	10	◪	2	50/6"			Grades gray, moist, very dense, with asphalt and grass	11		
280							Pieces of brick and wood in cuttings			
						ML	SILT gray, black, and brown mottled, very stiff, moist, with fine to coarse sand and pieces of wood			
	15	◪	4	24				16		
	20	◪	6	21			Grades with pieces of wood and concrete			
						SM	**ALLUVIUM** Silty SAND grayish-brown, very dense, slightly moist, fine to coarse, with trace fine gravel			
270		□	7	50/6"						
	25	◪	8	50/4"				4		
		□	9	82						
	30	◪	10	50/6"						
260										
	35	⊠	11	89/11"			Grades gray, with fine to coarse gravel			
							∇			
	40									

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LOG OF BORING

PROPOSED WEST CAMPUS INFRASTRUCTURE PROJECT
UNION STATION
LOS ANGELES, CALIFORNIA

URS

FIGURE A-5

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per 6-inch	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	40		12	53		SM	Silty SAND gray, very dense, moist, fine to coarse, with fine to coarse gravel			
250										
	45		13	50/5"		SP-SM	SAND with silt gray, very dense, wet, fine to coarse, with fine gravel			
	50		14							Sample may contain slough
240	55									
	60									
230	65									
	70									
220	75									
	80									
210	85									
	90									

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FIGURE A-5

Date(s) Drilled	10-14-02	Logged By	Jeff Pyska
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	8-inch O.D.
Drill Rig Type	B61	Hammer Data	140 lbs, 30-inch drop
Sampling Method(s)	Dames & Moore Type-U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	Groundwater encountered at 24 feet below ground surface on 10/14/2002		
Comments	None		

Boring B-6

Sheet 1 of 2

Job Number	29401632.00001
Total Depth Drilled (ft)	51.0
Approximate Ground Surface Elevation(ft)	278 feet MSL

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per 6-inch	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0		Bk-1			SM	About 2.5-inch thick Asphaltic Concrete			
			1	9		ML	**FILL** Silty SAND brown, moist, fine to coarse, with fine gravel	25		-200(76); +4(0) CORR
							Sandy SILT grayish-brown, loose, moist, fine to coarse, with trace fine to coarse gravel and some clay			
	5		2	26		SM	**ALLUVIUM** Silty SAND	3	92	
270			3	35			brown, medium dense to dense, moist, fine to coarse, with some fine to coarse gravel and trace clay	2		
	10		4	63			Grades with iron-oxide staining and trace gray clay/silt chunks			
	15		5	50/6"			Grades very dense, without clay/silt chunks	4		-200(9); +4(39)
260										
	20		6	50/6"			Grades gray	3	115	
	25		7	37			Grades dense, wet	12		
250										
	30		8	31		ML	Sandy SILT greenish-gray, medium dense, wet, fine to coarse, with fine to coarse gravel and some clay			CON, DSCD
	35		9	5			Grades loose	45		-200(92); +4(0)
240						SP	SAND			
	40									

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LOG OF BORING

PROPOSED WEST CAMPUS INFRASTRUCTURE PROJECT
UNION STATION
LOS ANGELES, CALIFORNIA

URS

FIGURE A-7

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per 6-inch	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	40	■	10	36		SP	SAND gray, medium dense, wet, fine to coarse			
						SM	Silty SAND gray to greenish-gray, very dense, wet, fine to coarse, with some fine gravel			
	45	◪	11	56						
230										
	50	⊠	12	50/6"				12		
	55									
220										
	60									
	65									
210										
	70									
	75									
200										
	80									
	85									
190										
	90									

Date(s) Drilled	10-16-02	Logged By	Jeff Pyska
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	8-inch O.D.
Drill Rig Type	B61	Hammer Data	140 lbs, 30-inch drop
Sampling Method(s)	Dames & Moore Type-U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	No groundwater encountered		
Comments	None		

Boring B-7

Sheet 1 of 1

Job Number	29401632.00001
Total Depth Drilled (ft)	16.0
Approximate Ground Surface Elevation(ft)	278 feet MSL

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per 6-inch	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0		Bk-1			SM	About 4-inch thick Asphaltic Concrete over 2-inch thick Base			
							FILL			
			1	4		ML	Silty SAND reddish-brown, moist, fine to coarse, with trace fine to coarse gravel and brick fragments	13		-200(37); +4(18)
							Sandy SILT			
	5		2	35			dark brown, loose, moist, fine to coarse	8	115	
						SP-SM	**ALLUVIUM**			
							SAND with silt yellowish-brown, medium dense to dense, moist, fine to coarse, with some fine to coarse gravel			
270			3	34						
	10		4	50/5"			Grades very dense			
	15		5	50/5"				5		
260	20									
250	25									
	30									
240	35									
	40									

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LOG OF BORING

PROPOSED WEST CAMPUS INFRASTRUCTURE PROJECT
UNION STATION
LOS ANGELES, CALIFORNIA

URS

FIGURE A-8

1020212205514722

Date(s) Drilled	10-16-02	Logged By	Jeff Pyska
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	8-inch O.D.
Drill Rig Type	B61	Hammer Data	140 lbs, 30-inch drop
Sampling Method(s)	Dames & Moore Type-U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	No groundwater encountered		
Comments	None		

Boring B-8

Sheet 1 of 1

Job Number	29401632.00001
Total Depth Drilled (ft)	16.5
Approximate Ground Surface Elevation(ft)	278 feet MSL

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per 6-inch	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0		Bk-1			SM	About 4-inch thick Asphaltic Concrete			
							FILL Silty SAND brown to dark brown, loose, moist, fine to coarse, with fine to coarse gravel and concrete debris			
			1	19						
	5		2	25		SM	**ALLUVIUM** Silty SAND brown to yellowish-brown, medium dense, slightly moist, fine to coarse, with fine to coarse gravel	2		
270			3	26		SP-SM	SAND with silt brown, medium dense, slightly moist, fine to coarse, with trace fine gravel	4	96	
	10		4	10						
	15		5	24			Grades yellowish-brown, moist, with some silt lenses, and iron-oxide staining	8	100	
260	20									
	25									
250	30									
	35									
240	40									

Report: URS-1FOOT; Project File: G:\GINT-ZZW\PROJECTS\UNION3.GPJ; Data Template:DMLA.GDT Printed: 10/24/03

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LOG OF BORING

PROPOSED WEST CAMPUS INFRASTRUCTURE PROJECT
UNION STATION
LOS ANGELES, CALIFORNIA

URS

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	*GRAVEL AND GRAVELLY SOILS* MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	*CLEAN GRAVELS* (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	*CLEAN SANDS* (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND - SILT MIXTURES
			SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	*SILTS AND CLAYS*	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Dual symbols are used to indicate gravels or sand with 5-12% fines and soils with fines classifying as CL-ML. Symbols separated by a slash indicate borderline soil classifications.

Sampler and Symbol Descriptions

- Dames & Moore Type-U sample
- Standard Penetration Test
- No Recovery
- Bk Bulk sample
- Disturbed Type-U Sample
- Pitcher Tube Sample
- Shelby Tube Sample
- Rock Core Sample
- Approximate depth of perched water or groundwater

Note: Number of blows required to advance driven sample 12" (or length noted) is recorded.

Laboratory and Field Test Abbreviations

CBR	California Bearing Ratio Test
COL	Collapse Potential test (test result in parentheses)
COMP	Compaction test
CON	Consolidation test
CORR	Corrosivity test
DSCD	Consolidated drained direct shear test (normal pressure and shear strength results shown)
EI	Expansion Index test (test result in parentheses)
LL=29	Liquid limit (Atterberg limits test)
PI=11	Plasticity Index (Atterberg limits test)
PP	Pocket Penetrometer test (test result in parentheses, tsf)
R-Value	Resistance Value test
SA	Sieve Analysis (-200 result in parentheses)
SE	Sand Equivalent test (test result in parentheses)
SWELL	Swell Load test (test result in parentheses)
TV	Torvane test (test result in parentheses, tsf)
-200	Percent passing #200 sieve (test result in parentheses)

KEY TO LOG OF BORING

PROPOSED 3-STORY OFFICE BUIDLING
LOS ANGELES, CALIFORNIA
FOR: CATELLUS DEVELOPMENT CORPORATION

Figure A-0

URS

Date(s) Drilled	9/11/01	Logged By	TO
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	Drag
Drill Rig Type	Mobile Drill B-61	Hammer Data	140-lbs Hammer / 30-inch drop
Sampling Method(s)	Dames & Moore Type U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	Not encountered		
Comments	None		

Boring BH-1
Sheet 1 of 2

Job Number	59-00112046.01
Total Depth Drilled (ft)	51.5
Approximate Ground Surface Elevation(ft)	278

Elevation (ft)	Depth (ft)	SAMPLES Type Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					4-inch Asphalt over 6-inch base material			
					SM	**ARTIFICIAL FILL (Af):** Dark brown silty fine to medium SAND, moist (loose)			
		Bk-1							
	5	1	23				7	107	
					SP	**ALLUVIUM (Qal):** Dark gray fine to coarse SAND with fine gravel, moist (medium dense)			
270									
	10	2	23						
	15	3	100/8"			Grades medium to coarse sand with fine gravel (very dense)	3		DSCD -200(5)
260									
						PUENTE FORMATION (Tp): Dark olive-gray SILTSTONE and CLAYSTONE, moist (weathered)			
	20	4	52						
	25	5	50/2"						
250									
	30	6	50/6"			Grades with clasts			
	35	7	50/5"						
240									
	40								

Report: DMG4; Project File: G:\GINTW\PROJECTS\UNION2.GPJ; Data Template:DMLA.GDT Printed: 10/30/02

LOG OF BORING

PROPOSED 3-STORY OFFICE BUIDLING
LOS ANGELES, CALIFORNIA
FOR: CATELLUS DEVELOPMENT CORPORATION

URS

Figure A-1

10293122990514722

LOS ANGELES, CALIFORNIA

FOR: CATELLUS DEVELOPMENT CORPORATION

Boring BH-1

Elevation (ft)	Depth (ft)	SAMPLES Type Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	40	8	80						
	45	9	32			Grades olive-brown			
230									
	50	10	70/10"			Becomes interbedded with SANDSTONE, thinly bedded, bedding inclined about 40 degrees from horizontal			
						Boring completed to a depth of 51.5 feet below the existing ground surface. Borehole backfilled with soil cuttings on 9/11/01.			
	55								
220									
	60								
	65								
210									
	70								
	75								
200									
	80								
	85								
190									
	90								

Report: DMG4; Project File: G:\GINTW\PROJECTS\UNION2.GPJ; Data Template:DMLA.GDT Printed: 10/30/02

URS

Figure A-1

1020312200514722

Date(s) Drilled	9/11/01	Logged By	TO
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	Drag
Drill Rig Type	Mobile Drill B-61	Hammer Data	140-lbs Hammer / 30-inch drop
Sampling Method(s)	Dames & Moore Type U, SPT	Job Number	59-00112046.01
Approximate Groundwater Depth and Date Measured	24.5 feet	Total Depth Drilled (ft)	50.9
Comments	None	Approximate Ground Surface Elevation(ft)	278

Boring BH-2

Elevation (ft)	Depth (ft)	SAMPLES Type Number	SAMPLES Blows per foot	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0				4-inch of asphalt over 6-inch of base material			
				SM	**ARTIFICIAL FILL (Af):** Dark brown moist silty fine to medium SAND with gravel to 0.5 inches, moist (medium dense)			
	5	1	29	CL	Dark brown silty CLAY with coarse sand, moist (stiff)			
270		2	42	SP	**ALLUVIUM (Qal):** Yellowish-brown fine to medium SAND with trace coarse sand, moist (medium dense)	3	108	DSCD
	10	3	11			12		
				ML	Dark brown fine to medium sandy SILT, wet (medium dense)			
				SP	Yellowish-brown fine to medium SAND with trace gravel up to 2-inch, moist (very dense)			
	15	4	50/6"			3	97	
260								
	20	5	50/6"					
	25			CL	Light brown silty CLAY, wet (hard)			
250		6			Grades bluish-gray			
	30	7	79		**PUENTE FORMATION (Tp):** Dark olive-gray interbedded CLAYSTONE and SANDSTONE, wet (weathered)			
	35	8	50/4"					
240								
	40							

Report: DMG4; Project File: G:\GINTW\PROJECTS\UNION2.GPJ; Data Template:DMLA.GDT Printed: 10/30/02

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LOG OF BORING

PROPOSED 3-STORY OFFICE BUIDLING
LOS ANGELES, CALIFORNIA
FOR: CATELLUS DEVELOPMENT CORPORATION

URS

Figure A-2

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	40		9	50/6"						
	45		10	100/10"			Grades black SILTSTONE with fine sand			
230										
	50		11	50/5"			Grades dark gray			
							Boring completed to a depth of 51 feet below the existing ground surface. Borehole backfilled with soil cuttings 9/11/01.			
	55									
220										
	60									
	65									
210										
	70									
	75									
200										
	80									
	85									
190										
	90									

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URS

Figure A-2

Date(s) Drilled	9/11/01	Logged By	TO
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	Drag
Drill Rig Type	Mobile Drill B-61	Hammer Data	140-lbs Hammer / 30-inch drop
Sampling Method(s)	Dames & Moore Type U, SPT		
Approximate Groundwater Depth and Date Measured	20 feet		
Comments	None		

Boring BH-3

Job Number	59-00112046.01
Total Depth Drilled (ft)	51.0
Approximate Ground Surface Elevation(ft)	278

Elevation (ft)	Depth (ft)	SAMPLES Type Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					4-inch of Asphalt over 6-inch of base material			
					SM	**ARTIFICIAL FILL (Af):** Dark brown silty fine to medium SAND with gravel up to 0.5-inch, moist (loose to medium dense)			
	5	1	27		SP	**ALLUVIUM (Qal):** Yellowish-brown fine to medium SAND, slightly moist (loose)			DSCD CORR
					SP-SC	Dark brown fine to medium SAND with clay, moist (medium dense)			
270					SP	Yellowish-brown fine to coarse SAND with fine to coarse gravel, slightly moist (dense)			
	10	2	45				3		SA(3) CORR
	15	3	50/5"				3	93	CON
260						**PUENTE FORMATION (Tp):** Yellowish-brown SANDSTONE and bluish-gray SILTSTONE, thinly bedded, moist (weathered)			
	20	4	50						
	25	5	50/5"			Becomes wet, less weathered	27	95	CON
250									
	30	6	50						
	35	7	100/8"						
240									
	40								

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LOG OF BORING

PROPOSED 3-STORY OFFICE BUIDLING
LOS ANGELES, CALIFORNIA
FOR: CATELLUS DEVELOPMENT CORPORATION

URS

Figure A-3

1020312200514722

Elevation (ft)	Depth (ft)	SAMPLES Type Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	40	8	85						Bedding inclined at about 30 to 35 degrees from horizontal
	45	9	50/6"						Bedding inclined at about 65 to 70 degrees from horizontal
230									
	50	10	50						
						Boring completed to a depth of 51 feet below the existing ground surface. Borehole backfilled with soil cuttings 9/11/01.			
	55								
220									
	60								
	65								
210									
	70								
	75								
200									
	80								
	85								
190									
	90								

Report: DMG4; Project File: G:\GINTW\PROJECTS\UNION2.GPJ; Data Template:DMLA.GDT Printed: 10/30/02

Date(s) Drilled	9/11/01	Logged By	TO
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	Drag
Drill Rig Type	Mobile Drill B-61	Hammer Data	140-lbs Hammer / 30-inch drop
Sampling Method(s)	Dames & Moore Type U, SPT		
Approximate Groundwater Depth and Date Measured	19.5 feet		
Comments	None		

Boring BH-4
Sheet 1 of 2

Job Number	59-00112046.01
Total Depth Drilled (ft)	50.9
Approximate Ground Surface Elevation(ft)	278

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0						4-inch of Asphalt over 6-inch of base material			
						SM	**ARTIFICIAL FILL (Af):** Dark brown silty fine to medium SAND with gravel up to 2.5-inch, moist (loose)			
	5	■	1	20			Grades brown	12	116	-200(30)
270						SP	**ALLUVIUM (Qal):** Yellowish-brown fine SAND with trace coarse sand and fine to coarse gravel, moist (dense)			
	10	◪	2	40				3		
	15	■	3	50/4"				5	116	
260										
	20	◪	4	38			▼ **PUENTE FORMATION (Tp):** Gray CLAYSTONE and yellowish-brown SANDSTONE, thinly bedded, wet (weathered)			Bedding inclined at about 50 to 60 degrees from horizontal
	25	■	5	50/5"						
250										
	30	◪	6	65			Grades light bluish-gray and dark gray			
	35	■	7	50/4"						
240										
	40									

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LOG OF BORING

PROPOSED 3-STORY OFFICE BUIDLING
LOS ANGELES, CALIFORNIA
FOR: CATELLUS DEVELOPMENT CORPORATION

URS

Figure A-4

Elevation (ft)	Depth (ft)	SAMPLES Type Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	40	8	50/5"						
	45	9	50/4"						
230									
	50	10	50/5"						
						Boring completed to a depth of 51 feet below the existing ground surface. Borehole backfilled with soil cuttings 9/11/01.			
	55								
220									
	60								
	65								
210									
	70								
	75								
200									
	80								
	85								
190									
	90								

Report: DMG4; Project File: G:\GINTW\PROJECTS\UNION2.GPJ; Data Template:DMLA.GDT Printed: 10/30/02

URS

102031220051472

Date(s) Drilled	5/22/01	Logged By	KK - AP Engineering
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	8-inch O.D.
Drill Rig Type	Mobile Drill B-61	Hammer Data	140 lbs, 30-inch drop
Sampling Method(s)	Dames & Moore Type U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	Encountered at 24.0 feet, 5/22/01		
	None		

Boring BH-1

Job Number	59-00112046.01
Total Depth Drilled (ft)	50.5
Approximate Ground Surface Elevation(ft)	278.0

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0						5-inches Asphalt			
						SM	Grayish-brown, silty fine SAND with gravel, dry (medium dense)			
				22						SA(13)
	5			41		SP-SM	Brown, fine SAND with silt and gravel to 3/4-inch, medium to coarse, dry (medium dense)	2	119	
270										
	10			46			Becomes yellowish-brown to grayish-brown (dense)	3		SA(5)
	15			50/4"		SP	Yellowish-brown, poorly graded SAND with gravel to 3/8-inch, medium to coarse, moist (very dense)	8	104	-200(4), DS
260										
	20			50/4"						No recovery @ 20'
						ML	Gray, sandy SILT, moist (dense)			
	25			60			Becomes wet	29	96	-200(78), DS, CON
250						SP	Gray, poorly graded SAND, medium, trace gravel, wet (very dense)			
	30			70				13		-200(2)
	35			100/5"			Becomes coarse with more gravel	14	119	
240										
	40									

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LOG OF BORING

ONE UNION STATION PLAZA
LOS ANGELES, CALIFORNIA
FOR: CATELLUS DEVELOPMENT CORPORATION

DMG4 UNION_~1.GPJ DMLA.GDT 7/23/01

URS

10203122000514722

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	40			50/5"				17		
						SM	Gray, silty fine to medium SAND, wet (very dense)			
	45			50/1"				19	108	DS, CON
230						SP-SM	Gray, fine to medium SAND with silt, wet (very dense)			
	50			50/6"				24		
							Borehole completed to a depth of 50 1/2 feet below the ground surface on 05/22/01. Borehole backfilled with soil cuttings.			
	55									
220										
	60									
	65									
210										
	70									
	75									
200										
	80									
	85									
190										
	90									

DMG4 UNION_~1.GPJ DMLA.GDT 7/23/01

URS

Date(s) Drilled	5/22/01	Logged By	KK - AP Engineering
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	8-inch O.D.
Drill Rig Type	Mobile Drill B-61	Hammer Data	140 lbs, 30-inch drop
Sampling Method(s)	Dames & Moore Type U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	Encountered at 30.0 feet, 5/22/01		
	None		

Boring BH-2

Job Number	59-00112046.01
Total Depth Drilled (ft)	50.8
Approximate Ground Surface Elevation(ft)	278.0

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0						4-inches Asphalt over 3-inches of Base			
				24		SM	Dark grayish-brown, silty fine to medium SAND with fine gravel, moist (medium dense)	14	117	
	5			53		SP-SM	Grayish-brown, medium SAND with silt and gravel to 3/8-inch, moist (medium dense)		118	
270										
	10			62		SM	Grayish-brown, silty medium to coarse SAND, moist (dense)	8		-200(17)
	15			50		SP-SM	Olive-brown, medium SAND with silt and fine gravel, moist (very dense)	4		CORR
260										
	20			50/2"			Becomes yellowish-brown, gravel to 3/4-inch	6		-200(7)
	25			30				22		
250						ML	Gray, sandy SILT, moist (medium dense)			
	30			36			Becomes wet	38	79	LL=44, PI=15 -200(88), DS, CON
						SP	Gray, poorly graded SAND with gravel, medium, wet (very dense)			
	35			70				9		-200(4)
240										
	40									

DMG4 UNION_~1.GPJ DMLA.GDT 7/23/01

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LOG OF BORING

ONE UNION STATION PLAZA
LOS ANGELES, CALIFORNIA
FOR: CATELLUS DEVELOPMENT CORPORATION

URS

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	40	■		50/2"			Becomes fine to medium	17	117	
	45	◪		40		SP-SM	Gray, medium SAND with silt, trace gravel, wet (dense)	18		-200(7)
230										
	50	■		50/3"			Becomes very dense	18	112	DS
							Borehole completed to a depth of 50 3/4 feet below the ground surface on 05/22/01. Borehole backfilled with soil cuttings.			
	55									
220										
	60									
	65									
210										
	70									
	75									
200										
	80									
	85									
190										
	90									

DMG4 UNION_~1.GPJ DMLA.GDT 7/23/01

URS

Date(s) Drilled	5/22/01	Logged By	KK - AP Engineering
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	8-inch O.D.
Drill Rig Type	Mobile Drill B-61	Hammer Data	140 lbs, 30-inch drop
Sampling Method(s)	Dames & Moore Type U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	Encountered at 24.0 feet, 5/22/01		
	None		

Boring BH-3

Sheet 1 of 1

Job Number	59-00112046.01
Total Depth Drilled (ft)	36.0
Approximate Ground Surface Elevation(ft)	278.0

Elevation (ft)	Depth (ft)	SAMPLES: Type	SAMPLES: Number	SAMPLES: Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	4-inches Asphalt Dark brown, silty fine to medium SAND, moist (medium dense)			
		☒ ◪		17						
	5	■		32		SP	Yellowish-brown, poorly graded SAND with gravel to 3/4-inch, medium, dry (medium dense)	2	115	-200(2)
270										
	10	◪		57			Gravel to 3/8-inch (very dense)	2		
	15	■		50/1"		SP-SM	Brown, medium to coarse SAND with silt and gravel to 3/8-inch, dry (very dense)	3	112	-200(6)
260										
	20	◪		50/6"			Becomes grayish-brown, medium	3		
							▼			
	25	■		50/5"			Becomes wet	20	100	DS
250										
	30	◪		50/6"			Becomes gray	11		-200(7)
	35	■		50/2"				16	108	Drill chatter @ 35' DS
							Borehole terminated due to refusal at a depth of 36 feet below the ground surface on 05/22/01. Borehole backfilled with soil cuttings.			
240										
	40									

DMG4 UNION_-1.GPJ DMLA.GDT 7/23/01

LOG OF BORING

ONE UNION STATION PLAZA
LOS ANGELES, CALIFORNIA
FOR: CATELLUS DEVELOPMENT CORPORATION

URS

Date(s) Drilled	5/22/01	Logged By	KK - AP Engineering
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	8-inch O.D.
Drill Rig Type	Mobile Drill B-61	Hammer Data	140 lbs, 30-inch drop
Sampling Method(s)	Dames & Moore Type U, SPT, Bulk		
Approximate Groundwater Depth and Date Measured	Encountered at 29.0 feet, 5/22/01		
	None		

Boring BH-4

Sheet 1 of 2

Job Number	59-00112046.01
Total Depth Drilled (ft)	50.9
Approximate Ground Surface Elevation(ft)	278.0

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0						5-inches Asphalt over 5-inches Base			
						SP-SM	Grayish-brown, fine SAND with silt, dry (loose)			
				15				6	115	
	5			24			Becomes medium with gravel to 3/8-inch (medium dense)	2		
270						SM	Brown, silty medium SAND with gravel to 3/8-inch, moist (dense)			
	10			67				16	106	-200(34)
						SP-SM	Grayish-brown, medium SAND with silt and gravel to 3/8-inch, dry (very dense)			
	15			50/6"				3		CORR
260						SM	Gray, silty fine SAND, moist (medium dense)			
	20			45				27	98	-200(45), DS, CON
						SP-SM	Gray, medium SAND with silt, moist (dense)			
	25			31				11		
250						ML	Gray, sandy SILT, very moist (medium dense)			
	30			19			Becomes wet	34		-200(84)
						SP-SM	Gray, medium SAND with silt and gravel, wet (very dense)			
	35			55				10		-200(7)
240										
	40									

DMG4 UNION_~1.GPJ DMLA.GDT 7/23/01

This log is part of the report prepared by Dames & Moore for this project and should be read together with the report. This summary applies only at the location of the exploration and at the time of drilling or excavation. Subsurface conditions may differ at other locations and may change at this location with time. Data presented are a simplification of actual conditions encountered.

LOG OF BORING

ONE UNION STATION PLAZA
LOS ANGELES, CALIFORNIA
FOR: CATELLUS DEVELOPMENT CORPORATION

URS

Elevation (ft)	Depth (ft)	SAMPLES Type	Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	40	◪		49				18		-200(7)
	45	◪		50/5"		ML	Gray, sandy SILT, wet (very dense)	12		
230										
	50	◪		50/5"						
							Borehole completed to a depth of 51 feet below the ground surface on 05/22/01. Borehole backfilled with soil cuttings.			
	55									
220										
	60									
	65									
210										
	70									
	75									
200										
	80									
	85									
190										
	90									

DMG4 UNION_~1.GPJ DMLA.GDT 7/23/01

URS

Existing Geotechnical Boring Logs

Law Crandall, 1997

BORING 1

DATE DRILLED: August 19, 1997
EQUIPMENT USED: 8" - Diameter Hollow Stem Auger
ELEVATION: 275**

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.		DESCRIPTION
								ML	3" Asphalt Paving ARTIFICIAL FILL (af) CLAYEY SILT - some bedrock fragments, some roots, light brown
		23.2	89	0		23	■		
270	5								
		19.5	104	0		14	■	ML	SANDY SILT - brown
								SP	ALLUVIUM (Qal) SAND - fine to coarse, some Gravel, few Cobbles (to 6" in size), brown
265	10	--	--	0		16	☒		Sample not recovered
260	15	1.7	106	0		41	■		
		9.9	105	0		105	■		Some Silt
255	20								
		31.0	85	>1000		65	■		SAN PEDRO FORMATION (Qsp) SILT - bedded, lenses of fine Sand, dark grey
250	25	--	--			100	☒		Sample not recovered
		--	--			75 for 4"	☒		Sample not recovered Some Clay
245	30								Some sulfur odor
		27.0	93	>1000		76	■		
240	35	30.3	90	>1000		79	■		
235	40	33.6	84	>1000		55	■		END OF BORING AT 40'.

* Number of blows required to drive the Crandall sampler 12 inches using a 140 pound hammer falling 30 inches.

** See Plot Plan for location of bench mark

*** OVA Gastechtor Model No. 1238 used

NOTE: Water not encountered.

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL

BORING 2

DATE DRILLED: August 19 and 21, 1997
EQUIPMENT USED: 24"-Diameter Bucket to 16½'
10"-Dia. Hollow Stem Auger to 40½'
ELEVATION: 275

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	USCS	DESCRIPTION
							SM	4" Asphalt Paving ARTIFICIAL FILL (af) SILTY SAND - fine to coarse, about 40% Gravel, few Cobbles (to 5" in size), some pieces of brick, brown
		12.1	114	0		1		
		4.8	119	0		1		
270	5						SW	ALLUVIUM (Qal) SAND - well graded, about 10% Gravel and Cobbles, light brownish grey
		2.3	111	0		4		
		2.1	122	20		6		
265	10							About 30% Gravel and Cobbles (to 6" in size)
		2.9	128	30		5		
260	15							
		8.1	133	0		12		Grey
255	20						SP-SM	SAND and SILTY SAND - fine to coarse, about 20% Gravel, light greyish brown
				0	100			
		16.4	116	0		68+	SW	SAN PEDRO FORMATION (Qsp) SAND - well graded, thin layers of Clayey Silt, some Gravel, grey to dark grey
250	25							
				0	90			Some fine Sand
245	30	24.1	98	0		47		SILT - bedded, lenses of fine Sand, dark grey
				0	100 for 8"			
240	35	25.6	100	0		65		
				0	50			
235	40							

* Number of blows required to drive the Crandall sampler 12 inches using a 1600 pound hammer falling 12 inches.

\+ Number of blows required to drive the Crandall sampler 12 inches using a 140 pound hammer falling 30 inches.

It is not warranted to be representative of subsurface conditions at other locations and times.

(CONTINUED ON FOLLOWING FIGURE)

LOG OF BORING

LAW/CRANDALL

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.

BORING 2 (Continued)

DATE DRILLED: August 19 and 21, 1997
EQUIPMENT USED: 24"-Diameter Bucket to 16½'
10"-Dia. Hollow Stem Auger to 40½'
ELEVATION: 275

END OF BORING AT 40½'.

NOTE: BUCKET BORING: Water seepage encountered during drilling at a depth of 14½'. Bucket boring terminated at a depth of 16½' due to caving and sloughing below water seepage.

HOLLOW STEM AUGER BORING: To obtain future water level measurement and sampling installed 4-inch-diameter PVC pipe to 40'. Pipe perforated between depths of 10' and 40'. Backfilled with sand to within 8' of ground surface and filled with concrete above 3'. A bentonite plug placed between depths of 3' and 8' of ground surface. Water level measured in the monitoring well at a depth of 14' on 8/26/97.

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

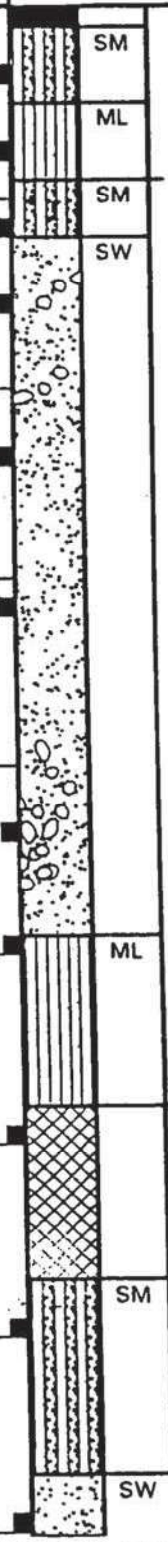
LAW/CRANDALL

BORING 3

DATE DRILLED: August 14, 1997
EQUIPMENT USED: 24"-Diameter Bucket to 17½'
10"-Dia. Hollow Stem Auger to 42'
ELEVATION: 277

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.
		6.9	114	30		1	■
		18.6	105	0		<1	■
		8.0	100	20		1	■
		2.6	122	50		5	■
		3.7	113	80		6	■
		11.4	116	0		2	■
		11.5	120	50		135	■
		33.0	90	60		75 for 10"	■
		27.1	96	200		70	■
		35.1	89	0		47	■
		15.0	111	0		65	■

Elevation scale: 275, 270, 265, 260, 255, 250, 245, 240
Depth scale: 5, 10, 15, 20, 25, 30, 35, 40



7" Asphalt Paving

ARTIFICIAL FILL (af)

SM — SILTY SAND - fine to coarse, some Clay, some Gravel, dark grey

ML — SANDY SILT - grey

ALLUVIUM (Qal)

SM — SILTY SAND - fine, some pieces of wood, light brown

SW — SAND - well graded, some Gravel and Cobbles (to 8" in size), light brownish grey

About 30% Gravel

Grey

ML — CLAYEY SILT - grey to dark grey

SAN PEDRO FORMATION (Qsp)

SILT - massive, dark grey

SM — SILTY SAND - fine, thin layers of Silty Clay, bluish grey to dark grey

SW — SAND - well graded, some lenses of Clayey Silt, dark grey

(CONTINUED ON FOLLOWING FIGURE)

It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL

FIGURE A-…

BORING 3 (Continued)

DATE DRILLED: August 14, 1997
EQUIPMENT USED: 24"-Diameter Bucket to 17½'
10"-Dia. Hollow Stem Auger to 42'
ELEVATION: 277

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.
235							

END OF BORING AT 42'.

NOTE: BUCKET BORING: Water seepage encountered during drilling at a depth of 15'. Water level measured after completion of drilling. Raveling from 6' to 15'. Bucket boring terminated at a depth of 17½' due to caving and sloughing below water.

HOLLOW STEM AUGER BORING: To obtain future water level measurement and sampling installed 4-inch-diameter PVC pipe to 42'. Pipe perforated between depths of 10' and 40'. Backfilled with sand to within 8' of ground surface and filled with concrete above 4'. A bentonite plug placed between depths of 4' and 8' of ground surface. Water level measured in the monitoring well at a depth of 15' on 8/26/97.

It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL

FIGURE A-1.3b

BORING 4

DATE DRILLED: August 20, 1997
EQUIPMENT USED: 8" - Diameter Hollow Stem Auger
ELEVATION: 276

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.
275							
		9.7	103	0		17	■
				0		35	■
	5						
270							
		2.8	107	0		36	■
	10						
265							
		42.8	79	0		10	■
	15						
260							
		6.2	124	5		57	■
	20						
		8.5	126	10		60	■
255							
		29.9	91	10		34	■
	25						
250							
		25.8	98	300		80	■
		25.4	100	190		80	■
	30						
245							
		26.0	100	250		75 for 4"	■
	35						
240							
		25.9	97	200		80	■
	40						

SM
3' Apshalt Paving
ARTIFICIAL FILL (af)
SILTY SAND - fine, some Gravel, brownish grey

SW
ALLUVIUM (Qal)
SAND - well graded, about 30% Gravel, light grey

* Number of blows required to drive the Crandall sampler 12 inches using a 140 pound hammer falling 30 inches.

Layer of Silty Clay

Some fine Sand

About 40% Gravel

SAN PEDRO FORMATION (Qsp)
SILT - bedded, lenses of fine Sand, dark grey

NOTE: Water seepege encountered during drilling at depths of 18' to 20', and 30'. Water level measured at a depth of 18' at completion of drilling.

END OF BORING AT 40'.

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL

FIGURE A-1.4

BORING 5

DATE DRILLED: August 13, 1997
EQUIPMENT USED: 24" - Diameter Bucket

ELEVATION: 278

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.
		--	--	0		4	
275		1.4	121	0		3	
	5	1.9	128	0		7	
270	10	3.3	103	0		2	
265		6.3	114	0		4	
	15						
260		29.5	97	0		1	
	20	37.4	85	0		<1	
255	25	35.1	87	0		<1	
250		14.0	109	10		9	
	30	25.7	100	100		11	
245		23.0	104	175		19	

SM — 3½" Asphalt Paving
ARTIFICIAL FILL (af) - SILTY SAND - fine, light grey

SW — ALLUVIUM (Qal)
SAND - well graded, about 40% Gravel, few Cobbles (to 5" in size), light grey

* Number of blows required to drive the Crandall sampler 12 inches using a 140 pound hammer falling 30 inches.

ML — CLAYEY SILT - dark grey

SW — SAN PEDRO FORMATION (Qsp)
SAND - well graded, lenses of Silty Sand and Clayey Silt, dark grey

SILT - bedded, lenses of fine Sand, dark grey

(BORING TERMINATED AT A DEPTH OF 33' DUE TO DIFFICULT DRILLING BELOW WATER).

NOTE: Water seepage encountered during drilling at a depth of 22'. Water level measured at a depth of 22' 30 minutes after completion of drilling. Raveling from 2' to 8' (to 3½' in diameter) and from 8' to 17' (to 2½' in diameter).

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL

FIGURE A-1.5

BORING 6

DATE DRILLED: August 19, 1997
EQUIPMENT USED: 24"-Diameter Bucket to 30'
10"-Dia. Hollow Stem Auger to 42'
ELEVATION: 278

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.	USCS	DESCRIPTION
									4" Asphalt Paving - 6" Brick floor
		1.4	116	50		2	■	SM	<u>ARTIFICIAL FILL (af)</u> SILTY SAND - fine to coarse, brown
275		1.7	103	75		1	■	SW	<u>ALLUVIUM (Qal)</u> SAND - well graded, about 40% Gravel, and Cobbles (to 5" in size), light brownish grey
	5	1.6	117	10		5	■		
270		1.8	115	0		6	■		
	10	2.7	99	0		5	■		
265		4.1	114	0		8	■		
	15	30.3	94	0		4	■		Thin layers of Sandy Silt
260	20	22.1	104	0		6	■		
255		7.8	118	0		1	■	SM	SILTY SAND - fine, lenses of Sandy Silt, few Gravel, grey
	25	18.3	114	0		2	■		
250	30	10.7	117	0		145 +	■	SW	SAND - well graded, about 15% Gravel and Cobbles, grey
245	35								
240	40	8.6	136	0		70	■		

* Number of blows required to drive the Crandall sampler 12 inches using a 1600 pound hammer falling 12 inches.

\+ Number of blows required to drive the Crandall sampler 12 inches using a 140 pound hammer falling 30 inches.

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

(CONTINUED ON FOLLOWING FIGURE)

LOG OF BORING

LAW/CRANDALL

FIGURE A-1.6a

BORING 6 (Continued)

DATE DRILLED: August 19, 1997
EQUIPMENT USED: 24"-Diameter Bucket to 30'
10"-Dia. Hollow Stem Auger to 42'
ELEVATION: 278

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.
					50 for 1"		

END OF BORING AT 42'.

NOTE: <u>BUCKET BORING:</u> Water seepage encountered during drilling at a depth of 24'. Water level measured at a depth of 24' 15 minutes after completion of drilling. Bucket boring terminated at a depth of 30' due to caving and sloughing.

<u>HOLLOW STEM AUGER BORING:</u> To obtain future water level measurement and sampling installed 4-inch-diameter PVC pipe to 42'. Pipe perforated between depths of 15' and 40'. Backfilled with sand to within 11' of ground surface and filled with concrete above 3'. A bentonite plug placed between depths of 3' and 11' of ground surface. Water level measured in the monitoring well at a depth of 22' on 8/26/97.

It is not warranted to be representative of, subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL

FIGURE A-1.6b

BORING 7

DATE DRILLED: August 18, 1997
EQUIPMENT USED: 8" - Diameter Hollow Stem Auger
ELEVATION: 278

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.
		13.4	109	0		13 for 6"	■
275							
	5	--	--	0		50 for 6"	⊠
270							
	10	2.9	105	0		73 for 11"	■
265		3.5	110	0		75 for 11"	■
	15						
260		1.9	98	0		50 for 4"	■
	20	37.4	82	0		26	■
255							
	25	30.1	92	0		62	■
250		24.3	97	0		69	■
	30	26.8	97	0		73	■
245							
	35	29.7	94	0		75	■
240							
	40	21.7	99	0		32	■

ML

5" Asphalt Paving
ARTIFICIAL FILL (af)
SANDY SILT - some Clay, some pieces of brick, brown

Pieces of concrete
Sample not recovered

SW

ALLUVIUM (Qal)
SAND - well graded, about 30% Gravel and Cobbles (to 6" size), light brown

* Number of blows required to drive the Crandall sampler 12 inches using a 140 pound hammer falling 30 inches.

SAN PEDRO FORMATION (Qsp)
SILT - bedded, lenses of Sand, dark grey

More Clay

NOTE: Water seepage encountered during drilling at a depth of 20'. Water level measured at a depth of 36' 5 minutes after completion of drilling.

END OF BORING AT 40'.

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL

FIGURE A-1.7

1020312200514722

BORING 8

DATE DRILLED: August 18, 1997
EQUIPMENT USED: 8" - Diameter Hollow Stem Auger
ELEVATION: 278

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	USCS	DESCRIPTION
							SM	3" Asphalt Paving ARTIFICIAL FILL (af) SILTY SAND - fine to medium, some Gravel, few Cobbles (to 6" in size), brown
275		8.2	108	0		51		
	5	--	--	0		39	SP	ALLUVIUM (Qal) SAND - fine to medium, some coarse, about 30% Gravel and Cobbles (to 6" in size), light brownish grey Sample not recovered
270		1.6	108	0		58		
	10	4.4	92	0		50 for 9"		Fine Sand, less Gravel
265				0	64 for 9"			
260	15	1.7	115	0		50 for 6"	SW	SAND - well graded, about 30% Gravel and Cobbles (to 6" in size), light brownish grey
	20			0	73 for 9"			
255		8.7	123	0		50 for 9"		
250	25			0	50 for 4"			
	30	13.3	117	0		57		
245				0	85 for 10"		ML	SANDY SILT - some Clay, light greyish green
	35	--	--			48		Sample not recovered
240				0	32			SAN PEDRO FORMATION (Qsp) SILT - bedded, lenses of fine Sand, dark grey
	40							

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

(CONTINUED ON FOLLOWING FIGURE)

LOG OF BORING

LAW/CRANDALL

FIGURE A-1.8a

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.	
		26.3	99	0		72		
235								
	45			0	54			
230		--	--	0		64		Sample not recovered
	50							
225				0	75			
	55							
		26.1	95	0		69		
220								
	60			0	50 for 6"			

BORING 8 (Continued)

DATE DRILLED: August 18, 1997
EQUIPMENT USED: 8" - Diameter Hollow Stem Auger
ELEVATION: 278

END OF BORING AT 61'.

NOTE: Water seeepage encountered during drilling at a depth of 23'. Water level measured at a depth of 38' 5 minutes after completion of drilling.

Note: The log of subsurface conditions shown herein applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL

FIGURE A 1.8b

BORING 9

DATE DRILLED: August 18, 1997
EQUIPMENT USED: 8" - Diameter Hollow Stem Auger
ELEVATION: 278

MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.		
						SM	3" Asphalt Paving ARTIFICIAL FILL (af) SILTY SAND - fine to coarse, some Gravel, grey and brown
12.6	106	0		34	■		
16.4	104	0		25	■		
--	--	0		50 for 6"	⊠	SW	ALLUVIUM (Qal) SAND - well graded, some Gravel and Cobbles (to 6" in size), light brownish grey Sample not recovered
2.6	--	0		75 for 11"	■		About 50% Gravel, some Cobbles (to 10" in size)
4.2	108	0		55	■	SP	SAND - fine, some Gravel, brown
--	--	0		50 for 3"	⊠		Sample not recovered
--	--	0		50 for 6"	⊠	SW	SAND - well graded, about 30% Gravel and Cobbles (to 6" in size), light grey Sample not recovered
3.9	107	0		53	■		
11.6	120	0		58	■		Layer of fine to medium Sand
8.2	125	0		40	■		
--	--	0		17	⊠		Sample not recovered
--	--	0		29	⊠		Sample not recovered

ELEVATION (ft.): 275, 270, 265, 260, 255, 250, 245, 240

DEPTH (ft.): 5, 10, 15, 20, 25, 30, 35, 40

Note: The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

(CONTINUED ON FOLLOWING FIGURE)

LOG OF BORING

LAW/CRANDALL

FIGURE A-1.9a

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.
				0	77		

BORING 9 (Continued)

DATE DRILLED: August 18, 1997
EQUIPMENT USED: 8" - Diameter Hollow Stem Auger

ELEVATION: 278

END OF BORING AT 41'.

NOTE: Water seepage encountered during drilling at a depth of 26'. Water level measured at a depth of 31' 10 minutes after completion of drilling.

LOG OF BORING

LAW/CRANDALL

FIGURE A-1.9b

BORING 10

DATE DRILLED: August 19, 1997
EQUIPMENT USED: 8" - Diameter Hollow Stem Auger
ELEVATION: 279

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.		Description
								SM	3" Asphalt Paving ARTIFICIAL FILL (af) SILTY SAND - fine to coarse, some Gravel, some pieces of brick, brown
		8.9	110	50		32			
								SP	ALLUVIUM (Qal) SAND - fine to medium, about 15% Gravel, light brown
275									
	5	2.0	86	10		16			
270		3.2	103	10		19			
	10								
				0	55			SW	SAND - well graded, about 20% Gravel and Cobbles, grey
265		4.8	121	0		55			
	15								
				0	60				
260									About 40% Gravel and Cobbles (to 6" in size)
	20	2.3	110	0		55			
255				0	50				
	25								
		13.4	117	0		49			
250				0	95				
	30								
		--	--			37			Sample not recovered
245									
	35	10.7	128	0		55			
								SP-SM	SAND and SILTY SAND - fine to coarse, about 10% Gravel, grey
240				0	70				
	40								

It is not warranted to be representative of subsurface conditions at other locations and times.

(CONTINUED ON FOLLOWING FIGURE)

LOG OF BORING

LAW/CRANDALL

BORING 10 (Continued)

DATE DRILLED: August 19, 1997
EQUIPMENT USED: 8" - Diameter Hollow Stem Auger
ELEVATION: 279

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	O.V.A.*** (ppm)	"N" VALUE STD.PEN.TEST	BLOW COUNT* (blows/ft.)	SAMPLE LOC.		DESCRIPTION
		18.5	110	0		75			
235	45							SW	SAND - well graded, about 10% Gravel and Cobbles, grey
				50	100 for 9"				
230	50	--	--			65			Sample not recovered
225	55			0	54				
220	60			0	97				END OF BORING AT 60½'.

NOTE: Water seepage encountered during drilling at a depth of 23'. Water level measured at a depth of 35½' 5 minutes after completion of drilling.

It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LAW/CRANDALL

FIGURE A-1.10b

Existing Geotechnical Boring Logs

J Byer, 1998

LOG OF BORING 1

PROJECT: JB:17776-B CATELLUS
DATE LOGGED: 6/4/98 BY: JWB
BORING TYPE: 8 Inch Hollow-Stem
SURFACE: 5 Inch AC Pavement
REPORT DATE: 7/9/98 ELEVATION: 276.4

Depth (Feet)	Moisture Content %	Dry Density (pcf)	Blow Count	Sample Type	Symbol USCS	Description
0						4 Inches Asphalt
	26.0	96.9	15*	R	SC	FILL: Clayey Sand, dark brown, moist, dense, some debris, asphalt, concrete, brick
					SC	ALLUVIUM: Clayey Sand, dark brown, moist, medium dense, porous, grades to sand, light brown, moist, dense
5	6.2	119.5	43	R	SM	Silty Sand, light and dark brown, moist, medium dense with round granite cobbles
	3.1	—	43	R		Silty Sand, light brown, moist, dense
						Gravelly layers with coarse sand
10	33.6	80.9	9	R		Sandy Silt, gray green, moist, firm, some peat
	4.6	112.3	40	R	SG	Gravelly Sand, light brown, moist, dense
15	36.7	83.5	25	R		Water at 16 Feet
					ML	Clayey Silt, light bluish gray, saturated, soft
					SG	Gravelly Sand, gray, saturated, dense
	9.8	118.4	50	R		
20	10.6	114.7	43	R	GW	Sandy Gravel, gray, saturated, dense, rounded granite clasts
						*140 Pound hammer, 30 Inch drop
	12.0	125.9	45	R		
25						

LOG OF BORING 1 (Continued)

PROJECT: JB:17776-B CATELLUS
DATE LOGGED: 6/4/98 BY: JWB
BORING TYPE: 8 Inch Hollow-Stem
SURFACE: Asphalt Parking Lot
REPORT DATE: 7/9/98 ELEVATION: 276.4

Depth (feet)	Moisture Content %	Dry Density (pcf)	Blow Count	Sample Type	Symbol USCS	Description
26	31.2	93.0	50	R		**BEDROCK:** Siltstone, blue gray, saturated, bedded, with layers of fine grained sandstone, soft to very firm
	28.2	96.4	50/9	R		Hydrogen Sulfide odor
30						
						Siltstone with sandstone interbeds, firmer
	29.9	94.3	50/11	R		
35						slow drilling
	34.6	87.1	50/9	R		Siltstone continues
40						
45						
50						*End at 50 Feet; Water at 16 Feet.* Boring developed as 2 inch diameter monitoring well, sand to 15 feet, bentonite plug to top.

LOG OF BORING 2

PROJECT: JB:17776-B CATELLUS
DATE LOGGED: 6/4/98 BY: JWB
BORING TYPE: 8 Inch Hollow-Stem
SURFACE: 5 Inch AC Pavement
REPORT DATE: 7/9/98 ELEVATION: 276.4

Depth (feet)	Moisture Content %	Dry Density (pcf)	Blow Count	Sample Type	Symbol USCS	Description
0					SM	**FILL:** Silty Sand, dark brown, moist, dense, with rock fragments and brick
5					SG	**ALLUVIUM:** Gravelly Sand, light brown, moist, dense
10					SW	grades to fine grained sand with gravel
12						
15					GW	Gravel and Cobble layer, 4 feet thick, hard drilling
20					SW	
23						Water at 23 Feet
25						

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LOG OF BORING 2 (Continued)

PROJECT: JB17776-B CATELLUS

DATE LOGGED: 6/4/98 BY: JWB

BORING TYPE: 8 Inch Hollow-Stem

SURFACE: 5 Inch AC Pavement

REPORT DATE: 7/9/98 ELEVATION: 276.4

Depth (feet)	Moisture Content %	Dry Density (pcf)	Blow Count	Sample Type	Symbol USCS	Description
26						
30						
32					ML	**WEATHERED BEDROCK:** Clayey Silt, greenish gray, saturated, soft to firm
35						
36						**BEDROCK:** Siltstone, blue gray, very moist, bedded, fine sandstone layers
38						*End at 38 Feet; Water at 23 Feet; Fill to 6 Feet.*

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